BOSTON UNIVERSITY Global Development Policy Center

GEGI WORKING PAPER 034 • 10/2019

Shareholder Activism and Firms' Voluntary Disclosure of Climate Change Risks

CAROLINE FLAMMER, MICHAEL W. TOFFEL, AND KALA VISWANATHAN

ABSTRACT

This paper examines whether—in the absence of mandated disclosure requirements—shareholder activism can elicit greater disclosure of firms' exposure to climate change risks. We find that environmental shareholder activism increases the voluntary disclosure of climate change risks, especially if initiated by investors who are more powerful (institutional investors) or whose request has more legitimacy (long-term institutional investors). We also find that companies that voluntarily disclose climate change risks following environmental shareholder activism achieve a higher valuation, suggesting that investors value transparency with respect to climate change risks.

Keywords: shareholder activism; climate risk; climate change; corporate disclosure; corporate governance.

Caroline Flammer *is an associate professor of strategy and innovation at Boston University's Questrom School of Business. Her research interests are in competitive strategy at the intersection of corporate governance, impact investing, corporate social responsibility, climate change, and innovation.*

Michael W. Toffel *is the Senator John Heinz Professor of Environmental Management and the Faculty Chair of the HBS Business and Environment Initiative and Environment Initiative. His work ranges from academic articles based on econometric analyses of large datasets to case studies of individual companies.*

Kala Viswanatham *is a doctoral student in the Technology and Operations Management unit at Harvard Business School. She worked on environmental policy at the Natural Resources Defense Council. Her main research interests are in corporate sustainability, firm strategy, and innovation.*

Introduction

Managers increasingly face shareholder pressure to disclose and manage their climate change risks. For example, in May 2017, the shareholders of ExxonMobil voted for a comprehensive assessment of risks related to climate change (*New York Times*, 2017*)*. Shareholders of Occidental Petroleum Corporation, PPL Corp, and many other companies have also demanded greater disclosure of climate change risks (*Wall Street Journal*, 2018a). More generally, companies faced a record number of climate-related shareholder proposals at their 2019 shareholder meetings (*Wall Street Journal*, 2019). This increase in shareholder pressure is not only reflected in the exploding number of shareholder proposals submitted, but also in the increasing shareholder support and approval rates (Flammer, 2015; *Wall Street Journal,* 2018a).

One reason for this surge in climate-related shareholder activism is the growing recognition of increased costs and risks associated with climate change (*New York Times*, 2018). Many companies—from Silicon Valley tech firms to European financial institutions—are increasingly bracing for the direct and indirect impacts of climate change on their bottom lines, as extreme weather conditions pose major risks to their operations and supply chains (CDP, 2016; *New York Times*, 2019).[1] Given the global reach of climate change, firms across industries and regions are exposed to climate change risks, regardless of their own emission levels.

The second reason for climate-related shareholder activism is the fact that, in many countries (including the U.S.), the disclosure of nonfinancial information is not mandated by law. For example, the U.S. Securities and Exchange Commission (SEC) currently merely recommends that companies disclose their climate change risks, but neither mandates such disclosure nor offers any guidance on what information to provide.[2] As a result, companies often provide limited (if any) information.

For the above reasons, it is not surprising that investors incorporate the climate risk exposure of their portfolio companies into their decision-making and are increasingly vested in companies' disclosure of climate risks and their efforts to manage those risks (Ceres, 2018; *Financial Times*, 2017, 2018; Krueger, Sautner, and Starks, 2019; *New York Times*, 2017; *Wall Street Journal*, 2018a, 2019).[3,4] In fact, a recent survey of 439 institutional investors paints a striking picture: the majority believe that climate risk reporting is *as important as* financial reporting, and one-third believe that climate risk reporting is *even more impor-*

1 For example, flooding and fiercer storms recently disrupted U.S. drug maker Eli Lilly's manufacturing facilities in Puerto Rico after Hurricane Maria in 2017. The Japanese manufacturer Hitachi Ltd. reports that increased rainfall and flooding in Southeast Asia could disrupt its supply chain. Banco Santander Brasil, a large Brazilian bank, anticipates that increasingly severe droughts might hurt borrowers' ability to repay loans. Pacific Gas and Electric (PG&E), California's largest electric utility, faces increased wildfire risk, partly driven by global warming. In fact, the company was held liable (facing at least $30 billion in fire liabilities) for the disastrous 2018 California wildfire—the deadliest to date—and filed for bankruptcy protection in early 2019 (*Forbes*, 2019). Google's parent company, Alphabet Inc., expects that rising temperatures could increase the cost of cooling its energy-intensive data centers. All these examples feature direct impacts of climate change. In addition, climate change may also hurt companies indirectly. For example, energy companies face a significant financial risk of so-called "stranded assets"—coal, oil, and gas reserves that companies list as part of their assets, but might in fact be worthless, since those reserves may never be drilled but instead be left stranded due to stricter regulations intended to curb climate change (e.g., *Financial Times*, 2015; *Fortune*, 2015). Such assets also include buildings in high-risk flood zones, power plants that may need to shut down, etc. (*New York Times*, 2019).

2 While the SEC requested public feedback in 2016 about potentially changing the climate-related risks required for disclosure in SEC filings, action on this front has stalled since President Donald Trump's election that year. The discussion around mandatory disclosure of climate change risks has since regained traction with several Democratic presidential candidates in 2019 putting forward proposals on how to address climate change (*Politico*, 2019).

3 This increase in investors' interest in the disclosure of climate risk information—and ESG (environmental, social, and governance) information more generally—is also reflected in the rapid increase in the number of signatories of the United Nations' Principles for Responsible Investment (PRI) network. Launched in 2016, this network has grown to approximately 2,250 signatories and $80 trillion in assets under management in November 2018. Similarly, the Coalition for Environmentally Responsible Economies (Ceres) reports that concerns about environmental and social risks increasingly influence investors' decision-making—in 2016, responsible investment accounted for 26 percent, or $22.89 trillion, of all professionally managed assets globally—and investors pay close attention to corporate disclosure informing them about companies' climate risk exposure and strategies to address these risks (Ceres, 2018).

4 For example, the *Wall Street Journal* (2018a) discusses the case of ExxonMobil: "Most notable was Exxon's 2017 annual meeting, when more than 60 per cent of shareholders, including BlackRock, revolted and voted against the board. Exxon has subsequently improved its disclosure of information around climate change."

tant (Krueger *et al*., 2019).

Despite the growing importance of climate change risks, little is known about companies' exposure to climate change risks, their disclosure of such risks, and what strategic actions they take to manage and mitigate those risks. Instead, scholarly attention has focused on the participation in voluntary initiatives (e.g., the Climate Leaders Program) and the disclosure of greenhouse gas emissions (e.g., Fisher-Vanden and Thorburn, 2011; Jira and Toffel, 2013; Kim and Lyon, 2011a, 2011b; Krueger, 2015; Lewis, Walls, and Dowell, 2014; Lyon and Maxwell, 2011; Matisoff, 2013; Reid and Toffel, 2009). Yet, a firm's carbon footprint and participation in climate-related initiatives are very different from a firm's exposure to climate change risks. The latter pertains to the threat of damage, injury, liability, loss, or any other harm to the company that could be caused by climate-related events. In particular, climate change risks include physical risks (such as flooding, fierce storms, drought, and extreme temperatures), regulatory risks arising from current and expected governmental policies related to climate change (such as energy efficiency standards and carbon trading schemes), and other climate-related risks (such as reputation, changing consumer behavior, and increasing humanitarian demands).[5] Importantly, firms across industries face exposure to climate change risks, ***regardless*** of their own emission levels.[6]

This study advances the literature by focusing on firms' exposure to climate change risks. Specifically, we examine whether, in the absence of public governance, private governance—in the form of shareholder activism—can elicit greater disclosure of firms' exposure to climate change risks along with information on how firms are managing those risks (henceforth "climate risk information"). We further explore the heterogeneity among shareholders, characterizing which types are particularly effective in eliciting such disclosure. Finally, we examine the valuation implications to assess whether investors value the disclosure of climate risk information.

To guide our theoretical predictions, we extend the salience framework for secondary stakeholders (e.g., Eesley and Lenox, 2006; Mitchell, Agle, and Wood, 1997) to the context of ***primary*** stakeholders—that is, the shareholders. Specifically, we argue that shareholders' salience increases with their power and with the legitimacy of their request. Accordingly, we hypothesize that companies are more likely to respond to a shareholder's demand for the disclosure of climate risk information if the shareholder is powerful and the request has legitimacy.

To test these arguments empirically, we merge a novel proprietary dataset from CDP (formerly, the Carbon Disclosure Project) on the disclosure of climate risk information with the Institutional Shareholder Services (ISS) database that compiles information on shareholder activism. We find that environmental shareholder activism (measured by the number of environment-related proposals submitted by the firm's shareholders) induces managers to voluntarily disclose climate risk information. Consistent with our arguments, we find that environmental shareholder activism is particularly effective if it is initiated by shareholders with more power (institutional shareholders) or whose request has more legitimacy (long-term institutional shareholders). We also show that companies that voluntarily disclose climate risk information following environmental shareholder activism achieve a higher valuation post disclosure, suggesting that investors value the voluntary disclosure of the firm's exposure to climate risks and how they are managing these risks. Overall, our findings highlight shareholders' ability to elicit greater disclosure of climate risk information, and further indicate that such disclosure is valuable to investors.

