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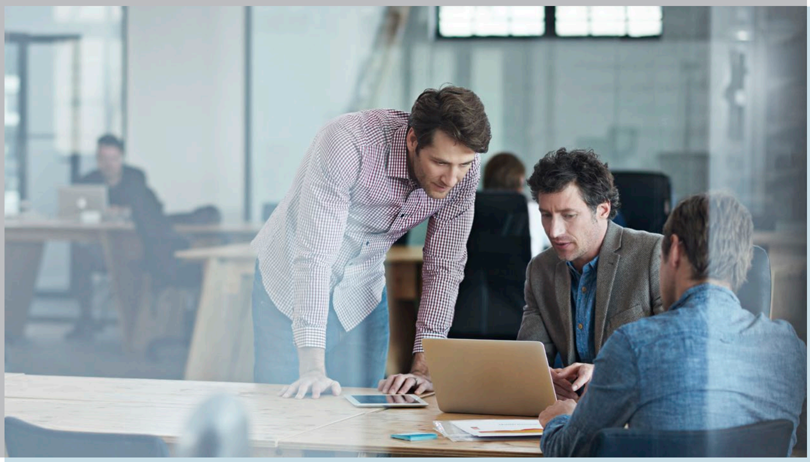

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The Sustainability Footprint of Institutional Investors

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Abstract

Little is known about the environmental and social (or sustainability) preferences of 13F institutional investors. In this paper, we propose a novel measure to quantify the portfolio-level sustainability of institutional investors. We show that portfolios of institutions with longer investment horizons exhibit higher sustainability and that risk-adjusted performance is positively related to sustainability, primarily through a reduction of portfolio risk. Using exogenous shocks to investor sustainability induced by natural disasters we provide evidence of a causal impact of sustainability on risk-adjusted performance. An instrumental variable strategy using geographic variation in constituency statutes further supports a causal interpretation of our results.

JEL classification: G20, G23, G30, M14, Q01, Q50

Keywords: Investment horizon, institutional investors, sustainability footprint, portfolio turnover, risk-adjusted performance, CSR, ESG impact, socially responsible investing, sustainable investing, impact investing

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I. Introduction

Institutional investors such as mutual funds, hedge funds, pension funds, or insurance companies play a central role in today's stock markets. Accordingly, institutional investors have been extensively studied in a variety of contexts. McConnell and Servaes (1990) provide early evidence on a positive relation between firm value and institutional ownership. Other studies have, for instance, addressed issues such as the impact of institutional investors on firms' research and development (R&D) spending (see Bushee (1998)), on their stock prices (see Gompers and Metrick (2001)), or institutional investors' monitoring incentives (see Gaspar, Massa, and Matos (2005) or Chen, Harford, and Li (2007)).[1]

Apart from a few recent contributions, however (see, for instance, Hong and Kostovetsky (2012), Dimson, Karakaş, and Li (2015), Dyck et al. (2016), Hoepner et al. (2016), Nofsinger, Sulaeman, and Varma (2016), Fernando, Sharfman, and Uysal (2016), Amel-Zadeh and Serafeim (2017), Barber, Morse, and Yasuda (2017), or Chen, Dong, and Lin (2017)), financial economics research has left unanswered important questions regarding institutional investors' preferences, attitudes, and policies with respect to sustainability (or corporate social responsibility, CSR) issues.[2]

The limited scientific knowledge on the role of environmental and social issues at the institutional investor-level is surprising not only in light of the academic attention such issues have received at the firm-level (see, for instance, De Bettignies and Robinson (2015), Liang and Renneboog (2017), or Lins, Servaes, and Tamayo (2017)), but also when considering anecdotal evidence suggesting that institutional investors increasingly care about these issues: for instance, as of October 2016, about 1,500 finance institutions representing assets under management of about $62 trillion worldwide have adopted the Principles for Responsible Investment (PRI)[3]. In a similar spirit, according to the U.S Forum for Sustainable and Responsible Investment[4] more than one out of every five dollars under professional management in the United States was invested according to some form of sustainable investment at the end of 2015 (see USSIF, 2016).

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[1] See section II.A for a more detailed literature review.

[2] More specifically, when referring to sustainability, we have in mind a broad set of environmental (E) and social (S) topics, such as natural resource use, ecosystems services, air and water pollution, carbon emissions, employee relations, gender and diversity issues, labor- and human rights, community relations, or business ethics.

[3] See http://www.unpri.org/about

[4] See http://www.ussif.org

This paper contributes to the emerging literature studying sustainability at the institutional investor-level by systematically assessing the sustainability characteristics of 13F institutional investors' stock portfolios and relating their portfolio-level sustainability to their risk-adjusted investment performance. We pursue two main objectives: First, we propose novel measures to quantify the environmental, social, and aggregate sustainability *footprint (or "impact")* at the institutional investor stock portfolio-level. The measures we propose are based on a combination of (i) institutional investor equity holdings as reported in quarterly 13F filings to the SEC and (ii) stock-level environmental and social scores collected from different data providers. Secondly, we want to understand *why* specific institutions hold sustainability oriented stock portfolio allocations. For that purpose, we examine whether and how these footprint measures are related to the institutions' investment horizons and relate their portfolio-level risk and return characteristics to their sustainability footprint measures.

To attain our second objective, we draw on Bénabou and Tirole (2010) and derive two distinct hypotheses as to *why* institutional investors might choose sustainable stock portfolio allocations. The first view, which we refer to as the "overcoming short-termism" hypothesis, suggests that institutional investors choose sustainability oriented portfolio allocations because it allows them to take a long-term perspective and maximize (inter-temporal) risk-adjusted investment performance. The second view, which we refer to as the "managerially driven philanthropy" hypothesis, suggests that investor-level sustainability policies reflect managers' own self-serving aspirations to engage in sustainability for reasons rooted in self- and social-image concerns. We conjecture that if the "overcoming short-termism" hypothesis holds, long-term oriented institutions should have better (that is higher) sustainability footprints. More importantly, institutional investors with better sustainability footprints should also exhibit better risk-adjusted investment performance under this hypothesis. In contrast, under the "managerially driven philanthropy" hypothesis, risk-adjusted performance should be negatively related to sustainability footprints.

In a first set of empirical tests, we examine predictions regarding the relationship between investment horizon and sustainability footprints that are necessary to support the "overcoming short-termism" hypothesis. We relate sustainability footprints to proxies of investor horizon. To measure investment horizon, we first use a common investor classification (see Bushee (2001) and Abarbanell, Bushee, and Raedy (2003)) that categorizes investors according to their fiduciary responsibilities and legal types. Secondly, we employ portfolio turnover (see Carhart, (1997)) as a time varying measure of investment horizon. We provide evidence that longer term oriented institutional investors—as defined either by investors' legal types (e.g., pension funds or insurance companies) or by low portfolio turnover—are characterized by significantly higher (i.e. better) environmental, social, and overall sustainability footprints. In contrast, investors with shorter investment horizons (e.g., independent investment advisors) have significantly worse sustainability footprints. These results on the positive relation between sustainability and investment horizon should be interpreted with caution since it is possible that institutions' sustainability preferences and their investment horizon are endogenously determined. However, the results on the negative relation between sustainability and turnover remain robust to including various types of fixed-effects (e.g., at the institutional investor-, institution-type-, and country-level), allowing us to rule out that unobservable factors are driving the results. Our empirical tests are also robust to different ways of measuring sustainability footprints (e.g., equally weighted vs. value weighted) and trading intensity (e.g., portfolio "churn" in the spirit of Gaspar, Massa, and Matos, (2005)).

In a second step, we then test a sufficient condition for distinguishing between the "overcoming short-termism" and the "managerially driven philanthropy" hypotheses, that is, we relate institutions' risk-adjusted portfolio performance to their sustainability footprints. We find that institutional investors' risk-adjusted returns at both shorter (i.e., quarterly) and longer (i.e., annual) horizons are higher for investors with better sustainability footprints. This positive relationship is more pronounced at the annual horizon and appears to be primarily driven by a negative relation between total portfolio risk and sustainability footprints.

To argue for a causal interpretation of the relationship between sustainability footprints and risk-adjusted performance, we rely first on an identification strategy that isolates exogenous variation in institutional investor-level sustainability by using the occurrence of natural disasters. The idea behind this identification strategy is that the occurrence of natural disasters close to the institutional investors' headquarters provides exogenous shocks to the institutional investors' sustainability preferences. Research in behavioral finance has shown that experiencing macroeconomic shocks has a profound impact on individual risk-taking behavior (see Malmendier and Nagel (2011)). We conjecture that experiencing natural disasters (in particular, those related to extreme weather events) similarly affects individuals' attitudes and preferences towards sustainability issues. Our identification strategy is motivated by the availability heuristic (see Tversky and Kahneman (1974)), which postulates that judgments and individual behavior are disproportionally influenced by information and facts that immediately spring to the mind of the decision maker. Indeed, Demski et al. (2017) show that when individuals experience extreme weather events, they tend to act more strongly on sustainability related issues, a behavior that should thus also apply to decision-makers working for the institutional investors we study in this paper.

Using twenty major natural disasters in the U.S. between 2002 and 2013 in combination with data on the geographic location of institutional investors' headquarters, we show that institutional investor-level sustainability footprints increase strongly after the investors' headquarters are hit by natural disasters ("treatment").[5] In a second step, we show that over a period of three years following the natural disaster treatment, risk-adjusted performance is positively related to sustainability footprints for treated institutions. This evidence suggests that the relationship between risk-adjusted performance and sustainability footprints is likely to be causal.

To further support a causal interpretation of the relation between sustainability and risk-adjusted performance, we also rely on an instrumental variable (IV) strategy. Our instrument exploits geographic variation in the existence of state-level constituency statutes that provide a legal framework for directors to explicitly consider non-shareholder interests in their decision making (see Geczy et al. (2015) or Flammer and Kacperczyk (2016)). The instrument, which varies at the institutional investor's incorporation state-level, is the length of time a state has had such stakeholder oriented constituency statutes in place. The instrument is highly significant in the first stage regression and two stage least squares estimates continue to show a significant positive impact of the sustainability footprint on institutional investors' risk-adjusted performance.

Thus, taken together, our empirical evidence is consistent with the "overcoming short-termism" hypothesis.

We believe that our study makes several important contributions to the literature. First, to the best of our knowledge, our study is the first to propose measures that systematically quantify

[5] We use the same natural disasters as Barrot and Sauvagnat (2016).

the environmental, social, and aggregate sustainability footprint of 13F institutional investor stock portfolios and relate these measures to proxies of investor horizon. Second, we know of no other paper that studies the cross section of 13F institutional investors' sustainability footprints and the relationship between their sustainability footprints and risk-adjusted financial performance. We also contribute to the literature examining the link between risk-adjusted investment performance and sustainability (see, for instance, Geczy, Stambaugh, and Levin (2005)) by showing in a quasi-experimental setting that higher sustainability seems to cause better risk-adjusted investment performance.

The rest of the paper is structured as follows: In section II, we discuss the related literature and develop our main hypotheses. In section III, we describe the data and discuss how we construct the main variable of interest, i.e. the sustainability footprint at the institutional investor portfolio-level. In section IV, we present the main empirical results on the relationship between sustainability footprints and proxies for institutional investors' investment horizon and also examine how footprints relate to risk-adjusted investment performance. In section V, we discuss the two empirical strategies we employ to causally relate sustainability footprints to institutional investors' risk-adjusted investment performance. Section VI concludes.

II. Related literature and hypothesis development

A. Related literature

A large body of finance, economics, and management research has, in a variety of settings, attempted to answer a range of different questions related to sustainability (or CSR) at the firm-level. For instance, prior research has examined the characteristics of firms engaging in sustainability activities and their motivations for doing so. Cheng, Hong, and Shue (2016) show that firm-level sustainability is partly due to agency problems (see also Bénabou and Tirole (2010) or Masulis and Reza (2014)). In contrast, Ferrell, Liang, and Renneboog (2016) provide evidence that well-governed firms engage more strongly in sustainability. Using an international sample of firms, Liang and Renneboog (2017) explore other determinants of firm-level sustainability and find that a country's legal origin (see La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998)) is a much more fundamental determinant of a firm's sustainability than firm-level variables. Other research has focused on financial constraints (see Hong, Kubik, and Scheinkman (2012)), the political views of corporate decision makers (see Di Giuli and Kostovestsky (2014)), or other preferences of corporate decision makers (see Cronqvist and Yu (2017)) as important factors influencing firm-level sustainability.

Another large stream of literature has examined the relationship between sustainability and financial performance. At the investor-level, some empirical studies find no (see, for instance, Hamilton, Jo, and Statman (1993)) or negative effects (see Geczy, Stambaugh, and Levin (2005), Renneboog, Ter Horst, and Zhang (2008), or Hong and Kacperczyk (2009)) of sustainability on investment performance. Other studies, by contrast, find that sustainability can enhance investment performance. For instance, Statman and Glushkov (2009) show that portfolios based on sustainability signals can outperform on a risk-adjusted basis. At the firm-level, Lins, Servaes, and Tamayo (2017) show that during the 2008-2009 financial crisis, firms with high sustainability experienced four to seven percentage points higher stock returns than firms with low sustainability. Servaes and Tamayo (2013) show that sustainability and firm value are positively related for firms with high customer awareness. Eccles, Ioannu, and Serafeim (2014) show that portfolios of high sustainability firms outperform portfolios of matched low sustainability firms. In a similar spirit, Edmans (2011) documents that investing in the "best companies to work for in America" yields significantly positive risk-adjusted performance. At the firm-level, Deng, Kang, and Low (2013) show that high sustainability results in better post-acquisition performance. Ferrell, Liang, and Renneboog (2016) document that high sustainability firms have higher firm value. Krüger (2015) examines short-term financial valuation effects of positive and negative sustainability news and provides and shows that negative news about a firm's environmental and social impact lead to substantial declines in firms' equity market valuations.

While there is increasing evidence regarding a positive relationship between sustainability and financial performance, the exact mechanisms through which sustainability translates into firm value still remain ambiguous as it is often hard to establish the direction of causation. A notable exception is Flammer (2015), who relies on a regression discontinuity design to show that higher sustainability causes higher firm-value. Our paper also uses quasi-experimental methods, thereby contributing significantly to advancing our understanding of whether sustainability causes risk-adjusted performance at the institutional investor-level.[6]

We also contribute to the empirical literature studying the behavior and heterogeneity of institutional investors. In addition to the papers mentioned in the introduction, other papers have explored the role of institutional investors in shareholder proposals (see Gillan and Starks (2000)), their impact on executive compensation (see Hartzell and Starks (2003)), or more generally focused on institutional investors' attitudes towards corporate governance (see McCahery, Sautner, and Starks (2016)). The literature on the heterogeneity of institutional investors has also examined the implications of investment horizons for issues such as monitoring of firms' managers, trading, or price formation. Gaspar, Massa, and Matos (2005) study how the investment horizon of a firm's institutional shareholders impacts the market for corporate control. Chen, Harford, and Li (2007) empirically study which kinds of institutional investors matter for monitoring managers and find that independent long-term institutions with concentrated holdings tend to monitor more intensively. More recently, Harford, Kecskes, and Mansi (2017) show that long-term investors strengthen corporate governance and restrain managerial misconduct and that through their influence on corporate policies, shareholders benefit through both unexpectedly higher profitability and lower risk. Yan and Zhang (2009) show that the positive relation between institutional ownership and future stock returns (see Gompers and Metrick (2001)) is mainly due to short-term oriented institutions. Cella, Ellul, and Giannetti (2013) show that during periods of market turmoil there is increased price pressure for stocks held mostly by short term oriented institutional investors (i.e. investors with high portfolio churn). In contrast, Derrien, Kecskés, and Thesmar (2012) show that longer investor horizons attenuate the effect of stock mispricing on corporate policies.

Finally, we add significantly to the emerging literature that studies sustainability at the institutional investor-level. Hong and Kostovetsky (2012) show that democratically inclined fund-managers hold more sustainable investment portfolios. Relying on proprietary data from one large UK based institutional investor, Dimson, Karakaş, and Li (2015) study private (or behind-the-scene) sustainability oriented shareholder engagements and show that successful

[6] Other studies have examined issues such as the relation between systematic and idiosyncratic risk on the one hand and sustainability on the other (see, for instance, El Ghoul et al. (2011), and Albuquerque, Durnev, and Koskinen (2016)).

engagements generate shareholder value. Using archival data, Dyck et al. (2016) show that firm-level sustainability is related positively to institutional ownership. They also show this relationship to be strongest for ownership by institutional investors based in countries with strong social norms. Hoepner et al. (2016) show that institutional investors' shareholder engagements on environmental, social, and governance (ESG) issues reduce firms' downside risk. Nofsinger, Sulaeman, and Varma (2016) study institutional ownership in firms with good and bad environmental and social performance. Amel-Zadeh and Serafeim (2017) survey senior investment professionals working at institutional investors to examine why and how investors use ESG information in the investment process. Chen, Dong, and Lin (2017) show that higher institutional ownership and more concentrated shareholder attention induce corporate managers to invest more in sustainability activities.

