ecgi

Climate Risk Disclosure and Institutional Investors

Finance Working Paper N° 661/2020
November 2022

Emirhan Ilhan
National University of Singapore Business School and Sustainable and Green Finance Institute

Philipp Krueger
University of Geneva, GFRI, SFI and ECGI

Zacharias Sautner
Frankfurt School of Finance and Management and ECGI

Laura T. Starks
University of Texas at Austin and ECGI

ECGI Working Paper Series in Finance

Climate Risk Disclosure and Institutional Investors

Working Paper N° 661/2020
November 2022

Emirhan Ilhan
Philipp Krueger
Zacharias Sautner
Laura T. Starks

We would like to thank Itay Goldstein (the Editor) and two anonymous referees for their very constructive comments. We would also like to thank Edward Baker, Alexander Dyck, Miguel Ferreira, Henri Servaes, Harrison Hong, Andrew Karolyi, Michelle Lowry, Pedro Matos, Jerry Parwada, Jose Scheinkman, and seminar participants at the PRI Academic Conference 2019 in Paris, the Shenzhen Sustainable Finance Forum 2019, the European Commission Summer School on Sustainable Finance in Ispra 2019, Stockholm School of Economics, Sveriges Riksbank, University of Mannheim, University of St. Gallen, University of Groningen, Canadian Sustainable Finance Network, the Sustainable Finance Conference 2021 at the University of Luxembourg, University of DuisburgEssen, University of Technology Sydney, Corporate Finance Webinar Seminar Series, ERIC 2021 Conference, the 2021 EFA Meetings, the 2022 University of Delaware Weinberg Center/ECGI Corporate Governance Symposium, Cornell University, the AFA 2022 Meetings, and the CEPR Paris Symposium 2022. Valentin Jouvenot provided excellent research assistance.

Abstract

Through a survey and analyses of observational data, we provide systematic evidence that institutional investors value and demand climate risk disclosures. The survey reveals the investors have a strong demand for climate risk disclosures, and many actively engage their portfolio firms for improvements. Empirical analyses of holdings data corroborate this evidence by showing a significantly positive association between climate-conscious institutional ownership and better firm-level climate risk disclosure. We establish further evidence of institutional investors' influence on firms' climate risk disclosures by examining a shock to the climate risk disclosure demand of French institutional investors (French Article 173).

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

JEL Classifications: G11, G3, Q54

Emirhan Ilhan
Assistant Professor
National University of Singapore Business School
15 Kent Ridge Drive, Mochtar Riady Building
Singapore 119245,
e-mail: ilhan@nus.edu.sg

Philipp Krueger
Associate Professor of Responsible Finance
University of Geneva, Geneva School of Economics and Management
40, Bd du Pont-d'Arve
1211 Geneva 4, Switzerland
phone: +41 223 798 569
e-mail: philipp.krueger@unige.ch

Zacharias Sautner*
Professor of Finance
Frankfurt School of Finance and Management
Adickesallee 32-34
60322 Frankfurt am Main, Germany
phone: +49 69 154008 755
e-mail: z.sautner@fs.de

Laura T. Starks
George Kozmetsky Centennial University Distinguished Chair
University of Texas at Austin, McCombs School of Business
2110 Speedway
Austin, TX 78705, United States
phone: +1 512 471 5899
e-mail: laura.starks@mccombs.utexas.edu

*Corresponding Author

Climate Risk Disclosure and Institutional Investors

Emirhan Ilhan Philipp Krueger Zacharias Sautner Laura T. Starks

September 2022

Abstract

Through a survey and analyses of observational data, we provide systematic evidence that institutional investors value and demand climate risk disclosures. The survey reveals the investors have a strong demand for climate risk disclosures, and many actively engage their portfolio firms for improvements. Empirical analyses of holdings data corroborate this evidence by showing a significantly positive association between climate-conscious institutional ownership and better firm-level climate risk disclosure. We establish further evidence of institutional investors' influence on firms' climate risk disclosures by examining a shock to the climate risk disclosure demand of French institutional investors (French Article 173).

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

JEL Codes: G11; G3; Q54

Emirhan Ilhan is at the National University of Singapore (NUS) Business School (ilhan@nus.edu.sg). Philipp Krueger is at the University of Geneva and the Swiss Finance Institute (Philipp.Krueger@unige.ch). Zacharias Sautner is at the Frankfurt School of Finance & Management (z.sautner@fs.de). Laura T. Starks is at the McCombs School of Business, University of Texas at Austin (Laura.Starks@mccombs.utexas.edu). We would like to thank Itay Goldstein (the Editor) and two anonymous referees for their very constructive comments. We would also like to thank Edward Baker, Alexander Dyck, Miguel Ferreira, Henri Servaes, Harrison Hong, Andrew Karolyi, Michelle Lowry, Pedro Matos, Jerry Parwada, Jose Scheinkman, and seminar participants at the PRI Academic Conference 2019 in Paris, the Shenzhen Sustainable Finance Forum 2019, the European Commission Summer School on Sustainable Finance in Ispra 2019, Stockholm School of Economics, Sveriges Riksbank, University of Mannheim, University of St. Gallen, University of Groningen, Canadian Sustainable Finance Network, the Sustainable Finance Conference 2021 at the University of Luxembourg, University of Duisburg-Essen, University of Technology Sydney, Corporate Finance Webinar Seminar Series, ERIC 2021 Conference, the 2021 EFA Meetings, the 2022 University of Delaware Weinberg Center/ECGI Corporate Governance Symposium, Cornell University, the AFA 2022 Meetings, and the CEPR Paris Symposium 2022. Valentin Jouvenot provided excellent research assistance.

Financial market efficiency relies on timely and accurate information regarding firms' risk exposures, including 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 can be essential for regulatory efforts to protect financial stability, as pointed out by regulators in the UK, US, and EU.[1]

However, many believe that investors lack sufficient information on corporate climate risks. Because of the perceived shortcomings, initiatives have been developed to encourage improved reporting on these risks. Examples of such initiatives include the Task Force on Climate-related Financial Disclosures (TCFD), the International Sustainability Standards Board (ISSB), or letters by specific investor to CEOs (e.g., Blackrock 2021). In addition, governments are increasingly mandating disclosures, particularly aligned with the TCFD recommendations. Examples include the European Union, Japan, New Zealand, Switzerland and the UK. Countries that have not yet moved on the regulatory front are evaluating the introduction of mandatory climate risk disclosure (e.g., the US, see SEC 2022). Jointly, these initiatives reflect a belief that the provision of climate risk information by publicly listed firms is valuable and necessary for investment decision-making.

The fact that many firms 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. Moreover, Goldstein et al. (2022) show that mandated disclosure of non-pecuniary information may affect the pricing

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

of financial information.[2]

In this paper, we develop and test hypotheses regarding the preferences of institutional investors with respect to climate risk disclosures. Preferences for climate risk disclosures differ from preferences for traditional corporate disclosure because of the multidimensionality of this type of disclosure, combined with the properties of climate risk: Climate risk disclosure is hard to compare and standardize, it targets a wider audience, and it is argued to have important externality benefits beyond a firm (Christensen, Hail, and Leuz 2021). Institutional investors have the potential to play a pivotal role for climate risk disclosure given that their pressure is considered to be the most powerful financial mechanism to reduce firms' climate risk exposures according to a survey by Stroebel and Wurgler (2021). This pressure is likely to also extend to climate risk disclosure.

We provide evidence that institutional investors value and demand climate risk disclosure. To establish these results, we employ firm-level climate risk disclosure data from the CDP (formerly the Climate Disclosure Project) and examine the relation between disclosure measures and holdings of institutional investors.[3] A shock to the institutions' climate-related regulatory environments allows us to identify disclosure-related influence effects of the institutional investors. We preview our tests with insights from a survey of institutional investors regarding their opinions about climate risk disclosure. The survey also serves the purpose of validating key hypotheses tested in the data and of adding insights difficult to research through archival methods.

The global respondent group of the survey consists of important decision makers at some of the world's largest investors: about one-third of the 439 respondents work 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

[2] Moreover, Bond and Goldstein (2015) show 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. The authors' setting is with governments as the decision maker, but the authors point out that their results would also apply to firms. In a climate context, however, given the uncertainties surrounding the effects of climate change and the governmental responses, managers may rely more than in other circumstances on learning from prices.

[3] The CDP is an international non-profit organization that surveys firms (and other organizations such as cities) to obtain information on their environmental impacts.

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 that incorporate climate risks into investment decisions because of legal obligations or fiduciary duties, investors from countries with high environmental norms, and very large (and arguably universal) investors attach a greater importance to climate risk disclosure.

Constituting the core of our paper, we use equity holdings and climate risk disclosure data to test hypotheses linking institutional ownership to climate risk reporting in an international sample. Rather than considering broadly-defined institutional ownership, we focus on three specific types of institutional owners who would be likely to have a stronger demand for meaningful climate risk disclosure. We term these three groups "climate-conscious investors" and predict effects for their holdings.

We define our first group of climate-conscious institutional investors as those 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 ownership group definition considers that the demand for climate reporting depends, at least in part, on whether the investors are located in countries where norms to be more climate-conscious exist (Dyck et al. 2019). Finally, the third group consists of universal owners, who by virtue of their broad ownership across many firms face externalities in their holdings. These investors would be expected to demand more climate risk disclosure as they need the information to understand their externality exposures and to potentially pressure firms to reduce carbon emissions, which would reduce the externalities the investors face. We expect that higher ownership by the three climate-conscious groups of investors should be associated with a greater tendency for their portfolio firms to voluntarily disclose climate risks either because of influence or selection effects.

We use three measures derived from CDP data to capture firms' climate risk disclosure choices. 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; Seltzer, Starks and Zhu 2022). Second, we use a measure of disclosure on broadly-defined climate risks developed by Flammer, Toffel, and Viswanathan (2021) (FTV henceforth). This measure is based on whether firms identify and disclose information on three climate-related risks to CDP: regulatory, physical, and other risks. Finally, to capture the overall quality of a firm's CDP climate risk disclosures, we compute a score that measures the completeness of a firm's CDP survey responses.

Our analyses show that all of these CDP-based measures of climate risk disclosure are positively and significantly associated with each of the climate-conscious ownership groups. For example, 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. Similarly, a one-standard deviation increase in ownership from investors located in a high-norms country comes with an increase in the FTV disclosure measure of 0.07 or 14% of the variable's mean. All estimations account for investor preferences for overall voluntary disclosure by controlling for whether firms provide earnings forecasts (e.g., Li and Yang 2016 or Tsang, Xi, and Xin 2019).

We complement these findings by providing suggestive evidence that climate risk reporting depends on the costs and benefits of producing such disclosures. 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. In particular, the relationship between climate-conscious ownership and disclosure appears moderated for firms with high proprietary disclosure costs, but magnified for firms where the externality benefits of the disclosure should be higher because they operate in high-emission industries. We consider these tests to be informative, but not definitive since they are based on rough proxies.

The estimated relationships we document between disclosure and climate-conscious ownership could exist for two primary 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). To show that institutional investors can actively influence

climate risk disclosure, we exploit a regulation adopted in France in 2015. Article 173 of the *Energy Transition for Green Growth Act* 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 experienced a plausibly exogenous shock to the demand for climate risk disclosure. Indeed, we demonstrate for firms owned by many French institutions that their disclosures improve in response to Article 173. The Scope 1 disclosure rate, for example, increases by 2pp more at firms with high French institutional ownership (above the median) when Article 173 takes effect compared to firms with low French ownership, a large effect compared to the variable's mean of 28% in the estimation period.