In our analysis, we consider the potential endogeneity of environmental shareholder activism with respect to climate risk disclosure. Because environmental shareholder activism is not randomly assigned to companies, it might be correlated with unobservables that also affect climate risk disclosure. To address this concern, we exploit the fact that shareholder activism often comes in "waves": a given shareholder

5 See CDP (2016) for a detailed characterization of climate change risks.

6 A case in point is the insurance industry, which faces tremendous exposure to climate change risks despite its low emission levels (see, e.g., *Wall Street Journal*, 2018b).

adopts an agenda and submits the same proposal to all firms in her portfolio. In such cases, the active shareholder targets a wide set of firms (regardless of their characteristics)—that is, the targeting itself is plausibly exogenous with respect to any specific firm characteristics. Our results continue to hold when using such "waves" as instrument, suggesting that they are unlikely to be driven by endogeneity.

Theory

Voluntary disclosure of climate risks—a governance issue

Companies can benefit from disclosing climate risk information. For example, transparency can foster trust, allowing companies to strengthen their (long-term) relationships with investors and stakeholders. But the disclosure of climate risk information also has potential downsides. In particular, it may reveal vulnerabilities that companies would prefer to keep from investors, competitors, customers, and other stakeholders. Furthermore, the reactions of these stakeholders might hurt the disclosing company. For example, investors might use this information to rebalance their portfolios, reallocating funds away from the disclosing company to other companies with more favorable risk-return profiles. Managers therefore have incentives to not disclose such information unless they feel compelled to do so.

We expect that this reluctance to disclose is further accentuated by the temporal separation between the potential short-term costs and long-term benefits of disclosing climate risk information. A large literature in psychology and economics suggests that individuals are "hyperbolic discounters," that is, they have an excessive preference for the present, preferring short-term rewards over long-term rewards even if the latter are substantially higher (e.g., Ainslie 1975; Frederick, Loewenstein, and O'Donoghue, 2002; Loewenstein and Prelec, 1992; O'Donoghue and Rabin, 1999; Thaler and Shefrin, 1981). This preference for short-term results is likely reinforced for executives as they face short-term pressures, such as career concerns (e.g., Gibbons and Murphy, 1992) and pressures to meet or beat analysts' quarterly earnings expectations (e.g., DeGeorge, Patel, and Zeckhauser, 1999). As a result, managers tend to favor investments that pay off in the short run at the expense of long-term investments (e.g., Graham, Harvey, and Rajgopal, 2005; Holmstrom, 1999; Stein, 1988, 1989). It follows that shareholders face a "time-based agency conflict" (Flammer and Bansal, 2017)—that is, managers have an excessive preference for the present, and hence might not act in shareholders' (long-term) best interest. This time-based agency conflict implies that managers will likely put more weight on the potential short-term costs of climate risk disclosure, as opposed to the potential long-term benefits of managing and mitigating climate risks.

A second implication of this time-based agency conflict is that managers may focus their attention on stakeholders that have short-term financial performance implications (e.g., customers and employees) at the expense of stakeholders that may be financially material to the company's operations in the long run but not necessarily in the short run (e.g., communities and the natural environment) (Eesley and Lenox, 2006; Flammer, Hong, and Minor, 2019; Mitchell *et al.*, 1997). Accordingly, as managers devote less attention to the natural environment, they may simply be unaware of the risks climate change poses to their business.

Taken together, the above arguments suggest that, in the absence of public governance, managers may prefer to not disclose their company's exposure to climate change risks. In the following, we explore circumstances under which private governance—through pressure from different types of shareholders—might induce companies to nevertheless disclose their climate change risks.

Shareholder activism and the voluntary disclosure of climate risk information

To mitigate the gap between what investors demand and what companies provide, investors can exert pressure through shareholder activism demanding managerial actions such as the re-assessment of organizational practices and the disclosure of information. Indeed, investors often pressure managers to

disclose and address social and environmental issues and this pressure has increased over the years (e.g., Flammer, 2015).

A priori, it is far from obvious whether shareholders can trigger myopic managers to voluntarily disclose climate risk information since most shareholder proposals receive little support at annual meetings.[7] In other words, the majority of shareholders tend to vote against shareholder-sponsored resolutions. Accordingly, one might expect management to pay little attention, if any, to the demands of those few shareholders sponsoring and supporting the proposals, and instead maintain their practice of not disclosing the firm's exposure to climate change risks or how the firm is managing them. On the other hand, it could also be that—despite low support at annual meetings—environmental shareholder activism does trigger companies to disclose climate risk information. In the following, we discuss two potential reasons: environmental shareholder activism might (a) trigger a re-evaluation of the company's disclosure practice, and (b) increase management's awareness of the firm's exposure to climate risks.

First, despite the low support that shareholder proposals garner, studies indicate that shareholder activism—pertaining to a wide range of subject matters (e.g., executive compensation, antitakeover provisions, social and environmental practices)—can nevertheless be impactful and induce management to re-evaluate and adjust their business practices in line with the aims of the proposals (e.g., Cuñat, Giné, and Guadalupe, 2012; Flammer, 2015; Flammer and Bansal, 2017; McDonnell, King, and Soule, 2015; Vasi and King, 2012).[8] Environmental shareholder activism may thus lead managers to reconsider their company's climate risk disclosure practices and become more transparent.

Second, environmental shareholder activism might increase managers' awareness of the firm's exposure to climate risks. Specifically, environmental shareholder activism may induce managers to pay more attention to the natural environment—a stakeholder that myopic managers might otherwise neglect (Flammer *et al*., 2019)—making them more aware of the firm's vulnerability to climate change risks. In turn, this could induce managers to conduct an assessment of the firm's exposure to climate change risks, consider how to manage those risks, and disclose information about these risks and management's efforts to mitigate them.

Taken together, the above arguments suggest that companies are more likely to disclose climate risk information under shareholder pressure. This motivates our baseline hypothesis:

> *Hypothesis 1. Environmental shareholder activism increases companies' voluntary disclosure of climate change risk information.*

In the following, we refine our arguments and explore how the effectiveness of shareholder activism to induce the disclosure of climate change risk information depends on the active shareholders' power and the legitimacy of their request.

Heterogeneity in shareholders' demands for climate risk disclosure

Extending Eesley and Lenox's (2006) and Mitchell *et al*.'s (1997) salience framework for secondary stakeholders to *primary* stakeholders (that is, shareholders), we argue that the salience of active shareholders increases with (a) their power and (b) the legitimacy of their request. That is, we expect that companies are more likely to respond to shareholders' demands for climate risk disclosure if the shareholder is more

7 This is a common feature of shareholder proposals. For example, Flammer (2015) finds that the average vote outcome for SRI (socially responsible investing) proposals is 13.5% (p. 2553). Similarly, Cuñat, Giné, and Guadalupe (2012) find that the average shareholder vote on governance proposals is 36.2% (p. 1949).

8 Relatedly, other environmental activist campaigns (such as boycotts, protests, and private politics) are found to improve firms' environmental practices (Lenox and Eesley, 2009) and elicit greater corporate transparency (Reid and Toffel, 2009).

"powerful" and the request has more legitimacy.[9]

SHAREHOLDER POWER

In contrast to individual investors, institutional investors—public pension funds, mutual funds, hedge funds, and many others—tend to hold large stakes in their portfolio companies. As such, they are particularly vulnerable to climate-related risks. Accordingly, institutional investors have a strong interest in monitoring their portfolio companies, identifying governance issues, and raising these issues to the management's attention requesting them to take proper actions (Bethel and Liebeskind, 1993; Ilhan ***et al.***, 2019; Krueger ***et al.***, 2019; Shleifer and Vishny, 1986). This active monitoring and engagement with their portfolio companies allows institutional investors to play an important and leading role in the governance of these companies (Gillan and Starks, 2000). In contrast, other (non-institutional) shareholders have less incentive (and capacity) to monitor and actively engage with the management as they are smaller, are more likely to be resource-constrained, and can free-ride on the monitoring and costly engagement of institutional investors (Grossman and Hart, 1980; Shleifer and Vishny, 1986). Moreover, even if they do actively engage with the management, they are likely less able to coordinate with other shareholders and garner broad support for their shareholder proposals (see, e.g., Gillan and Starks, 2000).

Shareholder activism initiated by institutional investors tends to receive more support among shareholders (e.g., Flammer, 2015; Gillan and Starks, 2000). Moreover, institutional investors tend to be more successful than other investors in actively engaging with management (Dimson, Karakas, and Li, 2015). This suggests that institutional investors benefit from greater power than other investors, and hence are likely to be more salient to the companies in which they invest. The salience of institutional investors is likely reinforced by the potential downside of not addressing their demands. In particular, failing to disclose relevant information may lead institutional investors to sell their shares and rebalance their portfolios toward companies that are willing to disclose climate risk information. In sum, we expect that environmental shareholder activism initiated by institutional investors is more likely to be salient, and ultimately induce managers to assess and report on the firm's climate risk information. This motivates the following hypothesis:

> *Hypothesis 2. Management is more likely to voluntarily disclose climate change risk information if the environmental shareholder activism is initiated by institutional investors.*

LEGITIMACY OF THE SHAREHOLDER'S REQUEST

Climate change is an especially complex issue and—despite extensive scientific evidence—it has been disputed by climate change deniers and other vocal critics.[10] Given the complex and contested nature of climate change, we expect that management is more likely to consider a request to be desirable, proper, and appropriate—and hence more legitimate (Suchman, 1995)—if brought forward by shareholders whose interests are aligned with the firm's long-term value. As we discuss below, long-term institutional investors are likely to meet that criterion.

