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Institutional Investors and ESG Preferences

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Abstract

We examine the effect of multiple environmental, social and governance (ESG) scores on institutional investor ownership of firms and investor portfolio weightings. We are also the first to analyze the three individual components of ESG rankings to estimate the relative preferences of institutional investors. Using a unique panel dataset covering US companies and institutional investor portfolios over the 2010-2019 period, we find that while investors are driven to add high-quality ESG companies to their portfolios, there is a negative relationship with ESG when it comes to taking large ownership stakes. Furthermore, ESG scores are negatively related to the portfolio weightings of institutional investors, which raises concerns of greenwashing. Our analysis of individual ESG scores points to significantly larger effects of G scores in terms of holdings, and G is the only score with no negative impact on portfolio weightings. Finally, in support of systematic stewardship theory, top institutional investors allocate higher proportions of their portfolios to firms with high ESG ratings. Our results are robust to the use of a difference-in-differences analysis addressing endogeneity concerns.

Keywords: ESG, Sustainable Finance, Institutional Investors, Financial Performance, Disclosure

JEL Classifications: G12, G14, G15, G23, G32, M1

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Institutional Investors and ESG Preferences

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1. Introduction

The last decade has seen an explosion in institutional investor demand for environmental, social and governance (ESG) investments. According to Morningstar (2023), the amount of net inflows into the global universe of sustainable or ESG funds exceeded USD 63 billion in 2023. Data from the Global Sustainable Investment Alliance (2021) indicate that total sustainable investment assets in Europe increased from USD 12 trillion at the start of 2020 to USD 14 trillion at the start of 2022, and the amount of global sustainable assets under management exceeded USD 30 trillion in 2022. Moreover, the number of UN Principles for Responsible Investment (PRI) signatories rose by 26% in 2022, reaching a total of 4,902 investors with an estimated total assets under management of USD 121.3 trillion (PRI, 2022). Given researchers' and policy makers' increasing interest in ESG investing, we examine investor ESG preferences and investment decisions, as reflected in ownership holdings and portfolio weights.

The nascent literature has offered two contrasting views on investors' preferences for ESG investment (Gillan et al. (2021); Hornuf and Yuksel (2023); Hong and Shore (2023); Friede et al. (2015); Kim et al. (2019); Drobetz et al. (2023); Velte (2023); and Ceccarelli et al. (2021)). Starks (2023) describes the central difference of these two views in terms of its connection to pecuniary and non-pecuniary motivations. The first view holds that there is a relationship between ESG and corporate financial performance and therefore "value." Early studies provide considerable evidence on the impact of ESG on returns (Friede et al., 2015). More-recent studies, however, have found mixed results (Whelan et al., 2021; Gillan et al., 2021). Our analysis of investor preferences, proxied by ownership holdings and portfolio weightings, controls for firm financial performance in order to consider this motivation.

The second view holds that investor demand for ESG investments is driven by factors other than the connection between ESG and firm performance, what Starks (2023) would group under the term "values." A first version of this view holds that a subset of investors with a non-pecuniary component of utility are willing to accept lower potential returns in exchange for holding firms with high ESG quality (Fama and French, 2007; Pastor et al., 2021; Pedersen et al., 2021; Oehmke and Opp, 2023). This may explain the empirical evidence of

the underperformance of ESG mutual funds and the flow of funds into and out of ESG funds as a function of ESG performance (Hartzmark and Sussman, 2019; Renneboog et al., 2008a, 2008b). Another version on this view suggests that some funds cater to a clientele with non-pecuniary preferences for ESG. This view is similar to Allen et al.'s (2002) argument for high dividend-yield stocks. Such asset managers are incentivized to adopt ESG investment strategies because they can increase their management fees as they attract this clientele and grow assets under management.[1]

A final version on the non-pecuniary benefits view applies to large asset managers' preferences for ESG investments. Albuquerque et al. (2020) argue that ESG can be used to diversify systemic risk. Following Gordon (2022), since investors want to maximize risk-adjusted returns, it is in the asset manager's interest to support ESG as it reduces systemic risk. In this sense, "systemic stewardship" ends up serving investor and social welfare. In support of this arguments, Fichtner et al. (2017) report that large asset managers are much less exposed to systemic risks and are, therefore, motivated to reduce the systemic risks in their portfolios that are associated with ESG factors (e.g., climate risk). Similarly, there is also research suggesting that improvements in ESG metrics are associated with decreased risk (Shafer and Szado, 2019; Hanson et al., 2017; Hoepner et al., 2019; Bialkowski and Starks, 2016).

We draw on arguments based on clientele effects and systematic stewardship theory to examine the effect of multiple environmental, social and governance (ESG) scores on institutional investor ownership of firms and investors' portfolio weightings. More specifically, we investigate the connection between these metrics and the ESG quality of companies and its individual ESG component scores. We also contrast the results using the Bloomberg disclosure-based scores and the subjective Sustainalytics ratings.

We put together a rich panel data set containing data on 853 US firms over the 2010-2019 period, with a total of 6407 firm-year observations, to study how ESG preferences influence the portfolio holdings and weightings of institutional investors. To estimate investor preferences, we calculate several measures of institutional investor ownership for each firm:

[1] This argument is similar to the one in Lewellen and Lewellen (2022) in the context of institutional investors and their engagement in corporate governance.

the total number of institutional investors in each firm; the total percentage of a firm's outstanding shares held by institutional investors; the mean ownership percentage of institutional investors in the firm; and the shareholder concentration of institutional investors (using the HHI measurement). To complement these measures, we look into each institutional investor portfolio and calculate the average portfolio weighting of each individual firm investment. This number provides us with an alternative way of looking at the investors' relative commitment to ESG in their portfolios.

Our first set of findings shows that, controlling for firm performance, institutional investors show significant preference for firms with high ESG rankings. These results are statistically significant for the ESG ratings from both Bloomberg and Sustainalytics, but the disclosure-based Bloomberg ESG scores are more strongly correlated than the subjective Sustainalytics ratings. One potential reason for this is the different methodologies and data used by the rating agencies, a finding that is consistent with recent work on ratings (Berg et al., 2021; Billio et al., 2022). Our results suggest that ESG disclosure-based measures play a more important role than quality-based measures in determining institutional investor ESG preferences.

We continue our analysis examining the individual components of ESG rankings to estimate the relative preferences of institutional investors among the three ESG dimensions. This issue relates to the deeper debate about what is behind ESG (Starks (2023), Pollman (2022)). Although the term ESG has the benefit of appealing to a large set of populations, it also masks its true underlining drivers. A central component of ESG is still deeply rooted in the original governance factors that the early literature linked to higher valuations and returns. Governance could therefore be a central factor attracting investors.

Our results show that the Governance (G) dimension is the most important factor in investors' choice of portfolio companies. Specifically, these results also suggest that G is responsible for most of the statistical and economic significance of ESG effects on institutional ownership. In fact, G is the only dimension with a non-negative effect on investor portfolio weightings: institutional investors have lower weights on high E and S stocks but keep those with high G. The disaggregated results for Bloomberg and Sustainalytics mimic the overall ESG score findings described above. A striking finding is that the coefficient on the Bloomberg Governance rating is more than six times larger than

that of the Bloomberg Environmental rating and three times larger than that of the Social rating.

In contrast to the previous findings, our second set of results reveal that high ESG scores are associated with lower concentrations of ownership stakes by institutional investors. The lower ownership concentration of institutional investors on high ESG companies is the outcome of a greater number of institutional investors and a non-significant overall percentage ownership of these investors. We also find a negative relationship between ESG ratings and portfolio weightings of institutional investors. The lower portfolio weightings is significant for high E and S firms.

Overall, the pattern of results suggest that the average asset manager is present in high ESG stocks but takes small stakes in these firms, particularly in those with high E and S scores. Being "present" in high ESG quality firms is way to attract a clientele of investors who have a non-pecuniary motive for investing in ESG. However, the average institutional investor tends to weight its portfolio away from high ESG firms. The pattern is suggestive of window-dressing and potential evidence of "greenwashing" by funds (Parise and Rubin, 2023). Our findings also provide some support for the clientele, as investors hold a label to attract investors who are willing to forgo returns due to their ESG preferences (Fama and French, 2007), lower costs of diversification (Heinkel, 2001; Edmans et al, 2022), or both.

In addition to concerns about institutional investor greenwashing, our results could indicate an "ESG stagnation" problem to the extent that investors with small stakes tend to eschew presenting or voting on ESG shareholder proposals (Brav et al., 2019). Although institutional ownership is associated with ESG improvements (Dyck et al., 2019; Wang and Sun, 2022), there is a danger that, as increased ESG leads to lower shareholder concentration, institutional investors will find it increasingly difficult or be disincentivized to enact further ESG improvements in the long run.

We test the robustness of our results in several ways, including different regression specifications and controls. We also confirm governance as the most important factor through the use of an analysis using principal components. Importantly, we complement our findings performing two series of additional tests that bring to light other interesting patterns in our data. First, we test robustness to the size of the institutional investor by segmenting out the

ownership pattern of the five largest institutional investors in our dataset (i.e., Blackrock, State Street, Vanguard, Fidelity, and Capital Group). We find that most trends described above also hold for the top five investors. Yet, econometric analysis finds that these large investors hold larger stakes in higher ESG firms, particularly those with higher G scores. These differences could be viewed as supportive of the systematic stewardship theory (Gordon, 2022), which proposes that large institutional investors with long-term horizons can use their voice over companies to help promote ESG-related advocacy (Fichtner and Heemskerk, 2020).

The final set of robustness tests addresses endogeneity concerns. Velte (2023) points to significant endogeneity concerns of previous papers in this area and urges for regression methods to tackle this issue. Although we use a variety of methods to identify the relationships described above, we acknowledge that establishing causality is difficult. For this reason, we address the potential endogeneity of our results in two ways. First, since the ESG quality of companies may be a driver of investor choices, we test for endogeneity using a firm ESG shock. Following the method in Kim et al. (2023), we use a staggered difference-in-differences analysis to examine a legal shock to firms' climate risk reporting disclosures. Our analysis is based on the introduction of the US Securities and Exchange (SEC) 2010 Climate Change Risk (CCR) disclosure rule, which impacts public companies' CCR reporting in their 10-K Forms. Our results show that companies' voluntary CCR disclosures in their 10-K Forms amplify the impact of ESG ratings on investor holdings.

The second, and complementary, set of endogeneity tests considers a potential shock to the ESG preferences of institutional investors. Here, we follow the method in Liang et al. (2022) and examine investor preferences in relation to ESG before and after institutional investors sign the UN Principles of Responsible Investing (UN PRI). Our results show that, while ESG was an important determinant of portfolio weights before these institutional investors signed the UN PRI, ESG ratings became an even more important factor after their signing.

Our study contributes to the growing literature exploring the relationship between institutional investor ownership and ESG scores (Barko et al., 2018; Amel-Zadeh and Serafeim, 2017; Eccles et al., 2011; Hanson et al., 2017; Gibson et al., 2021). We contribute to this literature by providing novel evidence of various measurements of institutional investor ownership and portfolio weightings. The use of multiple measures based on firm

ownership by institutions and investor portfolio weights, provides new results that point towards window-dressing and greenwashing by the average institutions investor. We rationalize these findings based on pecuniary and non-pecuniary benefits from an ESG investor strategy.

