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## Abstract

We examine disasters caused by individual firms with severe environmental impacts. These disasters trigger industry-wide demand for corporate social responsibility (CSR). We analyze whether affected firms respond by adopting substantive or symbolic CSR measures. We find that firms increase overall CSR performance through improvements in diversity and human rights rather than decreasing environmental concerns. This suggests firms prioritize symbolic CSR to legitimize their operations rather than substantive measures to mitigate environmental harm. We also document diverging costs and welfare effects. On average, substantive CSR actions are costlier and cause lower margins but avoid divestments by ESG-oriented funds while improving long-term credit ratings. Some of these benefits of substantive actions also accrue through symbolic actions at a lower cost.

Keywords: Environmental disaster, Symbolic CSR, Substantive CSR, Impression Management

JEL Classifications: G30, M41

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# Demand-driven Corporate Social Responsibility: Symbolic *versus* Substantive Change after Environmental Disasters[†]

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**Abstract**

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# 1 Introduction

In the wake of environmental disasters caused by corporations and increasing climate change awareness, there is a growing demand for corporate social responsibility (CSR) practices. However, little is known about how firms react to such external demands for CSR, and what CSR practices flourish. In this paper, we investigate whether these external demands for CSR lead to costly actions that change production and supply chain processes (substantive actions), or to actions that seek to legitimize current practices without changing them (symbolic actions). In doing so, we reflect on the potential negative consequences of externally imposing CSR change on firms without providing clear guidance on desirable practices.

We argue that, optimally, firms react to external demands for CSR change implementing actions that directly reduce negative externalities (e.g., investing in technologies to reduce oil spills, or $CO_2$ emissions) and thus, the potential for further harm. We refer to these actions as substantive CSR. However, it is also possible that firms react by implementing actions aimed at gaining the support of their stakeholders and legitimizing the policies and operations that generate the negative externalities, without changing them. We refer to these actions as symbolic CSR actions, which include, for example, corporate giving or self-interested behaviour disguised as ethical actions.

The case of the 2010 BP oil spill is useful to illustrate the conceptual and practical differences between substantive and symbolic CSR. After an oil spill, substantive CSR would entail investments in production processes that minimize the probability of future spills. In turn, symbolic CSR would be restricted to legitimizing actions, like compensating those affected by the oil spill (e.g., fisheries, resorts, or restaurants in the Gulf area) beyond what is established by the regulator. Our view of symbolic actions is not that they are negative per se, as they can benefit the environment and/or certain stakeholders. However, they are

sub-optimal and can be negative when used as leverage to mislead stakeholders and avoid engaging in direct relevant substantive action.[1]

Against this backdrop, we study environmental disasters that plausibly lead to exogenous increases in external pressures to improve CSR performance, and examine whether firms respond by implementing substantive or symbolic CSR actions. We focus on firms operating in the same industry as the firm responsible for the disaster. Our research question is therefore rooted in understanding the mechanisms that underpin firms' initiation of CSR practices, and whether such demand-driven CSR leads to substantive or symbolic action. This is an important question that is not well understood in the literature. Prior findings of endogenous CSR action cannot be generalized because, increasingly, CSR action emerges in response to social and regulatory demands, and not endogenously due to changes in firm awareness of the importance of CSR performance. By focusing on firms in affected industries, we can identify and provide more granular evidence on what type of CSR policies emerge in response to external pressure for CSR action and assess their consequences.

In our tests, we use The International Disaster Database (EM-DAT) and select 12 staggered large technological disasters associated with environmental damages that happened between 2000 and 2013. We conduct our empirical tests with a stacked cohort difference-in-differences design (Gormley and Matsa 2011; Cengiz et al. 2019; Armstrong et al. 2022; Baker et al. 2022; Fiechter et al. 2024), creating separate datasets for each of the industries

[1]Another useful example is carbon offsetting. Carbon offsetting refers to firm policies aimed at reducing the firm's carbon footprint, but not through changing the operations that create the greenhouse emissions, but through other actions (for example, reforestation or methane capture from large-scale animal husbandry). Some view carbon offsetting as positive for the environment. Others argue that it only serves to legitimize the operations of polluting firms in the eyes of environmentally conscious stakeholders and consumers, while allowing polluting firms to delay or stop substantive change to their production processes. In line with this view, a recent article in The Guardian (2022), claims that carbon offsetting accelerates environmental collapse. While we acknowledge this is debatable, carbon offsetting fits well with our definition of 'symbolic' action: it does not entail actions that change production processes (or supply chains) in a way that greenhouse emissions are reduced. Substantive action would entail changing production processes to reduce emissions. These substantive actions could then be complemented with carbon offsetting initiatives, that would further benefit the environment. For a summary of the opposing views and recent evidence on this debate, see Gao and Souza (2022).

we identify as being affected by a technological disaster. Then, we estimate the effect of the disasters on non-responsible same-industry (treated) firms' CSR performance.

We empirically isolate substantive and symbolic change using KLD data in two ways. First, in our setting of environmental disasters, we consider improvements to the environmental category of KLD as substantive actions, while we consider improvements to any of the other KLD categories (Community, Human Rights, Employee Relations, Diversity, Governance and Product) as symbolic. Second, within each category, we consider decreases in concerns as substantive actions and increases in strengths as symbolic. The rationales for these classifications are as follows. Regarding our view of environmental actions as substantive, if firms in the affected industries react by improving their production processes to reduce their environmental impact, we expect their efforts to lead to an improvement in the environmental score, as a signal of potential substantive action. Therefore, we interpret increases in the other (non-environmental) KLD categories as increases in symbolic actions. These actions are easily perceived by outsiders and thus may be used as impression management tools to gain legitimacy. For example, in the case of the BP oil spill, voluntary actions to compensate the communities in the Gulf of Mexico area are captured by KLD in the community category. We classify increases in the community score as symbolic. Granted, improving the community category through this kind of actions is not negative per se, but rather, sub-optimal in that these improvements constitute a form of real activities impression management that may divert firms from engaging in substantive change. Regarding the classification of strengths vs. concerns, scores in each KLD category decrease with identified concerns and increase with strengths. This separation provides a second way to identify and differentiate substantive from symbolic action. In particular, we study whether, within each KLD category, and especially in the environmental category, firm actions serve to decrease their concerns (which we view as substantive action) or to increase their strengths (which we view as symbolic).

To illustrate our identification approach, consider the environmental category. The environmental concerns listed in KLD are measurable outputs of corporate operations: toxic emissions and waste (including water pollution), and their effects on communities; lawsuits over a company's alleged contribution to climate change; release of non-hazardous, non-toxic waste, emissions, or effluents; and degradation of natural resources. These concerns can only be reduced through substantive change and action. Therefore, in line with our conceptualization, we consider decreases in concerns as indicative of substantive CSR actions. In contrast, the strengths category captures alleged inputs that can be managed to provide a favourable impression of the firm. Environmental strengths include that the firm provides carbon reduction targets, integration of ESG risk management policies into companies' overall financing and risk management strategies, acknowledgment of climate change as a business risk and, overall, 'efforts to develop' (not outputs, but programmes to implement in the future) environmentally-friendly policies. These actions are less costly than those that may resolve the grave concerns considered under the concerns category. Actions linked to improvements in strengths likely do not entail changing the firm main production or supply chain processes, and while they may serve to temporarily improve the reputation of the firm, we view them as close to impression management, and, therefore, indicative of symbolic actions.

Hence, we use decreases in CSR concerns as a proxy for substantive action and increases in strengths as a proxy for symbolic action. Measurement error may exist in that some strengths and concerns indicators can subsume not only substantive or symbolic actions but a combination of both. Our analyses suggest, however, that even with error, the overall strengths indicator (for the environmental category) captures mostly symbolic action, while the concerns indicator captures mostly substantive actions.

Overall, we find that demand-driven CSR increases are symbolic, and not substantive. Firms in affected industries increase CSR performance, mostly through the categories of

diversity and human rights and not through the improvement in environmental performance. Our results are consistent with the use of CSR as an impression management device.

Given their different nature, symbolic and substantive actions are expected to differ in their costs and welfare effects. Consistent with this notion, we find that substantive actions entail increases in capital expenditures and total operating expenses, while symbolic actions do not. These increased investments linked to substantive actions lead to lower margins. Therefore, we find differences in the investments and costs of firms that engage in substantive *versus* symbolic actions. We also find different economic effects. Interestingly, we document that engagement in symbolic CSR actions is also beneficial for firms. In particular, we see that ESG-oriented institutional investors do not decrease their holdings of symbolic firms (similar to those pursuing substantive CSR), whereas they reduce their holdings in firms that do not have a positive change in CSR (those that are neither symbolic nor substantive) of around 9% of sample standard deviation following a disaster. Additionally, unlike firms that do not have a positive change in CSR, both symbolic and substantive CSR firms have higher credit ratings in the post-disaster period. Therefore, firms with symbolic action seem to reap some of the benefits of firms with substantive action, without incurring similar operating expenses.

We also examine the determinants of the choice between symbolic and substantive action, and we find that substantive action is associated with equity holdings of socially responsible institutions, with the strength of the corporate governance structure, with the monitoring by governmental institutions and with the severity of the disaster, which attracts greater external attention. Finally, we seek additional evidence corroborating the validity of our empirical identification of symbolic and substantive action. In particular, we find that narratives in 10-K filings for firms with substantive action focus more on environmental matters while they focus more on other CSR categories for firms with symbolic action, and that firms that do not have a positive change in CSR (those that are neither symbolic nor substantive) avoid any discussion of CSR matters in their 10-K filings and make more political

contributions instead. We view these results as validating our empirical identification of symbolic *versus* substantive actions.

We contribute to the literature in several ways. First, we add to the literature that studies how environmental disasters affect corporate behaviour and CSR. Liang and Renneboog (2017) and Heflin and Wallace (2017) find increases in environmental indicators after the BP spill disaster for some of the non-responsible affected firms. We develop conceptually and empirically how to disentangle symbolic from substantive CSR, and our finding of increases in symbolic CSR enhances our understanding of how firms react to external pressure for CSR. This also adds to the current regulatory debate on whether CSR actions should be imposed and how. It suggests that imposing a given amount of CSR spending, over a short period of time, and without an improvement in the overall ethical standards of the firm would not lead to substantive improvements in the social and environmental profile of firms. Our evidence suggests that clear targets and guidelines on practices to pursue may be fundamental to achieve substantive change, and particularly to lower environmental concerns.

We also add to prior research on the use of CSR disclosures for impression management. Prior evidence shows that firms raise their pro-social claims through different disclosure channels, as an impression management tool when facing increased scrutiny on their inimical effects for society (Ingram and Frazier 1980; Patten 1992; Clarkson et al. 2004; Lyon and Maxwell 2011; McDonnell and King 2013; Marquis and Qian 2014; Cho et al. 2015; Marquis et al. 2016; Huang et al. 2022). We add to this disclosure work and show that impression management is implemented also through CSR real actions: symbolic ones. As with CSR disclosures used for legitimacy and that do not reflect actual CSR actions, symbolic CSR may deviate external attention from the relevant issues, and thus, help firms maintain a good image and re-gain legitimacy.

Finally, Hawn and Ioannou (2016) argue that prior research categorizes CSR actions in an ad-hoc and atheoretical fashion and adopt the categorizations of data providers. We

extend prior research and categorize CSR actions from a conceptual standpoint into substantive and symbolic actions and propose how to capture these two categories empirically using KLD data.

## 2 Non-responsible Firms' Responses to Large Environmental Disasters: Substantive vs Symbolic Action.

Large-scale disasters caused by a firm generate negative spillover effects that can be substantial for other non-responsible firms that operate in the same industry, or that otherwise look similar to the responsible firm (T. Yu et al. 2008; Jonsson et al. 2009). These effects can take the form of a negative stock market reaction (Blacconiere and Patten 1994; Diestre and Rajagopalan 2014; Heflin and Wallace 2017), increased regulatory scrutiny (Desai 2011), or reduced foreign direct investment (Pek et al. 2018). Firms in the affected industry may share relations with the responsible firm (e.g., suppliers or clients), use the same inputs, or even have a direct relation with the responsible firm (T. Yu et al. 2008), and they can be regarded as sharing the values that underpin the disaster (Diestre and Rajagopalan 2014).

These disasters create shocks to CSR demand. For example, they can create shifts in consumer demand that force firms to improve their CSR performance (Liang and Renneboog 2017). Optimally, firms respond to this external demand with CSR improvements that lower the likelihood of similar events taking place. However, firms can also improve other aspects of CSR to gain legitimacy and sympathy, using CSR as an impression management tool. Large environmental disasters that generate a temporary social demand for CSR improvements are at risk of prompting this latter reaction; leading to actions that assuage and distract stakeholders' concerns, but without taking root in the organization nor changing its ethical profile.

