

Climate Risk Disclosure and Institutional Investors

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Abstract

Employing disclosure theory, we develop hypotheses regarding the preferences of institutional investors with respect to firms' climate risk disclosures. Through a survey and empirical tests, we test these hypotheses and provide systematic evidence suggesting that institutional investors value and demand climate risk disclosures, that climate-specific disclosure costs and benefits affect these demands, and that influence and selection effects explain the equilibrium relations between institutional ownership and disclosure. We establish evidence on the influence and selection effects of the climate risk disclosures by examining the French Article 173, the investor coalition Climate Action 100+, and the UK mandatory carbon disclosure regulation.

Keywords: Climate risks, disclosure, non-financial reporting, institutional investors

JEL Classifications: G11, G3, Q54

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Financial market efficiency relies on timely and accurate information regarding firms' risk exposures. However, many believe that investors lack sufficient information on an increasingly important and pertinent risk, climate risk. High-quality information on firms' climate risk exposures is critical for informed investment decisions as well as the appropriate pricing of these risks and their related opportunities (Litterman 2016; Krueger, Sautner, and Starks 2020). Moreover, with climate change increasingly considered to be a danger to the financial system, sound disclosure on climate risks is essential for regulatory efforts to protect financial stability, as pointed out by regulators in the UK, US and EU.¹

Because of the perceived shortcomings in climate risk disclosures, initiatives have developed to encourage or mandate improved reporting on these risks. These initiatives, such as the Task Force on Climate-related Financial Disclosures (TCFD), investor letters to CEOs (Blackrock 2021), or government-mandated disclosures as already occurring in New Zealand, the UK or France and recently called for by the G7, reflect a belief that climate risk information is valuable and necessary for investment decision-making.²

However, the fact that many firms still do not provide the disclosures voluntarily suggests there exist counterbalancing considerations. As pointed out in reviews by Goldstein and Yang (2017) for financial information, and Christensen, Hail, and Leuz (2021) for non-financial information, although disclosure may have benefits, for example by increasing stock liquidity, reducing a firm's cost of capital, or making the pricing of risks more efficient, disclosure may also impose unwarranted costs on a firm. For example, in the climate context, disclosure on climate risks could reveal proprietary information about a firm's future strategy and current operations. Further, Bond and Goldstein (2015) show theoretically that if firm managers rely on market prices to learn, there may exist a cost to divulging too much information that can affect the prices.³ In a climate context, however, given the uncertainties surrounding the effects of climate change and the expected governmental responses,

¹ See Carney (2015), Davidson (2021), or European Central Bank and European Systemic Risk Board (2021).

² See Carbis Bay G7 Summit Communiqué (2021).

³ The authors' setting is with governments as the decision maker, but the authors point out that their results would also apply to firm management and boards of directors.

corporate managers may rely more than in other circumstances on learning from market prices. Moreover, Goldstein et al. (2021) show that mandated disclosure of non-pecuniary information may affect the pricing of financial information.

Consistent with these diverging perspectives on climate reporting and its benefits and costs, little systematic evidence exists regarding the extent to which institutional investors actually attribute value to firms' climate risk disclosures. Institutional investors have the potential to play a pivotal role in climate finance – their pressure is considered to be the most powerful financial mechanism to reduce firms' climate risk exposures according to the investors and academics surveyed by Stroebel and Wurgler (2021). This pressure is likely to extend also to climate-related disclosures.

In this paper, we employ concepts from theories of corporate disclosure to develop hypotheses regarding the preferences of institutional investors with respect to climate risk disclosures. Our hypotheses take into account that climate reporting differs from financial reporting. We then test these hypotheses using several approaches. Employing climate risk disclosure data from CDP (formerly called the Carbon Disclosure Project) for an international sample, and from 10-K annual reports for US firms, we examine the relation between disclosure measures and holdings of institutional investors. We also employ shocks to the firms' and investors' climate-related regulatory and operating environments to more closely examine disclosure-related influence and selection effects of the institutional investors.

We preview these empirical tests with insights from a survey of institutional investors regarding their opinions about climate disclosure. The survey serves the purpose of validating key hypotheses tested in the data and of adding insights difficult to research through archival methods. Our global respondent group consists of important decision makers at some of the world's largest investors: about one-third of the 439 respondents works at the executive level and 11% work for institutions with more than \$100bn in assets under management.

The respondents share a strong belief that climate risk disclosure is important: 79% believe climate risk reporting to be at least as important as financial reporting, with almost one-third considering it to be more important. At the same time, the respondents state that the current disclosures are uninformative and imprecise. Investors from countries with high

environmental norms, very large (and arguably universal) investors, and investors that incorporate climate risks when investing because of legal obligations or fiduciary duties attach a greater importance to climate risk reporting. Such investors also show a stronger demand for climate risk reporting and a higher willingness to engage firms to demand such disclosures. Investors who believe that reporting is lacking judge there to be more climate-related overvaluation in equity markets. Better disclosure may in turn contribute to the more efficient pricing of climate risks. Assuming the disclosure is related to financial effects of climate risk, this implication is consistent with academic theory and practitioners' views.⁴

Constituting the core of our paper, we use the holdings and disclosure data to test a series of hypotheses linking institutional ownership to climate risk reporting in an international sample. Instead of considering broadly-defined institutional ownership, we partition institutional ownership and predict effects for specific groups of institutional owners that would plausibly reflect a stronger demand for more meaningful climate disclosure.

Our first measure captures ownership from countries where institutional investors are expected to follow stewardship codes designed to promote corporate sustainability. In order to follow these codes, these institutions need more information from their portfolio firms and they should in turn have a higher propensity to demand climate risk disclosure. The second measure we employ takes into consideration that the demand for climate reporting should be based in part on whether the investors are located in countries with norms to be more climate-conscious (Dyck et al. 2019). Finally, the third measure identifies disclosure demand by universal owners, who by virtue of their broad ownership across many firms face externalities in their holdings.⁵ These investors can benefit if climate risk disclosure mandates pressure firms to reduce carbon emissions, i.e., reducing the externalities they face. We label these three measures of institutional investor ownership as "climate-conscious." Given the theoretical literature that suggests that voluntary climate disclosure can have unwarranted

⁴ See Goldstein and Yang (2017) or the statement by Michael Bloomberg, Chair of the TCFD, that "*increasing transparency makes markets more efficient, and economies more stable and resilient.*" (<https://www.fsb-tcfd.org/>). If the disclosure is related to non-pecuniary information regarding climate risk, Goldstein et al. (2021) show that these statements about the relation between transparency and market efficiency may not hold.

⁵ As defined by Hawley and Williams (2000), a universal owner is a large institutional investor with three attributes: owning a broad cross-section of the economy, holding shares for the long term and not trading often, making them exposed to firms' externalities.

costs to firms and that our survey indicates institutional investors value such information, we expect that higher ownership by the climate-conscious groups of investors would be associated with a greater tendency for the firm to voluntarily disclose climate risks.

We use several measures to capture climate risk disclosures. First, we identify whether firms disclose their Scope 1 carbon emissions to CDP. Scope 1 emissions derive from sources directly owned or controlled by firms, and thus, serve as a proxy for regulatory climate risks (Ilhan, Vilkov, and Sautner 2021; Bolton and Kacperczyk 2021a). Second, we use a measure of disclosure on broadly-defined climate risks developed by Flammer, Toffel, and Viswanathan (2021). This measure is based on whether firms identify and disclose information on three climate-related risks to CDP: regulatory, physical, and other risks. Third, to capture the overall quality of a firm's CDP climate risk disclosures, we employ a score that measures the completeness of a firm's CDP survey responses.

All of these CDP-based measures of climate disclosure are positively and significantly associated with each of our three measures of climate-conscious ownership. Universal ownership most strongly predicts disclosures (always at the 1% significance level), but we also find meaningful associations between disclosure and the other measures of the presence of climate-conscious owners. In terms of magnitudes, a one-standard deviation increase in universal ownership implies an increase in the Scope 1 disclosure rate by 6 percentage points (pp), or 23% of the variable's mean. In addition, a one-standard deviation increase in ownership from high-norms country investors comes with an increase in the disclosure measure by Flammer, Toffel, and Viswanathan (2021) by 0.06 or 12% of the variable's mean.⁶

In complementary tests, we extend the CDP disclosure measures along two dimensions. First, we measure whether CDP-disclosing firms verify their emissions by third parties, and whether they break down the emission origins by country. The findings from these tests are consistent with the earlier tests. Second, we use measures of climate risk disclosures for US firms based on the SEC Form 10-K. We employ the methodology from Matsumura, Prakash, and Vera-Muñoz (2021) of counting the presence of climate-related keywords in the 10-K

⁶ For all estimates, we control for the proxy of financial disclosure quality proposed by Chen, Miao, and Shevlin (2015) as investors who demand more climate risk reporting may favor greater financial reporting in general.

filings. We find that climate-conscious ownership is unrelated to the count-based measure. In addition, we use data from Kölbel et al. (2021) who use machine learning to determine whether 10-Ks discuss climate risks and for this measure find significant effects, but only for the universal ownership variable.⁷

We extend our baseline findings by leveraging the fact that climate risk reporting should depend on the costs and benefits of producing such disclosures (Goldstein and Yang 2017; Christensen, Hail, and Leuz 2021). While the disclosure costs should be considered by firms and their investors, that is, in the supply and demand of the information, some disclosure benefits are not fully internalized by firms and accrue only for (some) investors.

Climate risk disclosures are associated with proprietary costs if they reveal confidential information about a firm's strategy to competitors (Verrecchia 1983). We test for the role of proprietary disclosure costs by exploiting that such costs are larger when firms operate in more competitive environments (Verrecchia 1990). The demand for climate risk disclosure by climate-conscious institutions should in turn be smaller for firms facing more competition. Climate risk disclosure can further be costly as firms need to collect, compile, and report information (Christensen, Hail, and Leuz 2021). Different from financial reporting, firms may lack the structures or processes to efficiently produce the required climate risk data. Such information production costs likely have a significant fixed cost component, implying that larger firms should find it less costly to produce the information and thus face stronger demand for climate risk disclosures by climate-conscious investors. Lastly, an externality benefit of climate reporting is that it can increase firms' accountability regarding climate change, which has been shown to reduce their climate externalities on society (Tomar 2021; Downar et al. 2021; Jouvenot and Krueger 2021). Hence, we predict the demand for climate disclosure by climate-conscious institutions to be larger for firms in high-emission industries.

Our evidence demonstrates that the disclosure demand by climate-conscious

⁷ These weaker results could in part be caused by the generally less-structured and less-standardized climate disclosures in 10-Ks, possibly because these disclosures are more easily greenwashed compared to CDP disclosures. Our survey corroborates this interpretation, with our respondents emphasizing a lack of standardization and uninformative data as problems of mandatory disclosures such as 10-Ks. This interpretation is supported by the evidence in Bingler, Krauss, and Leippold (2021) that climate risk reporting in annual reports is mostly cheap talk with firms cherry-picking the information they provide.

institutions is indeed affected by climate-specific disclosure costs and benefits. Consistent with our prediction, the effect of climate-conscious ownership on climate disclosure is moderated among firms with high proprietary costs, and it is magnified among large firms with relatively lower information production costs. Further, as predicted, climate-conscious ownership more strongly affects climate disclosure among firms in high-emission industries.

The estimated relationships could exist for two non-mutually exclusive reasons. Climate-conscious institutions may actively engage firms to demand that they voluntarily produce such information (influence effect), or climate-conscious institutions could have a propensity to invest in firms that already provide such disclosures (selection effect). We explore three settings to understand whether the relationship between climate-conscious ownership and climate reporting originates from either of these types of effects.

We start by exploiting a new regulation in France, Article 173, which requires French institutional investors to disclose the climate risks of their portfolio assets. As a result of the rule, firms owned by many French institutions should experience a plausibly exogenous shock to the demand for climate risk disclosures. Indeed, we demonstrate for firms owned by many French institutions that their disclosures improve in response to Article 173.

We then estimate disclosure effects from being targeted by Climate Action 100+, an investor coalition which aims to enhance climate risk reporting of the world's largest carbon emitters. As the quality of the disclosures is an explicit goal of the coalition, we pay particular attention to this reporting dimension. At the intensive margin, engagement by the coalition improves the quality of the targets' emissions disclosures – these firms more frequently verify their emissions after being targeted. At the extensive margin, however, we observe no improvements in Scope 1 disclosures.⁸

These two settings support an interpretation whereby institutions influence firms to improve their reporting. To evaluate selection effects, we consider a shock to the supply of climate-related information in the UK. In 2013, the country passed a law requiring listed firms to disclose carbon emissions in their annual reports. Apart from making emissions public, the

⁸ The targeted firms are highly-visible carbon emitters that may have experienced pressure to disclose emissions prior to being targeted by Climate Action 100+. Thus, it is possible that the firms with bearable disclosure costs had already reported their emissions.

law made these data more comparable by mandating standardized disclosures. We find that climate-conscious institutions significantly increased investments in previously non-disclosing firms mandated by the law to increase their climate disclosures.

Overall, we conclude that climate risk disclosures are the results of investors actively demanding more information, but also that these disclosures lead to increased investments by institutions that value such disclosures. An understanding of the equilibrium level of climate reporting in turn requires the consideration of influence and selection effects.

Our paper contributes several novel findings to the literature on voluntary disclosure (Bond and Goldstein 2015; Jayaraman and Wu 2019, 2020), and specifically to the literature on non-financial reporting, of which climate risks are the most important current component (Leuz and Wysocki 2016, Goldstein and Yang 2017, and Christensen, Hail, and Leuz 2021 review the disclosure literature). Most closely related to our work is Flammer, Toffel, and Viswanathan (2021) who find that activism by long-term institutional investors increases their portfolio firms' climate risk disclosures to CDP. While our work is complementary to that of Flammer, Toffel, and Viswanathan (2021), it is also fundamentally different as we examine investor heterogeneity across the climate-conscious investor dimension; we consider the role of influence and selection effects in three unique settings; we validate our insights with a survey instrument; and we provide global evidence.

We also contribute to the broader literature on climate disclosure. Matsumura, Prakash, and Vera-Muñoz (2014) conclude that markets discount firms that do not disclose emissions through CDP, although Griffin, Lont, and Sun (2017) suggest that the differences may not arise from CDP disclosure. Bolton and Kacperczyk (2021b) find that Scope 1 disclosures lead to lower returns and divestments by institutional investors (which they argue is due to exclusionary screening based on *disclosed* emissions). Matsumura, Prakash, and Vera-Muñoz (2021) analyze 10-K climate disclosures and find that disclosers have lower costs of equity, Kölbel et al. (2021) show that 10-K climate disclosure affects CDS spreads, and Berkman, Jona, and Soderstrom (2021) find that a 10-K measure of climate risk negatively correlates with firm value. Our paper is also related to Solomon et al. (2011) who interview investors revealing that they use private channels of discourse with firms to compensate for

the inadequacies of climate reporting, and Ramadorai and Zeni (2021) and Bolton and Kacperczyk (2021c) who use CDP data to infer firms' emission abatement plans or net-zero commitments. Focusing on the oil and gas industry, Eccles and Krzus (2019) examine the extent to which firms disclose information in line with the TCFD recommendations. Climate effects of institutional owners are explored in Azar et al. (2021) who find that Big-3 ownership is associated with emission reductions, and in Kundu and Ruenzi (2021) who show that firms that experience increases in climate-conscious ownership reduce emissions in the longer run.

In terms of our specific settings, we relate to Krueger (2015) who shows beneficial valuation effects resulting from the UK carbon disclosure regulation, Jouvenot and Krueger (2021) who use the same setting to document emission reductions for UK firms relative to non-UK control firms, and Bolton and Kacperczyk (2021b) who find that the UK reform reduced stock-level uncertainty. Mésonnier and Nguyen (2021) show that Article 173 reduced the financing of fossil fuel firms by institutions subject to the new law.

1. Hypothesis Development

1.1 Institutional Ownership and Climate Risk Disclosure

Our first hypotheses link institutional ownership to climate risk reporting, taking into account that climate reporting differs from financial reporting (Christensen, Hail, and Leuz 2021). Notably, climate-related reporting targets a wider audience, is multidimensional, is difficult to measure in monetary terms, is hard to compare and standardize, can have costs for firms, but is also argued to have externality benefits beyond a firm. These aspects affect the demand for such information more for some institutional investors. Thus, instead of considering broadly-defined institutional ownership, we develop measures that plausibly reflect a stronger demand for climate risk reporting by certain types of investors (Dasgupta, Fos, and Sautner 2021 highlight the importance of addressing such heterogeneity).

The first measure captures institutional ownership from countries with stewardship codes that develop principles for institutional investors with regard to their portfolio firms. Stewardship codes relate to the oversight role of institutions to create long-term value for their clients or beneficiaries, and they aim to promote corporate sustainability. Investors

subject to stewardship codes should consequently have a higher propensity to demand climate risk disclosure from portfolio firms.⁹

The second measure captures disclosure demand due to environmental norms in an institutional investor's home country. In Williamson's (2000) framework for institutional influences in economic activity, the most fundamental are social norms and cultural influences. Similarly, Guiso, Sapienza, and Zingales (2006) discuss the link between economic and culture outcomes, which they define as "*those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.*" Further, Dyck et al. (2019) show that investors from countries with high environmental norms actively improve firms' ESG policies. Thus, we expect that demand for climate reporting is based in part on whether investors are from countries with more climate-conscious norms.