Second, our results are related to the literature that examines the role of composite ESG scores and the individual E, S, and G sub-dimensions in the financial performance of companies around the world. We expand on these studies with the first analysis of the effects of individual ESG components on the ownership structure and the portfolio allocation process. The overall picture of our findings suggests a degree of window-dressing as investors hold high G-score companies in detriment of the E and S components. This pattern would be consistent with the findings in the corporate governance literature that point to better performance of better-governed firms. We also contribute to this literature by using secondary data, rather than a global index, to study the effects of the individual E, S, and G dimensions on US companies.

Finally, this study contributes to the body of literature examining the effects of ESG disclosure. Prior evidence on the value-added role of ESG disclosure has mostly focused on to its positive effects on financial performance (Dhaliwal et al., 2011). Related studies examine whether mandating ESG disclosure improves firms' informational environment and environmental performance (Kruger et al., 2021; Jouvenot and Kruger, 2012). Wen et al. (2022) find that ESG disclosure quality helps increase firms' financial performance and reduces downside risk. However little attention has been given to whether ESG disclosure quality can drive increased institutional ownership stakes. We provide new insights contrasting the differences between ESG disclosure-based and quality-based scores in terms of institutional investor preferences. Our findings reveal an important set of facts relating ESG disclosure-based ratings and institutional investor behavior.

The remainder of the paper is organized as follows. Section 2 develops further our hypotheses in connection to the previous literature. Section 3 introduces the data and explains our empirical methodology. Section 4 presents and analyzes the results of institutional investors' relative preferences for the overall ESG scores and the three separate dimensions of ESG. Section 5 offers a set of robustness checks and endogeneity tests. Section 6

concludes the paper with further implications of our findings and highlights the potential of additional work in the area.

2. Literature review and hypothesis development

There is considerable evidence that institutional investors widely incorporate ESG considerations into their portfolio management activities (Barko et al., 2018; Amel-Zadeh and Serafeim, 2017; Eccles et al., 2011; Hanson et al., 2017). While various types of institutional investors are involved in ESG investment, their motivations differ. Velte (2023) argues that institutional investors are heterogeneous, indicating that differences in categories of investors (e.g., long-term sustainable, foreign, or independent institutions) will likely influence their holdings. Supporting this view, Drobetz et al. (2023) and Hong and Shore (2023) show that specific types of institutional investors (e.g., long-term investors such as pension funds and university endowments) tend to be more concerned with social norms. In contrast, hedge funds and other short-term institutions that are likely to have pecuniary motives. Starks (2023) and Pedersen et al. (2023) further show that ESG-oriented investors are driven by values and value.

Recent research shows that institutional investors consider ESG in their investment decision-making processes for two main reasons. Starks (2023) describes these contrasting set of reasons in connection to investor pecuniary and non-pecuniary motives. The first motive for investors to incorporate ESG into their asset management strategies is a potential relationship between ESG and superior financial performance (Statman and Glushkov, 2009; Barnett and Salomon, 2006; Sherwood and Pollard, 2018; Hanson et al., 2017; Whelan et al., 2021). Superior financial performance due to ESG quality may be explained by higher costs of capital faced by firms with poor ESG characteristics, if the subset of investors with non-pecuniary utility functions is sufficiently large. As these investors with non-pecuniary preferences for ESG divest from companies with poor ESG credentials, the remaining investors in those companies need to hold more of those companies' securities than is optimal from a portfolio diversification standpoint. Due to the resulting inefficient diversification, investors left holding these companies' securities will demand higher risk premia, thereby driving up the costs of capital for such firms (Heinkel, 2001; Edmans et al., 2022).

The second set of reason behind the holding of high ESG stocks involves the existence of a subset of investors with a non-pecuniary component in their utility functios. This non-pecuniary component makes them willing to accept investments with poorer financial performance as long as these investments have positive ESG characteristics (Fama and French, 2007; Riedl and Smeets, 2017; Renneboog et al., 2008a, 2008b), or the investors are driven by a desire to influence firms' ESG policies (Starks et al., 2017; Gibson and Kruger, 2018; Kim et al., 2019; Gibson et al., 2020). This reason may help explain the empirical results documenting the relative underperformance of ESG mutual funds, as well as the flow of funds into and out of ESG funds as a function of ESG performance (Hartzmark and Sussman, 2019; Renneboog et al., 2008a, 2008b).

A related take on this view argues that given a clientele with such preferences, asset managers could be incentivized to adopt ESG strategies for some or all of their investments to attract ESG-motivated investors. Additional evidence along these lines shows that asset managers can increase their total fee revenues more by growing assets under management, which appeal to this clientele, than by increasing the value of existing investments (Lewellen and Lewellen, 2022). The higher costs of capital for companies with poor ESG quality may also appeal to activist investors who can earn superior returns by investing in poor-ESG companies and push them to improve their ESG performance and, consequently, their financial valuations (see Gilson and Gordon (2013); Christie (2021); and Barko et al.(2018)). Related empirical evidence shows that improvements in ESG metrics are associated with lower costs of capital and decreased risks, potentially due to decreased regulatory, litigation, and reputational risks faced by firms with high ESG quality (Shafer and Szado, 2019; Hanson et al., 2017; Hoepner et al., 2019; Bialkowski and Starks, 2016; and Albuquerque et al., 2020).

Finally, expanding on the non-pecuniary view, very large asset managers, such as the Big Three (State Street, Blackrock, and Vanguard), may prefer investments with high ESG quality as a way to reduce their exposure to systemic risks. Very large asset managers are so well-diversified across industries and the economy as a whole (Fichtner et al., 2017) that they are much less exposed to firm-specific risks and are, therefore, motivated to reduce their portfolio systemic risks associated with ESG factors (e.g., climate risk). This is the central argument behind the theory of systematic stewardship proposed in Gordon (2022).

Given the various motives for institutional investors to consider ESG in their investments and, consequently, the incentives for firms to consider ESG in order to attract different categories of investors, we propose the hypothesis that ESG scores are positively related to the number of investors but inversely related their actual "skin in the game."

A second level of questions that we would like to address, relates to the relative attractiveness of each of the individual components of ESG quality. This issue relates to the deeper debate about what is behind ESG (Starks, 2023; Pollman, 2022). Although the ESG term has the benefit of appealing to a large set of populations, it also masks its true underlining drivers. One can argue that ESG is a development on the analysis of long-term factors that affect firm value (Edmans, 2022). Chronologically, the finance literature on this issue started with corporate governance broadening to corporate social responsibility (CSR) before its enlargement to ESG to incorporate the sustainability and responsible investing agenda.

Today, a central component of ESG is still deeply rooted in the original governance factors that the early literature linked to higher valuations and returns. Beyond the impact of better corporate governance embedded in investor protection in regulation (La Porta et al., 1997, 1998, 2006, 2014), the prior literature has established a link between superior financial performance and good firm governance characteristics (Gompers et al., 2003; Bebchuk et al., 2009; and Bebchuck et al., 2013). Previous empirical studies have established a strong relationship between firm-level differences in governance and financial performance even within the same countries (Beltratti and Stulz, 2009; Doidge et al., 2006). Furthermore, given the importance of voice to institutional investors (McCahery et al., 2016), one could also speculate that governance is a key ingredient allowing investors to voice their preferences for firm policy while considering long-term value creation and social and environmental sustainability goals. Based on all of this evidence, we could expect firm-level differences in the G component to still impact institutional investor holdings and financial performance despite the relatively high level of overall governance among US firms.

Our analysis aims to study the impact of the E, S and G scores individually and gauge the relative impact of each of these factors in strategic asset-allocation decisions of institutional investors, even among US-listed firms. Given the amount of evidence reviewed above, we propose the hypothesis that the G scores will have a significant positive relationship with institutional investor ownership stakes in firms and investor portfolio weightings. In terms of

Environmental and Social scores, there seems to be evidence of a general positive relationship between institutional investor ownership and E and S performance over time (Dyck et al. 2019). While systematic stewardship (Gordon, 2022) may explain this relationship for very large investors, other studies illustrates the heterogenous nature of institutional investors with respect to E and S (Velte, 2023; Drobetz et al., 2023; Hong and Shore, 2023). Given the lack of a clear theoretical framework for institutional investor preferences towards E and S, we would like to remain agnostic as to the proposed relationship with institutional investor holdings.

A third level of analysis in our paper relates to the measurement of ESG. To measure ESG, we consider the divergence among ratings examined in the literature. Prior studies have sought to examine correlation or divergence among CSR ratings (Chatterji and Toffel, 2010). For instance, competing environmental ratings are strongly correlated (Delmas et al., 2013). Along the same lines, Daines et al. (2010), for example, find that corporate governance ratings have little predictive power for performance, but slightly more for ratings based on financial disclosures rather than on qualitative information on corporate governance. Similarly, numerous researchers find that market intermediaries often influence ESG ratings and that changes in firm performance often precede the publication of a ratings change, thus making the ratings less useful for investors since they convey information already absorbed by market prices (Doh et al., 2010).

Recent studies show the difficulty in creating a standard and objective framework for measuring, reporting, and evaluating ESG data metrics (e.g., Amel-Zadeh and Serafeim (2017), Kotsantonis and Serafeim (2019), Berg et al. (2020), Boffo and Patalano (2020), Christensen et al. (2022) and Starks (2023)). While Eccles and Stroehle (2018) show that some of the differences in ratings can be attributed to the "mission" and origins of the rating provider (i.e. “values-oriented” versus “value-driven”), Gibson et al. (2019) find that the discrepancies among ESG ratings are due to differences in the legal systems of the countries in which ratings providers are based. The latter view, however, overlooks the globalized nature of the ESG ratings market and the cross-country nature of some ratings due to partnerships between rating providers located in different countries (e.g., the Robeco index is managed jointly by S&P and Robeco). Therefore, regardless of the origins of the differences, divergence is a significant issue when comparing ESG ratings data.

The two indices we use in this paper differ in terms of their content and methodology to come up with ESG rankings. Comparing the two data providers we examine, there is a sharp contrast between the disclosure-based Bloomberg indices and the quality-based Sustainalytics scores (see the following section for more details). We believe that the Bloomberg ESG disclosure indices are the more relevant. In comparing the relative importance of the subjective Sustainalytics index and the objective Bloomberg disclosure index, we posit that the primary driver of investor interest is the pure disclosure of ESG data. One reason is that Bloomberg provides the most objective set of ratings since they simply measure how much data along each dimension of ESG a company discloses. Given the difficulty of relying on one particular ESG rating provider, investors who are interested in these data should find companies that disclose the most data to be the most attractive. Another reason is the absence of standardized and comparable ESG ratings. In this setting, investors might prefer to have the option of evaluating company ESG criteria themselves in order to supplement or complement third- party ESG ratings. Finally, in the absence of mandatory ESG disclosure guidelines and objective ESG ratings, investors may view companies' self-disclosure of high levels of ESG data as a signal of high quality (Lopez de Silanes et al., 2019). Therefore, under the theory that hard disclosures have a higher impact that subjective ratings which are more prone to biases, we propose the hypothesis that ESG disclosure ratings are more significant than quality ratings in driving interest from investors.

3. Data and Methodology

This section describes our methodology and dataset construction. It also provides an overview of the summary statistics of our dataset.

3.1. Measuring ESG

We have obtained data on ESG composite ratings and the component ratings for each dimension— environmental (E), social (S), and governance (G) —from two of the most well-known data providers: Bloomberg and Sustainalytics.