Additional tests support this influence channel interpretation, whereby French institutions engage firms to improve their reporting after Article 173 (or firms preempt this by disclosing more), rather than an interpretation whereby French institutions increase holdings in firms with better disclosures. For example, results are robust to using pre-reform French institutional ownership in the estimation, instead of the more endogenous contemporaneous ownership. We also try to isolate the influence channel by conditioning the estimation on firm-level changes in French ownership around Article 173 and on pre-Article 173 climate risk disclosure levels. Furthermore, we find no evidence that French institutional ownership increases relatively more after Article 173 among firms with better pre-reform climate risk disclosure. Although these tests provide support for the influence channel we propose, we do not completely rule out the presence of some selection effects also existing around the introduction of Article 173.

Our paper contributes 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 risk disclosures are arguably an important component.[4] Most closely related to our paper is the work by FTV 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 FTV, it is also fundamentally different given our

[4] See Leuz and Wysocki (2016), Goldstein and Yang (2017), and Christensen, Hail, and Leuz (2021) for reviews of the disclosure literature.

different focus in that we examine investor heterogeneity along the dimension of investors' climate-consciousness; we consider the role of influence effects in a unique setting; we validate our insights with a survey instrument; and we provide global evidence.

We also contribute to the broader literature on climate risk 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 (due to exclusionary screening based on *disclosed* emissions). Matsumura, Prakash, and Vera-Muñoz (2022) find that 10-K climate disclosure is associated with lower costs of equity, Kölbel et al. (2022) 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. Solomon et al. (2011) 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 (2022) use CDP data to infer emission abatement 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. Azar et al. (2021) find that institutional ownership by the Big 3 index investors (Blackrock, Vanguard, and State Street) is associated with emission reductions, and Kundu and Ruenzi (2021) show that firms that experience increases in climate-conscious ownership reduce emissions in the longer run. We also relate to Mésonnier and Nguyen (2022) who show that Article 173 reduced the financing of fossil fuel firms by institutions subject to the new law. Our work contributes unique insights regarding the relationship between institutional investor ownership and firms' climate risk disclosure.

1. Conceptual Framework

Climate risk disclosure differs from financial disclosure as it often targets a wider audience, is multidimensional, is difficult to measure in monetary terms, is hard to compare and standardize, and has externality benefits beyond a firm (Christensen, Hail, and Leuz 2021).

These aspects affect the demand for climate risk information more for certain types of institutional investors. Thus, we define three ownership groups of climate-conscious investors, who plausibly exhibit a stronger demand for climate risk reporting (Dasgupta, Fos, and Sautner 2021 highlight the importance of addressing such heterogeneity).

The first group 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.[5]

The second group definition reflects disclosure demand due to environmental norms in an institutional investor's home country. In Williamson's (2000) framework for institutional influences on economic activity, the most fundamental are social norms and culture. 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 risk disclosure can originate from whether investors are based in countries with more climate-conscious norms.

The third ownership group consists of universal owners, building on the idea that these investors face externality risks and consequently they demand more information and also could reap benefits from climate risk disclosure.[6] Specifically, climate risk disclosure 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

[5] While stewardship codes do not formally require compliance with their principles, typically 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) demonstrate that stewardship codes enhance the monitoring activities of institutional investors. Bonacchi et al. (2022) show how compliance with the UK's stewardship code improves the ESG performance of portfolio firms.

[6] 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.

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.

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 should depend on the corresponding costs and benefits. While the disclosure costs should be considered by firms and their investors, that is, in their supply and demand of the information, since the disclosure benefits are not fully internalized by firms, they would not be equally rewarding to all investors. One potential cost arises because the climate risk disclosure could reveal proprietary information about a firm's strategy to its competitors. For example, Google reportedly would not reveal its carbon footprint because of concerns regarding trade secrecy. Similarly, a group of oil and gas firms maintain that practical or legal reasons could prohibit them or limit their scope for revealing disaggregated information about climate risks (WBSCD 2018).[7] Griffin and Jaffe (2018) point out that these costs of disclosure can be significant – that disclosing such confidential information, which would be available to rivals, *"could be particularly burdensome."*[8] As proprietary disclosure costs are likely to be higher for firms operating in more competitive markets, we expect that the demand for such disclosure by climate-conscious institutions is smaller when competitive pressures are larger.

A benefit of climate-specific disclosure 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 2022; Downar et al. 2021; Jouvenot and Krueger 2021).[9] This externality benefit implies that the disclosure demand by climate-conscious institutions

[7] Climate risk disclosure may have other more general costs (it may crowd out information acquisition, reduce risk sharing, or increase return volatility) and benefits (it may improve liquidity, lower the costs of capital, improve risk sharing, or facilitate monitoring).

[8] Verrecchia (1990) shows that product market competition is pivotal for the magnitude of proprietary disclosure costs, and that competition reduces the propensity to make proprietary disclosures. Internet Appendix A provides anecdotal evidence on these costs.

[9] Further evidence on the beneficial real effects of mandatory ESG disclosures comes from Christensen et al. (2017) who consider effects of disclosure on mine safety records in financial reports, and from Bonetti, Leuz, and Michelon (2022) who consider disclosure on hydraulic fracking fluids.

should be larger for firms in high-emission industries.

2. Climate Risk Disclosure and Institutional Investors: Survey Evidence

In this section, we provide insights from a survey that previews the main analysis that uses climate risk disclosure and ownership data. The survey analysis aims to corroborate our hypotheses and to provide results and insights unobtainable from the observational data.

2.1 Data and Survey Design

The 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 employed in our tests; definitions are provided in the Data Appendix. IA Table 1 documents that about one-third of respondents hold executive-level positions in their institutions. Eleven percent are employed by institutions with assets of more than $100bn. We are confident that in the vast majority of cases we have only one observation per institution as for 87% of the observations, key identifying characteristics do not coincide. Although our respondents are likely biased toward investors with a high ESG awareness (given the high median ESG share and that such investors may be more disposed to participate in our survey), responses of such investors are important, because they are more likely to shape future climate risk disclosure policies through engagement, industry initiatives, or lobbying. Moreover, given that 27% of the investors manage more than $50bn, they have the clout to be effective in their efforts. Internet Appendix B2 discusses concerns over non-response and acquiescence bias.

2.2 Investor Views on Climate Risk Disclosures

In light of the potential benefits and costs of climate risk 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 climate risk disclosure to be 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. According to Table 2, panel A, a widespread view exists that current disclosures are uninformative. Many respondents believe that management discussions on climate risks (68% agree/strongly agree) and quantitative information on these risks (67% agree/strongly agree) are imprecise. These responses suggest that the current largely voluntary reporting regime does not enable fully informed climate-related investment decisions. Further, these survey responses indirectly imply that many managers do not consider the net benefits of climate risk reporting to be sufficiently high, as they would otherwise reveal such information voluntarily and with better quality. At the same time, many investors value such information, as indicated by their responses, believing that the benefits 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 just 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/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/strongly agree), and that those that exist are uninformative (64% agree/strongly agree). These views are consistent with 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 in many jurisdictions, but some countries such as the US are considering to make them mandatory, and as such, they could

eventually constitute the basis for mandatory disclosures in many countries.[10]

As a result of current disclosure shortcomings, some investors have developed engagement-focused initiatives beyond the TCFD to improve access to climate risk data (e.g., Climate Action 100+).[11] Consistent with such initiatives, Table 2, panel A, shows that many respondents believe that investors should put pressure on firms to disclose more on climate risks (74% agree/strongly agree). In addition, in Table 2, panel B, 59% of investors (plan to) engage firms to report according to the TCFD recommendations. These responses indicate that many investors have a demand for climate risk disclosure, as hypothesized in Section 1. In later tests we provide evidence that this demand leads to more disclosure by firms.

Finally, we surveyed the investors' opinions regarding the reporting on climate risks in their own portfolios (as required by the French Article 173). Our respondents indicate support for this approach with 60% stating that they (plan to) disclose their portfolio carbon footprints (Table 2, panel B). 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.

Overall, the responses to our survey 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 Investor Views on Climate Risk Disclosures

As discussed earlier, we expect that views on climate risk disclosure are based in part on whether investors are subject to stewardship codes, 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 with this statement, and zero otherwise. To quantify country norms, we follow Dyck et al. (2019) and use Yale

[10] The SEC proposal follows many of the TCFD recommendations (https://www.sec.gov/rules/proposed/2022/33-11042.pdf).
[11] Climate Action 100+ is an investor-led initiative launched in 2017 to engage the largest carbon emitters.

University's Environmental Performance Index (EPI) to measure environmental awareness. *HQ country norms* takes larger values for investors from countries with a stronger common belief in the importance of environmental issues. Finally, *Very large institution* equals 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.

In Table 3, we report the analyses of the relations between these three ownership variables and respondents' views on climate risk disclosures. In column 1, more importance is placed on climate risk reporting by all three identified ownership groups: the 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. In the remaining columns, 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, these estimates validate some key assumptions in the development of our hypotheses.[12]

3. Climate Risk Disclosure and Institutional Investors: Archival Evidence

In this section, we employ observational data to explore the relationship between firms' climate risk disclosures and institutional ownership. We provide evidence from panel regressions and a regulatory disclosure reform in France.

[12] The estimates control for several variables. *Climate risk ranking* captures how the respondents rank climate risks relative to traditional investment risks; *Climate risk financial materiality* reflects how financially material the investor considers climate risks to be; and *ESG portfolio share* is the fraction of assets subject to ESG principles. We control for investor horizon as longer-term investors may particularly value climate risk disclosure (Starks, Venkat, and Zhu 2022; FTV), and for fixed effects for the respondents' positions (e.g., CEO), the survey distribution channels, and investor types.

3.1 Data

3.1.1 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. CDP does not reveal which firms they contact, 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 an approach inspired by Krueger (2015), which builds on the idea that CDP typically requests information from the largest 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 1 in Internet Appendix D shows the sample country distribution of our "universe" of firms.

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

The first variable, *Scope 1 disclosure*, equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. Scope 1 emissions are direct emissions from owned or controlled sources of the disclosing firm, and the variable is available for all sample years. Scope 1 emissions are disclosed in 26% of sample firm-years (Table 1, panel B).

Next, to capture disclosure on climate risks more broadly, we adopt a variable used by FTV which leverages the fact that CDP asks firms to disclose information on regulatory, physical, and other climate 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. We construct the measure from 2010 to 2016 (from 2017 onwards, the structure of the question changed). *Climate risk disclosure* has a mean of 0.5, and the correlation with

Scope 1 disclosure is 78% (IA Table 2, panel A). 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); these three risks are disclosed in 17% to 19% of the firm-years.

Finally, to capture the overall quality of climate risk disclosures, we use a 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 and ranges from 0 to 100). The score is available from 2010 to 2015 as the CDP introduced a new methodology from 2015 onwards.[13] The average score across all firm-years is 16.

Throughout our analysis, we focus on understanding institutional investors' preferences towards voluntary climate risk disclosure. To disentangle the preference for such disclosure from a preference for overall voluntary disclosure, we employ a measure from the accounting literature that proxies for firms' voluntary disclosure practices. We follow Li and Yang (2016) and Tsang, Xi, and Xin (2019) and create *Forecast occurrence*, which equals one if a firm issues at least one voluntary earnings forecast in a year, and zero otherwise. Results are unaffected if we use the logarithm of the number of voluntary earnings forecasts. Internet Appendix E contains details on the variable construction.

3.1.2 Institutional Ownership Data. Consistent with the conceptual framework in Section 1, 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 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

[13] Between 2010 and 2015, CDP assigned a disclosure score (which we use in our analysis) and a letter rating that measured the performance of a firm. From 2015, there is only one letter rating for each disclosure submission and the CDP describes its new methodology to *"result in a score, which assesses the level of detail and comprehensiveness of the content, as well as the company's awareness of climate change issues, management methods and progress towards action taken on climate change as reported in the response."*

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 three largest index fund providers (Blackrock, Vanguard, and State Street), the universal owners include a number of institutions that are not primarily passive investors.