The third measure captures ownership by universal owners, building on the idea that the benefits of climate risk disclosure are not reaped equally across investors. Specifically, climate reporting can enhance the accountability of firms, which in turn can cause the firms to reduce their emissions and the corresponding negative externalities on other firms or society more generally (Christensen, Hail, and Leuz 2021). These benefits likely matter most for universal owners as they are long-term investors owning large parts of the economy and thus subject to climate externalities. Consequently, firms with greater ownership by universal owners would be expected to experience stronger demand for climate risk disclosure.

For the sake of brevity, we label these three groupings of institutional investors as "climate-conscious" investors.

1.2 Costs and Benefits of Climate Risk Disclosure

Reporting on climate risks can have benefits but also costs to a firm and its investors. As pointed out by Goldstein and Yang (2017) for disclosure in general, and Christensen, Hail, and Leuz (2021) for CSR disclosure, the demand and supply of climate risk disclosure depends on these costs and benefits. Our next hypotheses take into account the role of climate-specific

⁹ While stewardship codes do not formally require compliance with their principles, institutions that do not comply with them need to explain publicly why they did not follow a specific recommendation of the code. Compliance is therefore usually high. Shiraishi et al. (2019) provide international evidence demonstrating that stewardship codes are effective by enhancing the monitoring activities of institutional investors.

disclosure costs and benefits.¹⁰ While the disclosure costs should be considered by firms and their investors, that is, in their supply and demand of the information, some of the disclosure benefits are not fully internalized by firms and accrue only for (some) investors.

An indirect disclosure cost arises because disclosure can result in proprietary costs to the firm (Verrecchia 1983; Berger, and Hann 2007; Ellis, Fee, and Thomas 2012). For example, climate risk disclosure could reveal proprietary information about a firm's strategy to its competitors. This issue has been pointed out consistently by firms and other observers. For example, Google reportedly would not reveal its carbon footprint because of trade secrecy and similarly, a group of oil and gas firms that were trying to abide by the TCFD recommendations maintain that contractual, practical or legal reasons could prohibit them or limit their scope for revealing disaggregated information about climate risks (WBSCD 2018). Moreover, Griffin and Jaffe (2018) point out that these indirect costs of disclosure can be significant – that disclosing such confidential information, which would be available to rivals, *“could be particularly burdensome.”* An example of a further cost to firms is that disclosure on physical climate risks in the supply chain could cause upstream firms to switch suppliers (Pankratz and Schiller 2021). These costs can be particularly high for detailed disclosures. Internet Appendix A1 provides further anecdotal evidence on these costs.

To test for the role of proprietary disclosure costs, we build on evidence that product market competition is pivotal for the magnitude of such costs, and that competition reduces the propensity to make proprietary disclosures (Verrecchia 1990). This suggests that the proprietary costs should be higher for firms operating in more competitive markets, and the demand for disclosure by climate-conscious institutions should be smaller when firms face more competition.

Climate risk disclosure is also costly because of the need to develop new processes and structures to collect, compile, and report the relevant information (see Internet Appendix A2 for anecdotal evidence). As these information production costs are likely to have a large fixed cost component, they should be considered less burdensome for larger firms (Christensen,

¹⁰ Climate disclosure, as other disclosure types, may have other costs and benefits. On the benefit side, it may improve liquidity, lower the costs of capital, improve risk sharing, or facilitate monitoring. On the cost side, it may crowd out information acquisition, reduce risk sharing, or increase return volatility.

Hail, and Leuz 2021). We therefore expect the demand for climate risk information by climate-conscious institutions to be greater for larger firms with relatively lower information production costs.

Beyond the costs there can also exist specific benefits from climate risk disclosure. A particularly relevant benefit for some investors is that the disclosure could increase pressure on firms to reduce the reported carbon emissions, which has been shown to lead to a reduction in the negative externalities generated on other firms and the environment more generally (Tomar 2021; Downar et al. 2021; Jouvenot and Krueger 2021). This externality benefit implies that the disclosure demand by climate-conscious institutions should be larger for firms in high-emission industries.¹¹

2. Climate Risk Disclosures and Institutional Investors: Survey Evidence

In this section, we preview the analysis using disclosure and ownership data with insights from a survey to corroborate our hypotheses and to provide results that cannot be obtained from the archival data. Surveys are increasingly used in the ESG literature (McCahery, Sautner, and Starks 2016; Krueger, Sautner, and Starks 2020; Amel-Zadeh and Serafeim 2018).

2.1 Survey Design

Our survey was developed through an iterative process and distributed through four channels, yielding a total of 439 responses. Internet Appendix B1 provides details on the design and delivery. Table 1, panel A, reports summary statistics of the survey-based variables that we employ in our tests.¹² Definitions are provided in the Data Appendix. We are confident that in the vast majority of cases we have only one observation per institution.¹³

We assess the role of non-response bias by comparing key characteristics of the

¹¹ Beyond, the externality benefit, disclosure among high carbon emitters could allow for better pricing and hedging of climate risks by the firms where the risk is particularly eminent. Further, it might be important for a firm operating in a high-emission sector to signal to investors that it has lower emissions relative to sector peers. Both factors should also increase the disclosure demand by climate-conscious investors in high-emitting firms.

¹² IA Table 1 documents that about one-third of respondents hold executive-level positions in their institutions. Respondents work for asset managers (23%), banks (22%), pension funds (17%), insurance companies (15%), and mutual funds (8%). Eleven percent are employed by institutions with assets of more than \$100bn, and the respondents' institutions are headquartered around the world.

¹³ For 87% of the observations, key identifying characteristics do not coincide. In the other cases, we cannot exclude the possibility that respondents work for the same institution. We exploit these cases below to evaluate disagreement in the responses of individuals possibly working for the same institution.

responding investors to those of the institutional investors in the FactSet population.¹⁴ Although our respondents may be biased toward investors with a high ESG awareness (given the high median ESG share of 30% and that such investors may be more disposed to participate in our survey), responses of such investors are particularly important, because they are more likely to shape future climate disclosure policies through engagement, industry initiatives, or lobbying with regulators. Moreover, given that 27% of investors manage more than \$50bn, they have the clout to be effective in their efforts.¹⁵

2.2 Investors' Views on Climate Risk Disclosures

In light of the hypothesized benefits and costs of climate reporting, the importance that institutional investors attribute to this reporting is ambiguous. To evaluate the ambiguity, we asked the survey participants to indicate how important they consider the reporting on firms' climate risks relative to the reporting on financial information. Figure 1 shows that 79% of respondents believe that climate risk disclosure is at least as important as financial disclosure, with almost one-third considering it to be more important.

The fact that climate risk disclosures are considered important for the majority of the respondents raises the question of how they perceive the quality of the current disclosure practices. Table 2, panel A, shows a widespread view that existing climate disclosures are uninformative. Specifically, many respondents believe that management discussions on climate risks (68% agree or strongly agree) and quantitative information on these risks (67% agree or strongly agree) are imprecise. This suggests that the current voluntary reporting regime does not enable fully informed climate-related investment decisions (this could be a reason why climate risks are difficult to price in equity markets, an issue we address below). Indirectly, the responses further imply that many firms do not consider the net benefits of climate risk reporting to be sufficiently high, as they would otherwise reveal such information

¹⁴ This approach follows Karolyi, Kim, and Liao (2019). IA Figure 1 shows that pension funds and banks are overrepresented in our sample, while mutual funds and asset managers are underrepresented. Our respondents are more likely to work for institutions in North America and Europe.

¹⁵ A related concern could be that some of the respondents answered the survey untruthfully. To mitigate this concern, in the survey introduction we guaranteed their anonymity, we did not request their identities (or those of their employers), and we collected only limited information on their positions and institutions. Internet Appendix B2 discusses concerns over non-response and acquiescence bias in detail.

voluntarily and with better quality. At the same time, many investors value such information, as indicated by their responses, believing that the benefits of disclosure outweigh the costs at a typical firm.

The diverging perspectives between firms and their investors raise the question of whether mandatory and standardized reporting is needed. In general, the rationale for mandatory disclosure regulation requires the existence of externalities or market-wide cost savings that regulations can mitigate (Shleifer 2005). A firm's contribution to climate change is such an externality. Further, standardization would make it less costly for investors to acquire and interpret information relevant to evaluating a firm's climate risks. Mandatory disclosure could also provide commitment and credibility for firms' climate disclosures, especially if the standards are specific and well enforced (Christensen, Hail, and Leuz 2021).

Indeed, Table 2, panel A documents that many investors believe that standardized and mandatory climate risk reporting is necessary (73% agree or strongly agree). However, a significant challenge for changing the current reporting environment seems to be that standardized disclosure tools and guidelines are not yet widely available (61% agree or strongly agree), and that those that exist are uninformative (64% agree or strongly agree). These views are consistent with recent initiatives that provide explicit disclosure tools and guidelines. Notably, part of the TCFD recommendations center on how climate risks are reflected in metrics and targets. These recommendations are currently voluntary, but they could eventually constitute the basis for mandatory disclosures in many countries.

As a result of current disclosure shortcomings, some investors have developed initiatives beyond the TCFD to improve access to climate risk data (e.g., Climate Action 100+). Consistent with such initiatives, Table 2, panel A, shows that many respondents hold the belief that investors should put pressure on firms to disclose more on their climate risks (74% agree or strongly agree). In addition, in Table 2, panel B, 59% of investors engage or plan to engage firms to report according to the TCFD recommendations. These responses strongly indicate that many investors have a demand for climate risk disclosure, as hypothesized in Section 1. We will provide evidence that this demand leads to more disclosure by firms.

Finally, we surveyed the investors' opinions regarding reporting climate risks for their

own portfolios (as required by the French Article 173). In Table 2, panel B, our respondents indicate support for this approach with 60% stating that they (plan to) disclose their portfolio carbon footprints. Guided by these responses and the resultant need for data, we test below whether Article 173 increased disclosures of firms owned by many French institutions.¹⁶

Overall, our responses support key elements of our hypotheses by indicating a strong demand for climate risk disclosure by institutional investors, and by suggesting that many investors are willing to actively engage firms to increase such disclosure.

2.3 Explaining Investors' Views on the Climate Risk Disclosures

As hypothesized, we expect that views on climate risk disclosure are based in part on whether investors are subject to stewardship codes in their home countries, are located in countries where norms make them more climate-conscious, or are universal investors.

In the survey analysis, we proxy for whether an institution is subject to stewardship codes (or similar rules) based on a question in which the respondents were asked whether their institutions have to incorporate climate risks in the investment process because of legal obligations or fiduciary duties. *Fiduciary duty institution* equals one if a respondent strongly agrees to this statement, and zero otherwise. To quantify country norms, we follow Dyck et al. (2019) and use the Yale University's Environmental Performance Index (EPI) to measure environmental awareness across countries. The variable *HQ country norms* takes larger values for investors from countries with a stronger common belief in the importance of environmental issues (EPI value is greater than or equal to the median in a year). Finally, we define a *Very large institution* to be equal to one for responses from an institution with more than \$100bn in assets under management, and zero otherwise. Very large investors tend to be universal owners whose broad-ranging ownership, as argued in Section 1, makes them more susceptible to the externalities engendered by climate change. We thus expect them to be more interested in climate risk disclosures and demand that firms produce them.

¹⁶ Our data allow us some (limited) examination of within-institution disagreement in the responses. Using basic identifying characteristics, we identify 35 respondents possibly working at the same 15 institutions (at most four per institution). For these respondents, the explanatory power of respondent-institution fixed effects (adjusted R^2) is largest for the panel B responses (49% for the TCFD question, 67% for the disclosure question); for the Figure 1 and panel A responses, the mean adjusted R^2 is 23%. Within-institution disagreement is hence lowest for the less subjective questions that are driven by observable behavior of the institutions.

We include several controls when relating these three variables to the respondents' views on climate risk disclosure. *Climate risk ranking* captures how the respondents rank climate risks relative to traditional investment risks.¹⁷ *Climate risk financial materiality* ranges between one and five with larger values reflecting that climate risks are considered to be more financial materiality (we average the responses to questions about the materiality of regulatory, physical, and technological risks). *ESG share of portfolio* is the fraction of assets under management that is subject to ESG principles. We control for an investor's horizon as longer-term investors may particularly value climate risk disclosure (Starks, Venkat, and Zhu 2020; Flammer, Toffel, and Viswanathan 2021). Finally, we account for fixed effects for the respondents' positions, the survey distribution channels, and investor types.¹⁸

Table 3, panel A, reports the results. We estimate OLS regressions but results are unaffected when we use (ordered) logit models instead. The dependent variable in column 1 is the perceived importance of climate risk disclosure (larger values indicate that climate risk reporting is relatively more important). The estimates show that more importance is placed on climate risk reporting by investors that incorporate climate risks in the investment process for legal/fiduciary reasons, by investors from countries with higher environmental norms, and by very large (potentially universal) investors. Beyond the ownership classifications, investors who consider climate risk to be more important and more financially material, also think climate reporting is more important. In the remaining tests, the fiduciary duty investors also believe that current quantitative information on climate risks is imprecise and that investors should demand better disclosure. Further, investors from high-norms countries are more likely to engage firms to demand reporting according to the TCFD recommendations and very large institutions are more likely to disclose their carbon footprints. Overall, Table 3, panel A, validate some key assumptions in our hypotheses development.

2.4 Investors' Views on Climate Risk Disclosure and Climate Risk Mispricing

An important role for climate risk disclosure is in correcting asset mispricing for climate risks, which evidence shows may be present in equity markets (Hong, Li, and Xu 2019). Daniel,

¹⁷ The variable ranges between one (climate risks are the least important risk) and six (most important risk).

¹⁸ In an unreported analysis of variance, these fixed effects play only a modest role in explaining the responses.

Litterman, and Wagner (2018) develop a model in which uncertainty about the effect of emissions on temperature (and on eventual damages from climate change) gradually resolves over time. A mechanism through which this uncertainty disappears is via climate risk disclosures. As firms evaluate climate risks and make their assessments public, equity prices converge towards their fair valuations through the harmonization and comparability benefits of disclosures (Jouvenot and Krueger 2021).

To measure beliefs about equity mispricing, in our survey we allow investors to indicate whether they think that equity valuations in 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). We then create for each respondent *Climate risk underpricing*, which averages all positive mispricing scores across sectors (negative scores are set to zero). The variable hence captures the extent to which a respondent believes that climate-related overvaluation exists.¹⁹

In Table 3, panel B, we report regressions to explain perceptions about climate risk mispricing. The results show that perceptions of mispricing are higher for investors that attribute more importance to climate risks, who believe that management discussions or the available quantitative information about climate risks are imprecise, who more strongly agree that investors should demand climate risk disclosure, or who engage firms on either the TCFD recommendations or disclosing carbon footprints. Overall, the respondents' beliefs about the importance, quality, and demand for climate risk disclosure are associated with a perceived underpricing of climate risks. An implication is that better disclosure may contribute to a more efficient pricing of the risks. This insight is difficult to obtain from other types of data.

3. Climate Risk Disclosure and Institutional Ownership

In this section, we employ data on firms' climate disclosures and their institutional investor shareholdings to test our hypotheses regarding institutional investors' preferences for disclosure. We also test hypotheses on the costs and benefits of climate-related disclosure.

¹⁹ The average respondent believes that equity valuations in the average sector do not fully reflect the risks from climate change, as the mean of *Climate risk underpricing* exceeds zero (Table 1, panel A). As IA Figure 2 shows, the mean overvaluations are highest in the oil and automotive sector.

3.1 Carbon-related Disclosure Data from CDP

Our disclosure data derive from CDP, which conducts an annual survey of firms on behalf of institutional investors and other stakeholders. CDP requests that firms voluntarily produce the climate-related data. One complication arises because CDP does not reveal which firms they contact for participation in the survey, thus making it difficult to identify whether a missing observation is due to a firm's refusal to participate in the survey, or because a firm was not requested to participate. To remedy this issue, we follow the approach suggested in Krueger (2015), which builds on the idea that CDP typically requests information from the largest publicly listed firms in a country. Therefore, we create a sample of firms that CDP likely contacted based on their size relative to other firms in their countries. IA Figure 3 shows the sample country distribution of our "universe" of firms.

We use multiple complementary measures of climate risk disclosures from the CDP data over the 2010 to 2019 sample period: a measure of whether a firm discloses their carbon emissions, a measure of the types of climate risks the firm discloses, a CDP-assigned score regarding the completeness of the firm's disclosures, and two measures of the quality of the carbon disclosures (among CDP disclosers). Not all of these measures are available for every sample year because CDP added or deleted some questions over time. CDP also modified for some questions the response categories, making a reliable comparison across years difficult. We indicate for which years the respective variables are available.