The Bloomberg ESG disclosure score and its component scores are not quality measures; these ratings measure only the extent of a company's ESG-related data disclosure. They are Bloomberg proprietary scores that measure how many of the ESG-related datapoints collected by Bloomberg a company actually discloses. Bloomberg states that "each data point is weighted in terms of importance" and that "the score is also tailored to different industry sectors. In this way, each company is only evaluated in terms of the data that is relevant to its industry sector" (Bloomberg Financial Terminal, 2019). While the Bloomberg ESG disclosure scores measure the amount of ESG data a company reports publicly and not the quality of a company's performance on any data point, previous research has shown that part of being a high-quality ESG company is the transparency and disclosure of ESG quality. Lopez de Silanes et al. (2019) establish that, given the largely voluntary nature of ESG disclosure requirements and the lack of standardization, there exists a strong correlation between ESG disclosure and ESG quality.

In contrast, the Sustainalytics ESG quality ranking is "assigned to the company based on its environmental, social and governance (ESG) total score relative to its industry peers" (Bloomberg Financial Terminal, 2019). The Sustainalytics ESG ranking and its components are meant to encompass a company's level of preparedness, disclosure and involvement in controversy across all three ESG themes.

In the context of our research question, the Bloomberg ESG disclosure score comes across as a more objective and transparent measure than that of Sustainalytics: it does not assign subjective quality judgements to the individual ESG criteria, aside from the relative importance of the data point itself, and does not incorporate value judgements. While widely-published and used by industry, Sustainalytics' scores, seem to contain significant value judgements as to what constitutes a company's "good" or "poor" performance with regard to ESG. Previous results in the area have shown to be highly sensitive to the ESG ratings provider being used. Therefore, our motivation for using different ratings providers is to demonstrate the sensitivity of our results to the particular rating.

3.2. Dataset construction

In constructing our dataset, we screened for US publicly listed companies for which the ESG composite and all three ESG component ratings from Bloomberg and Sustainalytics were available for any of the years between 2010 and 2019. Any company-year observation that did not have a complete set of ratings from both providers was excluded. We also excluded any company-year observation that did not have the complete financial and market data or ownership information necessary to calculate the dependent and independent variables used in our econometric analysis. We also accessed ownership data available through the Refinitiv Database to match institutional holding data to each company-year observation.

From the above sources, we calculated several proxies for institutional investor presence and ownership for each of the firms in our final sample. In particular, we computed: (i) the natural logarithm of the number of institutional investors; (ii) the proportion of all outstanding shares in the firm held by institutional investors; (iii) the mean proportion of outstanding shares held by institutional investors in the company; and (iv) the HHI measure of ownership concentration. The HHI of ownership concentration is computed by summing the square of the proportion of outstanding shares held by each institutional investor in the firm. Therefore, a higher HHI indicates a higher number of shares held by a smaller number of investors. Finally, using data from each institutional investor portfolio, we computed the mean proportion of the portfolio (i.e., the average portfolio weight) allocated by each institutional investor to each firm. Appendix Table A provides detailed definitions of each variable used in the paper.

Financial and accounting data to calculate control variables for our econometric tests were taken from Refinitiv and CRSP. We chose a set of control variables that previous papers have shown to have an effect on institutional investor ownership (see Gompers and Metrick, 2001; Yan and Zhang, 2009; Döring et al., 2021). Our firm-level control variables include: (i) the natural logarithm of the firm's market capitalization; (ii) the natural logarithm of firm age; (iii) the dividend yield; (iv) the market-to-book ratio; and (v) the annual return and (vi) volatility of the firm's common equity. We use dummy variables to control for industry-level and year fixed effects. This is particularly important, as ESG ratings are adjusted periodically and adapted to each industry.

3.2. Descriptive statistics of the final sample

Table 1 shows our screening steps and provides summary statistics of the surviving companies at each step. We use t-tests and z-tests to test for statistically significant differences in means and medians, respectively, between samples before and after each screening criterion was applied. Table 1 shows that there are statistically significant differences in the mean and median market capitalization after the first screening criterion is applied, but not for any subsequent sample screenings. There are no statistically significant differences in mean or median market-to-book ratios between the sample sets of any screening criteria. This information illustrates that despite some initial drift towards larger companies, the characteristics of our final firm sample population are generally stable throughout our screening.

Table 2 contains summary statistics for the variables used in our regressions. Some of these numbers will be used to calculate the economic magnitudes of ESG on institutional investor ownership measures. Appendix Table B shows additional characteristics of our dataset, breaking down the number of total observations and distinct firms by year. Meanwhile, Appendix Table C presents correlation coefficients for all variables used in our regressions. It is of particular interest to notice that the Bloomberg and Sustainalytics ESG scores are statistically significantly correlated, but the highest correlation is 0.66 and some of the correlations amongst components are as low as 0.15.

4. Base Results

We begin our analysis by examining the relative preferences of institutional investors for the overall ESG indices and their three underlying dimensions. Specifically, we look at how investors allocate their capital among companies by considering firm characteristics and their ESG ratings. We conduct our analysis using the ESG ratings of Bloomberg and Sustainalytics across all tables.

In Tables 3 to 7, we examine four measures of firm-level institutional ownership, and a measure of institutional investor's portfolio weights derived from the composition of each investor's holdings. The five dependent variables are: (i) the natural logarithm of the number of institutional investors in each firm; (ii) the total proportion of all shares held by

institutional investors; (iii) the mean proportion of outstanding shares held by each institutional investor; (iv) the HHI measure of ownership concentration in each firm; and (v) the mean portfolio weight that each institutional investor allocates to a specific firm.

The regression analysis is designed to test the extent to which investors are drawn to firms based on their ESG scores and their individual components controlling for other firm characteristics that may affect investors' relative portfolio allocations, drawn from previous literature, as well as industry and year fixed effects. To estimate the impact of ESG ratings on institutional investor preferences, we regress several models in each table. The first model uses the composite ESG ratings from each of our two ratings providers. We then regress their separate environmental, social, and governance component scores one at a time. We end with the analysis with a combined model including the E, S, and G component scores at the same time. The last specification may be subject to multicolinearity problems to the extent that components are correlated with each other (see Appendix Table C), but we run it nonetheless in the spirit of a "race" amongst components.[2] We split our base results in two subsections to facilitate the conceptual analysis of our findings.

4.1. ESG and overall presence and holdings of institutional investors

In Tables 3 and 4, we present the first set of econometric results analyzing the impact of ESG scores on the natural logarithm of the number of institutional investors in each firm (Table 3), and the total proportion of shares held by all institutional investors in each company (Table 4).

The results in Table 3 show that, across all models, we see that institutional investors have significant preferences for firms with high ESG rankings or, stated differently, firms with high ESG scores attract a larger number of institutional investors. The regression coefficients are positive and statistically significant for the composite ESG scores as well as for each of the component scores from both ratings providers.

[2] In the robustness section, we use principal component analysis to further explore the impact of different components of the ESG index.

However, the Bloomberg ESG scores are more strongly correlated with the number of institutional owners than are the Sustainalytics ratings. In terms of economic magnitude, a one-standard-deviation increase in the Bloomberg ESG score results in an 8.1% standard deviation increase in the log number of institutional investors. This is twice as large an economic effect to that of the Sustainalytics ESG score. The fact that Bloomberg disclosure scores have the strongest relation to holdings may indicate that investors prefer holding companies with strong ESG disclosure records. We already discussed some potential explanations for this finding in the introduction and in section 2 of this paper. The evidence points to a preference for objective scores but also for the more quality or values-oriented quality measure included in the Sustainalytics ratings (see Eccles and Stroehle (2018) on the values-oriented versus value-based approach of ratings providers).

Table 3 also allows us to look at the relative preferences of institutional investors among the three dimensions of ESG. A comparison of the coefficients across the E, S and G components shows Governance as the strongest dimension for both the Bloomberg and the Sustainalytics ratings. We note that the coefficient on the Bloomberg governance rating is more than six times that of the Bloomberg environmental rating and three times that of the social rating. The coefficients on the Sustainalytics ratings clearly indicate a similar ranking of G over S over E. In terms of economic magnitude, a one-standard-deviation increase in the Bloomberg governance score results in a 8.4% standard deviation increase in the log number of institutional investors. This magnitude is close to 30% larger than that of the Bloomberg social score and almost 40% larger than that of the Bloomberg environmental score. The economic magnitudes of all Sustainalytics scores are close to half of those of the Bloomberg scores.

In Table 4, we show the results of regressions where the dependent variable is the aggregate proportion of outstanding shares of a firm held by all institutional investors. Results show a similar trend in relation to ESG as in the previous table. With the Bloomberg scores, we see statistical significance on the governance and social scores, with a higher coefficient on the governance score. However, the Bloomberg environmental score lacks statistical significance. The largest economic impact is that of the Bloomberg governance score: a one-standard-deviation increase in this score translates into a 15.6% increase of the standard deviation of total institutional investor ownership. The regression models with the Sustainalytics scores show statistical significance only on the Sustainalytics governance

score. However, the economic effect is close to half of that of the Bloomberg governance score.

Overall, the results of Tables 3 and 4 and the economic magnitudes of the effects of the ESG scores indicate that institutional investors prefer ESG-related disclosure over ESG quality and prefer G to S and E. The pattern emerging from these findings seems to suggest that indeed, institutional investors are attracted by high ESG companies, particularly those with high governance scores. We find a strong relationship between institutional holdings and a firm's combined environmental, social and governance ratings. This is consistent with the findings of Dyck et al. (2019), but our analysis extends beyond the E and S dimensions of ESG. Furthermore, our result regarding the overwhelming importance of G to institutional investors is not inconsistent with Dyck et al.'s (2019) premise that institutional ownership drives increases in E and S over time. In fact, our results so far suggest that it is through investing in firms with high governance quality that investors are able to effectively drive increased E and S performance.

4.2. ESG scores, mean institutional ownership, ownership concentration and portfolio weightings

In this section, we look at the effect of ESG on our other measures of institutional investor ownership. In particular, we assess the relationship between ESG scores and: the average institutional investor holdings (Table 5); the HHI measure of institutional investor firm-ownership concentration (Table 6); and the institutional investor portfolio weightings for each firm (Table 7). The results emerging from these three tables provide a different picture than the one we obtained in the previous section. These results suggest window-dressing and greenwashing by the average institutional investor.

In Table 5, the dependent variable is the mean percentage of outstanding shares held by institutional investors. The results in this table contrast with the previous two tables: mean ownership is not statistically significantly related to any of the aggregate ESG scores or their components. Putting together the last three tables, it seems that high ESG scores attract a larger number of institutional investors who buy shares of the firm, and the total percentage

of shares held by institutional investors is higher, but the average number of shares held by each investor appears unaffected. This result supports our hypothesis that ESG is positively related to the number of institutional investors but not to the size of the stakes.

Regressions of ESG scores on firm institutional ownership concentration, as measured by our HHI index, are shown in Table 6. Echoing the findings in Table 5, this table shows a statistically significantly negative relationships with all ESG scores except for the social component of the Sustainalytics ratings. The economic magnitude of the effects, however, is between 30 and 50% smaller than those in Tables 3 and 4.

The negative relationship between firm ESG scores and the HHI measure of institutional investor concentration implies that high-ESG companies have less-concentrated shareholdings. These results indicate that more institutional investors are drawn to taking small stakes as firm ESG scores increase, thus supporting our hypothesis that many institutional investors take small foothold stakes in high-ESG firms. As discussed in previous sections, low shareholder concentration in high-ESG firms can lead to a stagnation problem. Investors with small stakes tend to eschew presenting and voting on shareholder proposals (Brav et al., 2019) and may be disincentivized to push for further ESG improvements.