Table 1, panel B, shows that the three ownership variables vary between 9% and 14%, with considerable cross-sectional heterogeneity. IA Table 2, panel B, demonstrates that the measures, as would be expected, correlate positively, but the fact that correlations are between 34% and 58% reflects that they capture different aspects. We create and control for three measures of the residual ownership by "non-climate-conscious" institutions.

3.2 Climate Risk Disclosure and Institutional Investors: Evidence from Panel Data

3.2.1 Climate Risk Disclosure and Climate-Conscious Institutions. 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 model is as follows:

$$\textit{Climate disclosure}_{f,c,t} = \alpha + \beta\, \textit{IO}_{f,c,t} + \delta\, \boldsymbol{X}_{f,c,t} + \textit{Fixed Effects} + \varepsilon_{f,c,t}, \quad (1)$$

where $\textit{Climate disclosure}_{f,c,t}$ represents *Scope 1 disclosure*, *Climate risk disclosure*, or *log(1 + Climate disclosure score)*, $\textit{IO}_{f,c,t}$ denotes *Stewardship code IO*, *High-norms IO*, or *Universal owner IO*, and $\boldsymbol{X}_{f,c,t}$ contains the control variables. The control variables include the residual ownership measures, financial characteristics, and the proxy for overall voluntary disclosures. As climate risks vary across sectors and time, we include industry fixed effects interacted with year fixed effects. Unless indicated differently, we also include country fixed effects 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 *log(1 + Climate disclosure score)*. As explained earlier, the number of observations differ across regressions as the three variables are available for different years. We indicate the sample periods in the table.

In columns 1 to 3, we find strong and consistent evidence that climate-conscious ownership positively relates to the decision to disclose Scope 1 emissions. In column 1, a one-standard deviation increase in *Stewardship code IO* is associated with a 3pp increase in the propensity to disclose emissions, or 12% of the variable's mean. Effects are strongest in column 3, with a one-standard deviation shock to *Universal owner IO* increasing the Scope 1 disclosure rate by 6pp, or 23% of the variable's mean. We again find strong and significant effects in columns 4 to 6 where we use *Climate risk disclosure* as the dependent variable. For example, in column 5, a one-standard deviation increase in ownership from high-norms country investors comes with an increase in the disclosure measure by FTV of 0.07 or 14% of the variable's mean. Finally, in columns 7 to 9, for our third measure, the climate risk disclosure score, we continue to find positive and significant effects for all three climate-conscious ownership variables when we explain the climate risk disclosure score.

The table also reports interesting results for the firm characteristics. Across all specifications, large firms, firms with higher dividend payouts, growth firms disclose more and firms that voluntarily provide earnings forecasts disclose more regarding their climate risks.[14]

We provide additional tests in the internet appendix. In IA Table 4, we examine the disclosure of the three components of climate risk separately. Climate-conscious ownership positively relates to regulatory, physical, and other climate risk disclosures.

In IA Table 5, for comparison purposes, we provide complementary tests using a text-based measures of climate risk disclosure in the 10-Ks of US sample firms defined by Matsumura, Prakash, and Vera-Muñoz (2022). In these tests the dependent variable equals one if at least one of eight climate-related keywords occurs in a 10-K, and zero otherwise (Internet Appendix F contains details). We find no relationship between this variable and climate-conscious ownership. The lack of an effect may be explained by the less-structured and less-standardized climate disclosures currently available in 10-Ks. (The 10-K-based measure correlates only weakly with the CDP measures, see IA Table 2, panel A.) Investors

[14] IA Table 3 shows that it is important to control for voluntary disclosure, with *High-norm IO* being positively and significantly related to *Forecast occurrence*. (These results are unaffected if we use the logarithm of the number of voluntary earnings forecasts). Hence, there is some evidence that climate-conscious institutions have a preference for voluntary disclosure more generally.

may in turn prefer the structured and standardized CDP disclosures.[15] 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.

3.2.2 Climate Risk Disclosure: Role of Disclosure Costs and Benefits. We next consider that the demand for climate risk disclosure by climate-conscious institutions should depend on the costs and benefits of making these disclosures. For this purpose, we amend Equation (1) and allow the effects of $IO_{f,c,t}$, to vary across firms depending on costs or benefits:

$$\textit{Climate disclosure}_{f,c,t} = \alpha + \beta_1 IO_{f,c,t} \times Z_{f,c,t} + \beta_2 IO_{f,c,t} + \beta_3 Z_{f,c,t} + \delta \boldsymbol{X}_{f,c,t} + \textit{Fixed Effects} + \varepsilon_{f,c,t}, \quad (2)$$

where $\textit{Climate disclosure}_{f,c,t}$, and $IO_{f,c,t}$ are defined as above, and $Z_{f,c,t}$ is a proxy for a cost or benefit of climate risk disclosure. To test for the role of proprietary disclosure costs, we use the Hoberg and Phillips (2016) text-based HHI measure for whether a firm operates in a competitive environment. $\textit{High-competition firm}_{f,c,t}$, is one if a firm operates in a competitive environment where the HHI is below the median in a year (this measure is only available for US firms). Since proprietary disclosure costs are expected to be higher for firms in more competitive markets, the demand for climate risk disclosure by climate-conscious institutions should be smaller among such firms; this implies a negative estimate for β_1.

Further, the demand for climate risk disclosure by climate-conscious investors should be greater for firms in high-emitting industries, mainly because of the potential disclosure externality benefits in such sectors. We test this effect by interacting $IO_{f,c,t}$ with $\textit{High-emission industry}_f$, which equals one if a firm operates in one of the twenty SIC2 industries with the highest Scope 1 emissions. In these regressions, we expect that β_1 is positive.

Table 5 reports the results. In panel A, proprietary costs affect the disclosure demand as the β_1 coefficients are negative across all disclosure variables and for all climate-conscious ownership variables. Panel B also suggests a stronger disclosure demand for firms in high-emitting industries, with six of the nine specifications providing positive and significant β_1

[15] In IA Table 6, climate-conscious ownership positively and significantly relates to CDP-based disclosures among US firms.

estimates. Surprisingly, the disclosure demand by *Universal owner IO* for firms in high-emitting industries is only significant for *Climate risk disclosure*. Overall, Table 5 provides descriptive evidence that the climate risk disclosure demand by climate-conscious institutions depends on the costs and benefits of the reporting.

3.3 Climate Risk Disclosure and Institutional Investors: Evidence from French Article 173

3.3.1 Institutional Setting and Estimation. The positive relationship between climate-conscious ownership and climate risk disclosure in Section 3.2.1 could exist for two reasons. One explanation is that climate-conscious institutions actively engage firms and demand that they voluntarily produce climate risk information as suggested by our survey results. Such an influence effect may arise, for example, through (behind the scenes) dialogue between investors and a firm's management or the submission of shareholder proposals calling for firms to share more information on their exposure to climate risks. Engagement by institutional investors to demand disclosure can originate from several potential sources: the investors' beliefs that the disclosure will inform their investment decisions, including the possibility that disclosure will reduce climate risks in their portfolios; the investors' needs to publish climate-related data in their own regulatory filings; or demands from the investors' clients or beneficiaries. An alternative but non-mutually exclusive explanation is related to selection effects, that is, climate-conscious institutions may invest more in firms that provide better disclosures because they believe such firms are less risky or because their clients and beneficiaries impose such a constraint.

To test for the presence of influence effects, we exploit a regulatory shock to the demand for climate risk information. On August 17, 2015, shortly before the Paris Agreement, 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.[16] In order to comply with Article 173, French institutional investors would need climate risk information on their portfolio holdings, increasing their demand for climate risk disclosures. Consequently, we hypothesize that firms held by many French institutions increased their

[16] Though, formally, the regulation is on a "comply or explain" basis, compliance among French institutions is high (86% in the years 2017/2018 according to Novethic 2018).

climate risk disclosures after Article 173 went into effect in January 2016, either because French institutions actively engaged these firms or because these firms wanted to preempt such engagement (the latter effect would also be consistent with an influence channel). French institutions may engage firms on their own or as lead investors in investor coalitions, as documented for PRI, the Principles for Responsible Investment, in Dimson, Karakaş, 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 for our prediction of influence effects as a result of Article 173, we estimate for firm *f* in country *c* and year *t* variants of the following regression model for the narrow [-2; +2]-year event window around the passage of Article 173 in 2015:[17]

$$\textit{Climate disclosure}_{f,c,t} = \alpha + \beta_1\, \textit{Post Article 173}_t \times \textit{High French IO}_{f,c,t} + \beta_2\, \textit{High French IO}_{f,c,t} + \delta\, \boldsymbol{X}_{f,c,t} + \textit{Fixed Effects} + \varepsilon_{f,c,t}, \quad (3)$$

where $\textit{Climate disclosure}_{f,c,t}$ is $\textit{Scope 1 disclosure}_{f,c,t}$ or $\textit{Climate risk disclosure}_{f,c,t}$. (The variable $\textit{Climate disclosure score}_{f,c,t}$ is unavailable after Article 173, which is why we do not use it in this setting.) $\textit{Post Article 173}_t$ reflects that the regulation became effective in 2016 and in turn equals one in the years 2016 and 2017, and zero in the years before. (The non-interacted effect of $\textit{Post Article 173}_t$ is absorbed by the fixed effects.) $\textit{High French IO}_{f,c,t}$ equals one if French institutional ownership is above the median in a year. The coefficient of interest is β_1, which captures how the disclosure of firms with high French institutional ownership changes from before to after Article 173, relative to firms with low French ownership. Our main specifications include industry fixed effects interacted with year fixed effects as well as country fixed effects. Some regressions also estimate firm fixed effects. Summary statistics for the key variables used in this analysis are reported in Table 1, panel C.

3.3.2 Baseline Regression Results. Table 6 provides the baseline estimations of Equation (3). In this and the following tables, we focus primarily on *Scope 1 disclosure* (columns 1 to 4), as observations on *Climate risk disclosure* (column 5) are only available for one year after the

[17] Our choice of event window tries to be sufficiently narrow to isolate the effects of Article 173, without being too wide to be affected by disclosure spillover effects or unrelated market and disclosure developments.

passage of Article 173. In column 1, firms with high French institutional ownership (*High French IO*) have a significantly higher propensity of disclosing their Scope 1 emissions after Article 173 becomes effective, compared to firms with lower French ownership. The magnitudes are meaningful: After Article 173 takes effect, *Scope 1 disclosure* increases by 2pp more at firms with high French ownership compared to firms with low French ownership, a large effect compared to the variable's mean of 28% during the estimation period.

In column 2, we exclude French firms from the estimation for two reasons. First, French investors would presumably exercise more pressure on local firms, possibly because of domestic reputational concerns (Krueger, Sautner, and Starks 2020) or privileged access to the French firms' executives, perhaps due to shared educational background. Second, Article 173 also mandates that French-listed firms disclose their climate risks, which implies a potentially confounding shock to the supply of climate risk reporting for French firms. When adding the sample restriction in column 2, we continue to find a positive and significant effect of *High French IO* among the large set of non-French firms. The magnitude of the effect is unchanged relative to column 1. In column 3, we replace the industry-by-year fixed effects with firm fixed effects (and year fixed effects) to identify the changes in *Scope 1 disclosure* around the passage of Article 173 from within-firm variation (we use a balanced panel for these within-firm regressions). The estimated effects of Article 173 are about 50% larger compared to those obtained in columns 1 and 2. In column 4, we replace *High French IO* with *French IO*, a continuous measure of French institutional ownership, and additionally require that French ownership is at least 3% to ensure that results are present among the subsample of firms where very large French institutional ownership most plausibly predicts improved disclosures. We continue to find a positive and significant effect of French institutional ownership. Finally, in column 5, *Climate risk disclosure* also increases more strongly after Article 173 came into force at firms with high French institutional ownership.