Long-term institutional investors hold stocks for a longer period of time and are less transaction-oriented than "transient investors" (such as hedge funds) whose holdings tend to be driven by short-term speculation (Bushee, 1998, 2001; Gaspar, Massa, and Matos, 2005). Accordingly, long-term institutional investors are less likely to withdraw their funds in the short run upon the announcement of negative information (Starks, Venkat, and Zhu, 2017). Instead, they have a vested interest in improving the firms' business

9 In addition to power and legitimacy, the third component of Eesley and Lenox's (2006) and Mitchell *et al.*'s (1997) salience framework is "urgency." This element is held constant in our context, as we consider only one type of shareholder activism—namely, shareholder activism pertaining to the environment.

10 See, e.g., the scientific controversy as to whether East Antarctica is gaining or losing mass, summarized in *Scientific American* (2017).

practices and are more inclined to actively engage with their portfolio companies in order to improve corporate governance and the long-term value of the firm (Krueger *et al.*, 2019; Neubaum and Zahra, 2006). As such, long-term institutional investors—as opposed to short-term (i.e., transient) institutional investors—who demand the disclosure of climate change risk information are more likely to help their portfolio companies manage and mitigate their climate risk exposure going forward. This also implies that management is less likely to face an "exit" (i.e., a divestment) of these investors in case the voluntarily disclosed information on climate risks sheds a negative light on the company.

In sum, we posit that the requests of long-term institutional investors are more likely to be perceived as legitimate in the context of climate change. As such, they are likely more effective in eliciting the voluntary disclosure of climate change risk information. This leads to the following hypothesis:

> *Hypothesis 3. Management is more likely to voluntarily disclose climate change risk information if the environmental shareholder activism is initiated by long-term institutional investors.*

Implications for valuation

The previous arguments suggest that shareholder activism can motivate companies to disclose climate risk information. In this regard, it serves as an important tool in improving transparency, thereby mitigating information asymmetries between a firm and its investors. Greater transparency about a firm's climate risk information may, in turn, translate into higher valuation. Indeed, the argument that greater transparency brings about higher valuation has a long tradition in the accounting literature (for a survey, see Healy and Palepu, 2001). The rationale is intuitive—investors dislike uncertainty and are willing to pay a premium for less opaque companies. In this vein, greater transparency with respect to climate change risks is likely valuable to investors, as it resolves uncertainty with regard to a potentially important source of risk.[11] Investors gain insights not only on the firm's assessment of its exposure to climate change risks but also—and perhaps more importantly—on the actual steps it is taking to manage and mitigate its exposure going forward. For example, firms may report that they are diversifying their supplier base across geographic regions to minimize disruptions in case of flooding and fierce storms. Or they may be shifting their product mix towards energy-efficient products to appeal to shifting consumer preferences, improve their reputation, and meet current or expected governmental climate policies. As these examples illustrate, the management and mitigation of climate risks is likely valuable to investors.

Furthermore, by disclosing their climate risk information, firms allow their investors to engage with them in a more informed fashion. This is likely valuable to investors as well. Indeed, Krueger *et al.*'s (2019) survey suggests that investors prefer to actively engage with their portfolio companies in order to manage and minimize climate risks, as opposed to divesting from firms with high risk exposure.

In sum, we expect companies to achieve a higher valuation following the (shareholder-induced) disclosure of climate risk information. This leads to our final hypothesis:

> *Hypothesis 4. Firms that voluntarily disclose climate change risk information following environmental shareholder activism achieve a higher valuation.*

11 This argument is in line with the findings of Ioannou and Serafeim (2019) and Krueger (2015), who document higher valuations following the mandatory disclosure of nonfinancial information.

Data

Data sources

CLIMATE CHANGE RISK DISCLOSURE

The data on climate change risk disclosure are obtained from CDP (formerly Carbon Disclosure Project), a nonprofit organization based in London. Each year, CDP asks large public companies to disclose information about the risks and opportunities posed by climate change, their strategies to address them, and other environment-related information. By participating in this process, companies are able to voluntarily disclose information to investors in a structured fashion. In 2016, 67 percent of the S&P 500 companies disclosed at least some of this information to CDP. We obtained annual CDP data for the years 2010–2016, the time frame during which the CDP survey consistently asked about climate risk information. We focus on S&P 500 companies because this is the sole overlap between the coverage of CDP and that of Institutional Shareholder Services, described next.

SHAREHOLDER ACTIVISM

The data on shareholder activism are obtained from the Institutional Shareholder Services (ISS) database. ISS compiles information about shareholder proposals that were submitted to S&P 1,500 companies from 1997 onward. The database distinguishes between shareholder proposals on governance topics and those on socially responsible investing (SRI) topics. For each proposal, the database provides a description of the proposal, the date of the annual meeting, the proposal's sponsor, the voting requirement, and several other attributes.

In our baseline analysis, we restrict the sample to firms that are targeted by SRI proposals during the sample period. For each firm, we include the years within 2010–2016 that range from its earliest SRI proposal through its most recent one. This approach ensures that the firms in our sample face a credible risk of being the target of SRI-related shareholder activism.[12] Our baseline sample consists of 1,110 firm-year observations pertaining to 265 U.S. public firms.

Definition of variables

DEPENDENT VARIABLE

In the CDP questionnaire (question CC5.1), companies can disclose information on three types of climate change risks: 1) regulatory risks, 2) physical risks, and 3) other risks. *Regulatory risks* arise from current and expected (local, national, or global) governmental policy related to climate change; for example, the imposition of emissions limits, energy efficiency standards, and carbon trading schemes. *Physical risks* are those arising from extreme weather events or subtle changes in weather patterns. *Other risks* include, among others, reputation, changing consumer behavior, induced changes in human and cultural environments, fluctuating socio-economic conditions, and increasing humanitarian demands. (For more details on these three types of risk, see CDP, 2016.) For each type of climate risk they disclose, companies are asked to describe the risk and its potential impact; characterize its timeframe, likelihood, and magnitude of impact; estimate its financial implications before taking mitigating actions; and describe how the risk is being managed and the costs associated with those actions.

Our main dependent variable, *disclosure of climate change risks*, counts how many of these three climate change risks the company discloses (that is, it ranges from 0 to 3). In auxiliary analysis, we examine each disclosure category separately by using individual indicator variables for the disclosure of

12 Our results are not sensitive to this criterion. In robustness checks, we obtain similar results when we use the broader sample of firms that are targeted by either governance or SRI proposals. In principle, we could further expand the sample by including firms that are never targeted by shareholder proposals. Yet such firms are unlikely to provide an appropriate comparison group; for those firms, the notion "shareholder activism" is not well defined as they do not have active shareholders in the first place.

regulatory, physical, and other climate change risks, respectively.

INDEPENDENT VARIABLES

We measure *environmental shareholder activism* as the number of environment-related shareholder proposals a company faces in a given year. Specifically, we consider all shareholder proposals in ISS for which the field "resolution type" is "SRI" (socially responsible investment), and read the description of these proposals to determine which are environment-related. In our baseline sample, 33 percent of the 1,110 firm-year observations have at least one environment-related shareholder proposal (the maximum is five).

We also distinguish between environmental shareholder activism exerted by institutional investors—investors with power who tend to hold large stakes and actively monitor the companies they invest in—and by non-institutional investors, who are often smaller, individual investors. We code proposal sponsors as non-institutional if the field "sponsor type" in ISS is "individual," "union," "religious," or "other." All other sponsor types are coded as institutional; this includes public pension funds, SRI funds, special interest investors, and asset management funds.[13]

We further divide institutional investors into those with a long-term or short-term horizon. We categorized all SRI investors and special interest investors as long-term as they are unambiguously long-term given their mandate. For all other institutional investors (such as asset management funds), we use Thomson-Reuters 13F data to calculate investors' quarterly churn rate, which is the extent to which they rebalance their portfolio each quarter.[14] Intuitively, investors who frequently rebalance their portfolio (i.e., high churn rate) have a shorter holding period and hence a shorter time horizon. We then calculate each investor's annual average churn rate, and categorize those above the average churn rate as short-term investors, and those below as long-term investors (Gaspar *et al*., 2005).[15] For those institutional investors in the ISS data that could not be matched to the Thomson-Reuters 13F data, we create an additional category, "institutional shareholders with unknown temporal horizon."

It is important to note that most of the proposals are defeated in shareholder meetings. This is a common feature of shareholder-sponsored (as opposed to management-sponsored) proposals (see Cuñat *et al*., 2012; Flammer, 2015). Nevertheless, shareholders often submit proposals not so much because they expect them to pass, but rather to bring important issues to the attention of the management (Loss and Seligman, 2004). As such, the very act of submitting an environment-related proposal is intended to pressure management to disclose and address environmental issues.