Finally, we assess how ESG relates to portfolio weightings of institutional investors. The results presented in Table 7 show that, while institutional investors are strongly motivated to invest in companies with high-quality ESG, this does not correlate with making large portfolio allocations on these firms. In fact, some of the coefficients imply that institutional investors decrease their portfolio weightings of firms in response to ESG. It seems that investors are actually demotivated to allocate large proportions of their portfolios in high ESG scores, particularly in high Bloomberg E and S scores. The Bloomberg G score is the only component for which no statistically significant relationship with portfolio weight exists. None of the Sustainalytics' scores are statistically significant either. In addition, the lack of statistical significance on either G rating partially supports our hypothesis of the importance of higher governance scores for institutional investors. Overall, the results with respect to portfolio weighting support our hypothesis that ESG does not contribute to increased ownership stakes or portfolio weightings despite the fact that more investors are interested in holding some of the higher-ESG firms.

The results in tables 5 to 7 may resonate with the efforts of activist and value investors to identify undervalued companies with poor ESG performance, as described by Barko et al. (2018). It may also be related to the idea of governance arbitrage proposed by Gilson and Gordon (2013) and extended to ESG generally by Christie (2021). At the same time, it may also be evidence suggestive of the overpricing of companies with high ESG ratings – driven by attention from very large investors who are well-diversified against firm-specific risks due to their extensive shareholdings across the economy and who, instead, are more focused on reducing systemic risk exposure in their portfolios (Gordon, 2022).

5. Further analysis and robustness checks

In this section, we expand our analysis and perform various robustness tests to assess the validity of our previous results. In particular, we try to address three issues. First, we analyze if our previous findings are applicable to the largest institutional investors. To examine this hypothesis, we focus on the top five largest institutional investors in our dataset and examine how their holdings relate to firm ESG scores. Second, given the high correlation between the three ESG dimensions, we perform a principal components analysis. This analysis also helps us corroborate the importance of governance indicators of ESG scores. Finally, and importantly, we address potential endogeneity concerns using two different experiments and econometric tests.

5.1. Do large investors behave as the average institutional investor?

Given that motives for institutional investors may differ depending on the size of the investors, we analyze in more depth the five largest institutional investors in our dataset (Blackrock, State Street, Fidelity, Vanguard, and Capital Group) and examine their ownership patterns. Table 8, columns 1 and 4, show how ownership by these very large institutional investors is related to firm ESG scores. In each column, we show the results of eight separate regressions of component and composite ESG scores. In column 1, the dependent variable is the total proportion of outstanding shares held by these five largest institutional investors. In column 4, the dependent variable is the mean portfolio allocation of

these five investors in each firm. For comparison, columns 2 and 5 present the results for all institutional investors.

The effects of ESG on ownership characteristics are similar between the top five and institutional investors generally. However regressions on portfolio weightings show that ESG scores have a much bigger effect for the top five, and this holds across all ESG composite and component ratings of both indices. We use a chi-square test to confirm these results. Columns 3 and 6 present the results of chi-square tests of the coefficients of the regressions on ownership characteristics and portfolio weightings for the five largest institutional investors versus all institutional investors. In terms of economic magnitude, the impact of ESG measures on the top investors is generally twice as large as for the average investor. The impact of G scores is also quite significant for top investors: a one-standard-deviation increase in the Bloomberg G score is associated with an almost 20% increase of a standard deviation in the total ownership of the top five.

Systematic stewardship theory (Gordon, 2022) is one possible explanation for the difference in portfolio weightings of the top five. The evidence is also consistent with the possibility that large institutional investors cannot exit underperforming companies as quickly and are more likely to use voice rather than exit, while smaller institutional investors are more likely to fully or partially exit. Finally, it could also be that activist investors take advantage of arbitrage by investing in firms that underperform with respect to ESG in order to increase their ESG and, by extension, decrease their costs of capital, as more investors will be interested in the firms' securities as their ESG increases (see Gilson and Gordon, 2013; Christie, 2021; and Edmans et al., 2022).

5.2. What is the primary driver – E, S, or G?

Measures of economic magnitude and combined models with all three ESG component scores support the hypothesis that G is the most important ESG dimension for institutional investors. However, the high correlation among ESG component ratings (see Appendix Table C) suggests a need for further evidence on this issue. We use a principal components analyses to shed more light and confirm the result that governance is a primary driver of institutional ownership characteristics.

Appendix Table D presents the results of a principal components analysis of the Bloomberg and Sustainalytics environmental, social, and governance scores, along with their loadings and explained variance. The table shows that the Bloomberg environmental score loads mostly on the third principal component (PC3 Bloomberg) and the social score on the first and second principal components (PC1 Bloomberg and PC2 Bloomberg). Meanwhile the governance score loads almost entirely on the first principal component (PC1 Bloomberg). We also note that the first principal component explains 73.9% of the variance and is the only principal component with an eigenvalue greater than one for the Bloomberg ratings.

Results are very similar if we look at the Sustainalytics ratings: the environmental score loads mostly on the third principal component (PC3 Sustainalytics); the social score mostly on the first principal component (PC1 Sustainalytics) but also substantially on the second principal component (PC2 Sustainalytics); and the governance score loads entirely on the first principal component (PC1 Sustainalytics), with negative loadings on the other principal components. We also note that the first principal component (PC1 Sustainalytics), where governance is loaded, explains 59.4% of the variance and is the only principal component greater than one for the Sustainalytics ratings.

Table 9 builds on these results and presents a set of regressions using the first principal components of the Bloomberg (PC1 Bloomberg) and Sustainalytics (PC1 Sustainalytics) ratings onto the firm institutional ownership characteristics. We use the first principal component of the Bloomberg and Sustainalytics scores, on which governance loads most heavily, in place of the ESG scores in previous tables. The regressions use each principal component separately but also include the previously-used control and dummy variables, but the table of results does not present the coefficients of all regressors in order to present all dependent variables in the same table. Results show strong statistical support for the governance hypotheses, as PCI Bloomberg and PC1 Sustainalytics load heavily on governance.

5.3. Endogeneity

In this section, we perform various additional tests to assess the validity of our results. Our first endogeneity test uses a staggered difference-in-differences methodology examining the

exogenous shock to firms' climate risk disclosure practices resulting from the US Securities and Exchange Commission (SEC) 2010 Climate Change Risk (CCR) disclosure rule in 2010. Our second endogeneity test examines how institutional investor preferences for ESG change when investors sign the UN Principals of Responsible Investing (UN PRI).

5.3.1. Firm-side effect

The regression results presented in the previous section are open to the question of whether or not firm ESG characteristics are a causal predictor of institutional ownership, or if there is another factor driving both firm ESG and institutional ownership. In order to test for this possibility, we employ a staggered difference-in-differences econometric analysis to examine how the relationship between institutional ownership and firm ESG scores is affected by a firms' voluntarily opting to include an ESG-related disclosure addendum to its SEC 10K form. Kim et al. (2023) utilize a similar test in another context.

In January 2010, the SEC responded to hearings of the US Senate Subcommittee on Banking, Housing and Urban Affairs and a request by Senator Jack Reed to issue interpretative guidance regarding mandatory CCR disclosure. On January 27, 2010, the SEC voted to require registrants to disclose material climate change information. Implemented on February 10, 2010, the SEC 2010 rule provided an increase in public companies' reporting of CCR in their Form 10-Ks concerning the disclosure of climate change considerations involving regulatory, physical and other business risks. The CCR rule reflects the agency's increased attention to key climate-change-related risks and commitment to help provide decision-useful information for investors to evaluate the effects of a firm's climate change matters.

Table 10 presents the results of our difference-in-differences analyses. Following Kim et al. (2023), we consider companies that start including an addendum to their 10K filings disclosing ESG data after the introduction of this SEC rule. We construct a dummy variable called "ESG 10K disclosure" to indicate whether a company has opted to include an ESG addendum in a particular year starting with fiscal year 2011. Each panel of Table 10 presents a set of regressions with a different dependent variable measuring institutional investor ownership characteristics. Each regression model uses a different ESG score as an independent variable, as shown by the column labels at the top of the table. The variable "ESG 10K disclosure x ESG score" measures the interaction effect between the ESG score

and the company's decision to include an ESG-related addendum to its 10K. Firm-level control variables are used in all regressions, as well as dummy variables to control for year and industry effects in all regressions.

The results of these regressions show that voluntarily including an ESG addendum has a much greater impact on the institutional ownership characteristics of firms with low-ESG quality. This is in line with signaling effects whereby firms with low ESG quality receive a much greater benefit by voluntarily disclosing more information; similarly, firms with high ESG quality are likely already signaling this through other channels before voluntarily adding ESG addendums.

To control for heterogeneity effects, we repeat our difference-in-differences analyses using a dummy variable to indicate if a company is below the median of a particular ESG score instead of the ESG score itself. The results of these regressions are shown in Table 11. They are supportive of our previous findings too. The results are robust to testing on terciles, both with and without the middle tercile included.

5.3.2. Investor-side

As one of our dependent variables, mean portfolio weight of institutional investors, can be thought of as an investor-side variable, we also consider an endogeneity check involving an event on the investor side. To do this, we focus on the subset of the five largest institutional investors and analyze how the relationship between portfolio weightings and firm ESG scores changes as they sign the United Nations Principals of Responsible Investing (UN PRI).

While not binding from a legal or regulatory standpoint, institutional investors signing the UN PRI provide a signaling effect to their stakeholders and ultimate investors that they are serious about integrating ESG considerations into their investment management process. Although an investor may have already been doing so, it would now be more difficult to justify deviations from stringent ESG considerations. Signing the UN PRI may also help to address agency problems by mitigating conflicts of interest from stakeholders and management, which could result in different preferred investment strategies.

This approach to testing endogeneity is similar to the endogeneity test employed by Liang et al. (2022), who look at how the ESG characteristics of hedge fund investments change in response to the country where the hedge fund is domiciled, adopting a stewardship code. The approach is also similar to the methodology employed by Hartzmark and Sussman (2019), who examine investors moving funds into and out of mutual funds in response to changes in the sustainable ratings of those mutual funds.

In order to implement our test, we include in our regressions on the mean portfolio weight of the top five institutional investors a "post-PRI" dummy variable to indicate whether an investor has already signed the UN PRI. We also incorporate an interaction variable to show how adopting the UN PRI changes the impact that each ESG composite and component rating from Bloomberg and Sustainalytics has on investor ownership in a firm and the mean portfolio weighting devoted to a firm.

The results of this endogeneity test appear in Table 12. The results of these regressions show that, while ESG was an important determinant of portfolio weight before these institutional investors signed the UN PRI, ESG became even more important after the signing. As before, we see firms willing to take larger stakes but smaller portfolio weights in firms with higher ESG scores. And, again, we find that the effects are most significant with respect to governance.

Our results here also help to tease out the effects of whether institutional ownership itself affects firm ESG. While institutional ownership itself may drive firms to increase ESG over time (as established by Dyck et al. (2019)), our results show that institutional investors shift their portfolio weightings in response to ESG, and the rate at which they do so changes statistically significantly upon signing the UN PRI.

6. Conclusion

In this paper, we examine the financial and nonpecuniary ESG preferences of institutional investors. Using a unique dataset covering the period from 2010 to 2019, we focus our analysis on the SEC 13F filings of institutional investors of US equities to test institutional

investors' interest in companies. This study offers new evidence on the relationship between ESG scores and institutional investor ownership.

