

Institutional Investors' Views and Preferences on Climate Risk Disclosure

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March 2020

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Abstract

Surveying institutional investors on portfolio firms' climate risk disclosures, we find that many think climate risk reporting to be as important as traditional financial reporting and that it should be mandatory and more standardized. We find systematic variation in their opinions depending on investor characteristics and their beliefs about climate change. For example, the belief that current disclosure is deficient derives more from investors that believe climate risks are underpriced in equity markets. We complement the survey analysis with archival data showing that greater institutional ownership is associated with a higher propensity of firms to voluntarily disclose their carbon emissions.

Keywords: climate finance, climate risk disclosure, transparency, institutional investors

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1. Introduction

Financial market efficiency relies on timely and accurate information regarding firms' risk exposures. An increasingly important and pertinent risk exposure relates to climate change, which can originate from natural disasters, government regulation to combat a rise in temperature, or climate-related innovations that disrupt existing business models (Litterman 2016, Krueger, Sautner, and Starks 2020). Consequently, high-quality information on firms' climate risk exposures has become a significant component of informed investment decisions and of correct market pricing of the risks and opportunities related to climate change. Furthermore, with climate change being increasingly considered as a danger to the financial system (Carney 2015), sound disclosure on climate risks is also essential for regulatory efforts to protect financial stability (Goldstein and Yang 2017).

However, many regulators and investors argue that climate risk disclosure is currently insufficient. For example, Mark Carney, Governor of the Bank of England, called for more to be done *"to develop consistent, comparable, reliable and clear disclosure around the carbon intensity of different assets"* (Carney 2015). In a similar spirit, Anne Stausboll, former CEO of CalPERS, argued that *"consistent and comparable corporate disclosure of material climate issues is critical [and that] investors require better climate disclosure"* (Stausboll 2014). More recently, Yngve Slyngstad, CEO of Norges Bank Investment Management, echoed these concerns by commenting on the difficulty of obtaining climate risk-related data: *"The only surprise [...] is how hard it is to get the data [...] I think it will take years to get good data from the majority of companies we are invested in."*¹

To address potential shortcomings in current disclosures, regulators, governments, and NGOs have been taking actions to improve firm-level reporting on climate risks. For instance, in 2015, the Financial Stability Board initiated the Task Force on Climate-related Financial Disclosures (TCFD), with the objective of developing voluntary climate-related financial risk disclosures. In a similar spirit, on

¹ See "Norway wealth fund builds tool to analyze climate risk to portfolio," *Reuters Market News*, October 31, 2018.

behalf of investors representing over \$87 trillion in assets under management, the CDP collects climate-related information through a questionnaire. In addition to these largely voluntary initiatives, some countries are mandating climate-related disclosures. For example, since 2013, the U.K. requires exchange-traded companies to disclose their carbon emissions (see Krueger 2015; Jouvenot and Krueger 2019), and since 2016, France requires institutional investors to report the carbon footprints of their investment portfolios.²

While these initiatives suggest that many investors increasingly require climate-related information for their investment decision making, little systematic evidence exists regarding how institutional investors think about such disclosures. In this paper, we directly survey institutional investors about their views and preferences with respect to climate-related disclosures. Surveys are increasingly used in the finance literature, enabling better understandings of such topics as corporate financing (Graham and Harvey 2001), investor activism (McCahery, Sautner, and Starks 2016), investor relations (Karolyi, Kim, and Liao 2019), climate risks (Krueger, Sautner, and Starks 2020), and ESG investing (Amel-Zadeh and Serafeim 2018). The surveys are most valuable in addressing questions that are theoretically ambiguous and that are difficult or impossible to research through archival methods. Since reporting on nonfinancial information can have benefits and costs (Christensen, Hail, and Leuz 2019), whether investors attribute value to the firms' climate risk disclosures is both theoretically ambiguous and not directly observable. For example, although such reporting may increase stock liquidity, reduce a firm's costs of capital, and make the pricing of climate risks more efficient, it may also allow competitors to infer proprietary information about a firm's future strategy (e.g., if future

² Recently, the *Climate Risk Disclosure Act of 2018* was introduced in the U.S. Senate, with the objective to introduce mandatory climate disclosure. If accepted, the bill would require firms to disclose greenhouse-gas emissions, risk-management strategies to address climate change, and discussion about how climate change affects valuations in different climate scenarios.

CO₂ targets are disclosed, this may indicate future investments or divestments). Consequently, a survey allows us to understand better whether and how investors value climate risk disclosure.

Moreover, because we are able to link the survey responses to data on investor characteristics, which we also collect by means of the survey, we can provide more insights into the relationship between the investors' characteristics and their perspectives and actions. Our respondent group consists of important decision makers at some of the world's largest investors. About one-third of the respondents works at the executive level in their institutions, 11% of all respondents work for institutions with more than \$100bn in assets under management, and 57% for institutions with more than \$20bn in assets under management.

Our analysis of the survey responses consists of three parts. We first consider investor views regarding the importance of firm-level climate reporting, the shortcomings of available reporting, and the need for mandatory and standardized reporting. We are also able to associate these views with investor beliefs and characteristics. In the second part of the analysis, we provide some first evidence on the relation between investor beliefs regarding the quality of current climate disclosures and perceived climate risk mispricing in equity markets. In the third part, we address investor views regarding important recent developments in climate disclosure—how their engagements with portfolio firms are influenced by the firms' climate disclosures and how the investors treat their own portfolio-level carbon footprint disclosures.

We find that the survey respondents share a strong general belief that climate disclosure is important. In fact, 51% of respondents believe that climate risk reporting is as important as traditional financial reporting, and almost one-third considers it to be more important. Only 22% of respondents regard climate reporting as less (or much less) important compared to financial reporting. Climate disclosure is perceived as more important among those investors who also believe more strongly that

climate risks matter, and among those who expect larger temperature increases due to climate change.

Climate change affects portfolio firms through three channels. Physical climate risks arise because of adverse effects of changes in the physical climate (e.g., sea level rises, natural disasters). Technological climate risks originate from climate-related innovations that disrupt traditional producers (e.g., electric car manufacturers could displace traditional manufacturers), and regulatory risks result from costs associated with changes in policies or regulations to combat climate change (e.g., carbon taxes, cap and trade markets).

With regard to these various types of climate risk, our survey reveals that climate disclosure is deemed most important by those investors that worry most strongly about the financial consequences of the risks for their portfolios.³ In terms of their relative importance, concerns about physical climate risks matter the most for the perceived importance of climate reporting, while regulatory risks matter the least. An implication of this finding is that disclosure is likely to be most valuable when it enables investors to better evaluate the physical climate risks of firms, which tend to be less visible to investors than the regulatory risks. One reason is that physical risks are generally firm and location specific, thus requiring precise information about a firm's exposure to evaluate them correctly. Regulatory risks, on the other hand, tend to be firm independent and regulator dependent, and information on such risks is easier to obtain from sources outside of the firm.

The vast majority of our respondents believe that current quantitative and qualitative disclosures on climate risks are uninformative and imprecise. Many investors, especially those that worry more about the financial effects of climate risks, share the view that climate risk reporting should be mandatory and standardized, as is currently the case with financial reporting. They generally

³ While this result may be unsurprising, it is consistent with the observation that many of those investors that push strongly for more climate disclosure investors are universal owners such as Norges Bank Investment Management, that is, investors whose broad global equity ownership makes it difficult to avoid the consequences of climate change.

believe that the situation could be improved if investors actively pressure firms to disclose more information about their climate risks. This widespread view echoes investor initiatives at Exxon Mobil and Occidental Petroleum, where a group of institutions submitted shareholder proposals calling for these firms to share more information on their climate policies. Moreover, when the subsequent disclosure was still deemed inadequate, investors called for voting against the entire board.⁴

Next, we build on recent theoretical work that predicts a link between climate mispricing and disclosure (Daniel, Litterman, and Wagner 2017). We find that investors' opinions on the availability and quality of current climate reporting are strongly related to the perceived underpricing of climate risks in equity markets (i.e., climate-related overvaluation of firms). Notably, respondents who believe that current reporting is lacking also judge there to be more mispricing in current equity valuations. An important consequence of this finding is that better disclosure may contribute to the more efficient pricing of climate risks. This implication is consistent with the view expressed by Michael R. Bloomberg, Chair of the TCFD, that *"increasing transparency makes markets more efficient, and economies more stable and resilient."*⁵

The majority of the respondents appear to embrace current developments in climate disclosure as they engage (or plan to engage) their portfolio firms regarding reporting that follows the recommendations of the TCFD.⁶ Further, our respondents indicate support for the recent French approach requiring institutional investors to report on the carbon footprints of their portfolios (60% either already disclose or plan to disclose their portfolios' footprints). This result indicates support for ongoing European Union policy efforts to broaden the French approach to other member states.

⁴ See "Exxon Shareholders Pressure Company on Climate Risks," *The Wall Street Journal*, May 31, 2017; "Occidental Shareholders Vote for Climate Proposal," *The Wall Street Journal*, May 31, 2017; and "Exxon Directors Face Shareholder Revolt Over Climate Change" *Bloomberg*, May 4, 2019.

⁵ See <https://www.fsb-tcfid.org/>.

⁶ These recommendations include disclosing climate-related risks and opportunities and their impact on firms' businesses; how firms' governance structures deal with these risks and opportunities; how firms identify, assess, and manage climate risks; and which metrics and targets firms use to assess and manage carbon emissions.

In terms of the generalizability of our findings, we recognize that our respondent group is likely biased toward investors with a relatively high awareness of climate risks. The reason is that such investors are probably more disposed to participate in a climate finance survey. In addition, some of our responses were obtained at ESG conferences. Nevertheless, understanding the views and preferences of such investors is particularly important, because they are more likely to shape future disclosure policies through industry initiatives (e.g., TCFD, CDP, or UN-PRI) or lobbying with regulators. Moreover, given that 27% of our survey participants have over \$50 billion in assets under management (11% have over \$100 billion) they have the clout to be effective in their engagement efforts.

Finally, to complement our survey analysis, we employ observational data to test a basic empirical prediction that follows from the survey responses, namely that the propensity to voluntarily disclose carbon emissions should be greater among firms with higher institutional ownership. Using an international sample of firms, we find that a one-standard deviation increase in institutional ownership increases the probability to disclose emissions to the CDP by 14% (about 83% relative to the unconditional probability). In line with recent research emphasizing the importance of social and environmental norms of the countries in which institutional investors are located (Dyck et al. 2019), we document that the positive relation between disclosure and institutional ownership is driven by institutions from countries with high social and environmental norms. Higher ownership by institutions from high-norm countries also increases the propensity that firms ask third parties to audit and verify the emissions data they disclosed. These findings originate from both domestic and foreign institutions of high-norm countries, with foreign owners contributing most strongly to the results. Overall, this complimentary evidence is broadly consistent with our survey responses, supporting the view that institutional investors value climate risk disclosure.⁷

⁷ We do not aim to establish a causal effect of institutional ownership on climate disclosure, but rather try to document some basic relations consistent with the survey responses. For example, the positive correlation between institutional ownership and carbon disclosure could also result from a selection effect, whereby some firms voluntarily disclose carbon-related information to attract institutional shareholders.

We contribute to a relatively scarce academic literature on climate-related disclosure. Solomon et al. (2011) interview institutional investors who reveal that they use private channels of discourse with portfolio firms to compensate for the inadequacies of public climate reporting. Matsumura, Prakash, and Vera-Muñoz (2014) conclude that markets discount firms that do not disclose emissions through the CDP, although Griffin, Lont, and Sun (2017) provide evidence suggesting that the differences may not arise from CDP disclosure. The latter authors also show that disclosing emissions through 8-Ks leads to higher volatility around the disclosures. Ilhan, Sautner, and Vilkov (2020) show that information about carbon risks (if disclosed) are used by investors, as firms with larger emissions exhibit higher tail risk. Matsumura, Prakash, and Vera-Muñoz (2018) analyze voluntary 10-K climate risk disclosures and find that disclosers have lower costs of equity. Our archival analysis relates to Flammer, Toffel, and Viswanathan (2019) who find that activism by institutional investors, especially the long-term ones, increases the voluntary disclosure of climate risks.

Krueger (2015) examines the valuation effects of the introduction of mandatory greenhouse-gas (GHG) disclosures in the U.K., and shows beneficial valuation effects resulting from the regulation. Examining the real effects of mandatory GHG reporting in the U.K., Jouvenot and Krueger (2019) document strong reductions in carbon emissions for U.K. firms relative to control firms from other jurisdictions. Focusing on the oil and gas industry, Eccles and Krzus (2018) examine the extent to which firms disclose information in line with the TCFD recommendations.

Our primary contribution to this literature is detailing institutional investors' views and actions on climate-related disclosures. We also contribute to the literature on nonfinancial (or sustainability) reporting, of which climate risks are currently the most important component. Christensen, Hail, and Leuz (2019) provide a review of the current literature on sustainability reporting. More broadly, we also contribute to the general disclosure literature (see Leuz and Wysocki 2016 and Goldstein and Yan 2017 for reviews on this literature).

2. Methodology and Survey Design

2.1 Survey Development and Delivery

Employing both an online and a paper version of the survey, we distributed the survey through four delivery channels, yielding a total of 439 responses.⁸ First, we personally distributed the paper version at four institutional investor conferences: The Sustainable Investment Conference in Frankfurt on November 9, 2017; the ICGN Paris Event on December 6-7, 2017; the Asset Management with Climate Risk Conference at Cass Business School in London on January 23, 2018; and the ICPM Conference in Toronto on June 10-12, 2018. We obtained a total of 72 responses from these four conferences.

Second, we distributed the online version to 1,018 individuals in senior functions at institutional investors. We identified these individuals using the help of a survey service provider that manages a global panel of more than 5m professionals. The panel contains detailed data on these individuals' job titles, employers, and their age to identify relevant subsamples. The service provider had several mechanisms in place to ensure the authenticity of the individuals. In March 2018, the provider emailed invitations to participate in the survey and we obtained 410 initial responses to these invitations. We then excluded 90 participants that took less than five minutes to complete the survey, and participants for which basic checks yielded logical inconsistencies in the responses (Meade and Craig 2012). This process left us with 320 responses of good quality. These respondents spent 15 minutes, on average, to complete the survey.