CONTROLS

All control variables are constructed from Compustat, which we merge to the ISS–CDP dataset by firm-year. *Size* is the natural logarithm of the book value of total assets. *Return on assets* (ROA) is the ratio of operating income before depreciation to the book value of total assets. *Market-to-book* is the ratio of the

13 As a robustness test, we consider an alternative way of distinguishing between non-institutional and institutional investors. Specifically, we classify individuals as non-institutional (i.e., investors for which the field "sponsor type" in ISS is "individual"), and all other investors as institutional. This broader definition of institutional investors yields very similar results.

14 The quarterly churn rate (CR) for investor i in quarter t is computed using the following formula (Gaspar *et al*., 2005, p. 143):

where P_{jt} and N_{jit} are the stock price of company j in quarter t, and the number of shares of company j held by investor i in quarter t, respectively.

15 As a robustness test, we distinguish between short- and long-term institutional investors using Bushee's (2001) classification in lieu of the churn rate. Bushee differentiates between three types of investors: transient, quasi-indexer, and dedicated. We code as short-term institutional investors those that Bushee classifies as "transient," which he defines as institutional owners "characterized as having high portfolio turnover and highly diversified portfolio holdings [...] reflect[ing] the fact that transient institutions tend to be short-term-focused investors whose interest in the firm's stock is based on the likelihood of short-term trading profits" (p. 214). Conversely, we code as long-term investors those Bushee classifies as "quasi-indexer" or "dedicated." This alternative approach yields very similar results as the churn rate. This is not surprising, since Bushee's coarser categorization is itself based on the churn rate.

market value of common stock to its book value. *Leverage* is the ratio of debt (long-term debt plus debt in current liabilities) to the book value of total assets. *Cash holdings* is the ratio of cash and short-term investments to the book value of total assets. To mitigate the impact of outliers, all ratios are winsorized at their 5th and 95th percentiles.

Summary statistics

Table 1 reports descriptive statistics and correlations. We note the positive correlation between *environmental shareholder activism* and *disclosure of climate change risks*, which is suggestive of Hypothesis 1 (the correlation is 10%, with a *p*-value of 0.002).

Table 1: Summary Statistics

		Mean	Std. dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Disclosure of climate change risks	2.206	1.161	0	3														
2	Disclosure of regulatory climate change risks	0.761	0.427	0	1	0.87													
3	Disclosure of physical climate change risks	0.760	0.427	0	1	0.88	0.65												
4	Disclosure of other climate change risks	0.685	0.465	0	1	0.89	0.65	0.69											
5	Environmental shareholder activism	0.341	0.682	0	5	0.10	0.09	0.05	0.11										
6	Environmental shareholder activism by non-institutional investors	0.118	0.407	0	4	0.12	0.10	0.08	0.13	0.68									
7	Environmental shareholder activism by institutional investors	0.223	0.505	0	3	0.03	0.05	0.00	0.04	0.81	0.11								
8	Environmental shareholder activism by institutional investors with long-term horizon	0.164	0.418	0	3	0.05	0.05	0.02	0.06	0.71	0.10	0.88							
9	Environmental shareholder activism by institutional investors with short-term horizon	0.053	0.228	0	2	-0.03	-0.01	-0.04	-0.04	0.40	0.02	0.52	0.08						
10	Environmental shareholder activism by institutional investors with unknown temporal horizon	0.006	0.079	0	1	0.04	0.04	0.02	0.05	0.24	0.12	0.24	0.08	0.03					
11	Size	10.502	1.332	7.577	14.761	0.02	-0.02	0.05	0.03	0.14	0.18	0.05	0.07	-0.04	0.06				
12	ROA	0.139	0.071	0.018	0.302	-0.03	-0.02	-0.07	0.00	0.05	0.03	0.04	0.02	0.05	0.01	-0.47			
13	Market-to-book	3.297	2.519	0.706	9.971	-0.11	-0.10	-0.12	-0.07	-0.01	-0.06	0.03	0.01	0.06	-0.02	-0.33	0.60		
14	Leverage	0.256	0.140	0.002	0.579	0.16	0.18	0.09	0.14	0.00	-0.04	0.03	0.03	0.02	-0.03	-0.04	-0.07	0.14	
15	Cash holdings	0.121	0.110	0.006	0.415	-0.05	-0.09	-0.03	-0.02	-0.14	-0.10	-0.11	-0.11	-0.03	-0.05	-0.02	0.20	0.15	-0.31

Notes. N = 1,110 firm-year observations.

In Appendix Table A1, we report summary statistics of these two variables by industry (partitioned according to SIC divisions). This reveals that *disclosure of climate change risks* tends to be greatest in mining, manufacturing, and utilities—all industries for which the natural environment is financially material to the firm's operations (based on the materiality scores of the Sustainability Accounting Standards Board (SASB)).[16,17] A similar pattern is found for *environmental shareholder activism*, with the interesting nuance that retail trade is also subject to a high degree of environmental shareholder activism (which likely reflects consumers' sensitivity to environmental issues). Finally, Appendix Table A2 reports summary statistics of these two variables by year, which indicate that both the disclosure of climate change risks and environmental shareholder activism have become more prevalent over the years.

METHODOLOGY

Baseline regression

To examine whether environmental shareholder activism induces firms to voluntarily disclose climate change risks, we estimate the following regression:

$$\textit{disclosure of climate change risks}_{it} = \alpha_i + \alpha_t + \beta \times \textit{environmental shareholder activism}_{it\text{-}1} + \gamma' \mathbf{X}_{\mathbf{it\text{-}1}} + \varepsilon_{it}, \quad (1)$$

where *i* indexes firms, *t* indexes years, α_i are firm fixed effects, and α_t are year fixed effects. All the right-hand-side variables are lagged by one year. **X** is the vector of control variables, which includes *size*, *ROA*,

- 16 For a description of the SASB data, see Khan, Serafeim, and Yoon (2016).
- 17 Construction also displays a high disclosure of climate change risks, but represents only a small fraction of the sample.

market-to-book, *leverage*, and *cash holdings*. ε is the error term. The regression is estimated by ordinary least squares (OLS). To account for dependence across firms within the same industry, we cluster standard errors at the industry level (using SIC divisions to partition industries). The coefficient of interest is β, which captures the change in the voluntary disclosure of climate change risks following environmental shareholder activism.

The inclusion of control variables mitigates the possibility that our findings are driven by omitted variables. For example, it could be that larger companies are more likely to voluntarily disclose climate change risks (e.g., due to more intense public scrutiny) and be targeted by environmental shareholder activism. Controlling for size addresses this potential confound. Similarly, the other controls account for differences in performance (*ROA* and *market-to-book*) and financing policies (*leverage* and *cash holdings*) that may correlate with both the decision to disclose climate change risks and environmental shareholder activism. The inclusion of firm fixed effects accounts for unobserved heterogeneity at the firm level. The inclusion of year fixed effects accounts for any time trend that could affect both the voluntary disclosure of climate change risks and environmental shareholder activism. In our main analyses, we also estimate a variant of model (1) in which we include the full set of industry-by-year fixed effects ($\alpha_j \times \alpha_t$, where *j* indexes industries), thereby allowing for industry-specific time trends.

Two-stage least squares (2SLS) regression

While the controls and fixed effects help address potential confounds, they do not fully rule out the possibility that *unobservable* time-varying firm characteristics might drive a spurious relationship between environmental shareholder activism and companies' disclosure of climate change risks. In robustness checks, we alleviate this concern by using an instrumental variable.

To construct an instrument for environmental shareholder activism, we exploit the fact that shareholder activism often comes in "waves." That is, a particular shareholder (such as BlackRock or CalPERS) adopts an agenda (for example, requesting companies to provide a climate risk report) and then submits a similar proposal to all firms in which it has nontrivial holdings (e.g., Gillian and Starks, 2007; Yermack, 2010). In such case, the active shareholder targets a wide range of firms across industries and geographies, and the motive of doing so is orthogonal to (unobservable) characteristics of individual firms. In other words, environment-related proposals that are submitted as part of a wave are more likely to be exogenous with respect to any specific firm characteristics. (See also Flammer and Bansal (2017), who use a similar instrument for the submission of long-term compensation proposals.

More precisely, our instrument is an indicator variable equal to one if the company is targeted by a shareholder who submits the same environment-related proposal to at least five companies in the same proxy season (*environmental activism wave*).[18] We then re-estimate model (1) by 2SLS, instrumenting *environmental shareholder activism* with *environmental activism wave* in the first stage.[19]

18 In robustness checks described below, we show that our results are not sensitive to the five-company cutoff.

19 Specifically, in the first-stage specification, we regress environmental shareholder activism on the instrument:

$$\text{environmental shareholder activism}_{it} = a_i + a_t + b \times \text{environmental activism wave}_{it} + c'X_{it-1} + e_{it}. \quad (2)$$

The predicted values from this regression provide environmental shareholder activism (instrumented). In the second stage, we then re-estimate equation (1) using environmental shareholder activism (instrumented) in lieu of environmental shareholder activism:

$$\text{disclosure of climate change risks}_{it} = \alpha_i + \alpha_t + \beta_{2SLS} \times \text{environmental shareholder activism (instrumented)}_{it-1} + \gamma'X_{it-1} + \varepsilon_{it}. \quad (3)$$

Results

Shareholder activism and the voluntary disclosure of climate change risks

Table 2 presents our main results. In columns (1) and (2), we estimate our baseline specification in equation (1) without and with controls. We find that environmental shareholder activism increases the voluntary disclosure of climate change risks. Specifically, the coefficient of *environmental shareholder activism* lies between 0.101 and 0.103, and is statistically significant at conventional levels (*p*-values between 0.043 and 0.046). Since companies in our sample report an average of 2.2 climate change risks (see Table 1), the coefficients of 0.101–0.103 imply that companies increase their voluntary disclosure of climate change risks by 4.6–4.7 percent following the submission of an environment-related shareholder proposal. In column (3), we obtain similar results when we include the full set of industry-by-year fixed effects. Overall, the results in Table 2 are consistent with Hypothesis 1, predicting that environmental shareholder activism increases companies' voluntary disclosure of climate change risks.