To understand the consequences of demand-driven increases in CSR performance and firm reactions to such pressures, we define the actions that may emerge as either substantive

or symbolic CSR. Substantive CSR reduces the negative externalities that firms create (i.e., for the environment: reducing emissions or oil spills). It is in line with what Hawn and Ioannou (2016) and Surroca et al. (2020) refer to as internal CSR. It requires "significant resource commitments and dictate notable organizational changes in core practices, norms, structures, and routines" (Surroca et al. 2020, p. 901) and can entail long-term investments. According to Hart and Zingales (2017), this is the type of CSR that firms should pursue. In line with the arguments in Hawn and Ioannou (2016) and Eccles et al. (2014), we view substantive CSR as involving investments whose effects manifest in the medium or long run.

Symbolic CSR, in turn, entails actions that deviate attention from the fact that the firm is not implementing costly actions to decrease the likelihood of a new disaster or negative impact. Symbolic CSR aims to legitimize the firms' actions, and include, among others, philanthropic programs, charitable donations, or disaster relief actions. Consistent with philanthropy playing a symbolic role, especially in this setting, Luo et al. (2018) find that philanthropy by petroleum firms is associated with increased future oil spills. They argue that such philanthropy is beneficial for oil firms and detrimental for society. Hart and Zingales (2017) do not consider corporate giving among the policies that make CSR desirable and focus instead on policies that decrease negative externalities. In fact, they argue that the view in Friedman (1970) that firms should focus on making profits, and let governments and individuals deal with externalities, holds especially for corporate giving. That is, the negative view of CSR in Friedman (1970) would apply, following Hart and Zingales (2017), only to symbolic CSR. Therefore, we view symbolic CSR as actions that do not decrease negative externalities. Symbolic CSR is also in line with the description of external CSR in Hawn and Ioannou (2016) and Surroca et al. (Surroca et al. 2020, p. 901), which they define as "highly visible public initiatives intended to influence external audiences to generate public endorsements of the firm, its management, and its practices", and with the ceremonial actions described by Zavyalova et al. (2012). Overall, we view symbolic CSR as

not intended to change current practices that generate negative externalities, but rather, to legitimise them.[2]

While the conceptual difference between symbolic and substantive CSR is complex, environmental disasters, such as an oil spill, provide a good setting to clearly separate the two. Substantive action entails changes to production processes and supply chains to avoid future disasters. In turn, symbolic action entails compensating the communities affected by the oil spill/disaster (as well as unrelated but visible initiatives, such as improving maternity support for employees). Carbon offsetting is also helpful to illustrate the differences between substantive and symbolic CSR. In a setting of greenhouse emissions, substantive action would lead to changes in production processes to reduce emissions. In contrast, symbolic actions would not reduce greenhouse gas emissions, but counteract their negative effects through other policies. These other policies could include, for example, reforestation programmes.[3]

For CSR practices to become institutionalized and take root in an organization (potentially changing its ethical profile), firms must create rules and routines and reinforce CSR implementation through intra-organizational managerial procedures and structures (Contrafatto 2014). Environmental disasters that drive external attention create a sense of urgency in implementing change, likely leading to CSR actions while skipping these steps. In addition, the environmental actions that we view as substantive, such as improving production processes in a way that minimises inimical effects in the environment, are costly (have a large impact in current and future income statements) and not overly visible to outsiders

[2]Hawn and Ioannou (2016) argue that both internal and external actions can be beneficial, but that a gap between the two (external actions without internal ones) is a signal of greenwashing. Prior research (i.e., Li and Wu 2020) uses the term "decoupling" to refer to the gap between internal and external actions.

[3]The literature that studies workers' conditions during the industrial revolution provides another illustrative example of symbolic *versus* substantive actions in response to external demand for socially responsible actions. Edwards (2022) finds that the British mining firm Staveley Coal & Iron Company implemented actions to improve the standard of living of their employees, projecting "the image of a caring employer through the provision of first-rate welfare facilities" (p. 329). Edwards (2022) describes these actions as "often designed to serve the shareholders' best interests rather than those of the workers and their families" (p. 333). Staveley denied employees access to their accounting records to avoid increasing their bargaining power in the negotiation of salaries. The welfare actions at Staveley would be classified as symbolic CSR, under our view. While these symbolic actions of the Staveley company are not necessarily negative for the overall welfare of employees, they can be negative if they are used as leverage to avoid implementing costlier substantive changes: safety improvements in the mines to avoid deaths, and fair salaries.

(Joshi et al. 2001). Also, the potential benefits of substantive actions (for the firm, the environment and society) are not expected to accrue immediately, but over the medium to long term. This creates additional incentives for firms that lack the proper ethical standards to resort to symbolic actions, which become a form of impression management, being less costly and immediately visible to external stakeholders, potentially allowing the firm to restore legitimacy, without substantially changing its procedures and ethical profile.

Against this backdrop, our main hypothesis is:

***H1:*** *Demand-driven CSR improvements are symbolic rather than substantive.*

Separating empirically substantive from symbolic action is challenging, and, therefore, so is testing H1. We consider improvements to environmental policies to be substantive, while we view as symbolic the changes in other CSR policies, especially those typically classified in prior research (Servaes and Tamayo 2013; Lins et al. 2017) as externally oriented. In our example of oil spills, substantive action would lead to changes to production processes to reduce the gallons of oil spilt, and this would be captured in environmental indicators about pollution. In contrast, symbolic actions could come in the form of philanthropy programs typically implemented by oil firms (see Luo et al. 2018) and that will be classified outside the environmental categories.

Therefore, we formulate the following testable hypothesis, derived from H1:

***H2a:*** *Demand-driven CSR improvements consist of externally oriented social policies rather than environmental policies.*

In addition, we expect that symbolic actions manifest as increases in CSR strengths, while substantive actions manifest as decreases in CSR concerns. Concerns capture *ex-post* pollution measures, like green-house emissions, or waste. Reducing pollution can only be achieved through costly substantive actions. In contrast, strengths can be increased through firm's allegations about potential actions and plans to provide a favourable impression of the firm. Environmental strengths include that the firm provides carbon reduction targets,

integration of ESG risk management policies into companies' overall financing and risk management strategies, acknowledgment of climate change as a business risk and, overall, several 'efforts to develop' different actions, but not outputs. Therefore, increasing CSR strengths is less costly, need not entail changing the main production or supply chain processes, and can be aimed, mostly, at improving firm reputation.

Given these arguments, we formulate the following hypothesis, also derived from H1:

***H2b:*** *Demand-driven CSR improvements consist of increases in CSR strengths rather than decreases in CSR concerns.*

# 3 Research Design

## 3.1 Selection of Technological Disasters

In our empirical work, we focus on disasters that are large enough to influence all firms in the affected industries. We select these events from The International Disaster Database (EM-DAT), which is widely used in the literature (e.g., Evan et al. 2011; Lutz et al. 2014; Lesk et al. 2016; Pek et al. 2018; Kong et al. 2021) and is one of the most comprehensive databases on world-wide disaster events (Voigt et al. 2016). This database has information about technological (e.g., industrial, transport) and natural disasters (e.g., geophysical, meteorological, hydrological). We focus on technological disasters, as they can be attributed to the actions of a responsible firm. EM-DAT categorizes the technological disasters as *Transport*, *Collapse*, *Fire*, *Explosion* and *Miscellaneous Accident*. We use the period 2000 (the first year covered in EM-DAT) to 2013, because our KLD data stops in 2018, and we require 5 years of data pre- and post- events for our tests. To select events appropriate for testing our hypotheses (both damaging to the environment and notorious enough to elicit external demand for CSR actions), we first use key information provided in EM-DAT, such as the date, location, and type of a disaster. Using this information, we manually gather additional details about each event from publicly available online sources.

Regarding the category *Explosions*, these events draw significant attention from various stakeholder groups including the local community, government, and employees. Based on our hypotheses, this increased attention should motivate firms within the same industry as the responsible firm to engage in CSR-related activities. Additionally, explosions typically result in immediate environmental damage due to the release of hazardous materials into the air and/or the subsequent contamination of the surrounding environment. From the 12 events in the EM-DAT database classified as explosions, we select 11 with available data for our tests. Regarding the events classified as *Transport*, we discard all but one as they refer to airplane or train crashes, or traffic or ship accidents, all without environmental impacts. The only transport related event that we include in our sample because it fits our criteria of being visible, environmentally related, and within our study period is a gas leak in Aiken County. This event was caused by the collision of two trains and led to a significant chlorine gas explosion, causing extensive environmental damage.[4] Finally, we discard the events categorized as collapses (that refer to collapses of buildings or other infrastructures), fires (in facilities like apartment buildings) and miscellaneous accidents (i.e., poisoning at restaurants) because they do not have significant environmental effects. We describe briefly our 12 events in Appendix B.

## 3.2 Empirical Specification

To test our hypotheses, we use a stacked cohort regression design (e.g., Gormley and Matsa 2011; Cengiz et al. 2019; Armstrong et al. 2022; Baker et al. 2022; Fiechter et al. 2024). We create separate datasets for each technological disaster at the industry level. Given that some disasters occur in the same industry-firm-fiscal year, we treat these disasters as one group (hereafter, cohort) (e.g., Fiechter et al. 2024). We assign an event window for each cohort, spanning from year t-5 to year t+5, centered around an effective year of a technological disaster (i.e., t = 0). Firms that belong to the same two-digit SIC industry as

[4]Our inferences do not change if we exclude this event from our sample.

a firm that experienced a technological disaster are identified as treated firms, while firms in industries that remain unaffected by technological disasters are labelled as control firms. This approach provides us with control groups that would be unavailable in a within-firm analysis, allowing us to better identify the treatment effect of this type of disasters on firms decisions to engage in CSR activities. In total, we have 12 cohorts that are stacked into one dataset, resulting in 142,500 firm-year observations, 4,823 of which relate to treatment firm-years and 137,677 relate to control firm-years. They correspond to 426 treated and 2,787 control firms.[5] The main benefit of using a stacked event design is that it avoids using already-treated observations as controls for later treatments and eliminates the bias that might arise from time-varying treatment effects when using a staggered difference-in-differences (DiDs) design (see, Barrios 2021; Goodman-Bacon 2021; Baker et al. 2022). Our main stacked linear regression model is as follows:

$$CSR_{i,t} = \alpha_{ic} + \alpha_{tc} + \beta_1 Disaster_{j,t} + \sum_{a=1}^{n} \gamma_{a,i,t} Controls_{a,i,t} + \epsilon_{i,t}, \tag{1}$$

where indices $i$, $t$, $j$ and $c$ indicate firm, fiscal year, industry and cohort, respectively. $\alpha_{ic}$ and $\alpha_{tc}$ are firm-by-cohort and year-by-cohort fixed effects. The dependent variable, $CSR$, is one of our CSR proxies. The main coefficient of interest is $\beta_1$ that, under H1, is expected to be positive and statistically significant.[6] Throughout the analyses, we cluster standard errors by firm and year, and winsorize all continuous variables at the top and bottom percentiles. Our final sample ensures that there are no missing or singleton observations of main variables

[5] Please note that the above number of treated and control firms in the sample correspond to unique firms. Given that some of our treated industries (please refer to Appendix B) experience an event multiple times, this implies using the same firms within different cohorts, which increases the total number of observations but not the number of unique firms.

[6] $Disaster$ captures the traditional difference-in-differences (DiDs) estimator ($Post \times Treatment$). Our $Treatment$ variable is omitted due to firm-by-cohort fixed effects. $Post$ equals one after one of the firms in an associated two-digit SIC code industry experiences a technological disaster, zero otherwise. It drops due to year-by-cohort fixed effects. $Post \times Treatment$ ($Disaster$) is our DiDs estimator, where the first difference is between treated and control firms, and the second is between before and after a disaster. We estimate our models using the "reghdfe" STATA package, where the intercept is estimated as the average of the residualized dependent variable, conditional on the residualized regressors, after absorbing the fixed effects.

under consideration and non-missing information in the pre- and post-disaster one-year event period.