CDP requests that firms report Scope 1, Scope 2, and Scope 3 emissions.²⁰ Our tests use *Scope 1 disclosure*, which is one if a firm discloses these emissions to CDP in a year, and zero otherwise. The variable is available for all sample years. Table 1, panel B, shows that Scope 1 emissions are disclosed in 26% of sample firm-years.

To capture disclosure on climate risks more broadly, we adopt a variable used by Flammer, Toffel, and Viswanathan (2021) which leverages the fact that CDP asks firms to

²⁰ Scope 1 emissions are direct emissions from owned or controlled sources of the disclosing firm. 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). Firms that report on one emission type usually report on other emission types as well. In our sample, the correlation between Scope 1 and either Scope 2 or Scope 3 disclosures are above 96%, and we find similar results if we use either Scope 2 or Scope 3 as alternative emissions measures.

disclose information on regulatory, physical, and other risks. *Climate risk disclosure* can take four values: zero if no information on the risks is disclosed; one if information on one risk type is disclosed; two if information on two risk types is disclosed; and three if information on all three risk types is disclosed.²¹ We construct the measure from 2010 to 2016 (from 2017 onwards, the structure of the question changed), and we provide complementary tests for *Regulatory*, *Physical*, and *Other risk disclosure* (each variable equals one if information on the respective risk is disclosed, and zero otherwise). Table 1, panel B, shows that these three risks are disclosed in 17% to 19% of the firm-years. The mean of *Climate risk disclosure* is 0.5, and the correlation with *Scope 1 disclosure* is 70% (IA Table 2, panel A).

To capture the overall quality of firms' climate disclosures, we use a climate disclosure score computed by CDP to measure the completeness of a firm's survey responses. CDP allocates points to each survey question depending on the amount of data requested, and the *Climate disclosure score* reflects the fraction of the answered questions. The score is multiplied by 100, such that the variable can range from 0 to 100. The score is available from 2010 to 2015 as it was replaced in 2016 with a revised score that conflates climate disclosure quality with climate performance (e.g., in the revised score, lower reported emissions lead to higher disclosure scores). The average score across all firm-years is 16.

For CDP disclosers, we create two further measures for the quality of the disclosed emissions. First, *Scope 1*, *Scope 2*, and *Scope 3 verification* each equal one if the reported emissions in each category are externally verified. CDP added these questions in 2011. Second, *Scope 1 (Scope 2) country breakdown* equals one if a firm provides a country breakdown of its Scope 1 (Scope 2) emissions. (A question on Scope 3 breakdowns does not exist.) Emission breakdowns are useful for investors that want to evaluate the impact of carbon risks across the countries in which a firm operates (emission regulation is usually at the production source). Among CDP disclosers, Scope 1 emissions are verified in 69% of firm-years, and Scope 1 country breakdowns are provided in 65% of firm-years.

To disentangle the effects on climate reporting from a broader financial reporting

²¹ For regulatory risks, firms report on carbon taxes, cap and trade schemes, or product efficiency regulations. For physical climate risks, they disclose uncertainty on natural disasters or long-run changes in temperatures. Other risks include climate-related reputational costs or changes in consumer behavior.

preference, we control for the measure of financial disclosure quality proposed by Chen, Miao, and Shevlin (2015). A benefit of their measure is that it can be constructed for the full sample. As in their paper, we count the number of non-missing Compustat line items, and scale the resultant count by the number of possible line items to capture the completeness of firms' reports. We use the completeness of the income statement, as we find this variable to be more strongly correlated with institutional ownership than a balance sheet measure.²²

3.2 Climate Risk Disclosure Data from 10-Ks

For complementary tests, we create text-based measures of climate risk disclosure in the 10-Ks of US sample firms. The measures build on the 2010 interpretive guidance by the SEC, which states that firms are expected to disclose material climate risks in their 10-Ks (SEC 2010).²³ The first measure follows Matsumura, Prakash, and Vera-Muñoz (2021) and is one if at least one of eight climate-related keywords occurs in a 10-K, and zero otherwise. Internet Appendix E contains details on the variable construction and a list of the keywords. (Results are unaffected if we use the keyword frequency.)

The second measure is based on data from Kölbel et al. (2021) who employ a contextual machine learning algorithm to determine the probability that a 10-K sentence is about climate risks. The authors apply the method on 10-K Item 1.A and aggregate the probabilities into a score. We create two dummies: the first measure equals one if the score is positive, and zero otherwise; and the second measure equals one if the score is above the median, and zero otherwise. The variables are available for a sample of US firms with credit default swaps.

3.3 Institutional Ownership Data

We use FactSet data to create three institutional ownership variables.

Stewardship code IO is the fraction of a firm owned by institutional investors from countries with stewardship codes. To determine whether an institution's home country has a

²² IA Table 3 shows that climate-conscious ownership is positively related to financial disclosure quality. Our regressions use country fixed effects to control for the data source (Compustat NA or Global), but we add a *Compustat NA firm* dummy (not reported) as the sample contains four North American firms that are in Compustat Global (e.g., Royal Caribbean Group).

²³ The guidance points to "Item 1 – Business," "Item 1A - Risk Factors," "Item 3 - Legal Proceedings," and "Item 7 – Management's Discussion & Analysis" as the most relevant sections to disclose climate risks.

stewardship code in place, we use data from Katelouzou and Siems (2021) who document the staggered introduction of these codes across countries.

High-norms IO captures the fraction of ownership by institutions from countries with high environmental norms as suggested by Dyck et al. (2019). We again use the data from EPI and the same procedure as in Section 2.3.

Universal owner IO reflects the fractional ownership by universal owners. To identify such owners, we use FactSet to rank institutions based on the number of firms they own in a year, and classify investors as universal owners if they rank in the top 1%. Beyond the Big 3, universal owners include a number of institutions such as AXA that are not primarily passive investors.

Table 1, panel B, shows that the three ownership variables vary between 9% and 15%, with considerable cross-sectional heterogeneity (standard deviations between 11% and 14%). IA Table 2, panel B, demonstrates that the measures, as would be expected, correlate positively, but the fact that correlations are between 60% and 74% reflects that they capture somewhat different aspects. We also create and control for three measures of the residual ownership by “non-climate-conscious” institutions.

3.4 Institutional Ownership and Climate Risk Disclosure: Baseline Results

We analyze the CDP data by relating climate risk disclosure to climate-conscious institutional ownership. For firm f in country c and year t , the baseline model is:

$$\text{Climate disclosure}_{f,c,t} = \alpha + \beta IO_{f,c,t} + \delta \mathbf{X}_{f,c,t} + \mu_f \times \vartheta_t + \gamma_c + \varepsilon_{f,t} \quad (1)$$

where $\text{Climate disclosure}_{f,c,t}$ represents *Scope 1 disclosure*, *Climate risk disclosure*, or *Climate disclosure score* (Section 3.1), $IO_{f,c,t}$ denotes *Stewardship code IO*, *High-norms IO*, or *Universal owner IO* (Section 3.3), and $\mathbf{X}_{f,c,t}$ contains control variables. We control for the residual ownership measures, financial characteristics, and the quality of financial disclosures. As climate risks vary across sectors and time, we include industry fixed effects (μ_f) interacted with year fixed effects (ϑ_t). Unless indicated differently, we include country fixed effects (γ_c) to account for cross-country differences. Standard errors are clustered at the country level.

In Table 4, we report the results in columns 1 to 3 for *Scope 1 disclosure*, in columns 4 to 6 for *Climate risk disclosure*, and in columns 7 to 9 for *Climate disclosure score*. As explained earlier, the observations differ across regressions as the three variables are available for different years. We indicate the sample periods in the table.

We find strong and consistent evidence that climate-conscious ownership positively relates to the decision to disclose emissions, overall climate risk disclosure, and climate risk disclosure quality. In terms of statistical significance, *Universal owner IO* most strongly predicts disclosure (always at the 1% level). In column 1, a one-standard deviation increase in *Stewardship code IO* is associated with a 3pp increase in the propensity to disclose Scope 1 emissions, or 12% of the variable's unconditional mean. Across all specifications, large firms, firms with higher dividend payouts, and growth firms disclose more.

In IA Table 4, we examine the disclosure of the three components of climate risk separately. *Universal owner IO* predicts disclosure of all three risk components (i.e., regulatory, physical, and other risks), while the effects of *Stewardship code IO* and *High-norms IO* originate mostly from disclosure of regulatory climate risk. The weaker effects for physical and other risks may be due to an investor belief that such risks materialize later compared to regulatory risks. Consistent with this notion, Krueger, Sautner, and Starks (2020) find that many investors think that regulatory risks have already started materializing, while physical and other risks are expected to materialize over longer horizons. The more immediate characteristics of regulatory risks may imply that disclosure about them is more important. The strong effects for *Universal owner IO* further indicate the importance of disclosure externalities, which matter the most for universal owners.

IA Table 5 replaces the CDP variables with the climate risk measures based on SEC Form 10-K. When the count-based disclosure measure of Matsumura, Prakash, and Vera-Muñoz (2021) is the dependent variable, we find no relationship to the ownership variables. For the measures from Kölbel et al. (2021), there are significant positive relations for *Universal owner IO*. The weaker results may be explained with the generally less-structured, less-standardized, and more-greenwashed climate disclosures in 10-Ks. Investors may in turn prefer the structured and standardized CDP disclosures. (In unreported results, climate-conscious

ownership remains positively and significantly related to carbon disclosures among US firms). This interpretation is consistent with our survey results in which the investors emphasized a lack of standardization and uninformative disclosures as problems of mandatory disclosure such as 10-Ks (Table 2, panel B). IA Table 2, panel A, also shows that the 10-K-based measures correlate only weakly with the CDP measures.

3.5 Costs and Benefits of Climate Risk Disclosure

We next consider that the demand for climate risk reporting by climate-conscious institutions should depend on the costs and benefits of making these disclosures. To test our predictions, we amend Equation (1) and allow the effects of the particular institutional ownership, $IO_{f,c,t}$, to vary across firms depending on the cost or benefit proxy:

$$\begin{aligned} \text{Climate disclosure}_{f,c,t} = & \alpha + \beta_1 IO_{f,c,t} \times Z_{f,c,t} + \beta_2 IO_{f,c,t} + \beta_3 Z_{f,c,t} + \delta X_{f,c,t} + \\ & \mu_f \times \vartheta_t + \gamma_c + \varepsilon_{f,c,t}, \end{aligned} \quad (2)$$

where $\text{Climate disclosure}_{f,c,t}$, and $IO_{f,c,t}$ are defined as above, and $Z_{f,c,t}$ is one of three proxies for the costs or benefit of climate reporting, varying at the firm or industry level, respectively.

To test for the role of proprietary costs, we interact $IO_{f,c,t}$ with the Hoberg and Phillips (2016) firm-level, text-based HHI measure for whether a firm operates in a competitive environment. Specifically, *High-competition firm* $_{f,c,t}$, is one if a firm operates in a competitive environment where the HHI is below the median in a year. For these tests, we have a smaller sample because the Hoberg and Phillips measure is only available for US firms. Since we predict proprietary disclosure costs to be higher for firms in more competitive markets, the demand for climate reporting by climate-conscious institutions should be smaller among such firms; this implies a negative estimate for the β_1 coefficient.

To test for the role of information production costs, we interact $IO_{f,c,t}$ with *Large firm* $_{f,c,t}$, which equals one if a firm's assets are above the median in a year, and zero otherwise. As information production costs are likely to have a sizable fixed cost component, they should be less relevant for larger firms. We in turn expect the demand for climate information by climate-conscious investors to be greater for larger firms, and predict a positive β_1 estimate.

Further, we predict that the demand for climate disclosure by climate-conscious investors should be greater for firms in high-emitting industries. We test this effect by interacting $IO_{f,c,t}$ with *High-emission industry_f*, which equals one if a firm operates in one of the twenty industries with the highest Scope 1 emissions. In these regressions, we predict that β_1 is positive.

Table 5 reports the results using interaction terms with *High-competition firm_{f,c,t}* in panel A, with *Large firm_{f,c,t}* in panel B, and with *High-emission industry_f* in panel C. All panels control for the variables of Table 4 with the exception of panel B, which does not include a control for *Log(Assets)* since it includes a size dummy.

Panel A support the prediction that proprietary costs affect the disclosure demand as the coefficients on *High-competition firm x IO* are negative across all disclosure variables and for all climate-conscious ownership variables. In column 1, the positive effect of *Stewardship-code IO* on *Scope 1 disclosure* is reduced by half among firms in competitive environments. Further, in panel B, we find that information production costs affect the disclosure demand, that is, climate-conscious ownership more strongly predicts climate reporting among larger firms. In column 6, for example, the effect of *Universal owner IO* on *Climate risk disclosure* almost doubles for large firms. Panel C also largely confirms the prediction of a stronger disclosure demand for firms in high-emitting industries, with six of the nine specifications providing positive and significant estimates for β_1 . Surprisingly, *Universal owner IO* only relates to *Climate risk disclosure*. Overall, Table 5 demonstrates that the climate reporting demand by climate-conscious institutions depends on the costs and benefits of the reporting.

IA Table 6 provides estimates without *IO* and the relevant interaction effects. Firms generally disclose less on climate risks if their proprietary costs are higher, and they disclose more if they are larger (information productions costs relatively lower). There is no evidence that industry-level emissions affect firms' disclosure decisions.

4. Shocks to the Demand and Supply of Climate Risk Information

The positive relationship between climate-conscious ownership and climate risk disclosure that we have documented could exist for two *non-mutually exclusive* reasons, both of which

may be relevant in practice. First, the relationship could exist because of influence effects, that is, climate-conscious institutions may actively engage firms to demand that they voluntarily produce climate risk information. Examples include recent investor initiatives such as Climate Action 100+, an initiative to ensure the world's largest carbon emitters take action on climate change, or the submission of shareholder proposals calling for firms to share more information on their climate policies.²⁴ Engagement by institutional investors to demand disclosure can originate from several sources: the investors' beliefs that the disclosure will inform their investment decisions, including the possibility that it will reduce climate risks in the portfolios, the investors' needs to publish data in their own filing requirements, or the investors' own clients' or beneficiaries' desires for such disclosures.

A second explanation derives from selection effects, that is, climate-conscious institutions are likely to invest in firms that provide better disclosures because they believe such firms are less risky or because their clients and beneficiaries impose such a constraint. We exploit shocks to the demand and the supply of climate risk information in order to gauge whether one or both of them better explain the findings. The shocks we employ are changes in regulatory settings that allow us to directly speak to the influence and selection effects.

4.1 French Climate Risk Disclosure Article 173

Shortly before the Paris Agreement, on August 17, 2015, France passed the *Energy Transition for Green Growth Act*. As part of this law, Article 173 requires French institutional investors to disclose their climate risk exposures. Though, formally, the regulation is on a "comply or explain" basis, compliance among French institutions is high (86% in 2017/2018 according to Novethic 2018). In order to comply with Article 173, French institutional investors would need information on their portfolio holdings, increasing their demand for climate risk disclosures. Consequently, we hypothesize that firms held by many French institutions should have increased their climate risk disclosures after Article 173 went into effect in January 2016.

²⁴ In some cases, when the subsequent disclosure in response to these proposals has still been deemed inadequate, investors called for voting against the entire board. 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.

Although the demand effect should impact firms with large French institutional ownership around the world, a corollary prediction is that it should be particularly strong for firms headquartered in France. First, French investors would presumably exercise more pressure on local firms, possibly because of domestic reputational concerns (Krueger, Sautner, and Starks 2020). Second, Article 173 also mandates that French-listed firms disclose their climate risks, which at first glance implies an additional supply reporting shock for local firms. However, the law allows large discretion for French firms in how to comply with the mandate, suggesting that they could simply provide boilerplate disclosures and exploit the large ambiguity about how compliance is enforced. Thus, the French institutional investors may act as catalysts to improve disclosure even among French firms.²⁵ Consequently, we predict that the climate disclosures of firms owned by many French institutions increases in response to the Article 173 relative to those of other firms. French institutions may engage firms on their own or as lead investors in investor coalitions, as documented for PRI in Dimson, Karakas, and Li (2021). The latter channel leverages the equity stakes of other investors and is, for example, used by Amundi, France's largest institutional investor (Amundi 2020).

To test our prediction, we estimate difference-in-differences regression (DiD) for firm f in country c and year t :

$$\begin{aligned} \text{Climate disclosure}_{f,c,t} = & \alpha + \beta_1 \text{Post Article 173}_t \times \text{French IO}_{f,c,t} + \beta_2 \text{Post} \\ & \text{Article 173}_t + \beta_3 \text{French IO}_{f,c,t} + \delta \mathbf{X}_{f,c,t} + \mu_f \times \vartheta_t + \gamma_c + \varepsilon_{f,c,t}, \end{aligned} \quad (3)$$

where $\text{Climate disclosure}_{f,c,t}$ is *Scope 1 disclosure* or *Climate risk disclosure*. (*Climate risk disclosure* is available only for one year, and *Climate disclosure score* is unavailable, after Article 173.) $\text{Post Article 173}_t$ equals one for 2016 and afterwards, and zero before. *French IO* denotes one of two measures of French institutional ownership: *French IO* is the percentage ownership by French institutions; and *High French IO* indicates whether French institutional ownership is above the sample median. Our coefficient of interest is β_1 , which captures how the disclosure of firms with high French ownership changes from before to after Article 173.