Third, in April 2018, we emailed invitations to participate in the survey to a list of institutional investors that cooperate with a major asset owner through CERES and IIGCC on climate risk topics. We

⁸ The survey instrument is provided in Internet Appendix A. The original survey also contained questions on climate risk management and shareholder engagement, which are covered in Krueger, Sautner, and Starks (2020). Details of the iterative process that was used for developing the survey are provided in Krueger, Sautner, and Starks (2020).

obtained 28 responses through this channel. Fourth, we sent invitations to participate in the online survey to personal contacts at different institutional investors, yielding 19 additional responses.

We are confident that in the vast majority of cases we have only one observation per institution. The reason is that, for 87% of the observations, key identifying characteristics do not coincide.⁹ In the remaining cases we cannot exclude the possibility that respondents work for the same institution. However, the responses are sufficiently different among these respondents to discount that possibility with some degree of assurance.

2.2 Respondent Characteristics

Table 1 provides an overview of the characteristics for our respondent groups. The largest numbers of respondents are fund or portfolio managers (21%), followed by executive or managing directors (18%). About one-third hold positions at the executive level in their institutions, as CIO (11%), CEO (10%), or in related functions (10%). Most respondents work for asset managers (23%) and banks (22%), followed by pension funds (17%), insurance companies (15%), and mutual funds (8%). We also have a wide variation in the institutions' size as 11% of the respondents work for institutions with assets of more than \$100bn, 16% with assets between \$50bn and \$100bn, 23% with assets between \$20bn and \$50bn, 32% with assets between \$1bn and \$20bn, and 19% with assets less than \$1bn.

Only 5% of respondents' institutions typically hold investments for less than six months, 38% have medium holding periods (six months to two years), 38% have long holding periods (two years to five years), and the remaining 18% typically hold investments for more than five years. Our respondent' institutions are headquartered around the world: 32% are located in the U.S., 17% in the U.K. and Ireland, 12% in Canada, and 11% in Germany, among others. At the institution level, the

⁹ These characteristics are location, assets under management, institutional investor type, investor horizon, ESG share (+/-10% variation in the variable), equity share (+/-10%), and passive share (+/-10%).

portfolio share, on average, that incorporates ESG is 41%, invested in equities is 47%, invested in fixed income is 43%, and passively invested is 38%.

2.3 Response Bias

A question that naturally arises is the extent to which the characteristics of our respondents as well as their responses are representative of the institutional investor population. We assess this question through a partial evaluation of nonresponse bias by comparing key characteristics of the responding investors to those of the institutional investor population at large. To do this, we use data from the FactSet population of institutional investors and compare characteristics of these investors to our sampled population.¹⁰ The comparison, reported in Internet Appendix Figure 1, shows that pension funds and banks are somewhat overrepresented in our sample, while mutual funds and asset managers are somewhat underrepresented. In terms of geographic distribution, our respondents are more likely to work for institutions in North America and Europe.

Although our respondent group may be likely biased toward investors with a relatively high awareness of ESG topics in general (given their high average ESG share of 41%), and a high awareness of climate risks in particular, such investors may be more disposed to participate in a climate survey (especially through our conference channel). As explained above, we consider this a strength rather than a weakness, as understanding the views and preferences of such investors is particularly important, because they are more likely to shape future disclosure policies.

A related concern may arise that respondents could have answered our survey questions strategically or untruthfully. To mitigate this concern, in the survey introduction we guaranteed their anonymity. In particular, we did not request their identities or the identities of their employers, and we collected only limited information on their positions or their respondents' institutions.

¹⁰ This approach has also been employed by Karolyi, Kim, and Liao (2019).

3. Evidence on Climate Risk Disclosure

3.1 Importance of Climate Risk Disclosure

Reporting on nonfinancial information through corporate sustainability reports or climate risk reporting can have benefits but also costs to a firm and its investors. On the one hand, nonfinancial disclosure can increase stock liquidity by alleviating adverse selection among investors (Verrecchia 2001). Reporting on nonfinancial information can also lower the cost of capital of portfolio firms (Plumlee et al. 2015, Matsumura, Prakash, and Vera-Muñoz 2018), and it may allow for better pricing and hedging of climate risks. On the other hand, nonfinancial disclosure can be costly. A primary cost would result from disclosure that reveals proprietary information to competitors (Ellis, Fee, and Thomas 2012). While this cost may be less relevant for high level or aggregated disclosures, it could be substantial for detailed disclosures. For example, if a firm discloses detailed carbon reduction targets, this may allow competitors to infer a firm's future product market strategy. In light of the potential benefits and costs of climate reporting, the importance investors attribute to this reporting is theoretically ambiguous.

To evaluate this theoretical ambiguity, we asked respondents to indicate how important they consider the reporting on firms' climate risks *relative to* the reporting on the firms' financial information (Question B1). The corresponding responses, reported in Figure 1, indicate that 51% of respondents believe that climate risk reporting is as important as financial reporting, and almost one-third even considers it to be more important. Interestingly, only 22% of respondents regard climate risk reporting as less or much less important compared to financial reporting. Overall, these responses imply that disclosures related to a firm's climate risk exposure are considered important for the majority of institutional investors.

We examine cross-sectional differences in the responses to Question B1 to understand how investors vary in the extent to which they view the importance of climate-related disclosures. We

hypothesize that the importance investors place on climate-related disclosures should be related to the relative importance they place on climate risk overall as well as how financially material they think each of the three components of climate risk (physical, technological and regulatory) to be. In addition, we expect that another factor would be their expectations about the extent of future climate change measured through their forecasts of temperature changes. Finally, we hypothesize that the perceived importance of climate-related reporting should exhibit systematic variation across investor characteristics. To examine these hypotheses, we conduct ordered logit regressions in which the dependent variable is the response to the question displayed in Figure 1, which varies between one (climate risk reporting is much less important compared to financial reporting) and five (climate risk reporting is much more important). The primary independent variables to potentially explain the response to this question are five investor responses to other survey questions as well as investor characteristics.

The first independent variable we consider is the importance the respondent attaches to climate risk itself, which we capture using the respondent's *Climate risk ranking*. To construct this variable, we asked the respondent to rank climate risk relative to other investment risks, such as traditional financial risks, operational risks, governance risks, social risks, and other environmental risks (see Question A1). The resulting variable ranges between one (climate risk is the most important risk) and six (climate risk is the least important risk). Summary statistics, reported in Table 2, show that the investors consider the other risks to be relatively more important. However, as explained in Krueger, Sautner and Starks (2020), overall, investors consider climate risks to be important risks given that they rate the three types of climate risk as being important risks on their own.

We also include a set of investor characteristics as independent variables: investor horizon, investor size (assets under management), the ESG and the passive share of the investor's portfolio, whether an investor is an independent institution (Ferreira and Matos 2008), and the social and

environmental norms in an investor's country (Dyck et al. 2019). We further include fixed effects for the respondents' positions in their institutions and for the distribution channels.

We report the results from ordered logit regressions for *Climate risk ranking* in Table 3, Column (1), which shows that those investors who rank climate risks higher among other risks also believe that climate reporting is more important. The effects are economically meaningful. An investor who ranks climate risks one-standard deviation higher deems climate reporting 0.2 units more important, which equals about 22% of the variable's standard deviation (calculated for simplicity from an OLS regression).

We next decompose climate risk into its component parts, physical risk, regulatory risk and technological risk, to understand how investors' ratings of the financial materiality of these different risk components are related to their views on the importance of climate disclosure. As discussed earlier, climate change can affect the value of portfolio firms through three channels. Physical climate risks can affect firms because of temperature rises, severe weather events, droughts, or rises in sea levels. Regulatory risks encompass costs that result from regulations aimed at reducing the negative impacts of climate change.¹¹ Technological risks relate to climate-related technological disruption that may adversely affect portfolio firms. In our survey, we asked the investors to rate the financial materiality of each of these risks. We then construct three variables to measure the investors' assessments of these risks (*Regulatory climate risk*, *Physical climate risk*, and *Technological climate risk*). Each of the variables can vary between one (not at all important) and five (very important). As the summary statistics reported in Table 2 indicate, the respondents, on average, consider these risks to be fairly important in terms of financial materiality.

In Table 3, Columns (2) to (4), we report ordered logit estimates for whether the importance of climate disclosure varies across investors based on how financially material they perceive each of

¹¹ Examples for such regulation include a carbon tax such as the one proposed in the *Economists Statement on Carbon Dividends*, signed by over 3,500 economists <https://www.clcouncil.org/>.

these three risks to be. The results show that for each type of climate risk investors who deem it to be more financially material, also attach greater importance to climate reporting. This finding is consistent with the survey results for a related but different survey question reported in Amel-Zadeh and Serafeim (2018). They find that investment professionals consider ESG information financially material to investment performance. Most interestingly, the three coefficient estimates in Columns (2) to (4) differ substantially in magnitude. The estimate in Column (4) on *Physical climate risk* is almost 2.5 times as large as the estimate on *Regulatory climate risk* in Column (3). In a similar but less pronounced way, the estimate on *Technological climate risks* in Column (4) is substantially larger than the estimate on *Regulatory climate risk* in Column (3).¹² These differences suggest that disclosure is seen as most important when it comes to physical climate risks, followed by technological and then regulatory risks.

The strong role of physical risks in explaining the importance of climate disclosure may be due to the fact that such risks tend to be more firm and location specific, requiring relatively precise information about a firm's exposure for evaluation. Thus, investors generally have lesser ability to gather the information and greater need for firm disclosure. In contrast, regulatory climate risks are more firm independent and regulator dependent, and information on such risks may be easier to obtain since firms in the same industry and country face similar regulatory risks (e.g., information could also be obtained from competitors).¹³

Another factor that could help explain investors' perceived importance regarding climate reporting lies in their climate change expectations. To elicit these expectations through the survey, we

¹² As the distributions of the three risk variables are almost identical (see Table 2), we can directly compare the coefficient estimates to evaluate their relative importance. The coefficient on *Regulatory climate risk* is statistically different from those on *Physical climate risk* and *Technological climate risk*, while the latter two do not differ statistically.

¹³ In addition, Krueger, Sautner, and Starks (2020) show that a relatively large fraction of investors believe that regulatory climate risks have already started materializing, while physical and technological risks are expected to materialize over somewhat longer horizons. The more immediate character of regulatory risks might therefore imply that disclosure about them is less important than information about (potentially more distant) technological and physical risks.

used the 2°C target of the Paris Climate Accord as an anchor and asked the respondents about their own global temperature expectations by the turn of this century (Question E1).¹⁴ Responses could vary between one (no expectation of a temperature rise) and five (more than 3°C expected). Across all respondents, only 3% do not expect any temperature increase by 2100, 16% expect an increase by up to 1°C, and 30% by up to 2°C. Four in ten respondents expect a temperature rise that exceeds the Paris 2°C target, with 12% expecting an increase of more than 3°C.

The results, reported in Column (5), show that personal climate expectations appear highly relevant for explaining the investors' opinions on the importance of climate reporting: investors who expect a higher temperature rise also consider climate reporting to be more important. A one-standard deviation increase in the expected temperature rise, which corresponds to moving up one notch in the possible response category, is associated with a 0.17 higher value for the importance attached to climate disclosures (18% of the variable's standard deviation; obtained again from OLS estimates).

These results on the associations between investors' perceived importance of climate-related disclosures for their portfolio firms and their beliefs about the importance of climate risk and its components as well as their expectations of temperature changes also serve as a type of internal validation of the survey itself.

We further examine whether systematic variations exist across investor characteristics. The results reported in Table 3 show, perhaps surprisingly, that we find no apparent differences across investor horizons: medium- and long-term investors do not differ from short-term investors in their perceptions of the importance of climate reporting. However, we find that investor size does matter as those investors with more assets under management believe that climate reporting is more important, which is plausible as such investors tend to be universal owners and stand to lose more

¹⁴ Under the 2015 Paris Climate Accord, 195 countries agreed to take significant measures to keep the global temperature rise under 2°C by the end of this century.

from climate risks. The ESG-oriented investors generally regard climate disclosure as being more important, which is again unsurprising since the investment mandate of such investors is partially based on environmental considerations. Finally, we find that institutional investors who are based in more climate-conscious countries generally regard climate disclosure as being more important, consistent with Dyck et al. (2019).

3.2 Evaluation of Current Disclosure Practice

As discussed in the previous subsection, theory and archival evidence suggest that firms' nonfinancial information, and in this case, climate disclosure, should add value to firms. Further, investors have advocated for climate risk reporting by portfolio firms and the results in Figure 1 and Table 3 support the argument that investors believe such reporting has value. However, firms' climate disclosure is still in its infancy and as a result, largely voluntary and unstandardized.¹⁵ In order to better understand investors' views on the informativeness of current climate disclosures, we survey the investors with a series of questions on qualitative disclosures, which can include narratives of how climate change affects business models or how climate risks are governed, and on quantitative disclosures, which can contain data on emissions or emissions reduction targets. To assess investors' views on these disclosures, in Question B3 respondents were asked to indicate their agreement with a set of statements on a scale of one ("strongly disagree") through five ("strongly agree").

The responses, reported in Table 4, demonstrate a widespread view that current quantitative and qualitative disclosures are imprecise and not sufficiently informative. Specifically, many of our respondents strongly agree that management discussions on climate risks (20.8% strongly agree) as well as quantitative information on these risks (19.4% strongly agree) are not sufficiently precise. Further, the average response to each question is significantly higher than the neutral response to the question. These results suggest that the current voluntary reporting regime does not enable fully

¹⁵ To the best of our knowledge, the only country that compels all companies to follow a mandatory and prescriptive climate disclosure regime is the U.K., which introduced this with *The Companies Act 2006, Regulations 2013*. For an analysis of the U.K. regulation see Krueger (2015).

informed investment decisions, at least for firms with large exposures to climate risks. This could be one reason why climate risks are considered difficult to price in equity markets, an issue we address below.

The responses to the previous two questions indicate that many firms currently do not consider the net benefits of reporting on climate risks to be sufficiently high, as they would otherwise reveal such information voluntarily. At the same time, investors seem to value such information, which raises the question of whether mandatory and standardized reporting on climate risks is needed. In general, the economic rationale for mandatory disclosure regulation on climate risks requires the existence of externalities or market-wide cost savings that regulations can mitigate (Shleifer 2005). A firm's contribution to climate change can be viewed as such an externality. Standardization of climate reporting could make it easier and less costly for investors to acquire and interpret information relevant to evaluating a firm's climate risk. It could, thus, facilitate cross-firm and cross-industry benchmarking. A mandatory disclosure regime could also provide commitment and credibility for firms' climate disclosure, especially if the standards are specific and well enforced (Christensen, Hail, and Leuz 2019).