We use a set of control variables, $Controls$, to account for factors that determine CSR performance. We borrow from the prior literature and control for firm size ($Size$) (e.g., Udayasankar 2008); market-to-book ratio ($MTB$) to account for the overall stability of the firms and the risk associated with CSR (Cochran and Wood 1984; Orlitzky and Benjamin 2001); firm age ($Log(Age)$) (e.g., Moore 2001); financial performance measures (e.g., Waddock and Graves 1997; Hong et al. 2012) - return on sales ($ROS$), leverage ($Leverage$), and sales growth ($SaleGrowth$); cash dividends ($Dividend$), as dividend-paying firms have better CSR performance (Di Giuli and Kostovetsky 2014). To control for reputation insurance (e.g., Peloza 2006) in case of litigation, we add the ex-ante estimate of the likelihood that the firm will be subject to litigation in the next year, measured as the predicted probability derived from a first-stage logit regression of (I. Kim and Skinner 2012). Finally, we control for the share of institutional ownership (T. Chen et al. 2020) and KLD's net governance score (Jo and Harjoto 2012), as they are positively associated with CSR policies. Appendix A presents all variable definitions.

## 3.3 Measures of Corporate Social Responsibility

We obtain CSR data from MSCI (formerly KLD). KLD covers the largest U.S. publicly traded companies, its ratings are well known and widely used in the CSR literature (Godfrey et al. 2009; Barnett and Salomon 2012; Flammer 2015; Lins et al. 2017; Fernando et al. 2017). KLD provides information on how firms address the needs of their stakeholders along seven dimensions: environment, community, human rights, employee relations, diversity, products, and corporate governance. For each of these dimensions, KLD provides a score for strengths, and a score for concerns. To construct our aggregate CSR proxy (CSR Score), we follow Servaes and Tamayo (2013) and Lins et al. (2017) and subtract concern-related measures from strength-related ones among the five social dimensions: environment, community, employee

relations, diversity, and human rights. Because the maximum number of strengths and concerns for each category varies across time, we follow Servaes and Tamayo (2013) and Lins et al. (2017) and standardize the measure scaling each KLD dimension (separately strengths and concerns) by the maximum annual value of this dimension.[7] To test our hypotheses we separately analyze strengths (linked to symbolic action) and concerns (linked to substantive). We also study the environmental category (directly linked with substantive actions) separately from the rest.

## 3.4 Sample and Descriptive Statistics

The earliest (the latest) firm-fiscal year that corresponds to the first (last) disaster is 2000 (2013). Thus, considering the event window of [-5, +5], the beginning (ending) of our sample is firm-fiscal year of 1995 (2018). We end in 2018 as this is the last year for which we have information from MSCI (KLD). The remainder of the data is constructed from the following sources. Firms' information on accounting fundamentals comes from Compustat/CRSP merged database and analysts' coverage from I/B/E/S. We use I/B/E/S-CRSP linking table to merge the data from I/B/E/S to CRSP/Compustat. Institutional ownership is from Thomson Reuters 13F filings.

Table 1 presents descriptive statistics. In particular, the table reports the differences in firm fundamentals between treated and control groups both in a pre-disaster (i.e., event window [-5, -1]) and a post-disaster (i.e., [0, 5]) periods. As seen from the table, treated firms have lower levels of CSR ($CSRScore$) in the pre-disaster period compared to control firms, where the difference is statistically significant (-0.088). However, in the post-disaster period, our treated firms have higher CSR scores (difference = 0.092). Importantly, the average net value of the CSR score of treated firms is negative in the pre-disaster period (i.e., -0.207), but is positive (i.e., 0.027) in the post-disaster period. This presents early descriptive evidence, based on unconditional mean values, that firms in disaster-affected industries increase CSR.

[7] We do not include governance, as governance is a complex construct and is arguably distinct from CSR. Instead, we use net governance scores as our control variable for firms' level of corporate governance.

Interestingly, treated firms have higher CSR-related strengths (*Strengths*) and concerns (*Concerns*) both in the pre- and post-disaster periods. The positive difference in strengths (concerns) increases (decreases) from 0.120 (0.208) to 0.249 (0.157) between the pre- and post-disaster periods. Analyzing separate dimensions of the net CSR score, we see that treated firms have higher values in the diversity, environmental strengths and concerns scores in the pre-disaster period (differences = 0.038, 0.059, 0.132, respectively). However, in the post disaster period, treated firms have also higher CSR scores related to employee and human dimensions, but lower in community and environmental ones. In relation to environment (*Environment*), treated firms, on average, have lower scores both in the pre- (difference = -0.074) and post-disaster (difference = -0.035) periods. However, this negative difference decreases in the post-disaster period. Importantly, our treated firms have higher environment-related strengths (*EnvirStrength*) and concerns (*EnvirConcern*) both in the pre- (difference = 0.059; 0.132) and post-disaster (difference = 0.087; 0.122) periods.

In relation to firm-fundamentals, treated firms are bigger, have greater growth opportunities (i.e., higher MTB), higher leverage and dividend payments, are older but have lower return on sales, institutional ownership and SG&A expenses both in the pre- and post-disaster periods. One notable difference is that in the pre-disaster period, treated firms have lower litigation risk (*Litigation* difference = -0.046), but in the post-disaster period this difference is statistically insignificant (difference = -0.001). Additionally, there is a negative difference in the corporate governance score (*Governance*) in the pre-disaster period (-0.004), however, this difference becomes positive and statistically significant in the post-disaster period (difference = 0.045). This potentially presents descriptive evidence that treated firms respond to negative effects from the disasters (e.g., reputational damage) by improving their governance. Finally, in the post-disaster period treated firms have higher impairments (*Impairment* difference = 0.001) and higher operating expenses (*TotExpense* difference = 0.248).

# 4 Empirical Results

## 4.1 Effects of the Disasters on Overall CSR Performance

Table 2 presents results from estimating Model (1) without (columns (1) to (3)) and with (columns (4) to (6)) controls. The main coefficient of interest is *Disaster* that is positive and statistically significant for the net CSR score ($CSRScore$) and CSR-related strengths ($Strengths$). Treated firms, on average, increase net CSR (CSR-related strengths) by around 0.116 (0.122) in the post-disaster period. In terms of economic significance this corresponds to about 20.2% (23.1%) of the sample standard deviation. This indicates that technological disasters are associated with an overall increase in CSR performance, and serves to validate our empirical strategy: the disasters do create an exogenous pressure for CSR actions in non-responsible firms, which react by improving CSR performance. However, both in columns (3) and (6) we do not find any statistically significant associations with the improvement in measures capturing CSR-related concerns. Thus, following our categorization of symbolic *versus* substantive actions, the results in Table 2 present early evidence that affected firms are more likely to increase symbolic actions (i.e., improve CSR-related strengths) rather than engaging in substantive actions (i.e., decrease CSR-related concerns).

To validate our results, we ensure that the parallel trends assumption holds. Particularly, we examine whether there is a pre-existing differential trend in CSR performance between treated and control firms. First, we start with the plots of average CSR scores separately for treated and control firms in event time as presented in Figure 1. As seen from the unconditional means, there is a clear increase in the gap between treated and control samples in post-disaster periods for net CSR score ($CSRScore$) and CSR-related strengths ($Strengths$) and plausibly parallel evolution of CSR in the pre-disaster period. Next, we re-estimate Model (1) by interacting an indicator variable $Treated$ (identifying firms in industries affected by disasters) with year indicators ($Indicator_i$). We set the year immediately before a disaster ($t-1$) as the base year. Table 3 reports the results. We find that none of

the coefficients in the pre-disaster period (from $t-5$ to $t-1$) is positive and statistically significant. Figure 2 summarizes the results in Table 3. The vertical axis represents the value of the main coefficient ($\beta_1$). The horizontal axis represents years relative to the disaster ($t0$). The positive association between the disaster and CSR performance appears only after the event period $t0$ (i.e., a technological disaster in treated industries). The effect begins the second year following the disaster and is positive and statistically significant for our net CSR performance measure ($CSRScore$), but is driven by an increase in CSR-related strengths ($Strengths$), and not by a decrease in CSR-related concerns ($Concerns$).[8] Importantly, while we do not observe any pre-trends differences in both net CSR performance and CSR-related strengths, which supports the assumption of parallel trends, we find a negative and statistically significant difference for CSR concerns in the pre-disaster period $t-4$. While parallel trends assume that in the absence of a disaster the CSR activities for the treated and control firms would trend in a parallel manner after controlling for firm-cohort and year-cohort fixed effects and other time-varying firm-level controls, we can not inherently control for all firm-level factors that can potentially explain the differences. Therefore, in the next sections we conduct a number of additional tests to bolster the robustness of our findings.

## 4.2 Substantive *versus* Symbolic CSR - Different CSR Dimensions

Once we have established that the disasters are associated with an increase in CSR for non-responsible firms in the affected industries, we further explore whether this increase is achieved through substantive or symbolic actions. In Table 4, we test hypotheses H1a and H1b, where we focus on whether affected firms engage in environment-related actions (reported in columns 1 to 3), or in other types of CSR actions, which we view as symbolic (columns 4 to 7). If the implemented CSR actions are symbolic, we expect them to be mostly

[8] The timing of the effect (at t=2) may well capture the lag between the actual actions the firms take and the corresponding ratings that they receive. Particularly, treated firms may well start CSR-related actions in period t=0 or t=1, but CSR ratings are expected to capture this performance with a lag.

externally oriented actions, as prior research identifies them as the most visible for external parties, and, therefore, the ones that firms are expected to use to gain legitimacy.

In the first column of Table 4 we study the implementation of actions of affected firms considering the environmental category as a whole, including strengths minus concerns. The coefficient on *Disaster* is positive, but statistically insignificant (0.015, p-value $> 0.10$) consistent with the disasters, on average, not triggering concurrent increases in environmental performance. Similarly, turning into separate measures of environment-related strengths (*EnvirStrength*), which are expected symbolic actions, *versus* concerns (*EnvirConcerns*), which are expected substantive actions, we document that the increase in environment-related strengths is positive but statistically insignificant (0.011, p-value $> 0.10$) and that there is statistically insignificant decrease in concerns (-0.004, p-value $> 0.10$).

This lack of evidence for an increase in substantive environmental performance contrasts with the results for symbolic actions. In particular, in columns (4) to (7), we document that the coefficient on Disaster is positive and statistically significant for the diversity score (0.036 corresponding to 10.4% of the sample standard deviation, p-value $< 0.05$) and human score (0.049 corresponding to 35.3% of the sample standard deviation, p-value $< 0.01$).[9] This is again consistent with the implementation of symbolic CSR after the disasters.

# 5 Consequences of Symbolic *versus* Substantive CSR

To enhance our understanding of the nature of symbolic *versus* substantive CSR actions, we examine their welfare effects. For this purpose we use the model below, which segregates treated firms into those that choose substantive, symbolic or no CSR actions following a

[9] In untabulated analyses, we separately study concerns *versus* strengths of symbolic actions. In none (except weak negative significance of the employee score) of the proxies we document a statistically significant decrease in concerns. Quite the opposite, in the case of community there is an increase in concerns.

disaster:

$$Y_{i,t} = \alpha_{ic} + \alpha_{tc} + \beta_1 Disaster_{j,t} \times Symbolic_i + \beta_2 Disaster_{j,t} \times Substantive_i + \beta_3 Disaster_{j,t} \times NoSubstSymbAction_i + \sum_{a=1}^{n} \gamma_{a,i,t} Controls_{a,i,t} + \epsilon_{i,t}, \quad (2)$$

where *Substantive* is an indicator variable capturing the presence of substantive CSR actions. *Substantive* is equal to one if there is a decrease in environmental CSR concerns from period $t-1$ to $t+2$, zero otherwise.[10] *Symbolic* equals one if a firm is not identified as a substantive one and satisfies either of the following two criteria: 1) it increases environmental strengths and has a positive change in net CSR score excluding the environmental score; 2) there is no change in environmental concerns, and there is a positive change in net CSR score excluding the environmental score from period $t-1$ to $t+2$. Otherwise, *Symbolic* equals zero. *NoSubstSymbAction* is equal to one for firms without positive CSR actions, i.e., those that are classified as neither symbolic nor substantive.[11] We label instances where firms undertake substantive, symbolic and actions that are neither substantive nor symbolic CSR actions (i.e., $Substantive = 1$, $Symbolic = 1$, $NoSubstSymbAction = 1$, respectively) as $SubstantiveCSR = Disaster \times Substantive$; $SymbolicCSR = Disaster \times Symbolic$ and $NoSubstSymbCSR = Disaster \times NoSubstSymbAction$, respectively. The distribution of our treated firms across three groups is as follows: substantive - 24%; symbolic - 42%; neither symbolic nor substantive - 34%. Importantly, the three groups of firms are non-overlapping, allowing us to test them in one model. $Y_{i,t}$ is one of the dependent variables discussed below, while all other variables are as defined in Model (1).

[10] We use a change from period $t-1$ to $t+2$ (surrounding the disaster year $t0$) given that in Table 3 and in Figure 2, we document a statistically significant increase in CSR starting from $t+2$.

