The Sustainability Footprint of Institutional Investors

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Abstract

We propose a novel way of measuring the portfolio-level environmental and social characteristics of 13F institutional investors (the "sustainability footprint"). We show that the environmental (social) footprint of institutional investors has improved (deteriorated) over time and that institutions with longer investment horizons exhibit better footprints. Linking investment performance and footprints, we provide evidence that measures of risk-adjusted returns are positively related to the environmental footprint, with this link being particularly pronounced for institutions with longer investment horizons. Using exogenous shocks to sustainability preferences induced by natural disasters we provide evidence of a causal impact of sustainability on investment performance.

1. 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 Wermers (1999)), 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), Chen, Dong, and Lin (2018), or Amel-Zadeh and Serafeim (2018)), financial economics research has left unanswered important questions regarding institutional investors' preferences, attitudes, and policies with respect to sustainability 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, 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 June 2018, about 2,000 finance institutions representing assets under management of about $80 trillion worldwide have adopted

[1] See Section 2.2 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.

the sustainable investment framework of 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).

This paper contributes to the emerging literature studying sustainability (or environmental, social and governance (ESG) issues) 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 develop 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 data 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. To achieve the second objective, we examine whether and how portfolio-level risk and return characteristics are related to the sustainability footprint.

In order to frame our analysis, we inspire ourselves by Bénabou and Tirole (2010), who study why firms and individuals might engage in sustainability oriented activities. We adapt their arguments to the realm of institutional investors. Given that the paper by Bénabou and Tirole (2010) is about sustainability choices by firms and individuals, our paper does not intend to test their theories. Instead, we use their framework to derive several testable hypotheses as to why *institutional investors* might choose sustainable stock portfolio allocations and test whether these

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

hypotheses are supported by the data. The first view, which Bénabou and Tirole (2010) refer to as *"doing well by doing good"*, suggests that institutional investors choose sustainability oriented portfolio allocations because doing so allows them to improve their risk-adjusted investment performance. The second view, referred to as *"delegated philanthropy"*, suggests that institutional investors would engage in sustainable investment practices in order to reflect the social norms and moral values of their clients and beneficiaries, or more generally their stakeholders. The third view, i.e. *"insider initiated philanthropy"*, suggests that investor-level sustainability reflects fund managers' own self-serving aspirations to engage in sustainability for reasons rooted in self- and social-image concerns.

We conjecture that if the *"doing well by doing good"* view holds, institutional investors with better sustainability footprints should also exhibit better risk-adjusted investment performance, and more so if the investor has a longer investment horizon.[5] The predictions of the *"delegated philanthropy"* view are less straightforward. Under this view, portfolio sustainability could lead to better investment performance, but only if the benefits of doing so exceed the costs. We argue that under the second view, risk-adjusted investment performance should be positively (negatively) related to the environmental (social) footprint of the investor, mainly because representing social norms and moral values of beneficiaries might entail higher costs than benefits, while the benefits of analyzing environmental processes and policies at portfolio firms–perhaps in terms of risk reduction—are likely to outweigh the costs. Finally, the *"insider initiated philanthropy"* view suggests that risk-adjusted performance should be negatively related to sustainability footprints.

[5] The *"doing well by doing good"* view also suggests that more long-term oriented institutions should have better (that is higher) sustainability footprints, a prediction we confirm in the data.

We start by establishing several novel stylized facts about institutional investor portfolio-level sustainability footprints in the time series and cross section. First, the environmental footprint of the representative investor has been improving since 2002, while the social footprint has in fact deteriorated. Secondly, we provide evidence that institutional investors with longer investment horizons tend to exhibit better sustainability footprints. The result on the positive relation between sustainability and investment horizon should be interpreted with caution since it is likely that institutions' sustainability preferences and their investment horizon are endogenously determined. However, note that our results are robust to including various types of fixed-effects (e.g., at institutional investor-level), allowing us to rule out that an omitted variable is driving the results.

In the main set of tests, we then examine the relation between risk-adjusted investment performance and the sustainability footprints to distinguish between the hypotheses implied by the *"doing well by doing good"*, the *"delegated philanthropy"*, and the *"insider initiated philanthropy"* views. To do so, we regress standard measures of risk-adjusted portfolio performance (e.g., Sharpe ratios, characteristics adjusted returns in the spirit of Daniel et al. (1997) as well as Fama and French (2015) five factor alphas) on the portfolio-level sustainability footprints. We find that risk-adjusted returns are generally higher for investors with better environmental footprints. The results on the relation between risk-adjusted performance and the social footprint are less systematic in that they are either not significant or slightly negative. We also find a strong negative relation between measures of portfolio risk and both the social and the environmental footprint, highlighting the fact that sustainability analysis operates as a risk management device and allows institutional investors to effectively reduce their portfolio risk. Statistically speaking, the link between risk and sustainability footprints seems to be stronger in the data than the link between returns and sustainability footprints. We also provide evidence that sustainability matters more for the performance of institutions with longer investment horizons, which we measure using portfolio turnover.

To argue for a causal interpretation of the relation between risk-adjusted performance and sustainability footprints, we rely 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, research in environmental psychology by Demski et al. (2017) shows that when individuals experience extreme weather events, they tend to become more inclined to act on sustainability related issues. We conjecture that if this is true for individuals—as shown by Demski et al. (2017)—the same behavioral effects should 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 improve after the investors' headquarters are hit by natural disasters ("treatment"). In order to address the concern that our results are not driven by the institutions' holdings of local stocks—which might also be affected by the natural disasters—we use footprint measures that deliberately exclude local stock holdings.[6] In other words, institutional investors seem to increase their exposure to high sustainability stocks in geographic areas that are not directly hit by the natural disasters. We also use an equally weighted footprint measure whose weights are independent of market prices, ruling out the possibility that our results are primarily driven by stock price effects. In a second step, we show that following the natural disaster treatment, our measures of portfolio performance are positively related to sustainability footprints for treated institutions. This evidence suggests that the relation between risk-adjusted performance and sustainability footprints is likely to be causal.

Taken together, our empirical evidence is most consistent with the *"doing well by doing good"* and the *"delegated philanthropy"* views in determining institutions' sustainable investment policies, suggesting that it is probably a mix between risk-adjusted performance considerations and stakeholder driven normative motivations that lead institutions to adopt sustainable investment practices. We can rule out the *"insider initiated philanthropy"* view, since it would have suggested a negative relation between risk-adjusted performance and sustainability.

We believe that our study makes several important contributions to the literature. First, to the best of our knowledge, this study is the first to propose measures that systematically quantify the environmental, social, and aggregate sustainability footprint of 13F institutional investor stock portfolios. Second, we know of no other paper that studies the cross section and time series of 13F institutional investors' sustainability footprints. Finally, we 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 better sustainability seems to cause better risk-adjusted investment performance.

[6] This might be due to due to institutions' preferences for local stocks (see Coval and Moskowitz, 1999) or political considerations in which local pension funds might be inclined to invest in locally headquartered stocks.

2. Hypothesis development and related literature

2.1. Hypothesis development

Given the lack of finance theory that could guide hypotheses as to why institutional investors choose more or less sustainable stock portfolio allocations, we inspire ourselves by Bénabou and Tirole (2010), who set forth three motivations for why *firms* would engage in sustainability oriented behavior.

The first view, which Bénabou and Tirole (2010) refer to as *"doing well by doing good",* states that managers engage in sustainability oriented activities because such behavior allows firms to maximize (inter-temporal) profits. The idea is that by spending more on issues such as workplace safety or by reducing environmental pollution in the short run, long-term shareholder value is maximized.

The second motivation for why corporations would engage in sustainability is related to the concept of *"delegated philanthropy"* (see also Dimson, Karakas, and Li (2015)). The idea behind delegated philanthropy is that firms are better placed to express citizen values (i.e., moral values or social norms) on behalf of their stakeholders (e.g., clients, workers, communities) or even shareholders. The better position might result from firms having lower transaction costs or informational advantages. The mechanism Bénabou and Tirole (2010) have in mind is that firms engage in sustainable behavior on behalf of stakeholders by, for instance, choosing production facilities that pollute less or giving money to charity. While such delegated philanthropic activities might be consistent with enhancing firm value (e.g., the reduction of environmental pollution), there might also be cases where it reduces firm value. For instance, if a firm engages too excessively in philanthropy towards stakeholders (e.g., by overpaying workers or by contributing too much to other social causes), such behavior could reduce profits. Under this second view, the exact implication for firm value thus depends on the relation between the costs and benefits of the sustainability activity at hand and the empirical predictions are somewhat ambiguous and may depend on the specific sustainable activity (e.g., social versus environmental issues).

The third and most negative view on sustainability put forth by Bénabou and Tirole (2010) is one of *"insider initiated philanthropy"* according to which firms' sustainability oriented policies would reflect managers' own self-serving aspirations to engage in philanthropy for reasons rooted in self- and social-image concerns. For example, managers would choose sustainable business processes because doing so procures them public attention and thus personal benefits at the detriment of shareholders. Generally speaking, firms' sustainability choices are driven by the managers' own desires and their personal benefits. Sustainability activities driven by this 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 do Good with other peoples' money (see Masulis and Reza (2014) or Cheng, Hong, and Shue (2016)).

We assert that the three views spelled out by Bénabou and Tirole (2010) can—although not perfectly—be transposed to the realm of institutional investors and lead to testable hypotheses. We start with the first view *"doing well by doing good"*, which—in the context of institutional investors—would imply that

(i) risk-adjusted performance is positively related to the sustainability footprint of the investor's portfolio;

(ii) the link between risk-adjusted performance and the sustainability footprint is more pronounced for more long-term oriented institutions.[7]

The performance implications of the *"delegated philanthropy"* view are less clear cut. On the one hand, the view implies that if an institutional investor analyzes the environmental processes and social policies of portfolio firms on behalf of the institution's beneficiaries (i.e., final investors), such behavior might lead to higher risk-adjusted performance. On the other hand, if an institution expresses extreme social values on behalf of her beneficiaries, this could also lead to excessive costs and thus to lower risk-adjusted performance. Concretely, we expect that risk-adjusted investment performance should be higher when the benefits of engaging in E or S activities on behalf of beneficiaries—which could materialize in terms of risk reduction—outweigh their costs, that is risk-adjusted performance is

(iii) positively related to the environmental and/or social footprint of the institution's if the benefits outweigh the costs;

(iv) negatively or unrelated to the portfolio's environmental or social footprint if the costs outweigh (or equal) the benefits.

Much like the first view, the *"insider initiated philanthropy"* view makes a clear prediction about the relation between risk-adjusted performance and footprints, namely that

(v) risk-adjusted performance is negatively related to the sustainability footprint.