B. Hypothesis development

In order to better understand institutional investors' motivations for choosing more sustainable stock portfolio allocations, we draw on Bénabou and Tirole (2010) who set forth three motivations for why *firms* would engage in sustainability related activities. The first view, which they refer to as "doing well by doing good", states that managers engage in sustainability activities because this would allow them to take a long-term perspective and maximize inter-temporal profits. Secondly, Bénabou and Tirole (2010) argue that managers engage in sustainability because firms are better placed to efficiently "express citizen values" on behalf of their stakeholders (e.g., because of lower transaction costs or informational advantages). This second hypothesis—which some refer to as "delegated philanthropy" (see Dimson, Karakas, and Li (2015))—is also consistent with firm value enhancement and, as Bénabou and Tirole (2010) point out, hard to distinguish empirically from the "doing well by doing good view". The third and more negative view put forth by Bénabou and Tirole (2010) is one of "managerially driven philanthropy" according to which firms' CSR oriented policies would reflect managers' or board of directors' own self-serving aspirations to engage in philanthropy for reasons rooted in self- and social-image concerns. Sustainability activities driven by the latter motivation would ultimately be detrimental to firm-value. The third view is also observationally equivalent to the commonly held view that sustainability at the firm-level is a sign of agency problems whereby managers further their own personal benefits at the expense of shareholders (see Masulis and Reza (2014) or Cheng, Hong, and Shue (2016)).

We assert that the first and third view, i.e., "doing well by doing good" and "managerially driven philanthropy" may also apply to institutional investors and explain why institutions choose to pursue sustainability oriented portfolio allocations. Based on Bénabou and Tirole's (2010) characterization of these alternative explanations, we define and test both a necessary and a sufficient condition that underpin the first view, which we will from now on refer to as the "overcoming short-termism" hypothesis. The necessary condition to support the "overcoming short-termism" hypothesis states that long-term oriented institutions care more about sustainability issues than short term oriented ones. We therefore test whether more long-term oriented institutions display better (that is higher) sustainability footprints. The sufficient condition to support the "overcoming short-termism" hypothesis states that institutional investors with better sustainability footprints should also exhibit better risk-adjusted (long-term) investment performance. In a second step, we thus test if sustainability footprint positively affects risk-adjusted investment performance. In contrast, under the "managerially driven philanthropy" hypothesis, risk-adjusted performance should be negatively related to sustainability footprints.

III. Data and variable definitions

A. Stock-level sustainability scores

We start by building a stock-level dataset. To do so, we obtain stock-level sustainability scores from Thomson Reuters and MSCI for U.S. stocks, which we merge with CRSP[7] and Compustat. The sample period runs from 2002 to 2015. Both Thomson Reuters and MSCI[8] provide structured and standardized sustainability research data and scores at the stock-level. The scores are organized along three pillars, i.e. environmental, social, and governance (ESG). We use the overall environmental and social pillar scores from Thomson (i.e., the variables *ENVSCORE* and *SOCSCORE)* and MSCI (i.e., the variables *ENVIRONMENTAL_PILLAR_SCORE* and *SOCIAL_PILLAR_SCORE).* These pillar scores capture the overall social and environmental quality of the company's policies and products. For instance, Thomson's social pillar score captures issues such as the firm's relationship with its workforce, respect of human rights, relations with communities, and product responsibility. In a similar spirit, the environmental score captures issues like firms' overall resource use, all sorts of environmental emissions (i.e., including CO2), other environmental aspects of the production

[7] We restrict ourselves to stocks with CRSP share codes 10 and 11.
[8] See http://goo.gl/M1j7Sd and http://goo.gl/65LDYu

process such as the use of renewable energy as well as environmental innovation (which quantifies the extent to which the company offers environmentally friendly products and services). While MSCI and Thomson use proprietary methods to construct their scores, the set of relevant issues that feed into the construction of their scores are similar.

The stock-level coverage by the two data providers is low at the beginning of the sample period, but rises gradually. For instance, MSCI covers on average about 500 stocks between 2002 and 2011. The coverage increases to more than 2,000 firms by 2012. Coverage for Thomson Reuters is lower with, on average, about 400 stocks between 2002 and 2011 and about 700 stocks between 2011 and 2015.

----Table 1 about here----

We denote by *Envir_A4* (*Social_A4*) the environmental (social) score from Thomson, and analogously, by *Envir_MSCI* and *Social_MSCI* the corresponding scores from MSCI. To make scores comparable between data providers, we rescale the Thomson scores such that both measures have the same support (between 0 and 10). High values indicate positive (or good) stock-level sustainability performance, while low values indicate negative (bad) performance. Panel A of Table 1 shows summary statistics for the MSCI-Thomson-CRSP-Compustat merged sample at the annual frequency. While average values are quite similar for both the MSCI and Thomson Reuters scores (i.e., between 4 and 5), the cross-sectional dispersion is higher for Thomson's stock-level sustainability scores. However, Thomson does not use the full support of the distribution: while the minimum and maximum stock-level scores are 0 and 10 for the MSCI scores, the Thomson Reuters minimum (maximum) social scores are 0.35 and 9.88 (respectively 0.83 and 9.75 for the environmental score).

We now compute, whenever possible, a combined score using the scores from both data providers. Taking the environmental scores as an example, we calculate

$$Envir_{it} = \frac{1_{MSCI,it} \times Envir\_MSCI_{it} + 1_{A4,it} \times Envir\_A4_{it}}{1_{MSCI,it} + 1_{A4,it}},$$

where $1_{MSCI,it}$ ($1_{A4,it}$) is a dummy variable indicating if the MSCI (Thomson) environmental score is available for stock *i* in period *t*. This approach consists of using the average score whenever both MSCI and Thomson scores are available, and using only the available score whenever a stock is not covered by both data providers. We choose this approach to obtain the largest possible sample of stock-level sustainability scores.[9] We repeat the same procedure to calculate the combined social score, which we denote by $Social_{it}$. Next, we calculate our main stock-level sustainability score by taking the average environmental and social score at the stock-level, that is $Susty_{it} = 0.5 \times (Envir_{it} + Social_{it})$. The average (median) value of $Susty_{it}$ is 4.36 (4.2).

----Figure 1 about here----

In Panel A, Figure 1, we plot the distribution of *Susty* as well as the distributions of its component parts *Envir* and *Social*. The histograms show that the distributions of all three variables are non-normal and exhibit considerable cross-sectional variation. Relatively few stocks have high sustainability scores: only about 2.5 percent stock-years have a sustainability score exceeding 8.

In order to get a better idea of the characteristics of stocks for which we observe sustainability scores, we report in Panel B of Table 1 summary statistics for the CRSP-Compustat universe over the time period. Compared to the average CRSP-Compustat firm (Panel B, Table 1), stocks that are covered by MSCI and Thomson (Panel A, Table 1) tend to be larger (roughly three times the average market cap, assets, sales, and number of employees), have lower cash holdings, and higher return on assets. There seem to be no substantial differences in terms of capital expenditures or capital structures. About 40 percent of the firm-year observations belong to S&P500 firms suggesting that Thomson and MSCI also cover some small and midcap firms.

In addition to the standard environmental and social scores from MSCI and Thomson, we also use the recently launched MSCI ESG Sustainable Impact Metrics.[10] Since 2015, MSCI provides data that allow investors to identify firms that provide products or services addressing the major social and environmental challenges identified by the UN Sustainable Development Goals (UN SDGs).[11] MSCI has broken down the 17 Sustainable Development Goals into four impact themes: 1. basic needs, 2. empowerment, 3. climate change, and 4. natural capital. These

[9] In the Internet appendix we conduct analysis in which we use the scores from both data providers separately, leading to similar conclusions.
[10] See http://www.msci.com/esg-sustainable-impact-metrics
[11] The UN SDGs are an intergovernmental set of 17 aspiration goals with 169 specific targets that were adopted in 2014 by the UN General Assembly. (see http://www.un.org/sustainabledevelopment/sustainable-development-goals)

four impact themes belong to an environmental or social pillar. MSCI estimates companies' revenue exposure to all four impact themes. These measures capture how much of a firm's revenue is derived from products and services related to the themes. Examples include, but are not limited to, products and services that attempt to resolve water scarcity, water quality, or the provision of basic products that contribute to the daily intakes of essential nutrients. We focus on the variable *SI_SUST_IMPACT_MAX_REV*, which quantifies the fraction of a firm's total revenues derived from selling products and services related to any of the social and environmental impact themes identified by MSCI. We also use the variable *CT_TOTAL_MAX_REV,* which captures the fraction of revenues derived from products and services addressing environmental themes (e.g., alternative energy, energy efficiency, green building, pollution prevention, or sustainable water), as well as the variable *SI_TOTAL_MAX_REV,* which measures all revenues derived from products and services to social impact themes (e.g., major diseases treatment, SME finance, education or affordable real estate). The overall, social, and environmental impact measures are denoted by *SDG impact*, *Envir impact,* and *Social impact*. Given the novelty of the data, the variables are only available for 2015. Panel A of Table 1 shows that on average the sample stocks derive 6.27 % of their revenues from products and services addressing at least one of the SDG themes. The corresponding figures for revenues derived from environmentally and socially related SDG themes are 4.82 and 1.44 percent. Overall, we thus observe that firms derive a low fraction of their revenues from products and services that address SDGs.

B. Institutional investor-level sustainability footprints

The first objective of this paper is to quantify the sustainability footprint at the institutional investor portfolio-level. To do so, we obtain institutional investor equity holdings data from 13F filings.[12] We focus on institutional-investor holdings of common stocks that can be linked with CRSP and Compustat. We combine the annual stock-level sustainability scores described in section III.A with the quarterly 13F stock holdings data to calculate quarterly

[12] The Securities and Exchange Commission (SEC) requires all institutional investment managers who exercise investment discretion over $100 million or more in Section 13(f) securities to report, at the end of each calendar quarter, their holdings on Form 13F. Section 13(f) securities include equity securities that trade on exchanges, certain equity options and warrants, shares of closed-end investment companies, and certain convertible debt securities. The shares of open-end investment companies (i.e., mutual funds) are not Section 13(f) securities. (see http://www.sec.gov/answers/form13f.htm)

footprint measures at the institutional investor-level. Our main variable of interest is the overall sustainability footprint of the institutional investor, which we define as

$$Susty\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt} \times Susty_{it-1},$$

where w_{ijt} denotes the value-weight of stock *i* in investor *j's* portfolio in quarter *t*, $Susty_{it-1}$ the sustainability score of stock *i* in quarter *t-1*, and N_{jt} the total number of stocks investor *j* holds in quarter *t* for which stock-level sustainability scores are available. This variable quantifies the sustainability footprint of institutional investor *j* in quarter *t* as the weighted average sustainability score of the stocks that make up the institution's portfolio. The sustainability footprint of the investor thus depends on (i) the sustainability scores of the individual stocks in the investor's portfolio and (ii) the size of the individual stock holdings. Analogously, we calculate the social and environmental footprints by individually using the two components of the stock-level sustainability score, that is $Social\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt} \times Social_{it-1}$ and $Envir\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt} \times Envir_{it-1}$.[13] We also calculate footprint measures that are restricted to the investor's holdings in S&P 500 stocks, which we denote by $Social\_VW\_SP_{jt}$, $Envir\_VW\_SP_{jt}$, *and* $Susty\_VW\_SP_{jt}$.

In Panel B of Figure 1, we plot the distributions of *Social_VW*, *Envir_VW*, and *Susty_VW*. The histograms reveal that there is considerable dispersion in the footprint measures and that relatively few institutions possess very good footprints (that is high values). The distribution of institutional investor-level footprints differs substantially from the stock-level sustainability scores (Panel A, Figure 1).

----Table 2 about here----

In Table 2, we display summary statistics at the institutional investor-level. The median value weighted sustainability footprint (i.e., *Susty_VW*) is 4.41 and the 75h percentile is 5.76 out of 10. Looking at the tail of the distribution, only about 2.5 % of institution-quarter observations exhibit footprints exceeding 8 (out of 10). The latter observation is due to (i) very few stocks displaying high sustainability scores (above 8) and (ii) most institutional investors holding diversified stock portfolios.

[13] For robustness checks discussed in the Internet appendix, we also calculate equally weighted footprints by setting $w_{ijt} = 1/N_{jt}$. Analysis based on these equally weighted footprints generates similar results.

----Figure 2 about here----

In order to check the plausibility of our sustainability footprint measures, we plot the evolution of average footprints over time. Consistent with the fact that environmental and social issues have become more important for institutional investors over time, Figure 2 shows that our measures exhibit positive upward time trends: the average values of all three measures have generally been increasing since 2002. More specifically, the average sustainability footprint has increased by about 65 percent between 2002q1 and 2015q4. Increasing investor-level sustainability footprints complement evidence in Dyck et al. (2016), who document that *firm-level* environmental and social scores have been improving over time. Interestingly, the positive time-trend is most pronounced for the average environmental footprint, which has increased by about 85 percent between 2002q1 and 2015q4. The environmental footprint also appears to be decoupling from the social footprint since the second half of 2010. This might be due to the impact of the Deepwater Horizon oil spill (or so called "BP oil spill"), which occurred around that time.[14]

C. Measures of investor horizon

One of the objectives of the paper, as stated in section II.B, is to test two competing hypotheses as to why some institutional investors choose more sustainable portfolio allocations than others. The "overcoming short termism" hypothesis predicts higher sustainability footprints for investors with longer investment horizons. Given that investor horizon is not directly observable, we use two proxies. First, we rely on a common classification of 13F institutions (see Bushee (2001) and Abarbanell, Bushee, and Raedy (2003)). The classification is based on the strictness of the institutions' fiduciary responsibilities (or legal types).[15] Secondly, we rely on investor holdings data to infer investment horizon from portfolio turnover (see Froot, Perold, and Stein (1992)).

C.1 Legal type classification (Bushee (2001) and Abarbanell, Bushee, and Raedy (2003))

[14] See also Dyck et al. (2016), who use this event as a quasi-experiment.

[15] The classification is based on the old CDA/Spectrum classification and maintained by Professor Brian Bushee from the Wharton School. The data may be downloaded on his website: http://goo.gl/rCZNhh. The classification is only available until the end of 2013, which is why empirical analysis that uses the classification runs only until the end of 2013.

The eight categories used in the Bushee (2001) and Abarbanell, Bushee, and Raedy (2003) classification are: banks, insurance companies, corporate pension funds, public pension funds, investment companies, independent investment advisors, university and foundation endowments, and a category of miscellaneous institutions. The bank category mainly identifies bank trust departments. Investment companies are mutual fund management companies and the independent investment advisors category regroups institutions such as asset management companies, investment banks, brokers, private wealth management companies, hedge funds, or mutual funds. Prior research suggests that the behavior of institutional investors is likely to vary depending on their legal type as institutions may be subject to differences in preferences, investment horizons, incentives, trading, and investment strategies driven in part by the regulatory constraints that these investors are facing (see, for instance, Gompers and Metrick (2001), Bennet, Sias, and Starks (2003), or Cella, Ellul and Giannetti (2013)).

To gain insights on the relative importance of the different categories, we calculate aggregate stock holdings for each category. The largest category is that of independent investment advisors, representing aggregate stock holdings of about $25 trillion (tn) at the end of 2013. The second largest investor category is that of investment companies (about $8tn), followed by banks (about $6tn), and insurance companies (about $2tn). At the end of 2013, aggregate common stock holdings of miscellaneous institutions, public pension funds, corporate pension funds, and university endowments were respectively about $2.8tn, $1.5tn, $0.3tn, and $0.084tn.[16] Note that all these holdings are direct stock holdings and exclude mandates or shares of open-end investment companies such as mutual funds. Some institutional investors (e.g., public pension funds) are likely to have much higher investment discretion through such mandates or other instruments for which there are no reporting requirements. Unfortunately, data on mandates or other instruments are not available to us.