[11] Essentially, *NoSubstSymbAction* captures firms that exhibit any of the following four characteristics: 1) a decline in net CSR score excluding the environmental score; 2) an increase in the environmental concern score; 3) a decrease in total CSR strength excluding the environmental score; or 4) an increase in total CSR concerns excluding the environmental score.

## 5.1 Costs of Substantive *versus* Symbolic Actions

In our first set of tests, we study operating activities of treated firms choosing substantive, symbolic or no CSR actions. In line with our theoretical arguments, we expect that substantive CSR leads to investments that decrease the potential for future disasters. This likely implies costly actions like renewing property plant and equipment, dismantling contaminating facilities, etc. Such actions would be reflected in firms' financial statements as increases in capital expenditures and operating expenses. In turn, symbolic CSR, as defined, refers to impression management actions that would not, on aggregate, lead to substantial spending. This is because firms that undertake symbolic CSR are not expected to follow through with the costly necessary actions to improve the technology and the safety of firm operations. The objective of symbolic CSR is to distract external attention from the critical areas that need improvement (safety standards, improvements to operational procedures). Considering the evidence that reducing concerns in the critical areas is costlier than other, more cosmetic, CSR actions (e.g., Joshi et al. 2001; Fernando et al. 2017), an extension of our hypotheses is that symbolic CSR is less costly than substantive CSR actions.

Table 5 Panel A presents the results of Model (2), where the dependent variable is either capital expenditure (CAPEX), SG&A, R&D, total operating expenses (i.e., sum of CAPEX, SG&A, R&D, advertising) relative to total revenue or impairments relative to total assets. As seen from the table, treated firms that increase substantive CSR actions following a disaster are associated with an increase in CAPEX relative to total revenues (4.4%, p-value $< 0.01$) in the post-disaster period. In contrast, treated firms that increase symbolic CSR actions are not associated with an increase in any of the operating expenses (except impairments, which increase by 0.1% of total assets), but rather have a decrease in R&D expenses by 1.4% (p-value $< 0.10$) and a decrease in total operating expenses by 7.8% (p-value$< 0.10$) relative to total revenue. One potential issue with the interpretation of the results might be that firms trade-off increases in one type of operating expenses for the other. For example, treated firms that increase substantive CSR and that are neither

substantive nor symbolic firms ($NoSubsSymbCSR$) are associated with a decrease in SG&A expenses, but an increase in impairments. Similarly, treated firms increasing symbolic CSR are associated with a decrease in R&D and total operating expenses, but an increase in impairments. If treated firms simply trade-off one expense item for the other, we should not observe any impact on the income statement. Following this logic, we estimate the change in return-on-sales (ROS, income before extraordinary items scaled by total sales).[12] As seen in Table 5 Panel A column (5), only treated firms that increase substantive CSR following a disaster are associated with a decline in income of around 4.4% (unlike firms with symbolic or neither symbolic nor substantive CSR increase) following the disaster. This further supports our hypothesis that firms increasing substantive CSR following a disaster are likely to incur costs associated with their CSR actions in the post-disaster period.

## 5.2 Effects of Substantive *versus* Symbolic actions

In Table 5 Panel B we explore the capital allocations of investors with a preference for socially responsible investments, and examine how investments of green and socially responsible funds change based on firms' decisions to undertake substantive, symbolic, or no positive CSR actions following a disaster. To do this we use 1) Morningstar's "quintessential" list of 311 sustainable mutual funds[13], and 2) the ownership of Socially Responsible Investors (SRIs) (Hwang et al. 2022). Table 5 Panel B, columns (1) and (2) report the results. We document that there is a drop in ESG mutual funds holdings of firms that are classified as neither symbolic nor substantive ones ($NoSubsSymbCSR$) (-0.018, p-value $< 0.10$), which corresponds to 9% of sample standard deviation. Importantly, we do not find any change in holdings of firms that increase substantive CSR despite the fact that these firms are

[12] We use ROS instead of ROA as in the latter case the numerator (i.e., income) and denominator (i.e., total assets) are expected to be affected in different directions. For example, firms with substantive CSR increase CAPEX, therefore increasing total assets. This can lead to lower profitability mechanically, even if income is not affected.

[13] https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fim.morningstar.com%2Fim%2FQuintessentialSustainable.xlsx&wdOrigin=BROWSELINK. We manually match the fund list to CRSP mutual fund identifiers ("fundno" and "portno") through manual ticker and funds' names searches.

associated with a decrease in operating performance as reported in Table 5 Panel A, column (5). This potentially indicates that socially responsible investors value substantive CSR actions despite the fact that they require more resources. Additionally, the absence of a statistically significant effect in case of firms pursuing symbolic CSR actions potentially indicates the benefits of symbolic CSR actions, namely, no drop in ESG-oriented institutional investors.

Next, we study capital markets effects. To study whether firms that increase substantive CSR are associated with lower risk following a disaster, we study annual volatility of stock returns and S&P credit ratings. In Table 5 Panel B column (3) we observe a decline in stock performance of treated firms that choose substantive CSR actions. Potentially this can be explained by the increase in operating expenses, which causes a decline in net income of treated firms (see Table 5 Panel A, column (6)). Looking at volatility of returns, Table 5 Panel B column (4), we document that all three groups have an increase in the volatility that can be potentially explained by the average negative effect of a disaster on treated firms.[14] However, Table 5 Panel B column (5) indicates that firms with either substantive or symbolic CSR increases have higher long-term S&P credit ratings (column (5): -0.026, p-value $< 0.05$ and -0.019, p-value $< 0.10$). Please note that the higher the score, the lower the credit rating. This further sheds light on potential benefits of engaging in substantive and symbolic CSR over no positive CSR actions. Overall, firms that increase substantive CSR following a disaster experience a decline in stock performance (potentially this can be explained by an increase in operating expenses leading to a decline in net income), but have higher long-term credit ratings that is in line with the previous literature indicating the preferences of debtholders for CSR initiatives (e.g., Amiraslani et al. 2023).

[14]We checked for the significance of the differences in magnitudes of these coefficients across the groups and document that they are statistically insignificant.

# 6 Determinants of Symbolic *versus* Substantive Actions

Although we find that firms, on average, respond to a disaster event by increasing symbolic CSR actions, this average likely masks heterogeneity in the effects of different types of firm characteristics. Such heterogeneity can limit the generalisability of the estimated average effect. Guided by prior literature, we identify firm-characteristics that are likely to determine the choice of substantive over symbolic CSR actions. For this purpose, we modify Model (1) by replacing *Disaster* with two non-overlapping indicator variables *Disaster* × *Above* and *Disaster* × *Below*. *Disaster* × *Above* (*Disaster* × *Below*) equals one for affected firms after a disaster that have a specific firm characteristic (measured at $t0$) that is above (below) the median value within a cohort, zero otherwise. Essentially, we test whether higher salience (i.e., above), compared to instances of lower salience (i.e., below), of certain firm-characteristics is more likely to be associated with CSR conditional on disasters taking place.

First, we analyze the heterogeneity in the pre-disaster level of corporate governance, which is associated with enhanced firm value (Gompers et al. 2003; Chhaochharia and Grinstein 2007; Cuñat et al. 2012), facilitates investment efficiency through monitoring managerial decisions and reducing inefficient investments (Kang et al. 2010; S.-S. Chen and I.-J. Chen 2012; Y. Chen and Vann 2017), and positively impacts CSR policies (Livne et al. 2013; Borghesi et al. 2014; Ferrell et al. 2016; McGuinness et al. 2017). We expect firms with better corporate governance to be more likely to implement substantive actions following a disaster. Table 6 Panel A presents the results. Firms with weaker corporate governance are associated with an increase in symbolic CSR, such as an increase in non-environmental strengths (*StrengthNoEnvir*: 0.077, p-value $< 0.01$). On the other hand, firms with stronger corporate governance increase substantive CSR by decreasing environmental concerns (*EnvirConcerns*: -0.060, p-value $< 0.05$) and the difference between strong

and weak governance firms is statistically significant ($\beta^{Above} = \beta^{Below}$: p-value $< 0.05$). Additionally, firms with strong corporate governance have higher increase in non-environmental strengths ($StrengthNoEnvir$: 0.313, p-value $< 0.05$; $\beta^{Above} = \beta^{Below}$: p-value $< 0.05$).

Second, we examine the choice of substantive *versus* symbolic actions based on firms' exposure to government monitoring. In particular, recent research documents that the government, as an additional stakeholder, has strong preferences for better CSR performance of firms that are exposed to government monitoring (e.g., Flammer 2018; Gantchev et al. 2022). For this analysis, we collect information on firms that receive government subsidies using data from Good Jobs First. To estimate the exposure to government monitoring, we calculate the total dollar value of subsidies received by a firm over a pre-disaster period (i.e., [-5, 0]) and segregate firms into above and below cohort medians as discussed above. Table 6 Panel B presents the results. Firms with higher levels of government monitoring are associated with both an increase in symbolic CSR, such as an increase in environmental ($EnvirStrength$: 0.029, p-value $< 0.10$) and non-environmental strengths ($StrengthNoEnvir$: 0.128, p-value $< 0.05$), and an increase in substantive CSR, such as a decrease in environmental concerns ($EnvirConcerns$: -0.029, p-value $< 0.10$). In contrast, firms with lower levels of government monitoring increase only symbolic CSR, such as CSR strengths that are not related to environmental matters ($StrengthNoEnvir$: 0.096, p-value $< 0.01$)

Third, we study the cross-sectional heterogeneity in CSR's preferences of firms' investor base. For this, we split firms into above and below the sample median based on the sum of the share of socially responsible investors (SRI) and ESG mutual funds. Table 6 Panel C presents the results. Specifically, firms with a higher share of CSR-oriented institutional investors are associated with both an increase in non-environmental strengths ($StrengthNoEnvir$: 0.131, p-value $< 0.05$) and a decrease in environmental concerns ($EnvirConcerns$: -0.027, p-value $< 0.05$). In contrast, firms that have lower share of CSR-oriented institutional investors increase only symbolic CSR, such as CSR strengths that are not related to environmental matters ($StrengthNoEnvir$: 0.102, p-value $< 0.01$).

Finally, we study the salience of our disasters. The disasters in our sample are expected to differ in terms of their negative impact. We hypothesize that more severe disasters are likely to attract greater external attention, which, in turn, is expected to trigger a stronger demand for CSR actions. These actions are expected to be more value-enhancing (i.e., substantive). Since not all disasters in our sample have data on the number of injured individuals or the total value of the damage produced, we use Google Search Volume (SVI) to measure how often a particular disaster was searched for on Google within a year following its occurrence to capture the public attention that it draws.[15] Table 6 Panel D presents the results. Treated firms that operate in industries that experience more salient disasters are associated with both an increase in substantive CSR, such as a decrease in environmental concerns (*EnvirConcerns*: -0.045, p-value $< 0.01$) and an increase in symbolic CSR (i.e., non-environmental strengths: 0.143, p-value $< 0.01$). In contrast, firms that operate in industries that experience less salient disasters are associated with an increase in symbolic CSR, such as an increase in environmental (*EnvirStrength*: 0.051, p-value $< 0.10$) and non-environmental strengths (*StrengthNoEnvir*: 0.144, p-value $< 0.05$), but these firms are associated with an increase in environmental concerns (*EnvirConcerns*: 0.037, p-value $< 0.10$)

Overall, the results in Table 6 suggest that stronger corporate governance and external oversight by responsible investors and government agencies influence the preference for substantive over symbolic CSR actions. This highlights the potential significance of external demand-side factors in shaping the selection of various CSR strategies.

[15]Prior studies (e.g., Da et al. 2011; Drake et al. 2012) use SVI as a proxy for investor attention. We use weekly data and calculate the average value over a year starting from the disaster date. The data is available starting from 2004 onwards. We were able to collect data for the following disaster titles including the disaster event date: "Upper Big Branch explosion," "Sugar Refinery explosion," "Sago Mine explosion," "Refinery explosion," "Explosion in Cleburne," "Gas leak," "Gas pipeline explosion," "West Fertilizer Plant explosion," and "Deepwater Horizon oil spill." The search start date is set to coincide with the disaster date, and the coverage is limited to the US. Table 6 Panel D includes only the cohorts for which we were able to identify the SVI index.

# 7 Robustness Tests

## 7.1 Other Approaches to Identify Substantive *versus* Symbolic Actions

Given that separating symbolic from substantive action is challenging, we implement two additional sets of tests to further analyze whether our identification is valid. In particular, we examine the text that refers to CSR policies in 10-K filings and firms' political contributions.