We establish four main results. First, we find that institutional investors have significant preferences for firms with high ESG scores as more of these investors tend to hold these stocks. Second, and in contrast to the first finding, we find evidence of a negative relationship between high ESG scores and the weightings these firms have in the portfolios of institutional investors. These effects are more pronounced for the disclosure-based Bloomberg ESG scores than for the subjective Sustainalytics ratings. Third, we find that, among the three dimensions of ESG, the governance dimension is the most important factor influencing increased institutional investor ownership. Furthermore, the governance component is the only dimension with no negative effect on portfolio weightings.
This set of results suggest that fund managers take small stakes in firms with high ESG scores as way to attract a clientele of investors who have a non-pecuniary motive for investing in ESG. Hence, our results are consistent with the view of investors weighting their portfolios away from these firms, implying a sort of window-dressing or "greenwashing" by funds.

Our final result is based on an examination of our previous findings as they apply to the largest institutional investors. While most trends hold, we find some differences for the top investors, suggesting that systematic stewardship issues drive the portfolio allocation decisions of very large institutional investors with long-term horizons. Our results are robust to a number of checks for endogeneity.

Our findings offer important policy implications for institutional investors, managers and policymakers. Given the ongoing debate on ESG scores, this paper shows the importance of examining greenwashing for investors who have a concern regarding the extent to which the valuation of assets might be influenced by unsupported sustainability claims. In addition, our study adds to the debate regarding ESG investing and systematic stewardship theory.

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Table 1: Data selection criteria

This panel illustrates the screening steps used in compiling our dataset, along with mean and median statistics for log market capitalization and market-to-book ratio for each sample as further screening criteria are applied. T-tests and z-tests are used to test for statistically significant differences in medians and means compared to each prior sample. Statistical significance is denoted at the *10 percent, **5 percent, and ***1 percent levels.

sample selection criteria	distinct companies	firm-year observations	mean log market cap	median log market cap	mean market to book ratio	median market to book ratio
US-listed firms in the period 2010-2019 with Sustainalytics ratings	1664	7838	8.9177	8.8855	2.1054	1.6195
...remove observations missing any of the four Sustainalytics ratings	1629	7639	9.1899*	9.0793*	2.1014	1.6295
...remove observations missing any of the four Bloomberg ratings	878	6767	9.1979	9.0802	2.1010	1.6310
...remove observations with incomplete or missing ownership data	869	6648	9.2215	9.1043	2.1280	1.6475
...remove observations with incomplete or missing accounting or market data	853	6407	9.2238	9.1064	2.1352	1.6488

Table 2: Summary statistics

This table presents summary statistics for all variables used in the analyses, with the exception of year and industry dummy variables (n=6407 distinct company-year observations).

Variable	Minimum	5%	Mean	Median	95%	Maximum	Std. Dev.
Log number of institutional investors	1.9459	4.7274	5.9719	5.9915	7.2685	8.1458	0.8205
Total ownership by institutional investors	0.0009	0.4037	0.7765	0.8175	0.9721	0.9999	0.1759
Mean ownership by institutional investors	0.0001	0.0005	0.0025	0.0020	0.0057	0.0210	0.0044
Ownership concentration (HHI)	0.0165	0.0249	0.0534	0.0418	0.0937	0.8335	0.0720
Mean portfolio weight of institutional investors	7.14E-06	0.0008	0.0037	0.0028	0.0094	0.0657	0.0038
Total ownership by top 5 insitutional investors	0.0000	0.0669	0.1560	0.1535	0.2436	0.4436	0.0528
Mean portfolio weight of top 5 institutional investors	0.0000	1.47E-05	0.0008	0.0003	0.0034	0.0270	0.0017
Bloomberg ESG score	0.0724	0.2774	0.4003	0.3587	0.6268	0.8201	0.1153
Bloomberg E score	0.0000	0.0000	0.1701	0.0704	0.5841	0.9230	0.2028
Bloomberg S score	0.0000	0.0257	0.1797	0.1324	0.4481	0.6941	0.1280
Bloomberg G score	0.2167	0.7815	0.8497	0.8498	0.9374	1.0000	0.0537
Sustainalytics ESG score	0.3500	0.4375	0.5504	0.5300	0.7109	0.8800	0.0874
Sustainalytics E score	0.2371	0.3400	0.5216	0.5000	0.7700	0.9622	0.1351
Sustainalytics S score	0.2700	0.3973	0.5524	0.5433	0.7386	0.9250	0.1038
Sustainalytics G score	0.3700	0.4844	0.6323	0.6358	0.7745	0.9000	0.0900
Log of market capitalization	3.2504	6.4447	9.2238	9.1064	11.5130	13.8860	1.4800
Log of firm age	1.3863	2.7726	4.0635	4.0775	5.0999	5.5255	0.7560
Dividend yield	0.0000	0.0000	0.0186	0.0152	0.0492	0.8392	0.0257
Market to book ratio	0.5968	0.9867	2.1352	1.6488	4.9627	23.1330	1.5455
Return	-0.7927	-0.3234	0.2475	0.1562	0.6765	4.3043	6.0525
Volatility	0.0099	0.0190	0.0391	0.0348	0.0719	0.2926	0.0192

Table 3: ESG and the number of institutional investors

This table shows OLS regressions where the dependent variable is the natural logarithm of the number of institutional investors. In addition to firm characteristics and industry and year fixed-effects, each regression includes a different ESG score. Regressions 1 to 5 use Bloomberg ESG scores, while Regressions 6 to 10 use Sustainalytics ESG scores. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: log number of institutional investors										
	1	2	3	4	5	6	7	8	9	10
Bloomberg ESG score	0.5768***									
	(0.0352)									
Bloomberg E score		0.2412***			0.0695***					
		(0.0188)			(0.0248)					
Bloomberg S score			0.4090***		0.1789***					
			(0.0311)		(0.0408)					
Bloomberg G score				1.2763***	1.0601***					
				(0.0678)	(0.0726)					
Sustainalytics ESG score						0.5405***				
						(0.0390)				
Sustainalytics E score							0.2843***			0.1439***
							(0.0266)			(0.0318)
Sustainalytics S score								0.3541***		0.1826***
								(0.0330)		(0.0394)
Sustainalytics G score									0.4300***	0.2783***
									(0.0405)	(0.0438)
Log of market capitalization	0.4438***	0.4513***	0.4509***	0.4533***	0.4427***	0.4518***	0.4510***	0.4575***	0.4637***	0.4533***
	(0.0029)	(0.0028)	(0.0028)	(0.0026)	(0.0029)	(0.0026)	(0.0030)	(0.0028)	(0.0027)	(0.0030)
Log of firm age	0.0311***	0.0345***	0.0347***	0.0316***	0.0281***	0.0338***	0.0431***	0.0422***	0.0428***	0.0381***
	(0.0043)	(0.0044)	(0.0044)	(0.0043)	(0.0043)	(0.0042)	(0.0044)	(0.0044)	(0.0044)	(0.0044)
Dividend yield	0.4296***	0.4683***	0.4536***	0.6147***	0.5115***	0.5971***	0.5812***	0.5772***	0.6188***	0.5371***
	(0.1191)	(0.1200)	(0.1200)	(0.1179)	(0.1180)	(0.1146)	(0.1172)	(0.1173)	(0.1170)	(0.1167)
Market to book ratio	-0.0192***	-0.0202***	-0.0211***	-0.0216***	-0.0195***	-0.0228***	-0.0231***	-0.0229***	-0.0247***	-0.0223***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0020)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Return	-0.0379***	-0.0411***	-0.0382***	-0.0403***	-0.0368***	0.0008*	0.0008*	0.0009*	0.0009**	0.0009*
	(0.0100)	(0.0100)	(0.0100)	(0.0099)	(0.0098)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Volatility	-0.2485	-0.1757	-0.0972	-0.1819	-0.2916	0.1278	-0.2424	-0.0867	0.0432	-0.1274
	(0.1908)	(0.1923)	(0.1916)	(0.1890)	(0.1888)	(0.1815)	(0.2140)	(0.2130)	(0.2130)	(0.2131)
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.9061	0.9046	0.9047	0.9073	0.9082	0.9009	0.8767	0.8768	0.8767	0.8782

Table 4: ESG and total institutional investor ownership

This table shows OLS regressions where the dependent variable is the total proportion of outstanding shares owned by institutional investors. In addition to firm characteristics and industry and year fixed-effects, each regression includes a different ESG score. Regressions 1 to 5 use Bloomberg ESG scores, while Regressions 6 to 10 use Sustainalytics ESG scores. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: total ownership by institutional investors										
	1	2	3	4	5	6	7	8	9	10
Bloomberg ESG score	0.0547**									
	(0.0243)									
Bloomberg E score		-0.0077			-0.0815***					
		(0.0128)			(0.0171)					
Bloomberg S score			0.0430**		0.0470*					
			(0.0213)		(0.0281)					
Bloomberg G score				0.5097***	0.5804***					
				(0.0466)	(0.0501)					
Sustainalytics ESG score						0.0325				
						(0.0288)				
Sustainalytics E score							0.0180			0.0000
							(0.0185)			(0.0222)
Sustainalytics S score								0.0046		-0.0365
								(0.0230)		(0.0275)
Sustainalytics G score									0.1327***	0.1480***
									(0.0281)	(0.0306)
Log of market capitalization	-0.0065***	-0.0035*	-0.0060***	-0.0105***	-0.0074***	-0.0107***	-0.0289***	-0.0281***	-0.0284***	-0.0277***
	(0.0020)	(0.0019)	(0.0019)	(0.0018)	(0.0020)	(0.0019)	(0.0021)	(0.0019)	(0.0019)	(0.0021)
Log of firm age	-0.0017	-0.0004	-0.0014	-0.0048	-0.0037	-0.0062**	-0.0038	-0.0035	-0.0055*	-0.0050
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0031)
Dividend yield	-0.9649***	-0.9449***	-0.9641***	-0.9422***	-0.9141***	-0.9811***	-1.0350***	-1.0301***	-1.0478***	-1.0393***
	(0.0821)	(0.0821)	(0.0822)	(0.0811)	(0.0814)	(0.0846)	(0.0815)	(0.0815)	(0.0812)	(0.0815)
Market to book ratio	-0.0048***	-0.0054***	-0.0049***	-0.0042***	-0.0051***	-0.0052***	-0.0040***	-0.0042***	-0.0039***	-0.0042***
	(0.0015)	(0.0015)	(0.0014)	(0.0014)	(0.0014)	(0.0015)	(0.0015)	(0.0015)	(0.0014)	(0.0015)
Return	0.0079	0.0070	0.0079	0.0092	0.0089	-0.0004	-0.0007**	-0.0007**	-0.0007**	-0.0007**
	(0.0069)	(0.0069)	(0.0069)	(0.0068)	(0.0068)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Volatility	-0.9455***	-0.9055***	-0.9330***	-1.0205***	-0.9681***	-0.5882***	-0.2994**	-0.2862*	-0.2664*	-0.2571*
	(0.1316)	(0.1316)	(0.1312)	(0.1300)	(0.1302)	(0.1340)	(0.1488)	(0.1481)	(0.1479)	(0.1488)
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.1158	0.1152	0.1157	0.1316	0.1347	0.1265	0.1719	0.1718	0.1748	0.1748

