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Climate Risk Disclosure and Institutional Investors

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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). (*JEL* G11, G3, Q54)

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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 United Kingdom, United States, and European Union.[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 United Kingdom. Countries that have not yet moved on the regulatory front are evaluating the introduction of mandatory climate risk disclosure (e.g., the United States; 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 nonfinancial 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 nonpecuniary information may affect the pricing 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

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

[2] Moreover, Bond and Goldstein (2015) show that if firm managers rely on market prices to learn, divulging too much information can incur a cost 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.

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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 difficult 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 $100 billion in assets under management. The respondents share a strong belief that climate risk disclosure is important: 79% believe climate risk reporting to be at least as important as financial reporting, with almost one-third considering it to be more important. At the same time, the respondents state that the current disclosures are uninformative and imprecise. Investors 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

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

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codes designed to promote corporate sustainability. 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 because of 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, Sautner, and Vilkov 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, Xie, 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

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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 2 pp 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 nonfinancial 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

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

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is complementary to that of FTV, it is also fundamentally different given our 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 (because of 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 difficult 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

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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 generally (Dasgupta, Fos, and Sautner 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

[5] While stewardship codes do not formally require compliance with their principles, institutions that do not comply with them typically need to explain publicly why they did not follow a specific recommendation of the code. Compliance is therefore usually high. Shiraishi et al. (2022) demonstrate that stewardship codes enhance the monitoring activities of institutional investors. Bonacchi et al. (2022) show how compliance with the United Kingdom'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.

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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 (WBCSD 2018).[7] Griffin and Jaffe (2016) 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 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; Table A1 defines the variables. Internet Appendix 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 $100 billion. 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

[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.

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Table 1
Summary statistics

A. Survey variables

Variable	Mean	SD	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
B. Climate-related disclosure and investor holdings variables				
Scope 1 disclosure	0.26			43,221
Climate risk disclosure	0.50	1.08	0.00	25,932
Regulatory risk disclosure	0.19			25,932
Physical risk disclosure	0.18			23,892
Other risk disclosure	0.17			23,892
Climate disclosure score	16.47	32.82	0.00	25,934
10-K Climate risk disclosure	0.70			3,962
Stewardship code IO	0.14	0.17	0.07	43,221
High-norms IO	0.09	0.11	0.05	43,221
Universal owner IO	0.14	0.14	0.09	37,740
Nonstewardship code IO	0.14	0.22	0.06	43,221
Low-norms IO	0.18	0.24	0.09	43,221
Nonuniversal owner IO	0.13	0.14	0.08	37,740
High-competition firm	0.50			4,739
High-emission industry	0.38			43,221
log(Assets)	15.03	2.05	15.00	43,221
Dividends/net income	0.38	0.69	0.27	42,867
Debt/assets	0.45	0.20	0.45	36,164
EBIT/assets	0.07	0.10	0.06	42,317
CapEx/assets	0.04	0.05	0.03	42,967
Book-to-market ratio	0.72	0.57	0.58	43,174
Forecast occurrence	0.72			43,221
C. French Article 173 variables				
Scope 1 disclosure	0.28			21,606
Climate risk disclosure	0.54	1.12	0.00	17,284
Δ French IO pre- to post-Article 173	−0.0001	0.0114	0.00	19,229
Post-Article 173	0.40			21,606
French IO	0.007	0.0208	0.001	21,606
Forecast occurrence	0.73			21,606

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. Table A1 defines all variables.

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

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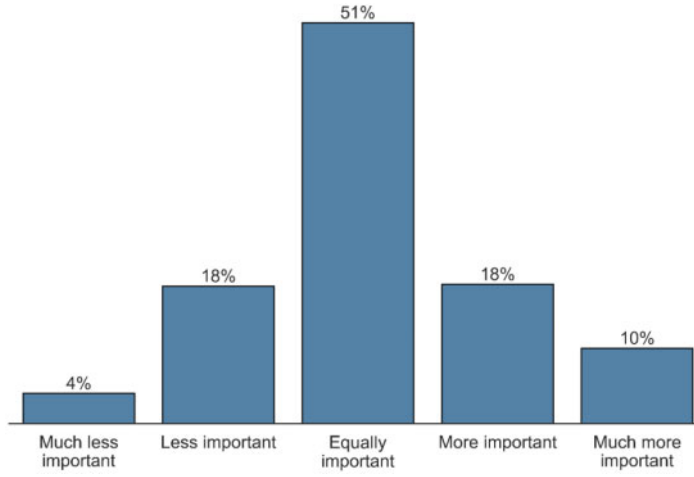

Figure 1
Importance of climate risk disclosure
This figure illustrates how important investors consider reporting by portfolio firms on climate risks compared to reporting on financial information (question B1 from the survey). Of the 439 individuals that participated in our survey, 416 responded to this question. Internet Appendix B3 provides the actual survey question.

risk disclosure policies through engagement, industry initiatives, or lobbying. Moreover, given that 27% of the investors manage more than $50 billion, they have the clout to be effective in their efforts. Internet Appendix B2 discusses concerns over nonresponse 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.