C.2 Portfolio turnover

Froot, Perold, and Stein (1992) suggest that portfolio turnover can be used as a proxy of investor horizon. We follow this proposition and calculate portfolio turnover at the institutional investor-level as the minimum of the absolute values of aggregated sales and aggregated

[16] We report a graph showing the temporal evolution of aggregate stock holdings for the different categories in the Internet appendix to this paper.

purchases during a quarter divided by the average total net asset value of the investor's portfolio during the quarter, that is

$$\text{Turnover}_{\text{jt}} = \min(|Buy_{jt}|, |Sale_{jt}|)/0.5 \times (TNA_{jt} + TNA_{jt-1}),$$

where Buy_{jt} is the total dollar value of buys, $Sale_{jt}$ the total dollar value of sales since the last filing, and TNA_{jt} is the total net asset value of all equity holdings of investor j at date t. We assume that all trading happens at date t and at prices at the end of period *t-1* (see Wermers (2000), Brunnermeier and Nagel (2004), or Ben-David, Franzoni, and Moussawi (2012)). Because *Turnover* is calculated using quarterly holding snapshots, it does not capture trading at frequencies higher than one quarter and thus understates trading activity. As Chen, Jegadeesh, and Wermers (2000) note, the above definition of turnover captures institutional investor trading that is unrelated to investor inflows or redemptions. This is because the definition uses the minimum of buys and sells and the dollar value of buys minus sells is equal to the net inflow (or outflow) of money from investors (controlling for changes in fund cash holdings). Loosely speaking, turnover measures the percentage of the portfolio's holdings which changed since the previous reporting period. Note that this measure is not a perfect measure of investment horizon since more long-term oriented investors may also trade actively in the short term, for instance, because of hedging or regulation driven mechanic portfolio rebalancing motives.

D. Portfolio returns

In the second part of the empirical analysis, we test whether risk-adjusted portfolio performance is associated with investors' sustainability footprints. Indeed, a positive relationship between risk-adjusted performance and sustainability footprint is a sufficient condition to validate the "overcoming short-termism" hypothesis. To this end, we calculate a return measure at the institutional investor portfolio-level, which we denote by *Return (Quarterly).* This variable measures the value-weighted quarterly portfolio return of the institutional investor, which we calculate as the hypothetical holdings returns of the long equity portion of the institutional investor's portfolio. The portfolio return is computed assuming that positions are held until the new quarterly holdings are observed and that trades occur only at the end of the quarter. This is a constraint imposed by the 13F holdings data, which is only available at the quarterly frequency. We thus miss all positions that were traded in and out during the quarter. Our return measure based on 13F institutional ownership data should thus not be seen as an exact return measure for institutions that engage in high frequency trading, that rely heavily on short positions or derivatives, and that are invested predominantly in other asset classes (e.g., fixed income). The holdings return also does not account for transaction fees, management fees, or investor taxes. Yet, we believe the holdings returns reflect the returns on the long leg of institutions' equity holdings reasonably well.[17] By cumulating quarterly returns in a given year at the institutional investor-level, we also calculate an annual portfolio return, which we denote as *Return (Annual).*[18] The average quarterly (annual) portfolio return is 0.68 (3.16) percent (see Table 2).

E. Control variables

We calculate several other characteristics at the institutional investor portfolio-level, such as the size of the common stock holdings *(Assets)*, number of stocks *(# stocks)*, or number of SIC2 industries in which the investor holds positions. The variable *Coverage (Value)* is the percentage of the investor's portfolio value for which stock-level sustainability scores are available. The variables *% stocks S&P500* and *% value S&P500* capture the fraction of stocks (value) of the investor's portfolio invested in firms belonging to the S&P500 index.

As Table 2 shows, the average (median) size of the investor's holdings is $12.42bn ($0.99bn). There is considerable skewness and dispersion in terms of the size of the investors' equity holdings: some institutions are negligibly small, while others are gigantic with common stock holdings in excess of $4tn. The average (median) institution holds 194 (69) stocks and less than 5 percent of investor-quarter observations belong to institutions that are invested in two or fewer SIC2 industries. Thus, overall institutional investors' stock holdings appear to be well diversified. The variable *Coverage (Value)* shows that on average, about 78 % of the institutional investor's portfolio value is covered by stock-level sustainability scores, suggesting that stock-level sustainability scores generally cover the majority of stocks in which the 13F investors invest. When looking at the median investor, *Coverage (Value)* is 90 percent. Using the quarterly time-series of portfolio returns (i.e., *Return (Quarterly)*), we also estimate the institutional investor's

[17] For a sample of mutual funds at the monthly frequency, Kacperczyk, Sialm, and Zheng (2008) compare returns calculated from holdings data with reported returns. They find dispersion in the difference between reported and holdings returns, but document that the difference is on average close to zero.
[18] We retain only annual return observations for which all four quarterly observations are available.

exposure to the four Carhart (1997) factors using rolling windows of 12 quarters. *Beta_mkt, Beta_smb, Beta_hml, and Beta_umd* measure these factor exposures.

IV. Empirical analysis

A. Investment horizon and sustainability footprints

In this section we conduct our empirical tests with the objective of better understanding which institutions choose sustainability oriented portfolio strategies. The "overcoming short-termism" hypothesis suggests, according to Bénabou and Tirole (2010), that sustainability oriented investors make decisions while adopting a long term perspective. Given anecdotal evidence that institutions like pension funds and insurance companies are subject to longer investment horizons, and the evidence that portfolio turnover is lower for these institutions (see supplementary analysis in our Internet appendix or evidence in Cella, Ellul, and Giannetti (2013)), we start by plotting average sustainability footprints by investor categories.

----Figure 3 about here----

In Panel A, Figure 3, we show the average social, environmental, and overall sustainability footprint for each of the eight investor categories. The upper subfigures in Panel A show average values of the environmental and social footprint (i.e., *Envir_VW* and *Social_VW*) by investor category, while the lower subfigure displays the average values of the combined sustainability score *Susty_VW*. All three figures suggest that longer term oriented institutions (i.e., banks, insurance companies as well as corporate and public pension funds) have, on average, better sustainability footprints (i.e., higher values) than shorter-term oriented institutions such as independent investment advisors and investment companies. In terms of economic magnitudes, the differences are sizeable.[19] Focusing on the combined sustainability footprint for instance (lower subfigure of Panel A), the data suggest that banks have an about 28 percent (5.5/4.3-1) better sustainability footprint than independent investment advisors. The differences

[19] Because of their long-term liabilities and legal asset-liability-management constraints, pension funds and insurance companies are likely to be more long-term oriented and thus less active in terms of short-term trading. In a similar spirit, bank trusts are known for providing conservative investment management services, not the least because of the requirement that trustees respect *prudent man laws*. For instance, Del Guercio (1996) shows that bank based investment managers, who invest primarily on behalf of private trust and pension plan clients and are captured by the *Banks* category of the Bushee classification, tilt portfolios to stocks that courts consider to be prudent.

with respect to independent investment advisors are less pronounced for public and corporate pension funds (21 and 19 percent) as well as insurance companies (12 percent).

To corroborate the graphical evidence, we estimate pooled cross-sectional regressions in which we relate the three footprint measures to categorical dummy variables and a set of control variables. We also include year-quarter and country fixed effects. The base category is that of independent investment advisors.

----Table 3 about here----

In column 1 and 2, we report the results for regressions in which the environmental and social footprints serve as dependent variables. Column 3 shows the results for the combined sustainability footprint. The regression analysis confirms that banks, insurance companies, and pension funds have significantly better social, environmental, and combined sustainability footprints than independent investment advisors, even after controlling for observable investor-level and unobservable country characteristics. In contrast, miscellaneous institutions, university and foundation endowments, and investment companies exhibit no differences with respect to independent investment advisors. In terms of economic magnitude, the effect sizes are similar to those documented in Panel A, Figure 3. Focusing on the overall sustainability footprint (column 3), the coefficient for banks is 0.87, which amounts to a 20 percent (0.87/4.3) higher footprint compared to the average independent investment advisor. There does not appear to be a big difference in terms of effect sizes when looking at social and environmental footprint separately. If anything, the effect sizes are slightly larger for the environmental footprint.

The coefficients on the control variables are informative too. In the cross section, institutional investors with more stocks tend to have better footprints. In contrast, institutional investors who pursue industry oriented investment strategies tend to perform more poorly in terms of sustainability: the coefficient on the dummy variable *# Industries<=2,* which indicates whether the investor's holdings are concentrated in two or fewer industries, is negative. Apart from the coefficient on the momentum factor exposure *Beta_umd,* which is generally not different from zero in all three specifications, all other factor exposures turn out to be significantly negative: institutional investors with higher exposure to high beta, small, and value stocks tend to have worse sustainability footprints. The negative coefficients for the variables

Beta_smb and *Beta_hml* seem plausible given that smaller and value firms generally display lower sustainability scores.

Investment horizon is likely to be somewhat homogeneous in a given investor category. Hence, the investor categories already capture investment-horizon to some extent. However, there can still be considerable variation in investment horizons within a given investor legal type category. For instance, not all investment advisors are equally short-term oriented. In a similar spirit, not all pension funds are equally long-term oriented. To exploit such intra-category variation in investment horizon, we now use the portfolio turnover measure described in subsection III.C.2 as a time varying proxy for investment horizon. Given the quarterly frequency of the holdings data, the turnover measures will capture the change of the institutional investor's portfolio from one quarter to the other. Turnover is a proxy of investment horizon because institutions with longer investment horizons and buy-and-hold investment strategies should change their portfolio composition less often and thus have lower portfolio turnover. In each quarter, we sort institutions by portfolio turnover and categorize institutional investors as having low, medium, or high turnover based on the terciles of the quarterly turnover distribution. Low turnover institutions are institutions in the first tercile of the distribution. In contrast, high turnover are institutions for which turnover falls into the third tercile distribution in a given quarter. We then calculate average sustainability footprints for each of the three terciles, which we plot in Panel B of Figure 3.

The figure shows substantial differences in all three sustainability footprint measures for low- and high turnover institutions. For example, low turnover institutions have an average environmental footprint of 5.2, while that of high turnover institutions is 3.7. This amounts to a 40.5 percent difference between low and high turnover institutions. The figure also reports a *t*-statistic of -30.93 for the mean difference test between the low and high tercile, indicating the difference to be highly statistically significant. Differences in the social and sustainability footprints between low and high turnover are of similar magnitude: low turnover institutions have a 37 percent (4.9/3.6-1) higher social and 38 percent (5.1/3.7-1) higher overall sustainability score than their high turnover counterparts.

In order to ensure that the results presented in Panel B of Figure 3 are not driven by omitted variables, we now turn to testing the relationship between sustainability footprint and turnover more formally. Given that the relation between social and environmental footprints on the one hand, and portfolio turnover on the other seem to be quite similar, we restrict the regression analysis to the combined sustainability footprint as the dependent variable in the regression analysis.[20]

----Table 4 about here----

In Column 1 of Table 4, we simply regress the sustainability footprint on turnover and year-quarter fixed effects. The regression shows a coefficient of -4.40 suggesting that a one standard deviation lower quarterly portfolio turnover (-0.12) is associated with an about 12 percent higher sustainability footprint (-4.40*-0.12/4.41). In column 2, we control for the number of stocks, the industry concentration dummy, and the total size of equity holdings. In addition, we include institution-type fixed effects. The coefficient remains virtually unchanged. In column 3, we introduce country fixed effects in order to account for the fact that institutional investors from some countries might be more inclined to hold portfolios with higher sustainability footprints (see Dyck et al. (2016) for evidence supporting this view). Again, the coefficient does not change much. In column 4, we control for the factor exposures of the institutional investors, which reduces the coefficient on turnover somewhat, suggesting that investment style has a first order impact on the sustainability footprint of institutional investors. This seems plausible since stock-level sustainability scores differ systematically along the dimension of value, growth, size, and beta. In column 5, we include investor fixed effects, which additionally reduces the economic magnitude of the coefficient estimate on *Turnover*. However, the coefficient remains highly significant statistically speaking.

The regression models in columns 1-4 suggest that in the cross section investors with portfolios consisting of more stocks tend to have higher sustainability footprints. Interestingly, however, the sign of the coefficient on *Stocks* switches sign and becomes negative in the investor fixed effects specification in column 5. This implies that for a given investor, increases in the number of stocks result in lower sustainability footprints. This pattern seems intuitive to the extent that large investors probably care more about sustainability and, as a result, have higher scores (between dimension). In contrast, when controlling for unobserved investor heterogeneity

[20] The internet appendix contains analysis in which the environmental and social footprints are analyzed separately. It shows that, if anything, the results are slightly stronger (both economically and statistically) for the environmental footprint.

(within dimension), increasing the number of portfolio firms results in lower footprints, which might be due to concessions in terms of sustainability that have to be made when increasing the number of portfolio firms (diversification).

In column 6, we measure the sustainability footprint of the institutional investor by using only the investor's holdings in S&P500 firms. We do so in order to hold constant the set of stocks used in calculating the footprint. To account for the fact that investors have different holdings of S&P 500 stocks, we control for the fraction of S&P stocks in the investor's overall portfolio *(% stocks S&P500)*. We also control for the fraction of the portfolio's value invested in S&P 500 stocks *(% value S&P500)*. We further include the full set of control variables as well as time, investor category, and country fixed effects which we used in column 4. The regression coefficient on *Turnover* is again negative and highly significant. When including investor fixed effects in column 7, the coefficient estimate changes in magnitude, but remains highly significant.[21]

One objection to these results could be the extent to which our dependent variables actually capture the sustainability footprint or the effective sustainability impact of investors. To address this concern, we use an alternative portfolio footprint measure which is based on the MSCI ESG Sustainable Impact Metrics. This measure quantifies how much of the investor's portfolio firms' revenues are derived from products and services related to achieving one of the sustainable development goals (see Section III.A for a more thorough discussion of the measure at the stock-level). Since this measure is only available for 2015, we choose to estimate a pooled cross-sectional regression. We cannot include investor-type fixed effects because the Bushee (2001) and Abarbanell, Bushee, and Raedy (2003) categorization is not available for 2014 and 2015. In line with the previous results, we see in column 8 of Table 4 that the portfolio-level revenue from products and services related to the SDG's is also significantly negatively related to turnover.

Given the evidence that longer term oriented institutions tend to have more sustainable portfolio allocations, the first set of results presented in this section is so far consistent with the "overcoming short-termism" hypothesis. This evidence on the positive association between

[21] In robustness checks in the Internet appendix, we use several alternative definitions of turnover and portfolio "churn" (see Gaspar, Massa, and Matos (2005) or Cella, Ellul and Giannetti (2013)), which lead to similar conclusions.

sustainability and measures of investment horizon should however be interpreted with caution since it is possible that institutional investors' sustainability preferences and investment horizons are endogenously determined. Note however that the evidence based on portfolio turnover (as a proxy of investor horizons) remains robust to including various types of fixed-effects (e.g., at the institutional investor-, institution-type-, and country-level) allowing us in particular to rule out the possibility that omitted factors are driving our results.

Irrespective of the potential endogenous determination of sustainability preferences and investor horizon, the observation that long-term oriented institutions have higher sustainability footprints is a necessary but not a sufficient condition to support the "overcoming short-termism" hypothesis. The "overcoming short-termism" hypothesis makes explicit predictions about the relation between investors' financial performance and their sustainability footprints, a relationship that we examine in the next subsection.

B. Risk-adjusted performance and sustainability footprint

In this section, we test the relationship between investment performance and institutional investors' sustainability footprints. To do so, we calculate standard risk and return measures at the institutional investor-level using both quarterly and annual returns. We start by computing the quarterly *Mean portfolio return* of investor j as $\mu_j = 1/T_j \sum_{t=1}^{T_j} r_{jt}$, where r_{jt} denotes the portfolio return of investor j in quarter t, and T_j the total number of quarterly return observations available for investor j. Similarly we calculate *Total portfolio risk* of investor j as $\sigma_j = \sqrt{1/T_j \Sigma_{t=1}^{T_j} (r_{jt} - \mu_j)^2}$ and define investor j's Sharpe ratio as $SR_j = \frac{\mu_j}{\sigma_j}$. We also calculate the corresponding annual metrics by using annual returns, which we obtain by cumulating quarterly returns. See section III.D for details on how we compute the time series of investor-level portfolio returns. In Table 5, we report cross sectional summary statistics for the distribution of the quarterly (Panel A) and annual (Panel B) risk and return measures.

----Table 5 about here----

The quarterly average *Mean portfolio return* is 0.69 percent. For comparison, the average quarterly return on the value weighted CRSP market return for the same period was 1.37 percent. The average quarterly (annual) *Sharpe ratio* is about 0.24 (0.50). The Sharpe ratios appear lower than, for instance, empirical Sharpe ratios reported in Lo (2000), but this is likely to be due to the fact that we use holdings based returns, which are only an approximation of the true returns (see also our discussion of the holding returns in section III.D). Nonetheless, the holdings returns are the best return measure we can obtain for such a comprehensive sample of institutional investors. Note also that these returns are calculated for the entire equity holdings of an institutional investor and are likely to aggregate many different investment styles. Table 5 further shows that the average T_j, i.e. the average number of observations used to calculate the risk and return measures is about 34 quarters (see Panel A) respectively 7 years (see Panel B).

The "overcoming short-termism" hypothesis states that institutional investors adopt sustainable investment policies to take a long-term view, curb short-termism, and maximize (long term) investment performance. We thus expect a positive (negative) link between risk-adjusted performance and institutional investors' sustainability footprints if the "overcomig short-termism ("managerially driven philanthropy") hypothesis prevails.