Table 5: ESG and average institutional investor ownership stake

This table shows OLS regressions where the dependent variable is the mean proportion of outstanding shares owned by institutional investors. In addition to firm characteristics and industry and year fixed-effects, each regression includes a different ESG score. Regressions 1 to 5 use Bloomberg ESG scores, while Regressions 6 to 10 use Sustainalytics ESG scores. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: mean ownership by institutional investors										
	1	2	3	4	5	6	7	8	9	10
Bloomberg ESG score	0.0000									
	(0.0001)									
Bloomberg E score		0.0000			0.0000					
		(0.0001)			(0.0001)					
Bloomberg S score			-0.0001		-0.0002					
			(0.0001)		(0.0002)					
Bloomberg G score				0.0002	0.0003					
				(0.0003)	(0.0003)					
Sustainalytics ESG score						0.0000				
						(0.0002)				
Sustainalytics E score							0.0002*			0.0003**
							(0.0001)			(0.0001)
Sustainalytics S score								0.0000		-0.0001
								(0.0001)		(0.0001)
Sustainalytics G score									-0.0002	-0.0002
									(0.0001)	(0.0002)
Log of market capitalization	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***	-0.0009***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log of firm age	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0000***	-0.0000***	-0.0000***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dividend yield	-0.0027***	-0.0027***	-0.0027***	-0.0027***	-0.0027***	-0.0032***	-0.0029***	-0.0029***	-0.0029***	-0.0029***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Market to book ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000*	0.0000	0.0000	0.0000*
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Return	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Volatility	0.0025***	0.0025***	0.0025***	0.0024***	0.0025***	0.0041***	0.0053***	0.0054***	0.0054***	0.0052***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.7051	0.7051	0.7051	0.7051	0.7051	0.7011	0.6820	0.6818	0.6819	0.6821

Table 6: ESG and institutional investor ownership concentration

This table shows OLS regressions where the dependent variable is the HHI measure of ownership concentration in each firm. The HHI concentration measure is calculated by taking the sum of the squares of the proportion of outstanding shares held by each institutional investor in a firm. In addition to firm characteristics and industry and year fixed-effects, each regression includes a different ESG score. Regressions 1 to 5 use Bloomberg ESG scores, while Regressions 6 to 10 use Sustainalytics ESG scores. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: ownership concentration (HHI)										
	1	2	3	4	5	6	7	8	9	10
Bloomberg ESG score	-0.0306***									
	(0.0062)									
Bloomberg E score		-0.0082**			0.0079*					
		(0.0033)			(0.0044)					
Bloomberg S score			-0.0168***		-0.0019					
			(0.0055)		(0.0072)					
Bloomberg G score				-0.1524***	-0.1610***					
				(0.0120)	(0.0129)					
Sustainalytics ESG score						-0.0265***				
						(0.0069)				
Sustainalytics E score							-0.0144***			-0.0090
							(0.0046)			(0.0055)
Sustainalytics S score								-0.0053		0.0150**
								(0.0057)		(0.0068)
Sustainalytics G score									-0.0504***	-0.0520***
									(0.0070)	(0.0076)
Log of market capitalization	-0.0047***	-0.0055***	-0.0053***	-0.0042***	-0.0046***	-0.0055***	-0.0048***	-0.0054***	-0.0054***	-0.0052***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Log of firm age	0.0021***	0.0017**	0.0018**	0.0027***	0.0026***	0.0024***	0.0020***	0.0018**	0.0024***	0.0024***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Dividend yield	0.1164***	0.1119***	0.1134***	0.1055***	0.1018***	0.1113***	0.1039***	0.1004***	0.1061***	0.1051***
	(0.0211)	(0.0211)	(0.0211)	(0.0208)	(0.0209)	(0.0202)	(0.0202)	(0.0203)	(0.0201)	(0.0202)
Market to book ratio	0.0000	0.0001	0.0001	-0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Return	-0.0043**	-0.0040**	-0.0042**	-0.0045***	-0.0044**	0.0017***	0.0018***	0.0018***	0.0018***	0.0018***
	(0.0018)	(0.0018)	(0.0018)	(0.0017)	(0.0017)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Volatility	0.2862***	0.2774***	0.2760***	0.3004***	0.2945***	0.3046***	0.2405***	0.2302***	0.2220***	0.2260***
	(0.0338)	(0.0338)	(0.0337)	(0.0333)	(0.0334)	(0.0320)	(0.0369)	(0.0368)	(0.0367)	(0.0369)
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.1008	0.0982	0.0987	0.1200	0.1203	0.1568	0.1392	0.1380	0.1452	0.1456

Table 7: ESG and portfolio allocations of institutional investors

This table shows OLS regressions where the dependent variable is the mean portfolio weight of institutional investor portfolios invested in the firms. In addition to firm characteristics and industry and year fixed-effects, each regression includes a different ESG score. Regressions 1 to 5 use Bloomberg ESG scores, while Regressions 6 to 10 use Sustainalytics ESG scores. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: mean portfolio weight of institutional investors										
	1	2	3	4	5	6	7	8	9	10
Bloomberg ESG score	-0.0017*									
	(0.0009)									
Bloomberg E score		-0.0005**			0.0008					
		(0.0002)			(0.0006)					
Bloomberg S score			-0.0025**		-0.0034*					
			(0.0011)		(0.0018)					
Bloomberg G score				-0.0009	0.0005					
				(0.0027)	(0.0032)					
Sustainalytics ESG score						-0.0010				
						(0.0008)				
Sustainalytics E score							-0.0001			0.0006
							(0.0004)			(0.0007)
Sustainalytics S score								-0.0009		-0.0010
								(0.0007)		(0.0008)
Sustainalytics G score									-0.0012	-0.0011
									(0.0012)	(0.0013)
Log of market capitalization	0.0017***	0.0017***	0.0018***	0.0017***	0.0018***	0.0017***	0.0018***	0.0018***	0.0018***	0.0018***
	(0.0002)	0.0000	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Log of firm age	-0.0001	-0.0001	0.0000	-0.0001	-0.0001	-0.0001*	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dividend yield	-0.0002	-0.0005	0.0001	-0.0008	0.0000	0.0000	0.0005	0.0008	0.0007	0.0007
	(0.0018)	(0.0015)	(0.0018)	(0.0020)	(0.0017)	(0.0017)	(0.0020)	(0.0019)	(0.0019)	(0.0018)
Market to book ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Return	0.0004**	0.0005***	0.0004**	0.0005**	0.0004**	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0002)	0.0000	0.0000	0.0000	0.0000	0.0000
Volatility	0.0076**	0.0071***	0.0077**	0.0068**	0.0071**	0.0063**	0.0063**	0.0064**	0.0060**	0.0057*
	(0.0035)	(0.0023)	(0.0036)	(0.0034)	(0.0036)	(0.0028)	(0.0028)	(0.0030)	(0.0027)	(0.0030)
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.4187	0.4177	0.4211	0.4173	0.4217	0.3989	0.4051	0.4056	0.4057	0.4060

Table 8: ESG and large institutional ownership

This table shows the results of OLS regressions. In each of columns 1, 2, 4, and 5 the results of eight separate regressions are summarized with each regression using a different ESG score. In columns 1 and 2, the dependent variables are the total proportion of outstanding shares held by the five largest investors in our dataset (column 1) and the total ownership by all institutional investors (column 2). In columns 4 and 5, the dependent variables are the mean portfolio weighting of the five largest investors (column 4) and the mean portfolio weighting of all institutional investors (column 5). All regressions control for firm characteristics as well as industry and year fixed-effects. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Columns 3 and 6 show the results of the chi-square test of the null hypothesis that the coefficients of the five largest and all institutional investors are equal for corresponding regressions; p-values from chi-square tests appear in brackets below chi-square values. Detailed variable descriptions are provided in Appendix Table A.

	Total ownerhsip			Mean portfolio weight		
Dependent variable:	total ownership by top 5 institutional investors	total ownership by institutional investors	chi-square test of H0: coefficients are equal	mean portfolio weight of top 5 institutional investors	mean portfolio weight of institutional investors	chi-square test of H0: coefficients are equal
	1	2	3	4	5	6
Bloomberg ESG score	0.0349***	0.0547**	0.6221	0.0003*	-0.0017*	461.22***
	(0.0063)	(0.0243)	[0.4303]	(0.0002)	(0.0009)	[0.0000]
Bloomberg E score	0.0082**	-0.0077	1.4469	0.0003***	-0.0005**	1513.80***
	(0.0033)	(0.0128)	[0.2290]	(0.0001)	(0.0002)	[0.0000]
Bloomberg S score	0.0211***	0.0430**	0.9911	-0.0003	-0.0025**	383.69***
	(0.0055)	(0.0213)	[0.3195]	(0.0002)	(0.0011)	[0.0000]
Bloomberg G score	0.1909***	0.5097***	43.7538***	0.0009**	-0.0009	13642.07***
	(0.0123)	(0.0466)	[0.0000]	(0.0004)	(0.0027)	[0.0000]
Sustainalytics ESG score	0.0176**	0.0325	0.2531	0.0005**	-0.0010	508.76***
	(0.0069)	(0.0288)	[0.6149]	(0.0002)	(0.0008)	[0.0000]
Sustainalytics E score	0.0170***	0.0180	0.0028	0.0000	-0.0001	1462.05***
	(0.0044)	(0.0185)	[0.9581]	(0.0002)	(0.0004)	[0.0000]
Sustainalytics S score	0.0098*	0.0046	0.0484	0.0002	-0.0009	216.02***
	(0.0055)	(0.0230)	[0.8260]	(0.0002)	(0.0007)	[0.0000]
Sustainalytics G score	0.0263***	0.1327***	13.5662***	0.0005***	-0.0012	7807.56***
	(0.0067)	(0.0281)	[0.0002]	(0.0001)	(0.0012)	[0.0000]
Controls	yes	yes		yes	yes	
Year fixed-effects	yes	yes		yes	yes	
Industry fixed-effects	yes	yes		yes	yes	
n	6407	6407		6407	6407	

Table 9: Principal component regressions

This table shows the results of OLS regressions using the first principal components score of the ESG ratings for each provider. The dependent variables appear at the top of each column. In each column, the results of two separate regressions are summarized with each regression using a different first principal components score - “PC1 Bloomberg” and “PC1 Sustainalytics”. All regressions control for firm characteristics as well as industry and year fixed-effects. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

	Dependent variable						
	log number of institutional investors	total ownership by institutional investors	mean ownership by institutional investors	ownership concentration (HHI)	mean portfolio weight of institutional investors	total ownership by top 5 institutional investors	mean portfolio weight of top 5 institutional investors
	regressions 1-2	regressions 3-4	regressions 5-6	regressions 7-8	regressions 9-10	regressions 10-11	regressions 11-12
PC1 Bloomberg	0.0504***	0.0089***	0.0000	-0.0035***	-0.0001*	0.0041***	0.0000
	(0.0027)	(0.0019)	(0.0000)	(0.0005)	(0.0001)	(0.0005)	(0.0000)
PC1 Sustainalytics	0.0352***	0.0042**	0.0000	-0.0021***	-0.0001	0.0015***	0.0000
	(0.0026)	(0.0018)	(0.0000)	(0.0004)	(0.0001)	(0.0004)	(0.0001)
Controls	yes	yes	yes	yes	yes	yes	yes
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407

Table 10: Effects of company ESG disclosures on institutional ownership

This table shows the results of OLS regressions for our difference-in-difference analyses. Each panel presents a set of regressions with a different dependent variable shown at the top of the panel. Each regression uses a different ESG score as an independent variable as shown by the column labels at the top of the table. The dummy variable "ESG 10K disclosure" indicates whether a company has included an ESG addendum to its 10K filing in a particular year. The variable "ESG 10K disclosure x ESG score" measures the interaction effect between the ESG score and the company's inclusion of an ESG-related addendum to its 10K. All regressions control for firm characteristics as well as industry and year fixed-effects. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A. (n=4741 distinct firm-year observations for all regressions).