²⁵ As the evidence for French firms is more difficult to interpret, we focus on non-French firms to provide evidence for influence effects.

Some regressions include triple interactions to examine effects among French firms.

Table 6, columns 1 and 5, shows that firms with higher French ownership (*French IO*) increase climate reporting more after Article 173 is introduced, compared to firms with lower French ownership. Effects get stronger in columns 2 and 7 if we consider the subsample of firms where French institutional ownership is at least 3%. Similarly, columns 3 and 5 continue to show effects in the full sample for *High French IO*. In column 3, *Scope 1 disclosure* increases by 4pp more at firms with high French ownership after Article 173, a large effect compared to the mean of 26%. In columns 4 and 8, effects are amplified among French firms as indicated by the significant triple interactions. However, *Post Article 173 x High French IO* remains positive and significant, so the overall effects are not confined to French firms only. Overall, Table 6 supports the notion that the shock to the demand for climate risk disclosure by French institutions due to Article 173 improved firm-level disclosures.

4.2 Climate Action 100+ Disclosure Engagement

Launched in December 2017, Climate Action 100+ is an initiative backed by more than 600 institutions with over \$55 trillion in assets under management. The investor coalition has targeted 167 of the world's largest carbon emitters for engagement (these firms account for over 80% of industrial carbon emissions worldwide). A key objective of the initiative is to enhance the targets' climate risk disclosures in line with the TCFD recommendations.²⁶ We test whether the enhanced demand for climate risk reporting due to engagement by Climate Action 100+ achieves this target. As disclosure quality, notably reliable and verifiable information, is an explicit goal of the initiative, we pay particular attention to this dimension. To test our prediction, we estimate regressions for the 145 firms in our sample that are targeted by the investor coalition (targets outside of our sample are non-listed or from countries excluded from our sample):

$$Climate\ disclosure_{f,c,t} = \alpha + \beta_1 Post\ Climate\ Action\ 100+_t + \delta X_{f,c,t} + \mu_f \times \gamma_c + \varepsilon_{f,c,t} \quad (4)$$

where *Climate disclosure* represents one of two types of variables. We first consider effects

²⁶ Next to this goal, the initiative also aims to form a governance framework that articulates the board's accountability and oversight of climate risks and actions to reduce carbon emissions.

on the extensive margin, using *Scope 1 disclosure*, and then effects on the intensive margin, using *Scope 1 verification* (only for Climate Action targets disclosing Scope 1 emissions). We also consider verification of Scope 2 and 3 emissions, but we are unable to use *Climate risk disclosure*, *Climate disclosure score*, and the emission breakdowns as these variables are missing after Climate Action 100+ was established. *Post Climate Action 100+* equals one for the years of 2018 and afterwards, and zero before.²⁷

Table 7, column 1, shows on the extensive margin no change in Scope 1 disclosure after firms are engaged by Climate Action 100+ (In unreported regressions, we also find no effects for Scope 2 and 3). A reason could be that these highly-visible emitters already experienced substantial pressure to disclose their emissions prior to Climate Action 100+, implying that targets for which the net costs of disclosure were bearable disclosed emissions before 2018.

The absence of an effect for carbon reporting may conceal that disclosure could have improved along other dimensions. Indeed, in columns 2 to 4, we observe for the intensive margin that firms engaged by the coalition increase the quality of their carbon disclosures. The effects are modest for *Scope 1 verification*, but sizeable for verification of Scope 2 and 3 emissions; here the verification increases by 17pp (Scope 2) and 31pp (Scope 3), which compares to verification propensities of 78% and 54% among targets before 2018, respectively. The improvements are meaningful in light of survey evidence that 57% of firms oppose third-party verification of climate disclosures (Center for Capital Markets 2021).

Table 7 implies that the investor coalition successfully addresses a frequent impediment to voluntary disclosure, namely the need for assurance that the disclosure is truthful and of high quality. Especially for high emitters such verification is fundamental to climate reporting. For example, Flammer (2021) finds a stronger investor response to green bond issuance when the bonds are certified by a third party.

IA Table 7 complements this analysis and shows for the intensive margin among our broad sample climate-conscious ownership positively relates to the quality of disclosure (i.e., among firms that disclose emissions to CDP). These results are less well-identified than those

²⁷ In Table 7 (and IA Table 7), we include industry-by-county fixed effects (instead of industry-by-year and country fixed effects) as there is little variation in the verification variables within an industry-by-year category among the CDP disclosers (this is especially the case during the later sample years and among high-emitting industries).

in Table 7, but we can estimate them for the verification and country breakdown variables.

4.3 UK Mandatory Carbon Disclosure

We evaluate selection effects by exploiting a shock to the supply of climate risk information. In 2013, the UK passed a law requiring large, publicly listed UK firms to disclose carbon emissions in their annual reports (Krueger 2015; Jouvenot and Krueger 2021).²⁸ This mandate is intended to allow investors to incorporate climate risks into their analyses, and to better monitor whether the UK's carbon reduction objectives are being met. The regulation makes emissions available and more comparable, due to the standardized nature of the required disclosures. Hence, the regulation shocks the supply of climate information at previous non-disclosers, and it allows us to identify whether climate-conscious institutions increase investments in firms mandated to increase their disclosures. To test for the role of selection effects, we predict that climate-conscious institutional ownership in prior UK non-disclosers increases in response to the UK mandatory carbon disclosure requirement. We test this prediction using a triple DiD regression:

$$\begin{aligned}
 IO_{f,c,t} = & \alpha + \beta_1 \text{Post UK carbon disclosure}_t \times \text{UK firm}_{f,c,t} \times \text{No voluntary carbon} \\
 & \text{disclosure}_{f,c,t} + \beta_2 \text{Post UK carbon disclosure}_t \times \text{No voluntary carbon disclosure}_{f,c,t} + \beta_3 \\
 & \text{Post UK carbon disclosure}_t \times \text{UK firm}_{f,c,t} + \beta_4 \text{UK firm}_{f,c,t} \times \text{No voluntary carbon} \\
 & \text{disclosure}_{f,c,t} + \delta X_{f,c,t} + \mu_f \times \vartheta_t + \gamma_c + \varepsilon_{f,c,t},
 \end{aligned} \tag{5}$$

where $IO_{f,c,t}$ denotes one of the three climate-conscious ownership variables as well as the corresponding residual ownerships; *Post UK carbon disclosure* equals one for 2013 and afterwards, and zero otherwise; *No voluntary carbon disclosure* equals one if a firm did not disclose Scope 1 emissions to CDP before 2013, and zero otherwise; and *UK firm* is one if a firm is from the UK, and zero otherwise. The coefficient of interest is β_1 , which reflects how institutional ownership changes due to the regulation at UK firms that did not disclose emissions prior to 2013, relative to UK firms that did disclose emissions.

Table 8, columns 1 to 3, document that climate-conscious ownership increases more

²⁸ Our sample contains only large listed firms. Through the *Streamlined Energy and Carbon Reporting* policy, the UK recently extended this mandatory disclosure requirements to all firms.

strongly in UK firms forced to disclose emissions due the disclosure requirement, than in UK firms that already disclosed such information before the law was introduced. *Stewardship-code IO*, for example, increases by 1.8pp more at UK firms forced to comply, which compares with an average stewardship-code ownership in UK pre-reform non-compliers of 21% (regression coefficients are multiplied by 10 for presentation purposes). In columns 3 to 6, we find no such reactions for the residual ownership variables. In fact, non-universal ownership even decreases at firms prompted to comply with the regulation (the other estimates are positive but insignificant). Interestingly, the estimates for *Post UK carbon disclosure x No voluntary carbon disclosure* suggest that the residual owner types increase their holdings in non-disclosing firms outside of the UK.

Overall, the UK reform demonstrates that climate disclosure is not just the results of climate-conscious investors actively demanding more information, but that these investors also increase investments in firms that improve such disclosures.

5. Conclusion

High-quality information on firms' climate risks is a necessary component of informed investment decisions and of the correct market pricing of climate-related risks and opportunities. In this paper, we provide systematic international evidence from survey and portfolio holdings data on the preferences of institutional investors with respect to climate risk disclosures. We advance the literature by making three contributions.

First, we illustrate that institutional investors value and demand climate risk disclosures. In our survey, the respondents share a strong belief that climate disclosure is important, that their institutions have a strong investor demand for such disclosures, and that they actively engage portfolio firms to improve them. We corroborate these conclusions in our empirical tests using investor holdings, showing that ownership by institutions with a plausibly higher disclosure demand ("climate-conscious institutions") is positively associated with CDP-based measures of climate disclosure.

Second, the disclosure demand by climate-conscious investors is affected by climate-specific disclosure costs and benefits. Specifically, the effect of climate-conscious ownership

on climate risk disclosure is moderated among firms with high proprietary disclosure costs, it is magnified among large firms with lower information production costs, and it increases among firms where the climate externality benefits of the disclosures are higher.

Third, we demonstrate that influence and selection effects explain the equilibrium relations between institutional ownership and disclosure. Climate risk disclosure of firms owned by many French institutions improves in response to Article 173, which provides a shock to the disclosure demand of French investors. Similarly, climate disclosure quality of firms targeted by Climate Action 100+ improves in response to engagement by the investor coalition. Both results support an interpretation whereby institutions influence firms to improve their reporting. We also document selection effects in that we find that climate-conscious institutions significantly increase investments in previously non-disclosing firms mandated by a UK law to disclose carbon emissions.

Institutional investors will remain important in ensuring informative, high-quality climate-related disclosures even if such disclosures become mandatory.

Data Appendix

Panel A: Survey Analysis		
Variable	Definition	Survey Question
<i>Importance of climate risk disclosure</i>	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>Demand more disclosure</i>	Equals one if a respondent “strongly agrees” that investors should demand that portfolio firms disclose their exposure to climate risk, and zero otherwise. In the underlying questions, respondents were asked to indicate their agreement with the statements on a scale of one (“strongly disagree”) through five (“strongly agree”).	Question B3
<i>Quant. information imprecise</i>	Equals one if a respondent “strongly agrees” that firm-level quantitative information on climate risk is not sufficiently precise, and zero otherwise. In the underlying questions, respondents were asked to indicate their agreement with the statements on a scale of one (“strongly disagree”) through five (“strongly agree”).	Question B3
<i>Management discussions imprecise</i>	Equals one if a respondent “strongly agrees” that management discussions on climate risk are not sufficiently precise, and zero otherwise. In the underlying questions, respondents were asked to indicate their agreement with the statements on a scale of one (“strongly disagree”) through five (“strongly agree”).	Question B3
<i>TCFD engagement</i>	Equals 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>Carbon footprint disclosure</i>	Equals one if a respondent discloses or plans to disclose the overall carbon footprint of their portfolio, and zero otherwise.	Question B2
<i>Climate risk underpricing</i>	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 ranking</i>	Outcome of a ranking of the importance of climate risks relative to other investment risks. The variable ranges from one (if they are considered the least important risk) to six (if climate risks are considered the most important risk).	Question A1
<i>Climate risk financial materiality</i>	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>Fiduciary duty institution</i>	Equals one if a respondent strongly agrees to the statement that incorporating climate risks in the investment process “is a legal obligation/fiduciary duty that we have to consider,” and zero otherwise.	Question A4
<i>HQ country norms</i>	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>Very large institution</i>	Equals one if the size of an institutional investor is more than \$100bn, and zero otherwise.	Question G6
<i>ESG share of portfolio</i>	Percentage of the institution’s portfolio that incorporates ESG issues.	Question G5
<i>Medium-term horizon</i>	Equals 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>	Equals one if the indicated holding period of an institutional investor is above two years, and zero otherwise.	Question G2
Panel B: Holdings and Disclosure Data Analysis		
Variable	Definition	Source, Sample Years
<i>Scope 1 disclosure</i>	Equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise.	CDP, 2010-2019
<i>Climate risk disclosure</i>	Follows the definition in Flammer, Toffel, and Viswanathan (2021) and captures disclosure to CDP on up to three types of climate risks (regulatory, physical or other climate risks) in a year. It takes the value zero if a firm does not disclose climate risks to CDP in year, one if it discloses information on one type of climate risks, two if it	CDP, 2011-2016

	discloses information on two types of climate risks, and three if it discloses information on all three types of climate risks. This variable is available for the years 2011 to 2016 as CDP did not include this question in 2010 and changed the question design from 2017 onwards such that the responses are not comparable anymore for these years.	
<i>Climate disclosure score</i>	Measures how comprehensive climate risk disclosure to CDP is by counting the fraction of questions that were answered in the CDP survey in a year. This variable is only available between 2010 and 2015 as the score replaced by CDP in 2016 with an alternative measure that mixes disclosure and climate performance. The measures varies between 0 and 100 and higher numbers indicate better climate disclosure.	CDP, 2010-2015
<i>Scope 1 verification</i>	Equals one if a firm that reports Scope 1 emissions to CDP also obtains verification on Scope 1 emissions in a year, and zero otherwise. CDP did not include this question in 2010.	CDP, 2011-2019
<i>Scope 2 verification</i>	Equals one if a firm that reports Scope 2 emissions to CDP also obtains verification on Scope 2 emissions in a year, and zero otherwise. CDP did not include this question in 2010.	CDP, 2011-2019
<i>Scope 3 verification</i>	Equals one if a firm that reports Scope 2 emissions to CDP also obtains verification on Scope 3 emissions in a year, and zero otherwise. CDP did not include this question in 2010.	CDP, 2011-2019
<i>Scope 1 country breakdown</i>	Equals one if a firm that reports Scope 1 emissions to CDP also provides a breakdown of Scope 1 emissions across countries to CDP in a year, and zero otherwise. CDP did not include this question in 2010.	CDP, 2011-2019
<i>Scope 2 country breakdown</i>	Equals one if a firm that reports Scope 2 emissions to CDP also provides a breakdown of Scope 2 emissions across countries to CDP in a year, and zero otherwise. CDP did not include this question in 2010.	CDP, 2011-2019
<i>10-K Climate risk disclosure (MPV)</i>	Follows Matsumura, Prakash, and Vera-Muñoz (2021) and equals one if a 10-K contains the climate change words “carbon”, “climate change”, “emissions”, “greenhouse”, “GHG”, “hurricanes”, “renewable energy”, and “extreme weather” appear in a year, and zero otherwise. Only available for US firms.	SEC EDGAR, 2010-2019, US firms
<i>10-K Climate risk disclosure (KLRW)</i>	Follows Kölbel et al. (2021) and equals one if a 10-K contains discussions on climate risks according to an AI-based algorithm for language understanding, and zero otherwise. Only available for US firms in the sample of Kölbel et al. (2021).	Kölbel, et al. (2021), 2010-2019, US firms
<i>High 10-K Climate risk disclosure (KLRW)</i>	Follows Kölbel et al. (2021) and equals one if the amount of discussions on climate risk in 10-K according to an AI-based algorithm for language understanding is above the median, and zero otherwise. Only available for US firms in the sample of Kölbel et al. (2021).	Kölbel, et al. (2021), 2010-2019, US firms
<i>Stewardship code IO</i>	Fraction of outstanding shares owned by institutional investors that are subject to stewardship codes in their home countries in a year. Winsorized at 1%.	FactSet, Katelouzou and Siems (2021), 2010-2019
<i>High-norms IO</i>	Fraction of outstanding shares owned by institutional investors from high-norms countries (as defined by Dyck et al. 2019) in a year. An institutional investor's country is in the high-norms group if its Environmental Performance Index (EPI) is higher than the median in a year. Winsorized at 1%.	FactSet, 2010-2019
<i>Universal owner IO</i>	Fraction of outstanding shares owned by institutional investors that are classified as universal owners in a year. We classify as universal owners those institutional investors whose number of stocks in the portfolios is ranked in the top 1% across all institutions in a year. Winsorized at 1%.	FactSet, 2010-2019
<i>Non-stewardship code IO</i>	Fraction of outstanding shares owned by institutional investors that are not subject to stewardship codes in their home countries in a year. Winsorized at 1%.	FactSet, Katelouzou and Siems (2021), 2010-2019
<i>Low-norms IO</i>	Fraction of outstanding shares owned by institutional investors from low-norms countries (as defined by Dyck et al. 2019) in a year. An institutional investor's country is in the low-norms group if its Environmental Performance Index (EPI) is lower than the median in a year. Winsorized at 1%.	FactSet, 2010-2019