Indeed, Table 4 documents that many investors believe that standardized and mandatory reporting on climate risk is necessary (26.9% strongly agree and the average response is significantly greater than the neutral response). Similarly, there exists a widespread view that more standardization in climate-related financial disclosure across markets is warranted (27.4% strongly agree and the average response is significantly greater than the neutral response). However, according to our respondents, a significant challenge for changing the current reporting environment seems to be that standardized disclosure tools and guidelines are not yet widely available (21.3% strongly agree). Although our respondents on average agree that standardized and mandatory reporting of climate risk is necessary, the fact that there exists variation across the answer, with some investors disagreeing, suggests that they either do not see the value in such reporting or believe that the costs

of such reporting outweigh the benefits. Support for this latter potential explanation comes from evidence provided by Jayaraman and Wu (2019) that beyond providing informational benefits, mandatory disclosure can also impose real costs on firms.

Overall, our respondents' views are consistent with recent initiatives that increase transparency on climate. For example, in June 2017, the TCFD released its recommendations on climate-related financial disclosures, which centers on the role of climate risks for a firm's governance, strategy, and risk management, and how climate risks are reflected in metrics and targets. Using this comprehensive approach, the TCFD recommendations go beyond simply disclosing carbon emissions.

Although complying with the TCFD recommendations is currently voluntary, recent developments suggest that these recommendations will eventually constitute the basis for mandatory and standardized climate disclosure in many countries. For example, in January 2018, a large group of central banks and supervisors formed the Network for Greening the Financial System, with the purpose of defining and promoting best practices in the development of environment and climate risk management in the financial sector and to mobilize mainstream finance to support the transition toward a sustainable economy. Institutional investors have already begun to develop initiatives on their own to improve the climate risk of their portfolios and to access climate risk data. For example, institutional investors have formed organizations such as the Portfolio Decarbonization Coalition, the Montreal Carbon Pledge, Transitions Pathway Initiative, and Climate Action 100+. These initiatives are focused on climate risk in institutional investor portfolios, with some intent on reducing the carbon footprint of portfolios and others intent on engaging the largest greenhouse gas emitters to minimize and disclose their climate risk exposures. Consistent with these initiatives, many of our respondents hold the strong belief that investors should put pressure on firms to disclose more on their climate risks (27.6% strongly agree), which also echoes the recent investor initiatives at Exxon Mobil and Occidental Petroleum discussed earlier. This view of our respondents is also in line with the increasing role that climate-related topics played in the most recent proxy seasons (Ceres 2018, 2019).

Using ordered logit regression analysis we examine whether systematic variations exist in the institutional investors' responses to the qualitative statements on current practices of climate-related disclosures. In particular, we are interested in whether the investors who strongly agree with the statements also believe climate risks to be financially material. Thus, the dependent variables are dichotomous categorizations of investor responses to the questions and equal one if a respondent indicates "strong agreement" with a statement on the current disclosure practices, and zero otherwise. The main explanatory variable is *Climate risk financial materiality*, which measures how respondents evaluate the financial effects of climate risks (Question A2). This variable averages the responses to the three questions about the materiality of regulatory, physical, and technological climate risks, and ranges between one ("not at all important") and five ("very important").

We report the results of these regressions in Table 5. Columns (1) and (2) indicate that investors who believe that climate risks are more financially material also think more strongly that current information on climate risks is imprecise and uninformative. These investors also believe more strongly that there should be more standardization and mandatory requirements in climate disclosures (see Columns (3) and (4)). The results in Column (7) further suggest that investors who believe strongly that climate risks matter also strongly believe that investors should demand better disclosure from portfolio firms.

We also find systematic differences in responses across investor characteristics. Those investors with portfolios more subject to ESG integration believe more strongly that quantitative information on climate risks is imprecise. They also tend to agree more strongly that management discussions and disclosure forms are lacking in quality and informativeness. In addition, investors with a greater portfolio share of assets under ESG integration believe more strongly that tools and guidelines for standardized disclosure are currently not available.

3.3 Climate Risk Disclosure and Climate Risk Mispricing

An important role for climate risk disclosure is in correcting mispricing, which, according to recent research, may be present in equity markets. For example, Hong, Li, and Xu (2019) provide evidence suggesting that markets underreact to climate risks because of poor disclosure, implying that improved disclosures could reduce the mispricing. In addition, Daniel, Litterman, and Wagner (2017) develop a theoretical model in which uncertainty about the effect of CO₂ emissions on global temperature (and on eventual damages from climate change) gradually resolves over time. Their model suggests a high carbon price today that should decline over time as uncertainty about climate risks resolves. One mechanism through which these uncertainties disappear is via climate risk disclosures. As firms evaluate the risks climate change poses on their business models and make their assessments public, equity prices converge towards their fair valuations through the harmonization and comparability benefits of disclosures.

To develop measures on climate risk mispricing, we asked the institutional investors whether they believe that current equity valuations in different sectors of the economy correctly reflect the risks and opportunities related to climate change (Question D1).¹⁶ Specifically, we asked them whether they think each of the individual sectors potentially most affected by climate change are overvalued or undervalued. We designate the responses for each sector as ranging from plus two (for valuations much too high) to minus two (for valuations much too low). Figure 2 reports the mean responses, showing that overvaluations are highest in the oil and automotive sector. We use these data to create two variables that aggregate the responses across the sectors. For each respondent, *Climate risk underpricing* averages all positive mispricing scores across sectors (score of one or two), to capture the extent to which a respondent believes that climate-related overvaluation exists in the market (negative scores are set to zero). Table 2 shows that the average respondent believes that equity

¹⁶ We allowed for over- and undervaluation of market prices across different sectors as some sectors may be overvalued (e.g., the oil or coal sectors), while other sectors may be undervalued (e.g., the battery producers, water utilities). Krueger, Sautner, and Starks (2020) provide more discussion on how the perceived overvaluation varies across sectors.

valuations in the average sector do not fully reflect the risks from climate change, as the mean of *Climate risk underpricing* exceeds zero. Relatedly, to capture nondirectional mispricing, we define *Climate risk mispricing* to be the average for each respondent of the *absolute* values of their mispricing scores across all sectors.

In order to estimate whether investors' views on climate disclosure help explain any perceived climate risk mispricing, we develop three independent variables to capture the respondents' views on the quantity and quality of current climate reporting. The first variable (*Demand more disclosure*) measures whether a respondent "strongly agrees" that investors should demand more disclosure from portfolio firms about their exposure to climate risks. The other two variables capture perceptions about the quality of available climate information, both in terms of hard (*Quantitative information imprecise*) and soft information (*Management discussion imprecise*).

We report the results in Table 6. The results in Column (1) indicate that respondents who more strongly agree that investors should demand disclosure on climate risks also believe there exist stronger overvaluations in equity market pricing in general for the sectors most affected by climate change. In terms of magnitudes, the climate risk-related overvaluations perceived by these investors are 33% higher, relative to the mean overvaluation score of 0.6. The results in Column (2) indicate that investors who believe that the available quantitative information about climate risks are imprecise have more perceived overvaluation in these sectors. As shown in Column (3) we find similar results for investors who think that management discussions on climate risk are not sufficiently precise. Taken together, these results suggest that a lack of hard and soft information on climate risks contributes to the perception of climate risk underpricing in equity markets.

Columns (4) to (6) confirm these results using the measure that captures both directions of mispricing. The fact that we find similar effects for this alternative variable suggests that better climate disclosure is useful in alleviating both directions of climate risk mispricing, i.e., the underpricing and overpricing of climate risks. Overall, the results in Table 6 indicate that the demand for climate-related

information, and beliefs about the quality of climate-related disclosure, are associated with mispricing in equity markets, at least as perceived by our respondents. A striking implication of this evidence is that better disclosure can contribute to a more efficient pricing of climate risks.

3.4 Recent Trends in Climate Risk Disclosure

We used two questions to evaluate how investors view recent trends in climate risk disclosure. In the first question, we evaluated the respondents' views on a new investor practice championed by a French law, which since 2016 requires that asset owners and investment managers report on the carbon in their portfolios (Article 173 of the Energy Transition for Green Growth Law).¹⁷ Our respondents in general indicate support for this approach, which is considered one of the most ambitious climate risk regulations in the world: 60% stated in response to Question B2 that they already disclose or plan to disclose the carbon footprint of their investment portfolios (Figure 3). This result also speaks to ongoing policy efforts at the European Union level. Under Article 7 of the European Commission's action plan on sustainable finance, there exists discussion on amending EU Directive 2016/2341 (IORP 2-Pensions), which would require increased disclosures by institutional investors relating to sustainability risks.

In the second question, we asked whether the investors engage or plan to engage portfolio firms to report in accordance with the TCFD recommendations (Question E5). This is a highly relevant topic given that major investors have announced that this topic as a prime area for their shareholder engagement (Blackrock 2017). Figure 4 demonstrates that this approach is shared widely, as 59% of investors (plan to) engage firms on this topic. Interestingly, a quarter of our survey participants responded with "Do not know," which could indicate that these institutional investors have not made a decision on this type of engagement yet or perhaps that they are not familiar enough with the recommendations.

¹⁷ See "France Gets Climate Risks Disclosures from Invest Firms," *Wall Street Journal*, December 7, 2017. The law also requires investors to report on how they identify and manage climate risks.

In order to understand the cross-sectional differences in the investor responses, we conduct regressions using investor characteristics to explain the investors' behavior in terms of actions according to these recent developments. We use two dependent variables: *Carbon footprint* equals one if an investor discloses (or plans to disclose) the carbon footprint of their portfolio, and zero if not. *TCFD engagement* equals one if an investor engages (or plans to engage) portfolio firms to report according to the recommendations of the TCFD.

We report the results in Table 7. Column (1) indicates that investors who believe more strongly that climate risks are financially material are also more likely to disclose the carbon footprint of their portfolios. Investors with more assets under management, and investors whose portfolios have higher ESG shares, are also more likely to disclose their carbon footprints. These findings are intuitive as one would expect that investors have stronger incentives to make the carbon footprint of their portfolios publicly available if they believe in the materiality of climate risks and if they are more ESG oriented. To the extent that calculating and disclosing the carbon footprints of portfolios is costly, it is also unsurprising that larger institutions are more likely to do so (perhaps because they have more financial resources). Larger investors might also face more scrutiny by stakeholders on these issues, making them more likely to initiate actions. The latter argument is consistent with Krueger, Sautner, and Starks (2020), who find that reputational concerns are one of the key drivers for institutions to incorporate climate risks into the investment process. Contrary to what might be expected, medium- and long-term investors have a lower propensity to disclose the portfolio footprint compared to short-term investors.

The results in Column (2) of Table 7 suggest that investors with greater ESG shares are more likely to engage firms to report according to the TCFD recommendations. Moreover, investors located in countries in which environmental issues are seen to be more important are more likely to engage firms over climate disclosure, consistent with Dyck et al. (2019). We do not find that investors differ in their likelihood of engaging firms along dimensions of their beliefs in climate risk financial

materiality, their investment horizons, or their assets under management. This suggests that engagement regarding the adoption of these recommendations is widespread among a variety of institutional investors.

We also examine whether and how the adoptions of the recent developments in climate disclosure relate to investor demand about more and better climate reporting. First, we test whether investors who plan to disclose the portfolio carbon footprint want more high-quality reporting on climate risks, and whether they believe more strongly that investors should demand climate disclosures from portfolio firms. Second, we examine whether investors who plan to engage firms to report according to the TCFD recommendations see a stronger need for better quality, and more standardized, disclosures.

Table 8 reports regression results which use as independent variables the two indicators that capture the adoption of current trends in climate reporting, namely *Carbon footprint* and *TCFD engagement*. We use these variables to explain the respondents' perceptions of whether institutions should demand climate disclosure from portfolio firms; the quantity and quality of current climate disclosure; and the importance of standardized and mandatory reporting requirements (Question B3).

Table 8 indicates that investors who (plan to) disclose their portfolio carbon footprint see a bigger role for demanding more disclosure about climate risks, and believe that such disclosures should be more standardized and mandatory. Investors planning or already disclosing their portfolio footprints also believe more strongly that management discussions about climate risks are imprecise. These results are not surprising given that such information would be necessary to calculate the carbon footprints of their portfolios, which is consistent with the idea that, to disclose a portfolio footprint, standardized issuer-level information is required and that such data are often not available for all firms in the same format.¹⁸ However, given that calculating portfolio carbon footprints primarily

¹⁸ This interpretation is echoing the concern by Yngve Slyngstad of Norges Bank Investment Management (cited in the Introduction). Indeed, Jouvenot and Krueger (2019) show that mandatory and prescriptive carbon requirements dramatically increase the availability of carbon data at the issuer level.

requires quantitative information, we find surprisingly little evidence that investors who disclose their footprints perceive current quantitative information as imprecise. This is possibly the result of initiatives such as the CDP, which collects emissions data by means of a survey. Overall, investors that plan to engage firms to report according to the TCFD recommendations see a stronger need for more disclosure, and they also believe more strongly that disclosure should be standardized and mandatory. On the other hand, such investors do not seem to think that current quantitative information or management discussions are imprecise. One interpretation of this evidence is that investors view the TCFD recommendations as a way to impose structure on climate risk reporting (rather than to obtain more precise information).

4. Institutional Ownership and Climate Risk Disclosure: Complimentary Evidence from Archival Data

4.1 Institutional Ownership and Voluntary Disclosure of Carbon Emissions

The survey responses indicate that institutional investors value firm disclosures on climate risks and increasingly engage with portfolio firms to encourage such disclosures. To complement the survey analysis, we use archival data to test basic empirical predictions that follow from our survey responses. In a first test, we explore whether the propensity to voluntarily disclose carbon emissions is higher among firms with higher institutional ownership. Note that it is not the objective of this analysis to establish the causal effect of institutional ownership. Instead, we aim to document some basic relations in archival data that are consistent with our survey responses. That is, if we find a significantly positive relationship between institutional ownership in a firm and that firm's voluntary decision to produce carbon emissions data, as our survey implies we should find, there are two primary possible underlying explanations. The relationship could exist because the institutional investors engage and demand this data be produced or the relationship could arise because institutional investors are more likely to invest in firms that provide such disclosures. Either explanation is consistent with the implications from our survey of investors' views on climate reporting.