Regarding the text in 10-Ks, we expect substantive action to be correlated with a more pronounced emphasis on environment-related matters, while we expect firms engaging in symbolic action to focus their textual disclosures on other CSR categories. Additionally, firms that do not engage in positive CSR actions are expected to avoid discussions related to CSR in their 10-K disclosures. We download all the 10-K filings from EDGAR, clean these files[16] and count the total number of CSR-related keywords, as in the dictionary developed by Pencle and Mălăescu (2016), relative to the total number of words in the 10-K filings.[17] We construct a broad proxy for CSR disclosures that counts the number of unique words related to employees, environment, human rights, and social and community categories. Table 7 Panel A, columns (1) to (4) report the results. The findings indicate that firms pursuing symbolic CSR practices during the post-disaster period increase the references in their 10-K filings about employees (6.2%, p-value $< 0.05$) and social (5.5%, p-value $< 0.05$) issues. Importantly, firms that implement substantive CSR increase only the discussion of environment-related issues (8.5%, p-value $< 0.05$). As expected, we do not find any statistically significant results in cases where firms do not have a positive change in CSR activities ($NoSubstSymbCSR$). Overall, we document that firms with substantive CSR increase only environment-related disclosures. In contrast, firms with symbolic CSR increase

[16] First, we ensure that we analyze only the text that is inside the 10-K header. Second, we remove HTML tags, punctuation symbols, any sequences of empty spaces, unicode strings, any formatting text identifying the sections of the 10-Ks and a list of stop words (i.e., I, me, we, is, was, etc.). Third, we convert all words to lower case and tokenize them. All the analyses are conducted in Python.

[17] Appendix C presents an example of CSR-related keywords (unigrams) from the dictionary that we use.

non-environment-related disclosures. Finally, firms with no positive change in CSR activities are not associated with any changes in their textual disclosures in relation to CSR-matters. This further adds robustness to our identification of symbolic *versus* substantive CSR actions.

In our second test, we study whether affected firms increase their political contributions after their exposure to a disaster. A large literature documents that firms facilitate their relations with the government by making political contributions to affect the allocation of governmental resources (e.g., Goldberg and Maggi 1999; Schuler et al. 2002; De Figueiredo and Silverman 2006; Mian et al. 2010), obtain tax benefits (Alexander et al. 2009; Richter et al. 2009) and influence regulation (e.g., greenhouse gas emissions (Markussen and Svendsen 2005)). In our case, we expect firms with symbolic CSR, and even more so those with no change in CSR, to avoid costly substantive CSR investments by increasing political contributions that protect them from strict enforcement actions (e.g., F. Yu and X. Yu 2011; Correia 2014; C. Kim and Zhang 2016) that might be especially relevant during the post-disaster period. To test this, we collect the data of Political Action Committee (PAC) contributions from the Center for Responsive Politics (CRP) (originally from the Federal Election Commission).[18] Table 7 Panel A, column (5) reports the results. Consistent with our expectations, we document that only firms pursuing no positive changes in CSR during the post-disaster period increase PAC contributions (0.139, p-value $< 0.10$). This test also provides additional evidence about the validity of our approach to separate symbolic from substantive actions. Additionally, it sheds further light on why firms choose symbolic actions over no actions.

## 7.2 Alternative CSR Data

Recent research highlights the lack of comparability across different ESG ratings. For example, the work of Berg et al. (2022) compares six prominent ESG rating agencies: KLD,

[18] https://www.opensecrets.org/bulk-data/downloads. PAC contributions are derived from detailed committee and candidate summary contribution files for each election cycle. We aggregate them into total dollar amounts within each firm-fiscal year by checking the dates when the PAC contributions were reported. Since the CRP does not use company identifiers (i.e., GVKEY), we use a fuzzy matching algorithm to match each firm name in the CRP data with the Compustat-CRSP merged database by applying a cutoff of more than 90% similarity in the respective company's name and manually ensure correctness of the matches.

Sustainalytics, Moody's ESG, S&P Global, Refinitiv (Asset4) and MSCI and find that these ratings differ along their measurement, scope and weight.[19] While these papers do not question the quality of the underlying data (i.e., each rating is valuable on its own), they highlight the difficulties in trying to make comparisons across different rating providers. Our research design hinges on a careful examination and categorization of the KLD categories, which cannot be mapped into other ratings in a direct way. Therefore, finding consistent results across ratings becomes a task that is nearly impossible, as these ratings simply measure different things, and the things they all measure, they measure differently. In addition to this, the differences among different databases can also be attributed to some databases (i.e., Asset4) overwriting past ratings (see Berg et al. 2021), making results of the diff-in-diff research designs like the one we use not reliable with their data.

In this section we discuss a preliminary attempt to explore how ESG data from other rating agencies can help address our main research questions. In particular, we use data from Refinitive Asset4 and from RepRisk. Asset4 provides an overall CSR score (without distinguishing strengths and concerns), while RepRisk provides a score of CSR incidents. Our tentative results show an increase in both the Asset4 overall CSR score and the RepRisk incidents score. We interpret this evidence (improvement in CSR score that does not lead to fewer incidents) as consistent with our results of an overall symbolic response to environmental disasters. Given prior evidence on the divergence of CSR ratings and over-writing problems, our findings need to be interpreted with caution, particularly until further research can dig deeper into how other CSR data sources can be used to tackle research questions such as ours, and we caution against trying to replicate mechanically our tests with ratings from different agencies.

[19] See also Christensen et al. (2022) and Kimbrough et al. (2024).

### 7.3 Entropy Balancing

In our final robustness test, to ensure that treated and control firms are comparable in terms of core observable economic characteristics, we re-run our main tests employing entropy-balancing. Entropy-balancing reduces potential bias introduced by co-variate differences, allowing for more reliable estimation of causal effects and enhancing the validity of our causal inferences. We match treated and control firms within each cohort on all control variables.[20] Table 7 Panel B presents the results including the weights from the entropy balancing. Overall, the results are in line with our main conclusions - firms in disaster-affected industries increase symbolic, but not substantive, CSR actions.

## 8 Summary and Conclusion

We identify large technological disasters that create external demand and pressure for CSR actions at the industry level and examine how firms respond to this increased CSR demand that originates outside the firm, focusing on whether the response leads to substantive or symbolic CSR actions. Substantive actions entail costly investments that change current practices and reduce the likelihood that another disaster takes place. Symbolic actions entail legitimizing actions to create a positive image and signal firms' social and environmental awareness through CSR, without changing their current practices. In both scenarios, CSR may help improve the relationship with stakeholders and reduce the negative effects that firms suffer because of the disaster.

Using a difference-in-differences approach, we find that firms in affected industries improve their CSR performance in the post-disaster period. However, these improvements in CSR are on average symbolic, and not substantive. That is, they are driven by increasing strengths and not by decreasing concerns, and by CSR categories other than environmental-related ones. We also show that there is cross-sectional heterogeneity in how firms respond,

[20] We exclude the third cohort from the analysis because the algorithm failed to converge in identifying the weights for this group.

and that firms that respond with substantive action invest more in capital expenditures after the disasters, while symbolic CSR is not related to costly actions. Substantive and symbolic actions also differ in their effects, and we show that only substantive action leads to positive economic effects. Better governed firms, and firms monitored by socially responsible investors and by the government are more likely to implement substantive actions.

Taken together, our evidence suggests that when managers are forced to improve CSR performance over a short period of time, they implement symbolic practices that are not associated with real changes in firms' ethical or safety standards. This calls into question the effectiveness of external demands for CSR practices, either regulatorily or socially enforced. This evidence is consistent with prior research about other corporate aspects that questions the effectiveness of regulation in attaining the desirable outcomes (e.g., Duchin et al. 2010). Our results are of interest to the regulatory debate on whether CSR spending should be imposed by law. They can be also useful for investors to differentiate between firms that implement symbolic and substantive CSR actions.

Finally, we believe that our conceptualization of symbolic *versus* substantive action extends beyond environmental disasters and applies broadly to various negative externalities. While our empirical analysis focuses on environmental issues, our framework is adaptable to other contexts. For instance, in a disaster involving loss of human life due to poor working conditions, substantive action would involve improving workplace safety, whereas symbolic action would entail initiatives that enhance the company's image without addressing the root problem - such as a mining company opening a childcare facility instead of improving mine safety. Thus, our framework can be used to study corporate social responsibility actions across diverse settings.

# A Appendix: Variable Definitions

| Variable | Definition of main variables |
|---|---|
| **Panel A: Main Dependent Variables** | |
| CSRScore | Net CSR rating score, measured as total strengths minus total concerns in the five social dimensions of the KLD data: community, diversity, employee relations, the environment, and human. We merge the data using historical CUSIP information. In case the CUSIP is missing, we merge using the ticker and manually ensure that company names do match. |
| Strengths | Sum of total strengths in the five social dimensions of the KLD data: community, diversity, employee relations, the environment, and human. |
| Concerns | Sum of total concerns in the five social dimensions of the KLD data: community, diversity, employee relations, the environment, and human. |
| Employee | Net score of the employee relations dimension, measured as strengths minus concerns in the employee relations dimension of the KLD data scaled by the maximum annual value of this dimension. |
| Community | Net score of the community dimension, measured as strengths minus concerns in the community dimension of the KLD data scaled by the maximum annual value of this dimension. |
| Diversity | Net score of the diversity dimension, measured as strengths minus concerns in the diversity dimension of the KLD data scaled by the maximum annual value of this dimension. |
| Environment | Net score of the environmental dimension, measured as strengths minus concerns in the environmental dimension of the KLD data scaled by the maximum annual value of this dimension. |
| EnvirStrength | Number of environmental strengths scaled by the maximum annual value of this dimension. |
| EnvirConcerns | Number of environmental concerns scaled by the maximum annual value of this dimension. |
| Human | Net score of the product human, measured as strengths minus concerns in the human dimension of the KLD data scaled by the maximum annual value of this dimension. |
| ESGScore | ESG score from Asset4 scaled by 100. |
| EnvirScore | Environment score from Asset4 scaled by 100. |
| SocialScore | Social score from Asset4 scaled by 100. |
| ControvScore | Controversies score from Asset4 scaled by 100. |
| RepRiskIndex | Current RepRisk index (RepRiskIndex) that quantifies a company's exposure to reputational risks related to ESG. Values between 0 - 0.25 = low risk exposure; 0.26 - 0.49 = medium risk exposure; 0.50 - 0.59 = high risk exposure; 0.60 - 0.74 = very high risk exposure; 0.75 - 1.00 = extremely high risk exposure. |
| EnvirRisk | The percentage of environmental links in proportion to the total number of links in the risk incidents that makes up the RepRisk index. |
| SocialRisk | The percentage of social links in proportion to the total number of links in the risk incidents that makes up the RepRisk index. |
| GovernRisk | The percentage of governance links in proportion to the total number of links in the risk incidents that makes up the RepRisk index. |
| StrengthNoEnvir | Sum of total strengths in the four social dimensions of the KLD data: community, diversity, employee relations and human. |
| ConcernNoEnvir | Sum of total concerns in the four social dimensions of the KLD data: community, diversity, employee relations and human. |

Appendix A - Continued

| Variable | Definition of main variables |
|---|---|
| **Panel B: Main Independent Variables** | |
| Disaster | Equals to one for treatment firms following the year of a disaster related to another firm in the associated two-digit SIC code industry (essentially, it is an interaction term between a dummy indicating treatment firms and a dummy indicating the post-disaster period). |
| **Panel C: Main Control Variables** | |
| Size | Firm size, measured as natural logarithm of market value of equity. |
| Leverage | Long-term debt issuance plus current liabilities scaled by total assets. |
| Age | Firm age, estimated using the CRSP database. |
| MTB | The market-to-book ratio, estimated as the ratio of the market value of equity to shareholders' equity. |
| ROS | Return on sales, estimated as income before extraordinary items scaled by lagged sales. |
| SaleGrowth | Growth rate of sales. |
| Dividend | The ratio of cash dividends scaled by total assets. |
| InstOwner | Percentage of institutional shareholders. |
| Litigation | The ex ante estimate of the likelihood that the firm will be the subject of litigation in the next year, measured as the predicted probability derived from a first-stage logit regression of I. Kim and Skinner (2012). Specifically, we follow the litigation risk column supplied in Model (3) of I. Kim and Skinner (2012) to estimate litigation risk. |
| Governance | Net governance rating score, measured as total strengths minus total concerns in the governance category of the KLD ratings data scaled by the maximum annual value of this dimension. |
| **Panel D: Additional Variables** | |
| CAPEX | Capital expenditures scaled by lagged revenues. |
| SG&A | SG&A expenditures scaled by lagged revenues. |
| R&D | Annual firm dollars spent on R&D scaled by lagged revenues. |
| Impairment | Total asset impairment multiplied by -1 and scaled by lagged total assets. |
| BHR | Buy-and-hold raw returns estimated over the fiscal year. |
| Std(Return) | Yearly standard deviation of daily stock returns. |
| Rating | The numerical equivalent of S&P domestic long-term issuer credit rating (splticrm) that decreases in credit quality. Example, rating = 2 when it is "AAA", while rating = 29 in case of "SD". |
| SRI | Equity holdings of socially responsible institutional investors. We define socially responsible investors following Hwang et al. (2022). We first calculate, for each institution year, the value-weighted average of the size-adjusted CSR measure of the firms that the institution holds in its portfolio. Then we rank the institutions with those in the top quartile defined as socially responsible. $SRI$ at the stock level is calculated as the percentage of shares held by SR institutions, divided by shares held by all institutions. |
| ESGFunds | Morningstar's quintessential list of 311 sustainable funds available at https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fim.morningstar.com%2Fim%2FQuintessentialSustainable.xlsx&wdOrigin=BROWSELINK. We manually match the fund list to CRSP mutual fund identifiers ("fundno" and "portno") through manual ticker and funds' names searches. |