[7] Another explicit implication of this view is that investors with a longer investment horizon should hold more sustainability oriented stock portfolios, a view that Bénabou and Tirole (2010) spell out explicitly, by stating that "socially responsible investors should position themselves as long-term investors."

We will use the sustainability footprint measure (which we introduce in Section 3.2) in conjunction with standard measures of risk-adjusted returns to examine which of these three views are more likely to be borne out by the data.

2.2. 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)), other preferences of corporate decision makers (see Cronqvist and Yu (2017)), or state ownership (see Hsu, Liang, and Matos (2018)) as important factors influencing firm-level sustainability.

Another large stream of literature has examined the relation 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. In a follow up paper Amiraslani et al. (2017) examine the bond market benefits of sustainability during the financial crisis. 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 returns. 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 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 of a positive relation 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.[8]

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). Relevant for us is also the literature examining the investment performance of institutional investors (see, for instance, Wermers (2000)).

[8] 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, Koskinen, and Zhang (2018)).

We also 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 engagements generate shareholder value. Using archival data, Dyck et al. (2018) show that firm-level sustainability is related positively to institutional ownership. They also show this relation to be strongest for ownership by institutional investors based in countries with strong social norms. Hoepner et al. (2018) 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 (2018) survey senior investment professionals working at institutional investors to examine why and how investors currently use or plan to use ESG information in the investment process. Chen, Dong, and Lin (2018) show that higher institutional ownership and more concentrated shareholder attention induce corporate managers to invest more in sustainability activities. Using measures of sustainability that are different from ours and focusing on the firm-level, Starks, Venkat, and Zhu (2017) show that preferences for corporate ESG depend critically on investor horizons, a finding that we confirm in our paper. Barber, Morse, and Yasuda (2018) study impact funds, a class of investors with the dual objective of generating financial returns and positive externalities. Fernando, Sharfman, and Uysal (2017) show that institutional investors shun stocks with high environmental risk exposure.

3. The sustainability footprint and data

3.1. 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[9] and Compustat. The sample period runs from 2002 to 2015. Both Thomson Reuters and MSCI[10] 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 social and environmental quality of the company's policies, processes, and products.[11]

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. Panel A of Table 1 shows summary statistics for the MSCI-Thomson-CRSP-Compustat merged sample at the annual frequency.

----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. 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.

[9] We restrict ourselves to stocks with CRSP share codes 10 and 11.
[10] See http://goo.gl/M1j7Sd and http://goo.gl/65LDYu
[11] For instance, Thomson's social pillar score captures issues such as the firm's relation 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 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.

However, Thomson does not use the full support of the distribution: while the minimum and maximum stock-level social scores are 0 and 10 for the MSCI scores, Thomson Reuters' minimum (maximum) social scores are 0.35 and 9.88 (respectively 0.83 and 9.75 for the environmental score).

To make scores comparable across data providers, we standardize the scores to have a mean of zero and a standard deviation of one. We denote the standardized scores by $z_t(x)$. Higher values indicate better stock-level sustainability performance. We now compute, whenever possible, a combined score using the standardized scores obtained from both data providers. Taking the environmental dimension as an example, we calculate

$$Envir_{it} = \frac{1_{MSCI,it} \times z_t(Envir_{MSCI_{it}}) + 1_{A4,it} \times z_t(Envir_{A4_{it}})}{1_{MSCI,it} + 1_{A4,it}},$$

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 an average standardized score whenever both MSCI and Thomson scores are available, and using only the available standardized score whenever a stock covered one data provider only. We choose this approach for two reasons. First, we believe that the average of two sustainability scores is a better estimator of the true sustainability performance at the stock-level. Second, the approach allows obtaining the largest possible sample of stock-level sustainability scores. 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 $Susty_{it} = 0.5 \times (Envir_{it} + Social_{it})$.

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 same 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, higher return on assets, lower book-to-market, higher gross profitability, and lower stock volatility. 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.

3.2. *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 through the Thomson Reuters s34 database.[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 3.1 with the quarterly 13F stock holdings data to calculate quarterly footprint measures at the institutional investor-level.

One issue is that the criteria and methodologies used to examine the sustainability at the stock-level could have changed over time. In other words, MSCI and Thomson might not have applied the same criteria to examine and measure the sustainability of stocks in 2005 than they did in 2015. This makes the comparison of levels of the score difficult over time. In addition, there might be composition effects to the extent that the two ratings providers increased firm coverage over time. To address these issues, we focus on a relative measure by calculating the normalized rank of stock *i* in period *t*. We calculate these ranks separately using the

[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*)

environmental, social, and overall footprint. We normalize ranks between 0 and 1 and denote them as $rk_t(Envir_{it})$, $rk_t(Social_{it})$, and $rk_t(Susty_{it})$. The normalized ranks give an indication of the relative sustainability position of a stock *i* at a given point in time *t*. Our main measure of the sustainability footprint of the institutional investor is defined as

$$Susty\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt-1} \times rk_t(Susty_{it}).$$

In this equation, w_{ijt-1} denotes the value-weight of stock *i* in investor *j's* portfolio in year-quarter *t-1*, $rk_t(Susty_{it})$ is the normalized rank of the standardized sustainability score of stock *i* in year-quarter *t*, and N_{jt} the total number of stocks investor *j* holds in year-quarter *t* for which stock-level sustainability scores are available. This variable quantifies the sustainability footprint of institutional investor *j* in year-quarter *t* as the weighted average of the sustainability ranks of the stocks that make up the institution's portfolio. The sustainability footprint of the investor thus depends on (i) the rank of the sustainability scores of the individual stocks in the investor's portfolio and (ii) the size of the individual stock holdings. Conveniently, the score is normalized between 0 and 1. Analogously, we calculate the social and environmental footprints by individually using the environmental and social components of the stock-level sustainability score, that is $Social\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt-1} \times rk_t(Social_{it})$ and $Envir\_VW_{jt} = \sum_{i=1}^{N_{jt}} w_{ijt-1} \times rk_t(Envir_{it})$.[13]

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

In 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.

[13] We also calculate equally weighted footprints by setting $w_{ijt-1} = 1/N_{jt-1}$.

----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 0.670 and the 75h percentile is 0.744.

3.3. Portfolio returns

In this paper, we examine whether risk-adjusted portfolio performance is associated with investors' sustainability footprints. 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. We also miss returns from other securities (e.g., fixed income) as well as fees and transaction costs. Our return measure based on 13F filings should thus be seen as reflecting the return on the long leg of institutions' equity holdings.[14]

Based on the quarterly holdings return time series we calculate several risk-adjusted performance metrics at the investor-level. To avoid look-ahead bias, we focus on performance metrics calculated on a forward rolling basis using windows of 10 qurters (i.e., between year-quarters t and $t+9$). The main dependent variables are *Mean portfolio return*$_{j(t,t+9)}$, which is the mean quarterly return of investor j between year-quarter t and $t+9$. *Total portfolio risk*$_{j(t,t+9)}$

[14] 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.

denotes the standard deviation of quarterly returns of investor *j* between periods *t* and *t+9*. $Sharpe\ ratio_{j(t,t+9)}$ is simply the ratio between the mean quarterly return of investor *j* between *t* and *t+9* in excess of the risk free rate normalized by *Total portfolio risk*. We also calculate the characteristics-adjusted portfolio return of Daniel et al. (1997), which we denote as $Mean\ portfolio\ DGTW\ return_{j(t,t+9)}$. Using the same rolling forward windows, we also calculate a Fama and French (2015) five factor alpha denoted by *Alpha_FF5* and the corresponding five factor exposures *Beta_mkt*, *Beta_smb*, *Beta_hml*, *Beta_qcma*, and *Beta_qrmw*.

Table 2 reports cross sectional summary statistics for the distribution of our risk-adjusted performance metrics. The quarterly average *Mean portfolio return* is 2.6 percent. For comparison, the 10 quarter rolling average return on the value weighted CRSP market return for the same period was 2.5 percent, thus of very similar magnitude. The average rolling quarterly *Sharpe ratio* is about 0.373. The average five factor alpha is 0.117 percent, thus close to zero.

3.4. 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)*, and the 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.

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, in line with Carhart (1997), as the minimum of the absolute values of aggregated sales and aggregated 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.

Finally, we also use an investor classification based on Bushee (2001) and Abarbanell, Bushee, and Raedy (2003) to control for the fact that the behavior of institutional investors is likely to depend on their legal type. It seems plausible that different 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)). The classification distinguishes between banks, insurance companies, corporate pension funds, public pension funds, investment companies, independent investment advisors, university and foundation endowments, and a category of miscellaneous institutions. We refer to this classification as *Institution type.*

As Table 2 shows, the average (median) size of the investor's common stock holdings (i.e. the variable *Assets*) is \$4.196bn (\$0.335bn). 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 \$1tn. The average (median) institution holds 194 (69) stocks and less than 5 percent of investor-Year-quarter observations belong to institutions that are invested in two or fewer SIC2 industries. Thus, overall institutional investors' stock holdings appear to be relatively 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 our stock-level sustainability scores generally cover the majority of stocks in which the average 13F investor invests. When looking at the median investor, *Coverage (Value)* is even higher (about 90 percent).

4. Stylized facts on the sustainability footprint

4.1. Time series

To check the plausibility of our footprint measure, we plot the evolution of the environmental, social, and overall sustainability footprints for the average investor in Figure 2.

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

Consistent with the notion that environmental issues have become more important for institutional investors over the last decade, the upper left panel of Figure 2 shows a pronounced positive upward trend (that is improvement) of the average environmental footprint both in value- and equally-weighted terms. More specifically, the value-weighted environmental footprint (solid line) has improved by about 14% ((0.669-0.588)/0.588) over the sample period. In contrast, there appears to be an opposite trend for the social footprint of the average institutional investor (see upper right panel of Figure 2). Between 2002 and 2015 the value-weighted social footprint of the average institutional investor has worsened by about 16% (0.5602-0.665)/0.665)). Furthermore, the negative trend in the social footprint appears to have accelerated in the later part of the sample period (from around 2012).[15] This may be due to the sluggish macro-economic conditions and firm-level cost cutting that we have observed worldwide since the great financial crisis which could have made both firms and investors even more reluctant to engage socially.

In the subfigures, we also plot the time series of the ranked sustainability scores for the average firm. These scores have exactly the same support as the footprint, i.e. between 0 and 1. The subfigures show that the environmental and social scores of the average firm have not changed much over the sample period. For the environmental respectively social dimension, the score has changed by -0.11% ((0.5055-0.5061)/0.5061) respectively 0.69% ((0.5042-0.5007)/0.5042) between the first and the last quarter of the sample period.

The fact that both the value- and the equally-weighted environmental footprint at the institutional investor level have improved over time—while the firm-level environmental score has remained largely flat—suggests that institutions have indeed increased their exposure to stocks with better environmental characteristics.