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Table 2
Survey responses on climate risk disclosure

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

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

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.

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

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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 United States, 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 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

[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.

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Table 3
Explaining survey responses on climate risk disclosure

	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	.207	.099	.085	.135	.066	.025

This table reports OLS regressions at the respondent level explaining investors' views on climate risk disclosure where the dependent variables are as follows: (a) *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); (b) *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); (c) *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); (d) *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); (e) *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 (f) *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.* Table A1 defines all variables. Standard errors (in parentheses) are clustered at the respondent's country level. *$p < .1$; **$p < .05$; ***$p < .01$.

importance of environmental issues. Finally, *Very large institution* equals one for responses from an institution with more than $100 billion 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.

Table 3 reports 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

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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.

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. Internet Appendix 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

[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.

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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 onward, the structure of the question changed). *Climate risk disclosure* has a mean of 0.5, and the correlation with *Scope 1 disclosure* is 78% (Internet Appendix 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 onward.[13] The average score across all firm-years is 16.

Throughout our analysis, we focus on understanding institutional investors' preferences toward 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, Xie, 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.

[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 toward action taken on climate change as reported in the response."

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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 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. Internet Appendix 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:

$$Climate\ disclosure_{f,c,t} = \alpha + \beta IO_{f,c,t} + \delta \boldsymbol{X}_{f,c,t} + Fixed\ effects + \varepsilon_{f,c,t}, \quad (1)$$

where $Climate\ disclosure_{f,c,t}$ represents *Scope 1 disclosure*, *Climate risk disclosure*, or *log(1 + Climate disclosure score)*; $IO_{f,c,t}$ 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 (unless indicated differently).

Table 4 reports 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.

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Table 4
Climate risk disclosure and institutional investors

	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)
Nonstewardship 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)	
Nonuniversal 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 × 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	35,350	35,350	31,059	21,312	21,312	20,716	21,168	21,168	20,584
Adj. R^2	.291	.291	.290	.252	.251	.249	.304	.303	.301

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 of 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: (a) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (b) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norms countries in a year; and (c) *Universal owner IO* is the fraction of outstanding shares owned by institutional investors classified as universal owners in a year. Table A1 defines all variables. Standard errors (in parentheses) are clustered at the country level. *$p < .1$; **$p < .05$; ***$p < .01$.

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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 3-pp 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 6 pp, 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 Internet Appendix 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 Internet Appendix Table 5, for comparison purposes, we provide complementary tests using a text-based measures of climate risk disclosure in the 10-Ks of U.S. 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 Internet Appendix Table 2, panel A.) Investors 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.

[14] Internet Appendix 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, some evidence indicates that climate-conscious institutions have a preference for voluntary disclosure more generally.

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

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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:

$$\begin{aligned} \textit{Climate disclosure}_{f,c,t} = \alpha + \beta_1 IO_{f,c,t} \times Z_{f,c,t} + \beta_2 IO_{f,c,t} + \beta_3 Z_{f,c,t} + \delta \boldsymbol{X}_{f,c,t} \\ + \textit{Fixed effects} + \varepsilon_{f,c,t}, \end{aligned} \tag{2}$$

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. *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 U.S. 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 *High-emission industry*$_f$, which equals one if a firm operates in 1 of the 20 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 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

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Table 5
Climate risk disclosure and institutional investors: Costs and benefits of disclosure

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 × Stewardship code IO	−0.29**			−5.47***			−5.59**		
	(0.11)			(1.27)			(2.30)		
High-competition firm × High-norms IO		−1.09***			−3.44**			−6.09**	
		(0.39)			(1.46)			(2.43)	
High competition firm × 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		U.S. firms			U.S. firms			U.S. 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	3,967	3,967	3,575	2,387	2,387	2,387	2,372	2,372	2,372
Adj. R^2	.235	.240	.254	.193	.184	.179	.279	.274	.280

(*Continued*)

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Table 5
(Continued)

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 × Stewardship code IO	0.13***			0.39*			0.83***		
	(0.04)			(0.19)			(0.21)		
High-emission industry × High-norms IO		0.21***			0.53			1.03***	
		(0.06)			(0.33)			(0.29)	
High-emission industry × 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 × 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	35,350	35,350	31,059	21,312	21,312	20,716	21,168	21,168	20,584
Adj. R^2	.292	.293	.291	.254	.253	.251	.306	.304	.303

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 of 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: (a) *Stewardship code IO* is the fraction of outstanding shares owned by institutional investors subject to stewardship codes in their home countries in a year; (b) *High-norms IO* is the fraction of outstanding shares owned by institutional investors from high social norm countries in a year; and (c) *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 U.S. firms as the competition measure is only available for such firms. *High-emission industry* in panel B is absorbed by the fixed effects. Table A1 defines all variables. 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. $^*p < .1$; $^{**}p < .05$; $^{***}p < .01$.