Appendix A - Continued

| Variable | Definition of main variables |
|---|---|
| Government Monitoring | Total dollar value of government subsidies received by a firm over a pre-disaster period (i.e., [-5, 0]). The data are from Good Jobs First. |
| Employ/Envir/ Human/Social Words (%) | Percentage of employee-/environment-/human-/social-related CSR words from Pencle and Mălăescu (2016) dictionary scaled by the total number of words in a 10-K filing. Link. |
| PACs | Logarithm of total political contributions in 1000s over a fiscal year as reported in Center for Responsive Politics. Firm-year observations without PACs are set equal to zero. |

# B Appendix: Sample of Technological Disasters

| Event number | Event Name in EM-DAT | Date | Affected SIC2 code | Affected Industries | Type | Location | Responsible firm | Description |
|---|---|---|---|---|---|---|---|---|
| 1 | Conduite de gaz | 19.aug.00 | 49 | Electric, Gas and Sanitary Services | Explosion (Miscellaneous) | Near Carlsbad (Nouveau Mexique) | El Paso Natural Gas Company | The Carlsbad pipeline explosion was caused by severe internal corrosion in a segment of the natural gas pipeline, which led to a rupture and subsequent massive explosion near Carlsbad, New Mexico. The environmental impact included the immediate incineration of vegetation over a large area around the explosion site, and the release of significant quantities of greenhouse gases and other pollutants into the atmosphere, contributing to air quality degradation in the region. |
| 2 | Pharmaceutic factory | 29.jan.03 | 28 | Chemicals and Allied Products | Explosion (Industrial) | Kinston, near Chapel Hill (North Carolina) | West Pharmaceutical Services, Inc. | The explosion at the pharmaceutical factory was caused by the ignition of highly flammable chemicals used in the production of drugs, resulted in substantial damage to the facility and several injuries. Environmentally, the explosion led to the release of hazardous chemical pollutants into the air, which could have short-term impacts on air quality and long-term health effects on local communities. The dispersion of these chemicals might have also affected nearby water bodies and soil, posing additional risks to wildlife, and potentially contaminating local agricultural land. This event highlighted the importance of environmental safety protocols in chemical management and manufacturing processes. |
| 3 | Chemical/oil carrier "Bow Mariner" | 28.feb.04 | 44 | Water Transportation | Explosion (Industrial) | Near Virginia coast | Ceres Hellenic Enterprises, Ltd. | On February 28, 2004, the chemical/oil tanker "Bow Mariner" suffered a catastrophic incident off the coast of Virginia. The ship was carrying ethanol and other chemicals when an explosion occurred, likely triggered by improper handling of hazardous materials. This led to the vessel sinking and releasing over 3.2 million gallons of ethanol into the ocean along with other toxic chemicals. The environmental impact was notable, affecting marine life and local ecosystems due to the sudden influx of chemicals and fuel. The disaster prompted a significant emergency response, including environmental cleanup efforts and an investigation into maritime safety practices. |
| 4 | Gaz leak Aiken county (South Carolina) | 07.jan.05 | 40 | Railroad Transportation | Rail (associated: gaz leaak) | Aiken county (South Carolina) | Norfolk Southern Corporation | On January 7, 2005, a Norfolk Southern train carrying chlorine and other hazardous materials collided with a parked train in Graniteville, South Carolina, due to a misaligned switch track. The crash punctured a chlorine tank car, releasing about 60 tons of toxic gas into the environment. This incident caused significant ecological damage, contaminating water systems and local flora with chlorine, and requiring a lengthy recovery process. The chlorine gas leak prompted mass evacuations, impacting thousands and disrupting the local economy. Resulting lawsuits and regulatory changes sought to enhance railroad safety and hazardous materials management. The Graniteville incident stands out as one of the most severe chlorine gas leaks from a rail accident in U.S. history. |
| 5 | Raffinerie BP | 23.mar.05 | 29 | Petroleum Refining and Related Industries | Explosion (Industrial) | Houston (Texas) | BP (British Petroleum) | The Texas City Refinery explosion was primarily caused by the overfilling of a tower during startup procedures, leading to the release of highly flammable vapor. This, coupled with inadequate safety systems, equipment failures, and poor communication among refinery personnel, resulted in the catastrophic explosion that claimed 15 lives and caused numerous injuries. The incident shed light on broader organizational issues within BP, prompting investigations, lawsuits, and regulatory actions. Additionally, the environmental impact of the disaster included significant damage to marine and coastal ecosystems due to the release of pollutants into the surrounding environment. |
| 6 | Mine | 02.jan.06 | 12 | Bituminous Coal and Lignite Mining | Explosion (Industrial) | Tallmansville (Virginia) | International Coal Group, Inc. | This incident is known as The Sago Mine disaster. It was triggered by an explosion believed to be initiated by lightning that ignited methane gas within the mine. This is noted as the worst mining disaster in the U.S. since the Blue Creek No. 5 mine disaster. The environmental consequences of such a disaster include substantial methane emissions, which contribute to global warming, potential contamination of local water sources due to disrupted soil and chemicals and degradation of air quality from emitted gases. |
| 7 | Sugar Refinery | 07.feb.08 | 20 | Food and Kindred Products | Explosion (Industrial) | Georgia, Savannah, Port Wentworth | Imperial Sugar Company | The explosion at the Imperial Sugar refinery was triggered by combustible dust, primarily sugar dust, which is highly flammable when airborne in sufficient concentrations. This event emphasized the critical need for stringent dust management and control measures in industries dealing with combustible materials. Environmentally, the explosion likely contributed to local air pollution due to the release of particulates and other combustion byproducts. |
| 8 | Coal mine "Upper Big Branch" | 05.apr.10 | 12 | Bituminous Coal and Lignite Mining | Explosion (Industrial) | Montcoal (West Virginia) | Performance Coal Company (subsidiary of Massey Energy) | The Upper Big Branch mine disaster resulted from a series of events that ignited methane gas. The presence of coal dust in the mine significantly exacerbated the situation, leading to an intense explosion. This disaster is among the most severe mining disasters in recent U.S. history. The environmental impacts included significant methane emissions, which contribute to global warming, and potential contamination of nearby waterways from disrupted soil and debris. |
| 9 | Oil platform "Deepwater Horizon" | 20.apr.10 | 13, 29 | Oil and Gas Extraction (13); Petroleum Refining and Related Industries (29) | Explosion (Industrial) | Mexico Gulf | BP (British Petroleum) | The BP oil spill, also known as the Deepwater Horizon disaster, was primarily caused by a blowout that resulted from a failure in the cement barrier used in the well. This failure led to a massive explosion on the drilling rig, which then caused the rig to sink and initiated an uncontrollable oil leak from the seabed. Over the course of 87 days, approximately 4.9 million barrels of oil spilled into the Gulf of Mexico, making it one of the largest environmental disasters in U.S. history. The spill had devastating effects on marine and wildlife habitats, significantly impacted the fishing and tourism industries along the Gulf Coast, and caused extensive damage to the marine and coastal ecosystems due to the oil's pervasive presence in the water and along the shores. |
| 10 | Gazoduc | 07.jun.10 | 49 | Electric, Gas and Sanitary Services | Explosion (Industrial) | Texas | Enterprise Products Partners L.P | The explosion in Cleburne, Texas, was triggered when a crew working on a utility project accidentally struck a 36-inch natural gas pipeline, causing a massive explosion. The blast resulted in a large fireball that scorched the surrounding area, destroyed nearby vehicles and equipment, and significantly impacted local wildlife and vegetation. The explosion also raised concerns about safety standards and the monitoring of pipeline integrity in urban and suburban development areas. |
| 11 | Gas pipeline | 09.sep.10 | 49 | Electric, Gas and Sanitary Services | Explosion (Miscellaneous) | San Bruno (California) | Pacific Gas and Electric Company | The San Bruno gas pipeline explosion was caused by a ruptured pipeline that had been inadequately maintained, leading to a massive explosion in a residential neighborhood in San Bruno, California. The blast and ensuing fire destroyed numerous homes, led to several fatalities, and caused extensive damage to the local infrastructure. The environmental aftermath included the release of significant amounts of greenhouse gases and toxic pollutants into the atmosphere, which had long-term impacts on air quality and local ecosystems. |
| 12 | Fetilizer plant | 21.mai.13 | 28 | Chemicals and Allied Products | Explosion (Industrial) | Near Waco (Texas) | West Fertilizer Co. | The disaster at the fertilizer plant was caused by a massive explosion involving nitrogenous fertilizers. The blast was particularly severe due to the volatile nature of ammonium nitrate, a common nitrogenous fertilizer that can become explosive under certain conditions. The environmental consequences of the explosion were significant, leading to the release of toxic chemicals into the air and water. These chemicals, including ammonia and nitrogen oxides, can contribute to air pollution, acid rain, and water contamination, affecting local ecosystems and posing long-term health risks to the local population. The incident highlighted the need for stricter safety standards and regulatory oversight in the handling and storage of hazardous materials in industrial settings. |

This table provides an overview of the technological disasters that are used in the paper. All events are selected from The International Disaster Database (EM-DAT). We collect the description of each event from public sources (e.g., google, Wikipedia, other media outlets, etc.).

# C Appendix: CSR Disclosure

| Employee | Environment | Human Rights | Social and Community |
|---|---|---|---|
| Balancing | Biodiversity | African | Affordable |
| Benefits | Carbon | Abuse | Bribe |
| Bonus | Chemicals | Civil | Cultures |
| Certifications | CO2 | Constitution | Education |
| Disability | Conservation | Discrimination | Minority |
| Diversity | Dioxide | Ethical | Healthcare |
| Ethic | Emission | Race | Foodbank |
| Payroll | Fossil | Religious | Charity |
| Union | Nuclear | Reservation | Unethical |
| Wheelchair | Ozone | Unbiased | Stakeholders |

The table above presents a sample of 10 words from the population of CSR-related words in the dictionary of Pencle and Mălăescu (2016). The CSR-related words are segregated into four categories: employee, the environment, human rights, and social and community aspects.

# Reference


Alexander, R., S. W. Mazza, and S. Scholz. 2009. "Measuring rates of return on lobbying expenditures: An empirical case study of tax breaks for multinational corporations." *Journal of Law Politics* 25:401.

Amiraslani, H., K. V. Lins, H. Servaes, and A. Tamayo. 2023. "Trust, social capital, and the bond market benefits of ESG performance." *Review of Accounting Studies* 28 (2): 421–462.

Armstrong, C., J. D. Kepler, D. Samuels, and D. Taylor. 2022. "Causality redux: The evolution of empirical methods in accounting research and the growth of quasi-experiments." *Journal of Accounting and Economics* 74 (2-3): 101521.

Baker, A. C., D. F. Larcker, and C. C. Wang. 2022. "How much should we trust staggered difference-in-differences estimates?" *Journal of Financial Economics* 144 (2): 370–395.

Barnett, M. L., and R. M. Salomon. 2012. "Does it pay to be really good? Addressing the shape of the relationship between social and financial performance." *Strategic Management Journal* 33 (11): 1304–1320.

Barrios, J. M. 2021. "Staggeringly problematic: A primer on staggered DiD for accounting researchers." *Available at SSRN 3794859.*

Berg, F., K. Fabisik, and Z. Sautner. 2021. "Is history repeating itself? The (un) predictable past of ESG ratings." *SSRN Electronic Journal,* 1–59.

Berg, F., J. F. Koelbel, and R. Rigobon. 2022. "Aggregate confusion: The divergence of ESG ratings." *Review of Finance* 26 (6): 1315–1344.

Blacconiere, W. G., and D. M. Patten. 1994. "Environmental disclosures, regulatory costs, and changes in firm value." *Journal of Accounting and Economics* 18 (3): 357–377.