3.3.3 Alternative Explanations and Robustness. The estimates in Table 6 are consistent with an influence effect interpretation, whereby the shock to the demand for climate risk disclosure by French institutions due to Article 173 leads to improved firm-level disclosures.

To bolster this interpretation, Table 7 provides a series of tests that address different concerns with the analysis in Table 6.

Table 7, panel A, addresses the concern that the estimates may in part reflect selection effects. Specifically, as French institutional investors are required to disclose their climate risk exposures, they may select to increase (decrease) holdings in firms with better (worse) climate risk disclosures. We estimate different variations of Equation (3) to gauge the importance of this alternative channel. The objective of these tests is to isolate – as much as possible – the influence channel of French institutions.

In column 1, we control for changes in French institutional ownership around Article 173's passage, measured as the change in the firm-level average of *French IO* from before to after the reform. We continue to find a positive and significant effect of *Post Article 173* x *High French IO*. Importantly, the magnitude of the effect is almost identical to the baseline estimate in Table 6, column 1. Unobserved variables correlated with French ownership changes around the introduction of Article 173 should thus *not* unduly bias our estimation.

In column 2, we replace *High French IO* with *High French IO Pre Article 173,* which captures whether French ownership is large in the years *prior* to Article 173's effective date. The benefit of using past values in the estimation is that it reduces concerns about the treatment status (high French institutional ownership) being endogenously affected by a selection channel. Column 2 confirms the results obtained in the prior column.

Finally, in column 3, we control for a firm's Scope 1 disclosures in the years *before* Article 173 comes into force, as the selection channel is plausibly strongest among those firms that already provided climate-related disclosures prior to the reform – these firms may see the strongest increase in French holdings. Again, results are unaffected and, if anything, become stronger in terms of economic magnitude and statistical significance.

Table 7, panel B, addresses different concerns about the empirical specification used to estimate Equation (3). One concern is that our results are affected by serial correlation in the error term. Following the guidance provided by Bertrand, Duflo, and Mullainathan (2004), in the specification reported in column 4, we cluster standard errors at the firm level after estimating regressions on a balanced panel with firm fixed effects. Next, in the column 5

specification we estimate a firm-level regression model using data that are collapsed in the pre- and post-Article 173 period (2013-2015 versus 2016-2017), after including again firm fixed effects. The estimates in both columns are in line with our previous results.

In column 6, we consider the role of pre-trends by estimating a version of Equation (3) that includes dynamic treatment effects for the individual years around the passage of Article 173 in 2015 (the year 2015 constitutes the baseline year). We observe no significant effects of *High French IO* for the years prior to the passage of Article 173 (2013 and 2014), but positive and significant effects for 2016 and 2017. The effect size for 2016 is about ten times larger than that for 2014, and the effect increases further in 2017.

Table 7, panel C, provides a placebo test to corroborate that our results are not due to unobservable differences in *general* voluntary disclosure practices between firms with high- and low French institutional ownership that coincided with Article 173. To this end, we re-estimate Equation (3) but replace climate risk disclosure with *Forecast occurrence*, the proxy for general voluntary disclosure. As is evident from column 7, in this falsification test *Post Article 173 x High French IO* is not significantly different from zero.

3.3.4 Changes in French Institutional Ownership. In Table 8, we take further steps to mitigate concerns about selection effects. Specifically, we examine whether changes in *French IO* around Article 173 depend on the practices of firm-level climate risk disclosure in years *before* the reform. For this purpose, we estimate for firm *f* in country *c* and year *t* the dynamics of French institutional ownership around Article 173*:*

$$\begin{aligned} \textit{French IO}_{f,c,t} = {} & \alpha + \beta_1 \textit{ Post Article 173}_t \text{ x } \textit{Climate disclosure Pre Article 173}_{f,c,t} \\ & + \beta_2 \textit{ Climate disclosure Pre Article 173}_{f,c,t} + \delta \boldsymbol{X}_{f,c,t} + \textit{Fixed Effects} + \varepsilon_{f,c,t}, \end{aligned} \tag{4}$$

where *French IO* $_{f,c,t}$ is French institutional ownership, and *Climate disclosure Pre Article 173*$_{f,c,t}$ is *Scope 1 disclosure* or *Climate risk disclosure* in the years *before* Article 173 became effective. We measure pre-reform disclosure using the firm-level averages of the disclosure measures for the years before 2016. As before, *Post Article 173*$_t$ equals one for 2016 and afterwards, and zero before, and we use again the same two-sided two-year time window around the

passage of the reform in 2015. (The non-interacted effect of *Post Article 173*$_t$ is again absorbed by the fixed effects.)

In columns 1 and 2, we are unable to detect that *French IO* increases more strongly among firms with relatively high pre-Article 173 disclosure levels. The absence of a significant effect further mitigates the concern that our results in Table 6 are driven by selection effects. The regressions also show that French institutional ownership is generally larger when firms disclose more on climate risks prior to Article 173. A natural caveat of this test is that, by conditioning on pre-Article 173 disclosure, we cannot eliminate any role of *expected future* disclosure after the reform, which may theoretically still explain some of the Table 6 effects. Overall, we believe that the set of results on Article 173 are more consistent with an influence channel. However, we do not want to rule out that some selection effects around the introduction of Article 173 might also have been at play.

4. 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 equity portfolio holdings data on the preferences of institutional investors with respect to climate risk disclosures. We advance the literature by making two primary contributions.

First, we illustrate that institutional investors value and demand climate risk disclosures. In our survey, the respondents share a strong belief that climate risk 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 risk disclosure.

Second, we demonstrate that 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 institutional investors. The results support an interpretation whereby

institutions influence firms to improve their reporting.

Overall, our results show the importance of institutional investors in demanding informative, high-quality disclosures from firms, in this case for climate-related risk disclosures.

Data Appendix

Panel A. Survey Analysis		
Variable	**Definition**	**Survey Question**
Importance of climate risk disclosure	Measures how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information. The variable ranges between one and five, with one indicating that climate risk reporting is "much less importance" and five indicating that it is "much more important".	Question B1
Demand more disclosure	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
Quant. information imprecise	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
Management discussions imprecise	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
TCFD engagement	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
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
Climate risk ranking	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
Climate risk financial materiality	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
Fiduciary duty institution	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
HQ country norms	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
Very large institution	Equals one if the size of an institutional investor is more than $100bn, and zero otherwise.	Question G6
ESG portfolio share	Percentage of the institution's portfolio that incorporates ESG issues.	Question G5
Medium-term horizon	Equals one if the indicated typical holding period of an institutional investor is between six months and two years, and zero otherwise.	Question G2
Long-term horizon	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**
Scope 1 disclosure	Equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise.	CDP, 2010-2019
Climate risk disclosure	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 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	CDP, 2011-2016

	design from 2017 onwards such that the responses are not comparable anymore for these years.	
Climate disclosure score	Measures how comprehensive a firm's climate risk disclosure is to CDP 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
10-K Climate risk disclosure	Follows Matsumura, Prakash, and Vera-Muñoz (2022) 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
Stewardship code IO	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
High-norms IO	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
Universal owner IO	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 (calculated at the parent level). The number of observations for this variable is lower than that for the other two ownership measures as we miss parent data for the last sample year. Winsorized at 1%.	FactSet, 2010-2018
Non-stewardship code IO	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
Low-norms IO	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
Non-universal owner IO	Fraction of outstanding shares owned by institutional investors that are not classified as universal owners in a year. Winsorized at 1%.	FactSet, 2010-2018
High-competition firm	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
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.	Ilhan, Vilkov, and Sautner (2021), 2010-2019
Assets	Total assets (Worldscope data item WC02999) at the end of the year. Winsorized at the 1% level. Winsorized at 1%.	Worldscope, 2010-2019
Dividends/net income	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
Debt/assets	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 itemWC02999). Winsorized at 1%.	Worldscope, 2010-2019
EBIT/assets	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
CapEx/assets	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

Book-to-market ratio	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
Forecast occurrence	Equals one if a firm issues at least one voluntary earnings forecast in a given year, and zero otherwise.	S&P Capital IQ
	Panel C. French Article 173 Analysis	
Post Article 173	Equals one for the years of 2016 and afterwards, and zero otherwise.	Self-constructed,
High French IO	Equals one if the fraction of outstanding shares owned by French institutional investors is above the median of a given year, and zero otherwise.	FactSet, 2010-2019
French IO	Continuous measure of institutional ownership by French institutions.	FactSet, 2010-2019
High French IO Pre Article 173	Equals one if the average fraction of outstanding shares owned by French institutional investors in the years before 2016 is above the median, and zero otherwise	FactSet, 2010-2019
Δ French IO Pre to Post Article 173	Average value of the fraction of outstanding shares owned by French institutional investors for the years 2016 and afterwards minus the same average value for the years before 2016.	FactSet, 2010-2019
Scope 1 disclosure Pre Article 173	Average value of *Scope 1 disclosure* for the years before 2016.	CDP, 2010-2019
Climate risk disclosure Pre Article 173	Average value of *Climate risk disclosure* for the years before 2016.	CDP, 2011-2016
French firm	Equals one if a firm is from France, and zero otherwise.	FactSet, 2010-2019

References

Amundi, 2020, Engagement report, retrieved from: https://www.amundi.com/int/Local-Content/News/Just-published!-Amundi-2020-Engagement-Report

Azar, José, Miguel Duro, Igor Kadach, and Gaizka Ormazabal, 2021, The Big Three and corporate carbon emissions around the world, *Journal of Financial Economics* 142, 674-696.

Berkman, Henk, Jonathan Jona, and Naomi Soderstrom, 2021, Firm-specific climate risk and market valuation, Working Paper, University of Auckland.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan, 2004, How much should we trust differences-in-differences estimates?, *Quarterly Journal of Economics* 119, 249-275.

Blackrock, 2021, Larry Fink's 2021 letter to CEOs, retrieved from: https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter.

Bolton, Patrick, and Marcin Kacperczyk, 2021a, Do investors care about carbon risk?, *Journal of Financial Economics* 142, 517-549.

Bolton, Patrick, and Marcin Kacperczyk, 2021b, Carbon Disclosure and the cost of capital, Working Paper, Imperial College London.

Bolton, Patrick, and Marcin Kacperczyk, 2022, Firm commitments, Working Paper, Imperial College London.

Bonacchi, Massimiliano, April Klein, Sara Longo, and Giovanni Strampelli, 2022, The effects of credible voluntary disclosures: Institutional investor engagement and investees' ESG performances, Working Paper, Free University of Bolzano.

Bond, Philip, and Itay Goldstein, 2015, Government intervention and information aggregation by Prices, *Journal of Fina*nce 70, 2777-2811.

Bonetti, Pietro, Christian Leuz, and Giovanna Michelon, 2022, Internalizing externalities: Disclosure regulation for hydraulic fracturing, drilling activity and water quality, Working Paper, University of Navarra, IESE Business School.

Carbis Bay G 7 Summit Communiqué, 2021, retrieved from: https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/13/carbis-bay-g7-summit-communique/.

Carney, Mark, 2015, Breaking the tragedy of the horizon-climate change and financial stability, Speech 29 September 2015, Bank of England, Lloyds of London.

Christensen, Hans B., Luzi Hail, and Christian Leuz, 2021, Mandatory CSR and sustainability reporting: Economic analysis and literature review, *Review of Accounting Studies* 26, 1176–1248.