To further analyze the time series behavior of the average footprints, we now run several time series regressions in which we relate the time series of social and environmental footprints for the representative (i.e., average) investor to a constant and a time trend. We repeat the same procedure for the ranked sustainability scores of the representative firm. Formally, we estimate

$$y_t = a + b \times t + \epsilon_t,$$

where y_t denotes the average footprint or the average ranked sustainability score at the firm-level at time t and the variable t is simply a time trend. The results are reported in Table 3.

[15] When looking at the average equally-weighted footprints, the changes are of similar magnitude, i.e., 13 % ((0.6368-0.56517)/0.56517) for the average equally-weighted environmental footprint and –12% ((0.5483-0.6199)/0.6199) for the average equally-weighted social footprint.

---Table 3 about here----

In column (1) we use the average value weighted environmental footprint as the dependent variable. The coefficient estimate on the trend variable is positive and highly significant. As expected from Figure 2, the coefficient estimate for the trend variable is negative when the average social footprint serves as the dependent variable (see column (2)). In columns (3) and (4) we obtain similar results for the equally weighted footprint. Interestingly, the regression analysis reveals similar, albeit much weaker trends at the firm-level: the coefficient estimate in column (5) of Table 3 is significantly positive, suggesting that the average ranked environmental score at the firm-level has increased over time. In contrast, the coefficient estimate for the social score is negative (but only marginally significant).

In terms of magnitudes, the regression analysis confirms a much stronger trend at the investor-level than at the firm-level. Comparing the trend coefficient estimates for the equally weighted environmental footprint at the investor-level (column (3)) with the trend for the average firm-level score (column (5)), we find that that the trend coefficient is about 31 times larger (=0.00157/0.00005) at the investor- than at the firm-level.

Taken together, the regression results highlight that during the sample period the representative investor has improved her portfolio-level environmental footprint more than the representative firm has improved her environmental policies and processes.

4.2. Cross section

We now run three pooled cross-sectional regressions with the idea of better understanding how the sustainability footprint is related to general portfolio-level characteristics. We focus on measures of investment horizon, size, and factor exposures. We also control for investor, Institution-type×Year-quarter, and Country×Year-quarter fixed effects[16] to account for omitted variables and the fact that institutions of different types (e.g., Bank, insurance company, pension funds) and from different countries might have different preferences and restrictions when it comes to sustainability. The results are reported in Table 4.

---Table 4 about here----

Table 4 shows that portfolio turnover is generally negatively related with the sustainability footprint: this finding suggests that investors with longer investment horizons (i.e., lower turnover) tend to have better footprints. It also appears that investors holding a higher number of stocks tend to have better sustainability, while the size of the institution's equity portfolio tends to correlate negatively with the sustainability footprint. It seems plausible that as the scale of an institution's equity portfolio increases, that institution might be gradually forced to also invest in firms with lower sustainability, rationalizing the negative coefficient estimate for *ln(Assets)*. Institutional investors pursuing industry oriented investment strategies do not differ significantly from investors diversified over more industries: the coefficient estimates on the dummy variable *# Industries<=2,* which indicates whether the investor's holdings are concentrated in two or fewer SIC2 industries, is not significant. Some of the Fama and French 5 factor exposures turn out to be significantly related to the sustainability footprint. For instance, institutional investors with higher exposure to high beta *(Beta_mkt)* and small stocks *(Beta_smb)* tend to have significantly worse sustainability footprints. The negative coefficient for the variables *Beta_smb* seems plausible given that smaller firms generally display lower sustainability scores. Interestingly, investors with exposure to quality or gross profitability (see

[16] Note that some even though the portfolio firms are U.S. based, some 13F institutions are international investors. These are typically large institutions with considerable equity holdings in U.S. stocks.

Bouchaud et al. (2018) or Novy-Marx (2013)) tend to generally have better footprints: the coefficient estimate on *Beta_qmrw* is positive and significant.

5. Risk-adjusted performance and sustainability footprint

5.1. Baseline results

In this section, we test the relation between investment performance and the sustainability footprint. The *"doing well by doing good"* hypothesis states that institutional investors adopt sustainable investment policies to improve investment performance, which suggests a positive link. The *"delegated philanthropy view"* predicts that performance and footprints should be positively linked whenever the benefits of implementing sustainability exceed the costs. We conjecture that this is likely to be the case for environmental issues, but less so for social aspects. By contrast, according to the *"insider initiated philanthropy"* view the link between risk-adjusted performance and sustainability should be negative.

To distinguish between these three views, we start by providing some graphical evidence. In Figure 3, we sort institutional investors in each year-quarter into tercile bins based on the change in the quarterly sustainability footprint (i.e., between periods *t* and *t-1*). *Low change footprint* marks institutions with the most negative change (i.e., first tercile; deterioration), while *High change footprint* marks those with the most positive change in the footprint (third tercile; improvement). We then calculate average changes in the forward rolling *Sharpe ratio* (left subfigure) and forward rolling *Mean portfolio DGTW return* (right subfigure) for each tercile.

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

Both subfigures show a monotonically increasing relation between the change in sustainability footprint and the change in risk-adjusted performance, suggesting that institutions with improving (deteriorating) footprints are subject to improving (deteriorating) risk-adjusted performance. The mean difference tests between the high and low change in footprint bins are highly statistically significant with *t*-statistics of 4.12 (change in *Sharpe ratio)* and 6.62 (change in *Mean portfolio DGTW return*).[17]

We now verify in a panel-regression framework that the univariate analysis is robust to the inclusion of observable and unobservable characteristics. In Table 5 we relate levels of various forward rolling investment performance measures to the sustainability (Panel A), the environmental (Panel B), and the social footprint (Panel C). We include investor-level fixed effects such that identification is coming entirely from within-institution changes in the footprint over time. To avoid look-ahead bias, we relate forward rolling performance measures between year-quarter t and $t+9$ to footprints in year-quarter t. As in prior institution-level regressions, we include Institution-type×Year-quarter and Country×Year-quarter fixed effects to account for the fact that institutions of different legal types (e.g., Bank, insurance companies, pension funds, etc.) and from different countries are likely to be subject to different investment styles and restrictions. We also control for *Turnover*, *ln(# Stocks)*, the *# Industries<=2* dummy variable, and *ln(Assets)*.[18]

----Insert Table 5 here----

In columns (1) and (2), we use *Mean portfolio return* and *Mean portfolio DGTW return* as the dependent variables. Columns (3), (4), and (5) display the relation for *Total portfolio risk, Sharpe ratio,* and *Alpha FF5* (see Fama and French, 2015). While *Mean portfolio return* is not related to the sustainability footprint (see Column (1), Panel A, Table 5), column (2) confirms the univariate results from Figure 3 by showing a positive relation between *Mean portfolio DGTW*

[17] The t-statistics are corrected for clustering at the institutional-investor-level.
[18] To make the table more readable, we do not report the coefficient estimates for the control variables.

return and the sustainability footprint. Given that the *Mean portfolio return* is not significantly related to the sustainability footprint, it seems that the positive association between the *Sharpe ratio* and the sustainability footprint (Column (4), Panel A, Table 5 and Figure 3) is primarily driven by an inverse relation between *Total portfolio risk* and the sustainability footprint, a relation we confirm in Column (3), Panel A, Table 5. The last finding suggests that sustainability analysis operates mainly as a risk management device.

In Panel B and C, we estimate the panel regressions independently for the environmental and social footprints. Statistically speaking, the relation is much stronger for the environmental (Panel B) than for the social footprint (Panel C). The risk-adjusted performance measures are robustly related to the environmental footprint, while the evidence for the social dimension is inconclusive. Both *Mean portfolio return* and *Total portfolio risk* seem to be negatively related to the social footprint. While a better social footprint does seem to reduce portfolio risk (Column (3), Panel C, Table 5) it also seems to result in lower portfolio returns (see Column (1), Panel C, Table 5). These findings are consistent with the *"delegated philanthropy"* view in that the benefits from implementing socially oriented sustainable investment practices might not always outweigh the costs. In other words, it might require return concessions to implement social values in portfolio allocations and the risk reduction resulting from a better social footprint is not sufficient to offset the lower *Mean portfolio return* which leads to a negative although not statistically significant relation between the *Sharpe ratio* and the social footprint (see column (4), in Panel C, Table 5).

5.2 Risk-adjusted performance and sustainability: The role of investment horizon

The second prediction of the *"doing well by doing good"* view is that the link between investment performance and sustainability should be more pronounced for investors with longer investment horizons. To examine this possibility, we now interact the sustainability footprints with tercile dummies of *Turnover*. We calculate these tercile dummies in each quarter to avoid look-ahead bias. To reduce the number of regressions, we focus on Mean *portfolio DGTW return, Sharpe ratio,* and *Alpha FF5.* The results are reported in Table 6.

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

We find that the link between risk-adjusted performance and the sustainability footprint (and in particular the environmental dimension) depends monotonically on investment horizon. Columns (1)-(6) of Table 5 show that the link is systematically weaker (or non-existent) for institutions with higher portfolio turnover. The analysis also confirms that there is no significant link between risk-adjusted performance and the social footprint, not even for investors with the lowest portfolio turnover.

Overall, our results are supportive of both the *"doing well by doing good"* and the *"delegated philanthropy"* views inspired by Bénabou and Tirole (2010). We find a positive link between risk-adjusted performance and the sustainability footprint, which is evidence in favor of the *"doing well by doing good"* view. However, when we separately analyze the social and environmental components, the evidence that environmental sustainability is positively correlated with risk-adjusted performance while social sustainability is not also provides evidence for the *"delegated philanthropy view".* We can reject the *"insider initiated philanthropy"* view since it would have predicted the opposite result, i.e. lower risk-adjusted performance for institutions with better sustainability footprints. Note that, as pointed out by Bénabou and Tirole (2010), the *"delegated philanthropy"* and *"doing well by doing good"* views are not mutually exclusive, and our evidence thus suggests that a mix of the two motivations drives sustainability choices of institutional investors.