To examine this question, we identify whether firms voluntarily disclose their carbon emissions to the CDP, which is a non-profit organization that performs annual surveys among firms to collect emissions data. The CDP collects these data on behalf of institutional investors representing over 87 trillion USD in assets under management in 2018. The CDP provides the main source of carbon emissions data and many institutional investors use these data for their own climate risk management (Krueger, Sautner, and Starks 2020). Likewise, leading ESG data providers employ the CDP data as input for rating models (e.g., MSCI ESG Research, Bloomberg, Refinitiv, or Sustainalytics). Importantly, firms are not obliged by regulation or accounting standards to disclose their emissions to the CDP or other institutions, and many firms decide not to do so.¹⁹

To create a global sample of firms for this analysis, we start with all firms in the international Worldscope/Datastream universe between 2009 and 2017. A challenge with using this initial set of firms is that it is unknown which firms were contacted by the CDP with a request to report carbon information. Therefore, we follow the approach in Krueger (2015) and create a subsample of firms that CDP likely contacted.²⁰ We then classify firms into disclosing and nondisclosing firms based on data by the CDP. We obtain information on firms' institutional ownership from FactSet (Ferreira and Matos 2008). Summary statistics are reported in Internet Appendix Table 1.

Table 9 reports regressions explaining *Scope 1 disclosure*, which is a variable that equals one if a firm voluntarily disclosed Scope 1 emissions to the CDP in a given year, and zero otherwise. Scope 1 emissions are direct emissions from owned or controlled sources of the disclosing company. These emissions are distinct from Scope 2 and Scope 3 emissions, which are either indirect emissions from the generation of purchased energy (Scope 2), or all indirect emissions (except those included in Scope 2) that occur in the value chain (Scope 3). In Column (1), the independent variable of interest is *Total*

¹⁹ A notable exception is the U.K., where mandatory carbon emissions disclosure in firms' annual reports was introduced for large listed companies in 2013 (see Krueger 2015 and Jouvenot and Krueger 2019). Through the Streamlined Energy and Carbon Reporting (SECR) policy, the U.K. government has recently extended this mandatory disclosure requirements to all firms.

²⁰ As in Krueger (2015), we take, for example, the largest 500 firms from the U.S., the 725 largest firms from the U.K, the top 500 from Japan, the top 250 from France, etc.

IO, which is the fraction of a firm's equity that is owned by institutional investors. We report results with and without industry-by-year fixed effects and we estimate OLS models as logit models do not converge due to the large number of fixed effects. The estimates reported in Column (1) reveal a significantly positive association between voluntary Scope 1 disclosure and institutional ownership. The effects are large: a one-standard deviation increase in *Total IO* increases the probability of disclosing emissions by 14%, which equals about 83% of the unconditional mean of the variable.

In Column (2), we examine whether the propensity to disclose emissions depends on the extent to which a firm's institutional owners are located in countries with high social and environmental norms. This analysis is inspired by Dyck et al. (2019), who provide evidence that a firm's CSR policies are driven by institutional owners located in countries with high social norms towards the environment. We stratify ownership according to whether institutions are headquartered in countries with high or low social norms. As in Dyck et al. (2019), we measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI). An investor's country is in the high-norm (low-norm) group if its EPI is higher (lower) than the median in a given year. *High-norm (Low-norm) IO* measures the percentage of a firm's equity owned by institutions from high (low) norm countries. The estimates in Column (2) show that the effect in Column (1) originates mostly from institutional owners located in high-norm countries; ownership from low-norm countries does not seem to matter. Columns (3) and (4), show that the results are robust to accounting for disclosure trends within a given industry and year. In Internet Appendix Table 2, we obtain similar results when we replace Scope 1 disclosure with Scope 2 (Scope 3) disclosure.

4.2 Institutional Ownership and the Quality of Voluntary Carbon Disclosure

In a second test, we examine whether the *quality* of the disclosed carbon information is higher among firms with greater institutional ownership. Besides requesting information on the quantity of carbon emissions, the CDP also asks whether a third party has verified the reported emissions. Akin to the auditing of financial accounts, emissions auditing firms offer disclosure verification. We measure

such verification by creating the integer-valued variable *Emissions verification*, which takes values between zero and three, with three indicating that a firm obtained external verification of its reported Scope 1, Scope 2, and Scope 3 emissions, and zero that a firm does not obtain any such verification (or that it does not disclose emissions at all). The variable takes the intermediate values (of one and two) if a firm obtains verification on one or two of the emissions types only. (In most cases, firms verify all three emissions types jointly.) We interpret the resulting variable as a measure of disclosure quality.

We report the results in Table 10. As Column (1) shows, we find no relationship between *Total IO* and emissions verifications. However, this pattern changes sharply in Column (2), where we find that higher ownership by institutions from high-norms countries is positively associated with disclosure quality. Interestingly, the reverse seems true for ownership from low-norms countries, though this effect turns insignificant with industry-by-year fixed effects.

4.3 Effects of Domestic versus Local Institutional Ownership

One concern with the analyses in Tables 9 and 10 is that the results may reflect a form of “home bias”, that is, the fact that high-norms investors (say Dutch pension funds) are more invested in local firms (Dutch firms), who also happen to have better climate disclosure policies. To examine whether this channel is driving our results, we divide institutional ownership at the firm level into its foreign and local components. We perform the same decomposition for the high- and low-norm components of institutional ownership. Internet Appendix Table 3 shows for *Scope 1 disclosure* that foreign ownership from high-norm countries drives the results: while both components of high-norm ownership are positively associated with more disclosure, the point estimates of the foreign component are about twice as large as those of the local component. Internet Appendix Table 4 presents a similar picture for *Emissions verification*.

5. Conclusion

We employ a global survey of institutional investors to examine their perceptions and actions regarding the climate risk disclosures of their portfolio firms. A large majority of our respondents believes that climate risk reporting by portfolio firms is important. In fact, many respondents consider it as important, or even more important, than reporting on traditional financial risks. At the same time, a widespread view exists that climate risk disclosure needs improvement, particularly in terms of the availability and quality of hard and soft climate-related information. Many investors further believe that firm-level reporting should be more standardized and mandatory.

In cross-sectional tests, we find that the investors who think that climate risks are more financially material also deem climate disclosure to be more important. In a similar spirit, investors who expect higher future global temperatures also believe that climate disclosure is more important. Our analysis suggests that firm-level disclosure is more important for assessing physical and technological climate risks, and less so for regulatory risks.

The views on the availability and quality of climate-related disclosures are associated with investor-level perceptions of climate risk mispricing in the equity market. Respondents who believe that investors should require firms to report on climate risks, and investors who regard both quantitative and qualitative climate information to be insufficient, perceive more mispricing in current equity valuations. Finally, the majority of our respondents plans to engage portfolio firms to report according to the TCFD recommendations. A majority of investors also discloses or plans to disclose the carbon footprint of their own investment portfolio.

We complement our survey analysis by using archival data to examine implications derived from the survey responses. We show that the propensity to voluntarily disclose carbon emissions is larger among firms with higher institutional ownership, in particular if such ownership originates from countries with high environmental norms. The presence of institutional owners from countries with

high environmental norms is also related to the quality of carbon disclosures. This complementary evidence supports our interpretations from the survey that institutional investors value climate disclosure and increasingly engage firms on such disclosures, whether because they are attracted to firms with such disclosures, they push firms to make those disclosures or both.

Our analysis is important because through our survey we are able to shed light on many important investor perspectives and actions that cannot be studied using archival data. This enables us to contribute to the emerging literature on climate finance and, more generally, to the literature on nonfinancial disclosure.

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Data Appendix

Variable	Definition	Survey Question
<i>Importance of climate risk disclosure</i>	This variable measures how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information. The variable ranges between one and five, with one indicating that climate risk reporting is “much less importance” and five indicating that it is “much more important”.	Question B1
<i>Climate risk ranking</i>	This variable is the outcome of a ranking of the importance of climate risks relative to other more standard investment risks. The variable ranges from one (if climate risks are considered the most important risk) to six (if they are considered the least important risk).	Question A1
<i>Regulatory climate risk</i>	This variable measures the financial materiality of regulatory climate risk. The variable can range between one (not at all important) and five (very important).	Question A2
<i>Physical climate risk</i>	This variable measures the financial materiality of physical climate risk. The variable can range between one (not at all important) and five (very important).	Question A2
<i>Technological climate risk</i>	This variable measures the financial materiality of technological climate risk. The variable can range between one (not at all important) and five (very important).	Question A2
<i>Temperature rise expectation</i>	<i>Temperature rise expectation</i> measures investors’ expectations about what the global temperature rise will be by the end of the 21 st century. This variable can vary between one (no expectation of a temperature rise) and five (more than 3°C expected).	Question E1
<i>Climate risk financial materiality</i>	This variable averages the responses to three questions about the financial materiality of regulatory, physical, and technological climate risk. Each of these three variables can range between one (not at all important) and five (very important).	Question A2
<i>Management discussions imprecise</i>	This variable takes the value of one if a respondent strongly agrees that management discussions on climate risk are not sufficiently precise, and zero otherwise.	Question B3
<i>Quant. information imprecise</i>	This variable takes the value of one if a respondent strongly agrees that firm-level quantitative information on climate risk is not sufficiently precise, and zero otherwise.	Question B3
<i>Stand. and mandatory reporting necessary</i>	This variable takes the value of one if a respondent strongly agrees that standardized and mandatory reporting on climate risk is necessary, and zero otherwise.	Question B3
<i>More standardization across markets</i>	This variable takes the value of one if a respondent strongly agrees that there should be more standardization across markets in climate-related financial disclosure, and zero otherwise.	Question B3
<i>Standardized tools not available</i>	This variable takes the value of one if a respondent strongly agrees that standardized disclosure tools and guidelines are currently not available, and zero otherwise.	Question B3
<i>Disclosure forms not sufficiently informative</i>	This variable takes the value of one if a respondent strongly agrees that mandatory disclosure forms are not sufficiently informative regarding climate risk, and zero otherwise.	Question B3
<i>Demand more disclosure</i>	This variable takes the value of one if a respondent strongly agrees that investors should demand that portfolio firms disclose their exposure to climate risk, and zero otherwise.	Question B3
<i>Climate risk underpricing</i>	This variable averages positive mispricing scores (negative scores are set to zero). The variable ranges between plus two (strong average overvaluation) and zero (no average overvaluation).	Question D1
<i>Climate risk mispricing</i>	This variable averages the absolute values of all mispricing scores and can take the values of zero, one, and two.	Question D1

<i>Carbon footprint</i>	This variable takes the value of one if a respondent discloses or plans to disclose the overall carbon footprint of their portfolio, and zero otherwise.	Question B2
<i>TCFD engagement</i>	This variable takes the value of one if a respondent engages or plans to engage portfolio companies to report according to the recommendations of the Task Force on Climate-related Financial Disclosures, and zero otherwise.	Question E5
<i>Medium-term horizon</i>	This variable takes the value one if the indicated typical holding period of an institutional investor is between six months and two years, and zero otherwise.	Question G2
<i>Long-term horizon</i>	This variable takes the value one if the indicated holding period of an institutional investor is above two years, and zero otherwise.	Question G2
<i>Assets under management</i>	This variable indicates the size of an institutional investor and takes the values of one (assets under management less than \$1bn); two (between \$1bn and \$20bn); three (between \$20bn and \$50bn); four (between \$50bn and \$100bn); and five (more than \$100bn).	Question G6
<i>ESG share of portfolio</i>	This variable is the percentage of the institution's portfolio that incorporates ESG issues	Question G5
<i>Passive share of portfolio</i>	This variable is the percentage of the institution's portfolio that is passively managed.	Question G4
<i>Independent institution</i>	This variable takes the value one if an institutional investor is considered to be an independent institution, and zero otherwise. As in Ferreira and Matos (2008) and Dyck et al. (2019), independent institutions are more likely to collect information, have fewer potential business relationships with the corporations they invest in, and therefore are anticipated to be more involved in monitoring management. We classify mutual funds, asset managers, hedge funds, private equity funds, and public pension funds as independent institutions.	Question G1
<i>HQ country social norms</i>	This variable captures the importance of environmental issues in the country in which an institutional investor is headquartered. The data are from Dyck et al. (2019), who construct the variable based on the Environmental Performance Index obtained from the Yale Center for Environmental Law (Yale University) and the Center for International Earth Science Information Network (Columbia University) for 2004. Larger numbers reflect a stronger common belief in the importance of environmental issues.	Question G7
<i>Scope 1 disclosure</i>	This variable takes the value one if a firm discloses Scope 1 carbon emissions to the CDP in a given year, and zero otherwise	CDP
<i>Scope 2 disclosure</i>	This variable takes the value one if a firm discloses Scope 2 carbon emissions to the CDP in a given year, and zero otherwise	CDP
<i>Scope 3 disclosure</i>	This variable takes the value one if a firm discloses Scope 3 carbon emissions to the CDP in a given year, and zero otherwise	CDP
<i>Emissions verification</i>	This variable takes a value between zero and three, depending on the number of emission types (Scope 1, Scope 2, and Scope 3 emissions) for which a firm obtains external verification. Zero indicates that a firm either does not obtain any such verification or does not disclose carbon emissions at all. The variable takes the value of one or two if a firm obtains verification on one or two of the emissions types only and the value of three if a firm obtains verification on all three.	CDP
<i>Total IO</i>	Fraction of outstanding shares owned by institutional investors at the end of the fiscal year.	FactSet
<i>High norm IO</i>	Fraction of outstanding shares owned by institutional investors High Norm countries as defined by Dyck et al. (2019) at the end of the fiscal year.	FactSet

<i>Low norm IO</i>	Fraction of outstanding shares owned by institutional investors Norm countries as defined by Dyck et al. (2019) at the end of the fiscal year.	Low	FactSet
<i>Log(Assets)</i>	The natural logarithm of total assets (Worldscope data item WC02999) at the end of the fiscal year. Winsorized at the 1% level.		Worldscope
<i>Dividends/Net income</i>	Dividends (Worldscope data item WC04551) at the end of the fiscal year, divided by net income/loss at the end of the fiscal year (Worldscope data item WC01706). Winsorized at the 1% level.		Worldscope
<i>Debt/Assets</i>	Sum of the book value of long-term debt (Worldscope data item WC03251) and the book value of current liabilities (WC03101) at the end of the fiscal year, divided by total assets at the end of the fiscal year (Worldscope data item WC02999). Winsorized at the 1% level.		Worldscope
<i>EBIT/Assets</i>	Earnings before interest and taxes (Worldscope data item WC18191) at the end of the fiscal year, divided by total assets at the end of the fiscal year (Worldscope data item WC02999). Winsorized at the 1% level.		Worldscope
<i>CapEx/Assets</i>	Capital expenditures at the end of the fiscal year (Worldscope data item WC04601), divided by total assets at the end of the fiscal year (Worldscope data item WC02999). Winsorized at the 1% level.		Worldscope
<i>Book-to-market</i>	Difference between common equity (Worldscope data item WC03501) and preferred stock capital (WC03451) at the end of the fiscal year, divided by the equity market value (MV) at the end of the fiscal year. Winsorized at the 1% level.		Worldscope

Figure 1: Importance of Climate Risk Disclosure

This figure illustrates how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information (Question B1). Of the 439 individuals that participated in our survey, 416 responded to this question.