Christensen, Hans B., Eric Floyd, Lisa Yao Liu, and Mark Maffett, 2017, The real effects of mandated information on social responsibility in financial reports: Evidence from mine-safety records, *Journal of Accounting and Economics* 64, 284-304.

Dasgupta, Amil, Vyacheslav Fos, and Zacharias Sautner, 2021, Institutional investors and corporate governance, *Foundations and Trends in Finance* 12, 276-394.

Davidson, Kate, 2021, Yellen is creating a new senior treasury post for climate czar, *Wall Street Journal*, February 12, 2021.

Dimson, Elroy, Oğuzhan Karakaş, and Xi Li, 2021, Coordinated engagement, Working Paper, University of Cambridge.

Downar, Benedikt, Jürgen Ernstberger, Stefan J. Reichelstein, Sebastian Schwenen, and Aleksandar Zaklan, 2021, The impact of carbon disclosure mandates on emissions and financial operating performance, *Review of Accounting Studies* 26, 1137-1175.

Dyck, Alexander, Karl Lins, Lukas Roth, and Hannes Wagner, 2019, Do institutional investors drive corporate social responsibility? International evidence, *Journal of Financial Economics* 131, 693-714.

Eccles, Robert G., and Michael P. Krzus, 2019, Implementing the Task Force on Climate-related Financial Disclosures recommendations: An assessment of corporate readiness, *Schmalenbach Business Review* 71, 287-293.

European Central Bank and European Systemic Risk Board, 2021, Climate-related risk and financial stability, retrieved from: https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf.

European Commission, 2019, Technical Expert Group on Sustainable Finance: Climate-related disclosures: summary of responses to call for feedback, retrieved from: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190110-sustainable-finance-teg-report-climate-related-disclosures-summary-of-responses_en.pdf.

Financial Stability Board, 2019, Task Force on Climate-related Financial Disclosures: Status report, retrieved from: https://www.fsb.org/wp-content/uploads/P050619.pdf.

Flammer, Caroline, 2021, Corporate green bonds, *Journal of Financial Economics* 142, 499-516.

Flammer, Caroline, Michael W. Toffel, and Kala Viswanathan, 2021, Shareholder activism and firms' voluntary disclosure of climate change risks, *Strategic Management Journal* 42, 1850-1879.

Ghazal, Maria, 2022, The proposed SEC Climate Disclosure Rule: A comment from the Business Roundtable, retrieved from the Harvard Law School Forum on Corporate Governance: https://corpgov.law.harvard.edu/2022/07/12/the-proposed-sec-climate-disclosure-rule-a-comment-from-the-business-roundtable/.

Goldstein, Itay, Alexandr Kopytov, Lin Shen, and Haotian Xiang, 2022, On ESG investing: Heterogeneous preferences, information and asset prices. Working paper, University of Pennsylvania, The Wharton School.

Goldstein, Itay, and Liyan Yang, 2017, Information disclosure in financial markets, *Annual Review of Financial Economics* 9, 101-125.

Griffin, Paul and Amy Myers Jaffe, 2016, Should oil companies like Exxon be forced to disclose climate change risks, *The Conversation*, retrieved from: https://theconversation.com/should-oil-companies-like-exxon-be-forced-to-disclose-climate-change-risks-66961.

Griffin, Paul A., David H. Lont, and Estelle Y. Sun, 2017, The relevance to investors of greenhouse gas emission disclosures, *Contemporary Accounting Research* 34, 1265-1297.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales, 2006, Does culture affect economic outcomes? *Journal of Economic Perspectives* 20, 23-48.

Hawley, James P. and Andrew T. Williams, 2000, *The Rise of Fiduciary Capitalism: How Institutional Investors Can Make Corporate America More Democratic*. University of Pennsylvania Press.

Hoberg, Gerard, and Gordon Phillips, 2016, Text-based network industries and endogenous product differentiation, *Journal of Political Economy* 124, 1423-1465.

Ilhan, Emirhan, Zacharias Sautner, and Grigory Vilkov, 2021, Carbon tail risk, *Review of Financial Studies* 34, 1540-1571.

Jayaraman, Sudarshan, and Joanna Shuang Wu, 2019, Is silence golden? Real effects of mandatory disclosure, *Review of Financial Studies* 32, 2225-2259.

Jayaraman, Sudarshan, and Joanna Shuang Wu, 2020, Should I stay or should I grow? Using voluntary disclosure to elicit market feedback, *Review of Financial Studies* 33, 3854-3888.

Jouvenot, Valentin, and Philipp Krueger, 2021, Mandatory corporate carbon disclosure: Evidence from a natural experiment, Working Paper, University of Geneva.

Katelouzou, Dionysia, and Mathias Siems, 2021, The global diffusion of stewardship codes, in *Global Shareholder Stewardship: Complexities, Challenges and Possibilities*, Dionysia Katelouzou and Dan W. Puchniak eds, Cambridge University Press.

Kölbel, Julian F., Markus Leippold, Jordy Rillaerts, and Qian Wang, 2022, Ask BERT: How regulatory disclosure of transition and physical climate risks affects the CDS term structure, *Journal of Financial Econometrics*, forthcoming.

Krueger, Philipp, 2015, Climate change and firm valuation: Evidence from a quasi-natural experiment, Working Paper, Swiss Finance Institute.

Krueger, Philipp, Zacharias Sautner, and Laura T. Starks, 2020, The importance of climate risks for institutional investors, *Review of Financial Studies* 33, 1067-1111.

Kundu, Santanu, and Stefan Ruenzi, 2021, Institutional Investors and carbon emissions: Evidence from the US EPA's semi-scientific reporting mandate, Working Paper, University of Mannheim.

Leuz, Christian, and Peter D. Wysocki, 2016, The economics of disclosure and financial reporting regulation: Evidence and suggestions for future research, *Journal of Accounting Research* 54, 525-622.

Li, Xi, and Holly I. Yang, 2016, Mandatory financial reporting and voluntary disclosure: The effect of mandatory IFRS adoption on management forecasts, *The Accounting Review* 91, 933-953.

Litterman, Bob, 2016, *Climate Risk: Tail Risk and the Price of Carbon Emissions − Answers to the Risk Management Puzzle*. Hoboken, NJ: John Wiley & Sons.

Matsumura, Ella M., Rachna Prakash, and Sandra C. Vera-Muñoz, 2014, Firm-value effects of carbon emissions and carbon disclosures, *The Accounting Review* 89, 695-724.

Matsumura, Ella M., Rachna Prakash, and Sandra C. Vera-Muñoz, 2022, Climate-risk materiality and firm risk, Working Paper, University of Wisconsin-Madison.

Mésonnier, Jean-Stéphane, and Benoit Nguyen, 2022, Showing off cleaner hands: mandatory climate-related disclosure by financial institutions and the financing of fossil energy, Working Paper, Banque de France.

Novethic, 2018, 173 shades of reporting: Season II. Climate and ESG reporting of French institutional investors, retrieved from: https://www.novethic.com/fileadmin/user_upload/tx_ausynovethicetudes/pdf_complets/Novethic_2018_173-Shades-of-Reporting-Season2.pdf.

Ramadorai, Tarun, and Federica Zeni, 2021, Climate regulation and emissions abatement: theory and evidence from firms' disclosures, Working Paper, Imperial College London.

SEC (Securities and Exchange Commission), 2010, Commission Guidance Regarding Disclosure Related to Climate Change. Release No. 33-9106 (FR-82), retrieved from: https://www.federalregister.gov/documents/2010/02/08/2010-2602/commissionguidance-regarding-disclosure-related-to-climate-change

Shiraishi, Yutaro, Naoshi Ikeda, Yasuhiro Arikawa, and Kotaro Inoue, 2019, Stewardship code, institutional investors, and firm value: International evidence, Working Paper, Tokyo Institute of Technology.

SEC, 2022, SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors, SEC Press Release, retrieved from: https://www.sec.gov/news/press-release/2022-46.

Seltzer, Lee, Laura Starks, and Qifei Zhu, 2022, Climate regulatory risks and corporate bonds, Working Paper, Federal Reserve Bank of New York.

Shleifer, Andrei, 2005, Understanding regulation, *European Financial Management* 11, 439-451.

Society for Governance, 2021, Public input on climate disclosure, retrieved from: https://www.sec.gov/comments/climate-disclosure/cll12-8914283-244663.pdf

Solomon, Jill F., Aris Solomon, Simon D. Norton, and Nathan L. Joseph, 2011, Private climate change reporting: an emerging discourse of risk and opportunity? *Accounting, Auditing & Accountability Journal* 24, 1119-1148.

Starks, Laura, Parth Venkat, and Qifei Zhu, 2022, Corporate ESG profiles and investor horizons, Working Paper, University of Texas at Austin.

Stroebel, Johannes, and Jeffrey Wurgler, 2021, What do you think about climate finance, *Journal Financial Economics* 142, 487-498.

Tomar, Sorabh, 2022, Greenhouse gas disclosure and emissions benchmarking, Working Paper, Southern Methodist University.

Tsang, Albert, Fei Xie, and Xiangang Xin, 2019, Foreign institutional investors and corporate voluntary disclosure around the world, *The Accounting Review* 94, 319-348.

Verrecchia, Robert E., 1990, Information quality and discretionary disclosure, *Journal of Accounting and Economics* 12, 365-380.

Williamson, Oliver E., 2000, The new institutional economics: Taking stock, looking ahead. *Journal of Economic Literature* 38, 595-613.

WBCSD (World Business Council for Sustainable Development), 2018, Climate-related disclosure by oil and gas companies: Implementation of the TCFD recommendations, retrieved from: https://docs.wbcsd.org/2018/07/Climate_related_financial_disclosure_by_oil_and_gas_companies.pdf

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 from the survey). Of the 439 individuals that participated in our survey, 416 responded to this question. The actual survey question is provided in Internet Appendix B3.

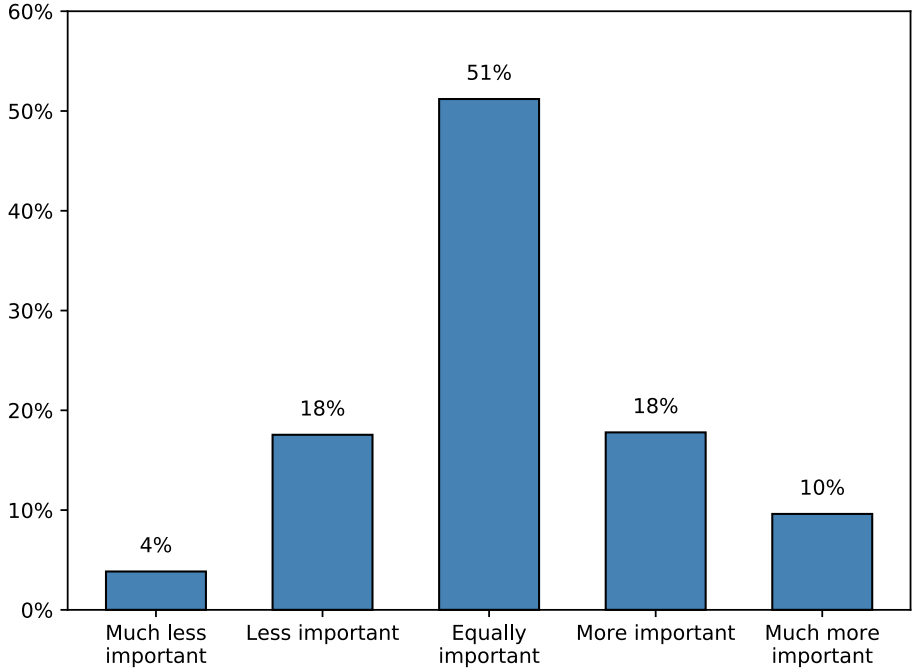


Table 1. Summary Statistics

This table provides summary statistics of the variables used in the survey (panel A) and in the climate disclosure and investor holdings (panels B and C) analyses. Observations in panel A are at the respondent level. Observations in panels B and C are at the firm-year level. The sample period in panel B is 2010 to 2019 and in panel C it is 2013 to 2017. Not all variables are available for all respondents and all firm-years. For dummy variables we report only mean values and the number of observations. All variables are defined in the Data Appendix.