<i>Non-universal owner IO</i>	Fraction of outstanding shares owned by institutional investors that are not classified as universal owners in a year. Winsorized at 1%.	FactSet, 2010-2019
<i>High-competition firm</i>	Equals one if a firm operates in a very competitive industry based on the text-based HHI measure developed by Hoberg and Phillips (2016), and zero otherwise. A firm operates in a very competitive industry if its HHI is below the sample median in a year. Only available for US firms.	Hoberg and Phillips (2016), 2010-2016, US firms
<i>Large firm</i>	Equals one if a firm's total assets are above the sample median in a year, and zero otherwise	Worldscope, 2010-2019
<i>High-emission industry</i>	Equals one if a firm operates in an SIC2 industry that is in the top 20 across SIC2 industries based on Scope 1 emissions, and zero otherwise.	Ilhan, Vilkov, and Sautner (2021), 2010-2019
<i>Post Article 173</i>	Equals one for the years of 2016 and afterwards, and zero otherwise.	Self-constructed,
<i>French IO</i>	Continuous measure of institutional ownership by French institutions.	FactSet, 2010-2019
<i>High French IO</i>	Equals one if the fraction of outstanding shares owned by French institutional investors is above the sample median, and zero otherwise.	FactSet, 2010-2019
<i>French firm</i>	Equals one if a firm is from France, and zero otherwise.	FactSet, 2010-2019
<i>Post Climate Action 100+</i>	Equals one for the years of 2018 and afterwards, and zero otherwise.	Self-constructed
<i>Post UK carbon disclosure</i>	Equals one for the years of 2013 and afterwards, and zero otherwise.	Self-constructed
<i>No voluntary carbon disclosure</i>	Equals one if a firm did not disclose Scope 1 emissions to CDP in the years before 2013, and zero otherwise.	CDP, 2010-2019
<i>UK firm</i>	Equals one if a firm is from the UK, and zero otherwise.	Worldscope, 2010-2019
<i>Assets</i>	Total assets (Worldscope data item WC02999) at the end of the year. Winsorized at the 1% level. Winsorized at 1%.	Worldscope, 2010-2019
<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 year (Worldscope data item WC01706). Winsorized at the 1% level. Winsorized at 1%.	Worldscope, 2010-2019
<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 year, divided by total assets at the end of the year (Worldscope data item WC02999). Winsorized at 1%.	Worldscope, 2010-2019
<i>EBIT/assets</i>	Earnings before interest and taxes (Worldscope data item WC18191) at the end of the year, divided by total assets at the end of the year (Worldscope data item WC02999). Winsorized at 1%.	Worldscope, 2010-2019
<i>CapEx/assets</i>	Capital expenditures at the end of the year (Worldscope data item WC04601), divided by total assets at the end of the year (Worldscope data item WC02999). Winsorized at 1%.	Worldscope, 2010-2019
<i>Book-to-market ratio</i>	Difference between common equity (Worldscope data item WC03501) and preferred stock capital (WC03451) at the end of the year, divided by the equity market value (MV) at the end of the year. Winsorized at 1%.	Worldscope, 2010-2019
<i>Financial disclosure quality</i>	Follows Chen, Miao, and Shevlin (2015) and measures the overall financial disclosure quality of a firm in a year. The measure counts the number of non-missing data items in the income statement as reported in Compustat. The variable is scaled by the maximum number of data items in the income statement so that it ranged between 0 and 1. Winsorized at 1%.	Compustat NA and Compustat Global, 2010-2019
<i>Compustat NA firm</i>	Equals one if a firm is included in Compustat North America, and zero if it is included in Compustat Global.	Compustat NA and Compustat Global

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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. The actual survey question is provided in Internet Appendix B3.

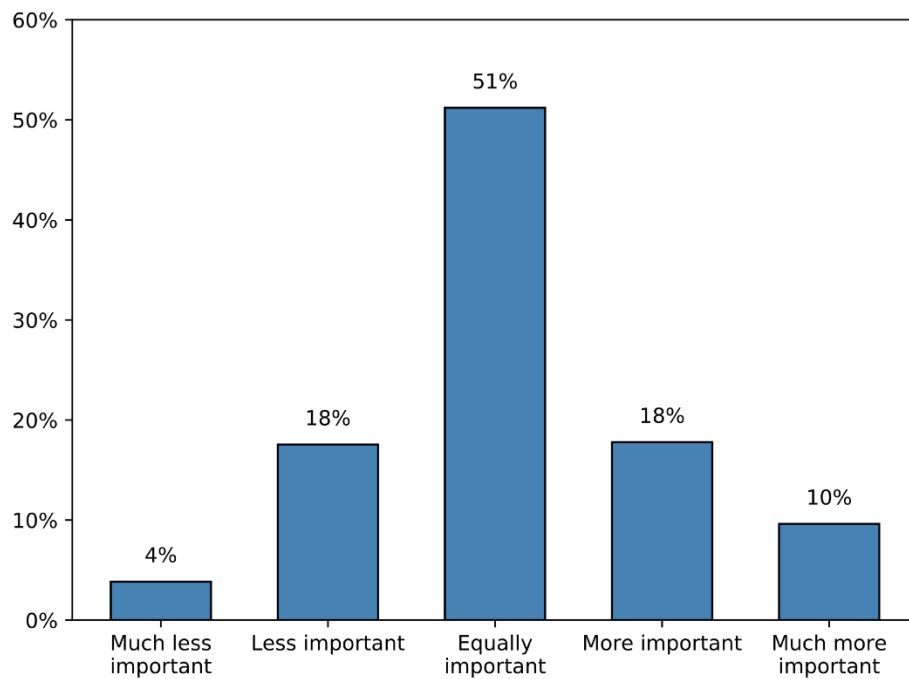


Table 1. Summary Statistics

This table provides summary statistics of the variables used in the survey (panel A) and climate disclosure and investor holdings (panel B) analysis. Observations in panel A are at the respondent level. Observations in panel B are at the firm-year level. Not all variables are available for all respondents and all firm-years.

Panel A. Survey Variables				
Variable	Mean	STD	Median	N
<i>Importance of climate risk disclosure</i>	3.12	0.94	3.00	416
<i>Demand more disclosure</i>	0.28			413
<i>Quant. information imprecise</i>	0.19			413
<i>Management discussions imprecise</i>	0.21			413
<i>TCFD engagement</i>	0.78			304
<i>Carbon footprint disclosure</i>	0.72			327
<i>Climate risk underpricing</i>	0.57	0.43	0.52	357
<i>Climate risk ranking</i>	2.95	1.64	3.00	386
<i>Climate risk materiality</i>	3.73	0.82	3.67	393
<i>Fiduciary duty institution</i>	0.27			415
<i>HQ country norms</i>	0.61	0.06	0.57	425
<i>Very large institution</i>	0.11			430
<i>ESG share of portfolio</i>	0.41	0.32	0.30	415
<i>Medium-term horizon</i>	0.77			432
<i>Long-term horizon</i>	0.18			432
Panel B. Climate-related Disclosure and Investor Holdings Variables				
Variable	Mean	STD	Median	N
<i>Scope 1 disclosure</i>	0.26			43221
<i>Scope 2 disclosure</i>	0.25			43221
<i>Scope 3 disclosure</i>	0.26			43221
<i>Scope 1 verification</i>	0.69			9718
<i>Scope 2 verification</i>	0.70			9189
<i>Scope 3 verification</i>	0.53			7977
<i>Scope 1 country breakdown</i>	0.65			8248
<i>Scope 2 country breakdown</i>	0.66			8248
<i>Climate risk disclosure</i>	0.50	1.08	0.00	25932
<i>Regulatory risk disclosure</i>	0.19			25932
<i>Physical risk disclosure</i>	0.18			23892
<i>Other risk disclosure</i>	0.17			23892
<i>Climate disclosure score</i>	16.47	32.82	0.00	25934
<i>10-K Climate risk disclosure (MPV)</i>	0.70			3962
<i>10-K Climate risk disclosure (KLRW)</i>	0.76			1855
<i>High 10-K Climate risk disclosure (KLRW)</i>	0.50			1855
<i>Stewardship code IO</i>	0.14	0.17	0.07	43221
<i>High-norms IO</i>	0.09	0.11	0.05	43221
<i>Universal owner IO</i>	0.14	0.14	0.09	37740
<i>Non-stewardship code IO</i>	0.14	0.22	0.06	43221
<i>Low-norms IO</i>	0.18	0.24	0.09	43221
<i>Non-universal owner IO</i>	0.13	0.14	0.08	37740
<i>French IO</i>	0.01	0.02	0.00	43221
<i>High French IO</i>	0.50			43221
<i>Post Article 173</i>	0.40			43221
<i>Post Climate Action 100+</i>	0.20			43221
<i>Post UK carbon disclosure</i>	0.70			43221
<i>High-competition firm</i>	0.50			4739
<i>Large firm</i>	0.50			43221
<i>High-emission industry</i>	0.38			43221
<i>Log(Assets)</i>	15.03	2.05	15.00	43221
<i>Dividends/net income</i>	0.38	0.69	0.27	42867
<i>Debt/assets</i>	0.45	0.20	0.45	36164
<i>EBIT/assets</i>	0.07	0.10	0.06	42317
<i>CapEx/assets</i>	0.04	0.05	0.03	42967
<i>Book-to-market ratio</i>	0.72	0.57	0.58	43174
<i>Financial disclosure quality</i>	0.68	0.09	0.71	31323
<i>Compustat NA firm</i>	0.21	0.41	0.00	31323

Table 2. Survey Responses on Climate Risk Disclosure

Panel A displays 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. Panel B reports survey responses to the question of 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), and whether the investors disclose or plan to disclose the carbon footprint of their portfolios (Question B2). The actual survey questions are provided in Internet Appendix B3.

Panel A. Respondents' Views on Current Climate Risk Disclosure Practices					
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Management discussions on climate risk are not sufficiently precise	1%	9%	22%	47%	21%
Firm-level quantitative information on climate risk is not sufficiently precise	1%	7%	24%	48%	19%
Standardized and mandatory reporting on climate risk is necessary	2%	5%	20%	46%	27%
There should be more standardization across markets in climate-related financial disclosure	2%	7%	16%	48%	27%
Standardized disclosure tools and guidelines are currently not available	3%	12%	24%	40%	21%
Mandatory disclosure forms are not sufficiently informative regarding climate risk	3%	6%	28%	46%	18%
Investors should demand that portfolio firms disclose their exposure to climate risk	2%	6%	18%	46%	28%
Panel B. Respondents' Views on TCFD and Carbon Footprint Disclosure (Percentages)					
	No	Yes	Do not know		
Do you engage (or plan to engage) portfolio companies to report according to the recommendations of the TCFD?	17%	59%	24%		
Do you disclose (or plan to disclose) the overall carbon footprint of your portfolio?	24%	60%	16%		

Table 3. Explaining Survey Responses on Climate Risk Disclosure

Panel A reports OLS regressions at the respondent level explaining investors' views on climate risk disclosure: (i) *Importance of climate risk disclosure* 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" compared to reporting on financial information (Question B1); (ii) *Management discussions imprecise* equals one if a respondent indicates strong agreement that management discussions on climate risk are not sufficiently precise, and zero otherwise (Question B3); (iii) *Quantitative information imprecise* equals one if a respondent indicates strong agreement to the statement that firm-level quantitative information on climate risk is not sufficiently precise, and zero otherwise (Question B3); (iv) *Demand more disclosure* equals one if a respondent indicates strong agreement that investors should demand that portfolio firms disclose their exposure to climate risk, and zero otherwise (Question B3); (v) *TCFD engagement* equals one if a respondent engages or plans to engage portfolio firms to report according to the recommendations of the TCFD (Question E5), and zero otherwise; and (vi) *Carbon footprint disclosure* equals one if a respondent discloses or plans to disclose the overall carbon footprint of their portfolio, and zero otherwise (Question B2). Panel B reports OLS regressions at the respondent level explaining perceptions of climate-related overvaluations: *Climate risk underpricing* averages positive mispricing scores across several sectors most affected by climate change (negative scores are set to zero). The variable ranges between plus two (strong average overvaluation) and zero (no average overvaluation) (Question D1). We use the following independent variables in both panels: *Fiduciary duty institution*; *HQ country norms*; *Very large institution*; *Climate risk rating* (larger numbers reflect that climate risk is ranked as relatively more important compared to other investment risks); *Climate risk financial materiality* (larger numbers reflect greater perceived financial materiality); *ESG share of portfolio*; *Medium-term horizon*; *Long-term horizon*. Panel B additionally controls for the six dependent variables of panel A. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the respondent's country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Explaining Views on Climate Risk Disclosure						
	<i>Importance of climate risk disclosure</i>	<i>Management discussions imprecise</i>	<i>Quantitative information imprecise</i>	<i>Demand disclosure</i>	<i>TCFD engagement</i>	<i>Carbon footprint disclosure</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fiduciary duty institution</i>	0.19* (0.10)	0.08 (0.05)	0.13* (0.06)	0.16*** (0.02)	0.04 (0.05)	0.01 (0.06)
<i>HQ country norms</i>	1.23** (0.52)	0.24 (0.37)	-0.15 (0.26)	0.07 (0.24)	1.08*** (0.18)	0.22 (0.34)
<i>Very large institution</i>	0.31** (0.11)	0.02 (0.04)	0.11* (0.06)	-0.02 (0.04)	0.04 (0.10)	0.18*** (0.06)
<i>Climate risk ranking</i>	0.11*** (0.02)	0.02* (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
<i>Climate risk financial materiality</i>	0.36*** (0.04)	0.07** (0.03)	0.04 (0.03)	0.10*** (0.03)	0.02 (0.02)	0.05** (0.02)
<i>ESG share of portfolio</i>	0.30 (0.29)	0.20*** (0.07)	0.14** (0.06)	0.04 (0.12)	0.34** (0.13)	0.23*** (0.07)
<i>Medium-term horizon</i>	-0.05 (0.19)	0.07 (0.08)	0.01 (0.08)	-0.06 (0.13)	0.07 (0.09)	-0.02 (0.10)
<i>Long-term horizon</i>	-0.12 (0.26)	0.11 (0.10)	0.06 (0.09)	-0.13 (0.12)	0.05 (0.07)	-0.09 (0.10)
Respondent Position Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Distribution Channel Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Institutional Investor Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	363	363	363	363	277	306
Adj. R ²	0.207	0.099	0.085	0.135	0.066	0.025

Table 3 (continued)

Panel B. Climate Risk Disclosure and Climate Risk Mispricing						
	Climate risk underpricing					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Importance of climate risk disclosure</i>	0.09** (0.03)					
<i>Management discussions imprecise</i>		0.21*** (0.07)				
<i>Quantitative information imprecise</i>			0.22** (0.07)			
<i>Demand more disclosure</i>				0.20*** (0.05)		
<i>TCFD engagement</i>					0.10* (0.06)	
<i>Carbon footprint disclosure</i>						0.15*** (0.03)
<i>Fiduciary duty institution</i>	0.06 (0.04)	0.05 (0.03)	0.04 (0.04)	0.04 (0.04)	0.06 (0.04)	0.07 (0.05)
<i>HQ country norms</i>	-0.35** (0.14)	-0.31* (0.18)	-0.21 (0.12)	-0.25* (0.14)	-0.36* (0.19)	-0.18 (0.30)
<i>Very large institution</i>	0.09 (0.15)	0.12 (0.15)	0.10 (0.16)	0.13 (0.15)	0.25 (0.14)	0.21 (0.15)
<i>Climate risk ranking</i>	0.00 (0.02)	0.01 (0.01)	0.01 (0.02)	0.01 (0.01)	0.02 (0.02)	0.01 (0.01)
<i>Climate risk materiality</i>	-0.02 (0.04)	-0.01 (0.03)	-0.00 (0.04)	-0.01 (0.03)	-0.03 (0.03)	-0.01 (0.03)
<i>ESG share of portfolio</i>	0.28*** (0.09)	0.28** (0.10)	0.29*** (0.09)	0.30*** (0.08)	0.36*** (0.11)	0.33*** (0.09)
<i>Medium-term horizon</i>	-0.04 (0.15)	-0.05 (0.14)	-0.04 (0.14)	-0.03 (0.12)	-0.12 (0.16)	-0.09 (0.17)
<i>Long-term horizon</i>	-0.03 (0.13)	-0.06 (0.12)	-0.05 (0.12)	-0.01 (0.11)	-0.08 (0.14)	-0.06 (0.16)
Respondent Position Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Distribution Channel Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Institutional Investor Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	335	335	335	335	262	282
Adj. R^2	0.066	0.071	0.073	0.074	0.069	0.075