Table 2: Environmental shareholder activism and the voluntary disclosure of climate change risks

Dependent variable:	Disclosure of climate change risks$_t$		
	(1)	(2)	(3)
Environmental shareholder activism$_{t-1}$	0.103	0.101	0.078
	(0.045)	(0.043)	(0.040)
Size$_{t-1}$		-0.206	-0.316
		(0.280)	(0.265)
ROA$_{t-1}$		0.471	-0.457
		(1.616)	(1.770)
Market-to-book$_{t-1}$		0.024	0.018
		(0.021)	(0.026)
Leverage$_{t-1}$		0.989	0.838
		(0.551)	(0.569)
Cash$_{t-1}$		1.443	1.449
		(0.989)	(0.939)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	–
Industry × year fixed effects	No	No	Yes
Adjusted R-squared	0.66	0.67	0.69
# Observations	1,110	1,110	1,110
# Firms	265	265	265

Notes. OLS estimates with standard errors (clustered at the industry level) in parentheses.

2SLS analysis

In Table 3, we estimate the 2SLS specification described in the methodology section, using *environmental activism wave* as instrument. As discussed above, if a shareholder targets companies in a wave, the targeting itself is plausibly exogenous with respect to a given individual company.

Table 3: 2SLS - Wave of environmental shareholder activism

	First stage			Second stage		
Dependent variable:	Environmental shareholder activism$_{t-1}$			Disclosure of climate change risks$_t$		
	(1)	(2)	(3)	(4)	(5)	(6)
Environmental shareholder activism (instr.)$_{t-1}$				0.337	0.350	0.392
				(0.148)	(0.126)	(0.107)
Environmental activism wave$_{t-1}$	0.911	0.913	0.937			
	(0.098)	(0.095)	(0.080)			
Size$_{t-1}$		-0.003	-0.034		-0.196	-0.295
		(0.073)	(0.073)		(0.227)	(0.221)
ROA$_{t-1}$		-0.234	-0.370		0.553	-0.355
		(0.441)	(0.337)		(1.389)	(1.506)
Market-to-book$_{t-1}$		0.016	0.009		0.020	0.015
		(0.014)	(0.011)		(0.018)	(0.024)
Leverage$_{t-1}$		-0.069	-0.209		1.020	0.933
		(0.475)	(0.466)		(0.464)	(0.483)
Cash$_{t-1}$		0.249	-0.027		1.435	1.529
		(0.625)	(0.659)		(0.834)	(0.814)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	–	Yes	Yes	–
Industry × year fixed effects	No	No	Yes	No	No	Yes
F-statistic (instrument)	85.55	91.90	136.07	–	–	–
Adjusted R-squared	0.47	0.46	0.49	0.66	0.67	0.69
# Observations	1,110	1,110	1,110	1,110	1,110	1,110
# Firms	265	265	265	265	265	265

Notes. 2SLS estimates, with standard errors (clustered at the industry level) in parentheses

We re-estimate the three specifications considered in Table 2 using 2SLS. The first-stage regressions are reported in columns (1)–(3) of Table 3. The coefficient on the instrument (*environmental activism wave*) is positive and highly significant in all three specifications. Importantly, the instrument qualifies as "strong" in statistical terms; its *F*-statistic ranges from 85.6 to 136.1, well above the $F = 10$ threshold of Staiger and Stock (1997) and the critical values of Stock and Yogo (2005) for strong instruments. The respective second-stage regressions are reported in columns (4)–(6) of Table 3. The coefficient on *environmental shareholder activism (instrumented)* is large and significant in all three specifications, ranging from 0.337 to 0.392 (with *p*-values from 0.000 to 0.022). Compared to the OLS estimates, the 2SLS estimates are larger in economic terms.[20] Overall, the 2SLS analysis confirms that our results are unlikely to be driven by endogeneity bias.

Robustness

Table 4 provides a series of robustness checks, all of which are variants of the specification in column (2) of Table 2 (henceforth "baseline specification").

• 20 The standard errors are larger as well, which is intuitive since we rely on a subset of the variation in environmental shareholder activism—namely, the variation triggered by the "wave" component of environmental shareholder activism—and hence we have less power in the regression.

Table 4: Robustness

Dependent variable:	Disclosure of climate change risks$_t$				
	Dynamics	Broader ISS sample	Poisson regression	2SLS – activism wave based on 4+ proposals	2SLS – activis wave based c 6+ proposals
	(1)	(2)	(3)	(4)	(5)
Environmental shareholder activism$_{t+1}$	-0.002				
	(0.066)				
Environmental shareholder activism$_t$	0.060				
	(0.064)				
Environmental shareholder activism$_{t-1}$	0.114	0.064	0.043		
	(0.044)	(0.032)	(0.015)		
Environmental shareholder activism$_{t-2}$	0.050				
	(0.038)				
Environmental shareholder activism (instr.)$_{t-1}$				0.235	0.331
				(0.053)	(0.195)
Size$_{t-1}$	-0.332	-0.058	-0.088	-0.201	-0.197
	(0.306)	(0.205)	(0.117)	(0.237)	(0.226)
ROA$_{t-1}$	-0.735	-0.402	0.345	0.515	0.547
	(2.032)	(1.572)	(0.621)	(1.413)	(1.372)
Market-to-book$_{t-1}$	0.033	0.012	0.012	0.022	0.021
	(0.019)	(0.009)	(0.007)	(0.019)	(0.017)
Leverage$_{t-1}$	0.809	0.916	0.391	1.006	1.018
	(0.534)	(0.526)	(0.216)	(0.465)	(0.467)
Cash$_{t-1}$	1.504	0.770	0.794	1.439	1.436
	(0.918)	(0.917)	(0.450)	(0.841)	(0.837)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.69	0.66	–	0.67	0.67
# Observations	997	1,631	1,110	1,110	1,110
# Firms	254	346	265	265	265

Notes. OLS estimates in columns (1) and (2); Poisson estimates in column (3); and 2SLS estimates in columns (4) and (5). Standard errors (clustered at the industry level) in parentheses.

Dynamics. In column (1) of Table 4, we examine the dynamics to rule out reverse causality concerns. Specifically, we augment our baseline specification in equation (1) by including leads and lags of *environmental shareholder activism* (in addition to the *t*–1 term used in the baseline specification). Only the coefficient on the *t*–1 term is large and statistically significant; the others are small and statistically insignificant. This confirms that environmental shareholder activism leads to subsequent increases in the voluntary disclosure of climate change risks (not the other way around), and that it takes about a year after the shareholder activism for the higher disclosure to materialize.[21]

External validity. In our baseline analysis, the sample is restricted to firms targeted by SRI proposals during the sample period. This criterion ensures that the comparison firms (i.e., the "control" group) face similar exposure to SRI-related shareholder activism. In column (2) of Table 4, we relax this criterion, extending the sample to all firms in the ISS and CDP databases that are targeted by *any* type of

21 If, for some reason, the disclosure of climate risks were to induce more environmental shareholder activism (either contemporaneously or with a lag), the coefficients of *environmental activism wave*$_{it}$ and *environmental activism wave*$_{it+1}$, respectively, would be significant.

shareholder proposal during the sample period. For each of these 346 firms, we now include the years within 2010–2016 that range from its earliest shareholder proposal of any type through its most recent proposal, yielding a sample of 1,631 firm-years (the "ISS sample"). Our main results continue to hold in this broader sample, indicating that our findings are generalizable to the broader set of companies with active shareholders.

Functional form. In our regressions, the dependent variable—*disclosure of climate change risks*—is a count variable that ranges from 0 to 3. In column (3) of Table 4, we re-estimate our baseline specification using a Poisson regression (in lieu of OLS). The results are very similar to our baseline OLS results: the 0.043 coefficient value is comparable to the 4.6 percent magnitude of our OLS estimate and the effect remains highly statistically significant (p-value = 0.004).

Alternative definition of environmental activism waves. In our main 2SLS approach, we coded waves based on a five-company threshold; that is, to qualify as a wave, the submitting shareholder needs to target at least five companies with the same proposal in the same proxy season. The threshold level seeks to balance two considerations. On one hand, the threshold needs to be sufficiently high such that the notion of "wave" is meaningful. On the other hand, too high a threshold reduces the number of waves and hence the power of the instrument. In columns (4) and (5) of Table 4, we re-estimate our 2SLS regression using a four- and six-company threshold, respectively, and find that our results are robust.

Types of voluntary climate change risk disclosure

To explore whether our results vary depending on what types of climate risk are disclosed, we re-estimate our baseline specification, decomposing the dependent variable into three dummy variables indicating the disclosure of climate risk information pertaining to (a) regulatory risks, (b) physical risks, and (c) other risks.