Panel A. Survey Variables				
Variable	Mean	STD	Median	N
Importance of climate risk disclosure	3.12	0.94	3.00	416
Demand more disclosure	0.28			413
Quant. information imprecise	0.19			413
Management discussions imprecise	0.21			413
TCFD engagement	0.78			304
Carbon footprint disclosure	0.72			327
Climate risk ranking	2.95	1.64	3.00	386
Climate risk materiality	3.73	0.82	3.67	393
Fiduciary duty institution	0.27			415
HQ country norms	0.61	0.06	0.57	425
Very large institution	0.11			430
ESG portfolio share	0.41	0.32	0.30	415
Medium-term horizon	0.77			432
Long-term horizon	0.18			432
Panel B. Climate-related Disclosure and Investor Holdings Variables				
Variable	Mean	STD	Median	N
Scope 1 disclosure	0.26			43221
Climate risk disclosure	0.50	1.08	0.00	25932
Regulatory risk disclosure	0.19			25932
Physical risk disclosure	0.18			23892
Other risk disclosure	0.17			23892
Climate disclosure score	16.47	32.82	0.00	25934
10-K Climate risk disclosure	0.70			3962
Stewardship code IO	0.14	0.17	0.07	43221
High-norms IO	0.09	0.11	0.05	43221
Universal owner IO	0.14	0.14	0.09	37740
Non-stewardship code IO	0.14	0.22	0.06	43221
Low-norms IO	0.18	0.24	0.09	43221
Non-universal owner IO	0.13	0.14	0.08	37740
High-competition firm	0.50			4739
High-emission industry	0.38			43221
Log(Assets)	15.03	2.05	15.00	43221
Dividends/net income	0.38	0.69	0.27	42867
Debt/assets	0.45	0.20	0.45	36164
EBIT/assets	0.07	0.10	0.06	42317
CapEx/assets	0.04	0.05	0.03	42967
Book-to-market ratio	0.72	0.57	0.58	43174
Forecast occurrence	0.72			43221
Panel C. French Article 173 Variables				
Scope 1 disclosure	0.28			21606
Climate risk disclosure	0.54	1.12	0	17284
Δ French IO Pre to Post Article 173	-0.0001	0.0114	0	19229
Post Article 173	0.40			21606
French IO	0.007	0.0208	0.001	21606
Forecast occurrence	0.73	0.44	1	21606

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 questions regarding 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 own 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

	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

This table reports OLS regressions at the respondent level explaining investors' views on climate risk disclosure where the dependent variables are as follows: (i) *Importance of climate risk disclosure* (as compared to reporting on financial information) 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" (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). We use the following independent variables: *Fiduciary duty institution; HQ country norms; Very large institution*; *Climate risk ranking* (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 portfolio share; Medium-term horizon; Long-term horizon.* 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.

	Importance of climate risk disclosure	*Management discussions imprecise*	*Quantitative information imprecise*	*Demand disclosure*	*TCFD engagement*	*Carbon footprint disclosure*
	(1)	(2)	(3)	(4)	(5)	(6)
Fiduciary duty institution	0.19*	0.08	0.13*	0.16***	0.04	0.01
	(0.10)	(0.05)	(0.06)	(0.02)	(0.05)	(0.06)
HQ country norms	1.23**	0.24	-0.15	0.07	1.08***	0.22
	(0.52)	(0.37)	(0.26)	(0.24)	(0.18)	(0.34)
Very large institution	0.31**	0.02	0.11*	-0.02	0.04	0.18***
	(0.11)	(0.04)	(0.06)	(0.04)	(0.10)	(0.06)
Climate risk ranking	0.11***	0.02*	0.01	0.01	0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Climate risk financial materiality	0.36***	0.07**	0.04	0.10***	0.02	0.05**
	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
ESG portfolio share	0.30	0.20***	0.14**	0.04	0.34**	0.23***
	(0.29)	(0.07)	(0.06)	(0.12)	(0.13)	(0.07)
Medium-term horizon	-0.05	0.07	0.01	-0.06	0.07	-0.02
	(0.19)	(0.08)	(0.08)	(0.13)	(0.09)	(0.10)
Long-term horizon	-0.12	0.11	0.06	-0.13	0.05	-0.09
	(0.26)	(0.10)	(0.09)	(0.12)	(0.07)	(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 4. Climate Risk Disclosure and Institutional Investors

This table reports regressions at the firm-year level explaining firms' climate risk disclosures. The dependent variables are as follows: *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 a firm's climate risk disclosure is to CDP 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.

	Scope 1 disclosure			*Climate risk disclosure*			*Log(1+ Climate disclosure score)*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stewardship code IO	0.17**			0.64**			1.17**		
	(0.08)			(0.28)			(0.51)		
High-norms IO		0.30**			0.63**			1.00**	
		(0.13)			(0.29)			(0.45)	
Universal owner IO			0.41***			0.67***			1.28***
			(0.08)			(0.20)			(0.26)
Non-stewardship code IO	0.04			-0.21			-0.38		
	(0.08)			(0.30)			(0.44)		
Low-norms IO		0.01			-0.10			-0.18	
		(0.11)			(0.35)			(0.51)	
Non-universal owner IO			-0.15			-0.27			-0.62
			(0.10)			(0.31)			(0.50)
Log(Assets)	0.13***	0.13***	0.13***	0.30***	0.30***	0.29***	0.57***	0.57***	0.56***
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Dividends/net income	0.02***	0.02***	0.02***	0.05***	0.05***	0.06***	0.08***	0.08***	0.09***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Debt/assets	-0.03	-0.03	-0.03	-0.23***	-0.22***	-0.20***	-0.47***	-0.46***	-0.42***
	(0.03)	(0.03)	(0.03)	(0.07)	(0.07)	(0.07)	(0.10)	(0.10)	(0.10)
EBIT/assets	0.01	0.01	0.02	-0.12	-0.12	-0.08	0.02	0.02	0.09
	(0.05)	(0.05)	(0.05)	(0.12)	(0.12)	(0.12)	(0.19)	(0.19)	(0.19)
CapEx/assets	0.05	0.05	0.05	0.14	0.15	0.24	-0.24	-0.20	-0.12
	(0.14)	(0.14)	(0.14)	(0.33)	(0.33)	(0.33)	(0.48)	(0.48)	(0.47)
Book-to-market ratio	-0.08***	-0.08***	-0.08***	-0.19***	-0.19***	-0.18***	-0.39***	-0.39***	-0.38***
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.06)
Forecast occurrence	0.06***	0.06***	0.06***	0.12*	0.12*	0.13*	0.12**	0.13**	0.14**
	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)
Sample	All Firms			All Firms			All Firms		
Years	2010-2019			2011-2016			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	35350	35350	31059	21312	21312	20716	21168	21168	20584
Adj. R^2	0.291	0.291	0.290	0.252	0.251	0.249	0.304	0.303	0.301

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 proxies of the costs and benefits of climate-related disclosure. The dependent variables are as follows: *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 a 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 a firm's climate risk disclosure is to CDP 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, *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. *High-emission industry* in panel B 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-by-year level. In panel B, standard errors (in parentheses) are clustered at the country level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Proprietary Disclosure Costs

	Scope 1 disclosure			*Climate risk disclosure*			*Log(1 + Climate disclosure score)*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High-competition firm	0.16*	0.17**	0.17*	0.71**	0.65**	0.62*	0.37	0.33	0.28
	(0.09)	(0.09)	(0.09)	(0.32)	(0.33)	(0.34)	(0.48)	(0.48)	(0.50)
High-competition firm x Stewardship code IO	-0.29**			-5.47***			-5.59**		
	(0.11)			(1.27)			(2.30)		
High-competition firm x High-norms IO		-1.09***			-3.44**			-6.09**	
		(0.39)			(1.46)			(2.43)	
High competition firm x Universal owner IO			-0.48***			-1.02*			-1.67*
			(0.16)			(0.57)			(0.86)
Stewardship code IO	0.53***			5.98***			8.48***		
	(0.14)			(1.05)			(1.84)		
High-norms IO		1.71***			4.67***			7.12***	
		(0.30)			(1.12)			(1.81)	
Universal owner IO			0.76***			0.85*			2.80***
			(0.12)			(0.46)			(0.65)
Sample	US Firms			US Firms			US Firms		
Years	2010-2019			2011-2016			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	0.235	0.240	0.254	0.193	0.184	0.179	0.279	0.274	0.280

Panel B. Disclosure Externality Benefits

	Scope 1 disclosure			*Climate risk disclosure*			*Log(1 + Climate disclosure score)*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High-emission industry x Stewardship code IO	0.13***			0.39*			0.83***		
	(0.04)			(0.19)			(0.21)		
High-emission industry x High-norms IO		0.21***			0.53			1.03***	
		(0.06)			(0.33)			(0.29)	
High-emission industry x Universal owner IO			0.12			0.60***			0.47
			(0.11)			(0.21)			(0.41)
Stewardship code IO	0.11			0.46**			0.81		
	(0.07)			(0.22)			(0.49)		
High-norms IO		0.22*			0.41**			0.60	
		(0.11)			(0.20)			(0.39)	
Universal owner IO			0.35***			0.40**			1.02***
			(0.08)			(0.17)			(0.32)
Sample	All Firms			All Firms			All Firms		
Years	2010-2019			2011-2016			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	35350	35350	31059	21312	21312	20716	21168	21168	20584
Adj. R^2	0.292	0.293	0.291	0.254	0.253	0.251	0.306	0.304	0.303

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

This table reports regressions at the firm-year level explaining how firms' climate risk disclosures change around the passage of Article 173 in France in 2015. The dependent variables are as follows: *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 a 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; *High French IO* equals one if the fraction of outstanding shares owned by French institutional investors is above the median of a given year, and zero otherwise; and *French IO* is a continuous measure of institutional ownership by French institutions. 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 disclosure				*Climate risk disclosure*
	(1)	(2)	(3)	(4)	(5)
Post Article 173 x High French IO	0.020**	0.021**	0.032**		0.078**
	(0.009)	(0.010)	(0.014)		(0.037)
Post Article 173 x French IO				1.379**	
				(0.540)	
High French IO	0.059***	0.059***	-0.007		0.074
	(0.012)	(0.012)	(0.012)		(0.052)
French IO				0.621	
				(0.445)	
Log(Assets)	0.13***	0.13***	0.00	0.18***	0.30***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.03)
Dividends/net income	0.03***	0.03***	0.01	0.02	0.06***
	(0.01)	(0.01)	(0.00)	(0.03)	(0.01)
Debt/assets	-0.02	-0.02	0.08	-0.06	-0.20**
	(0.03)	(0.03)	(0.06)	(0.15)	(0.08)
EBIT/assets	-0.03	-0.01	0.10**	0.00	-0.12
	(0.05)	(0.06)	(0.04)	(0.23)	(0.14)
CapEx/assets	0.05	0.09	-0.14*	-1.22***	0.06
	(0.17)	(0.17)	(0.07)	(0.22)	(0.34)
Book-to-market ratio	-0.08***	-0.07***	-0.02	-0.11***	-0.18***
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)
Forecast occurrence	0.07***	0.07***	0.02	-0.06*	0.15**
	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)
Sample	All Firms	All Non-French Firms	All Firms, Balanced Panel	All Firms with *French IO* >3%	All Firms
Years	2013-2017	2013-2017	2013-2017	2013-2017	2013-2016
Industry x Year Fixed Effects	Yes	Yes	No	Yes	Yes
Country Fixed Effects	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	No	Yes	No	No
Firm Fixed Effects	No	No	Yes	No	No
N	17878	16835	13126	1113	14294
Adj. R^2	0.302	0.295	0.784	0.485	0.257