Table 4. Climate Risk Disclosure and Institutional Investors: Baseline Results

This table reports regressions at the firm-year level explaining firms' climate risk disclosures: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Climate risk disclosure* captures disclosure to CDP on up to three types of climate risks (regulatory, physical or other climate risks) in a year. It takes the value zero if a firm does not disclose climate risks to CDP in the year, one if it discloses information on one type of climate risk, two if it discloses information on two types of climate risk, and three if it discloses information on all three types of climate risk. *Climate disclosure score* measures how comprehensive climate risk disclosure to CDP is by counting the fraction of questions that were answered in the CDP survey in a year. The measure varies between 0 and 100, and higher numbers indicate better climate disclosure. We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norms countries in a year; (iii) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 1 disclosure</i>			<i>Climate risk disclosure</i>			<i>Log(Climate disclosure score)</i>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Stewardship code IO</i>	0.19** (0.07)			0.57* (0.29)			0.98* (0.51)		
<i>High-norms IO</i>		0.24* (0.12)			0.52* (0.29)			0.72* (0.42)	
<i>Universal owner IO</i>			0.45*** (0.08)			0.76*** (0.20)			1.51*** (0.29)
<i>Non-stewardship code IO</i>	0.10 (0.08)			-0.02 (0.37)			-0.00 (0.57)		
<i>Low-norms IO</i>		0.09 (0.14)			0.11 (0.41)			0.27 (0.64)	
<i>Non-universal owner IO</i>			-0.09 (0.11)			-0.12 (0.30)			-0.38 (0.50)
<i>Log(Assets)</i>	0.14*** (0.01)	0.14*** (0.01)	0.14*** (0.01)	0.31*** (0.03)	0.31*** (0.03)	0.31*** (0.03)	0.59*** (0.04)	0.59*** (0.04)	0.58*** (0.04)
<i>Dividends/net income</i>	0.02*** (0.01)	0.02*** (0.00)	0.02*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.08*** (0.02)	0.08*** (0.02)	0.09*** (0.02)
<i>Debt/assets</i>	-0.04 (0.03)	-0.04 (0.03)	-0.03 (0.03)	-0.24*** (0.07)	-0.24*** (0.07)	-0.22*** (0.07)	-0.49*** (0.11)	-0.48*** (0.11)	-0.44*** (0.10)
<i>EBIT/assets</i>	-0.01 (0.06)	-0.01 (0.06)	-0.00 (0.05)	-0.16 (0.13)	-0.16 (0.13)	-0.12 (0.13)	-0.08 (0.19)	-0.08 (0.20)	-0.02 (0.18)
<i>CapEx/assets</i>	0.03 (0.15)	0.03 (0.15)	0.05 (0.15)	0.12 (0.34)	0.14 (0.34)	0.21 (0.34)	-0.24 (0.53)	-0.21 (0.53)	-0.13 (0.52)
<i>Book-to-market ratio</i>	-0.09*** (0.01)	-0.09*** (0.01)	-0.08*** (0.01)	-0.19*** (0.04)	-0.19*** (0.04)	-0.18*** (0.04)	-0.40*** (0.06)	-0.39*** (0.06)	-0.38*** (0.06)
<i>Financial disclosure quality</i>	0.04 (0.04)	0.05 (0.04)	0.07 (0.05)	0.16 (0.12)	0.14 (0.13)	0.20 (0.14)	0.53*** (0.17)	0.50*** (0.17)	0.62*** (0.18)
Sample Years	All Firms 2010-2019			All Firms 2011-2016			All Firms 2010-2015		
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	29467	29467	28185	19947	19947	19415	19801	19801	19282
Adj. R ²	0.300	0.300	0.298	0.258	0.258	0.257	0.311	0.310	0.310

Table 5. Climate Risk Disclosure and Institutional Investors: Costs and Benefits of Disclosure

This table reports regressions at the firm-year level explaining how firms' climate risk disclosures vary with measures of the costs and benefits of climate-related disclosure: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Climate risk disclosure* captures disclosure to CDP on up to three types of climate risks (regulatory, physical or other climate risks) in a year. It takes the value zero if a firm does not disclose climate risks to CDP in year, one if it discloses information on one type of climate risks, two if it discloses information on two types of climate risks, and three if it discloses information on all three types of climate risks. *Climate disclosure score* measures how comprehensive climate risk disclosure to CDP is by counting the fraction of questions that were answered in the CDP survey in a year. The measure varies between 0 and 100, and higher numbers indicate better climate disclosure. We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norm countries in a year; (iii) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. In panel A, *High-competition firm* equals one if a firm operates in a very competitive industry based on the text-based HHI measure by Hoberg and Phillips (2016), and zero otherwise. A firm operates in a very competitive industry if its HHI is below the sample median in a year. In panel B, *Large firm* equals one if a firm's total assets are above the sample median in a year, and zero otherwise. In panel C, *High-emission industry* equals one if a firm operates in an SIC2 industry that is in the top 20 across SIC2 industries based on Scope 1 emissions, and zero otherwise. Panel A contains only US firms as the competition measure is only available for such firms. All panels control for the same variables as the corresponding regressions in Table 4, except that panel B does not control for *Log(Assets)*. *High-emission industry* in panel C is absorbed by the fixed effects. Variable definitions are provided in the Data Appendix. In panel A, standard errors (in parentheses) are clustered at the industry-year level. In panels B and C, standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Proprietary Costs									
	Scope 1 disclosure			Climate risk disclosure			Log(Climate disclosure score)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>High-competition firm</i>	0.18** (0.09)	0.19** (0.08)	0.20** (0.09)	0.74** (0.32)	0.68** (0.33)	0.65* (0.33)	0.53 (0.46)	0.48 (0.46)	0.43 (0.48)
<i>High-competition firm x Stewardship code IO</i>	-0.31*** (0.11)			-5.45*** (1.29)			-5.70** (2.32)		
<i>High-competition firm x High-norms IO</i>		-1.09*** (0.39)			-3.42** (1.48)			-6.14** (2.44)	
<i>High-competition firm x Universal owner IO</i>			-0.49*** (0.16)			-1.05* (0.57)			-1.75** (0.86)
<i>Stewardship code IO</i>	0.54*** (0.14)			5.96*** (1.08)			8.54*** (1.85)		
<i>High-norms IO</i>		1.71*** (0.30)			4.66*** (1.14)			7.20*** (1.82)	
<i>Universal owner IO</i>			0.76*** (0.11)			0.87* (0.46)			2.83*** (0.65)
Sample Years	US Firms 2010-2019			US Firms 2011-2016			US Firms 2010-2015		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3967	3967	3575	2387	2387	2387	2372	2372	2372
Adj. R ²	0.236	0.240	0.254	0.192	0.183	0.179	0.281	0.276	0.281

Table 5 (continued)

Panel B. Information Production Costs									
	Scope 1 disclosure			Climate risk disclosure			Log(Climate disclosure score)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Large firm</i>	0.30*** (0.04)	0.26*** (0.03)	0.28*** (0.04)	0.58*** (0.16)	0.53*** (0.17)	0.63*** (0.17)	1.04*** (0.15)	0.95*** (0.14)	1.08*** (0.17)
<i>Large firm x Stewardship code IO</i>	0.25 (0.18)			1.66*** (0.48)			3.06*** (0.94)		
<i>Large firm x High-norms IO</i>		0.89*** (0.17)			2.34*** (0.72)			4.10*** (0.79)	
<i>Large firm x Universal owner IO</i>			0.36*** (0.09)			0.72*** (0.23)			2.14*** (0.23)
<i>Stewardship code IO</i>	0.24*** (0.05)			0.64*** (0.21)			1.17*** (0.36)		
<i>High-norms IO</i>		0.30*** (0.08)			0.67*** (0.20)			1.06*** (0.28)	
<i>Universal owner IO</i>			0.67*** (0.14)			1.32*** (0.35)			2.28*** (0.71)
Sample Years	All Firms 2010-2019			All Firms 2011-2016			All Firms 2010-2015		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	29467	29467	28185	19947	19947	19415	19801	19801	19282
Adj. R ²	0.238	0.243	0.240	0.211	0.213	0.210	0.243	0.244	0.244

Panel C. Disclosure Externality Benefits									
	Scope 1 disclosure			Climate risk disclosure			Log(Climate disclosure score)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>High-emission industry x Stewardship code IO</i>	0.15*** (0.05)			0.43* (0.22)			0.90*** (0.22)		
<i>High-emission industry x High-norms IO</i>		0.23*** (0.08)			0.54 (0.36)			1.05*** (0.34)	
<i>High-emission industry x Universal owner IO</i>			0.12 (0.11)			0.64** (0.24)			0.59 (0.43)
<i>Stewardship code IO</i>	0.12* (0.06)			0.37 (0.22)			0.59 (0.46)		
<i>High-norms IO</i>		0.15 (0.10)			0.29 (0.20)			0.30 (0.36)	
<i>Universal owner IO</i>			0.39*** (0.08)			0.46*** (0.16)			1.20*** (0.34)
Sample Years	All Firms 2010-2019			All Firms 2011-2016			All Firms 2010-2015		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	29467	29467	28185	19947	19947	19415	19801	19801	19282
Adj. R ²	0.301	0.301	0.299	0.261	0.260	0.259	0.313	0.312	0.312

Table 6. Climate Risk Disclosure and Institutional Investors: Effects of French Article 173

This table reports regressions at the firm-year level explaining how firms' climate risk disclosures change after Article 173 is implemented in France in 2016: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Climate risk disclosure* captures disclosure to CDP on up to three types of climate risks (regulatory, physical or other climate risks) in a year. It takes the value zero if a firm does not disclose climate risks to CDP in year, one if it discloses information on one type of climate risks, two if it discloses information on two types of climate risks, and three if it discloses information on all three types of climate risks. We use the following key independent variables: *Post Article 173* equals one for the years of 2016 and afterwards, and zero otherwise; *French IO* is a continuous measure of institutional ownership by French institutions; *High French IO* equals one if the fraction of outstanding shares owned by French institutional investors is above the sample median, and zero otherwise; and *French firm* equals one if a firm is from France, and zero otherwise. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 1 disclosure</i>				<i>Climate risk disclosure</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Post Article 173 x French IO</i>	0.89*** (0.32)	1.91*** (0.36)			1.96** (0.73)	2.20* (1.15)		
<i>Post Article 173 x High French IO</i>			0.04*** (0.01)	0.04** (0.02)			0.13*** (0.04)	0.13*** (0.04)
<i>Post Article 173 x High French IO x French firm</i>				0.07*** (0.02)				0.28*** (0.07)
<i>Post Article 173 x French firm</i>				-0.08*** (0.02)				-0.27*** (0.07)
<i>High French IO x French firm</i>				0.12*** (0.02)				0.33*** (0.07)
<i>French IO</i>	1.30*** (0.22)	0.51** (0.18)			3.72*** (1.03)	2.87*** (0.76)		
<i>High French IO</i>			0.04*** (0.01)	0.04*** (0.01)			0.06 (0.04)	0.05 (0.04)
<i>Log(Assets)</i>	0.14*** (0.01)	0.17*** (0.01)	0.14*** (0.01)	0.14*** (0.01)	0.31*** (0.03)	0.39*** (0.05)	0.31*** (0.03)	0.31*** (0.03)
<i>Dividends/net income</i>	0.02*** (0.00)	0.00 (0.02)	0.02*** (0.01)	0.02*** (0.01)	0.05*** (0.01)	0.05 (0.08)	0.05*** (0.01)	0.05*** (0.01)
<i>Debt/assets</i>	-0.04 (0.03)	-0.10 (0.11)	-0.03 (0.03)	-0.03 (0.03)	-0.24*** (0.07)	-0.41 (0.48)	-0.23*** (0.07)	-0.23*** (0.07)
<i>EBIT/assets</i>	0.00 (0.06)	0.01 (0.15)	-0.01 (0.06)	-0.01 (0.06)	-0.14 (0.12)	-0.28 (0.52)	-0.14 (0.13)	-0.14 (0.13)
<i>CapEx/assets</i>	0.04 (0.15)	-1.03*** (0.22)	0.02 (0.15)	0.02 (0.15)	0.16 (0.35)	-0.23 (0.92)	0.14 (0.34)	0.14 (0.34)
<i>Book-to-market ratio</i>	-0.09*** (0.01)	-0.11*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.19*** (0.04)	-0.14 (0.09)	-0.19*** (0.04)	-0.19*** (0.04)
<i>Financial disclosure quality</i>	0.07 (0.04)	0.13 (0.13)	0.07* (0.04)	0.07 (0.04)	0.18 (0.14)	0.22 (0.87)	0.20 (0.14)	0.20 (0.14)
Sample	All Firms	French IO >3%	All Firms	All Firms	All Firms	French IO >3%	All Firms	All Firms
Years	2010-2019				2011-2016			
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	29467	1952	29467	29467	19947	1266	19947	19947
Adj. R-sq.	0.30	0.482	0.30	0.30	0.26	0.405	0.26	0.26

Table 7. Climate Risk Disclosure and Institutional Investors: Effects of Climate Action 100+

This table reports regressions at the firm-year level explaining how firms' climate risk disclosures change after they are added to the engagement list of Climate Action 100+: (i) *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise; (ii) *Scope 1 verification* equals one if a firm that reports Scope 1 emissions to CDP also obtains verification on the emissions in a year, and zero otherwise. CDP did not include this question in 2010. Scope 2 verification and Scope 3 verification are defined accordingly. We use the following key independent variable: *Post Climate Action 100+* equals one for the years of 2018 and afterwards, and zero otherwise. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Scope 1 disclosure</i>	<i>Scope 1 verification</i>	<i>Scope 2 verification</i>	<i>Scope 3 verification</i>
	(1)	(2)	(3)	(4)
<i>Post Climate Action 100+</i>	0.01 (0.03)	0.06*** (0.02)	0.17*** (0.04)	0.31*** (0.05)
<i>Log(Assets)</i>	0.13*** (0.04)	-0.08 (0.05)	-0.07** (0.03)	-0.14* (0.06)
<i>Dividends/net income</i>	-0.03 (0.02)	-0.01 (0.02)	0.01 (0.01)	0.00 (0.02)
<i>Debt/assets</i>	-0.24* (0.14)	0.19 (0.11)	0.13 (0.10)	-0.34 (0.21)
<i>EBIT/assets</i>	0.12 (0.23)	0.16 (0.36)	-0.11 (0.32)	-0.29 (0.24)
<i>CapEx/assets</i>	0.11 (0.63)	-0.83 (0.54)	-0.59 (0.46)	-0.38 (0.91)
<i>Book-to-market ratio</i>	-0.06 (0.04)	0.07 (0.05)	0.08* (0.04)	0.11* (0.06)
<i>Financial disclosure quality</i>	0.53*** (0.14)	0.56** (0.27)	0.49** (0.19)	0.49** (0.19)
Sample	CA 100+ Firms	CA 100+ Firms If Disclose Scope 1	CA 100+ Firms If Disclose Scope 2	CA 100+ Firms If Disclose Scope 3
Years	2010-2019	2011-2019	2011-2019	2011-2019
Industry x Country Fixed Effects	Yes	Yes	Yes	Yes
N	1215	673	633	607
Adj. R^2	0.477	0.365	0.514	0.530

Table 8. Climate Risk Disclosure and Institutional Investors: Effects of UK Mandatory Carbon Disclosure

This table reports regressions at the firm-year level explaining how institutional ownership variables change after carbon disclosure is made mandatory in the UK in December 2017: (i) *Stewardship code IO* (*Non-stewardship code IO*) is the fraction of outstanding shares owned by institutional investors subject (not subject) to stewardship codes in their home countries in a year; (ii) *High-norms IO* (*Low-norms IO*) is the fraction of outstanding shares owned by institutional investors from high (low) social norm countries in a year; (iii) *Universal owner IO* (*Non-universal owner IO*) is the fraction of outstanding shares owned by institutional investors classified as universal owners (not universal owners) in a year. We use the following key independent variables: *Post UK carbon disclosure* equals one for the years of 2013 and afterwards, and zero otherwise; *No voluntary carbon disclosure* equals one if a firm did not disclose Scope 1 emissions to CDP in the years before 2013, and zero otherwise; *UK firm* equals one if a firm is from the UK, and zero otherwise. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. We multiplied the dependent variables by 10, to scale the regression coefficients up by that factor. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Stewardship code IO</i>	<i>High- norms IO</i>	<i>Universal owner IO</i>	<i>Non- stewardship code IO</i>	<i>Low- norms IO</i>	<i>Non- universal owner IO</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Post UK carbon disclosure x UK firm x No vol. carbon disclosure</i>	0.18** (0.09)	0.12*** (0.04)	0.31*** (0.07)	0.18 (0.11)	0.24 (0.17)	-0.17** (0.08)
<i>Post UK carbon disclosure x No voluntary carbon disclosure</i>	-0.10 (0.06)	0.02 (0.02)	-0.01 (0.05)	0.18*** (0.05)	0.06 (0.07)	0.12*** (0.02)
<i>Post UK carbon disclosure x UK firm</i>	-0.13 (0.17)	0.14*** (0.05)	-0.26** (0.10)	0.08 (0.09)	-0.23 (0.15)	0.43*** (0.05)
<i>UK firm x No voluntary carbon disclosure</i>	0.12 (0.11)	0.12** (0.05)	-0.27** (0.13)	-0.36 (0.22)	-0.37 (0.28)	0.14 (0.16)
<i>No voluntary carbon disclosure</i>	0.15 (0.09)	-0.00 (0.03)	0.07 (0.09)	-0.13 (0.09)	0.02 (0.15)	-0.10 (0.08)
<i>Log(Assets)</i>	0.10*** (0.02)	0.08*** (0.01)	0.16*** (0.03)	0.14** (0.06)	0.15** (0.07)	0.04 (0.03)
<i>Dividends/net income</i>	0.02 (0.01)	0.01 (0.01)	-0.02 (0.02)	-0.07** (0.03)	-0.05 (0.03)	-0.03 (0.02)
<i>Debt/assets</i>	-0.01 (0.12)	-0.11** (0.04)	-0.31*** (0.07)	-0.41*** (0.08)	-0.28* (0.15)	-0.13 (0.11)
<i>EBIT/assets</i>	0.64** (0.23)	0.65*** (0.21)	0.57*** (0.13)	0.56*** (0.16)	0.53*** (0.17)	0.41*** (0.14)
<i>CapEx/assets</i>	0.68*** (0.21)	0.43** (0.21)	0.07 (0.19)	-0.19 (0.29)	-0.01 (0.31)	0.19 (0.23)
<i>Book-to-market ratio</i>	-0.11*** (0.02)	-0.10*** (0.02)	-0.19*** (0.04)	-0.19*** (0.04)	-0.21*** (0.04)	-0.11*** (0.02)
<i>Financial disclosure quality</i>	1.80** (0.78)	0.44** (0.20)	0.35*** (0.07)	-1.01 (0.85)	0.40* (0.21)	0.46*** (0.16)
Sample Years	All Firms 2010-2019			All Firms 2010-2019		
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	29467	29467	29467	29467	28185	28185
Adj. R ²	0.614	0.764	0.561	0.860	0.726	0.679

Internet Appendix

for

Climate Risk Disclosure and Institutional Investors

Internet Appendix A: Anecdotal Evidence on Climate-related Disclosure Costs

Anecdotal evidence supports the argument that climate-related proprietary disclosure and information production costs are important for some firms.