----Figure 4 about here----

The upper subfigures of Figure 4 display the average *Mean portfolio return*, *Total portfolio risk*, and *Sharpe Ratio* at the quarterly horizon conditional on low, medium, and high terciles of the average sustainability footprint. To calculate these conditional averages, we sort the whole cross section of institutional investors into terciles of the sustainability footprint and calculate the average performance metrics for each of the three terciles. Since we are considering a cross section of risk and return measures (i.e., we have, per institution, one estimate for each metric), we use the average sustainability footprint during the sample period as the sorting variable, which we calculate as $\overline{Susty\_VW_j} = 1/T_j \sum_{t=1}^{T_j} Susty\_VW_{jt}$.

The upper left subfigure shows that there is a mildly decreasing relationship between the quarterly *Mean portfolio return* and the sustainability footprint. When looking at *Total portfolio risk*, we find a strongly monotonically decreasing relationship with the sustainability footprint and institutions with high sustainability footprint exhibit an almost 35 percent (2.673/4.105-1) lower *Total portfolio risk* compared to low sustainability investors. The difference between the *Total portfolio risk* of high and low sustainability footprint investors is highly statistically significant (*t*-statistic of -33.15). When analyzing the *Sharpe ratio* conditional on footprints (upper right subfigure), we find a positive relation between quarterly *Sharpe ratio* and sustainability footprint. In fact, institutions with high sustainability footprints have an about 43 % higher (0.278/0.194-1) quarterly *Sharpe ratio* than low sustainability footprint institutions. Again, the difference is statistically significant (*t*-statistic of 11.14). In the lower part of Figure 4, we repeat the same analysis at the annual horizon, which yields similar results. Consistent with the notion that sustainability matters more at longer horizons, the results for *Total portfolio risk* and *Sharpe ratio* appear slightly stronger at the annual horizon: high sustainability investors have, compared to low sustainability investors, an about 40 percent lower total portfolio risk (6.143/10.137-1) as well as an about 58 percent higher *Sharpe ratio* (0.614/0.388-1). The evidence of a positive relationship both at the quarterly and annual investment horizon jointly support the "overcoming short-termism" hypothesis. We now check in an OLS regression framework that the univariate analysis is robust to the inclusion of control variables.

----Insert Table 6 here----

In columns 1-3 of Table 6, we regress the investor's *Mean portfolio return*, *Total portfolio risk*, and *Sharpe ratio* at the quarterly horizon on the average sustainability footprint. In columns 4-6, we repeat the same analysis at the annual horizon. We also control for several characteristics of the investor, i.e. *Industries<=2* (which is a dummy equal to one if the investor, at any time during the sample period, had holdings concentrated in two or fewer industries), average size (i.e., *ln(Assets))*, average number of stocks in the portfolio (i.e., *Stocks*), the number of observations used to estimate the risk and return characteristics, as well as institution type[22] and country fixed effects.

In contrast to the univariate analysis of Figure 4, quarterly *Mean portfolio return* is not significantly related to the sustainability footprint (t-statistic=-0.72) in the cross section. The regression analysis of *Total portfolio risk* and *Sharpe ratio* mirrors the univariate evidence provided in Figure 4: *Total portfolio risk* and *Sharpe ratio* are negatively respectively positively related to the sustainability footprint. The economic magnitudes of the cross-sectional coefficient estimates appear economically meaningful. At the quarterly horizon for instance, a one standard deviation increase in the sustainability footprint is associated with a 19 percent (-0.394*1.57/3.32) lower *Total portfolio risk*. In a similar spirit, a standard deviation increase in

[22] The institution type fixed effects account for the fact that different types of institutional investors are subject to different investment styles and other restrictions (e.g., regulation).

the sustainability footprint is associated with a 17 percent (0.027*1.57/0.24) higher *Sharpe ratio*. Again, the effect sizes at the annual horizon (see columns 5 and 6) are slightly larger than those at the quarterly horizon: a standard deviation higher sustainability footprint at the annual horizon is associated with 21 percent lower *Total portfolio risk* (-1.046*1.62/8.01) and a 26 percent higher *Sharpe ratio* (0.079*1.62/0.5). The regression analysis in Table 6 thus corroborates our univariate findings from Figure 4.

The evidence from Figure 4 and Table 6 suggest that risk-adjusted performance is higher for high sustainability footprint institutions. Importantly, the positive cross-sectional relationship between *Sharpe ratio* and the sustainability footprint measure appears to be, both at the quarterly and at the annual horizons, driven primarily by a reduction in the investors' *Total portfolio risk*, suggesting that concerns with and portfolio tilts towards sustainability operate as a risk management device. Our findings on the positive risk-adjusted performance-sustainability link materializing through lower total portfolio risk of high footprint institutional investors are in line with recent findings by Kecskes, Mansi, and Nguyen (2016) who focus on the firm-level and show that, at the firm-level, the presence of long-term investors increases the financial value of CSR activities to shareholders, mainly as a result of lower cash flow risk.

In analysis reported in the Internet appendix, we decompose total risk into its market and idiosyncratic components and also calculate extreme loss probabilities. We show that above all, idiosyncratic risk and extreme loss probability are lower for high sustainability footprint investors. These findings further suggest that the positive relationship between sustainability footprint and risk-adjusted performance seems to operate primarily through a risk reduction channel, since the relation between raw portfolio returns and the investor's sustainability footprint is in general negative or insignificant.

Overall, this set of results is supportive of the "overcoming short-termism" hypothesis inspired by Bénabou and Tirole (2010) in that we find evidence that institutional investors with higher sustainability footprints act as long term value maximizers. Indeed, the "managerially driven philanthropy" hypothesis should have led to the opposite result, i.e. lower risk-adjusted performance, since this view suggests that activities that ultimately result in higher sustainability footprints are mainly driven by managerial self- and social-image concerns and are thus value destroying. In the analysis above, we find evidence of a strong, positive correlation between sustainability and risk-adjusted investment performance. However, such evidence does not establish a causal impact of sustainability on risk-adjusted investment performance, because OLS coefficient estimates could potentially be biased due to the endogenous determination of risk-adjusted performance and sustainability footprints (for instance, because of an omitted variable). In order to address this issue, the next section presents results from two identification strategies that allow us to address the endogeneity issue and ultimately argue for a causal impact of sustainability on institutional investors' risk-adjusted performance.

V. Identification

A. Natural disasters as a natural experiment

To provide evidence of a causal relationship between sustainability footprints and risk-adjusted performance, our first empirical strategy exploits the occurrence of natural disasters as a source of exogenous variation in investor-level sustainability. The idea is that the occurrence of a natural disaster in the close vicinity of an institutional investor's headquarters provides an exogenous shock to the institutional investor's sustainability preferences. Research in behavioral finance has shown that experiencing macroeconomic shocks can have a profound impact on individual risk-taking behavior (see Malmendier and Nagel (2011)). We conjecture that, in a similar spirit, experiencing natural disasters (in particular, those related to extreme weather events) affects individual attitudes and preferences towards sustainability issues. The identification strategy is motivated by the availability heuristic (see Tversky and Kahneman (1974)), which stipulates that judgements and individual behavior are disproportionally influenced by information and examples that are salient to the decision-maker.

Indeed, Demski et al. (2017) show that direct experience of extreme weather events leads to an increased salience of sustainability issues such as climate change. The experience of extreme weather events also induces more pronounced emotional responses to sustainability issues. Using survey methods in the context of a single natural disaster in the UK (i.e., the winter flooding of 2013), Demski et al. (2017) compare individuals personally affected by the extreme weather event ("treatment") with a representative "control" sample: the authors show that "direct flooding experience can give rise to behavioral intentions beyond individual sustainability actions, including support for mitigation policies, and personal climate adaptation in matters unrelated to the direct experience." We build on this evidence by hypothesizing that the sustainability preferences of portfolio managers working for institutional investors should also be affected by the experience of natural disasters. The mechanism is as follows: when natural disasters occur close to an institutional investor's headquarter, the institution's employees become more receptive to environmental and social issues and, as a result, the institution's portfolio-level sustainability increases subsequently ("treatment"). In contrast, institutional investors headquartered in areas unaffected by the natural disasters serve as the "control group". Given the exogeneity of natural disasters, it is plausible to think that investors are randomly assigned to the "treatment" and "control" groups.

Prior studies in economics and finance have exploited the occurrence of natural disasters for identification purposes. For instance, Barrot and Sauvagnat (2016) use natural disasters to study how idiosyncratic firm-level shocks propagate in production networks. Dessaint and Matray (2017) examine whether corporate managers' risk perceptions respond to hurricane strikes. Similar to these studies, we use natural disaster data from SHELDUS (Spatial Hazard and Loss Database for the United States). For each natural disaster in the U.S., the database provides information on the start date, the end date, and the Federal Information Processing Standards (FIPS) code of all affected counties. Following Barrot and Sauvagnat (2016), we use only major disasters, which are defined as disasters lasting less than 30 days with total estimated damages above $1 billion (in constant 2013 dollars).

----Table 7 about here----

Table 7 displays the list of disasters used in this study. The table shows that the majority of the disasters are hurricane strikes. However, the list also includes other natural disasters such as floodings or blizzards. We obtain the ZIP codes of the institutional investors' headquarters from SEC filings and link them to FIPS codes using a commonly available link table. Obviously, we restrict the analysis to U.S. based institutions.[23]

----Figure 5 about here----

[23] While we used a sample of about 4,000 unique 13F institutions (including foreign institutions) in the analysis of section IV.B, we now restrict the analysis to U.S. based institutions. The restriction to U.S. based 13F institutions and the availability of information on the location of the 13F institution's headquarter from SEC filings reduces the analysis to about 2,800 institutions in this section.

We provide a graphical representation of the geographic data in Figure 5. Panel A shows the geographic distribution of institutional investor headquarters. The map shows concentrations of headquarters around New York, Boston, Stamford, Chicago, Seattle, San Diego, and San Francisco. Panel B, Figure 5 displays a map highlighting the counties affected by the natural disasters. Note that some counties are hit several times by natural disasters.

Our identification strategy rests on two steps: First, we show that institutional investor-level sustainability footprints increase when natural disasters occur close to institutional investors' headquarters ("treatment"). Secondly, we show that their risk-adjusted performance is positively related to sustainability footprints following this treatment. To show that institutions increase sustainability footprints following a disaster treatment, we code treatment dummy variables indicating whether the county of the institutional investor's headquarter is hit by a natural disaster any time between quarter *t-m* and *t-n.* To gain insights on the time pattern of the institutions' responses, we use four distinct time periods for the dummy variables, namely *(t-1,t-4)*, *(t-5,t-8)*, *(t-9,t-12)*, and *(t-13,t-16)*. For instance, the variable $Disaster\ hits\ investor_{j(t-1,t-4)}$ indicates that the institution is subject to a disaster sometime between quarter *t-1* and *t-4* (i.e., a natural disaster hits the investor's headquarters county sometime between *t-1* and *t-4*). In Column 1, Table 8 we estimate the following simple investor-fixed effects specification

$$SUSTY\_VW_{jt} = a_0 + a_1\ Disaster\ hits\ investor_{j(t-m,t-n)} + \eta_j + \pi_t + \epsilon_{jt},$$

where $Disaster\ hits\ investor_{j(t-m,t-n)}$ is the treatment dummy indicating that the county of the institution's headquarter is subject to a natural disaster between quarters *t-m* and *t-n*, η_j are investor fixed effects, and π_t are year-quarter fixed effects. In columns 2 to 4 we use treatment dummy variables based on further lagged time periods, i.e. *(t-5,t-8)*, *(t-9,t-12)*, and *(t-13,t-16)*.

----Table 8 about here----

Columns 1-3 of Table 8 show statistically significant coefficient estimates for the treatment dummies $Disaster\ hits\ investor_{j(t-1,t-4)}$, $Disaster\ hits\ investor_{j(t-5,t-8)}$, *and* $Disaster\ hits\ investor_{j(t-9,t-12)}$. The coefficient estimate on $Disaster\ hits\ investor_{j(t-13,t-16)}$ *in column 4* is not significant, suggesting that the experience of disasters has an impact on the institution's sustainability preferences for a period of roughly three years. Relative to institutions not affected by disasters ("control") and relative to quarters during which the treated institution is not subject to natural disasters, the sustainability footprint increases in the quarters following natural disasters. In the specification of column 5, we use all treatment dummies together and in column 6 we add control variables: our conclusions remain unaffected.

In order to put the statistical significance of the coefficient estimates on the treatment dummies into perspective, we now run a Monte Carlo simulation. Between 2002 and 2013, there are a total of 1,535 county year-quarter pairs which are characterized by true natural disasters. In other words, 1,535 counties experience natural disasters during 2002 and 2013. As Panel B of Figure 5 suggests, this can include the same county multiple times. Hence, we randomly draw (with replacement) 1,535 observations from a sample of all possible county year-quarter pairs between 2002 and 2013. We choose to draw a random sample with replacement because counties can be affected multiple times by natural disasters. Based on this random sample of pseudo disaster observations, we recode the variables $\textit{Disaster hits investor}_{j(t-1,t-4)}$, $\textit{Disaster hits investor}_{j(t-5,t-8)}$, $\textit{Disaster hits investor}_{j(t-9,t-12)}$, *and* $\textit{Disaster hits investor}_{j(t-13,t-16)}$ and estimate the specification from column 6 of Table 8. We repeat this procedure 1,000 times and plot the distribution of the *t*-statistics for the coefficient estimates on the four pseudo treatment dummy variables in Figure 6.

----Figure 6 about here----

The median *t*-statistics for the coefficient estimates on $\textit{Disaster hits investor}_{j(t-1,t-4)}$, $\textit{Disaster hits investor}_{(t-5,t-8)}$, $\textit{Disaster hits investor}_{j(t-9,t-12)}$, *and* $\textit{Disaster hits investor}_{j(t-13,t-16)}$ *are 0.04, 0.01, -0.04, and -0.02.* The red vertical lines in the four subfigures indicate the magnitude of the respective *t*-statistic for the true natural disaster sample, i.e., the *t*-statistics from the point estimates from column (6) in Table 8. In fact, a mere 40 of the 1,000 estimations result in *t*-statistics for the coefficient on $\textit{Disaster hits investor}_{j(t-1,t-4)}$ larger than the *t*-statistic obtained from the estimation using the true disaster treatment sample. Thus, the Monte Carlo simulation supports the view that investors do change the sustainability characteristics of their portfolios following natural disasters and that the magnitude of the observed coefficient estimates for the treatment dummies is not simply coincidental.

Having shown that institutions increase portfolio-level sustainability footprints following exogenous shocks induced by natural disasters, we now interact the average sustainability footprint between quarters *t-m* and *t-n*, a variable which we denote by $\textit{Susty\_VW}_{j(t-m,t-n)}$, with the corresponding treatment dummies *Disaster hits investor*$_{j(t-m,t-n)}$ to show that the positive impact of sustainability on risk-adjusted investment performance identified in the previous section is likely to be causal. The dependent variables are *Mean portfolio return*$_{j(t,t+12)}$, *Total portfolio risk*$_{j(t,t+12)}$, and *Sharpe ratio*$_{j(t,t+12)}$. We calculate these performance metrics on a forward-rolling basis using windows of 12 quarters and estimate specifications of the following type:

$$y_{j(t,t+12)} = a_0 + a_1\, Disaster\ hits\ investor_{j(t-1,t-4)} + a_2\, Susty\_VW_{j(t-1,t-4)} + \boldsymbol{a_3}\, Susty\_VW_{j(t-1,t-4)} \times Disaster\ hits\ investor_{j(t-1,t-4)} + \cdots + \eta_j + \pi_t + \epsilon_{jt},$$

where $y_{j(t,t+12)}$ is one of the 12 quarter investment performance metrics, *Susty_VW*$_{j(t-1,t-4)}$ denotes the average institution-level sustainability footprint during quarters *t-1,* and *t-4*, and *Disaster hits investor*$_{j(t-1,t-4)}$ denotes the disaster treatment dummy as previously defined. The equation again includes time and investor fixed effects. The dots in the equation indicate that we also include the average sustainability footprints, disaster treatment dummy variables, and corresponding interaction terms using higher lags of the respective variables (i.e., *(t-5,t-8)*, *(t-9,t-12)*, and *(t-13,t-16)*). We regress *forward* investment performance measures (i.e., between period *t* and *t+12)* on *lagged* treatment and sustainability variables (i.e., between *t-m* and *t-n*) so that the post and the pre-treatment periods are clearly separated.