5.3. Is the sustainability footprint simply a proxy for other stock-level characteristics?

One potential concern with our results on the relation between risk-adjusted performance and sustainability footprints could be that stock-level sustainability is simply a proxy for other stock-level characteristics that have predictive power for investment performance. For instance, an argument could be made that rather than being due to institutions' preferences for sustainability, our results are primarily driven by institutions' preferences for other stock-level attributes such as size, risk, growth, value, or quality. The fact that we obtain consistent results independent of whether we use *Sharpe ratio* or measures that explicitly deal with the exposure to certain stock-level characteristics *(i.e. Mean portfolio DGTW return* or *Alpha FF5)* neutralizes this criticism already somewhat. Nonetheless, we tackle this issue head-on by calculating what we refer to as the *residual* or *excess* sustainability at the stock-level. The idea of residual sustainability is to isolate the portion of a stock's sustainability that is not explained by other stock-level characteristics. To calculate residual sustainability, we run a cross-sectional regression of sustainability on stock characteristics in each year-quarter *t*. Excess or residual sustainability is then simply the residual from this cross-sectional regression. We use market equity *(me)*, book-to-market *(bm)*, gross profitability *(gp)*, and total volatility *(tvol)* as predictors in this regression. Given that we use normalized ranks of sustainability in the calculation of our footprint measures, we also rank transform the stock-level characteristics in the estimation of residual sustainability. Formally, we estimate

$$rk_t(y_{it}) = a + b_{me} rk_t(me_{it}) + \; b_{bm} rk_t(bm_{it}) \; + \; b_{gp} rk_t(gp_{it}) \; + b_{tvol} rk_t(tvol_{it}) + e_{it}$$

at each date t. In this regression y_{it} is either *Envir*, *Social*, or *Susty* (see Table 2, Panel A). Residual sustainability is simply the residual from this regression and captures the component of sustainability not explained by the characteristics used in the regression. We denote the residuals by *Envir_R*, *Social_R*, and *Susty_R* and report descriptive statistics in Panel A, Table 1.

----Insert Table 7 here----

In Table 7, we report descriptive statistics for the model parameters resulting from the residual sustainability regressions (i.e., coefficient estimates, t-statistics, R^2). Panel B and C show that the predictive power of stock-level characteristics does not differ strongly between the environmental and social dimensions. Market equity *(me)* is the by far strongest cross-sectional predictor of stock-level sustainability. Taking the overall sustainability score as an example (see Panel A, Table 7), the average *t*-statistic of the coefficient estimate b_{me} for the size rank variable $rk_t(me)$ in the 56 predictive regressions is t_{me}=7.77. The second most important predictor is the gross profitability rank $rk_t(gp)$ with more profitable firms also scoring higher on sustainability (t_{gp}=4.58). Finally, the total volatility rank $rk_t(tvol)$ is also sometimes significant in predicting stock-level sustainability with t_{tvol}=-1.40.

To rule out that these other stock characteristics are driving our performance results, we now repeat the performance analysis from Table 6 using residual sustainability at the stock-level to construct the sustainability footprints. We denote footprints based on residual sustainability as *Susty_VW_R*, *Envir_VW_R*, and *Social_VW_R.* The results are reported in Table 8.

----Insert Table 8 here----

Even though the *t*-statistics of the coefficient estimates for the relation between residual sustainability and investment performance are somewhat lower, the analysis continues to show a solid positive association between risk-adjusted performance and the overall as well as the environmental footprints. As before, the link between risk-adjusted performance and the social footprint remains insignificant.

6. Identification: Natural disasters as a quasi-natural experiment

In the previous analysis, we find evidence of a strong, positive correlation between risk-adjusted investment performance and—above all—environmental sustainability. While such evidence is informative, it does not establish a causal impact of sustainability on risk-adjusted investment performance because the panel estimates could potentially be biased due to the endogenous determination of risk-adjusted performance and sustainability footprints. Note that all our specifications include institution-level fixed effects, ruling out that an omitted factor is driving our results.

To provide more direct evidence of a causal relation between sustainability footprints and risk-adjusted performance, our 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 experiencing natural disasters (in particular, those related to extreme weather events) affects individual attitudes and preferences towards sustainability issues in a similar way. 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 the direct experience of extreme weather events leads to an increased salience of and a pronounced emotional response 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 an 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 research in environmental psychology 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. We focus on the overall footprint because natural disasters affect both social and environmental preferences of the institutions' employees simultaneously and it is difficult to isolate shocks to either the environmental or social component. For instance, fund managers are likely to become not only more aware of environmental issues but also more empathic towards disaster victims and as such more concerned about social issues (e.g., the well-being of communities or employees).

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. Bernile, Bhagwat, and Rau (2017) and Bernile et al. (2017) examine how managers and fund-managers are affected by disasters.

Similar to prior 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., SHELDUS 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 9 about here----

Table 9 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 flooding or blizzards. We obtain the ZIP codes of the institutional investors' headquarters from SEC filings and link them to FIPS codes. We restrict the analysis to U.S. based institutions and focus on the period 2002-2013 because we use forward rolling performance measures for which we need 10 quarters of data.[19]

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

We provide a graphical representation of the geographic data in Figure 4. Panel A shows the geographic distribution of institutional investor headquarters. The map shows concentrations

[19] While we used a sample of about 4,000 unique 13F institutions (including foreign institutions) in the analysis of sections 4 and 5, 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. Given data quality problems in the Thomson Reuters ownership data from 2015 onwards, we cannot extend our analysis further than 2013 (given that we need 10 quarters to calculate forward performance).

of headquarters around New York, Boston, Stamford, Chicago, Seattle, San Diego, and San Francisco. Panel B of Figure 4 displays a map highlighting the counties affected by the natural disasters. Note that some counties are hit several times.

Our identification strategy rests on two steps: First, we show that institutional investor-level sustainability footprints improve when natural disasters occur close to institutional investors' headquarters ("treatment"). Secondly, we show that forward rolling risk-adjusted performance is more strongly related to sustainability footprints following such disaster treatment.

6.1. Sustainability footprints improve as a result of natural disasters

To show that institutions improve their sustainability footprints following a natural disaster, we code treatment dummy variables indicating whether the county in which the institutional investor is headquartered is hit by a natural disaster in year-quarter *t-n.* We use dummy variables with a horizon of up to 3 quarters (i.e., *t, t-1, t-2,* and *t-3).* For instance, the variable *Disaster hits investor*$_{jt}$ indicates that institution *j* is subject to a disaster in year-quarter *t*. In a similar spirit, the variable *Disaster hits investor*$_{jt-1}$ indicates that the institution was hit by a natural disaster one quarter ago. In Table 10 we provide the results from estimating specifications of the following type

$$y_{jglt} = \eta_j + \sum_{n=0}^{3} a_n \, Disaster\ hits\ investor_{jt-n} + b_n' \, X_{jt} + \theta_{gt} + \pi_{lt} + \epsilon_{jt},$$

where y_{jglt} measures the sustainability footprint of investor j, with institution type *l*, headquartered in state g, in year-quarter *t*. Institution types are based on Bushee (2001). In the above specification, η_j are investor fixed effects, *Disaster hits investor*$_{jt-n}$ are the treatment dummies indicating if the county of the institution's headquarters is subject to a natural disaster in Year-quarter *t-n*, θ_{gt} are the Headquarters state × Year-quarter fixed effects, and π_{lt} are Institution type × Year-quarter fixed effects. X_{jt} is a vector of control variables.

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

In column (1), we use the sustainability footprint *Susty_VW* as the dependent variable. The regression produces positive and highly significant coefficient estimates for the variables *Disaster hits investor*$_{jt}$, *Disaster hits investor*$_{jt-1}$, and *Disaster hits investor*$_{jt-2}$ suggesting that footprints improve in the disaster quarter but also during the two subsequent quarters. Given that the coefficient on *Disaster hits investor*$_{jt-3}$ is not significant, it seems as if the institutions permanently increase their sustainability footprint as a result of disasters. If the effect was transitory, one would have expected a negative coefficient estimate for *Disaster hits investor*$_{jt-3}$.

One concern might be that the disaster induced changes in the sustainability footprint are driven by the institution's holdings of local stocks: Coval and Moskowitz (1999) show that institutions invest predominantly in stocks that are located close to institutional investors' headquarters and since the sustainability footprint is also a function of the portfolio weights—and thus of the market prices of the stocks—it might be that natural disaster induced price effects of local stocks are behind the improving footprints. To address this issue, we deliberately exclude local stock holdings from the calculation of the institution's sustainability footprint by excluding stocks that are headquartered in the same state as the institutional investor. Any changes in this alternative sustainability footprint measure would thus be driven by investors increasing their exposure to high sustainability stocks in areas that are not directly hit by the natural disaster. We denote this footprint measure as *Susty_VW_HQ* and report the regression results using this measure as the dependent variable in column (2) of Table 10. Again the coefficient estimates on the variables *Disaster hits investor*$_{jt-n}$ are significant for $n=0,1,2$ and the coefficients are of similar magnitude when compared to those based on the footprint using all stock holdings (see column (1)). In column (3) we use equally weighted footprints which are—by definition—independent of the stock prices of the portfolio firms and again find a positive treatment effect. Taken together, the results from columns (1), (2), and (3) suggest that fund managers' experiencing of natural disasters does positively affect their sustainability preferences.

In column (4) of Table 10, we address the possible critique that the changes in the sustainability footprint are not due to institutions' preferences for sustainability but are more likely driven by institutions' preferences for other stock characteristics (e.g., risk, market capitalization, growth, value, or quality). The idea behind this critique is as follows: when a natural disaster hits the area of an institutional investor, portfolio managers reduce the risk of the portfolio by investing, for instance, in large-cap, low-volatility, or quality stocks. Given that these characteristics are somewhat correlated with sustainability, the question is whether the disaster-induced improvement in the footprint is due to changes in sustainability preferences or changes in investor-level preferences for other stock characteristics. To address this issue, we use sustainability footprints based on *residual* sustainability, which isolates the component of sustainability not explained by other stock-characteristics (see Section 5.3 for more details). In calculating the residual footprint we again exclude local stock holdings and denote this measure by *Susty_VW_R_HQ*. The analysis continue to show a significant treatment effect which is of similar magnitude to those documented in columns (1)—(3) of Table 10.