A1. Proprietary Disclosure Costs

1. Feedback to New EU Guidelines on Climate-related Disclosures

For example, in response to a call for feedback to new EU guidelines on climate-related disclosures, *“several respondents point out the sensitivity and competitive nature of some the suggested disclosures and argue against the level of transparency that is recommended in the report.”* Further, *“some respondents feared that detailed reporting on scenario analysis, in relation to financial impacts and strategy could result in the disclosure of competitive information”* (European Commission 2019).

2. Evidence from a Survey by the TCFD

In a TCFD survey, *“almost half of the respondents [...] found disclosing scenario analysis assumptions difficult due to their inclusion of confidential business information”* (Financial Stability Board 2019).

A2. Information Production Costs

Feedback to SEC on Climate Disclosures

In response to a request for comments by the SEC on climate disclosure, respondents stated that *“Any new requirement for prescriptive, quantitative disclosures will result in significant direct and indirect costs to companies in the forms of data gathering and systems costs, legal expense, consulting expense, public relations expense, and litigation risk expense, among others”* (Society for Governance 2021). It was further stated that *“One large-cap company in the energy industry described its TCFD reporting process as involving 40 people from the company and six months of nearly full-time participation by 20 core team members. Employee hours spent on climate reporting for the two companies that provided data on this point ranged from 7,500 to 10,000 annually.”*

Internet Appendix B: Details on Survey Data

B1. Survey Methodology and Design

The survey we employed was developed through an iterative process as suggested by Krosnick and Presser (2010). Thus we employed the feedback from academics and practitioners throughout the process with multiple versions of the survey presented for their feedback. We then had the survey reviewed by professional survey designer. The survey instrument is provided in Internet Appendix B2. The original survey also contained questions on climate risk management and shareholder engagement, which are covered in Krueger, Sautner, and Starks (2020). More details of the iterative process that was used for developing the survey are provided in Krueger, Sautner, and Starks (2020).

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. 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. The online version was programmed so that response choices had random orderings. 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 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. 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%). 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.

B2. Non-Response and Acquiescence Bias

As in most surveys, there may be some concerns about the pool of respondents in our study. First, the sample of contacted individuals are not randomly distributed across the entire institutional investor universe and not all contacted individuals working at institutional investors responded to our survey. We assess the role of non-response bias by comparing key characteristics of the responding investors to those of the institutional investor in the FactSet population. As explained in the paper, IA Figure 1 shows that pension funds and banks are overrepresented in our sample, while mutual funds and asset managers are underrepresented. In terms of geography, our respondents are more likely to work for institutions in North America and Europe. Our respondents may be biased toward investors with a high ESG awareness (given the high median ESG share of 30%) as such investors may be more disposed to participate in our survey.

Second, concerns over untruthful or strategic responses may exist. For example, one might argue that investors not only have incentives to refrain from participating in our survey, but also that they may provide answers that make their institutions appear to be more climate-conscious. Based on our conversations with some of the respondents that were willing to share their identities, we believe that these issues are unlikely to affect our results in a systematic way. This is for several reasons. In our survey, we did not request the identities of our respondents (or those of their employers), we collected only limited information on their positions and institutions, and in the online survey we did not trace back IP addresses. The anonymity of our survey should hence minimize the incentives for untruthful or strategic responses, as the respondents cannot reap the potential benefits (e.g., reputational) of answering in a certain way. Further, a systematic pattern of strategic responses from our respondents to shift the distribution of their responses to appear more climate-conscious overall is also unlikely, since this would assume an implicit collaboration by our respondents. It is also unclear how respondents would benefit from such a practice since the readers of our analysis cannot infer the identities of their institutions. Finally, the respondents we spoke to stated that they would not spend the time on the survey if they intended to provide untruthful response.

Third, concerns about incorrect conclusions from the responses to our survey due to non-response bias or untruthful responses are moderated by our complementary tests that use investor holdings data. This observational analysis not only helps us in alleviating the limitations of our survey analysis, with the tests being built on the entire observable institutional investor universe, but they also allow us to test whether institutional investors “walk the climate-risk disclosure talk.” We do this by designing tests that provide insights into the causal links between institutional ownership and climate-risk disclosure practices of their portfolio firms.

B3. Survey Instrument

Survey on Climate Risk

We are a team of professors from [XXX], [XXX], and [XXX].

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.

[XXX], [XXX], and [XXX]

GENERAL INFORMATION

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

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

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: [NOT COVERED IN THIS PAPER]

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 \$1 billion and \$20 billion |
| <input type="checkbox"/> Between \$20 billion and \$50 billion | <input type="checkbox"/> Between \$50 billion and \$100 billion |
| <input type="checkbox"/> More than \$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"/> Chief Executive Officer |
| <input type="checkbox"/> Investment Analyst/Strategist | <input type="checkbox"/> Executive/Managing Director |
| <input type="checkbox"/> Chief Investment Officer | <input type="checkbox"/> ESG/Responsible Investment Specialist |
| <input type="checkbox"/> CFO/COO/Chairman/Other Executive | <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 [NOT COVERED IN THIS PAPER]

A4: To what extent do you agree with the following statements?

Incorporating climate risk ...	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
• Is a legal obligation/fiduciary duty that we have to consider	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• [Other statements not used in this paper]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 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 C: Additional Tables

IA 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), and geographic distribution (Question G7). Variable definitions are provided in the Data Appendix. The actual survey questions are provided in Internet Appendix B3.

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

IA Table 2. Correlations

This table provides Spearman rank correlations of selected variables from the climate disclosure and investor holdings data. * indicates significance at the 5% level (or more). Variable definitions are provided in the Data Appendix

Panel A. Correlations of Climate Risk Disclosure Variables						
	(1)	(2)	(3)	(4)	(5)	
<i>Scope 1 disclosure</i>	(1)	1				
<i>Climate risk disclosure</i>	(2)	0.7038*	1			
<i>Climate disclosure score</i>	(3)	0.8130*	0.7043*	1		
<i>10-K Climate risk disclosure (MPV)</i>	(4)	0.1174*	0.1540*	0.0823*	1	
<i>10-K Climate risk disclosure (KLRW)</i>	(5)	0.0959*	0.1721*	0.0830*	0.2792*	1
<i>High 10-K Climate risk disclosure (KLRW)</i>	(6)	0.0329	0.1636*	0.0244	0.3910*	0.5835*

Panel B. Correlations of IO Variables			
	(1)	(2)	
<i>Stewardship code IO</i>	(1)	1	
<i>High-norms IO</i>	(2)	0.7240*	1
<i>Universal owner IO</i>	(3)	0.6792*	0.5927*

IA Table 3. Financial Disclosure Quality and Institutional Investors

This table reports regressions at the firm-year level explaining firms' overall financial disclosure quality: *Financial disclosure quality* follows Chen, Miao, and Shevlin (2015) and measures the overall financial disclosure quality of a firm in a year. The measure counts the fraction of non-missing data items in the income statement as reported in Compustat. The variable ranges between 0 and 1. We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norm countries in a year; (iii) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Financial disclosure quality</i>		
	(1)	(2)	(3)
<i>Stewardship code IO</i>	0.06*** (0.02)		
<i>High-norms IO</i>		0.04*** (0.01)	
<i>Universal owner IO</i>			0.02** (0.01)
<i>Non-stewardship code IO</i>	-0.02 (0.02)		
<i>Low-norms IO</i>		0.02* (0.01)	
<i>Non-universal owner IO</i>			0.03** (0.01)
<i>Log(Assets)</i>	0.00* (0.00)	0.00* (0.00)	0.00* (0.00)
<i>Dividends/net income</i>	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
<i>Debt/assets</i>	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)
<i>EBIT/assets</i>	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
<i>CapEx/assets</i>	0.04* (0.02)	0.04* (0.02)	0.04* (0.02)
<i>Book-to-market ratio</i>	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Sample Years	All Firms 2010-2019		
Industry x Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
N	29467	29467	28185
Adj. R ²	0.336	0.329	0.328

IA Table 4. Climate Risk Disclosure and Institutional Investors: Results by Risk Type Disclosure

This table reports regressions at the firm-year level explaining firms' climate risk disclosures: *Regulatory risk disclosure* captures disclosure to CDP on regulatory climate risks in a year. It equals one zero if a firm discloses regulatory climate risks to CDP in year, and zero otherwise. *Physical risk disclosure* and *Other risk disclosure* are defined accordingly, but for physical or other climate risks. We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norm countries in a year; (iii) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>Regulatory risk disclosure</i>			<i>Physical risk disclosure</i>			<i>Other risk disclosure</i>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Stewardship code IO</i>	0.23* (0.12)			0.18 (0.11)			0.16 (0.10)		
<i>High-norms IO</i>		0.20* (0.11)			0.16 (0.12)			0.13 (0.10)	
<i>Universal owner IO</i>			0.34*** (0.08)			0.25*** (0.08)			0.26*** (0.07)
<i>Non-stewardship code IO</i>	0.01 (0.14)			-0.02 (0.14)			-0.02 (0.16)		
<i>Low-norms IO</i>		0.07 (0.16)			0.03 (0.15)			0.03 (0.17)	
<i>Non-universal owner IO</i>			-0.05 (0.12)			-0.05 (0.11)			-0.07 (0.13)
<i>Log(Assets)</i>	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.12*** (0.01)	0.12*** (0.01)	0.12*** (0.01)	0.11*** (0.01)	0.11*** (0.01)	0.11*** (0.01)
<i>Dividends/net income</i>	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.00)	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.01)
<i>Debt/assets</i>	-0.09*** (0.02)	-0.09*** (0.02)	-0.08*** (0.02)	-0.09*** (0.02)	-0.09*** (0.02)	-0.08*** (0.03)	-0.09*** (0.02)	-0.09*** (0.02)	-0.08*** (0.03)
<i>EBIT/assets</i>	-0.07 (0.05)	-0.07 (0.05)	-0.06 (0.05)	-0.05 (0.05)	-0.05 (0.05)	-0.03 (0.05)	-0.06 (0.04)	-0.06 (0.04)	-0.05 (0.04)
<i>CapEx/assets</i>	0.03 (0.13)	0.04 (0.13)	0.07 (0.13)	-0.01 (0.14)	-0.00 (0.14)	0.02 (0.14)	0.07 (0.12)	0.08 (0.12)	0.11 (0.12)
<i>Book-to-market ratio</i>	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.07*** (0.01)
<i>Financial disclosure quality</i>	0.08** (0.04)	0.07* (0.04)	0.10** (0.04)	0.04 (0.04)	0.04 (0.04)	0.06 (0.05)	0.09* (0.05)	0.09* (0.05)	0.11** (0.05)
Sample Years	All Firms 2011-2016			All Firms 2011-2016			All Firms 2011-2016		
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18247	18247	17716	18247	18247	17716	18247	18247	17716
Adj. R ²	0.300	0.299	0.299	0.284	0.283	0.283	0.269	0.268	0.268

IA Table 5. Climate Risk Disclosure in 10-K Annual Reports

This table reports regressions at the firm-year level explaining firms' 10-K climate risk disclosures: *10-K Climate risk disclosure (MPV)* follows Matsumura, Prakash, and Vera-Muñoz (2021) and equals one if a 10-K contains the climate change words in a year, and zero otherwise. This variable is only available for US firms. *10-K Climate risk disclosure (KLRW)* follows Kölbel et al. (2021) and equals one if a 10-K contains discussions on climate risks according to their data, and zero otherwise. *High 10-K Climate risk disclosure (KLRW)* follows Kölbel et al. (2021) and equals one if the amount of discussions on climate risk in 10-K according to their data is above the median, and zero otherwise. Both of these measures are only available for US firms in the sample of Kölbel et al. (2021). We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norm countries in a year; (iii) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the industry-year level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	<i>10-K Climate risk disclosure (MPV)</i>			<i>10-K Climate risk disclosure (KLRW)</i>			<i>High 10-K Climate risk disclosure (KLRW)</i>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Stewardship code IO</i>	0.04 (0.16)			0.12 (0.25)			0.05 (0.30)		
<i>High-norms IO</i>		0.26 (0.28)			1.01* (0.53)			0.27 (0.52)	
<i>Universal owner IO</i>			-0.09 (0.10)			0.38* (0.20)			0.74*** (0.21)
<i>Non-stewardship code IO</i>	-0.15*** (0.06)			0.05 (0.12)			0.30** (0.13)		
<i>Low-norms IO</i>		-0.14*** (0.05)			-0.02 (0.12)			0.27** (0.12)	
<i>Non-universal owner IO</i>			-0.12* (0.07)			-0.17 (0.14)			-0.01 (0.13)
<i>Log(Assets)</i>	0.04*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
<i>Dividends/net income</i>	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)
<i>Debt/assets</i>	0.22*** (0.05)	0.22*** (0.05)	0.22*** (0.05)	-0.01 (0.09)	-0.01 (0.09)	-0.03 (0.10)	-0.19* (0.10)	-0.18* (0.10)	-0.19* (0.10)
<i>EBIT/assets</i>	0.36*** (0.09)	0.35*** (0.09)	0.37*** (0.09)	-0.12 (0.20)	-0.18 (0.20)	-0.12 (0.20)	-0.59*** (0.20)	-0.61*** (0.20)	-0.61*** (0.20)
<i>CapEx/assets</i>	0.89*** (0.20)	0.88*** (0.20)	0.89*** (0.20)	0.31 (0.42)	0.32 (0.42)	0.40 (0.43)	1.23** (0.48)	1.24** (0.48)	1.46*** (0.49)
<i>Book-to-market ratio</i>	0.16*** (0.03)	0.16*** (0.03)	0.16*** (0.03)	-0.14*** (0.05)	-0.14*** (0.05)	-0.15*** (0.05)	-0.25*** (0.05)	-0.25*** (0.05)	-0.26*** (0.06)
<i>Financial disclosure quality</i>	0.03 (0.10)	0.03 (0.10)	0.02 (0.10)	-0.27* (0.15)	-0.27* (0.15)	-0.26* (0.15)	-0.39** (0.15)	-0.39** (0.15)	-0.37** (0.15)
Sample Years	US Firms 2010-2019			US Firms in Kölbel et al. (2021) 2010-2019			US Firms in Kölbel et al. (2021) 2010-2019		
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3272	3272	3272	1506	1506	1474	1506	1506	1474
Adj. R-sq.	0.267	0.268	0.267	0.095	0.098	0.102	0.296	0.296	0.306