We are mainly interested in the coefficient estimates for the interaction effects, e.g. $\boldsymbol{a_3}$. These coefficients measure whether and how portfolio sustainability is related to risk-adjusted performance for "treated" firms. The two hypotheses we entertain in this paper make different predictions regarding the sign of these interaction coefficients. While the "overcoming short termism" hypothesis suggests positive coefficient estimates, the "managerially driven philanthropy hypothesis" implies negative coefficient estimates for these interaction terms. In other words, the former hypothesis suggests that higher portfolio sustainability due to exogenous shocks to the sustainability preferences of institutional investors translates into better risk-adjusted performance following a natural disaster, while the latter view predicts the opposite. We report the regression results for the three performance metrics in Table 9.

----Table 9 about here----

In column 1 of Table 9 we use *Mean Portfolio Return(t,t+12)* as the dependent variable.

The coefficient estimates on the interaction terms *Disaster hits investor*$_{j(t-1,t-4)}$ × *Susty_VW*$_{j(t-1,t-4)}$, *Disaster hits investor*$_{j(t-5,t-8)}$ × *Susty_VW*$_{j(t-5,t-8)}$, and *Disaster hits investor* $_{j(t-9,t-12)}$ × *Susty_VW*$_{j(t-9,t-12)}$ are significantly positive, suggesting that following natural disasters the portfolios of higher sustainability investors earn higher returns. In contrast, column 2 shows that the interaction terms are not significant when *Total portfolio risk(t,t+12)* serves as the dependent variable. When we use the *Sharpe ratio(t,t+12)* as the dependent variable, we observe a strongly positive and significant relation between the interaction terms for periods *(t-1,t-4)* and *(t-5,t-8)*, suggesting a causal relationship between risk-adjusted performance and portfolio-level sustainability. Thus, to summarize: after natural disasters institutional investors headquartered in affected areas experience a positive shock to their sustainability preferences and tilt their portfolios towards stocks with higher sustainability scores. The higher portfolio-level sustainability leads to higher post-treatment risk–adjusted performance, which is likely to be due to positive price pressure on high sustainability stocks following natural disasters.[24]

B. Instrumental variable strategy

To provide further evidence of a causal impact of sustainability footprints on risk-adjusted returns, we also implement an instrumental variables (IV) strategy. We use geographic variation to instrument for the sustainability footprint. Inspired by Flammer and Kacperczyk (2016) and Geczy et al. (2015), we construct an instrument based on the existence of state-level *constituency statutes* that provide a legal framework for directors to explicitly consider non-shareholder interests in their decision-making. Since this variable exploits differences in U.S. state laws, we again restrict the analysis to U.S. based 13F institutions for which we can obtain both the state of incorporation and the state of the headquarters from the institutions' SEC filings.[25]

----Table 10 about here----

[24] Note that the direct effect of a natural disaster on risk-adjusted performance is always significantly negative up to a two year horizon. The interpretation of this coefficient estimate is difficult, however, because natural disasters can affect risk-adjusted performance for many reasons unrelated to sustainability (e.g., heightened risk-aversion post disaster). The direct effect (i.e. treatment dummy) absorbs all these confounding factors which we do not study in this paper and allows us to better identify the causal impact of higher sustainability on risk adjusted performance, which is entirely captured by the interaction term between the treatment dummy and the institutional-level sustainability footprint.

[25] Compared to the OLS analysis (see Table 6) in which we used data on about 4,000 U.S. and non-U.S. 13F institutions, we obtain headquarter and incorporation states for about 2,300 U.S. based 13F investors.

Constituency statutes have been enacted in a number of U.S. states between 1983 and 2006. These statutes provide a legal framework for directors to consider non-shareholder constituents. As Geczy et al. (2015) note, "constituency statutes expand the protection of the business judgment rule by permitting, not mandating, directors to consider non-shareholder constituents." Such statutes have been enacted in a staggered way by some, but not all U.S. states (see Table 10). Typically, researchers use the enactment of these constituency statutes in a difference-in-differences (DID) framework (see, for instance, Flammer and Kacperczyk (2016)). Since all but one enactment fall outside of our sample period, we cannot use the staggered enactment in a DID setting. Instead, we use a two stage least squares (2SLS) approach and construct an instrument based on the length of time a constituency statute has been in existence in a given state. More specifically we argue that the longer a constituency statute has been in place in a given state, the more likely it should be that institutional investors incorporated in these states account for sustainability considerations in their decision-making. Hence, the length of existence of constituency statues provides a source of plausibly exogenous variation in the investor-level sustainability footprint. Note that the instrument varies at the institution's incorporation state-level. More formally, we define the instrument as follows

$$Constituency\ statute_j = \begin{cases} \mathbf{0} & \text{if no constituency statute in the state of incorporation of investor } j \\ \mathbf{2007} - \boldsymbol{year\ of\ enactment} & \text{if constituency statute in the state of incorporation of investor } j \end{cases}$$

The logic behind the construction of the instrument is as follows. The instrument takes on a value of zero for institutions incorporated in states that have not enacted constituency statutes. For institutions incorporated in states with constituency statutes, the instrument takes on values that are proportional to the length of time such statutes have been in place. The most recent constituency statute was enacted in Texas in 2006. Hence, for institutional investors incorporated in Texas, the instrument takes on a value of 2007-2006=1 (i.e., the lowest value for enactment states). Note that the only enactment that falls into our sample period is that in Texas in 2006. Institutions incorporated in states that have enacted constituency statutes before 2006 have proportionally higher values for the instrument *Constituency statute*. For example, for institutions incorporated in Ohio, which enacted in 1984, *Constituency statute* has a value of 2007-1984=23. Table 10 displays the number of investors by state of incorporation, the year in which the constituency statute was enacted, and the values of the instrument *Constituency statute*. There is considerable variation in the instrument across states.

The *Constituency statute* variable is a valid instrument if it is correlated with the sustainability footprint (relevancy condition) but impacts the dependent variables (e.g., *Sharpe ratio*) only through its effect on the sustainability footprint (exclusion restriction). The relevancy condition can be tested in a straightforward manner by regressing the endogenous variable (i.e., the sustainability footprint) on the instrument. It seems plausible that there should be a positive relation between the length of time a constituency statute has been enacted in the incorporation state of an institutional investor and the institution's sustainability footprint.

Testing the validity of the exclusion restriction is more difficult and there is no formal test to do so. Hence, we have to argue for the validity of the exclusion restriction. We believe there is no reason to think why constituency statutes would impact the risk-adjusted performance of institutional investor portfolios directly. First of all, institutions typically hold geographically diversified investment portfolios, reducing the possibility of a direct impact from the portfolio firms' incorporation state on the risk-adjusted performance of the institution. Note that even if there was a correlation between the state of incorporation of an institution and its portfolio firms, it is not clear a priori how constituency statutes would affect the performance of the institution's portfolio. Secondly, we use gross portfolio returns to calculate the dependent variables *Mean portfolio return*, *Total portfolio risk,* and *Sharpe ratio*. While net returns, which account for taxes and fees, could potentially vary across the institution's incorporation states—because of, for instance, state-level differences in wages or taxes—it seems implausible that institutions' gross portfolio returns would depend directly on the state of incorporation of the institution or on the number of years a constituency statute has been enacted in the incorporation state.

One particularity of the U.S. is that many firms (and institutional investors) choose to incorporate in Delaware. In our sample, about 900 13F institutions are incorporated in Delaware. It might be a concern that risk-adjusted performance is systematically different for Delaware incorporated 13F institutions. Again, it is not clear how such potential state-level performance differences would be directly related to our instrument. Nevertheless, we compare risk-adjusted performance between institutions incorporated in Delaware and those incorporated in other U.S.

states and find no significant difference between the two.[26] Overall, we believe that our instrument is valid.

----Table 11 about here----

In Table 11, we display the results from several specifications of the first stage regression in which the sustainability footprint (at the quarterly horizon) is related to the instrument.[27] In column 1 of Table 8, we regress the sustainability footprint on the instrument and an intercept. We double cluster standard errors by incorporation and headquarter state to account for the fact that the instrumental variable varies at the incorporation state level and that there might be additional clustering at the headquarter-incorporation-state pair level. The instrument is highly statistically significant (*t*-statistic=4.50) and positively related to the sustainability footprint: institutions' sustainability footprints are increasing in the time constituency statutes have been in place in the incorporation state. The F-statistic of the first stage regression that includes only the instrument (column 1) is around 20 and thus easily exceeds the value of 10, which is sometimes used as a threshold to rule out a weak instruments problem. In column 2, we add firm-level variables to the regression model, which leaves the coefficient on the instrument largely unchanged. In column 3, we add institution type fixed effects, which slightly reduces the magnitude of the estimate. Overall, the results show that the sustainability footprint is significantly positively related to the variable *Constituency statute* (i.e., the duration of time a constituency statute has been in place in the incorporation state). We use the full model from column 3 of Table 8 as our first stage regression.

----Table 12 about here----

In Table 12, we show the results from the second stage regressions. Columns 1-3 display the second stage regressions for *Mean portfolio return*, *Total portfolio risk*, and the *Sharpe ratio* at the quarterly horizon. Columns 4-6 display the respective regressions at the annual horizon. The 2SLS regressions from Table 12 correspond to the OLS regressions of Table 6. The results continue to show a significant negative (positive) relationship between the sustainability footprint and *Total portfolio risk* (*Sharpe ratio*). When compared to the OLS estimates of Table 6, the

[26] The average quarterly *Sharpe ratio* of Delaware incorporated institutions is 0.24, while that of institutions incorporated in other U.S. states is 0.25.
[27] The first stage regressions at the annual horizon are virtually identical and are therefore relegated to the Internet appendix.

statistical significance decreases somewhat, whereas the economic magnitude of the coefficient doubles when compared to the OLS estimates. Overall, the second stage estimates also suggest a causal impact of the sustainability footprint on institutional investor risk-adjusted performance.

VI. Conclusion

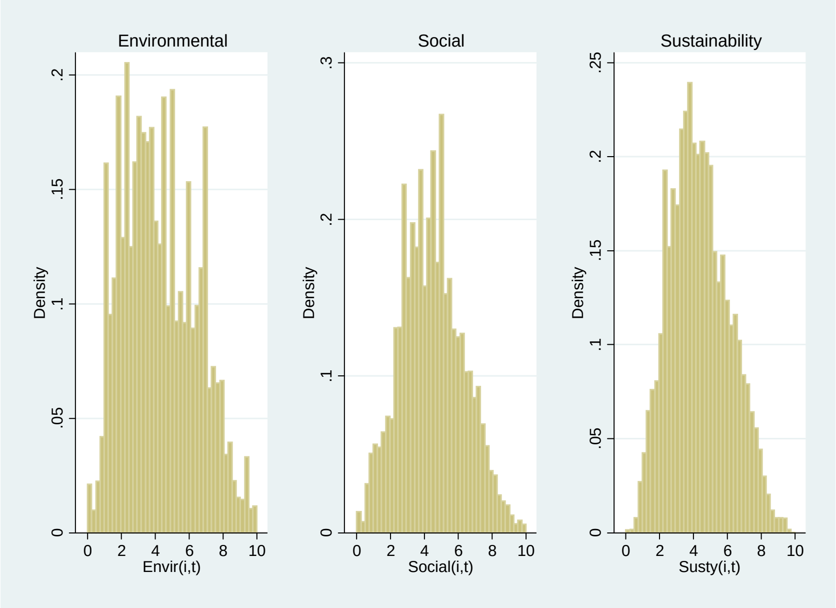
In this paper, we systematically examine and measure the social, environmental, and aggregate sustainability of 13F institutional investors. First, we construct a measure of the sustainability footprint at the institutional investor portfolio-level and study its time series and cross-sectional determinants. We document an upward trend in the average institutional investor sustainability footprint since 2002, and an intriguing divergence between the social and environmental footprints since about 2010: while the average social footprint has plateaued, the average environmental footprint has continued to rise. This divergence could be explained by the increasing regulatory and political pressures towards sound environmental policies.

Second, inspired by Bénabou and Tirole (2010), we conjecture that two views could underlie institutional investors' motivations to hold equity portfolios with higher sustainability footprints, namely "overcoming short-termism" and "managerially driven philanthropy". The first view implies both a necessary and a sufficient condition regarding respectively the types of investors that should hold sustainable portfolio allocations and the relation between risk-adjusted performance and sustainability. Our results favor the first view in that we first show that institutional investors with higher sustainability footprints also tend to have longer investment horizons independent of whether horizon is measured by investors' legal types or by their trading frequency. More importantly, we document that, in line with the sufficient condition to validate the "overcoming short-termism" hypothesis, high sustainability footprint investors also display higher risk-adjusted performance. The opposite result would have been expected under the competing "managerially driven philanthropy" hypothesis. We further document that this enhanced risk-adjusted performance of high sustainability footprint portfolios is primarily driven by a strong reduction in total portfolio risk, suggesting risk mitigation as being one of the main channels through which portfolio-level sustainability generates long-term value. To argue for a causal interpretation, we implement both an identification strategies based on the occurrence of natural disasters and state-level constituency statutes that provide a legal framework for directors to explicitly consider non-shareholder interests in their decision making. Both strategies suggest a positive and causal impact of sustainability footprints on institutional investors' risk-adjusted performance.

Our results contribute importantly to the literature on the relation between institutional investors' financial performance and their environmental and social portfolio policies, highlighting that the main driver of enhanced risk-adjusted performance is not return enhancement—but quite to the contrary—a less explored channel that is reduction of total portfolio risk. Thus, implementing responsible (or sustainable) investment practices is primarily a risk management device that strengthens the resilience of institutional investors' portfolios.

Figures

Panel A: Stock-level sustainability scores



Panel B: Institutional investor-level sustainability footprint

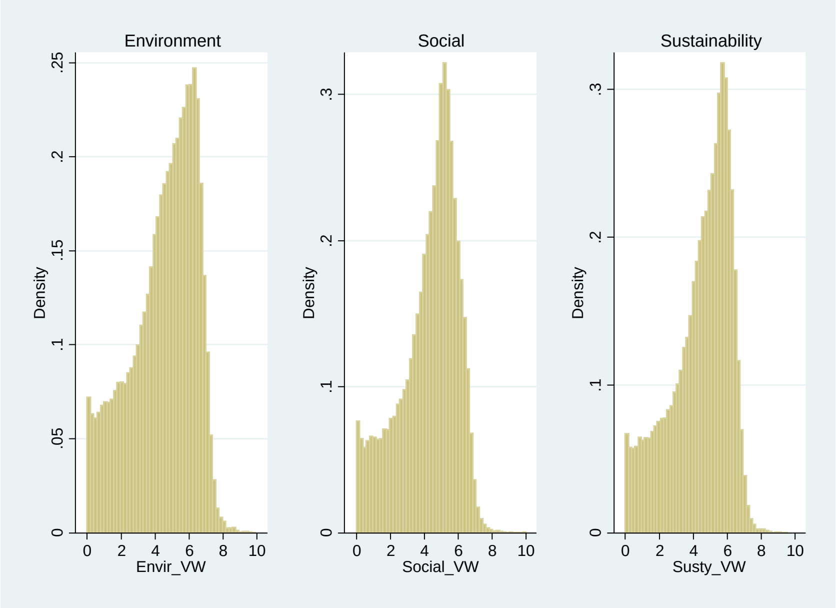


Figure 1

Panel A of this figure shows the distribution of the stock-level sustainability scores. The left, middle, and right subfigures show the distribution of the environmental, social, and overall sustainability scores at the stock-level. The overall sustainability score at the stock level is defined as the average environmental and social score. Panel B displays the distributions of the social, environmental, and overall sustainability footprints (value weighted) at the institutional-investor level. Investor-level footprints are weighted averages of stock-level scores, where the weights are simply the weights of the stocks in the investor's portfolio.