ESG score used:	BBG ESG	BBG E	BBG S	BBG G	Sustainalytics ESG	Sustainalytics E	Sustainalytics S	Sustainalytics G
Panel A: dependent variable: log number of institutional investors								
ESG 10K disclosure	0.2489***	0.0617***	0.0589***	1.5810***	0.1842***	0.1753***	0.0035	0.0839*
	(0.0323)	(0.0102)	(0.0137)	(0.1204)	(0.0547)	(0.0321)	(0.0423)	(0.0494)
ESG score	0.9068***	0.3615***	0.4097***	2.1457***	0.5597***	0.3456***	0.1648**	0.3341***
	(0.0800)	(0.0446)	(0.0646)	(0.1241)	(0.0843)	(0.0535)	(0.0651)	(0.0658)
ESG 10K disclosure x ESG score	-0.6144***	-0.2567***	-0.1646**	-1.8147***	-0.2804***	-0.2719***	0.0758	-0.059
	(0.0833)	(0.0477)	(0.0685)	(0.1416)	(0.0999)	(0.0628)	(0.0774)	(0.0773)
R2	0.9088	0.9072	0.907	0.9121	0.9069	0.9035	0.9032	0.9034
Panel B: dependent variable: total institutional ownership								
ESG 10K disclosure	0.1597***	0.0233***	0.0404***	0.6707***	0.2250***	0.1050***	0.0019	0.1783***
	(0.0224)	(0.0070)	(0.0095)	(0.0845)	(0.0377)	(0.0220)	(0.0290)	(0.0337)
ESG score	0.4720***	0.1847***	0.2746***	0.9805***	0.3748***	0.1581***	0.0291	0.2758***
	(0.0555)	(0.0308)	(0.0446)	(0.0871)	(0.0581)	(0.0366)	(0.0446)	(0.0450)
ESG 10K disclosure x ESG score	-0.4394***	-0.1896***	-0.2550***	-0.7931***	-0.4160***	-0.2045***	0.0043	-0.2798***
	(0.0578)	(0.0330)	(0.0472)	(0.0994)	(0.0688)	(0.0430)	(0.0531)	(0.0528)
R2	0.1862	0.1788	0.179	0.1975	0.1801	0.1896	0.1848	0.1931
Panel C: dependent variable: mean ownership stake of institutional investors								
ESG 10K disclosure	-0.0783***	-0.0166***	-0.0259***	-0.3848***	-0.0482***	-0.0469***	0.0039	-0.004
	(0.0062)	(0.0020)	(0.0026)	(0.0229)	(0.0105)	(0.0059)	(0.0077)	(0.0090)
ESG score	-0.1960***	-0.0722***	-0.1185***	-0.4257***	-0.0768***	-0.0528***	0.0134	-0.0293**
	(0.0153)	(0.0085)	(0.0123)	(0.0236)	(0.0162)	(0.0098)	(0.0119)	(0.0120)
ESG 10K disclosure x ESG score	0.1931***	0.0748***	0.1160***	0.4447***	0.0744***	0.0742***	-0.0265*	-0.0084
	(0.0159)	(0.0091)	(0.0131)	(0.0270)	(0.0192)	(0.0115)	(0.0142)	(0.0141)
R2	0.7063	0.6992	0.7007	0.7182	0.6957	0.6868	0.6835	0.6845
Panel D: dependent variable: HHI								
ESG 10K disclosure	-0.0391***	-0.0080***	-0.0117***	-0.2912***	-0.0424***	-0.0250***	0.0055	-0.0528***
	(0.0065)	(0.0020)	(0.0027)	(0.0241)	(0.0109)	(0.0063)	(0.0083)	(0.0096)
ESG score	-0.1005***	-0.0251***	-0.0478***	-0.3657***	-0.0615***	-0.0320***	0.0219*	-0.0860***
	(0.0161)	(0.0089)	(0.0129)	(0.0249)	(0.0168)	(0.0105)	(0.0127)	(0.0128)
ESG 10K disclosure x ESG score	0.0957***	0.0265***	0.0455***	0.3398***	0.0701***	0.0413***	-0.0206	0.0783***
	(0.0167)	(0.0095)	(0.0137)	(0.0284)	(0.0199)	(0.0123)	(0.0151)	(0.0150)
R2	0.0688	0.0613	0.0626	0.1093	0.0628	0.0576	0.0553	0.0661
Panel E: dependent variable: mean portfolio weight of institutional investors								
ESG 10K disclosure	-0.0008*	-0.0002	-0.0002	-0.0033*	0.0002	-0.0011**	0.0012**	0.0023***
	(0.0005)	(0.0002)	(0.0002)	(0.0019)	(0.0008)	(0.0005)	(0.0006)	(0.0007)
ESG score	-0.0039***	-0.0017**	-0.0040***	0.001	-0.0015	-0.0015*	0.0006	0.0014
	(0.0012)	(0.0007)	(0.0010)	(0.0019)	(0.0013)	(0.0008)	(0.0010)	(0.0010)
ESG 10K disclosure x ESG score	0.0022*	0.001	0.0016	0.0036	-0.0004	0.0018*	-0.0026**	-0.0040***
	(0.0013)	(0.0007)	(0.0010)	(0.0022)	(0.0015)	(0.0009)	(0.0011)	(0.0011)
R2	0.3785	0.3777	0.381	0.3779	0.3772	0.388	0.3888	0.3896

Table 11: Effects of company ESG disclosures on institutional ownership (grouped by median ESG scores)

This table shows the results of OLS regressions for our difference-in-difference analyses. Each panel presents a set of regressions with a different dependent variable shown at the top of the panel. Each regression uses a different ESG score as an independent variable as shown by the column labels at the top of the table. The dummy variable "ESG 10K disclosure" indicates whether a company has included an ESG addendum to its 10K filing in a particular year. The variable "ESG 10K disclosure x ESG below median" measures the interaction effect between whether a company is in the lower median of a particular ESG score and the company's inclusion of an ESG-related addendum to its 10K. All regressions control for firm characteristics as well as industry and year fixed-effects. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A. (n=4741 distinct firm-year observations for all regressions).

ESG score used:	BBG ESG	BBG E	BBG S	BBG G	Sustainalytics ESG	Sustainalytics E	Sustainalytics S	Sustainalytics G
Panel A: dependent variable: log number of institutional investors								
ESG 10K disclosure	0.0133	0.0149	0.0418***	0.0154	0.0261***	0.0234**	0.0633***	0.0569***
	(0.0106)	(0.0107)	(0.0102)	(0.0109)	(0.0101)	(0.0116)	(0.0109)	(0.0103)
ESG below median	-0.0870***	-0.0883***	-0.0521***	-0.0784***	-0.0648***	-0.0539***	-0.0218**	-0.0303***
	(0.0113)	(0.0112)	(0.0110)	(0.0109)	(0.0101)	(0.0117)	(0.0106)	(0.0105)
ESG 10K disclosure x ESG below median	0.0359**	0.025	-0.0086	0.0648***	0.0357**	0.0411***	-0.0288**	-0.0108
	(0.0169)	(0.0167)	(0.0158)	(0.0136)	(0.0156)	(0.0155)	(0.0140)	(0.0134)
R2	0.907	0.9072	0.9063	0.9066	0.9065	0.9029	0.9032	0.903
Panel B: dependent variable: total institutional ownership								
ESG 10K disclosure	-0.0242***	-0.0250***	-0.0102	-0.0112	-0.0249***	-0.0176**	0.0119	-0.0127*
	(0.0073)	(0.0074)	(0.0070)	(0.0075)	(0.0069)	(0.0080)	(0.0075)	(0.0070)
ESG below median	-0.0501***	-0.0467***	-0.0350***	-0.0322***	-0.0417***	-0.0315***	0.0081	-0.0278***
	(0.0078)	(0.0077)	(0.0076)	(0.0075)	(0.0070)	(0.0080)	(0.0073)	(0.0072)
ESG 10K disclosure x ESG below median	0.0414***	0.0518***	0.0152	0.0260***	0.0680***	0.0353***	-0.0086	0.0342***
	(0.0116)	(0.0115)	(0.0109)	(0.0094)	(0.0107)	(0.0106)	(0.0096)	(0.0091)
R2	0.1797	0.1789	0.176	0.1749	0.1808	0.188	0.1848	0.1882
Panel C: dependent variable: mean ownership stake of institutional investors								
ESG 10K disclosure	0.0021	0.0014	-0.0018	0.0025	-0.0049**	-0.0061***	-0.0131***	-0.0127***
	(0.0020)	(0.0020)	(0.0020)	(0.0021)	(0.0019)	(0.0021)	(0.0020)	(0.0019)
ESG below median	0.0204***	0.0199***	0.0154***	0.0175***	0.0086***	0.0052**	-0.0014	-0.0003
	(0.0022)	(0.0021)	(0.0021)	(0.0021)	(0.0019)	(0.0021)	(0.0019)	(0.0019)
ESG 10K disclosure x ESG below median	-0.0141***	-0.0113***	-0.0098***	-0.0197***	-0.0075**	-0.0077***	0.0054**	0.0051**
	(0.0032)	(0.0032)	(0.0030)	(0.0026)	(0.0030)	(0.0028)	(0.0026)	(0.0024)
R2	0.7005	0.7007	0.6978	0.6993	0.6955	0.6839	0.6837	0.6839
Panel D: dependent variable: HHI								
ESG 10K disclosure	-0.0007	-0.0005	-0.0005	0.0003	-0.0005	0.0001	-0.0096***	-0.0018
	(0.0021)	(0.0021)	(0.0020)	(0.0022)	(0.0020)	(0.0023)	(0.0021)	(0.0020)
ESG below median	0.0075***	0.0079***	0.0081***	0.0087***	0.0076***	0.0065***	-0.0063***	0.0052**
	(0.0023)	(0.0022)	(0.0022)	(0.0022)	(0.0020)	(0.0023)	(0.0021)	(0.0021)
ESG 10K disclosure x ESG below median	-0.0075**	-0.0073**	-0.0086***	-0.0092***	-0.0091***	-0.0082***	0.0071***	-0.0055**
	(0.0034)	(0.0033)	(0.0031)	(0.0027)	(0.0031)	(0.0030)	(0.0027)	(0.0026)
R2	0.062	0.0623	0.0627	0.0633	0.0629	0.0569	0.057	0.0563
Panel E: dependent variable: mean portfolio weight of institutional investors								
ESG 10K disclosure	0.0001	-0.0002	-0.0002	-0.0001	-0.0003*	-0.0002	-0.0003*	-0.0005***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
ESG below median	0.0005***	0.0004**	0.0003**	0.0002	0.0002	0.0002	0.0001	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
ESG 10K disclosure x ESG below median	-0.0002	0.0001	0.0003	-0.0003	0.0005**	0.0002	0.0004*	0.0006***
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
R2	0.3777	0.3778	0.3787	0.3766	0.3783	0.3887	0.3892	0.3892

Table 12 – ESG and ownership after signing the UN PRI

This table shows the results of OLS regressions. The dependent variable is the mean portfolio weighting toward each firm of the top five largest investors in our dataset. The regressions summarized in each column use a different ESG score as an independent variable as shown by the column labels at the top of the table. The dummy variable "post-PRI" indicates whether an investor has signed the UN PRI. The variable "post-PRI x ESG score" measures the interaction effects between this dummy and each ESG score. All regressions control for firm characteristics as well as industry and year fixed-effects. Standard errors are clustered at the industry level. Variables are winsorized at the 5 percent and 95 percent levels. Statistical significance is denoted as * for 10 percent, ** for 5 percent, and *** for 1 percent levels. Standard errors are shown in parentheses below coefficients. Detailed variable descriptions are provided in Appendix Table A.