The results, reported in Table 5, indicate that the voluntary disclosure of all three types of climate risk increases in response to environmental shareholder activism. All three point estimates are similar (ranging from 0.028 to 0.039, with *p*-values from 0.022 to 0.098), and do not significantly differ from one another.

Table 5: Types of voluntary climate change risk disclosure

Dependent variable:	Disclosure of regulatory climate change risks$_t$	Disclosure of physical climate change risks$_t$	Disclosure of other climate change risks$_t$
	(1)	(2)	(3)
Environmental shareholder activism$_{t-1}$	0.028	0.039	0.035
	(0.015)	(0.014)	(0.019)
Size$_{t-1}$	-0.038	-0.100	-0.068
	(0.102)	(0.113)	(0.101)
ROA$_{t-1}$	0.278	0.310	-0.117
	(0.541)	(0.387)	(0.759)
Market-to-book$_{t-1}$	0.011	0.006	0.007
	(0.004)	(0.008)	(0.011)
Leverage$_{t-1}$	0.452	0.262	0.275
	(0.217)	(0.205)	(0.231)
Cash$_{t-1}$	0.399	0.447	0.597
	(0.215)	(0.345)	(0.576)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R-squared	0.65	0.66	0.65
# Observations	1,110	1,110	1,110
# Firms	265	265	265

Notes. OLS estimates, with standard errors (clustered at the industry level) in parentheses.

Shareholder pressure by shareholder type

To examine how the relationship between shareholder activism and climate risk disclosure varies depending on shareholders' power and the legitimacy of their request, we refine our baseline analysis by decomposing *environmental shareholder activism* by shareholder type.

Institutional versus non-institutional shareholders. In column (1) of Table 6, we distinguish between environment-related shareholder proposals submitted by institutional versus non-institutional shareholders. The coefficient is large and statistically significant for *environmental shareholder activism by institutional shareholders* (*p*-value = 0.034), while it is smaller and statistically insignificant for *environmental shareholder activism by non-institutional shareholders* (*p*-value = 0.429). This lends support to Hypothesis 2, indicating that firms facing more shareholder activism by institutional investors disclose more climate risk information.[22]

Table 6: Environmental shareholder activism by shareholder type

Dependent variable:	Disclosure of climate change risks$_t$	
	(1)	(2)
Environmental shareholder activism by…		
… non-institutional shareholders$_{t-1}$	0.062	0.063
	(0.075)	(0.075)
… institutional shareholders$_{t-1}$	0.118	
	(0.047)	
… institutional shareholders with long-term horizon$_{t-1}$		0.151
		(0.065)
… institutional shareholders with short-term horizon$_{t-1}$		-0.011
		(0.129)
… institutional shareholders with unknown temporal horizon$_{t-1}$		0.286
		(0.189)
Size$_{t-1}$	-0.201	-0.198
	(0.282)	(0.283)
ROA$_{t-1}$	0.502	0.590
	(1.626)	(1.662)
Market-to-book$_{t-1}$	0.024	0.024
	(0.021)	(0.022)
Leverage$_{t-1}$	1.011	1.046
	(0.559)	(0.560)
Cash$_{t-1}$	1.450	1.435
	(0.999)	(0.975)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Adjusted R-squared	0.67	0.67
# Observations	1,110	1,110
# Firms	265	265

Notes. OLS estimates, with standard errors (clustered at the industry level) in parentheses.

22 We note that the difference between the two coefficients is not significant at conventional levels. As we are relying on subsets of the data, we may not have sufficient power to identify cross-sectional differences, even if they are present.

Long-term versus short-term institutional shareholders. In column (2) of Table 6, we further distinguish between institutional shareholders with long- versus short-term horizons. The coefficient is large and statistically significant for *environmental shareholder activism by institutional shareholders with long-term horizon* (*p*-value = 0.046), but small and insignificant for *environmental shareholder activism by institutional shareholders with short-term horizon* (*p*-value = 0.936). This supports Hypothesis 3, indicating that firms facing more shareholder activism by long-term institutional investors disclose more climate risk information.

Valuation implications

Finally, we examine whether companies achieve higher valuation following their (shareholder-induced) disclosure of climate risk information. To do so, we regress *market-to-book*$_{it}$ (that is, the market valuation of the firm's equity per dollar of book value) on a dummy variable equal to one for companies that disclose climate change risks after being targeted by environmental shareholder activism (*disclosure of climate change risks induced by environmental shareholder activism*$_{it-1}$), as well as controls, firm fixed effects, and year fixed effects.[23] For robustness, we also present a variant of this regression that includes industry-by-year fixed effects, thereby accounting for industry trends in market valuation.

The results, presented in Table 7, indicate that firms that voluntarily disclose climate change risks following environmental shareholder activism do achieve a higher valuation. Since the average market-to-book is 3.30 (Table 1), the coefficients of 0.158–0.162 imply that valuation increases by 4.8–4.9 percent.[24] These estimates are significant at conventional levels (*p*-values of 0.025–0.040). This finding lends support to Hypothesis 4—companies achieve a higher valuation post disclosure, as investors value the (voluntary) disclosure of climate change risks.

23 This regression mirrors our baseline specification in equation (1).

24 The magnitude is in the ballpark of the valuation gains that have been documented for the mandatory disclosure of sustainability-related information (e.g., Ioannou and Serafeim, 2019; Krueger, 2015). In particular, Ioannou and Serafeim (2019) find that a one-standard-deviation increase in the degree of mandatory ESG disclosure increases firm value by about 10%.

Table 7: Valuation implications

Dependent variable:	Market-to-book$_t$	
	(1)	(2)
Disclosure of climate change risks induced by environmental shareholder activism$_{t-1}$	0.158	0.162
	(0.066)	(0.060)
Size$_{t-1}$	-0.635	-0.544
	(0.219)	(0.331)
ROA$_{t-1}$	-0.139	1.001
	(3.442)	(4.891)
Market-to-book$_{t-1}$	0.728	0.754
	(0.077)	(0.086)
Leverage$_{t-1}$	1.088	0.609
	(1.221)	(0.982)
Cash$_{t-1}$	1.165	1.310
	(2.290)	(2.297)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	–
Industry × year fixed effects	No	Yes
Adjusted R-squared	0.85	0.86
# Observations	1,110	1,110
# Firms	265	265

Notes. OLS estimates, with standard errors (clustered at the industry level) in parentheses.

Discussion and Conclusion

Can shareholder activism successfully induce firms to voluntarily disclose their exposure to climate change risks and efforts to manage those risks? In this study, we shed light on this question and explore what types of shareholder are more effective in improving the voluntary disclosure of climate risk information. Moreover, we examine the valuation implications of such voluntary disclosure.

To guide our theoretical arguments, we extend the salience framework for secondary stakeholders (e.g., Eesley and Lenox, 2006; Mitchell ***et al***., 1997) to the context of *primary* stakeholders (i.e., shareholders). Specifically, we argue that the salience of active shareholders increases with (a) their power and (b) the legitimacy of their request—that is, we expect that firms are more likely to respond to shareholders' demands for the disclosure of climate risk information if the shareholder is powerful and the request has legitimacy.

Our results support these arguments. We find that environmental shareholder activism induces manag-

ers to voluntarily disclose climate change risks. Moreover, environmental shareholder activism is particularly effective if initiated by institutional investors (that is, investors who have more "power"), and even more so if initiated by long-term institutional investors (that is, investors whose request has more "legitimacy"). Finally, we find that companies that voluntarily disclose climate risk information following environmental shareholder activism achieve a higher valuation post disclosure, consistent with the notion that shareholders value the voluntary disclosure of climate risk information. Overall, our findings indicate that active shareholders can elicit greater climate risk disclosure, thereby improving the governance of their portfolio companies.

This study contributes to several strands of the literature. First, by showing that shareholder activism can elicit greater corporate transparency with respect to climate risks, and that companies achieve higher valuation following this (shareholder-induced) increase in transparency, we contribute to the literature on shareholder engagement (e.g., Aguilera ***et al.***, 2019; Dimson ***et al.***, 2015; Ferraro and Beunza, 2018; Gillan and Starks, 2000; Krueger ***et al.***, 2019). In particular, our study complements recent work on the value implications of ***mandatory*** disclosure of nonfinancial information (e.g., Ioannou and Serafeim, 2019; Krueger, 2015) by showing that—independent of (the lack of) government regulation—shareholder activism demanding the ***voluntary*** disclosure of ***climate change risk information*** has positive value implications, consistent with the notion that investors value the voluntary disclosure of the firm's exposure to climate change risks.

Second, we add to the literature that studies the voluntary disclosure of nonfinancial information. This literature mainly examines ***whether*** a firm discloses environmental information (such as greenhouse gas emissions) or participates in voluntary environmental initiatives (e.g., Jira and Toffel, 2013; Kim and Lyon, 2011a; Lewis, Walls, and Dowell, 2014; Lyon and Maxwell, 2011; Reid and Toffel, 2009). Our data allow us to go deeper: we explore ***how much*** and ***what type*** of environmental information—and more specifically what type of ***climate risk information***—is disclosed.