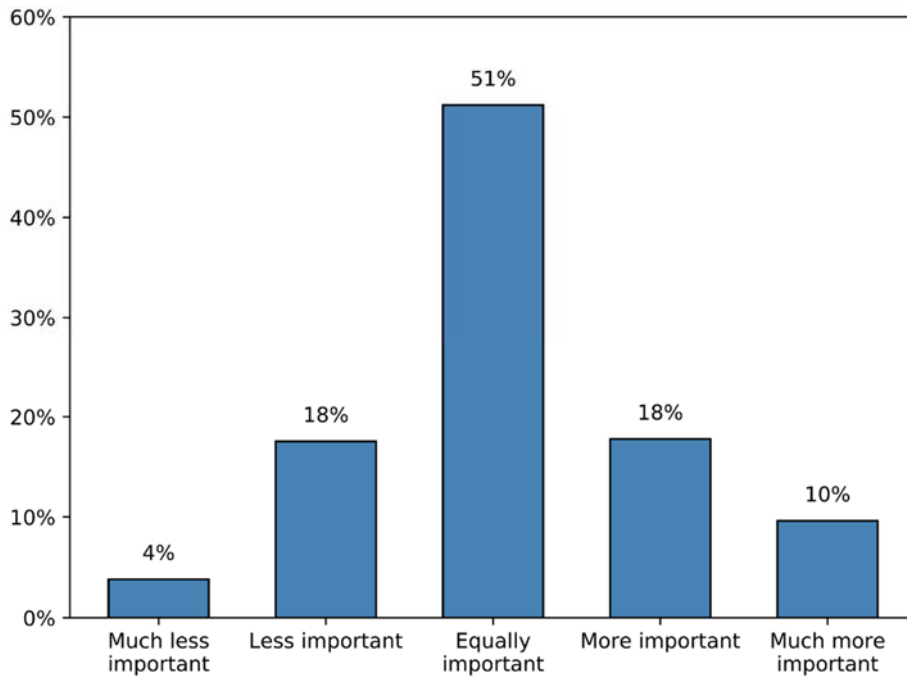


Figure 2: Climate Risk Mispricing across Sectors

This figure reports investors' beliefs about whether current equity valuations in specified sectors correctly reflect the risks and opportunities related to climate change (Question D1). Responses for each sector could vary between plus two (valuations much too high) and minus two (valuations much too low). The figure reports the mean response scores per sector. Of the 439 individuals that participated in our survey, 357 responded to this question.

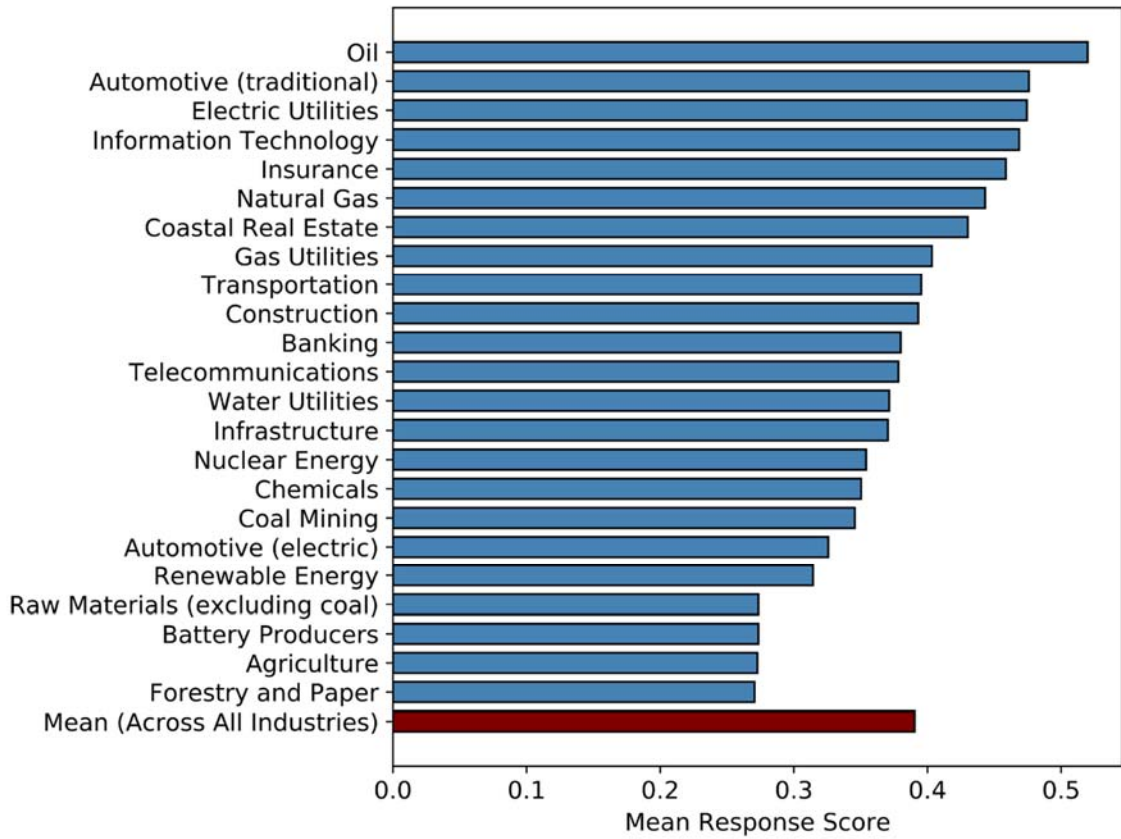


Figure 3: Carbon-Footprint Disclosure by Investors

This figure reports information about whether the investors disclose or plan to disclose the carbon footprint of their portfolios (Question B2). Of the 439 individuals that participated in our survey, 327 responded to this question.

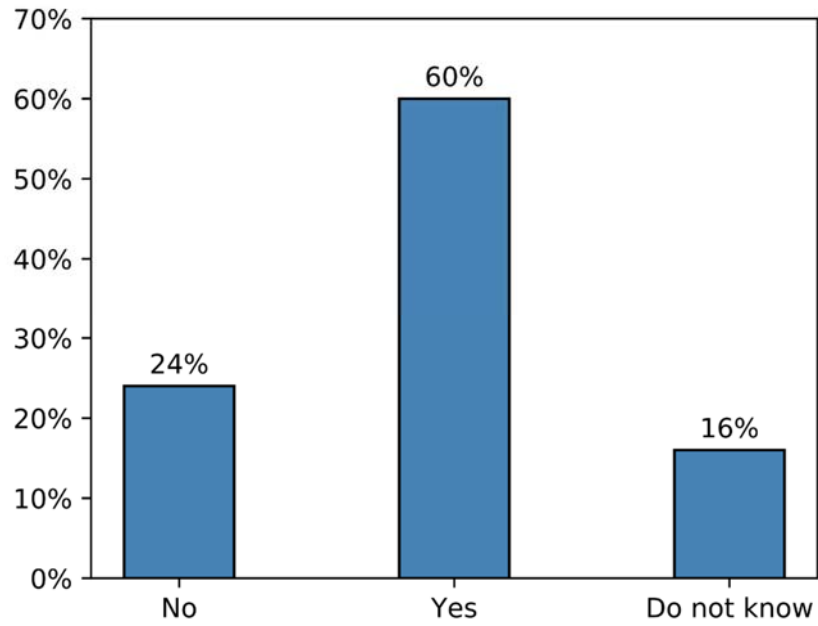


Figure 4: Engagement of Portfolio Firms to Report According to the TCFD Recommendations

This figure reports information about whether the investors engage or plan to engage their portfolio firms to report according to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) (Question E5). Of the 439 individuals that participated in our survey, 304 responded to this question.

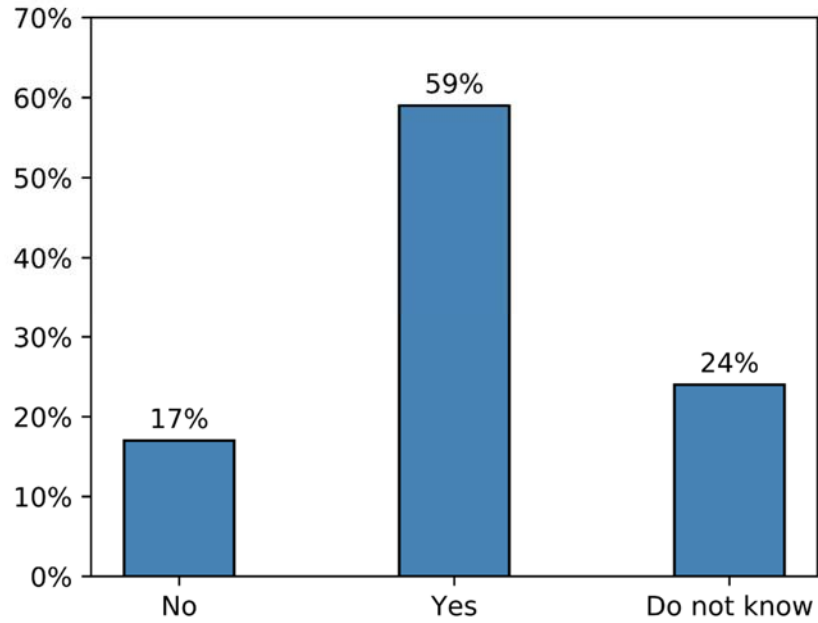


Table 1: Survey Respondent Characteristics

This table provides summary statistics on the characteristics of the 439 individuals that participated in our survey. As not all respondents provided information on all characteristics, we report the number of observations for different parts of the table. We report data on the distribution channel, position of the responding individuals (Question G8), type of institution they work for (Question G1), institution size (Question G6), investment horizon (Question G2), geographic distribution (Question G7). We also report the following percentages of the institution's portfolio: ESG share of portfolio (Question G5), equity and fixed-income share of portfolio (Question G3), and passive share of portfolio (Question G4). Detailed variable definitions are in the Data Appendix.

Distribution channels (N=439)		Percentage	Investor horizon (N=432)		Percentage
Panel		73	Short (less than 6 months)		5
Conferences		16	Medium (6 months to 2 years)		38
Asset owner		6	Long (2 years to 5 years)		38
Personal		4	Very long (more than 5 years)		18
Respondent position (N=428)		Percentage	Region (N=429)		Percentage
Fund/Portfolio manager		21	United States		32
Executive/Managing director		18	United Kingdom		17
Investment analyst/strategist		16	Canada		12
CIO		11	Germany		11
CEO		10	Italy		7
CFO/COO/Chairman/Other executive		10	Spain		5
ESG/RI specialist		10	The Netherlands		4
Other		2	France		3
Institutional investor type (N=439)		Percentage	Others (<3%)		9
Asset manager		23	Investment structure		Mean
Bank		22	ESG share of portfolio (N=415)		40.6%
Pension fund		17	Equity share of portfolio (N=400)		47.0%
Insurance company		15	Fixed-income share of portfolio (N=402)		43.1%
Mutual fund		8	Passive share of portfolio (N=419)		38.2%
Other institution		15			
Assets under management (N=430)		Percentage			
Less than \$1bn		19			
Between \$1bn and \$20bn		32			
Between \$20bn and \$50bn		23			
Between \$50bn and \$100bn		16			
More than \$100bn		11			

Table 2: Descriptive Statistics

This table provides summary statistics of the survey-based variables that we use in the regression analysis. The data are based on the responses of 439 individuals that participated in our survey. As not all respondents provided answers to all questions, the number of observations for a given variable are reported for each question. *Importance of climate risk disclosure* is based on a scale of one to five, where five is highest. *Climate risk ranking* is based on a relative scale of one to six, where one is highest. *Regulatory climate risk*, *Physical climate risk* and *Technological climate risk* measure the financial materiality of these types of climate risk and are based on absolute scales of one to five where five is highest. Temperature rise expectation is on a scale of one (no temperature rise) to five (more than 3°C rise). *Climate risk financial materiality* is on a scale of one to five where five is highest. The agreements on statements regarding disclosure are on a scale of one (strongly agree) to five (strongly disagree). More detailed variable definitions are in the Data Appendix.