6.2. Risk-adjusted performance is more strongly related to sustainability footprints after natural disaster treatment

Having shown that institutions increase portfolio-level sustainability footprints following exogenous shocks induced by natural disasters, we now interact the residual sustainability footprint in year-quarter *t-n* (i.e., $Susty\_VW\_R\_HQ_{jt-n}$) with the corresponding treatment dummies (i.e., $Disaster\ hits\ investor_{jt-n}$) to show that the positive impact of sustainability on risk-adjusted investment performance identified in Section 5 is likely to be causal. We use as dependent variables *Total portfolio risk (HQ), Mean portfolio return* (HQ), *Sharpe ratio (HQ), and Alpha FF5 (HQ),* where HQ indicates that we calculate the performance metrics excluding holdings of local stocks. In line with Section 5, we calculate these performance metrics on a forward-rolling basis using windows of 10 quarters and estimate specifications of the following type:

$$
\begin{aligned}
y_{jglt(t,t+9)} = \eta_j \\
&+ \sum_{n=0}^{2} (a_n\ Disaster\ hits\ investor_{jt-n} + b_n\ Disaster\ hits\ investor_{jt-n} \\
&\times Susty\_VW\_R\_HQ_{jt-n} + c_n\ Susty\_VW\_R\_\ HQ_{jt-n}) + b_n'\ X_{jt}\ + \theta_{gt} + \pi_{lt} \\
&+ \epsilon_{jt},
\end{aligned}
$$

where $y_{jgl(t,t+9)}$ is the forward investment performance measure for investor *j*, of type *l*, located in state *g*, and measured in year-quarter *t*. $Susty\_VW\_R\_HQ_{jt-n}$ denotes the institution-level residual sustainability footprint in year-quarter *t-n* excluding any holdings of local stocks. $Disaster\ hits\ investor_{jt-n}$ denote the disaster treatment dummies as previously defined. The equation again includes investor fixed effects as well as *Headquarters state×Year-quarter*, and *Institution type×Year-quarter* fixed effects. To avoid look-ahead bias, we regress *forward rolling* investment performance measures (i.e., measures between period *t* and *t+9)* on *lagged* and *current* treatment and sustainability variables (i.e., between *t and t-n*). Given that disaster treatment leads to changes in portfolio in quarter t, t+1 and t+2 (see Table 10), we let *n* go from 0 to 2 in that equation.

We are mainly interested in the coefficient estimates for the interaction effects *Disaster hits investor*$_{jt-n}$×*Susty_VW_R_HQ*$_{jt-n}$ that is the estimates for $\boldsymbol{b_n}$. These coefficients measure whether and how portfolio sustainability is related to risk-adjusted performance for "treated" firms. The hypotheses we entertain in this paper make different predictions regarding the sign of these interaction coefficients. While the *"doing well by doing good"* and to some extent also the *"delegated philanthropy"* view suggest positive coefficient estimates, the *"insider initiated philanthropy hypothesis"* implies negative coefficient estimates for $\boldsymbol{b_n}$. We report the regression results for the four performance metrics in Table 11.

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

In column (2) of Table 11 we use *Mean Portfolio Return* as the dependent variable. The coefficient estimates on the interaction terms *Disaster hits investor*$_{jt-1}$ × *Susty_VW_HQ*$_{jt-1}$ and *Disaster hits investor*$_{jt-2}$ × *Susty_VW_HQ*$_{jt-2}$ are significantly positive, suggesting that following natural disasters the portfolios of higher sustainability investors earn higher returns. When we use the *Sharpe ratio* as the dependent variable, we observe a strongly positive and significant relation between the interaction terms for periods *t, t-1,* and *t-2*, suggesting a causal and positive relation between risk-adjusted performance and portfolio-level sustainability (see column (3), Table 11). We find similar positive treatment effects when the five factor alpha serves as the dependent variable (column (4), Table 11).

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 footprint leads to higher post-treatment risk-adjusted performance for these institutional investors. The latter is likely to be due to the positive price pressure on high sustainability footprints stocks included in their portfolios following natural disasters.[20]

7. Conclusion

In this paper, we systematically examine and measure the social, environmental, and overall 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 environmental footprint since 2002, and a downward trend in the social footprint. We also document that more long-term oriented investors have better footprints.

Second, inspired by Bénabou and Tirole (2010), we conjecture that three views could underlie institutional investors' motivations to hold equity portfolios with higher sustainability footprints, namely "doing well by doing good", "delegated philanthropy", or "insider initiated philanthropy". The first view implies that investment performance and sustainability should be positively related, and more so if the institution is long-term oriented. The second view predicts that portfolio performance and sustainability should be positively related if the benefits of implementing sustainability exceed the costs. We conjecture that this is likely to be the case for the environmental but less so for the social dimension of the footprint. The last view suggests a negative tradeoff between sustainability and performance. We believe our results to be most consistent with the first and second views suggesting that a mix of performance considerations and stakeholders' norms based demands drive sustainability choices at the institutional-investor level.

[20] Note that the direct effect of a natural disaster on risk-adjusted performance tends to be significantly negative. 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.

To argue for a causal interpretation, we implement an identification strategy based on the occurrence of natural disasters in the U.S. that suggests a positive and causal impact of the sustainability footprint 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

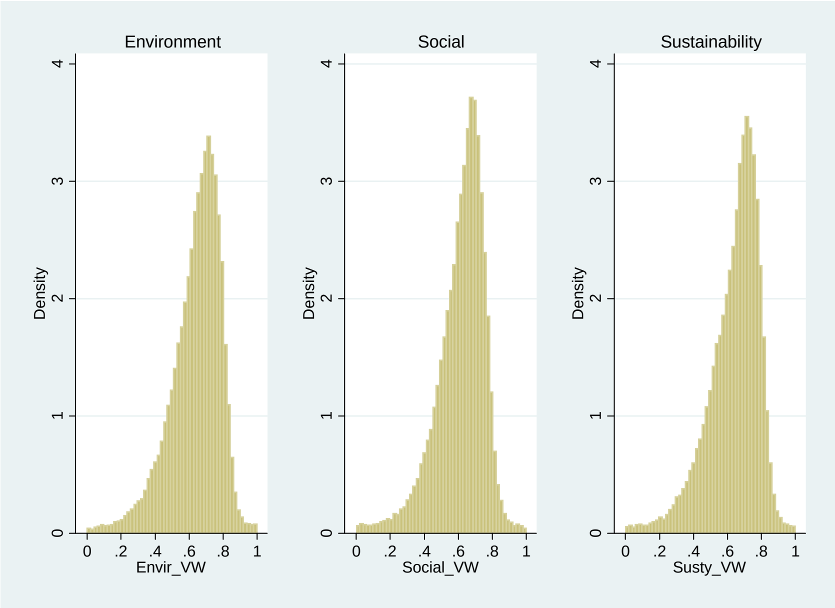


Figure 1
This figure displays the distributions of the social, environmental, and overall sustainability footprints (value weighted) at the institutional-investor level. Investor-level footprints are weighted averages of ranked stock-level scores, where the weights are simply the weights of the stocks in the investor's portfolio. Ranks are normalized between 0 and 1.

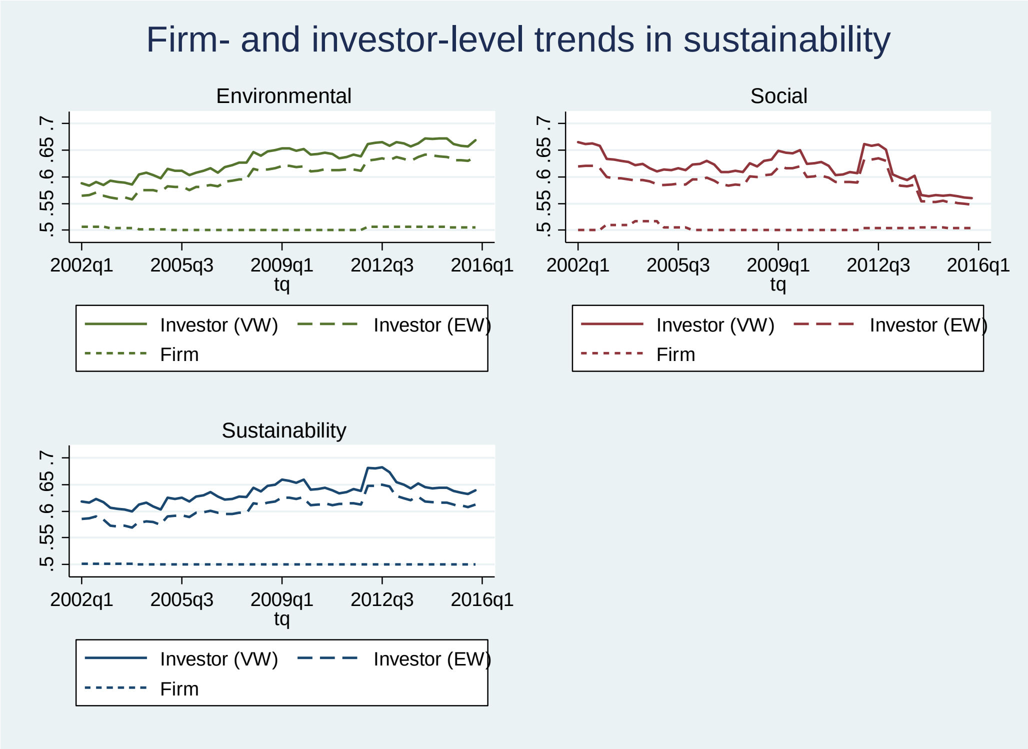


Figure 2
The sub-panels in this figure show the evolution of the average institutional investor-level environmental, social, and combined sustainability footprints, both in value- and equally-weighted terms (i.e., the time series of quarterly cross-sectional averages of *Envir_VW*, *Social_VW*, and *Susty_VW*). The graphs also show the evolution of the ranked environmental, social, and overall sustainability score for the average firm.