Borghesi, R., J. F. Houston, and A. Naranjo. 2014. "Corporate socially responsible investments: CEO altruism, reputation, and shareholder interests." *Journal of Corporate Finance* 26:164–181.

Cengiz, D., A. Dube, A. Lindner, and B. Zipperer. 2019. "The effect of minimum wages on low-wage jobs." *The Quarterly Journal of Economics* 134 (3): 1405–1454.

Chen, S.-S., and I.-J. Chen. 2012. "Corporate governance and capital allocations of diversified firms." *Journal of Banking & Finance* 36 (2): 395–409.

Chen, T., H. Dong, and C. Lin. 2020. "Institutional shareholders and corporate social responsibility." *Journal of Financial Economics* 135 (2): 483–504.

Chen, Y., and C. E. Vann. 2017. "Clawback provision adoption, corporate governance, and investment decisions." *Journal of Business Finance & Accounting* 44 (9-10): 1370–1397.

Chhaochharia, V., and Y. Grinstein. 2007. "Corporate governance and firm value: The impact of the 2002 governance rules." *The Journal of Finance* 62 (4): 1789–1825.

Cho, C. H., M. Laine, R. W. Roberts, and M. Rodrigue. 2015. "Organized hypocrisy, organizational façades, and sustainability reporting." *Accounting, Organizations and Society* 40:78–94.

Christensen, D. M., G. Serafeim, and A. Sikochi. 2022. "Why is corporate virtue in the eye of the beholder? The case of ESG ratings." *The Accounting Review* 97 (1): 147–175.

Clarkson, P. M., Y. Li, and G. D. Richardson. 2004. "The market valuation of environmental capital expenditures by pulp and paper companies." *The Accounting Review* 79 (2): 329–353.

Cochran, P. L., and R. A. Wood. 1984. "Corporate social responsibility and financial performance." *Academy of Management Journal* 27 (1): 42–56.

Contrafatto, M. 2014. "The institutionalization of social and environmental reporting: An Italian narrative." *Accounting, Organizations and Society* 39 (6): 414–432.

Correia, M. M. 2014. "Political connections and SEC enforcement." *Journal of Accounting and Economics* 57 (2-3): 241–262.

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

Da, Z., J. Engelberg, and P. Gao. 2011. "In search of attention." *The Journal of Finance* 66 (5): 1461–1499.

De Figueiredo, J. M., and B. S. Silverman. 2006. "Academic earmarks and the returns to lobbying." *The Journal of Law and Economics* 49 (2): 597–625.

Desai, V. M. 2011. "Mass media and massive failures: Determining organizational efforts to defend field legitimacy following crises." *Academy of Management Journal* 54 (2): 263–278.

Di Giuli, A., and L. Kostovetsky. 2014. "Are red or blue companies more likely to go green? Politics and corporate social responsibility." *Journal of Financial Economics* 111 (1): 158–180.

Diestre, L., and N. Rajagopalan. 2014. "Toward an input-based perspective on categorization: Investor reactions to chemical accidents." *Academy of Management Journal* 57 (4): 1130–1153.

Drake, M. S., D. T. Roulstone, and J. R. Thornock. 2012. "Investor information demand: Evidence from Google searches around earnings announcements." *Journal of Accounting Research* 50 (4): 1001–1040.

Duchin, R., J. G. Matsusaka, and O. Ozbas. 2010. "When are outside directors effective?" *Journal of Financial Economics* 96 (2): 195–214.

Eccles, R. G., I. Ioannou, and G. Serafeim. 2014. "The impact of corporate sustainability on organizational processes and performance." *Management Science* 60 (11): 2835–2857.

Edwards, J. R. 2022. "Accounting, publicity and class conflict in Victorian Britain." *Accounting and Business Research* 52 (3): 321–346.

Evan, A. T., J. P. Kossin, C. 'Eddy'Chung, and V. Ramanathan. 2011. "Arabian Sea tropical cyclones intensified by emissions of black carbon and other aerosols." *Nature* 479 (7371): 94–97.

Fernando, C. S., M. P. Sharfman, and V. B. Uysal. 2017. "Corporate environmental policy and shareholder value: Following the smart money." *Journal of Financial and Quantitative Analysis* 52 (5): 2023–2051.

Ferrell, A., H. Liang, and L. Renneboog. 2016. "Socially responsible firms." *Journal of Financial Economics* 122 (3): 585–606.

Fiechter, P., W. R. Landsman, K. Peasnell, and A. Renders. 2024. "Do industry-specific accounting standards matter for capital allocation decisions?" *Journal of Accounting and Economics* 77 (2): 101670. ISSN: 0165-4101.

Flammer, C. 2015. "Does product market competition foster corporate social responsibility? Evidence from trade liberalization." *Strategic Management Journal* 36 (10): 1469–1485.

———. 2018. "Competing for government procurement contracts: The role of corporate social responsibility." *Strategic Management Journal* 39 (5): 1299–1324.

Friedman, M. 1970. "The Social Responsibility of Business is to Increase Its Profits." *New York Times Magazine,* September 13.

Gantchev, N., J. Goldman, and S. Zhang. 2022. "The role of g (overnment) in corporate ESG policies." *Available at SSRN 4280531.*

Gao, F., and G. C. Souza. 2022. "Carbon offsetting with eco-conscious consumers." *Management Science* 68 (11): 7879–7897.

Godfrey, P. C., C. B. Merrill, and J. M. Hansen. 2009. "The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis." *Strategic Management Journal* 30 (4): 425–445.

Goldberg, P. K., and G. Maggi. 1999. "Protection for sale: An empirical investigation." *American Economic Review* 89 (5): 1135–1155.

Gompers, P., J. Ishii, and A. Metrick. 2003. "Corporate governance and equity prices." *The Quarterly Journal of Economics* 118 (1): 107–156.

Goodman-Bacon, A. 2021. "Difference-in-differences with variation in treatment timing." *Journal of Econometrics* 225 (2): 254–277.

Gormley, T. A., and D. A. Matsa. 2011. "Growing out of trouble? Corporate responses to liability risk." *The Review of Financial Studies* 24 (8): 2781–2821.

Hart, O., and L. Zingales. 2017. "Companies Should Maximize Shareholder Welfare Not Market Value." *Journal of Law, Finance and Accounting.*

Hawn, O., and I. Ioannou. 2016. "Mind the gap: The interplay between external and internal actions in the case of corporate social responsibility." *Strategic Management Journal* 37 (13): 2569–2588.

Heflin, F., and D. Wallace. 2017. "The BP oil spill: shareholder wealth effects and environmental disclosures." *Journal of Business Finance & Accounting* 44 (3-4): 337–374.

Hong, H., J. D. Kubik, and J. A. Scheinkman. 2012. *Financial constraints on corporate goodness.* Technical report. National Bureau of Economic Research.

Huang, Q., Y. Li, M. Lin, and G. A. McBrayer. 2022. "Natural disasters, risk salience, and corporate ESG disclosure." *Journal of Corporate Finance* 72:102152.

Hwang, C. Y., S. Titman, and Y. Wang. 2022. "Investor tastes, corporate behavior, and stock returns: An analysis of corporate social responsibility." *Management Science* 68 (10): 7131–7152.

Ingram, R. W., and K. B. Frazier. 1980. "Environmental performance and corporate disclosure." *Journal of Accounting Research,* 614–622.

Jo, H., and M. A. Harjoto. 2012. "The causal effect of corporate governance on corporate social responsibility." *Journal of Business Ethics* 106 (1): 53–72.

Jonsson, S., H. R. Greve, and T. Fujiwara-Greve. 2009. "Undeserved loss: The spread of legitimacy loss to innocent organizations in response to reported corporate deviance." *Administrative Science Quarterly* 54 (2): 195–228.

Joshi, S., R. Krishnan, and L. Lave. 2001. "Estimating the hidden costs of environmental regulation." *The Accounting Review* 76 (2): 171–198.

Kang, Q., Q. Liu, and R. Qi. 2010. "The Sarbanes-Oxley Act and corporate investment: A structural assessment." *Journal of Financial Economics* 96 (2): 291–305.

Kim, C., and L. Zhang. 2016. "Corporate political connections and tax aggressiveness." *Contemporary Accounting Research* 33 (1): 78–114.

Kim, I., and D. J. Skinner. 2012. "Measuring securities litigation risk." *Journal of Accounting and Economics* 53 (1-2): 290–310.

Kimbrough, M. D., X. Wang, S. Wei, and J. Zhang. 2024. "Does voluntary ESG reporting resolve disagreement among ESG rating agencies?" *European Accounting Review* 33 (1): 15–47.

Kong, D., Z. Lin, Y. Wang, and J. Xiang. 2021. "Natural disasters and analysts' earnings forecasts." *Journal of Corporate Finance* 66:101860.

Lesk, C., P. Rowhani, and N. Ramankutty. 2016. "Influence of extreme weather disasters on global crop production." *Nature* 529 (7584): 84–87.

Li, J., and D. Wu. 2020. "Do corporate social responsibility engagements lead to real environmental, social, and governance impact?" *Management Science* 66 (6): 2564–2588.

Liang, H., and L. Renneboog. 2017. "On the foundations of corporate social responsibility." *The Journal of Finance* 72 (2): 853–910.

Lins, K. V., H. Servaes, and A. Tamayo. 2017. "Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis." *The Journal of Finance* 72 (4): 1785–1824.

Livne, G., G. Markarian, and M. Mironov. 2013. "Investment horizon, risk, and compensation in the banking industry." *Journal of Banking & Finance* 37 (9): 3669–3680.

Luo, J., A. Kaul, and H. Seo. 2018. "Winning us with trifles: Adverse selection in the use of philanthropy as insurance." *Strategic Management Journal* 39 (10): 2591–2617.

Lutz, W., R. Muttarak, and E. Striessnig. 2014. "Universal education is key to enhanced climate adaptation." *Science* 346 (6213): 1061–1062.

Lyon, T. P., and J. W. Maxwell. 2011. "Greenwash: Corporate environmental disclosure under threat of audit." *Journal of Economics & Management Strategy* 20 (1): 3–41.

Markussen, P., and G. T. Svendsen. 2005. "Industry lobbying and the political economy of GHG trade in the European Union." *Energy Policy* 33 (2): 245–255.

Marquis, C., and C. Qian. 2014. "Corporate social responsibility reporting in China: Symbol or substance?" *Organization Science* 25 (1): 127–148.

Marquis, C., M. W. Toffel, and Y. Zhou. 2016. "Scrutiny, norms, and selective disclosure: A global study of greenwashing." *Organization Science* 27 (2): 483–504.

McDonnell, M.-H., and B. King. 2013. "Keeping up appearances: Reputational threat and impression management after social movement boycotts." *Administrative Science Quarterly* 58 (3): 387–419.

McGuinness, P. B., J. P. Vieito, and M. Wang. 2017. "The role of board gender and foreign ownership in the CSR performance of Chinese listed firms." *Journal of Corporate Finance* 42:75–99.

Mian, A., A. Sufi, and F. Trebbi. 2010. "The political economy of the US mortgage default crisis." *American Economic Review* 100 (5): 1967–98.

Moore, G. 2001. "Corporate social and financial performance: An investigation in the UK supermarket industry." *Journal of Business Ethics* 34 (3): 299–315.

Orlitzky, M., and J. D. Benjamin. 2001. "Corporate social performance and firm risk: A meta-analytic review." *Business & Society* 40 (4): 369–396.

Patten, D. M. 1992. "Intra-industry environmental disclosures in response to the Alaskan oil spill: A note on legitimacy theory." *Accounting, Organizations and Society* 17 (5): 471–475.

Pek, S., C. H. Oh, and J. Rivera. 2018. "MNC foreign investment and industrial disasters: The moderating role of technological, safety management, and philanthropic capabilities." *Strategic Management Journal* 39 (2): 502–526.

Peloza, J. 2006. "Using corporate social responsibility as insurance for financial performance." *California Management Review* 48 (2): 52–72.

Pencle, N., and I. Mălăescu. 2016. "What's in the words? Development and validation of a multidimensional dictionary for CSR and application using prospectuses." *Journal of Emerging Technologies in Accounting* 13 (2): 109–127.

Richter, B. K., K. Samphantharak, and J. F. Timmons. 2009. "Lobbying and taxes." *American Journal of Political Science* 53 (4): 893–909.

Schuler, D. A., K. Rehbein, and R. D. Cramer. 2002. "Pursuing strategic advantage through political means: A multivariate approach." *Academy of Management Journal* 45 (4): 659–672.

Servaes, H., and A. Tamayo. 2013. "The impact of corporate social responsibility on firm value: The role of customer awareness." *Management Science* 59 (5): 1045–1061.