Variable	Mean	STD	Median	Obs.	Survey question
Measures of risk importance					
<i>Importance of climate risk disclosure</i>	3.1	0.9	3.0	416	B1
<i>Climate risk ranking</i>	4.0	1.6	4.0	386	A1
<i>Regulatory climate risk</i>	3.8	1.0	4.0	393	A2
<i>Physical climate risk</i>	3.5	1.1	4.0	393	A2
<i>Technological climate risk</i>	3.8	1.0	4.0	393	A2
<i>Temperature rise expectation</i>	3.3	1.0	3.0	342	E1
<i>Climate risk financial materiality</i>	3.7	0.8	3.7	393	A2
Agreements on statements regarding disclosure					
<i>Demand more disclosure</i>	0.3	0.4	0.0	413	B3
<i>Quantitative information imprecise</i>	0.2	0.4	0.0	413	B3
<i>Management discussions imprecise</i>	0.2	0.4	0.0	413	B3
<i>Standardized and mandatory reporting necessary</i>	0.3	0.4	0.0	413	B3
<i>Disclosure forms not sufficiently informative</i>	0.2	0.4	0.0	411	B3
<i>More standardization across markets</i>	0.3	0.4	0.0	412	B3
<i>Standardized tools not available</i>	0.2	0.4	0.0	413	B3
Other variables					
<i>Climate risk underpricing</i>	0.6	0.4	0.5	357	D1
<i>Climate risk mispricing</i>	0.8	0.4	0.7	357	D1
<i>Carbon footprint</i>	0.7	0.5	1.0	327	B2
<i>TCFD engagement</i>	0.8	0.4	1.0	304	E5
<i>Medium-term horizon</i>	0.8	0.4	1.0	432	G2
<i>Long-term horizon</i>	0.2	0.4	0.0	432	G2
<i>Assets under management</i>	2.7	1.3	2.0	430	G6
<i>ESG share of portfolio</i>	0.4	0.3	0.3	415	G5
<i>Passive share of portfolio</i>	0.4	0.2	0.4	419	G4
<i>Independent institution</i>	0.5	0.5	1.0	439	G1
<i>HQ country social norms</i>	0.6	0.1	0.6	425	G7

Table 3: Importance of Climate Risk Disclosure

This table reports ordered logit regressions explaining the perceived importance of climate risk disclosure (relative to financial disclosure) (Question B1). The dependent variable, *Importance of climate risk disclosure*, measures how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information. The variable ranges between one and five, with one indicating that climate risk reporting is “much less important” and five indicating that it is “much more important”. We use the following independent variables: *Climate risk ranking* is the ranking of the importance of climate risks relative to other risks. The variable ranges from one (most important risk) to six (least important risk). *Regulatory, physical, and technological climate risk* measure the financial materiality of regulatory climate risk, physical climate risk and technological climate risk (Question A2). All three variables can range between one (not at all important) and five (very important). *Temperature rise expectation* measures investors’ expectations about the global temperature increase by the end of this century (Question E1). This variable can vary between one (no expectation of a temperature rise) and five (more than 3°C expected). The investor characteristics include: *Medium-term horizon; Long-term horizon; Assets under management; ESG share of portfolio; Passive share of portfolio; Independent institution; and HQ country social norms*. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the investor-country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Importance of climate risk disclosure</i>				
	(1)	(2)	(3)	(4)	(5)
<i>Climate risk ranking</i>	-0.30*** (-4.37)				
<i>Regulatory climate risk</i>		0.30*** (4.05)			
<i>Physical climate risk</i>			0.71*** (6.58)		
<i>Technological climate risk</i>				0.53*** (6.57)	
<i>Temperature rise expectation</i>					0.34*** (2.93)
<i>Medium-term horizon</i>	-0.22 (-0.52)	-0.11 (-0.21)	-0.2 (-0.33)	-0.2 (-0.48)	0.08 (0.16)
<i>Long-term horizon</i>	-0.1 (-0.20)	-0.14 (-0.23)	-0.37 (-0.50)	-0.22 (-0.36)	-0.03 (-0.05)
<i>Assets under management</i>	0.21*** (2.70)	0.23** (2.41)	0.18* (1.93)	0.23** (2.52)	0.25** (2.43)
<i>ESG share of portfolio (x100)</i>	0.83 (1.54)	0.88* (1.80)	0.66 (1.56)	0.7 (1.56)	0.98** (2.37)
<i>Passive share of portfolio (x100)</i>	-0.01 (-0.03)	0.07 (0.18)	-0.11 (-0.24)	0.01 (0.03)	-0.22 (-0.49)
<i>Independent institution</i>	-0.05 (-0.17)	-0.15 (-0.62)	-0.07 (-0.29)	-0.19 (-0.81)	0.01 (0.04)
<i>HQ country social norms</i>	1.28 (1.34)	1.59 (1.50)	2.48*** (3.14)	2.12** (2.16)	1.46 (1.00)
Respondent Position FE	Yes	Yes	Yes	Yes	Yes
Distribution Channel FE	Yes	Yes	Yes	Yes	Yes
Obs.	361	370	370	370	326
Pseudo R ²	0.06	0.05	0.09	0.07	0.05

Table 4: Evaluations of Climate Risk Disclosure Practices

This table reports survey responses to questions on different aspects of climate risk disclosure practices currently in use (Question B3). Respondents were asked to indicate their agreement with different statements on a scale of one (“strongly disagree”) through five (“strongly agree”). Column (1) presents the percentage of respondents indicating strong agreement with a statement. Column (2) reports the mean score, where higher values correspond to stronger agreement. Column (3) reports the number of respondents. Column (4) reports the results of a *t*-test of the null hypothesis that each mean score is equal to 3 (neither agree nor disagree). *** indicates statistical significance at the 1% levels. Column (5) reports the results of a *t*-test of the null hypothesis that the mean score for a given reason is equal to the mean score for each of the other reasons, where significant differences at the 10% level are reported.

Views on climate risk disclosure		% with 5 (“strongly agree”) score	Mean score	N	H ₀ : Mean score = 3	Significant differences in mean score vs. rows
		(1)	(2)	(3)	(4)	(5)
(1)	Management discussions on climate risk are not sufficiently precise	20.8%	3.78	413	***	1-4, 7
(2)	Firm-level quantitative information on climate risk is not sufficiently precise	19.4%	3.77	413	***	1-4
(3)	Standardized and mandatory reporting on climate risk is necessary	26.9%	3.91	413	***	4-7
(4)	There should be more standardization across markets in climate-related financial disclosure	27.4%	3.92	412	***	4-7
(5)	Standardized disclosure tools and guidelines are currently not available	21.3%	3.64	413	***	1-3, 5-6
(6)	Mandatory disclosure forms are not sufficiently informative regarding climate risk	17.8%	3.70	411	***	1-3, 5
(7)	Investors should demand that portfolio firms disclose their exposure to climate risk	27.6%	3.90	413	***	4-7

Table 5: Explaining Views on Climate Risk Disclosure Practices

This table reports the results of logit regressions explaining investors' views on climate risk disclosure practices currently in use (Question B3). We use seven dependent variables to capture respondents' agreements with different statements on climate risk disclosure on a scale of one ("strongly agree") through five ("strongly disagree") where each variable is an indicator equal to one if a respondent indicated strong agreement with a statement on the current disclosure practice, and zero otherwise. We use the following independent variables: *Climate risk financial materiality* (larger numbers reflect greater perceived importance); *Medium-term horizon*; *Long-term horizon*; *Assets under management*; *ESG share of portfolio*; *Passive share of portfolio*; *Independent institution*; and *HQ country social norms*. Detailed variable definitions are in the Data Appendix. We report marginal effects of the logit estimates. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the investor-country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Management discussions imprecise</i>	<i>Quantitative information imprecise</i>	<i>Stand. and mandatory reporting necessary</i>	<i>More standardization across markets</i>	<i>Standardized tools not available</i>	<i>Disclosure forms not sufficiently informative</i>	<i>Demand more disclosure</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Climate risk financial materiality</i>	0.09** (2.42)	0.06** (2.46)	0.10*** (4.06)	0.14*** (4.38)	0.08** (2.00)	0.06** (2.47)	0.15*** (3.99)
<i>Medium-term horizon</i>	0.11 (0.91)	-0.05 (-0.46)	0.12 (0.78)	0.03 (0.15)	0.08 (0.83)	-0.07 (-0.84)	-0.11 (-0.73)
<i>Long-term horizon</i>	0.14 (1.19)	0.02 (0.16)	0.14 (0.99)	0.03 (0.34)	0.08 (1.02)	-0.08 (-0.88)	-0.17 (-1.24)
<i>Assets under management</i>	0.01 (1.16)	0.00 (0.16)	-0.02 (-1.41)	-0.01 (-0.85)	0.03* (1.77)	0.02*** (3.87)	-0.01 (-0.94)
<i>ESG share of portfolio (x100)</i>	0.22*** (3.31)	0.14** (2.06)	0.27*** (3.22)	0.08 (0.94)	0.17** (2.18)	0.14*** (2.83)	0.05 (0.52)
<i>Passive share of portfolio (x100)</i>	-0.06 (-0.71)	0.06 (1.03)	0.12 (1.02)	-0.00 (-0.01)	0.09 (1.29)	-0.08 (-0.95)	0.14 (1.26)
<i>Independent institution</i>	0.04 (0.51)	0.01 (0.35)	-0.05 (-1.60)	-0.08 (-1.29)	0.08** (2.24)	0.04 (1.29)	-0.02 (-1.04)
<i>HQ country social norms</i>	0.33 (1.28)	-0.19 (-0.82)	-0.03 (-0.12)	-0.14 (-0.54)	0.08 (0.31)	0.04 (0.20)	0.01 (0.04)
Respondent Position FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distribution Channel FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	369	369	369	369	369	369	369
Pseudo R ²	0.13	0.09	0.11	0.11	0.10	0.11	0.15

Table 6: Climate Risk Disclosure and Climate Risk Mispricing

This table reports the results of OLS regressions explaining perceptions of climate risk mispricing (Question D1). We use two dependent variables to capture the respondents' views on the mispricing of climate risks: *Climate risk underpricing* averages positive mispricing scores across all specified sectors (negative scores are set to zero). The variable ranges between plus two (strong average overvaluation) and zero (no average overvaluation). *Climate risk mispricing* averages the absolute values of all mispricing scores across all specified sectors. We use the following independent variables: *Demand more disclosure* equals one if a respondent indicated strong agreement to the statement that investors should demand that portfolio firms disclose their exposure to climate risk, and zero otherwise (Question B3). *Quantitative information imprecise* equals one if a respondent indicated strong agreement to the statement that firm-level quantitative information on climate risk is not sufficiently precise, and zero otherwise (Question B3). *Management discussions imprecise* equals one if a respondent indicated strong agreement to the statement that management discussions on climate risk are not sufficiently precise, and zero otherwise (Question B3). We additionally control for: *Climate risk financial materiality* (larger numbers reflect greater perceived importance); *Medium-term horizon*; *Long-term horizon*; *Assets under management*; *ESG share of the portfolio*; *Passive share of the portfolio*; *Independent institution*; and *HQ country social norms*. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the investor-country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Climate risk underpricing</i>			<i>Climate risk mispricing</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Demand more disclosure</i>	0.20*** (4.29)			0.16*** (3.28)		
<i>Quantitative information imprecise</i>		0.24** (2.84)			0.24*** (4.79)	
<i>Management discussions imprecise</i>			0.22*** (3.53)			0.19*** (3.98)
<i>Climate risk financial materiality</i>	-0.01 (-0.43)	-0.01 (-0.14)	-0.01 (-0.16)	0.02 (0.73)	0.02 (0.64)	0.02 (0.70)
<i>Medium-term horizon</i>	-0.03 (-0.27)	-0.04 (-0.30)	-0.07 (-0.54)	0.01 (0.12)	0.01 (0.06)	-0.02 (-0.15)
<i>Long-term horizon</i>	-0.00 (-0.04)	-0.04 (-0.39)	-0.06 (-0.54)	0.03 (0.28)	-0.01 (-0.05)	-0.02 (-0.18)
<i>Assets under management</i>	0.03 (1.59)	0.03 (1.34)	0.03 (1.36)	0.00 (0.06)	0.00 (0.00)	-0.00 (-0.17)
<i>ESG share of portfolio (x100)</i>	0.29*** (3.60)	0.28*** (3.09)	0.26** (2.48)	0.19*** (3.01)	0.18** (2.52)	0.16* (2.03)
<i>Passive share of portfolio (x100)</i>	-0.02 (-0.21)	-0.00 (-0.05)	0.01 (0.08)	-0.05 (-0.49)	-0.03 (-0.34)	-0.02 (-0.18)
<i>Independent institution</i>	-0.03 (-0.47)	-0.04 (-0.58)	-0.05 (-0.82)	-0.03 (-0.49)	-0.04 (-0.59)	-0.04 (-0.82)
<i>HQ country social norms</i>	-0.20 (-1.63)	-0.16* (-1.82)	-0.29* (-2.10)	-0.30* (-2.11)	-0.26 (-1.68)	-0.37** (-2.25)
Respondent Position FE	Yes	Yes	Yes	Yes	Yes	Yes
Distribution Channel FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	343	343	343	343	343	343
Adjusted R ²	0.06	0.07	0.06	0.03	0.05	0.03

Table 7: Recent Trends in Climate Risk Disclosure

This table reports the results of logit regressions explaining recent trends in climate risk disclosure. We use two dependent variables. *Carbon footprint* equals one if a respondent discloses or plans to disclose the overall carbon footprint of their portfolio, and zero otherwise (Question B2). *TCFD engagement* equals one if a respondent engages or plans to engage portfolio firms to report according to the recommendations of the Task Force on Climate-related Financial Disclosures (Question E5), and zero otherwise. We use the following independent variables: *Climate risk financial materiality*; *Medium-term horizon*; *Long-term horizon*; *Assets under management*; *ESG share of portfolio*; *Passive share of portfolio*; *Independent institution*; and *HQ country social norms*. Detailed variable definitions are in the Data Appendix. We report marginal effects of the logit estimates. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the investor-country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Carbon footprint</i>	<i>TCFD engagement</i>
	(1)	(2)
<i>Climate risk financial materiality</i>	0.06*** (3.92)	0.04* (1.71)
<i>Medium-term horizon</i>	-0.14** (-1.97)	-0.03 (-0.45)
<i>Long-term horizon</i>	-0.20* (-1.84)	-0.04 (-0.62)
<i>Assets under management</i>	0.05* (1.78)	0.01 (0.23)
<i>ESG share of portfolio (x100)</i>	0.21*** (2.67)	0.38*** (3.33)
<i>Passive share of portfolio (x100)</i>	0.19 (0.97)	0.04 (0.45)
<i>Independent institution</i>	0.06 (1.14)	-0.01 (-0.35)
<i>HQ country social norms</i>	0.12 (0.36)	1.09*** (5.40)
Respondent Position FE	Yes	Yes
Distribution Channel FE	Yes	Yes
Obs.	306	275
Pseudo R ²	0.07	0.11