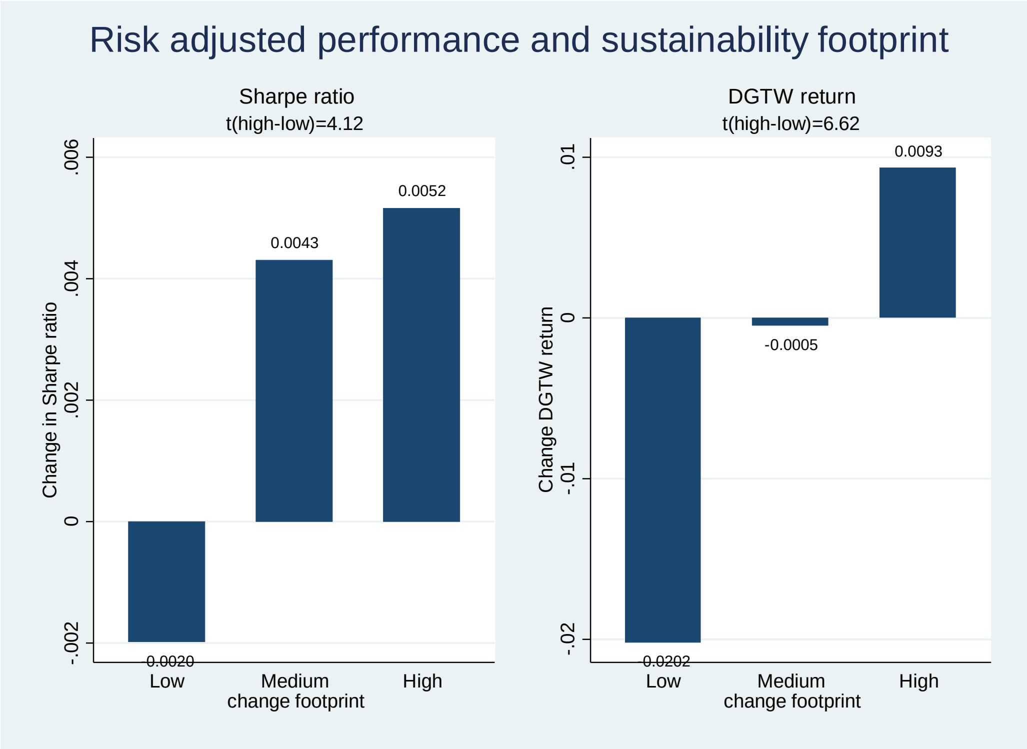
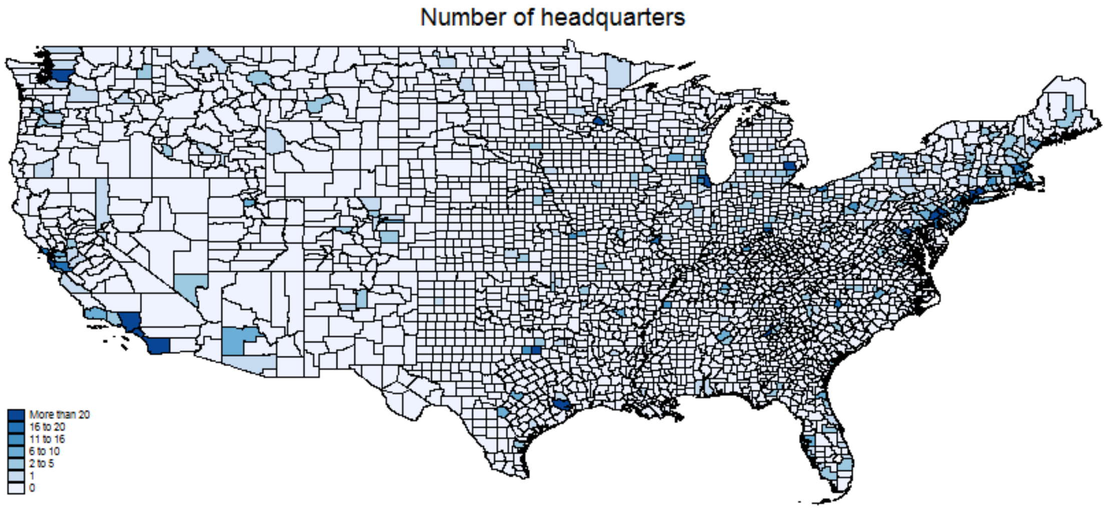


Figure 3
This figure shows the average change in Sharpe ratios and average change in portfolio DGTW returns conditional on the change in the sustainability footprint between periods *t* and *t-1*. In each quarter we sort institutions into tercile bins based on the change in the sustainability footprint and calculate the average change in the respective performance metric for each bin. To avoid look-ahead bias, the performance metrics are calculated on a forward rolling basis, with rolling windows of ten quarters (i.e., between t and t+9). The *t*-statistics of the mean difference tests are adjusted for clustering at the investor-level.

Panel A: Geographical distribution of institutional investor headquarters



Panel B: Geographical distribution of natural disasters

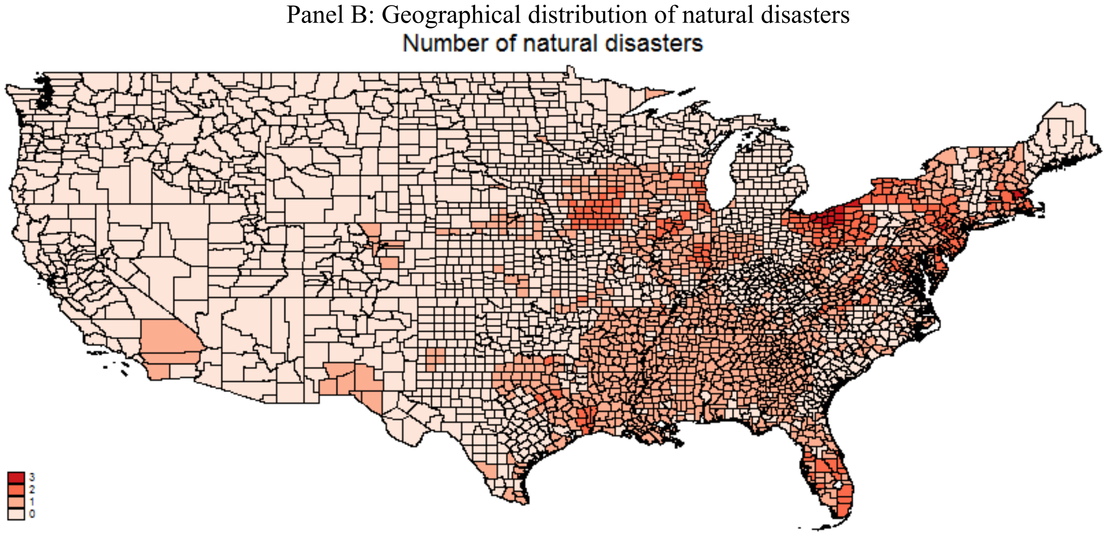


Figure 4

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.

Tables

Table 1. Stock-level summary statistics

This table shows summary statistics at the annual frequency 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. $z_t(x)$ denotes the z-score transformation of the raw scores. *Envir*, *Social*, and *Susty* are the combined z-transformed MSCI and Thomson scores at the stock-level. *Susty_R*, *Envir_R*, and *Social_R* are the residual sustainability measures at the stock-level (see Section 5.3 for more details). *S&P 500* is a dummy variable indicating S&P500 membership. *Market cap*, *Assets*, and *Sales* are in Million $. *Employees* is in thousands. *Roa* is return on assets. *Gross profitability* is defined as in Novy Marx (2013). *Book to market* is book equity to market equity. *Tvol* is the rolling volatility of the firm's quarterly stock returns.

Panel A: MSCI-Thomson-CRSP-Compustat sample								
	count	mean	sd	min	p25	p50	p75	max
Envir_A4	7961	4.5557	3.191	0.826	1.550	3.549	8.023	9.747
Social_A4	7961	4.9416	2.806	0.353	2.386	4.771	7.485	9.878
Envir_MSCI	14282	4.4038	1.966	0.000	3.000	4.400	5.700	10.000
Social_MSCI	13170	4.4437	1.621	0.000	3.310	4.460	5.410	10.000
z_t(Envir_A4)	7961	0.0732	1.013	-1.360	-0.864	-0.262	1.134	2.438
z_t(Social_A4)	7961	0.0952	0.985	-1.948	-0.795	0.015	0.976	2.104
z_t(Envir_MSCI)	14282	-0.1543	0.958	-3.134	-0.873	-0.195	0.453	3.103
z_t(Social_MSCI)	13170	-0.1742	0.927	-4.587	-0.803	-0.167	0.375	3.891
Susty	15819	-0.0023	1.001	-2.820	-0.776	-0.105	0.712	3.380
Envir	15819	-0.0010	1.000	-2.198	-0.826	-0.115	0.760	2.784
Social	15066	-0.0033	1.002	-4.129	-0.730	-0.029	0.677	3.577
Susty_R	14992	-0.0003	0.271	-0.742	-0.218	-0.000	0.221	1.259
Envir_R	14992	0.0001	0.274	-0.758	-0.223	-0.007	0.227	1.252
Social_R	14251	-0.0002	0.274	-0.802	-0.224	0.007	0.228	0.997
S&P 500	15819	0.4002	0.490	0.000	0.000	0.000	1.000	1.000
Market cap	15812	11,478.927	30,747.488	10.562	1,078.158	3,116.472	8,917.875	682,427.49
Assets	15818	25,478.194	121,206.63	7.121	1,261.676	3,746.807	12,119.000	2573126.0
Sales	15816	9,222.7322	24,809.163	-4,234.472	781.906	2,463.482	7,424.650	483,521.00
Employees	15740	26.1949	79.409	0.000	2.000	7.000	22.005	2,300.000
Capex / Fixed assets	14946	0.2567	0.208	-0.156	0.123	0.197	0.318	1.499
Liabilities / Assets	15768	0.5897	0.255	0.003	0.419	0.588	0.754	2.845
Cash/Fixed assets	15818	0.1596	0.183	0.000	0.033	0.091	0.216	0.996
Roa	15562	0.0380	0.093	-0.477	0.010	0.041	0.081	0.503
Book to market	14926	0.5933	0.464	0.001	0.274	0.479	0.781	3.757
Gross profitability	14994	0.2977	0.252	-1.317	0.120	0.262	0.424	2.071
Tvol	15776	0.0236	0.012	0.000	0.015	0.021	0.029	0.148
Panel B: CRSP-Compustat sample								
	count	mean	sd	min	p25	p50	p75	max
S&P 500	71141	0.1042	0.306	0.000	0.000	0.000	0.000	1.000
Market cap	70522	3,180.2981	15,822.938	0.471	75.418	301.099	1,261.885	682,427.49
Assets	71076	7,051.2451	59,501.306	0.000	102.278	460.238	1,904.238	2573126.0
Sales	71011	2,638.7234	12,533.798	-4,234.472	48.900	236.326	1,152.118	483,521.00
Employees	70095	8.6656	42.346	0.000	0.198	0.876	4.407	2,300.000
Capex / Fixed assets	57085	0.2686	0.249	-0.654	0.104	0.192	0.348	1.500
Liabilities / Assets	70767	0.5549	0.300	0.000	0.320	0.541	0.781	2.845
Cash/Fixed assets	71071	0.2022	0.236	-0.002	0.033	0.099	0.290	1.000
Roa	66124	0.0030	0.121	-0.480	-0.013	0.018	0.062	0.507
Book to market	61407	0.7181	0.582	0.000	0.320	0.573	0.934	3.759
Gross profitability	62677	0.2792	0.299	-1.578	0.068	0.249	0.433	2.071
Tvol	70375	0.0361	0.022	0.000	0.020	0.030	0.045	0.155