IA Table 6. Climate Risk Disclosure: Costs and Benefits of Disclosure

This table reports regressions at the firm-year level explaining how firms' climate risk disclosures varies with measures of the costs and benefits of climate-related disclosure: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Climate risk disclosure* captures disclosure to CDP on up to three types of climate risks (regulatory, physical or other climate risks) in a year. It takes the value zero if a firm does not disclose climate risks to CDP in year, one if it discloses information on one type of climate risks, two if it discloses information on two types of climate risks, and three if it discloses information on all three types of climate risks. *Climate disclosure score* measures how comprehensive climate risk disclosure to CDP is by counting the fraction of questions that were answered in the CDP survey in a year. The measures varies between 0 and 100 and higher numbers indicate better climate disclosure. We use the following key independent variables: In panel A, *High-competition firm* equals one if a firm operates in a very competitive industry based on the text-based HHI measure by Hoberg and Phillips (2016), and zero otherwise. An industry is defined as very competitive if a firm's HHI is below the sample median in a year. In panel B, *Large firm* equals one if a firm's total assets are above the sample median in a year, and zero otherwise. In panel C, *High-emission industry* equals one if a firm operates in an SIC2 industry that is in the top 20 across SIC2 industries based on Scope 1 emissions, and zero otherwise. Panel A contains only US firms as the competition measure is only available for such firms. All panels control for the same variables as the corresponding regressions in Table 4, except that panel B does not control for $\text{Log}(\text{Assets})$. *High-emission industry* in Panel C is absorbed by the fixed effects. Variable definitions are provided in the Data Appendix. In panel A standard errors (in parentheses) are clustered at the industry-year level. In panels B and C, standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Proprietary Costs			
	<i>Scope 1 disclosure</i>	<i>Climate risk disclosure</i>	<i>Log(Climate disclosure score)</i>
	(1)	(2)	(3)
<i>High-competition firm</i>	-0.05*** (0.02)	-0.06 (0.06)	-0.21** (0.09)
Sample Years	US Firms 2010-2019	US Firms 2011-2016	US Firms 2010-2015
Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
N	3967	2387	2372
Adj. R ²	0.231	0.172	0.270
Panel B. Information Production Costs			
	<i>Scope 1 disclosure</i>	<i>Climate risk disclosure</i>	<i>Log(Climate disclosure score)</i>
	(1)	(2)	(3)
<i>Large firm</i>	0.36*** (0.03)	0.78*** (0.12)	1.44*** (0.13)
Sample Years	All Firms 2010-2019	All Firms 2011-2016	All Firms 2010-2015
Controls	Yes	Yes	Yes
Industry x Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
N	29467	19947	19801
Adj. R ²	0.228	0.200	0.228
Panel C. Disclosure Externalities Benefit			
	<i>Scope 1 disclosure</i>	<i>Climate risk disclosure</i>	<i>Log(Climate disclosure score)</i>
	(1)	(2)	(3)
<i>High-emission industry</i>	0.00 (0.02)	0.08 (0.05)	-0.01 (0.07)
Sample Years	All Firms 2010-2019	All Firms 2011-2016	All Firms 2010-2015
Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
N	29487	19955	19808
Adj. R ²	0.276	0.245	0.298

IA Table 7. Climate Risk Disclosure: Emission Verification and Country Breakdowns

This table reports regressions at the firm-year level explaining CDP firms' climate risk disclosures: (i) *Scope 1 verification* equals one if a firm that reports Scope 1 emissions to CDP also obtains verification on Scope 1 emissions in a year, and zero otherwise (*Scope 2 verification* and *Scope 3 verification* are defined accordingly); (ii) *Scope 1 country breakdown* equals one if a firm that reports Scope 1 emissions to CDP also provides a breakdown of Scope 1 emissions across countries to CDP in a year, and zero otherwise (*Scope 2 country breakdown* is defined accordingly). CDP did not include this question in 2010. We use the following key independent variables: (i) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (ii) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norms in a year; (iii) *Universal owner IO* is fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

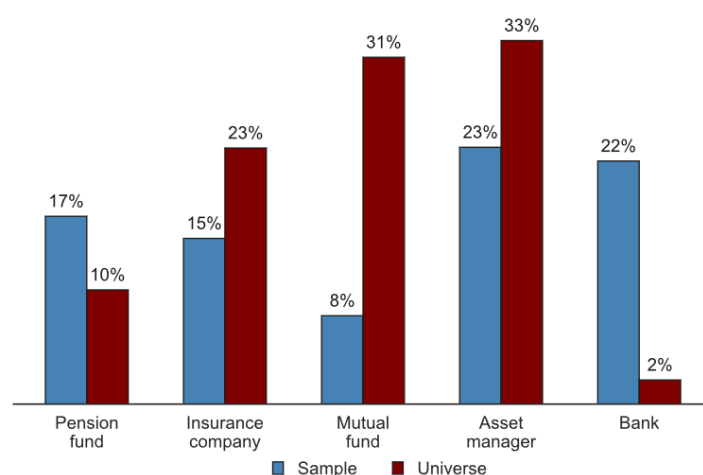
	Scope 1 verification			Scope 2 verification			Scope 3 verification			Scope 1 country breakdown			Scope 2 country breakdown		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>Stewardship code IO</i>	0.19** (0.08)			0.47*** (0.10)			0.65*** (0.09)			0.44** (0.17)			0.46** (0.18)		
<i>High-norms IO</i>		0.13 (0.11)			0.19 (0.18)			0.35 (0.27)			0.33*** (0.10)			0.24** (0.11)	
<i>Universal owner IO</i>			0.38* (0.20)			0.49** (0.24)			0.76*** (0.27)			0.45** (0.18)			0.46*** (0.17)
<i>Non-stewardship code IO</i>	0.05 (0.08)			-0.07 (0.09)			-0.00 (0.10)			0.16* (0.09)			0.13* (0.07)		
<i>Low-norms IO</i>		0.11 (0.08)			0.21** (0.08)			0.31*** (0.09)			0.25*** (0.09)			0.27*** (0.09)	
<i>Non-universal owner IO</i>			-0.09 (0.09)			-0.05 (0.18)			-0.05 (0.18)			0.11 (0.14)			0.07 (0.13)
<i>Log(Assets)</i>	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.12*** (0.01)	0.12*** (0.01)	0.12*** (0.01)	0.09*** (0.01)	0.09*** (0.01)	0.09*** (0.01)	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)
<i>Dividends/net income</i>	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01* (0.00)	-0.01** (0.01)	-0.01** (0.01)	-0.01** (0.01)	-0.01** (0.01)	-0.01** (0.01)	-0.01** (0.01)
<i>Debt/assets</i>	0.09 (0.07)	0.11 (0.07)	0.09 (0.07)	0.09 (0.08)	0.14 (0.11)	0.11 (0.09)	0.11 (0.09)	0.17 (0.13)	0.11 (0.11)	0.04 (0.06)	0.04 (0.06)	0.04 (0.06)	-0.03 (0.05)	-0.04 (0.05)	-0.03 (0.05)
<i>EBIT/assets</i>	-0.03 (0.11)	-0.03 (0.11)	-0.07 (0.11)	-0.04 (0.12)	-0.04 (0.13)	-0.07 (0.13)	0.14 (0.09)	0.14 (0.09)	0.09 (0.11)	0.04 (0.11)	0.04 (0.12)	0.04 (0.12)	0.02 (0.13)	0.02 (0.14)	0.02 (0.13)
<i>CapEx/assets</i>	0.06 (0.30)	0.04 (0.30)	-0.04 (0.29)	-0.42 (0.28)	-0.45 (0.28)	-0.46 (0.27)	-0.07 (0.27)	-0.14 (0.27)	-0.12 (0.27)	0.50** (0.18)	0.50*** (0.18)	0.51*** (0.17)	0.74*** (0.15)	0.74*** (0.14)	0.74*** (0.14)
<i>Book-to-market ratio</i>	-0.08** (0.03)	-0.08** (0.03)	-0.08** (0.03)	-0.06** (0.03)	-0.07** (0.03)	-0.07** (0.03)	-0.05* (0.03)	-0.06* (0.03)	-0.05* (0.03)	-0.03 (0.03)	-0.03 (0.03)	-0.03 (0.03)	-0.04 (0.03)	-0.04 (0.03)	-0.04 (0.03)
<i>Financial disclosure quality</i>	-0.05 (0.10)	-0.07 (0.10)	-0.04 (0.11)	-0.10 (0.12)	-0.17 (0.13)	-0.15 (0.13)	-0.29* (0.15)	-0.36* (0.18)	-0.38** (0.17)	0.22 (0.16)	0.22 (0.15)	0.23 (0.16)	0.23* (0.14)	0.22 (0.13)	0.24* (0.14)
Sample	All Firms If Disclose Scope 1 2010-2019			All Firms If Disclose Scope 2 2010-2019			All Firms If Disclose Scope 3 2010-2019			All Firms If Disclose Scope 1 2011-2017			All Firms If Disclose Scope 2 2011-2017		
Years															
Industry x Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6778	6778	6495	6299	6299	6120	5547	5547	5393	6424	6424	6420	6236	6236	6232
Adj. R ²	0.358	0.355	0.364	0.375	0.347	0.361	0.378	0.340	0.353	0.452	0.451	0.452	0.447	0.446	0.446

Internet Appendix D: Additional Figures

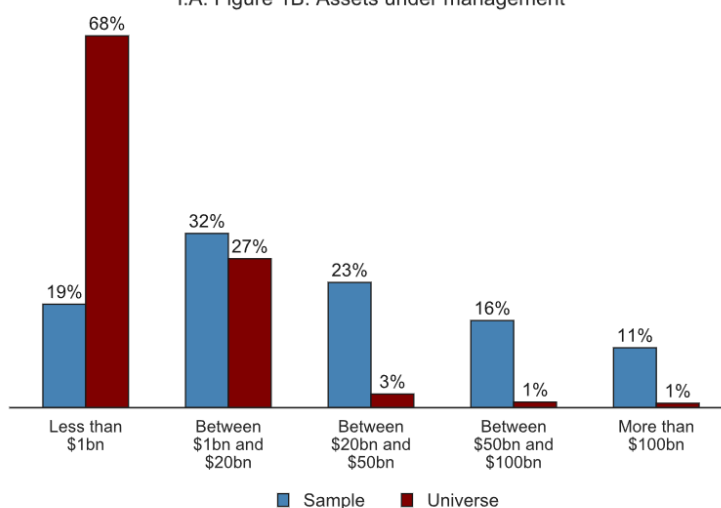
IA Figure 1. Comparison of sample characteristics with universe of institutional investors

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. In IA 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 IA 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 IA 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

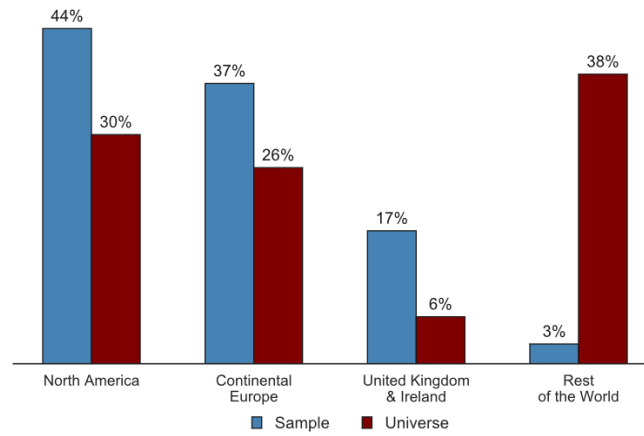


I.A. Figure 1B: Assets under management



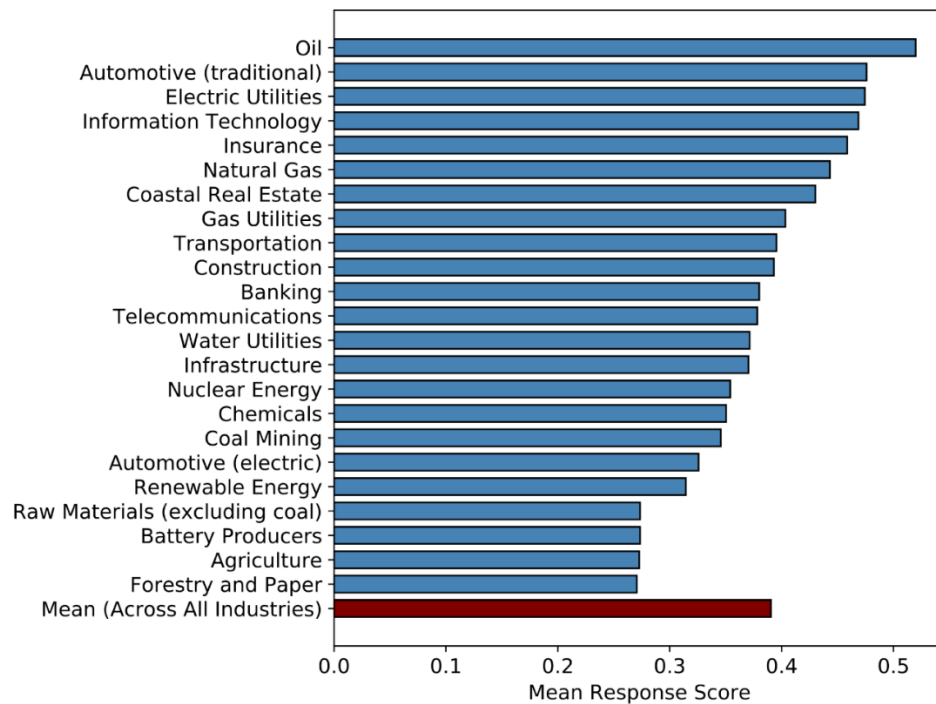
IA Figure 1 (continued)

I.A. Figure 1C: Region



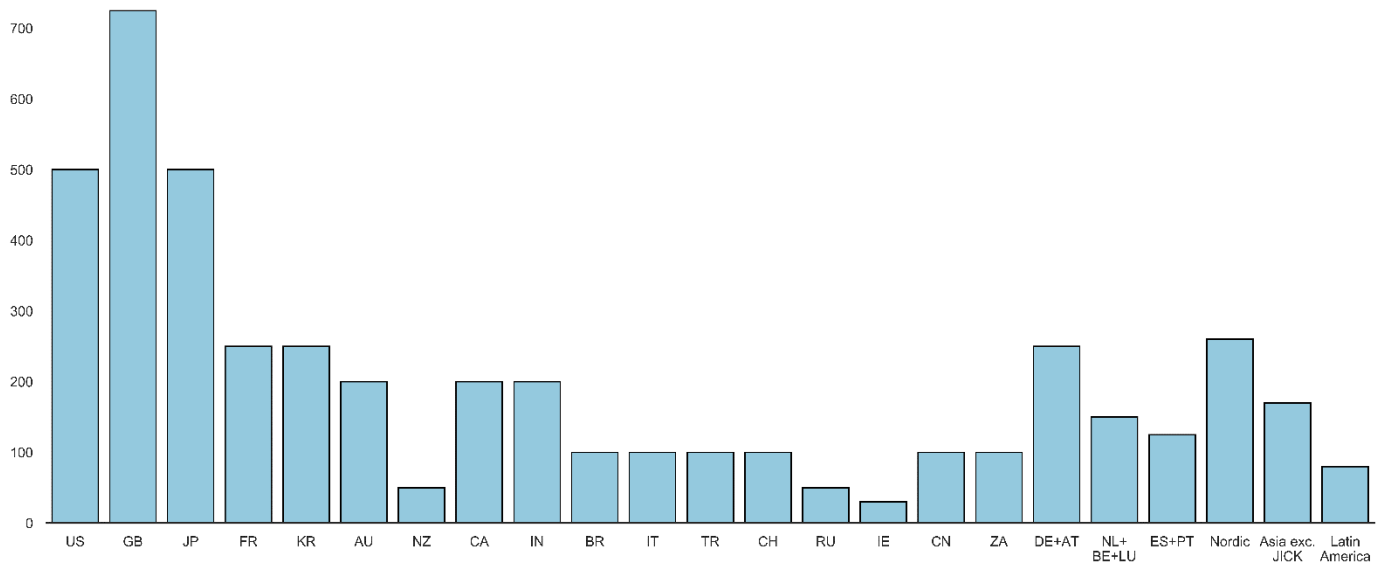
IA Figure 2. Climate Risk Underpricing

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.



IA Figure 3. Distribution of Investor Holdings Sample across Countries

This figure shows the distribution of the investor holdings sample across countries. The sample construction follows Krueger (2015). In the figure, Nordic countries are Sweden, Denmark, Norway, Finland, and Iceland; Asia exc. JICK are Asia excluding Japan, India, China, and South Korea (i.e., Hong Kong, Singapore, Taiwan, Philippines, Pakistan, Indonesia, Malaysia, Thailand); and Latin America is Mexico, Chile, Colombia, Peru.



Internet Appendix E: 10-K-Based Measure of Climate Risk Disclosure

To create the count-based measure of climate-related disclosures in 10-K we follow Matsumura, Prakash, and Vera-Muñoz (2021).

In a first step, we download a quarterly master index file, which contain links to all files disclosed to the SEC under <https://www.sec.gov/Archives/edgar/full-index/>. We then download all 10-K forms for our sample firms with a Python crawling algorithm. The resultant 10-K documents include the text in the annual 10-K reports, html code for formatting, as well as tables, exhibits and images. While a document does not have to be stripped-off of all unnecessary text structures such as html codes or tables for a word counting exercise, we nonetheless clean these documents to ensure our measure does not include any false positives. Since we are only interested in the text, we remove all Unicode characters such as ’ or . We also remove digits, symbols, punctuation, and stop words. Finally, we replace multiple spaces with single space.

In a second step, we lemmatize each token (i.e., anything that is between two spaces, aka words). Lemmatization serve the purpose of standardizing the texts. For example, the string “emission” does not match to “emissions”. But the lemmatized version of both “emission” and “emissions” is “emission”. This process does a few other things apart from removing plurals and it is rather standard in word counting algorithms. Next, we make all strings in a text lowercase such that we do not have issues like “ghg” not matching “GHG” or “climate change” not matching “Climate change”.

In a third step, we count how frequently climate change words of the dictionary by Matsumura, Prakash, and Vera-Muñoz (2021) appear in each 10-K. These words are “carbon”, “climate change”, “emissions”, “greenhouse”, “GHG”, “hurricanes”, “renewable energy”, and “extreme weather.” Note that before counting, we also lemmatize the dictionary and make all words lowercase. This only affects the string “emissions” and “hurricanes” which become singular, and the string “GHG” which becomes “ghg”.

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