Dependent variable: mean portfolio weight of top 5 institutional investors

	BBG ESG	BBG E	BBG S	BBG G	Sustainalytics ESG	Sustainalytics E	Sustainalytics S	Sustainalytics G
Post-PRI	0.0008***	0.0001*	0.0003***	0.0018***	0.0009***	0.0001	0.0000	-0.0001
	(0.0001)	(0.0000)	(0.0000)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
ESG score	0.0043***	0.0023***	0.0031***	0.0044***	0.0033***	0.0018***	0.0011***	0.0005
	(0.0004)	(0.0002)	(0.0004)	(0.0011)	(0.0004)	(0.0003)	(0.0004)	(0.0004)
Post-PRI x ESG score	-0.0025***	-0.0013***	-0.0023***	-0.0023***	-0.0019***	-0.0008***	-0.0006***	-0.0003
	(0.0002)	(0.0001)	(0.0002)	(0.0006)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes	yes	yes	yes	yes
n	6407	6407	6407	6407	6407	6407	6407	6407
R2	0.4416	0.4402	0.4436	0.4325	0.4343	0.5067	0.5047	0.5040

APPENDIX

Appendix Table A: Variable definitions

This table provides definitions of the variables used in our data analyses.

Variable	Definition	Source
	ESG Scores	
Bloomberg ESG score	This is a proprietary Bloomberg score based on the extent of a company's publicly disclosed ESG data. Bloomberg tailors the scoring to different industries. In this way, each company is evaluated only in terms of the data that are relevant to its industry sector. This score measures the amount of ESG data a company reports publicly and does not measure the company's performance on any data point.	Bloomberg
Bloomberg E score	This is a proprietary Bloomberg score based on the extent of a company's environmental disclosure as part of ESG data. Bloomberg tailors the score to particular industries. In this way, each company is evaluated only in terms of the data that are relevant to its industry sector. This score measures the amount of environmental data a company reports publicly and does not measure the company's performance on any data point.	Bloomberg
Bloomberg S score	This is a proprietary Bloomberg score based on the extent of a company's social disclosure as part of ESG data. Bloomberg tailors the score to particular industries. In this way, each company is evaluated only in terms of the data that are relevant to its industry sector. This score measures the amount of social data a company reports publicly and does not measure the company's performance on any data point.	Bloomberg
Bloomberg G score	This is a proprietary Bloomberg score based on the extent of a company's governance disclosure as part of ESG data. Bloomberg tailors the score to particular industries. In this way, each company is evaluated only in terms of the data that are relevant to its industry sector. This score measures the amount of governance data a company reports publicly and does not measure the company's performance on any data point.	Bloomberg
Sustainalytics ESG score	Sustainalytics assigns a rank to the company based on its total ESG quality relative to its industry peers. Aggregate ESG performance encompasses a company's level of preparedness, disclosure and controversy involvement across all three ESG themes.	Sustainalytics
Sustainalytics E score	Sustainalytics assigns a rank for the company's management of its environmental record in relation to industry peers. Environmental performance is determined by the level of environmental	Sustainalytics

	preparedness and disclosure in addition to environmental controversies.	
Sustainalytics S score	Sustainalytics assigns a rank for the company's management of its social impact relative to industry peers. Social performance is determined by the quality of policies, programs and management systems concerning employees, suppliers, customers and society in addition to related controversies.	Sustainalytics
Sustainalytics G score	Sustainalytics assigns a rank for the company's management of its governance activities in relation to industry peers.	Sustainalytics
	Ownership Variables	
Log number of institutional investors	This is the natural logarithm of the number of institutional investors in each firm based on 13F ownership forms filed with the SEC.	Refinitiv
Total ownership by institutional investors	This is the total proportion of all shares in a firm held by institutional investors.	Refinitiv
Mean ownership by institutional investors	This is the average proportion of outstanding shares held by institutional investors in a firm.	Refinitiv
Ownership concentration (HHI)	To measure ownership concentration, we use the HHI calculation. This is the sum of the squares of the proportion of outstanding shares held by each institutional investor. A higher HHI indicates a higher number of shares held by a smaller number of investors.	Refinitiv
Mean portfolio weight of institutional investors	This is the average proportion of institutional investor portfolios invested in the firm.	Refinitiv
Total ownership by top 5 institutional investors	This is the proportion of all outstanding shares in a firm owned by the five largest institutional investors in our dataset (Blackrock, State Street, Fidelity, Vanguard, and Capital Group).	Refinitiv
Mean portfolio weight of top 5 institutional investors	This is average proportion of portfolios of the five largest institutional investors in our dataset invested in the firm.	Refinitiv
	Control Variables	
Log of market capitalization	We use the natural logarithm of a firm’s market capitalization in order to control for firm size.	Refinitiv
Log of firm age	To control for firm age, we take the natural logarithm of the number of years since the firm was established.	Refinitiv
Dividend yield	This is the ratio of total dividends paid by the firm to the firm’s market capitalization.	Refinitiv
Market to book	This is calculated as the ratio of the market value of firm assets to the book value of assets. The market value of firm assets is	Refinitiv

	calculated as the market value of equity minus the book value of equity plus the book value of assets.	
Return	This is calculated as the holding period return of the firm's common stock over the year.	CRSP
Volatility	This is the standard deviation of stock returns during the fiscal year.	CRSP

Appendix Table B: Dataset summary

This panel shows how many firms have how many years of observations in our dataset and the number of firm-level observations in each year.

years of observations	number of firms	total firm-year observations
1	48	48
2	36	72
3	87	261
4	41	164
5	40	200
6	24	144
7	32	224
8	54	432
9	48	432
10	443	4430
total:	853	6407

year	number of firm-level observations
2010	503
2011	549
2012	567
2013	582
2014	604
2015	645
2016	679
2017	775
2018	740
2019	763
total:	6407

Appendix Table C: Correlation matrix

This table shows Pearson pair-wise correlation coefficients for between-the-firm ESG scores used as independent variables and the firm ownership statistics used as dependent variables in our regressions. Statistical significance is denoted at the *10 percent, **5 percent, and ***1 percent levels.

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 Bloomberg ESG score	0.95***	0.91***	0.65***	0.65***	0.63***	0.51***	0.32***	0.59***	-0.15***	-0.11***	0.22***	-0.54***	0.20***	0.33***	0.51***	0.22***	0.12***	-0.03*	-0.04*	-0.14***
2 Bloomberg E score	-	0.78***	0.53***	0.66***	0.64***	0.51***	0.32***	0.55***	-0.16***	-0.09***	0.21***	-0.50***	0.13***	0.33***	0.48***	0.22***	0.11***	-0.03*	-0.02*	-0.13***
3 Bloomberg S score		-	0.55***	0.56***	0.53***	0.45***	0.29***	0.55***	-0.15***	-0.08***	0.17***	-0.51***	0.19***	0.29***	0.48***	0.20***	0.12***	-0.02*	-0.05**	-0.13***
4 Bloomberg G score			-	0.35***	0.36***	0.24***	0.15***	0.43***	-0.02*	-0.10***	0.18***	-0.42***	0.35***	0.21***	0.35***	0.16***	0.07**	-0.01	-0.06**	-0.08**
5 Sustainalytics ESG score				-	0.86***	0.81***	0.59***	0.42***	-0.13***	-0.12***	0.19***	-0.36***	0.02*	0.28***	0.36***	0.23***	0.11***	-0.06**	-0.02*	-0.14***
6 Sustainalytics E score					-	0.49***	0.34***	0.48***	-0.09***	-0.12***	0.27***	-0.40***	0.06**	0.35***	0.45***	0.14***	0.06**	0.04**	0.00	-0.12***
7 Sustainalytics S score						-	0.31***	0.29***	-0.18***	-0.04*	0.10***	-0.26***	-0.01*	0.18***	0.24***	0.26***	0.15***	-0.17***	-0.04*	-0.15***
8 Sustainalytics G score							-	0.11***	-0.03*	-0.14***	-0.01*	-0.10***	-0.05**	0.05**	0.04**	0.13***	0.03*	-0.01	0.00	-0.03*
9 Log number of institutional investors								-	-0.19***	-0.28***	0.48***	-0.89***	0.09***	0.62***	0.93***	0.20***	0.05**	0.13***	0.09***	-0.34***
10 Total ownership by institutional investors									-	-0.09***	-0.08**	0.22***	0.27***	-0.24***	-0.24***	-0.18***	-0.18***	0.02*	0.01	0.14***
11 Ownership concentration (HHI)										-	-0.12***	0.31***	-0.07**	-0.12***	-0.18***	0.00	0.07**	-0.04**	-0.05**	0.07**
12 Mean portfolio weight of institutional investors											-	-0.32***	-0.02*	0.65***	0.57***	0.02*	0.02*	0.11***	0.10***	-0.21***
13 Mean ownership by institutional investors												-	-0.16***	-0.43***	-0.78***	-0.21***	-0.06**	-0.07**	-0.02*	0.25***
14 Total ownership by top 5 institutional investors													-	-0.08**	-0.06**	0.05**	0.16***	-0.07**	-0.06**	-0.13***
15 Mean portfolio weight of top 5 institutional investors														-	0.68***	0.13***	0.05**	0.07**	0.05**	-0.18***
16 Log of market capitalization															-	0.14***	0.02*	0.19***	0.14***	-0.38***
17 Log of firm age																-	0.11***	-0.18***	-0.04**	-0.19***
18 Dividend yield																	-	-0.16***	-0.10***	-0.14***
19 Market to book ratio																		-	0.22***	0.02*
20 Return																			-	-0.14***
21 Volatility																				-

Appendix Table D: Principal components analysis

This panel presents the three principal components of the Bloomberg environmental, social, and governance scores ("PC1 Bloomberg", "PC2 Bloomberg", and "PC3 Bloomberg"), as well as those of the Sustainalytics scores ("PC1 Sustainalytics", "PC2 Sustainalytics", and "PC3 Sustainalytics") along with their loadings and variances explained.

Principal Components Analyses

variables	PC1 Bloomberg	PC2 Bloomberg	PC3 Bloomberg	PC1 Sustainalytics	PC2 Sustainalytics	PC3 Sustainalytics
Bloomberg E score	0.608	0.373	0.700			
Bloomberg S score	0.612	0.341	-0.713			
Bloomberg G score	0.505	-0.863	0.021			
Sustainalytics E score				0.614	0.261	0.745
Sustainalytics S score				0.593	0.470	-0.654
Sustainalytics G score				0.521	-0.843	-0.134
Eigenvalue	2.216	0.584	0.201	1.781	0.714	0.505
Variance explained	73.9%	19.5%	6.7%	59.4%	23.8%	16.8%

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