Table 2. Institutional investor-level summary statistics

This table shows summary statistics at the institutional investor-level. *Susty_VW* is the value-weighted sustainability footprint of the institutional investor. *Susty_VW_HQ* is the value-weighted sustainability footprint of the institutional investor calculated excluding holdings of stocks with headquarters located in the same state as the institutional investor. *Susty_VW_R* is the residual sustainability footprint, where the stock level sustainability residual rank is calculated using the difference between the actual stock level-sustainability rank and a predicted stock-level sustainability rank, where the predictors are market equity, book-to-market, gross profitability, and total volatility (see Section 5.3 for more details). *Susty_EW* is the equally weighted sustainability footprint. We also calculate the corresponding environmental and social footprints, which we denote by *Envir_VW* and *Social_VW*. *Turnover* is the four quarter rolling average quarterly portfolio turnover. *Return (Quarterly)* is the investor's quarterly holdings return. *Mean portfolio return* is the ten quarter forward rolling average of the quarterly holdings return (calculated between bperiod t and t+9). *Mean portfolio DGTW return* is the ten quarter forward rolling average characteristics-adjusted portfolio return (See Daniel et al. 1997). *Total portfolio risk* is the forward rolling standard deviation of the holdings returns. *Sharpe ratio* is forward rolling Sharpe ratio. *Alpha FF5 is* the alpha from a Fama & French (2015) five factor model estimated using rolling windows of 10 quarters. *Beta_mkt*, *Beta_smb*, *Beta_hml*, and *Beta_qcma,* and *Beta_qrmw* are the corresponding factor exposures. *Assets* is the size of the institutional investor's common stock holdings (in bn. $). *# Stocks* is the number of stocks in the investor's portfolio. *# Industries<=2* is a dummy variable indicating if the institutional investor's portfolio firms belong to two or fewer two-digit SIC industries. *Coverage (Value)* is the percentage of the investor's portfolio value for which stock-level sustainability scores are available. 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
Susty_VW	147413	0.638	0.150	0.001	0.559	0.670	0.744	0.999
Susty_VW_HQ	107592	0.640	0.153	0.001	0.559	0.672	0.749	0.997
Susty_VW_R	147122	0.073	0.120	-0.630	0.016	0.095	0.150	0.880
Envir_VW	147408	0.638	0.148	0.001	0.560	0.665	0.742	0.999
Envir_VW_HQ	107584	0.641	0.151	0.002	0.561	0.669	0.748	0.999
Envir_VW_R	147117	0.078	0.121	-0.671	0.019	0.099	0.155	0.934
Social_VW	147160	0.615	0.143	0.001	0.542	0.641	0.711	1.000
Social_VW_HQ	107378	0.615	0.144	0.001	0.542	0.642	0.713	0.999
Social_VW_R	146863	0.054	0.115	-0.646	0.004	0.073	0.121	0.807
Susty_EW	147413	0.609	0.126	0.001	0.539	0.619	0.694	0.999
Envir_EW	147408	0.609	0.124	0.001	0.539	0.615	0.692	0.999
Social_EW	147160	0.591	0.118	0.001	0.530	0.602	0.667	1.000
Turnover	132709	0.124	0.123	0.000	0.039	0.080	0.166	0.702
Return (Quarterly)	147559	2.137	10.897	-77.866	-2.434	2.858	7.882	432.031
Mean portfolio return	97734	2.602	2.850	-14.829	1.211	2.964	4.290	20.469
Mean portfolio DGTW return	96914	0.046	1.106	-5.329	-0.484	0.014	0.516	5.410
Total portfolio risk	97696	0.085	0.044	0.005	0.049	0.079	0.109	0.381
Sharpe ratio	97779	0.373	0.415	-1.827	0.089	0.391	0.622	2.596
Alpha FF5	96974	0.117	2.254	-9.938	-0.844	0.025	1.008	10.029
Beta_mkt	121241	1.002	0.362	-0.599	0.841	0.986	1.139	2.571
Beta_smb	121549	0.128	0.655	-2.933	-0.187	0.052	0.397	3.044
Beta_hml	121442	0.037	0.628	-2.799	-0.230	0.019	0.301	2.838
Beta_qcma	120830	-0.026	0.769	-3.239	-0.323	0.035	0.326	3.301
Beta_qrmw	121371	-0.116	0.812	-3.687	-0.432	-0.045	0.250	3.607
Assets	150840	4.196	27.398	0.000	0.137	0.335	1.281	1,413.680
# Stocks	150845	193.974	405.771	1.000	30.000	69.000	158.000	4,282.000
# Industries<=2	150845	0.047	0.213	0.000	0.000	0.000	0.000	1.000
Coverage (Value)	150845	0.777	0.278	0.000	0.664	0.903	0.985	1.000

Table 3. Investor- and firm-level trends

The first four columns show time series regressions in which we relate value- and equally weighted environmental and social footprints of the representative investor to a constant and a trend variable. Footprints are value-weighted in columns (1) and (2) and equally-weighted in columns (3) and (4). Columns (5) and (6) show results from relating the ranked environmental and social scores of the representative firm to a time trend and a constant. Standard errors are robust. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Envir_VW	Social_VW	Envir_EW	Social_EW	Envir_Firm	Social_Firm
Trend	0.00163***	-0.00105***	0.00157***	-0.00059***	0.00005**	-0.00007*
	(23.55)	(-5.30)	(25.04)	(-3.40)	(2.40)	(-1.74)
Constant	0.31481***	0.82275***	0.29785***	0.70857***	0.49218***	0.51740***
	(23.73)	(22.17)	(24.63)	(21.92)	(109.54)	(61.89)
R-squared	0.890	0.354	0.915	0.191	0.110	0.061
Observations	56	56	56	56	56	56

Table 4. Sustainability footprint and portfolio characteristics

This table displays results from regressions of the overall sustainability footprint (column (1)), and its environmental and social components (columns (2) and (3)) on several portfolio-level characteristics. Turnover is the four quarter rolling average quarterly portfolio turnover. The variable *ln(# Stocks)* is the natural logarithm of 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. *ln(Assets)* is the natural logarithm of the total value of the investor's stock portfolio. *Beta_mkt*, *Beta_smb*, *Beta_hml*, *Beta_qcma*, and *Beta_qrmw* are the Fama and French (2015) five factor exposures. *Institution type* is based on the classification of 13F institutions in Bushee (2001). 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) Envir_VW	(3) Social_VW
Turnover	-0.03153**	-0.02809**	-0.03990***
	(-2.32)	(-2.03)	(-3.06)
ln(# Stocks)	0.00762***	0.00807***	0.00411
	(3.22)	(3.44)	(1.59)
# Industries<=2	-0.00553	-0.01125	-0.00111
	(-0.45)	(-0.83)	(-0.09)
ln(Assets)	-0.00382***	-0.00431***	-0.00255*
	(-2.59)	(-2.79)	(-1.81)
Beta_mkt	-0.00519**	-0.00733***	-0.00281
	(-2.23)	(-3.09)	(-1.20)
Beta_smb	-0.00553***	-0.00443***	-0.00694***
	(-4.23)	(-3.30)	(-5.33)
Beta_hml	0.00152	0.00235	0.00049
	(0.94)	(1.48)	(0.29)
Beta_qcma	0.00056	0.00055	-0.00048
	(0.52)	(0.53)	(-0.43)
Beta_qrmw	0.00428***	0.00238**	0.00485***
	(3.51)	(2.02)	(3.77)
Investor FE	Yes	Yes	Yes
Institution type # Year-quarter FE	Yes	Yes	Yes
Country # Year-quarter FE	Yes	Yes	Yes
R-squared	0.721	0.709	0.664
Observations	106980	106980	106884

Table 5. Investment performance as a function of sustainability footprint

This table shows the results from panel regressions of standard investment performance measures on the overall sustainability (Panel A), the environmental (Panel B), and the social (Panel C) footprint. Performance metrics are calculated using forward rolling windows of ten quarters, that is between quarter *t* and *t+9*. Sustainability footprints are measured as of quarter *t*. In column (1), the dependent variable is the institution's mean quarterly portfolio return. The dependent variable in column (2) is the institution's DGTW adjusted mean portfolio return. The dependent variable in column (3) is the standard deviation of the investor's portfolio returns. The dependent variable in column (4) is the Sharpe ratio and in column (5) the alpha resulting from a Fama and French 5 Factor model. All regressions control for *Turnover, Ln(# Stocks), the # Industries<=2* dummy, and the natural logarithm of the total value of the investor's stock portfolio, that is *ln(Assets)*. Standard errors are clustered at the institutional investor-level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Sustainability footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Susty_VW	0.22691	0.25265**	-0.01005***	0.07687***	0.43067**
	(1.19)	(2.08)	(-4.58)	(3.46)	(2.07)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.803	0.388	0.873	0.846	0.289
Observations	85330	84870	85306	85345	82921

Panel B: Environmental footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Envir_VW	0.83569***	0.51063***	-0.00882***	0.13642***	0.60188***
	(4.37)	(4.32)	(-4.12)	(6.10)	(2.99)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.803	0.389	0.872	0.846	0.289
Observations	85330	84870	85306	85345	82921

Panel C: Social footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Social_VW	-0.61866***	-0.12285	-0.00912***	-0.03404	-0.02927
	(-3.38)	(-1.07)	(-4.18)	(-1.62)	(-0.14)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.803	0.389	0.873	0.846	0.290
Observations	85197	84739	85173	85212	82790

Table 6. Investment performance as a function of sustainability footprint: The role of investment horizon

This table shows the relation between risk-adjusted performance and sustainability footprints for different levels of portfolio turnover. In the regressions, we interact tercile dummies based on *Turnover* with the sustainability footprint measures. Tercile dummies are calculated in each quarter. The regressions examine the relation between risk-adjusted performance and the sustainability footprint for investors with low, medium, and high turnover. 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 (see Carhart (1997)). We use a four quarter moving average of turnover. We use the same control variables as in Table 5. Standard errors are clustered at the institutional investor-level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1) Mean portfolio DGTW return	(2) Sharpe ratio	(3) Alpha FF5	(4) Mean portfolio DGTW return	(5) Sharpe ratio	(6) Alpha FF5	(7) Mean portfolio DGTW return	(8) Sharpe ratio	(9) Alpha FF5
Medium turnover	0.40533***	0.07207***	0.05759	0.51875***	0.09519***	0.28998	0.22818*	0.02739	-0.26078
	(3.22)	(3.08)	(0.24)	(4.28)	(3.95)	(1.24)	(1.73)	(1.17)	(-1.00)
High turnover	0.44223***	0.09720***	0.46647*	0.64712***	0.13618***	0.72202***	0.20564	0.01956	0.05027
	(2.87)	(3.35)	(1.69)	(4.31)	(4.64)	(2.75)	(1.33)	(0.68)	(0.17)
Susty_VW	0.64297***	0.15197***	0.73816**						
	(3.21)	(3.95)	(2.16)						
Medium turnover × Susty_VW	-0.52577***	-0.08700***	-0.07979						
	(-2.96)	(-2.63)	(-0.23)						
High turnover × Susty_VW	-0.52671**	-0.11024***	-0.62479						
	(-2.43)	(-2.69)	(-1.59)						
Envir_VW				1.10179***	0.25027***	1.19030***			
				(5.69)	(6.33)	(3.69)			
Medium turnover × Envir_VW				-0.70529***	-0.12338***	-0.43265			
				(-4.08)	(-3.57)	(-1.30)			
High turnover × Envir_VW				-0.85641***	-0.17302***	-1.02494***			
				(-4.00)	(-4.13)	(-2.70)			
Social_VW							0.03163	-0.03256	-0.14869
							(0.16)	(-0.86)	(-0.41)
Medium turnover × Social_VW							-0.26723	-0.02023	0.40636
							(-1.41)	(-0.60)	(1.09)
High turnover × Social_VW							-0.17187	0.01005	0.01384
							(-0.78)	(0.24)	(0.03)
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.388	0.846	0.289	0.390	0.847	0.289	0.389	0.846	0.290
Observations	84870	85345	82921	84870	85345	82921	84739	85212	82790

Table 7. Residual sustainability

In each quarter t we run a cross sectional regression of the normalized stock-level sustainability ranks on the normalized ranks of market equity *(me)*, book-to-market *(bm)*, gross profitability *(gp)*, and total volatility *(tvol)*. In these cross sectional regressions, we use normalized ranks of both the dependent and independent variables. Taking the sustainability score as an example, we estimate $rk_t(Susty_{it})=a + b_{me}rk_t(me_{it}) + b_{bm}rk_t(bm_{it}) + b_{gp}rk_t(gp_{it}) + b_{tvol}rk_t(tvol_{it})+ e_{it}$. Residual sustainability is simply the residual from this regression and captures the component of sustainability not explained by the characteristics used in the regression. This table shows descriptive statistics for the time series of model parameters resulting from these regressions (i.e., coefficient estimates, t-statistics, and R2 from the cross-sectional regressions).