Table 8: Recent Disclosure Trends and Assessment of Climate Risk Disclosure

This table reports the results of logit regressions explaining investors' views on current climate risk disclosure practices (Question B3). We use four dependent variables that reflect the respondents' agreement to different statements on a scale of one ("strongly agree") through five ("strongly disagree"). The four dependent variables are dummy variables that equal one if a respondent indicated strong agreement with a statement on the current disclosure practice, and zero otherwise. We use the following independent variables: *Carbon footprint* is a dummy variable equal to one if respondents disclose or plan to disclose the overall carbon footprint of their portfolio, and zero otherwise (Question B2). *TCFD engagement* is a dummy variable equal to one if respondents engage or plan to engage portfolio firms to report according to the recommendations of the Task Force on Climate related Financial Disclosures (Question E5). The following independent variables are also included: *Medium-term horizon*; *Long-term horizon*; *Assets under management*; *ESG share of portfolio*; *Passive share of portfolio*; *Independent institution*; and *HQ country social norms*. Detailed variable definitions are in the Data Appendix. We report marginal effects of the logit estimates. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the investor-country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Demand more disclosure</i>		<i>Quantitative information imprecise</i>		<i>Management discussions imprecise</i>		<i>Standardized and mandatory reporting necessary</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Carbon footprint</i>	0.23** (2.32)		0.06 (1.07)		0.07* (1.68)		0.11* (1.93)	
<i>TCFD engagement</i>		0.18** (2.24)		0.08 (1.29)		0.13* (1.66)		0.20*** (3.10)
<i>Medium-term horizon</i>	-0.07 (-0.49)	-0.08 (-0.50)	-0.09 (-0.73)	-0.03 (-0.23)	0.11 (0.75)	0.12 (0.83)	0.14 (0.89)	0.16 (0.97)
<i>Long-term horizon</i>	-0.02 (-0.17)	-0.08 (-0.49)	0.02 (0.13)	0.05 (0.33)	0.22 (1.49)	0.23 (1.61)	0.26 (1.58)	0.26 (1.38)
<i>Assets under management</i>	-0.02 (-1.20)	-0.01 (-0.69)	-0.00 (-0.08)	-0.01 (-0.77)	0.01 (1.17)	0.00 (0.14)	-0.04** (-2.14)	-0.05** (-2.56)
<i>ESG share of portfolio (x100)</i>	0.09 (0.86)	0.18* (1.92)	0.12* (1.96)	0.12 (1.49)	0.26*** (4.55)	0.29*** (3.24)	0.27*** (3.29)	0.25*** (3.05)
<i>Passive share of portfolio (x100)</i>	0.13 (0.73)	0.10 (0.65)	0.15** (2.24)	0.05 (0.78)	-0.01 (-0.09)	-0.03 (-0.31)	0.20* (1.87)	0.08 (0.59)
<i>Independent institution</i>	-0.02 (-0.58)	-0.02 (-0.58)	0.02 (0.66)	-0.02 (-0.37)	0.04 (0.54)	0.05 (0.59)	-0.05 (-1.04)	-0.05 (-1.36)
<i>HQ country social norms</i>	-0.31 (-0.66)	-0.40 (-1.49)	-0.39 (-1.59)	-0.44* (-1.81)	0.23 (0.51)	0.10 (0.19)	-0.25 (-0.71)	-0.31 (-1.16)
Respondent Position FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distribution Channel FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	305	292	309	292	305	292	309	292
Pseudo R ²	0.10	0.12	0.08	0.06	0.08	0.11	0.09	0.09

Table 9: Carbon Emissions Disclosure and Institutional Ownership

This table reports the results of OLS regressions explaining a firm's propensity to disclose Scope 1 carbon emissions to the CDP. The dependent variable, *Scope 1 disclosure*, equals one if a firm discloses Scope 1 carbon emissions to the CDP in a given year, and zero otherwise. We use the following independent variables: *Total IO* measures the fraction of a firm's equity owned by institutional investors. *High-norm IO* and *Low-norm IO* are components of *Total IO* and measure the fraction of a firm's equity that is owned by institutional investors from high and low social norm countries, respectively, where we measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI) obtained from Yale Center of Environmental Law and Center for international Earth Science Information Network. We define a country to be in the high-norm group if its EPI is higher than the median in that year and in the low-norm group otherwise. By construction, $Total\ IO = High\text{-}norm\ IO + Low\text{-}norm\ IO$. The following independent variables are also included: *Log(Assets)*; *Dividends/Net income*; *Debt/Assets*; *EBIT/Assets*; *CapEx/Assets*; and *Book-to-market*. The sample includes all firms contacted by the CDP and the sample period covers the years 2009 to 2017. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 1 disclosure</i>			
	(1)	(2)	(3)	(4)
<i>Total IO</i>	0.16** (2.10)		0.17** (2.35)	
<i>High-norm IO</i>		0.35*** (3.91)		0.30*** (3.86)
<i>Low-norm IO</i>		-0.03 (-0.68)		0.03 (0.70)
<i>Log(Assets)</i>	0.07*** (6.31)	0.07*** (8.03)	0.06*** (5.73)	0.07*** (6.76)
<i>Dividends/Net income</i>	0.02*** (3.64)	0.02*** (3.05)	0.02*** (3.92)	0.02*** (3.55)
<i>Debt/Assets</i>	-0.04* (-1.92)	-0.06** (-2.50)	0.01 (0.59)	-0.00 (-0.10)
<i>EBIT/Assets</i>	-0.14*** (-3.65)	-0.10** (-2.41)	-0.06 (-1.46)	-0.05 (-1.20)
<i>CapEx/Assets</i>	-0.02 (-0.14)	0.01 (0.06)	-0.09 (-0.75)	-0.09 (-0.75)
<i>Book-to-market</i>	-0.06*** (-4.25)	-0.06*** (-5.43)	-0.04*** (-3.84)	-0.04*** (-4.50)
Industry FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
Industry-Year FE	No	No	Yes	Yes
Obs.	28,347	28,347	28,338	28,338
adj. R-sq.	0.14	0.16	0.21	0.22

Table 10: Carbon Emissions Verification and Institutional Ownership

This table reports the results of OLS regressions explaining whether firms obtain third party verification for emissions reported to the CDP. The dependent variable, *Emissions verification*, takes a value between zero and three, depending on the number of emission types (Scope 1, Scope 2, and Scope 3 emissions) for which a firm obtains external verification. Zero indicates that a firm either does not obtain any such verification or does not disclose carbon emissions at all. The variable takes the value of one or two if a firm obtains verification on one or two of the emissions types only and the value of three if a firm obtains verification on all three. We use the following independent variables: *Total IO* measures the fraction of a firm's equity owned by institutional investors. *High-norm IO* and *Low-norm IO* are components of *Total IO* and measure the fraction of a firm's equity owned by institutional investors in high social norm countries and low social norm countries, respectively. We measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI) obtained from the Yale Center of Environmental Law and Center for international Earth Science Information Network. We define a country to be in the high-norm group if its EPI is higher than the median in that year and in the low-norm group otherwise. By construction, $Total\ IO = High\text{-}norm\ IO + Low\text{-}norm\ IO$. The following independent variables are also included: *Log(Assets)*; *Dividends/Net income*; *Debt/Assets*; *EBIT/Assets*; *CapEx/Assets*; and *Book-to-market*. The sample includes all firms contacted by the CDP and the sample period covers the years 2009 to 2017. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Emissions verification</i>			
	(1)	(2)	(3)	(4)
<i>Total IO</i>	0.12 (0.68)		0.13 (0.83)	
<i>High-norm IO</i>		0.53** (2.68)		0.40** (2.24)
<i>Low-norm IO</i>		-0.30*** (-3.53)		-0.14 (-1.40)
<i>Log(Assets)</i>	0.17*** (6.53)	0.18*** (8.48)	0.16*** (5.88)	0.17*** (6.98)
<i>Dividends/Net income</i>	0.04*** (3.60)	0.03*** (2.91)	0.04*** (3.48)	0.04*** (3.12)
<i>Debt/Assets</i>	-0.07 (-1.36)	-0.11* (-2.02)	0.03 (0.48)	-0.00 (-0.07)
<i>EBIT/Assets</i>	-0.29*** (-2.74)	-0.20 (-1.61)	-0.17 (-1.66)	-0.15 (-1.42)
<i>CapEx/Assets</i>	-0.33 (-1.05)	-0.27 (-0.88)	-0.31 (-0.93)	-0.31 (-0.94)
<i>Book-to-market</i>	-0.15*** (-4.66)	-0.15*** (-5.89)	-0.10*** (-4.51)	-0.11*** (-5.21)
Industry FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
Industry-Year FE	No	No	Yes	Yes
Obs.	28,347	28,347	28,338	28,338
adj. R-sq.	0.13	0.15	0.19	0.19

Internet Appendix

for

Institutional Investors' Views and Preferences on Climate Risk Disclosure

Emirhan Ilhan

Philipp Krueger

Zacharias Sautner

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Internet Appendix A: Survey Instrument



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German Excellence. Global Relevance.

Survey on Climate Risk

We are a team of professors from the University of Geneva, the Swiss Finance Institute, the University of Texas at Austin, and Frankfurt School of Finance & Management.

This survey seeks a better understanding of whether and how institutional investors incorporate **climate risk** when making investment decisions. The survey will take about **10 minutes**.

You can use this survey questionnaire or take the survey online at: [\[LINK\]](#)

We take the **confidentiality** of your responses very seriously. We **will not share your responses** with anyone, nor will individual firms or respondents be identified. Only aggregate data will be made public. We will not link the survey responses to any other data.

Thank you for participating in this survey. If you have any questions, please contact us.

Philipp Krueger, Ph.D. (Philipp.Krueger@unige.ch)

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GENERAL INFORMATION

G1: How is the institution at which you work best described?

- | | |
|---|--|
| <input type="checkbox"/> Public pension fund
<input type="checkbox"/> Insurance company
<input type="checkbox"/> Mutual fund management company
<input type="checkbox"/> Asset manager (for pension funds, endowments, etc.)
<input type="checkbox"/> Sovereign wealth fund
<input type="checkbox"/> Other (please specify): _____ | <input type="checkbox"/> Private pension fund
<input type="checkbox"/> Hedge fund
<input type="checkbox"/> Private equity fund
<input type="checkbox"/> Endowment, charity
<input type="checkbox"/> Bank |
|---|--|

G2: What is the typical holding period for investments in your portfolio, on average?

- Short (less than 6 months)
- Medium (6 months to 2 years)
- Long (2 years to 5 years)
- Very long (more than 5 years)

G3: What percentage of your portfolio is invested in fixed income versus equity securities?

___ % in fixed income
 ___ % in equities

G4: What percentage of your portfolio is invested actively versus passively?

___ % in active investments
 ___ % in passive investments

G5: What percentage of your portfolio incorporates Environmental, Social and Governance (ESG) issues? ___ %

G6: What is the total size of assets under management for your institution?

- | | |
|--|--|
| <input type="checkbox"/> Less than \$1 billion
<input type="checkbox"/> Between \$20 billion and \$50 billion
<input type="checkbox"/> More than \$100 billion | <input type="checkbox"/> Between \$1 billion and \$20 billion
<input type="checkbox"/> Between \$50 billion and \$100 billion |
|--|--|

G7: In which country are your institution's headquarters based? _____

G8: What is your position?

- | | |
|---|--|
| <input type="checkbox"/> Fund/Portfolio Manager
<input type="checkbox"/> Investment Analyst/Strategist
<input type="checkbox"/> Chief Investment Officer
<input type="checkbox"/> CFO/COO/Chairman/Other Executive | <input type="checkbox"/> Chief Executive Officer
<input type="checkbox"/> Executive/Managing Director
<input type="checkbox"/> ESG/Responsible Investment Specialist
<input type="checkbox"/> Other (please explain): _____ |
|---|--|

PART A: IMPORTANCE OF CLIMATE RISK

A1: Please rank the following six risks when making investments in portfolio firms from 1 to 6, where 1 is the most important to you and 6 the least important.

- | | |
|--|---|
| Financial risk (earnings, leverage, payout policy, etc.) | □ |
| Operating risk (changes in demand, input costs, etc.) | □ |
| Governance risk (board structure, executive pay, etc.) | □ |
| Social risk (labor standards, human rights, etc.) | □ |
| Climate risk | □ |
| Other environmental risk (pollution, recycling, etc.) | □ |

A2: We have divided climate risk into *regulatory risks* (changes in regulation), *physical risks* (changes in the physical climate), and *technological risks* (climate-related technological disruption). Please rate the financial materiality of these risks.

	Not at all important	Slightly important	Important	Fairly important	Very important
Regulatory risks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical risks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technological risks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A3 to A5: [NOT COVERED IN THIS PAPER]

PART B: DISCLOSURE ON CLIMATE RISK

B1: How important do you consider reporting by portfolio firms on climate risk compared to reporting on financial information?

Much less important	Less important	Equally important	More important	Much more important
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B2: Do you disclose (or plan to disclose) the overall carbon footprint of your portfolio?

- No Yes Do not know

B3: To what extent do you agree with the following statements regarding climate-risk disclosure by portfolio firms?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
• Investors should demand that portfolio firms disclose their exposure to climate risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Firm-level quantitative information on climate risk is not sufficiently precise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Management discussions on climate risk are not sufficiently precise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Standardized and mandatory reporting on climate risk is necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Mandatory disclosure forms are not sufficiently informative regarding climate risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• There should be more standardization across markets in climate-related financial disclosure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Standardized disclosure tools and guidelines are currently not available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART C: CLIMATE RISK MANAGEMENT & ENGAGEMENT

[NOT COVERED IN THIS PAPER]

PART D: PRICING OF CLIMATE RISK

D1: To what extent do equity valuations of firms in different industries reflect the risks and opportunities related to climate change?

Industry	Valuations much too high	Valuations somewhat too high	Valuations more or less correct	Valuations somewhat too low	Valuations much too low
Oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural gas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Renewable energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuclear energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electric utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gas utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coal mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Raw materials (excluding coal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Automotive (traditional)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Automotive (electric)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Battery producers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Banking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insurance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forestry and paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information Technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telecommunications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal real estate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D2 to D4: [NOT COVERED IN THIS PAPER]

PART E: ADDITIONAL INFORMATION

E1: The *Paris Climate Accord* aims to keep the global temperature rise “well below 2 degrees Celsius” above pre-industrial levels by the end of this century. What are your expectations for the global temperature rise by the end of this century?

Increase in global temperature by:					
None	Up to 1 degree	Up to 2 degrees	Up to 3 degrees	More than 3 degrees	Do not know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

E2 to E4: [NOT COVERED IN THIS PAPER]

E5: Do you engage (or plan to engage) portfolio companies to report according to the recommendations of the Task Force on Climate related Financial Disclosures (TCFD)?

No
 Yes
 Do not know

Internet Appendix B: Additional Tables

Internet Appendix Table 1: Summary Statistics

This table provides summary statistics for the analyses in Table 9, Table 10, as well as Internet Appendix Tables 2 through 5. The sample period covers the years 2009 to 2017.