Table 7. Climate Risk Disclosure and Institutional Investors: Robustness of French Article 173 Effects

This table reports regressions at the firm-year level (except in column 5) explaining how firms' climate risk disclosures change around the passage of Article 173 in France in 2015. The dependent variables are as follows: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Forecast occurrence* equals one if a firm issues at least one voluntary earnings forecast in a given year, and zero otherwise. We use the following key independent variables: *Post Article 173* equals one for the years of 2016 and afterwards, and zero otherwise; *High French IO* equals one if the fraction of outstanding shares owned by French institutional investors is above the median of a given year, and zero otherwise; *Δ French IO Pre to Post Article 173* is the average value of the fraction of outstanding shares owned by French institutional investors for the years 2016 and afterwards minus the same average value for the years before 2016; *High French IO Pre Article 173* equals one if the average fraction of outstanding shares owned by French institutional investors in the years before 2016 is above the median, and zero otherwise, and *Scope 1 disclosure Pre Article 173* is the average value of Scope 1 disclosure for the years before 2016. Variable definitions are provided in the Data Appendix. Standard errors (in parentheses) are clustered at the country level, except in columns 4 and 5 (clustered by firm). ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	Panel A. Addressing Selection Effects			**Panel B. Alternative Specifications**			**Panel C. Placebo Test**
	Scope 1 disclosure			*Scope 1 disclosure*			*Forecast occurrence*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post Article 173 x High French IO	0.022**		0.025***	0.032***	0.030***		0.006
	(0.010)		(0.008)	(0.011)	(0.010)		(0.008)
Post Article 173 x High French IO Pre Article 173		0.024**					
		(0.011)					
2017 x High French IO						0.027***	
						(0.010)	
2016 x High French IO						0.022*	
						(0.011)	
2014 x High French IO						0.002	
						(0.013)	
2013 x High French IO						0.005	
						(0.015)	
High French IO	0.053***		0.009	-0.007	-0.017	0.050***	0.046**
	(0.014)		(0.005)	(0.010)	(0.013)	(0.013)	(0.023)
Δ French IO Pre to Post Article 173	0.467	0.683	0.179			0.467	
	(0.565)	(0.615)	(0.178)			(0.564)	
High French IO Pre Article 173		0.056**					
		(0.024)					
Scope 1 disclosure Pre Article 173			0.954***				
			(0.013)				
Post Article 173					0.012*		
					(0.007)		
Sample	All Firms	All Firms	All Firms	All Firms, Balanced Panel, SE Clustered by Firm	All Firms, Firm-Years Collapsed in Pre/Post Years	All Firms	All Firms
Years	2013-2017	2013-2017	2013-2017	2013-2017	2013-2017	2013-2017	2013-2017
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year Fixed Effects	Yes	Yes	Yes	No	No	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	No	No	Yes	Yes
Year Fixed Effects	No	No	No	Yes	No	No	No
Firm Fixed Effects	No	No	No	Yes	Yes	No	No
N	15907	15907	15907	13126	6786	15907	17878
Adjusted R^2	0.296	0.296	0.730	0.784	0.818	0.296	0.221

Table 8. Changes in French Institutional Ownership around Article 173

This table reports regressions at the firm-year level explaining institutional ownership by French institutions. The dependent variable is as follows: *French IO* is a continuous measure of the fraction of outstanding shares owned by French institutional investors (multiplied by 100). We use the following key independent variables: *Post Article 173* equals one for the years of 2016 and afterwards, and zero otherwise; *Scope 1 disclosure Pre Article 173* is the average value of *Scope 1 disclosure* for the years before 2016; and Climate risk disclosure Pre Article 173 is the average value of *Climate risk disclosure* for the years before 2016. 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.

	French IO (x100)	
	(1)	(2)
Post Article 173 x Scope 1 disclosure Pre Article 173	-0.092	
	(0.065)	
Post Article 173 x Climate risk disclosure Pre Article 173		-0.028
		(0.026)
Scope 1 disclosure Pre Article 173	0.214**	
	(0.100)	
Climate risk disclosure Pre Article 173		0.091**
		(0.039)
Sample	All Firms	All Firms
Years	2013-2017	2013-2017
Controls	Yes	Yes
Industry x Year Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
N	17178	17159
Adj. R^2	0.513	0.513

Internet Appendix

for

Climate Risk Disclosure and Institutional Investors

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

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

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).

3. Evidence from a Comment Letter submitted on behalf of the Business Roundtable to the SEC regarding the Proposed SEC Climate Disclosure Rule

Under the section titled, Disclosure of competitively sensitive information, the letter states *"The Proposal would require companies to disclose information that may be competitively sensitive*" (Ghazal 2022).

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 Krueger, Sautner, and Starks (2020), pension funds and banks are overrepresented in the 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?

- □ Public pension fund
- □ Insurance company
- □ Mutual fund management company
- □ Asset manager (for pension funds, endowments, etc.)
- □ Sovereign wealth fund
- □ Other (please specify): _____
- □ Private pension fund
- □ Hedge fund
- □ Private equity fund
- □ Endowment, charity
- □ Bank

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

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

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

___ % in fixed income
___ % in equities

G4: [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?

- □ Less than $1 billion
- □ Between $1 billion and $20 billion
- □ Between $20 billion and $50 billion
- □ Between $50 billion and $100 billion
- □ More than $100 billion

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

G8: What is your position?

- □ Fund/Portfolio Manager
- □ Investment Analyst/Strategist
- □ Chief Investment Officer
- □ CFO/COO/Chairman/Other Executive
- □ Chief Executive Officer
- □ Executive/Managing Director
- □ ESG/Responsible Investment Specialist
- □ Other (please explain): _____

PART A: IMPORTANCE OF CLIMATE RISK

A1: Please rank the following six <u>risks</u> 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 <u>climate risk</u> 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	□	□	□	□	□
Physical risks	□	□	□	□	□
Technological risks	□	□	□	□	□

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	□	□	□	□	□
• [Other statements not used in this paper]	□	□	□	□	□

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
□	□	□	□	□

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	□	□	□	□	□
• Firm-level quantitative information on climate risk is not sufficiently precise	□	□	□	□	□
• Management discussions on climate risk are not sufficiently precise	□	□	□	□	□
• Standardized and mandatory reporting on climate risk is necessary	□	□	□	□	□
• Mandatory disclosure forms are not sufficiently informative regarding climate risk	□	□	□	□	□
• There should be more standardization across markets in climate-related financial disclosure	□	□	□	□	□
• Standardized disclosure tools and guidelines are currently not available	□	□	□	□	□

PART C: CLIMATE RISK MANAGEMENT & ENGAGEMENT

[NOT COVERED IN THIS PAPER]

PART D: PRICING OF CLIMATE RISK

[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
Panel	73
Conferences	16
Asset owner	6
Personal	4
Respondent position (N=428)	**Percentage**
Fund/Portfolio manager	21
Executive/Managing director	18
Investment analyst/strategist	16
CIO	11
CEO	10
CFO/COO/Chairman/Other executive	10
ESG/RI specialist	10
Other	3
Institutional investor type (N=439)	**Percentage**
Asset manager	23
Bank	22
Pension fund	17
Insurance company	15
Mutual fund	8
Other institution	15

Assets under management (N=430)	Percentage
Less than $1bn	19
Between $1bn and $20bn	32
Between $20bn and $50bn	23
Between $50bn and $100bn	16
More than $100bn	11
Investor horizon (N=432)	**Percentage**
Short (less than 6 months)	5
Medium (6 months to 2 years)	38
Long (2 years to 5 years)	38
Very long (more than 5 years)	18
Region (N=429)	**Percentage**
United States	32
United Kingdom	17
Canada	12
Germany	11
Italy	7
Spain	5
The Netherlands	4
France	3
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 higher). Variable definitions are provided in the Data Appendix.

Panel A. Correlations of Disclosure Variables

		(1)	(2)	(3)	(4)
Scope 1 disclosure	(1)	1			
Climate risk disclosure	(2)	0.7755*	1		
Climate disclosure score	(3)	0.8862*	0.7664*	1	
10-K Climate risk disclosure	(4)	0.1894*	0.2104*	0.1645*	1
Forecast occurrence	(5)	0.1159*	0.0662*	0.1017*	0.0267

Panel B. Correlations of IO Variables

		(1)	(2)
Stewardship code IO	(1)	1	
High-norm IO	(2)	0.5835*	1
Universal owner IO	(3)	0.4956*	0.3398*

IA Table 3. Voluntary Disclosure and Institutional Investors

This table reports regressions at the firm-year level explaining firms' voluntary disclosure choices. The dependent variable is as follows: *Forecast occurrence* equals one if a firm issues at least one voluntary earnings forecast in a given year, and zero otherwise. 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.

	Forecast occurrence		
	(1)	(2)	(3)
Stewardship code IO	-0.01		
	(0.06)		
High-norms IO		0.37**	
		(0.16)	
Universal owner IO			-0.04
			(0.11)
Non-stewardship code IO	-0.17		
	(0.14)		
Low-norms IO		-0.33**	
		(0.15)	
Non-universal owner IO			-0.20**
			(0.08)
Log(Assets)	0.03**	0.03**	0.02*
	(0.01)	(0.01)	(0.01)
Dividends/net income	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.01)
Debt/assets	0.01	0.02	0.02
	(0.02)	(0.02)	(0.02)
EBIT/assets	0.09*	0.07	0.08*
	(0.05)	(0.05)	(0.05)
CapEx/assets	0.10	0.09	0.10
	(0.08)	(0.08)	(0.09)
Book-to-market ratio	-0.03***	-0.03***	-0.04***
	(0.01)	(0.01)	(0.01)
Sample		All Firms	
Years		2010-2019	
Industry x Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
N	35350	35350	31059
Adj. R-sq.	0.237	0.248	0.236

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. The dependent variables are as follows: *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.