Panel A: Sustainability score (Susty)						
	Count	mean	sd	p25	p50	p75
b_{me}	56	0.97323	0.49593	0.34107	1.12233	1.26480
t_{me}	56	7.76617	2.66723	5.65320	6.57441	9.94888
b_{bm}	56	0.05076	0.08307	0.02065	0.05703	0.08453
t_{bm}	56	0.71503	2.01615	0.44965	1.31549	1.89121
b_{gp}	56	0.15820	0.07569	0.11730	0.15888	0.19909
t_{gp}	56	4.58221	3.51272	1.75580	3.73217	6.10229
b_{tvol}	56	-0.06745	0.07033	-0.11201	-0.06787	-0.02343
t_{tvol}	56	-1.40769	1.48212	-2.67462	-1.26878	-0.48412
R^2	56	0.12299	0.04426	0.09047	0.11096	0.15657
Panel B: Environmental score (Envir)						
	count	mean	sd	p25	p50	p75
b_{me}	56	0.82480	0.39637	0.29802	0.96317	1.08757
t_{me}	56	6.84572	2.42966	4.90874	6.54446	9.01915
b_{bm}	56	0.06089	0.10436	0.00482	0.06640	0.09839
t_{bm}	56	0.75940	2.35560	0.18102	1.46950	2.10100
b_{gp}	56	0.17476	0.04503	0.13808	0.17611	0.20358
t_{gp}	56	4.55565	2.64686	2.77497	3.66767	4.76799
b_{tvol}	56	-0.04773	0.05972	-0.09065	-0.04609	-0.00645
t_{tvol}	56	-1.01242	1.29818	-1.95441	-0.94862	-0.12519
R^2	56	0.09770	0.03615	0.06735	0.09262	0.12715
Panel C: Social score (Social)						
	count	mean	sd	p25	p50	p75
b_{me}	56	1.03519	0.68526	0.36999	1.22056	1.31597
t_{me}	56	6.84011	3.71529	4.84513	6.79581	9.65756
b_{bm}	56	0.04244	0.06640	-0.00337	0.03440	0.08361
t_{bm}	56	0.65711	1.40715	-0.06984	0.64081	1.76653
b_{gp}	56	0.12167	0.09434	0.10197	0.11902	0.19902
t_{gp}	56	3.47624	2.93585	1.34964	3.94718	4.72481
b_{tvol}	56	-0.07621	0.08672	-0.13686	-0.06258	-0.01017
t_{tvol}	56	-1.42967	1.67264	-2.45336	-1.25476	-0.28621
R^2	56	0.11862	0.05516	0.08730	0.12667	0.15776

Table 8. Investment performance as a function of the *residual* sustainability footprint

This table shows regressions of investment performance measures on the footprints calculated using residual sustainability. Panel A shows results for the overall sustainability footprint. Panel B and C display the results for the environmental and social dimension individually. All regressions control for *Turnover*, *Ln(# Stocks)*, the *# Industries<=2* dummy, and the natural logarithm of the total value of the investor's stock portfolio denoted by *ln(Assets)*. Standard errors are clustered at the institutional investor-level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Sustainability footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Susty_VW_R	0.42069**	0.32751**	-0.00511**	0.06424***	0.55028**
	(2.04)	(2.46)	(-2.16)	(2.65)	(2.48)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.803	0.388	0.872	0.846	0.289
Observations	85267	84809	85243	85282	82857

Panel B: Environmental footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Envir_VW_R	1.06140***	0.62026***	-0.00551**	0.12891***	0.76386***
	(5.22)	(4.96)	(-2.45)	(5.42)	(3.54)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.804	0.390	0.872	0.846	0.290
Observations	85267	84809	85243	85282	82857

Panel C: Social footprint

	(1) Mean portfolio return	(2) Mean portfolio DGTW return	(3) Total portfolio risk	(4) Sharpe ratio	(5) Alpha FF5
Social_VW_R	-0.42672**	-0.05451	-0.00318	-0.03371	0.05705
	(-2.12)	(-0.43)	(-1.34)	(-1.45)	(0.26)
Investor FE	Yes	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
Country × Year-quarter FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.803	0.389	0.873	0.846	0.290
Observations	85134	84678	85110	85149	82729

Table 9. 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 10. Sustainability footprint around natural disasters

This table shows the results from regressions in which we relate the sustainability footprint in quarter t to dummy variables indicating whether the county of the institutional investor's headquarters is hit by a natural disaster in quarter $t\text{-}n$. For example the variable $Disaster\ hits\ investor_{jt}$ is equal to one if the county of the institutional investor *j's* headquarters is subject to a natural disaster in quarter t, and equal to zero otherwise. In a similar way, the variable $Disaster\ hits\ investor_{jt-1}$ indicates that an institution was hit by a disaster one quarter ago. The dependent variable in column (1) is the value-weighted sustainability footprint. In column (2) we use the value-weighted sustainability footprint excluding the institution's holdings of firms that are headquartered in the same state as the institutional investor. In column (3) we use the equally weighted sustainability footprint (calculated using all the holdings of the institution). In column (4) we use the footprint based on the *residual* sustainability as the dependent variable. In calculating the residual sustainability footprints we also exclude holdings of stocks that are headquartered in the same state as the institutional investor. We control for *# Industries<=2*, *ln(Assets)*, and *ln(# Stocks).* 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	(2) Susty_VW_HQ	(3) Susty_EW	(4) Susty_VW_R_HQ
Disaster hits investor (t)	0.0128***	0.0096**	0.0063*	0.0085**
	(3.07)	(2.34)	(1.88)	(2.33)
Disaster hits investor (t-1)	0.0116***	0.0111***	0.0079**	0.0078**
	(2.78)	(2.65)	(2.27)	(2.15)
Disaster hits investor (t-2)	0.0100**	0.0122***	0.0090**	0.0083**
	(2.25)	(2.65)	(2.47)	(2.11)
Disaster hits investor (t-3)	0.0037	0.0041	0.0036	0.0011
	(0.74)	(0.76)	(0.93)	(0.22)
Control variables	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes
HQ State × Year-quarter FE	Yes	Yes	Yes	Yes
R-squared	0.707	0.696	0.702	0.580
Observations	67989	67621	67989	67571

Table 11. Investment performance, sustainability footprints, and natural disasters

In this table we regress forward rolling *Total portfolio risk*, *Mean portfolio return*, *Sharpe ratio,* and *Alpha FF5* on dummy variables indicating whether the county of the institutional investor's headquarters is hit by a natural disaster in quarter *t* (i.e., *Disaster hits investor*$_{jt-n}$*)*, the residual sustainability footprint in quarter *t* calculated excluding holdings of stocks that are headquartered in the same state as the institutional investor (i.e., *Susty_VW_R_HQ*$_{jt-n}$*)*, and the corresponding interaction terms *Disaster hits investor*$_{jt-n}$ × *Susty_VW_R_HQ*$_{jt-n}$. In calculating the performance metrics, we use forward rolling windows of 10 quarters (between *t* and *t+9*) based on a time series of institution-level quarterly portfolio returns that excludes holdings of stocks that are headquartered in the same state as the institutional investor. All regressions include control variables *# Industries<=2*, ln(*# Stocks)*, *Turnover*, 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) Total portfolio risk (HQ)	(2) Mean portfolio return (HQ)	(3) Sharpe ratio (HQ)	(4) Alpha FF5 (HQ)
Disaster hits investor (t)	-0.0009	-0.1782**	-0.0394***	-0.4606***
	(-0.85)	(-2.28)	(-2.93)	(-3.35)
Susty_VW_R_HQ(t)	0.0005	0.3025	0.0208	0.4298
	(0.17)	(1.39)	(1.01)	(1.50)
Disaster hits investor (t) × Susty_VW_R_HQ(t)	0.0134*	0.7654	0.3229***	3.4723***
	(1.94)	(1.49)	(4.05)	(3.45)
Disaster hits investor (t-1)	-0.0017*	-0.1839**	-0.0180	-0.4521***
	(-1.68)	(-2.31)	(-1.32)	(-2.96)
Susty_VW_R_HQ(t-1)	0.0026	0.3145**	0.0313**	0.1910
	(1.26)	(2.18)	(2.40)	(0.82)
Disaster hits investor (t-1) × Susty_VW_R_HQ(t-1)	0.0110*	1.3966**	0.1541**	3.3666***
	(1.86)	(2.54)	(1.99)	(3.20)
Disaster hits investor (t-2)	-0.0023**	-0.1805**	-0.0158	-0.2552*
	(-2.34)	(-1.98)	(-1.07)	(-1.88)
Susty_VW_R_HQ(t-2)	-0.0020	-0.1173	-0.0108	-0.5203**
	(-0.90)	(-0.62)	(-0.53)	(-2.02)
Disaster hits investor (t-2) × Susty_VW_R_HQ(t-2)	0.0168***	1.4046**	0.1856**	2.4938**
	(2.91)	(2.31)	(2.07)	(2.50)
Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Institution type × Year-quarter FE	Yes	Yes	Yes	Yes
HQ State × Year-quarter FE	Yes	Yes	Yes	Yes
R-squared	0.865	0.802	0.848	0.296
Observations	56111	56113	56136	53697

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