More broadly, the disclosure of climate risk information has received surprisingly little attention in the academic literature.[25] Yet, it is a key concern for investors (e.g., ***Financial Times***, 2018; Krueger ***et al***., 2019). For example, in the aforementioned survey by Krueger ***et al***. (2019), the majority of investors responded that climate risk reporting is as important as financial reporting, and about one-third reported that climate risk reporting is even more important. Accordingly—while this paper provides a first step in this direction—more research is needed to shed light on the determinants and implications of the (voluntary) disclosure of climate risks. Making ground on these questions is both a promising and important avenue for future research.

Third, this study adds to the strategy and management literature by taking a finer-grained view at shareholders and their influence on corporate behavior. The existing literature that studies how shareholders help shape corporate behavior—e.g., Chen and Feldman (2019), David, Hitt, and Gimeno (2001), Lenox and Eesley (2009), Reid and Toffel (2009)—typically (a) considers shareholders as one homogenous group (instead of distinguishing between different types of shareholders), or (b) only considers one specific subset of shareholders (such as hedge funds). Yet, there are considerable differences among shareholders (e.g., in terms of their time horizons, preferences, and objectives), and these differences are likely to have important implications for their interactions with their companies. In this study, we account for the heterogeneity among shareholder types and examine how these differences influence corporate behavior (in the specific context of shareholders' ability to elicit greater corporate transparency). As such, our findings add to the small but burgeoning literature that highlights the importance of distinguishing between different types of shareholders in strategy and management research (e.g., Connelly ***et al.***, 2019;

25 A firm's exposure to climate change risks is very different from a firm's environmental footprint. Firms across industries—whether emission-intensive or not—are exposed to climate change risks. As previously mentioned, climate change risks involve the threat of damage, injury, liability, loss, or any other harm to the company that is caused by climate-related events. They include physical risks, regulatory risks, and other climate-related risks.

Hoskisson *et al.*, 2002; Tihanyi *et al.*, 2003).

Our findings have important implications for practice, as they highlight the ability of investors to elicit greater corporate transparency with respect to climate change risks—even in the absence of mandatory disclosure requirements—and thus contribute to their portfolio companies' governance. In absence of mandatory disclosure requirements imposed by the government, this greater ability also implies that investors (particularly, long-term institutional investors) have a greater responsibility to be *active* owners and engage with management to elicit the disclosure of climate change risks.

On this note, we caution that, while our results indicate that private governance (in the form of shareholder activism) is effective in eliciting the disclosure of climate change risks, it is unlikely to substitute for public governance (Ho, 2018; Light and Orts, 2015; Vandenbergh, 2013). Indeed—and this is speculative—the latter might be more effective in (a) improving the quantity and quality of disclosure, (b) fostering standardization of disclosure (thereby facilitating investors' assessments of their portfolio companies), and (c) ultimately making progress in the fight against climate change. Long-term institutional investors may therefore find it worthwhile to both pursue shareholder activism and engage with the government to mandate climate change risk disclosure. Understanding how to effectively engage with companies and governments to induce greater climate risk disclosure—and what the optimal combination of these engagements is—is fertile ground for future research.

Appendix

Appendix Table A1. Disclosure of climate change risks and environmental shareholder activism by industry

		Disclosure of climate change risks				Environmental shareholder activism			
	N	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
Agriculture, forestry, and fishing	7	2.143	1.464	0	3	1.000	0.816	0	2
Construction	2	3.000	0.000	3	3	0.000	0.000	0	0
Finance, insurance, and real estate	191	1.953	1.202	0	3	0.131	0.353	0	2
Manufacturing	412	2.386	1.071	0	3	0.371	0.808	0	5
Mining	72	2.417	0.818	1	3	0.611	0.848	0	4
Retail trade	116	1.828	1.334	0	3	0.534	0.665	0	2
Services	84	2.214	1.173	0	3	0.202	0.460	0	2
Utilities	197	2.335	1.120	0	3	0.299	0.586	0	3
Wholesale trade	16	1.938	1.237	0	3	0.250	0.447	0	1
Nonclassifiable	13	0.692	1.316	0	3	0.615	0.650	0	2
All	1,110	2.206	1.161	0	3	0.341	0.682	0	5

Appendix Table A2. Disclosure of climate change risks and environmental shareholder activism by year

		Disclosure of climate change risks				Environmental shareholder activism			
	N	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
2010	167	1.772	1.279	0	3	0.281	0.710	0	5
2011	174	2.063	1.245	0	3	0.305	0.658	0	4
2012	171	2.170	1.188	0	3	0.263	0.580	0	4
2013	175	2.274	1.121	0	3	0.314	0.685	0	5
2014	165	2.333	1.073	0	3	0.418	0.716	0	4
2015	145	2.421	1.018	0	3	0.434	0.725	0	4
2016	113	2.558	0.944	0	3	0.416	0.691	0	2
All	1,110	2.206	1.161	0	3	0.341	0.682	0	5

REFERENCES

Aguilera RV, Bermejo VJ, Capapé J, Cuñat V. 2019. The firms' reaction to changes in the governance preferences of active institutional owners. Working paper, Northeastern University.

Ainslie G. 1975. Specious reward: a behavioral theory of impulsiveness and impulse control. *Psychological Bulletin* **82**(4): 463–496.

Bethel JE, Liebeskind J. 1993. The effects of ownership structure on corporate restructuring. *Strategic Management Journal* **14**(Special Issue): 15–31.

Bushee B. 1998. The influence of institutional investors on myopic R&D investment behavior. *Accounting Review* **73**(3): 305–333.

Bushee B. 2001. Do institutional investors prefer near-term earnings over long-run value? *Contemporary Accounting Research* **18**(2): 207–246.

CDP. 2016. Guidance for companies reporting on climate change on behalf of investors & supply chain members 2016. White paper, Carbon Disclosure Project.

Ceres. 2018. Disclose what matters: bridging the gap between investor needs and company disclosures on sustainability. White paper, Ceres.

Chen S, Feldman ER. 2019. Activist-impelled divestitures and shareholder value. *Strategic Management Journal* **39**(10): 2726–2744.

Connelly BL, Shi W, Hoskisson RE, Koka BR. 2019. Shareholder influence on joint venture exploration. *Journal of Management*, forthcoming.

Cuñat V, Giné M, Guadalupe M. 2012. The vote is cast: the effect of corporate governance on shareholder value. *Journal of Finance* **67**(5): 1943–1977.

David P, Hitt MA, Gimeno J. 2001. The influence of activism by institutional investors on R&D. *Academy of Management Journal* **44**(1): 144–157.

DeGeorge F, Patel J, Zeckhauser R. 1999. Earnings management to exceed thresholds. *Journal of Business* **72**(1): 1–33.

Dimson E, Karakas O, Li X. 2015. Active ownership. *Review of Financial Studies* **28**(12): 3225–3268.

Eesley C, Lenox MJ. 2006. Firm responses to secondary stakeholder action. *Strategic Management Journal* **27**(8): 765–781.

Ferraro F, Beunza D. 2018. Creating common ground: a communicative action model of dialogue in shareholder engagement. *Organization Science* **29**(6): 1187–1207.

Financial Times. 2015. Mark Carney warns investors face "huge" climate change losses. 29 September, https://www.ft.com/content/622de3da-66e6-11e5-97d0-1456a776a4f5, accessed October 2019.

Financial Times. 2017. Top investment groups push for action on climate risks. 1 October, https://www.ft.com/content/48ad5476-a6aa-11e7-ab55-27219df83c97, accessed October 2019.

Financial Times. 2018. Money managers: the new warriors of climate change. 26 December, https://www.ft.com/content/c245af4a-f875-11e8-af46-2022a0b02a6c, accessed October 2019.

Fisher-Vanden K, Thorburn KS. 2011. Voluntary corporate environmental initiatives and shareholder wealth. *Journal of Environmental Economics and Management* **62**(3): 430–445.

Flammer C. 2015. Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science*, **61**(11): 2549–2568.

Flammer C, Bansal P. 2017. Does long-term orientation create value? Evidence from a regression discontinuity. *Strategic Management Journal* **38**(9): 1827–1847.

Flammer C, Hong B, Minor D. 2019. Corporate governance and the rise of integrating corporate social responsibility criteria in executive compensation: effectiveness and implications for firm outcomes. *Strategic Management Journal* **40**(7): 1097–1122.

Forbes. 2019. Part I: PG&E gets burned for California wildfires. 7 February, https://www.forbes.com/sites/arielcohen/2019/02/07/part-1-pge-gets-burned-for-california-wildfires/, accessed October 2019.

Fortune. 2015. Energy companies face big risks from Paris climate deal. 17 December, https://fortune.com/2015/12/17/energy-companies-feel-the-burn-from-paris-climate-deal/, accessed October 2019.

Frederick S, Loewenstein G, O'Donoghue T. 2002. Time discounting and time preference: a critical review. *Journal of Economic Literature* **40**(2): 351–401.

Gaspar JM, Massa M, Matos P. 2005. Shareholder investment horizons and the market for corporate control. *Journal of Financial Economics* **76**(1): 135–165.

Gibbons R, Murphy KJ. 1992. Optimal incentive contracts in the presence of career concerns: theory and evidence. *Journal of Political Economy* **100**(3): 468–505.

Gillan SL, Starks LT. 2000. Corporate governance proposals and shareholder activism: the role of institutional investors. *Journal of Financial Economics* **57**(2): 275–305.