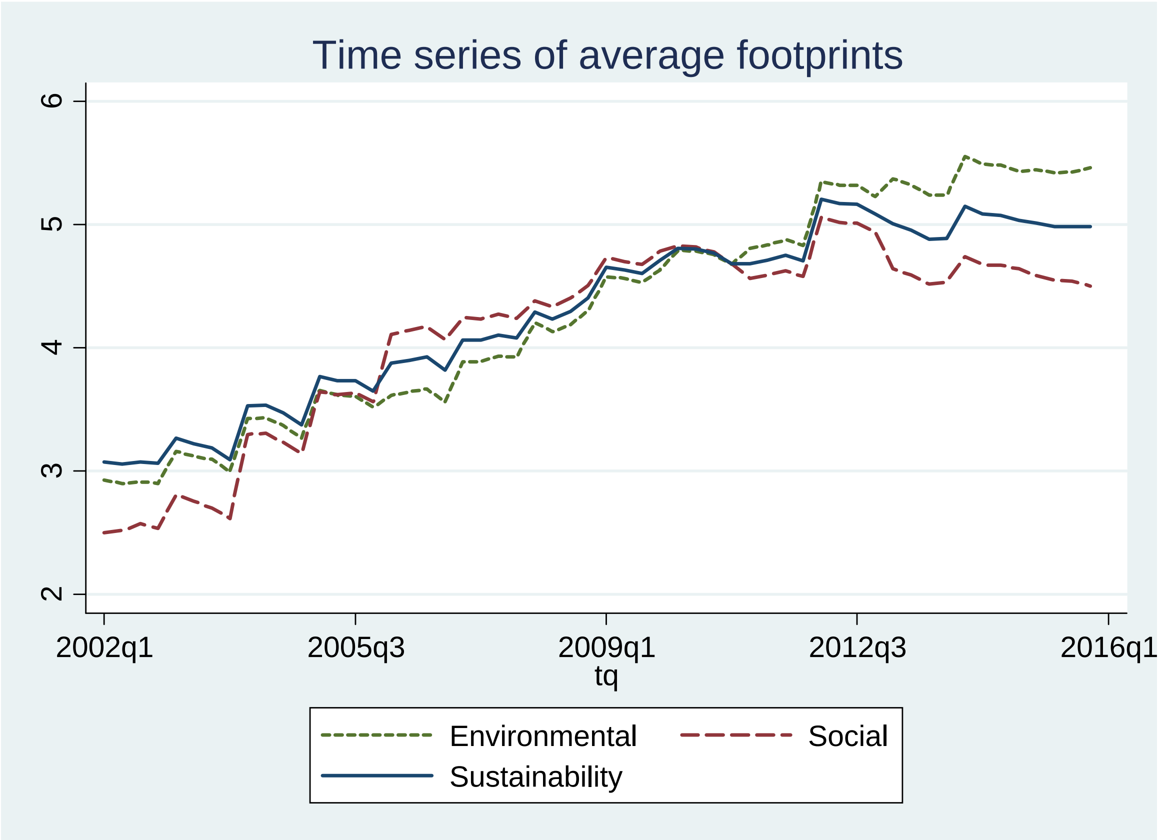
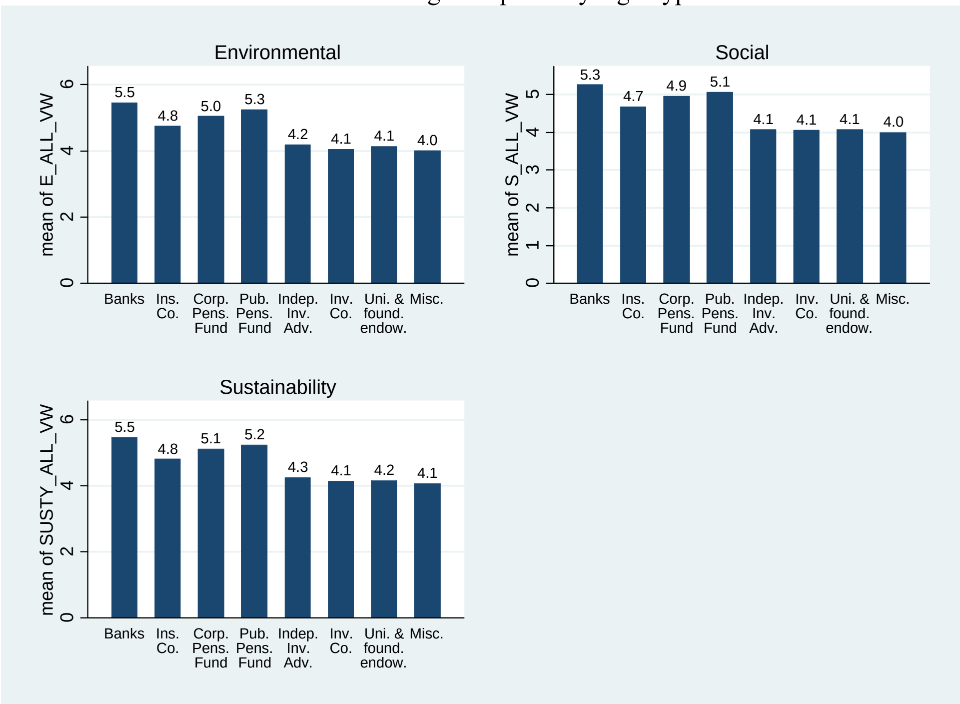


Figure 2

This figure shows the evolution of the average institutional investor-level environmental, social, and combined sustainability footprints over the sample period (i.e., the quarterly cross-sectional averages of *Envir_VW*, *Social_VW*, and *Susty_VW*).

Panel A: Average footprints by legal type



Panel B: Average footprints by terciles of portfolio turnover

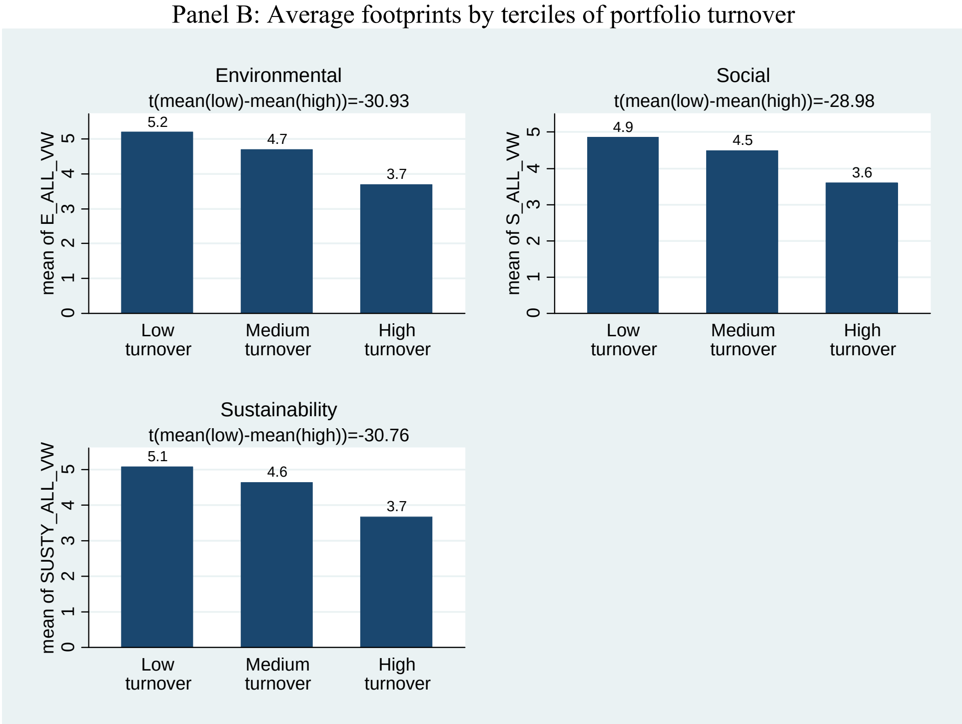


Figure 3

Panel A displays the average environmental (*Envir_VW)*, social (*Social_VW*) and combined sustainability footprint (*Susty_VW*) by legal type of the institutional investor. *Ins. Co.* is an abbreviation for insurance companies, *Inv. Co.* abbreviates investment companies, and *Uni. & found. endow.* stands for the category of university and foundation endowments. Panel B shows the average environmental, social, and combined sustainability footprint score by terciles (high, medium, low) of portfolio turnover. The *t*-statistics of the mean difference test are adjusted for clustering at the investor-level.

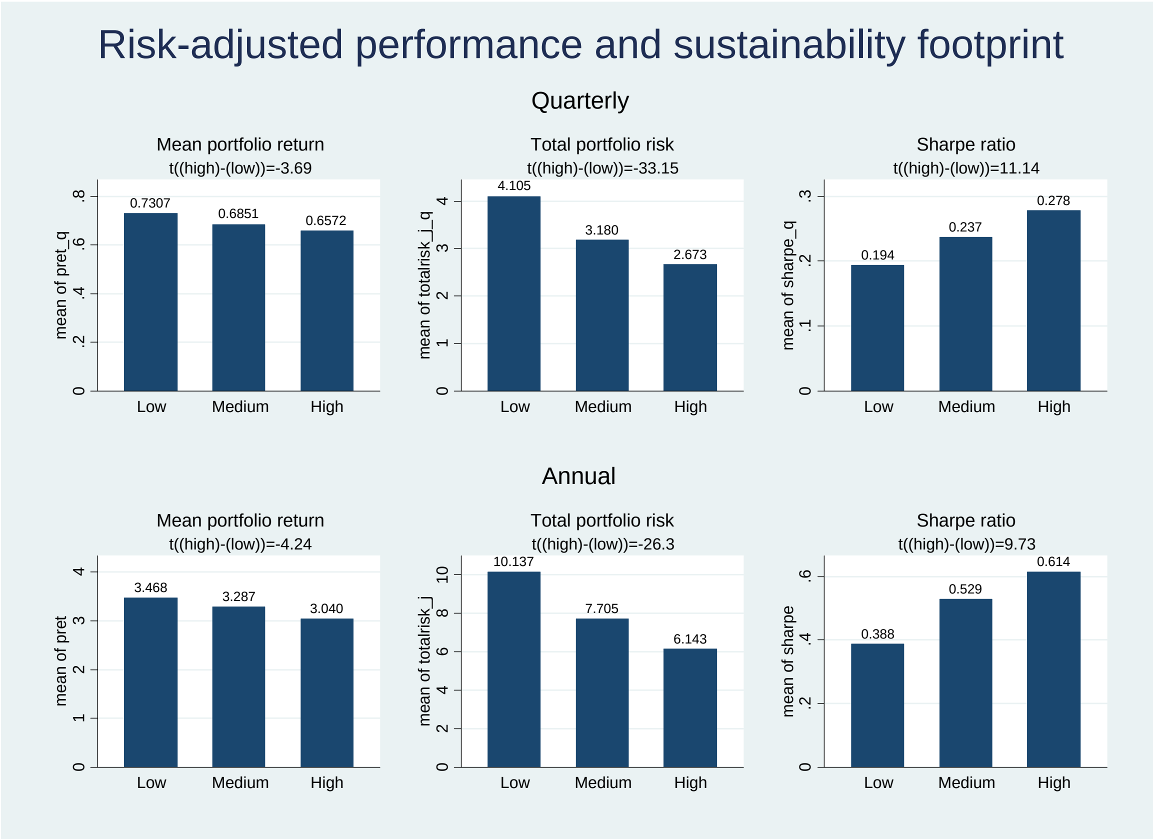
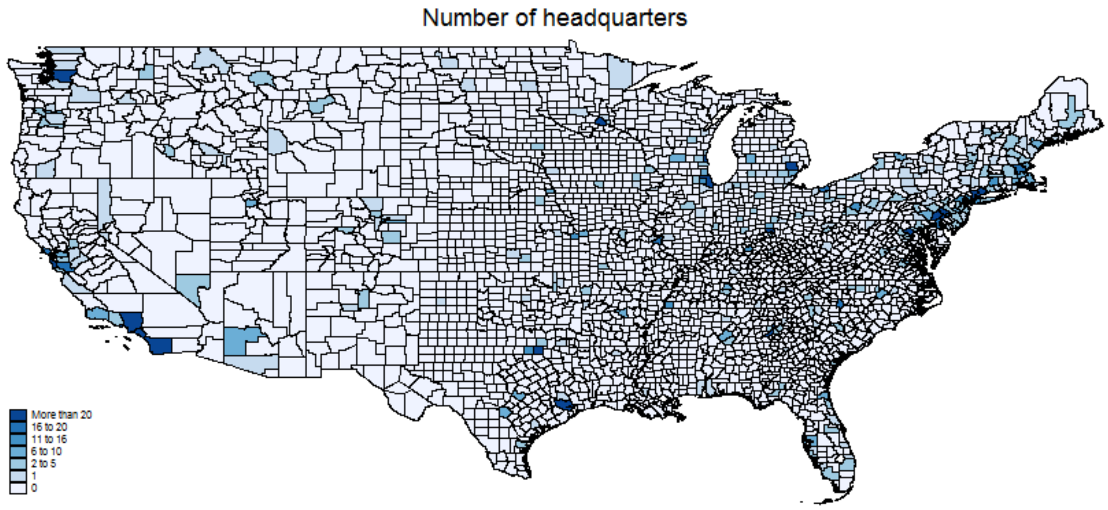


Figure 4

This figure shows average *Mean portfolio return*, *Total portfolio risk*, and Sharpe ratio by terciles of the combined sustainability footprint score. The upper figures of the graph use quarterly returns to calculate the performance measures, while the lower figures are based on annual returns. The *t*-statistics of the mean difference test are adjusted for clustering at the investor level.

Panel A: Geographical distribution of institutional investor headquarters



Panel B: Geographical distribution of natural disasters

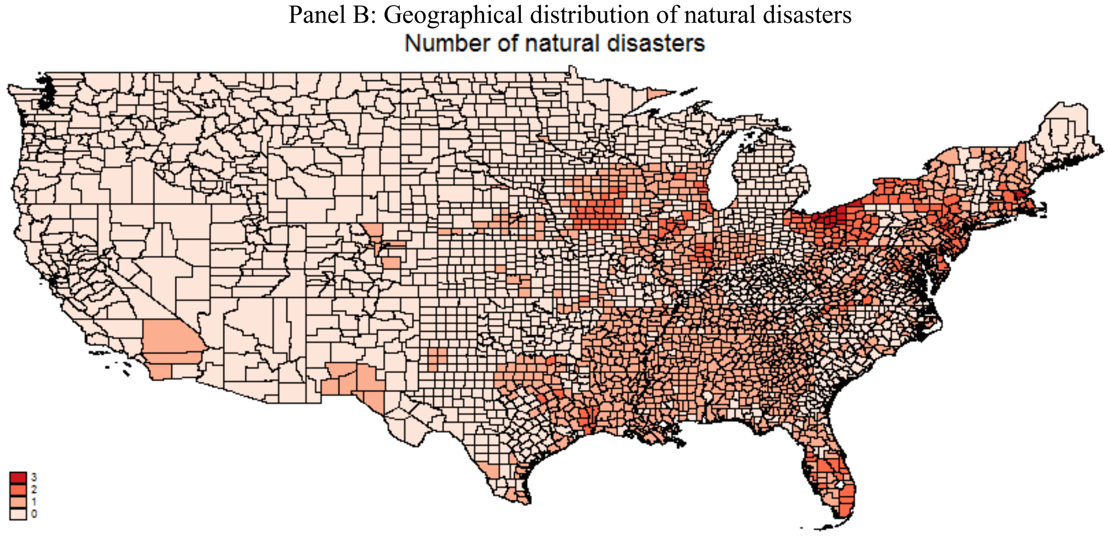


Figure 5

Panel A displays the geographic distribution of the headquarters of the 13F institutional investors. We obtain the headquarter location of the 13F institutional investors from SEC filings. Panel B shows the frequency with which counties are hit by natural disasters between 2002 and 2013.