	Regulatory risk disclosure			*Physical risk disclosure*			*Other risk disclosure*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stewardship code IO	0.27**			0.21*			0.19*		
	(0.12)			(0.11)			(0.10)		
High-norms IO		0.25**			0.20*			0.18*	
		(0.11)			(0.12)			(0.10)	
Universal owner IO			0.30***			0.22***			0.22***
			(0.07)			(0.08)			(0.07)
Non-stewardship code IO	-0.07			-0.09			-0.11		
	(0.11)			(0.11)			(0.12)		
Low-norms IO		-0.02			-0.05			-0.07	
		(0.13)			(0.12)			(0.14)	
Non-universal owner IO			-0.11			-0.10			-0.13
			(0.12)			(0.11)			(0.13)
Log(Assets)	0.12***	0.12***	0.12***	0.11***	0.11***	0.11***	0.11***	0.11***	0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Dividends/net income	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Debt/assets	-0.09***	-0.08***	-0.08***	-0.09***	-0.09***	-0.08***	-0.09***	-0.08***	-0.08***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
EBIT/assets	-0.06	-0.06	-0.04	-0.03	-0.03	-0.02	-0.04	-0.04	-0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
CapEx/assets	0.03	0.04	0.07	0.01	0.02	0.05	0.08	0.09	0.12
	(0.12)	(0.12)	(0.12)	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)	(0.11)
Book-to-market ratio	-0.08***	-0.08***	-0.08***	-0.08***	-0.08***	-0.07***	-0.08***	-0.08***	-0.08***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Forecast occurrence	0.04*	0.04*	0.05*	0.03	0.04	0.04*	0.03*	0.03*	0.04**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Sample		All Firms			All Firms			All Firms	
Years		2011-2016			2011-2016			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	19545	19545	18950	19545	19545	18950	19545	19545	18950
Adj. R^2	0.293	0.291	0.290	0.275	0.275	0.273	0.259	0.258	0.257

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 among US sample firms. The dependent variable is as follows: *10-K Climate risk disclosure* follows Matsumura, Prakash, and Vera-Muñoz (2021) and equals one if a 10-K contains climate change words in a year, and zero otherwise. This variable is only available for US firms. 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-by-year level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	10-K Climate risk disclosure		
	(1)	(2)	(3)
Stewardship code IO	0.04		
	(0.16)		
High-norms IO		0.27	
		(0.28)	
Universal owner IO			-0.10
			(0.10)
Non-stewardship code IO	-0.14**		
	(0.06)		
Low-norms IO		-0.15***	
		(0.05)	
Non-universal owner IO			-0.12
			(0.07)
Log(Assets)	0.04***	0.04***	0.05***
	(0.01)	(0.01)	(0.01)
Dividends/net income	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)
Debt/assets	0.22***	0.22***	0.22***
	(0.05)	(0.05)	(0.05)
EBIT/assets	0.37***	0.36***	0.37***
	(0.09)	(0.09)	(0.09)
CapEx/assets	0.89***	0.88***	0.89***
	(0.20)	(0.20)	(0.20)
Book-to-market ratio	0.17***	0.17***	0.17***
	(0.03)	(0.03)	(0.03)
Forecast occurrence	0.02	0.02	0.02
	(0.04)	(0.04)	(0.04)
Sample		US Firms	
Years		2010-2019	
Industry x Year Fixed Effects	Yes	Yes	Yes
N	3273	3273	3273
Adj. R^2	0.267	0.268	0.267

IA Table 6. Climate Risk Disclosure and Institutional Investors among US Firms

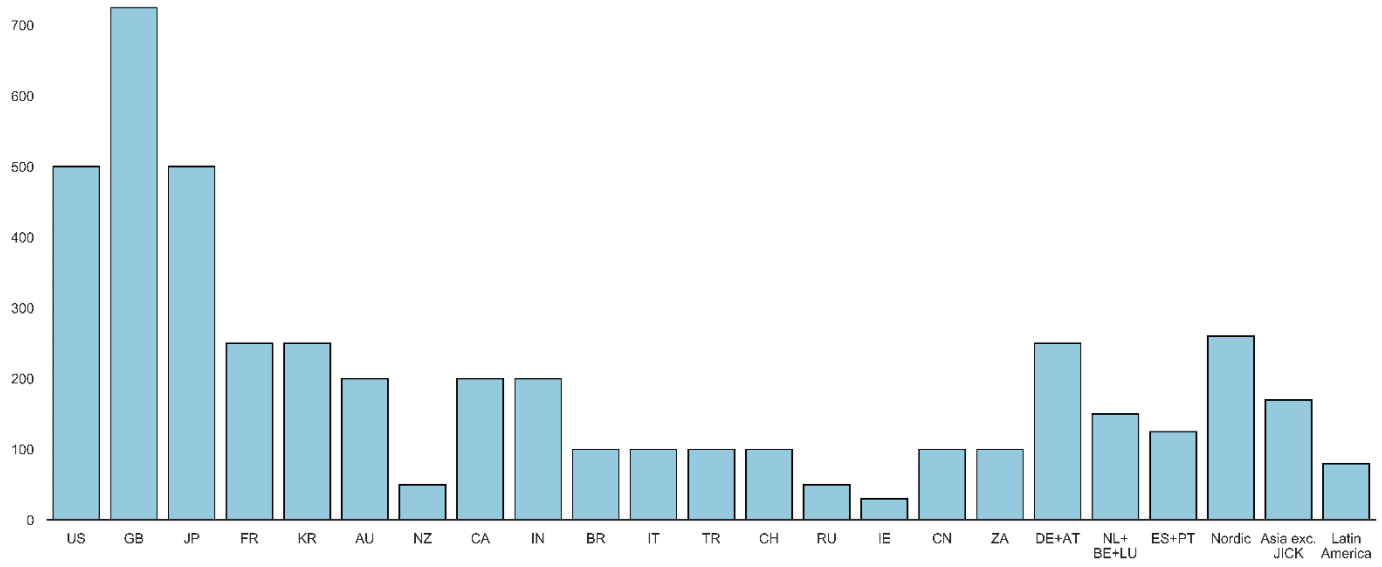
This table reports regressions at the firm-year level explaining firms' climate risk disclosures among US sample firms. The dependent variables are as follows: *Scope 1 disclosure* equals one if a firm discloses Scope 1 carbon emissions to CDP in a year, and zero otherwise. *Climate risk disclosure* 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 a firm's climate risk disclosure is to CDP 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 industry-by-year level. ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

	Scope 1 disclosure			*Climate risk disclosure*			*Log(1+Climate disclosure score)*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stewardship code IO	0.50***			3.11***			5.92***		
	(0.12)			(0.75)			(1.16)		
High-norms IO		1.44***			3.50***			4.92***	
		(0.22)			(0.81)			(1.20)	
Universal owner IO			0.32***			-0.27			0.94*
			(0.09)			(0.29)			(0.48)
Non-stewardship code IO	-0.22***			-0.98***			-1.03***		
	(0.06)			(0.21)			(0.34)		
Low-norms IO		-0.21***			-0.95***			-0.94***	
		(0.06)			(0.20)			(0.33)	
Non-universal owner IO			-0.43***			-0.92***			-1.60***
			(0.07)			(0.25)			(0.39)
Log(Assets)	0.18***	0.18***	0.19***	0.37***	0.37***	0.40***	0.81***	0.82***	0.85***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.03)
Dividends/net income	0.03**	0.03**	0.03**	0.00	0.01	0.00	0.04	0.05	0.06
	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)
Debt/assets	0.02	0.02	-0.00	-0.19	-0.19	-0.16	-0.61**	-0.60**	-0.51**
	(0.05)	(0.05)	(0.05)	(0.19)	(0.19)	(0.18)	(0.24)	(0.24)	(0.23)
EBIT/assets	0.27***	0.24***	0.19***	0.23	0.30	0.40*	0.62*	0.77**	0.83**
	(0.07)	(0.07)	(0.07)	(0.23)	(0.23)	(0.21)	(0.35)	(0.35)	(0.35)
CapEx/assets	-0.23	-0.27	-0.22	-0.26	-0.21	-0.13	-1.95	-1.88	-1.60
	(0.23)	(0.23)	(0.25)	(0.82)	(0.81)	(0.83)	(1.42)	(1.42)	(1.45)
Book-to-market ratio	-0.16***	-0.16***	-0.18***	-0.41***	-0.40***	-0.40***	-0.78***	-0.76***	-0.79***
	(0.04)	(0.04)	(0.04)	(0.15)	(0.15)	(0.15)	(0.21)	(0.21)	(0.20)
Forecast occurrence	-0.02	-0.02	-0.04	-0.09	-0.09	-0.11	0.00	-0.02	-0.06
	(0.04)	(0.04)	(0.04)	(0.13)	(0.13)	(0.13)	(0.17)	(0.17)	(0.17)
Sample		US Firms			US Firms			US Firms	
Years		2010-2019			2011-2016			2010-2015	
Industry x Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4063	4063	3665	2449	2449	2449	2429	2429	2429
Adj. R^2	0.284	0.288	0.290	0.236	0.235	0.226	0.315	0.311	0.310

Internet Appendix D: Additional Figures

IA Figure 1. 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: Measure of Voluntary Disclosure

We collect data on managerial forecasts from S&P Capital IQ for our sample period to proxy firms' voluntary disclosure practices. Since 2003, Capital IQ collects information on corporate guidance in text format across 90 countries around the world, from sources including newspapers, regulatory filings, press releases, news wires, company websites, or conference call transcripts. In cases where the information is available in the local language of a country, Capital IQ provides an English translation. The data Capital IQ compiles also includes information on company identifiers (i.e., company name and gvkey), headlines of the corporate performance forecasts, and the announcement date and time.

To create our measures of voluntary disclosure, we download all texts of performance forecasts issued by firms' managements in the Capital IQ "Key Developments" data set under "Corporate Guidance". As a first step, following Li and Yang (2016) and Tsang, Xi, and Xin (2019), we identify which texts are associated with earnings forecasts by performing a keyword search in the headlines and main texts for the words "earning" and "EPS." To ensure that we do not double count forecasts, we keep only one observation if multiple texts of managerial earnings forecasts are available for a given firm-day. In a second step, we count the number of forecasts each firm issues in a given year and construct two variables. *Forecast occurrence* equals one if a firm issues at least one voluntary forecast in a given year, and zero otherwise. *Forecast frequency* is the number of managerial forecasts issues in a given year. By construction, both variables are zero in firm-years with no voluntary earnings forecasts issued in Capital IQ. The tests reported in the paper use *Forecast occurrence*, but results are robust to using the logarithm of *Forecast frequency* instead.

Even though Capital IQ provides date and gvkey information, the most populated company identifier in our sample is ISIN. Consequently, we perform several steps to match the Capital IQ data with our other data sets. First, we download the entire sample from 2004 onwards from Compustat Global, which provides gvkey and ISIN information for firms in that sample. Second, we download the entire sample from 2004 from Compustat North America, which includes firms from the US and Canada. Compustat North America does not include ISINs, so we obtain the gvkey-CUSIP pairs and convert CUSIPs into ISINs by using the company headquarter country to determine the initial strings (i.e., "US" or "CA") of ISINs. As a final step, we merge these gvkey-ISIN pairs from Compustat Global and Compustat North America to create a gvkey to ISIN crosswalk file. This crosswalk file facilitates the merge between Capital IQ gvkeys and the ISINs in our sample.

Internet Appendix F: 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 (2022). 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).

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 &#146 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 (2022) 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".

We create a dummy variable that is one if at least one of these eight climate-related keywords occurs in a 10-K, and zero otherwise.

Swiss Finance Institute

Swiss Finance Institute (SFI) is the national center for fundamental research, doctoral training, knowledge exchange, and continuing education in the fields of banking and finance. SFI's mission is to grow knowledge capital for the Swiss financial marketplace. Created in 2006 as a public–private partnership, SFI is a common initiative of the Swiss finance industry, leading Swiss universities, and the Swiss Confederation.

swiss:finance:institute

c/o University of Geneva, Bd. Du Pont d'Arve 42, CH-1211 Geneva 4
T +41 22 379 84 71, rps@sfi.ch, www.sfi.ch

about ECGI

The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities.*

The ECGI will produce and disseminate high quality research while remaining close to the concerns and interests of corporate, financial and public policy makers. It will draw on the expertise of scholars from numerous countries and bring together a critical mass of expertise and interest to bear on this important subject.

The views expressed in this working paper are those of the authors, not those of the ECGI or its members.

ECGI Working Paper Series in Finance

www.ecgi.global/content/working-papers

Electronic Access to the Working Paper Series

The full set of ECGI working papers can be accessed through the Institute's Web-site (www.ecgi.global/content/working-papers) or SSRN:

Finance Paper Series	http://www.ssrn.com/link/ECGI-Fin.html
Law Paper Series	http://www.ssrn.com/link/ECGI-Law.html