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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 nonmutually 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] 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 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 also would 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]

$$\begin{aligned} \textit{Climate disclosure}_{f,c,t} = \alpha + \beta_1 \textit{Post-Article 173}_t \times \textit{High French IO}_{f,c,t} \\ + \beta_2 \textit{High French IO}_{f,c,t} + \delta \boldsymbol{X}_{f,c,t} + \textit{Fixed effects} + \varepsilon_{f,c,t}, \end{aligned} \tag{3}$$

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

[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.

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where *Climate disclosure*$_{f,c,t}$ is *Scope 1 disclosure*$_{f,c,t}$ or *Climate risk disclosure*$_{f,c,t}$ (our third variable, *Climate disclosure score*$_{f,c,t}$, is unavailable after Article 173, which is why we do not use it in this setting). *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 noninteracted effect of *Post-Article 173*$_t$ is absorbed by the fixed effects.) *High French IO*$_{f,c,t}$ equals one if French institutional ownership is above the median in a year. The coefficient of interest is $\beta_{1,}$ 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. Table 1, panel C, reports the summary statistics for the key variables used in this analysis.

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 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 2 pp 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 because of 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

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Table 6
Climate risk disclosure and institutional investors: Baseline effects of French Article 173

	Scope 1 disclosure				*Climate risk disclosure*
	(1)	(2)	(3)	(4)	(5)
Post-Article 173 × High French IO	0.020**	0.021**	0.032**		0.078**
	(0.009)	(0.010)	(0.014)		(0.037)
Post-Article 173 × 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 × 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	17,878	16,835	13,126	1,113	14,294
Adj. R^2	.302	.295	.784	.485	.257

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 of 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 afterward, 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. Table A1 defines all variables. Standard errors (in parentheses) are clustered at the country level. $^*p < .1$; $^{**}p < .05$; $^{***}p < .01$.

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

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Table 7
Climate risk disclosure and institutional investors: Robustness of French Article 173 effects

	A. Addressing selection effects *Scope 1 disclosure*			*B. Alternative specifications* *Scope 1 disclosure*			*C. Placebo test* *Forecast occurrence*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post-Article 173 × 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 × High French IO pre-Article 173		0.024**					
		(0.011)					
2017 × High French IO						0.027***	
						(0.010)	
2016 × High French IO						0.022*	
						(0.011)	
2014 × High French IO						0.002	
						(0.013)	
2013 × 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 × 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	15,907	15,907	15,907	13,126	6,786	15,907	17,878
Adjusted R^2	.296	.296	.730	.784	.818	.296	.221

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 afterward, 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 afterward 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. Table A1 defines all variables. Standard errors (in parentheses) are clustered at the country level, except in columns 4 and 5 (clustered by firm). $^*p < .1$; $^{**}p < .05$; $^{***}p < .01$.

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

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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* × *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 vs. 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.

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Table 8
Changes in French institutional ownership around Article 173

	French IO (×100)	
	(1)	(2)
Post-Article 173 × Scope 1 disclosure pre-Article 173	−0.092	
	(0.065)	
Post-Article 173 × 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 × year fixed effects	Yes	Yes
Country fixed effects	Yes	Yes
N	17,178	17,159
Adj. R^2	.513	.513

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 afterward, 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. Table A1 defines all variables. Standard errors (in parentheses) are clustered at the country level. *$p < .1$; **$p < .05$; ***$p < .01$.

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 reestimate 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 × 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:

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

where $\textit{French IO}_{f,c,t}$ is French institutional ownership, and $\textit{Climate disclosure pre-Article 173}_{f,c,t}$ is *Scope 1 disclosure* or *Climate risk disclosure* in the years *before* Article 173 became effective. We measure pre-reform disclosure using

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the firm-level averages of the disclosure measures for the years before 2016. As before, *Post-Article 173*$_t$ equals one for 2016 and afterward, and zero before, and we use again the same two-sided 2-year time window around the passage of the reform in 2015. (The noninteracted 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.

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Appendix

Table A1
Variable definitions

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 the 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 $100 billion, 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 6 months and 2 years, and zero otherwise	Question G2
Long-term horizon	Equals one if the indicated holding period of an institutional investor is above 2 years, and zero otherwise	Question G2

(*Continued*)

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Table A1
(Continued)

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 of 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 design from 2017 onward such that the responses are not comparable anymore for these years	CDP, 2011–2016
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 risk 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" in a year, and zero otherwise. Only available for U.S. firms	SEC EDGAR, 2010–2019, U.S. 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
Nonstewardship 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
Nonuniversal 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 U.S. firms	Hoberg and Phillips 2016, 2010–2016, U.S. 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, Sautner, and Vilkov 2021, 2010–2019

(*Continued*)

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Table A1
(Continued)

Variable	Definition	Source, sample years
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 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 item WC02999). 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 year, and zero otherwise	S&P Capital IQ
	C. French Article 173 Analysis	
Post-Article 173	Equals one for the years of 2016 and afterward, 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 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 afterward 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

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