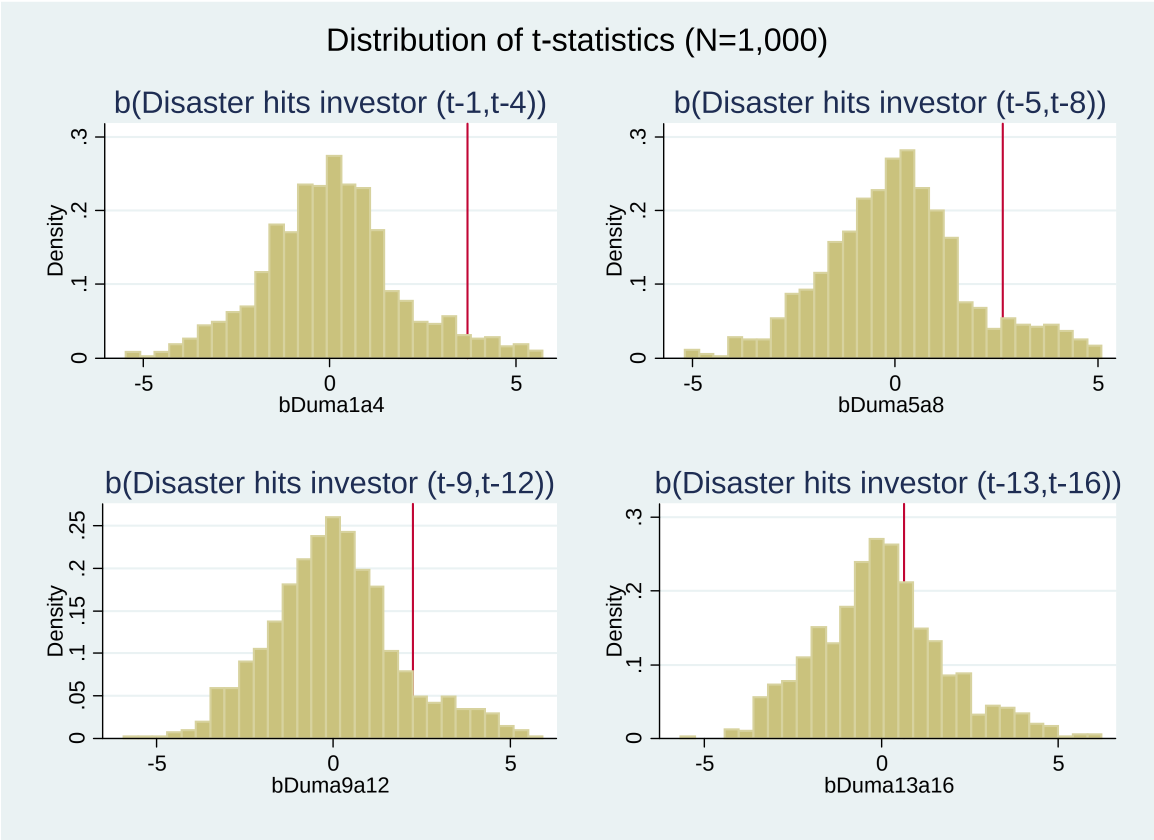


Figure 6

This figure shows the histograms of *t*-statistics for a Monte Carlo simulation involving placebo natural disasters. Between 2002 and 2013, there are a total of 1,535 county year-quarter observations characterized by *true* natural disasters. Hence, we randomly draw 1,535 county year-quarter pairs (with replacement) from a sample of all possible county year-quarter pairs between 2002 and 2013. Based on this sample of placebo disaster county year-quarter pairs, we code the variables *Disaster hits investor*$_{j(t-1,t-4)}$, *Disaster hits investor*$_{j(t-5,t-8)}$, *Disaster hits investor*$_{j(t-9,t-12)}$, *and Disaster hits investor*$_{j(t-13,t-16)}$. We then estimate the specification from column 6 of Table 8 and save the *t*-statistics for the coefficient estimates on all four dummy variables. We repeat this procedure 1,000 times and plot the distribution of the *t*-statistics in the four subfigures. The red vertical lines indicate the magnitude of the *t*-statistics obtained for the true natural disaster sample (i.e., the t-statistics from column 6, Table 8).

Tables

Table 1. Stock-level summary statistics

This table shows summary statistics of the main stock-level variables. The sample period is 2002-2015. Panel A shows summary statistics for the sample of stocks for which sustainability scores are available. For comparison, Panel B reports summary statistics for stocks belonging to the CRSP-Compustat universe over the same time period. *Envir_A4 (Social_A4)* is the stock-level environmental (social) score from Thomson Reuters. *Envir_MSCI and Social_MSCI* are the corresponding stock-level scores from MSCI. *Envir*, *Social*, and *Susty* are the combined MSCI and Thomson scores at the stock-level. *SDG impact* is the percentage of the firm's sales that is derived from goods and services that address at least one of the social and environmental challenges identified in the UN Sustainable Development Goals (UN SDGs). *Envir* and *Social impact* are the fractions of the firm's total sales derived from products and services related to environmentally and socially related SDG themes. *S&P 500* is a dummy variable indicating S&P500 membership. *Market cap*, *Assets*, and *Sales* are in Million $. *Employees* is in thousands.

Panel A: MSCI-Thomson-CRSP-Compustat sample

	count	mean	sd	min	p25	p50	p75	max
Envir_A4	7849	4.48	3.18	0.83	1.51	3.36	7.93	9.75
Social_A4	7849	4.86	2.80	0.35	2.31	4.63	7.39	9.88
Envir_MSCI	13887	4.39	1.96	0.00	3.00	4.40	5.70	10.00
Social_MSCI	13171	4.44	1.62	0.00	3.31	4.45	5.42	10.00
Envir	15449	4.28	2.15	0.00	2.51	4.01	6.00	10.00
Social	15091	4.45	1.85	0.00	3.10	4.40	5.70	10.00
Susty	15449	4.36	1.76	0.00	3.07	4.20	5.60	10.00
SDG impact	1964	6.27	18.39	0.00	0.00	0.00	0.44	100.00
Envir impact	1964	4.82	16.05	0.00	0.00	0.00	0.00	100.00
Social impact	1964	1.44	9.73	0.00	0.00	0.00	0.00	100.00
S&P 500	15449	0.39	0.49	0.00	0.00	0.00	1.00	1.00
Market cap	15440	11,081	29,588	10.56	1,048	3,030	8,711	682,427
Assets	15448	25,415	122,369	7.12	1,229	3,701	11,983	2,573,126
Sales	15446	9,089	24,686	-4,234	757.97	2,397	7,219	483,521
Employees	15376	25.51	78.28	0.00	1.90	6.77	21.40	2,300.00
Capex / Fixed assets	14407	0.26	0.21	-0.16	0.12	0.20	0.32	1.50
Liabilities / Assets	15398	0.59	0.26	0.00	0.42	0.59	0.76	2.80
Cash/Fixed assets	15448	0.16	0.18	0.00	0.03	0.09	0.22	1.00
Roa	15142	0.04	0.09	-0.44	0.01	0.04	0.08	0.47

Panel B: CRSP-Compustat universe

	count	mean	sd	min	p25	p50	p75	max
S&P 500	59353	0.11	0.31	0.00	0.00	0.00	0.00	1.00
Market cap	58855	3,341	15,977	0.47	85.14	332.91	1,389	682,427
Assets	59309	7,704	63,864	0.00	117.72	525.48	2,133	2,573,126
Sales	59254	2,857	13,315	-4,234	54.24	268.04	1,281	483,521
Employees	58628	9.07	44.15	0.00	0.21	0.94	4.75	2,300
Capex / Fixed assets	48465	0.27	0.25	-0.65	0.10	0.19	0.35	1.50
Liabilities / Assets	59048	0.56	0.30	0.00	0.33	0.54	0.78	2.82
Cash/Fixed assets	59304	0.20	0.24	0.00	0.03	0.10	0.29	1.00
Roa	55203	0.01	0.11	-0.44	-0.01	0.02	0.06	0.47

Table 2. Institutional investor-level summary statistics

This table shows summary statistics at the institutional investor-level. *Envir_VW (Social_VW)* is the value-weighted environmental (social) footprint of the institutional investor. *Envir_VW_SP (Social_VW_SP)* is the value-weighted environmental (social) footprint of the institutional investor calculated using only the investor's holdings in S&P 500 firms. *Susty_VW* is the average environmental and social (i.e., combined) footprint, and *Susty_VW_SP* is the overall footprint restricted to holdings of S&P500 stocks. *SDG impact VW* is the value-weighted average percentage of the portfolio firms' sales of goods and services that address one of the social and environmental challenges identified in the UN Sustainable Development Goals (UN SDGs). *Envir* respectively *Social impact VW* are the fractions of the portfolio firms' sales that address social respectively environmentally oriented SDGs. *Turnover* is quarterly portfolio turnover. *Return (Quarterly)* is the investor's quarterly holdings return. *Return (Annual)* is the investor's annual return. *Assets* is the size of the institutional investor's common stock holdings (in bn. $). *Coverage (Value)* is the percentage of the investor's portfolio value for which stock-level sustainability footprint measures are available. *# Industries<=2* is a dummy variable indicating if the institutional investor's portfolio firms belong to two or fewer two-digit SIC industries. *# Stocks* is the number of stocks in the investor's portfolio. The variable *% stocks S&P500* is the fraction of S&P500 stocks in the investor's portfolio and *% value S&P500* denotes the percentage of the investor's portfolio invested in S&P stocks. *Beta_mkt*, *Beta_smb*, *Beta_hml*, and *Beta_umd* are factor exposures from a Carhart (1997) model. To reduce the impact of statistical outliers, all variables except the footprint measures are trimmed by removing observations for which the value of a variable deviates from the median by more than five times the interquartile range.

	count	mean	sd	min	p25	p50	p75	max
Envir_VW	147401	4.47	1.90	0.00	3.23	4.83	5.99	9.90
Envir_VW_SP	142092	5.67	1.31	0.00	4.95	5.96	6.61	10.00
Social_VW	147149	4.25	1.71	0.00	3.25	4.65	5.49	10.00
Social_VW_SP	141750	5.38	1.22	0.00	4.85	5.55	6.24	9.87
Susty_VW	147406	4.41	1.75	0.00	3.36	4.82	5.76	9.56
Susty_VW_SP	142092	5.59	1.11	0.00	5.06	5.84	6.33	9.56
SDG impact VW	13136	8.87	7.27	0.00	3.83	8.75	12.11	100.00
Envir impact VW	13136	3.27	4.45	0.00	1.35	2.72	3.83	100.00
Social impact VW	13136	5.59	6.07	0.00	0.21	5.02	8.61	85.36
Turnover	132734	0.12	0.12	0.00	0.04	0.08	0.16	0.71
Return (Quarterly)	147173	0.68	3.43	-16.16	-0.77	1.01	2.65	18.08
Return (Annual)	30618	3.16	8.43	-29.74	0.33	3.79	7.01	37.40
Assets	150840	12.42	81.11	0.00	0.40	0.99	3.77	4,257
Coverage (Value)	150840	0.78	0.28	0.00	0.67	0.90	0.98	1.00
# Industries<=2	150840	0.05	0.21	0.00	0.00	0.00	0.00	1.00
# Stocks	150840	193.98	405.78	1.00	30.00	69.00	158.00	4,282
% stocks S&P500	150840	0.56	0.29	0.00	0.33	0.60	0.82	1.00
% value S&P500	150840	0.64	0.32	0.00	0.42	0.75	0.90	1.00
Beta_mkt	145305	0.98	0.40	-0.64	0.83	0.98	1.14	2.60
Beta_smb	146192	0.12	0.62	-2.79	-0.17	0.01	0.36	2.82
Beta_hml	146456	0.02	0.46	-1.94	-0.16	0.00	0.21	1.94
Beta_umd	144939	-0.00	0.29	-1.20	-0.11	0.00	0.11	1.19

Table 3. Sustainability footprint by type of institutional investor

This table displays results from regressions in which the environmental, social, and combined sustainability footprints are related to categorical dummy variables indicating the legal type of the institutional investor. The omitted base category is that of *Independent investment advisors*. *# Stocks* is the number of stocks in the investor's portfolio. *# Industries<=2* is a dummy variable indicating if the institutional investor's portfolio holdings are concentrated in two or fewer 2-digit SIC industries. *Beta_mkt*, *Beta_smb*, *Beta_hml*, and *Beta_umd* are factor exposures estimated using a Carhart (1997). *ln(Assets)* is the natural logarithm of the total value of the investor's stock portfolio. We also include and Year-quarter and Country fixed effects. Standard errors are clustered at the institutional investor level and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Envir_ VW	(2) Social_ VW	(3) Susty_ VW
Banks	0.90***	0.80***	0.87***
	(15.33)	(14.58)	(15.13)
Insurance company	0.40***	0.41***	0.41***
	(3.20)	(3.67)	(3.39)
Corporate pension fund	0.84***	0.79***	0.84***
	(6.20)	(7.08)	(6.69)
Public pension fund	0.68***	0.61***	0.66***
	(7.60)	(7.78)	(7.71)
Investment company	0.05	0.09	0.06
	(0.33)	(0.64)	(0.42)
University and foundation endowments	0.12	0.07	0.12
	(0.39)	(0.26)	(0.40)
Miscellaneous	0.04	0.06	0.05
	(0.53)	(0.84)	(0.66)
# Stocks	0.00***	0.00***	0.00***
	(4.71)	(3.57)	(4.25)
# Industries<=2	-0.88***	-0.56***	-0.71***
	(-4.98)	(-3.27)	(-4.14)
Beta_mkt	-1.11***	-1.07***	-1.11***
	(-21.33)	(-21.62)	(-21.61)
Beta_smb	-1.30***	-1.23***	-1.28***
	(-41.23)	(-40.97)	(-41.24)
Beta_hml	-0.44***	-0.46***	-0.45***
	(-11.74)	(-12.78)	(-12.17)
Beta_umd	0.10*	0.03	0.06
	(1.74)	(0.58)	(1.19)
ln(Assets)	-0.03**	-0.00	-0.02
	(-2.21)	(-0.02)	(-1.30)
Constant	4.53***	3.55***	4.43***
	(13.66)	(11.17)	(13.69)
Year-quarter fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
R-squared	0.398	0.387	0.368
Observations	102012	101896	102013

Table 4. Sustainability footprint and portfolio turnover

This table displays results from regressions of the sustainability footprint on portfolio turnover. The dependent variable in columns 1-5 is the value weighted sustainability footprint. In columns 6 and 7, the sustainability footprint measure is calculated using only the investor's holdings in S&P500 stocks. The dependent variable in column 8 is *SDG impact VW*, which captures the extent to which the sales of the investor's portfolio firms are derived from products and services that address the social and environmental challenges identified in the UN Sustainable Development Goals (UN SDGs). *Turnover* is defined as the lesser of dollar purchases or sales since the last portfolio holdings snapshot divided by the average dollar value of holdings during the quarter. *# Stocks* is the number of stocks in the investor's portfolio. *# Industries<=2* is a dummy variable indicating if the institutional investor's portfolio holdings are concentrated in two or fewer 2-digit SIC industries. *Beta_mkt*, *Beta_smb*, *Beta_hml*, and *Beta_umd* are factor exposures estimated using a Carhart (1997). *% stocks S&P500* is the percentage of the investor's portfolio firms belonging to the S&P500 Index. *% value S&P500* is the percentage of the investor's portfolio invested in S&P500 firms. *ln(Assets)* is the natural logarithm of the total value of the investor's stock portfolio. Standard errors are clustered at the institutional investor-level. ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Susty_ VW	(2) Susty_ VW	(3) Susty_ VW	(4) Susty_ VW	(5) Susty_ VW	(6) Susty_ VW_SP	(7) Susty_ VW_SP	(8) SDG impact VW
Turnover	-4.40***	-4.42***	-4.47***	-3.00***	-0.99***	-0.74***	-0.33***	-8.77***
	(-29.75)	(-26.47)	(-25.92)	(-19.85)	(-6.98)	(-9.73)	(-3.38)	(-8.99)
# Stocks		0.00***	0.00***	0.00***	-0.00***	0.00***	0.00***	0.00***
		(5.19)	(5.11)	(4.45)	(-3.59)	(12.99)	(2.69)	(5.25)
# Industries<=2		-0.81***	-0.85***	-0.73***	0.04	-0.21**	-0.01	-3.17**
		(-5.05)	(-5.10)	(-3.81)	(0.41)	(-2.33)	(-0.17)	(-2.23)
Beta_mkt				-1.01***	-0.17***	-0.04	-0.03	0.10
				(-15.68)	(-6.08)	(-1.27)	(-1.40)	(0.19)
Beta_smb				-1.29***	-0.12***	-0.10***	-0.01	-2.41***
				(-36.14)	(-7.27)	(-5.72)	(-0.74)	(-6.41)
Beta_hml				-0.55***	-0.04*	-0.12***	-0.04***	-3.18***
				(-13.93)	(-1.77)	(-5.68)	(-2.59)	(-8.10)
Beta_umd				0.02	-0.09***	0.00	-0.01	0.92***
				(0.29)	(-3.68)	(0.04)	(-0.30)	(2.86)
% stocks S&P500						0.93***	0.32***	
						(11.63)	(4.11)	
% value S&P500						0.83***	0.33***	
						(11.60)	(4.36)	
ln(Assets)		-0.04***	-0.05***	-0.03**	0.06***	-0.05***	-0.01	-0.23***
		(-3.08)	(-3.58)	(-2.18)	(4.46)	(-7.98)	(-1.35)	(-2.98)
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Institution type fixed effects	No	Yes	Yes	Yes	No	Yes	No	No
Country fixed effects	No	No	Yes	Yes	No	Yes	No	Yes
Investor fixed effects	No	No	No	No	Yes	No	Yes	No
R-squared	0.229	0.267	0.274	0.432	0.838	0.547	0.733	0.130
Observations	122848	98193	96038	92839	116977	91248	114452	10820

Table 5. Summary statistics risk-return and sustainability

This table displays cross sectional summary statistics of the main variables used in studying the relationship between the risk and return characteristics of the institutional investors' portfolio returns on the one hand, and the sustainability footprint on the other. In Panel A (B) we display summary statistics at the quarterly (annual) horizon. *Mean portfolio return* is defined as the average portfolio return of the investor throughout the sample period, which we calculate as the time series average using all returns available for the investor. *Total portfolio risk* is the time series standard deviation of portfolio returns and *Sharpe ratio* is the ratio between *Mean portfolio return* and *Total portfolio risk*. *Observations* is the number of investor-level observations used to calculate the risk and return characteristics. See section IV.B for the formal definitions. *Susty_VW* is the average sustainability footprint of the investor throughout the sample period. *Stocks* is the average number of stocks and *Industries<=2* is a dummy variable indicating if the investor had holdings concentrated in two SIC2 industries or less anytime throughout the sample period. To reduce the impact of statistical outliers, all variables are trimmed by removing observations for which the value of the variable deviates from the median by more than five times the interquartile range.