Variable	Mean	STD	25th	Median	75th	Obs.
<i>Scope 1 disclosure</i>	0.17					34,574
<i>Scope 2 disclosure</i>	0.16					34,574
<i>Scope 3 disclosure</i>	0.20					34,574
<i>Emissions verification</i>	0.34	0.88	0.00	0.00	0.00	34,574
<i>Total IO</i>	0.27	0.26	0.08	0.17	0.37	34,574
<i>High-norm IO</i>	0.16	0.20	0.03	0.08	0.20	34,574
<i>Low-norm IO</i>	0.11	0.20	0.01	0.04	0.10	34,574
<i>Log(Assets)</i>	15.00	2.05	13.63	14.96	16.33	34,574
<i>Dividends/Net income</i>	0.38	0.73		0.26	0.52	34,232
<i>Debt/Assets</i>	0.44	0.20	0.30	0.44	0.58	29,035
<i>EBIT/Assets</i>	0.07	0.10	0.02	0.06	0.11	33,888
<i>CapEx/Assets</i>	0.05	0.05	0.01	0.03	0.06	34,355
<i>Book-to-market</i>	0.74	0.58	0.34	0.60	0.98	34,538

Internet Appendix Table 2: Carbon Emissions and Scope 2 and Scope 3 Disclosure

This table reports the results of OLS regressions explaining a firm's propensity to disclose Scope 2 and Scope 3 carbon emissions to the CDP. We use two dependent variables: *Scope 2 disclosure* equals one if a firm discloses Scope 2 carbon emissions to the CDP in a given year, and zero otherwise. *Scope 3 disclosure* is defined accordingly but for Scope 3 carbon emissions. We use the following independent variables: *Total IO* measures the fraction of a firm's equity owned by institutional investors. *High-norm IO* and *Low-norm IO* are components of *Total IO* and measure the fraction of a firm's equity owned by institutional investors in high social norm countries and low social norm countries, respectively. We measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI) obtained from Yale Center of Environmental Law and Center for international Earth Science Information Network. We define a country to be in the high-norm group if its EPI is higher than the median in that year and in the low-norm group otherwise. By construction, $Total\ IO = High\text{-}norm\ IO + Low\text{-}norm\ IO$. The following independent variables are also included: $Log(Assets)$; $Dividends/Net\ income$; $Debt/Assets$; $EBIT/Assets$; $CapEx/Assets$; and $Book\text{-}to\text{-}market$. The sample includes all firms contacted by the CDP and the sample period covers the years 2009 to 2017. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 2 disclosure</i>				<i>Scope 3 disclosure</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Total IO</i>	0.16** (2.16)		0.17** (2.38)		0.14* (1.74)		0.14* (1.97)	
<i>High-norm IO</i>		0.34*** (3.97)		0.30*** (3.96)		0.32*** (3.58)		0.29*** (3.59)
<i>Low-norm IO</i>		-0.02 (-0.46)		0.03 (0.66)		-0.04 (-1.40)		-0.00 (-0.08)
<i>Log(Assets)</i>	0.06*** (5.96)	0.07*** (7.42)	0.06*** (5.42)	0.06*** (6.39)	0.08*** (9.69)	0.08*** (13.77)	0.07*** (8.91)	0.08*** (11.89)
<i>Dividends/Net income</i>	0.02*** (3.82)	0.02*** (3.21)	0.02*** (4.13)	0.02*** (3.73)	0.02*** (4.14)	0.02*** (3.58)	0.02*** (4.18)	0.02*** (3.85)
<i>Debt/Assets</i>	-0.03 (-1.38)	-0.05* (-1.97)	0.02 (0.93)	0.01 (0.25)	-0.04* (-1.71)	-0.06** (-2.58)	0.02 (0.84)	0.00 (0.12)
<i>EBIT/Assets</i>	-0.12*** (-3.09)	-0.09* (-1.99)	-0.06 (-1.29)	-0.04 (-1.02)	-0.13*** (-4.27)	-0.09** (-2.71)	-0.08** (-2.06)	-0.06* (-1.74)
<i>CapEx/Assets</i>	-0.03 (-0.19)	-0.00 (-0.00)	-0.10 (-0.79)	-0.10 (-0.79)	-0.06 (-0.49)	-0.03 (-0.27)	-0.07 (-0.56)	-0.07 (-0.56)
<i>Book-to-market</i>	-0.06*** (-4.19)	-0.05*** (-5.23)	-0.04*** (-3.83)	-0.04*** (-4.45)	-0.06*** (-4.93)	-0.06*** (-6.10)	-0.04*** (-4.07)	-0.04*** (-4.63)
<i>Constant</i>	-0.76*** (-6.08)	-0.82*** (-8.15)	-0.76*** (-5.41)	-0.80*** (-6.68)	-0.91*** (-8.78)	-0.97*** (-13.05)	-0.92*** (-7.81)	-0.97*** (-10.78)
Industry FE	No	No	Yes	Yes	No	No	Yes	Yes
Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry-Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Obs.	28,347	28,347	28,338	28,338	28,347	28,347	28,338	28,338
adj. R-sq.	0.13	0.15	0.20	0.21	0.15	0.17	0.24	0.24

**Internet Appendix Table 3: Carbon Emissions Disclosure and Institutional Ownership:
Foreign versus Local Ownership**

This table reports the results of OLS regressions explaining a firm's propensity to disclose Scope 1 carbon emissions to the CDP. The dependent variable, *Scope 1 disclosure*, equals one if a firm discloses Scope 1 carbon emissions to the CDP in a given year, and zero otherwise. We use the following independent variables: *Total IO foreign* measures the fraction of a firm's equity owned by institutional investors outside of a firm's country. *Total IO local* measures the fraction of a firm's equity owned by institutional investors from a firm's country. *High-norm IO foreign* and *Low-norm IO foreign* measure the fraction of a firm's equity owned by institutional investors from outside of a firm's country that are located in high social norm countries and low social norm countries, respectively. *High-norm IO local* and *Low-norm IO local* are defined accordingly. We measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI) obtained from Yale Center of Environmental Law and Center for international Earth Science Information Network. We define a country to be in the high-norm group if its EPI is higher than the median in that year and in the low-norm group otherwise. The following independent variables are also included (not reported): *Log(Assets)*; *Dividends/Net income*; *Debt/Assets*; *EBIT/Assets*; *CapEx/Assets*; and *Book-to-market*. The sample includes all firms contacted by the CDP and the sample period covers the years 2009 to 2017. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 1 disclosure</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Total IO foreign</i>	0.33*** (3.22)		0.28*** (2.87)		0.19** (2.62)	
<i>Total IO local</i>	0.12 (1.56)		0.14* (1.94)		0.02 (0.13)	
<i>High-norm IO foreign</i>		0.56*** (4.58)		0.42*** (3.89)		0.46*** (4.57)
<i>High-norm IO local</i>		0.29*** (3.77)		0.27*** (3.80)		0.07 (0.68)
<i>Low-norm IO foreign</i>		-0.06 (-1.04)		0.05 (0.70)		-0.18** (-2.21)
<i>Low-norm IO local</i>		-0.02 (-0.56)		0.02 (0.51)		-0.17** (-2.40)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	No	No
Year FE	No	No	Yes	Yes	No	No
Industry-Year FE	No	No	Yes	Yes	No	No
Country FE	No	No	No	No	Yes	Yes
Obs.	23,942	28,347	23,924	28,338	23,942	28,347
adj. R-sq.	0.14	0.16	0.22	0.22	0.19	0.21

**Internet Appendix Table 4: Carbon Emissions Verification and Institutional Ownership:
Foreign versus Local Ownership**

This table reports the results of OLS regressions explaining whether firms obtain third party verification for carbon emissions reported to the CDP. The dependent variable, *Emissions verification*, takes a value between zero and three, depending on the number of emission types (Scope 1, Scope 2, and Scope 3 emissions) for which a firm obtains external verification. Zero indicates that a firm either does not obtain any such verification or does not disclose carbon emissions at all. The variable takes the value of one or two if a firm obtains verification on one or two of the emissions types only and the value of three if a firm obtains verification on all three. We use the following dependent variables: *Total IO foreign* measures the fraction of a firm's equity owned by institutional investors outside of a firm's country. *Total IO local* measures the fraction of a firm's equity owned by institutional investors from a firm's country. *High-norm IO foreign* and *Low-norm IO foreign* and measure the fraction of a firm's equity owned by institutional investors from outside of a firm's country that are located in high social norm countries and low social norm countries, respectively. *High-norm IO local* and *Low-norm IO local* are defined accordingly. Following Dyck et al. (2019), we measure a country's social norms concerning environmental issues with the Environmental Performance Index (EPI) obtained from the Yale Center of Environmental Law and Center for international Earth Science Information Network. We define a country to be in the high-norm group if its EPI is higher than the median in that year and in the low-norm group otherwise. The following independent variables are also included (not reported): *Log(Assets)*; *Dividends/Net income*; *Debt/Assets*; *EBIT/Assets*; *CapEx/Assets*; and *Book-to-market*. The sample includes all firms contacted by the CDP and the sample period covers the years 2009 to 2017. Detailed variable definitions are in the Data Appendix. The *t*-statistics (reported in parentheses) are based on standard errors clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Emissions verification</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Total IO foreign</i>	0.51** (2.16)		0.42* (1.90)		0.21 (1.08)	
<i>Total IO local</i>	0.01 (0.07)		0.06 (0.40)		-0.04 (-0.17)	
<i>High-norm IO foreign</i>		1.10*** (3.62)		0.76*** (2.90)		0.87*** (3.23)
<i>High-norm IO local</i>		0.37** (2.50)		0.31** (2.10)		0.05 (0.25)
<i>Low-norm IO foreign</i>		-0.40*** (-3.94)		-0.08 (-0.70)		-0.63*** (-3.81)
<i>Low-norm IO local</i>		-0.29*** (-3.35)		-0.17* (-1.76)		-0.44** (-2.36)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes	No	No
Year FE	No	No	Yes	Yes	No	No
Industry-Year FE	No	No	Yes	Yes	No	No
Country FE	No	No	No	No	Yes	Yes
Obs.	23,942	28,347	23,924	28,338	23,942	28,347
adj. R-sq.	0.14	0.16	0.20	0.19	0.19	0.21

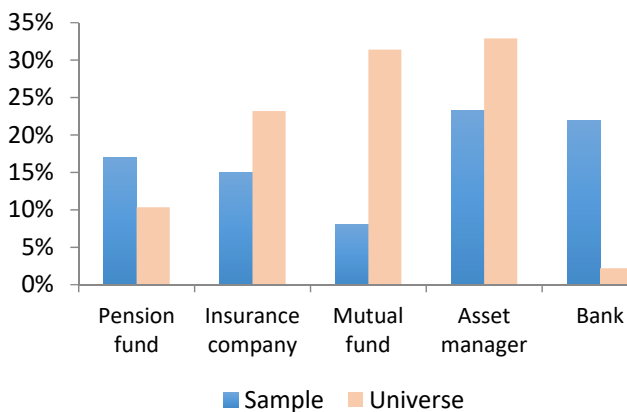
Internet Appendix C: Additional Figures

Internet Appendix Figure 1

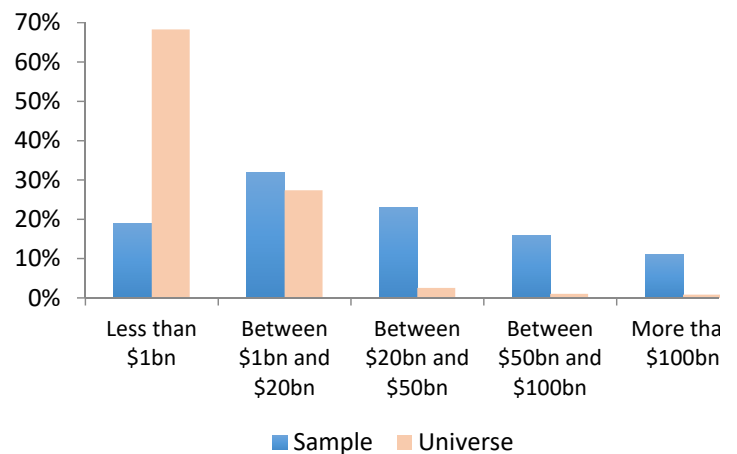
Comparison of sample characteristics with universe of institutional investors

These figures compare key characteristics of the institutional investors in our sample with those of the universe of institutional investors as defined by the FactSet Standard Entity database. Summary statistics of the sample are identical to the statistics reported in Table 1. In Internet Appendix Figure 1A we use the FactSet item “entity_sub_type” to identify institutional investor types. Pension fund, Insurance and Mutual Fund correspond to “Pension fund manager”, “Insurance Company”, and “Mutual fund manager” entity structures, respectively. Bank corresponds to “Bank investment division” and “Investment banking”. Asset manager includes “Fund of funds manager”, “Fund of hedge funds manager”, “Private banking/Wealth Management”, “Real estate manager”, “Family office” and “Investment Company entities”. In Internet Appendix Figure 1B assets under management measure the market value of a given fund portfolio. We use the Ownership (LionShares) - Unadjusted Fund Holdings Historical database to compute the market value of each fund portfolio. In Internet Appendix Figure 1C we identify the geographic region of an institution by using FactSet item “ISO_country”, which reports the country in which a security is domiciled. We do not use the fund country of incorporation since “ISO_country” better matches the location of the entity headquarters provided by the variable metro_area that reports the metropolitan area of the fund headquarters. Continental Europe includes Malta and Iceland. Our FactSet data covers the year 2015.

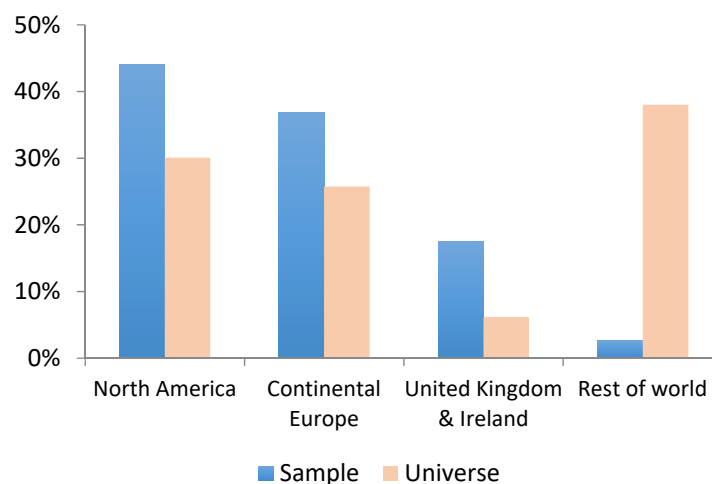
I.A. Figure 1A: Institutional investor type



I.A. Figure 1B: Assets under management



I.A. Figure 1C: Region



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