Gillan SL, Starks LT. 2007. The evolution of shareholder activism in the United States. *Journal of Applied Corporate Finance* **19**(1): 55–73.

Graham JR, Harvey CR, Rajgopal S. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* **40**(1–3): 3–73.

Grossman SJ, Hart OD. 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *Bell Journal of Economics* **11**(1): 42–64.

Healy PM, Palepu KG. 2001. Information asymmetry, corporate disclosure, and the capital markets: a review of the empirical disclosure literature. *Journal of Accounting and Economics* **31**(1–3): 405–440.

Ho VH. 2018. Nonfinancial risk disclosure and the costs of private ordering. *American Business Law Journal* **55**(3): 407–474.

Holmstrom B. 1999. Managerial incentive problems: a dynamic perspective. *Review of Economic Studies* **66**(1): 169–182.

Hoskisson RE, Hitt MA, Johnson RA, Grossman W. 2002. Conflicting voices: the effects of institutional ownership heterogeneity and internal governance on corporate innovation strategies. *Academy of Management Journal* **45**(4): 697–716.

Ilhan E, Krueger P, Sautner Z, Starks LT. 2019. Institutional investors' views and preferences on climate risk disclosure. Working paper, University of Geneva.

Ioannou I, Serafeim G. 2019. The consequences of mandatory corporate sustainability reporting. In *Oxford Handbook of Corporate Social Responsibility: Psychological and Organizational Perspectives*, Oxford University Press: Oxford, UK, forthcoming.

Jira, C, Toffel MW. 2013. Engaging supply chains in climate change. *Manufacturing & Service Operations Management* **15**(4): 559–577.

Khan M, Serafeim S, Yoon A. 2016. Corporate sustainability: first evidence on materiality. *Accounting Review* **91**(6): 1697–1724.

Kim EH, Lyon T. 2011a. When does institutional investor activism increase shareholder value? The Carbon Disclosure Project. *B.E. Journal of Economic Analysis & Policy* **11**(1).

Kim EH, Lyon T. 2011b. Strategic environmental disclosure: evidence from the DOE's voluntary greenhouse gas registry. *Journal of Environmental Economics and Management* **61**(3): 311–326.

Krueger P. 2015. Climate change and firm valuation: evidence from a quasi-natural experiment. Working paper, University of Geneva.

Krueger P, Sautner Z, Starks LT. 2019. The importance of climate risks for institutional investors. *Review of Financial Studies*, forthcoming.

Lenox MJ, Eesley CE. 2009. Private environmental activism and the selection and response of firm targets. *Journal of Economics & Management Strategy* **18**(1): 45–73.

Lewis, BW, Walls JL, Dowell GWS. 2014. Difference in degrees: CEO characteristics and firm environmental disclosure. *Strategic Management Journal* **35**(5): 712–722.

Light SE, Orts EW. 2015. Parallels in public and private environmental governance. *Michigan Journal of Environmental and Administrative Law* **5**(1): 1–72.

Loewenstein G, Prelec D. 1992. Anomalies in intertemporal choice: evidence and an interpretation. *Quarterly Journal of Economics* **107**(2): 573–597.

Loss L, Seligman J. 2004. *Fundamentals of Securities Regulation*. Aspen Publishers: New York, NY.

Lyon TP, Maxwell JW. 2011. Greenwash: corporate environmental disclosure under threat of audit. *Journal of Economics and Management Strategy* **20**(1): 3–41.

Matisoff DC. 2013. Different rays of sunlight: understanding information disclosure and carbon transparency. *Energy Policy* **55**(4): 579–592.

McDonnell MH, King BG, Soule SA. 2015. A dynamic process model of private politics: activist targeting and corporate receptivity to social challenge. *American Sociological Review* **80**(3): 654–678.

Mitchell RK, Agle BR, Wood DJ. 1997. Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Academy of Management Review* **22**(4): 853–886.

Neubaum DO, Zahra SA. 2006. Institutional ownership and corporate social performance: the moderating effects of investment horizon, activism and coordination. *Journal of Management* **32**(1): 108–131.

New York Times. 2017. Exxon Mobil shareholders demand accounting of climate change policy risks. 31 May, https://www.nytimes.com/2017/05/31/business/energy-environment/exxon-shareholders-climate-change.html, accessed October 2019.

New York Times. 2018. Major climate report describes a strong risk of crisis as early as 2040. 7 October, https://www.nytimes.com/2018/10/07/climate/ipcc-climate-report-2040.html, accessed October 2019.

New York Times. 2019. Companies see climate change hitting their bottom lines in the next 5 years. 4 June, https://www.nytimes.com/2019/06/04/climate/companies-climate-change-financial-impact.html, accessed October 2019.

O'Donoghue T, Rabin M. 1999. Doing it now or later. *American Economic Review* **89**(1): 103–124.

Politico. 2019. Democrats want companies to disclose their climate risks—and fossil fuel industry is worried. 17 June, https://www.politico.com/story/2019/06/17/democrats-energy-industry-climate-risk-1483586, accessed October 2019.

Reid EM, Toffel MW. 2009. Responding to public and private politics: corporate disclosure of climate change

strategies. *Strategic Management Journal* **30**(11): 1157–1178.

Scientific American. 2017. What to believe in Antarctica's great ice debate. 6 July, https://www.scientificamerican.com/article/what-to-believe-in-antarctica-rsquo-s-great-ice-debate/, accessed October 2019.

Shleifer A, Vishny RW. 1986. Large shareholders and corporate control. *Journal of Political Economy* **94**(3): 461–488.

Staiger DO, Stock JH. 1997. Instrumental variables regression with weak instruments. *Econometrica* **65**(3): 557–586.

Starks LT, Venkat P, Zhu Q. 2017. Corporate ESG profiles and investor horizons. Working paper, University of Texas at Austin.

Stein JC. 1988. Takeover threats and managerial myopia. *Journal of Political Economy* **96**(1): 61–80.

Stein JC. 1989. Efficient capital markets, inefficient firms: a model of myopic corporate behavior. *Quarterly Journal of Economics* **104**(4): 655–669.

Stock JH, Yogo M. 2005. Testing for weak instruments in linear IV regression. In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, Andrews DWK, Stock JH (eds). Cambridge University Press: Cambridge, UK; 80–108.

Suchman MC. 1995. Managing legitimacy: strategic and institutional approaches. *Academy of Management Review* **20**(3): 571–610.

Thaler RH, Shefrin HM. 1981. An economic theory of self-control. *Journal of Political Economy* **89**(2): 392–406.

Tihanyi L, Johnson RA, Hoskisson RE, Hitt MA. 2003. Institutional ownership differences and international diversification: the effects of boards of directors and technological opportunity. *Academy of Management Journal* **46**(2): 195–211.

Vandenberg MP. 2013. Private environmental governance. *Cornell Law Review* **99**(1): 129–200.

Vasi IB, King B. 2012. Social movements, risk perceptions, and economic outcomes: the effect of primary and secondary stakeholder activism on firms' perceived environmental risk and financial performance. *American Sociological Review* **77**(4): 573–596.

Wall Street Journal. 2018a. More shareholder proposals spotlight climate change. 8 February, https://blogs.wsj.com/riskandcompliance/2018/02/08/more-shareholder-proposals-spotlight-climate-change/, accessed October 2019.

Wall Street Journal. 2018b. Climate change is forcing the insurance industry to recalculate. 2 October, https://www.wsj.com/graphics/climate-change-forcing-insurance-industry-recalculate/, accessed October 2019.

Wall Street Journal. 2019. Show us your climate risks, investors tell companies. 28 February, https://www.wsj.com/articles/show-us-your-climate-risks-investors-tell-companies-11551349800, accessed October 2019.

Yermack D. 2010. Shareholder voting and corporate governance. *Annual Review of Financial Economics* **2**(1): 103–125.

BOSTON UNIVERSITY Global Development Policy Center

Boston University
53 Bay State Road
Boston, MA 02215

gdp@bu.edu
www.twitter.com/gdpc_bu
www.bu.edu/gdp

The Global Economic Governance Initiative (GEGI) is a research inititiative at Boston University's Global Development Policy Center. The GDP Center is a University wide center in partnership with the Frederick S. Pardee School for Global Studies. The Center's mission is to advance policy-oriented research for financial stability, human wellbeing, and environmental sustainability.

www.bu.edu/gdp

The views expressed in this Working Paper are strictly those of the author(s) and do not represent the position of Boston University, or the Global Development Policy Center.

ACKNOWLEDGMENTS

All authors contributed equally. We thank Ruth Aguilera, Frank Dobbin, Kira Fabrizio, Alfonso Gambardella, Olga Hawn, Jiao Luo, Mary-Hunter McDonnell, Aldo Musacchio, Yinuo Tang, and seminar participants at Bocconi University, Boston University, Chinese University of Hong Kong, George Washington University, Harvard University, KAIST, Korea University, Seoul National University, University of Victoria, the 2019 Alliance for Research on Corporate Sustainability Conference (UNC), the 2019 Micro Meets Macro Conference (ASU), the 2019 Principles for Responsible Investment (PRI) Academic Network Conference (Paris), and the 2019 Sustainable Finance Forum (Shenzhen) for helpful comments. We are grateful to Melissa Ouellet for excellent research assistance.