Panel A: Quarterly horizon								
	count	mean	sd	min	p25	p50	p75	max
Mean portfolio return	3980	0.69	0.51	-1.67	0.47	0.68	0.94	2.96
Total portfolio risk	3985	3.32	1.21	0.64	2.61	3.06	3.76	8.97
Sharpe ratio	4005	0.24	0.19	-0.60	0.14	0.22	0.31	1.06
Observations	4025	33.77	15.93	2.00	19.00	32.00	52.00	55.00
Susty_VW	4012	4.31	1.57	0.03	3.22	4.66	5.59	7.94
Stocks	4025	179.64	366.14	1.00	27.79	65.82	150.85	3,521.38
Industries<=2	4025	0.05	0.18	0.00	0.00	0.00	0.00	1.00
ln(Assets)	4025	19.34	1.86	10.46	18.30	19.12	20.37	26.88
Panel B: Annual horizon								
	count	mean	sd	min	p25	p50	p75	max
Mean portfolio return	3980	3.26	2.57	-8.51	2.20	3.23	4.53	14.94
Total portfolio risk	4026	8.01	4.16	0.02	5.96	7.79	9.88	26.90
Sharpe ratio	3778	0.50	0.58	-1.79	0.24	0.38	0.58	2.64
Observations	4044	7.27	3.89	2.00	4.00	7.00	11.00	13.00
Susty_VW	4028	4.29	1.62	0.03	3.19	4.65	5.61	8.16
Stocks	4040	176.53	362.13	1.00	28.00	65.53	149.35	3,587.77
Industries<=2	4040	0.05	0.19	0.00	0.00	0.00	0.00	1.00
ln(Assets)	4040	19.31	1.84	9.70	18.34	19.07	20.27	26.79

Table 6. Investment performance as a function of sustainability footprint (OLS)

The dependent variables in columns 1—3 are calculated using quarterly holdings returns. The dependent variable in column 1 is the *Mean portfolio return*, which is the average value-weighted quarterly portfolio return of the institutional investor. The dependent variable in column 2 is *Total portfolio risk*, which is calculated as the standard deviation of value-weighted quarterly returns at the institutional-investor level. In column 3, the dependent variable is the quarterly *Sharpe ratio*, which is calculated as the ratio of *Mean portfolio return* and *Total portfolio risk*. The dependent variables in columns 4—6 are analogous to those in columns 1—3 except that they are calculated using annual returns. *Susty_VW* is the average sustainability footprint of the investor during the sample period. The variable *Observations* denotes the number of observations used to estimate the *Mean portfolio return* and *Total portfolio risk*. *Stocks* is the average number of stocks and *Industries<=2* is a dummy variable indicating if the investor had holdings concentrated in two SIC2 industries or less anytime throughout the sample period. Standard errors account for heteroscedasticity and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Mean portfolio return (Quart)	(2) Total portfolio risk (Quart)	(3) Sharpe ratio (Quart)	(4) Mean portfolio return (Annual)	(5) Total portfolio risk (Annual)	(6) Sharpe ratio (Annual)
Susty_VW	-0.004	-0.394***	0.027***	-0.028	-1.046***	0.079***
	(-0.72)	(-31.12)	(12.65)	(-0.91)	(-24.90)	(12.45)
Industries<=2	0.045	1.616***	-0.081***	0.274	3.043***	-0.181**
	(0.49)	(7.27)	(-2.71)	(0.61)	(4.80)	(-2.14)
ln(Assets)	0.063***	-0.024*	0.020***	0.135***	-0.046	0.019**
	(9.65)	(-1.77)	(8.03)	(4.15)	(-1.00)	(2.33)
Stocks	-0.000***	-0.000***	-0.000***	-0.000***	-0.000	-0.000
	(-7.68)	(-4.03)	(-3.94)	(-3.10)	(-1.13)	(-0.83)
Observations	-0.002***	0.007***	-0.002***	-0.017	0.272***	-0.042***
	(-2.63)	(6.06)	(-9.86)	(-1.31)	(15.72)	(-12.40)
Institution type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.057	0.358	0.115	0.039	0.268	0.134
Observations	3807	3813	3825	3799	3838	3595

Table 7. Sample of natural disasters

This table summarizes information on the natural disasters we use in the present study. The columns show the name of the disaster, the date of its occurrence, and the states with counties affected by the disaster. The natural disaster data come from SHELDUS (Spatial Hazard and Loss Database for the United States). For each natural disaster, the database provides information on the start date, the end date, and the Federal Information Processing Standards (FIPS) code of all affected counties. Following Barrot and Sauvagnat (2016), we use only major disasters, which are defined as disasters lasting less than 30 days with total estimated damages above $1 billion (in constant 2013 dollars).

Natural disaster	Date	Affected states
Hurricane Isabel	2003q3	DE, MD, NC, NJ, NY, PA, VA, VT, WV
Southern California Wildfires	2003q4	CA
Hurricane Jeanne	2004q3	FL, GA, MD, NC, SC, VA
Hurricane Frances	2004q3	AL, FL, GA, KY, MD, NC, NY, OH, PA, SC, VA, WV
Hurricane Ivan	2004q3	AL, FL, GA, KY, MD, MS, NC, NH, NY, PA, SC, TN, WV
Hurricane Charley	2004q3	FL, GA, NC
Hurricane Rita	2005q3	AL, AR, LA, MS, TX
Hurricane Katrina	2005q3	AL, AR, FL, GA, IN, KY, LA, MI, MS, OH, TN
Hurricane Dennis	2005q3	AL, FL, GA, MS, TN
Hurricane Wilma	2005q4	FL
Midwest Floods	2008q2	IA, IL, IN, MN, MO, NE, WI
Hurricane Ike	2008q3	AR, LA, MO, TN, TX
Hurricane Gustav	2008q3	AR, LA, MS
Blizzard Groundhog Day	2011q1	CT, IA, IL, IN, KS, MA, MO, NM, NY, OH, OK, PA, TX, WI
Tropical Storm Lee	2011q3	AL, GA, LA, MS, NJ, NY, PA, TN, VA
Hurricane Irene	2011q3	CT, MA, MD, NJ, NY, VA, VT
Hurricane Isaac	2012q3	FL, LA, MS
Hurricane Sandy	2012q4	CT, DE, MA, MD, NC, NH, NJ, NY, OH, PA, RI, VA, WV
Flooding and Severe Weather Illinois	2013q2	IL, IN, MO
Flooding Colorado	2013q3	CO

Table 8. Sustainability footprint around natural disasters

This table shows the results from regressions in which the sustainability footprint in quarter *t* is related to dummy variables indicating whether the county of the institutional investor's headquarters is hit by a natural disaster any time between quarters *t-m* and *t-n*. For example the variable *Disaster hits investor (t-1,t-4)* is equal to one if the county of the institutional investor's headquarter is hit by a natural disaster any time between quarters *t-1* and *t-4*, and equal to zero otherwise. *# Industries<=2* is a dummy variable indicating if the institutional investor's portfolio holdings are concentrated in two or fewer 2-digit SIC industries. *ln(Assets)* is the natural logarithm of the total value of the investor's stock portfolio. *# Stocks* is the number of stocks in the investor's portfolio. Standard errors are clustered at the institutional investor level and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Susty_VW(t)	(2) Susty_VW(t)	(3) Susty_VW(t)	(4) Susty_VW(t)	(5) Susty_VW(t)	(6) Susty_VW(t)
Disaster hits investor (t-1,t-4)	0.09***				0.12***	0.12***
	(4.08)				(3.70)	(3.70)
Disaster hits investor (t-5,t-8)		0.08***			0.10***	0.10***
		(3.07)			(2.66)	(2.65)
Disaster hits investor (t-9,t-12)			0.08***		0.09**	0.09**
			(2.76)		(2.26)	(2.25)
Disaster hits investor (t-13,t-16)				0.01	0.03	0.03
				(0.14)	(0.69)	(0.65)
# Industries<=2						0.30**
						(2.38)
# Stocks						-0.00*
						(-1.96)
ln(Assets)						0.05**
						(2.22)
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investor fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.823	0.827	0.828	0.828	0.828	0.829
Observations	92451	76860	63183	51509	51509	51509

Table 9. Investment performance, sustainability footprints, and natural disasters

In this table we regress rolling *Mean portfolio return(t,t+12)*, *Total portfolio risk(t,t+12)*, and *Sharpe ratio(t,t+12)* on dummy variables indicating whether the county of the institutional investor's headquarters is hit by a natural disaster any time between quarters *t-m* and *t-n (i.e., Disaster hits investor (t-m,t-n)),* the average sustainability footprint between quarters *t-m* and *t-n (i.e. Susty_VW(t-m,t-n)),* and the corresponding interaction terms *Disaster hits investor (t-m,t-n) × Susty_VW(t-m,t-n)*. We use rolling windows of 12 quarters (between quarters *t* and *t+12*) to calculate the performance metrics. These performance metrics are based on portfolio holding returns at the quarterly horizon (see section III.D). All regressions include control variables *# Industries<=2*, *# Stocks*, and *ln(Assets)*. Standard errors are clustered at the institutional investor level and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Mean portfolio return(t,t+12)	(2) Total portfolio risk(t,t+12)	(3) Sharpe ratio(t,t+12)
Disaster hits investor (t-1,t-4)	-0.13*	-0.14*	-0.13***
	(-1.90)	(-1.87)	(-4.99)
Susty_VW(t-1,t-4)	0.04	-0.05***	0.00
	(1.35)	(-3.34)	(0.16)
Disaster hits investor (t-1,t-4) × Susty_VW(t-1,t-4)	0.03**	0.03**	0.03***
	(2.22)	(1.99)	(5.45)
Disaster hits investor (t-5,t-8)	-0.22**	-0.14	-0.11***
	(-2.56)	(-1.14)	(-2.84)
Susty_VW(t-5,t-8)	0.01	0.01	0.01
	(0.67)	(0.54)	(0.82)
Disaster hits investor (t-5,t-8) × Susty_VW(t-5,t-8)	0.06***	0.03	0.03***
	(2.98)	(1.30)	(3.63)
Disaster hits investor (t-9,t-12)	-0.11	0.09	-0.06
	(-1.26)	(0.58)	(-1.58)
Susty_VW(t-9,t-12)	0.02	-0.01	-0.00
	(1.19)	(-0.80)	(-0.25)
Disaster hits investor (t-9,t-12) × Susty_VW(t-9,t-12)	0.02	-0.02	0.01
	(1.22)	(-0.55)	(1.43)
Disaster hits investor (t-13,t-16)	-0.02	-0.04	-0.05
	(-0.23)	(-0.36)	(-1.47)
Susty_VW(t-13,t-16)	0.02	-0.02	0.02***
	(0.99)	(-1.21)	(3.60)
Disaster hits investor (t-13,t-16) × Susty_VW(t-13,t-16)	-0.01	0.01	0.01
	(-0.52)	(0.59)	(0.93)
Year-quarter fixed effects	Yes	Yes	Yes
Investor fixed effects	Yes	Yes	Yes
R-squared	0.877	0.915	0.897
Observations	27166	27166	27166

Table 10. Constituency statutes by incorporation state

This table shows the data we use to construct the constituency statutes based instrumental variable. *Investors* is the number of investors by state of incorporation. The third column shows the year in which a constituency statute was enacted in a given state. A missing year indicates that the state has not enacted a constituency statute. The variable *Constituency statute* takes on the value 0 for states which have not enacted constituency statutes. For states that have enacted a constituency statute, the value of the instrument is *2007-year of enactment*. We choose the year 2007 because the only constituency statute that was enacted during our sample period was in Texas in 2006.

	Investors	Year in which constituency statute enacted	Constituency statute
Alabama	8	.	0
Alaska	1	.	0
Arizona	6	1987	20
Arkansas	8	.	0
California	180	.	0
Colorado	28	.	0
Connecticut	33	1997	10
Delaware	977	.	0
District Of Columbia	2	.	0
Florida	33	1989	18
Georgia	29	1989	18
Hawaii	1	1989	18
Idaho	3	1988	19
Illinois	61	1985	22
Indiana	23	1989	18
Iowa	10	1989	18
Kansas	16	.	0
Kentucky	12	1989	18
Louisiana	4	1988	19
Maine	8	1986	21
Maryland	46	1999	8
Massachusetts	92	1989	18
Michigan	33	.	0
Minnesota	24	1987	20
Missouri	30	1989	18
Montana	3	.	0
Nebraska	10	.	0
Nevada	6	1991	16
New Hampshire	5	.	0
New Jersey	36	1989	18
New Mexico	2	1987	20
New York	176	1987	20
North Carolina	25	1993	14
North Dakota	1	1993	14
Ohio	59	1984	23
Oklahoma	4	.	0
Oregon	15	1989	18
Pennsylvania	78	1990	17
Rhode Island	6	1990	17
South Carolina	10	.	0
South Dakota	3	1990	17
Tennessee	21	1988	19
Texas	79	2006	1
Utah	5	.	0
Vermont	8	1998	9
Virginia	33	1988	19
Washington	29	.	0
West Virginia	3	.	0
Wisconsin	30	1987	20
Observations	2332		

Table 11. First stage regression (2SLS)

This table shows results from the first-stage regression in which we relate the sustainability footprint to the instrumental variable and other firm-level variables. The instrument *Constituency statute* measures the number of years a constituency statute has been enacted in the state in which the institutional investor is incorporated. *Stocks* is the average number of stocks in the portfolio of the investor throughout the sample period. *Industries<=2* is a variable indicating whether–throughout the sample period–the investor has held a portfolio concentrated in two or fewer two digit SIC industries. The variable *ln(Assets)* measures the average size of the investor's equity portfolio holdings and the variable *Observations* is the number of observations used to estimate the dependent variables of the second stage regression. Standard errors are double clustered at the incorporation and headquarter state-level and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Susty_VW	(2) Susty_VW	(3) Susty_VW
Constituency statute	0.04***	0.04***	0.03***
	(4.50)	(3.64)	(4.00)
Stocks		0.00***	0.00***
		(6.80)	(5.59)
Industries<=2		-0.85***	-1.22***
		(-3.67)	(-3.64)
ln(Assets)		-0.09	-0.10
		(-1.38)	(-1.64)
Observations		-0.00	-0.00*
		(-0.80)	(-1.76)
Constant	4.05***	5.74***	7.01***
	(20.59)	(4.25)	(5.81)
Institution type fixed effects	No	No	Yes
R-squared	0.051	0.071	0.102
F statistic	19.857	39.544	492.797
Observations	2331	2331	2318

Table 12. Investment performance as a function of sustainability footprint (2SLS)

In this table we show the second stage estimates for the relationship between investment performance and sustainability footprint. We restrict the sample to U.S. based 13F institutional investors for which we can identify headquarter and incorporation states. *Stocks* is the average number of stocks in the portfolio of the investor throughout the sample period. *Industries<=2* is a variable indicating whether–throughout the sample period–the investor has held a portfolio concentrated in two or fewer two digit SIC industries. The variable *ln(Assets)* measures the average size of the investor's equity portfolio holdings and the variable *Observations* is the number of observations used to estimate the dependent variables of the second stage regression. These estimates should be compared with the estimates from Table 6. Standard errors are double clustered at the incorporation and headquarter state-level and ***, **, and * indicate statistical significance at the 1, 5, and 10 level, respectively.

	(1) Mean portfolio return (Quart)	(2) Total portfolio risk (Quart)	(3) Sharpe ratio (Quart)	(4) Mean portfolio return (Annual)	(5) Total portfolio risk (Annual)	(6) Sharpe ratio (Annual)
Susty_VW	-0.038	-0.759***	0.042***	-0.289*	-1.758***	0.112***
	(-1.21)	(-23.79)	(3.77)	(-1.77)	(-7.18)	(3.63)
Industries<=2	0.045	0.859	-0.038	0.157	1.413	-0.003
	(0.41)	(1.24)	(-0.99)	(0.20)	(0.67)	(-0.02)
ln(Assets)	0.061***	-0.049**	0.019***	0.164**	-0.146	0.029**
	(4.87)	(-2.30)	(6.10)	(2.41)	(-0.76)	(2.55)
Stocks	-0.000***	0.000	-0.000**	-0.000	0.000	-0.000
	(-2.94)	(0.07)	(-2.52)	(-1.05)	(0.86)	(-1.52)
Observations	-0.003***	0.006***	-0.003***	-0.063***	0.295***	-0.050***
	(-5.92)	(3.59)	(-8.58)	(-3.10)	(8.74)	(-16.73)
Institution type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.033	0.145	0.098	0.000	0.230	0.139
Observations	2318	2318	2318	2338	2356	2197

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