Surroca, J. A., R. V. Aguilera, K. Desender, and J. A. Tribó. 2020. "Is managerial entrenchment always bad and corporate social responsibility always good? A cross-national examination of their combined influence on shareholder value." *Strategic Management Journal* 41 (5): 891–920.

The Guardian. 2022. *Carbon offsetting is not warding off environmental collapse – it's accelerating it.* Accessed July 2021, January. https://www.theguardian.com/commentisfree/2022/jan/26/carbon-offsetting-environmental-collapse-carbon-land-grab.

Udayasankar, K. 2008. "Corporate social responsibility and firm size." *Journal of Business Ethics* 83 (2): 167–175.

Voigt, S., F. Giulio-Tonolo, J. Lyons, J. Kučera, B. Jones, T. Schneiderhan, G. Platzeck, K. Kaku, M. K. Hazarika, L. Czaran, et al. 2016. "Global trends in satellite-based emergency mapping." *Science* 353 (6296): 247–252.

Waddock, S. A., and S. B. Graves. 1997. "The corporate social performance–financial performance link." *Strategic Management Journal* 18 (4): 303–319.

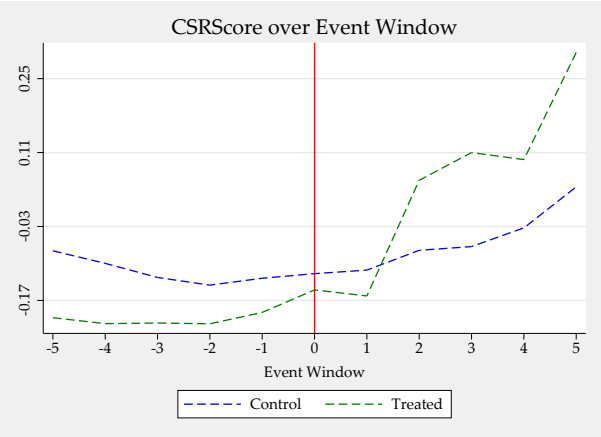
Yu, F., and X. Yu. 2011. "Corporate lobbying and fraud detection." *Journal of Financial and Quantitative Analysis* 46 (6): 1865–1891.

Yu, T., M. Sengul, and R. H. Lester. 2008. "Misery loves company: The spread of negative impacts resulting from an organizational crisis." *Academy of Management Review* 33 (2): 452–472.

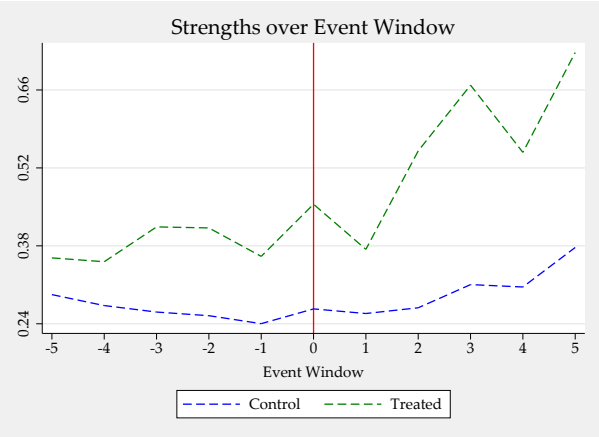
Zavyalova, A., M. D. Pfarrer, R. K. Reger, and D. L. Shapiro. 2012. "Managing the message: The effects of firm actions and industry spillovers on media coverage following wrongdoing." *Academy of Management Journal* 55 (5): 1079–1101.

**Figure 1:** The timing of change in CSR

These figures plot the timing of change in average CSR separately for treated and control firms in event time. The horizontal axis represents time in years relative to treatment event (i.e., the year of the disaster) while the vertical axis represents the averages of CSR estimates.




**(a)**

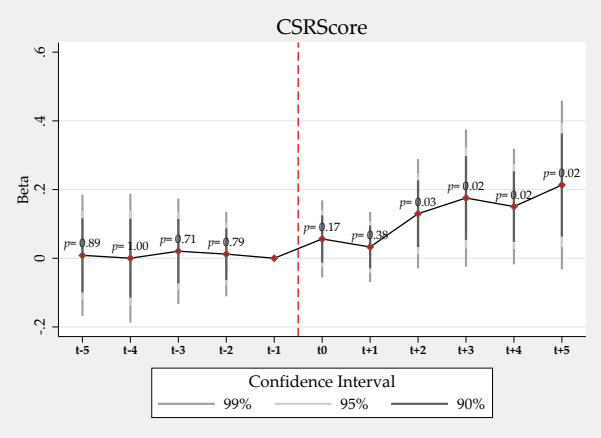



**(b)**

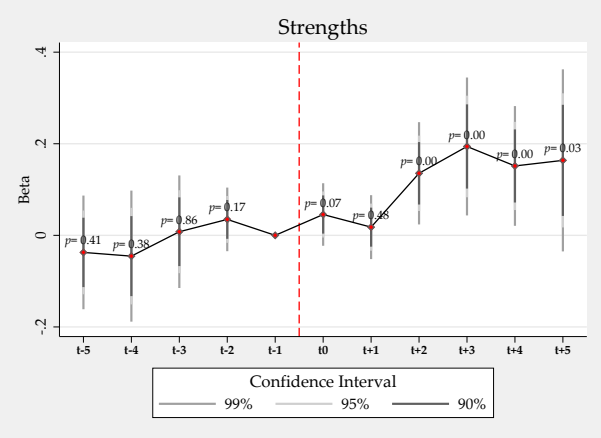

**(c)**

**Figure 2:** Dynamic Difference-in-Differences Estimates

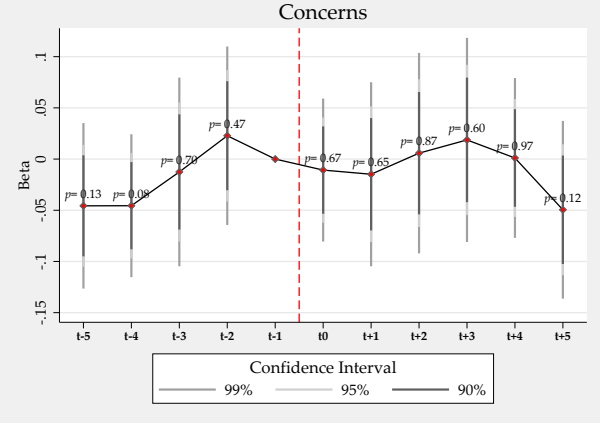
These figures plot the coefficients for the dynamic difference-in-differences regressions in Table 3. In particular, we replace *Disaster* in Model (1) with the multiplication of treated firms and year indicators surrounding the disaster event ($t0$) over the window $t-5$ to $t+5$. The vertical axis presents the estimate of the coefficient and its p-value. The horizontal axis represents time in years relative to the disaster year. The base year is set to the period immediately before the disaster event ($t-1$). All regressions are based on a stacked event estimation with 12 cohorts with year-by-cohort as well as firm-by-cohort fixed effects. Figure a) uses net CSR performance score, and Figure b) uses total CSR-related strengths, while c) uses total CSR-related concerns.




**(a)**




**(b)**




**(c)**

**Table 1:** Descriptive Statistics of Main Variables

| | Pre-Shock Period - [-5, -1] | | | | | | | Post-Shock Period - [0, 5] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | | Treated | | | Diff. (T-C) | Control | | | Treated | | | Diff. (T-C) |
| | Mean | Std | Median | Mean | Std | Median | Mean | Mean | Std | Median | Mean | Std | Median | Mean |
| **Main CSR Proxies** | | | | | | | | | | | | | | |
| CSRScore | -0.119 | 0.535 | -0.057 | -0.207 | 0.700 | -0.250 | -0.088*** | -0.066 | 0.586 | 0.000 | 0.027 | 0.773 | 0.000 | 0.092*** |
| Strengths | 0.260 | 0.438 | 0.143 | 0.380 | 0.535 | 0.200 | 0.120*** | 0.294 | 0.502 | 0.143 | 0.543 | 0.675 | 0.333 | 0.249*** |
| Concerns | 0.379 | 0.410 | 0.250 | 0.587 | 0.574 | 0.500 | 0.208*** | 0.360 | 0.416 | 0.250 | 0.517 | 0.630 | 0.333 | 0.157*** |
| Community | 0.013 | 0.153 | 0.000 | -0.029 | 0.242 | 0.000 | -0.042*** | 0.021 | 0.173 | 0.000 | -0.024 | 0.340 | 0.000 | -0.045*** |
| Diversity | -0.097 | 0.330 | 0.000 | -0.059 | 0.349 | 0.000 | 0.038*** | -0.099 | 0.354 | 0.000 | 0.003 | 0.372 | 0.000 | 0.102*** |
| Employee | -0.034 | 0.215 | 0.000 | -0.042 | 0.233 | 0.000 | -0.008 | -0.014 | 0.207 | 0.000 | 0.024 | 0.217 | 0.000 | 0.038*** |
| Environment | 0.019 | 0.145 | 0.000 | -0.054 | 0.274 | 0.000 | -0.074*** | 0.038 | 0.153 | 0.000 | 0.003 | 0.275 | 0.000 | -0.035*** |
| EnvirStrength | 0.045 | 0.143 | 0.000 | 0.104 | 0.205 | 0.000 | 0.059*** | 0.061 | 0.157 | 0.000 | 0.148 | 0.229 | 0.000 | 0.087*** |
| EnvirConcern | 0.026 | 0.097 | 0.000 | 0.158 | 0.228 | 0.000 | 0.132*** | 0.023 | 0.091 | 0.000 | 0.145 | 0.232 | 0.000 | 0.122*** |
| Human | -0.020 | 0.133 | 0.000 | -0.023 | 0.131 | 0.000 | -0.003 | -0.012 | 0.140 | 0.000 | 0.021 | 0.210 | 0.000 | 0.032*** |
| ESGScore | 0.350 | 0.174 | 0.317 | 0.411 | 0.207 | 0.375 | 0.061*** | 0.391 | 0.181 | 0.360 | 0.435 | 0.204 | 0.402 | 0.044*** |
| ESGControv | 0.847 | 0.279 | 1.000 | 0.824 | 0.300 | 1.000 | -0.023* | 0.851 | 0.280 | 1.000 | 0.834 | 0.292 | 1.000 | -0.016* |
| ESGEnvir | 0.204 | 0.247 | 0.116 | 0.315 | 0.273 | 0.285 | 0.111*** | 0.255 | 0.264 | 0.183 | 0.347 | 0.288 | 0.324 | 0.093*** |
| ESGSocial | 0.372 | 0.201 | 0.338 | 0.401 | 0.216 | 0.360 | 0.028*** | 0.412 | 0.204 | 0.381 | 0.433 | 0.224 | 0.395 | 0.021*** |
| RepRiskIndex | 0.048 | 0.091 | 0.000 | 0.076 | 0.114 | 0.000 | 0.028*** | 0.072 | 0.108 | 0.000 | 0.137 | 0.134 | 0.134 | 0.065*** |
| EnvirRisk | 0.057 | 0.178 | 0.000 | 0.176 | 0.284 | 0.000 | 0.119*** | 0.064 | 0.178 | 0.000 | 0.249 | 0.283 | 0.106 | 0.185*** |
| SocialRisk | 0.108 | 0.256 | 0.000 | 0.120 | 0.221 | 0.000 | 0.012 | 0.152 | 0.286 | 0.000 | 0.212 | 0.247 | 0.104 | 0.060*** |
| GovernRisk | 0.060 | 0.197 | 0.000 | 0.054 | 0.174 | 0.000 | -0.006 | 0.121 | 0.270 | 0.000 | 0.129 | 0.261 | 0.000 | 0.007 |
| EmployWord(%) | 3.829 | 0.952 | 3.667 | 3.678 | 0.689 | 3.659 | -0.150*** | 3.879 | 0.918 | 3.717 | 3.735 | 0.738 | 3.710 | -0.145*** |
| EnvirWord(%) | 2.504 | 0.503 | 2.475 | 3.265 | 0.726 | 3.157 | 0.761*** | 2.590 | 0.471 | 2.558 | 3.362 | 0.749 | 3.244 | 0.772*** |
| HumanWord(%) | 2.557 | 0.560 | 2.508 | 2.682 | 0.541 | 2.619 | 0.125*** | 2.666 | 0.530 | 2.607 | 2.768 | 0.522 | 2.692 | 0.102*** |
| SocialWord(%) | 3.264 | 0.712 | 3.144 | 3.567 | 0.674 | 3.487 | 0.303*** | 3.285 | 0.682 | 3.172 | 3.615 | 0.673 | 3.544 | 0.330*** |
| **Main Control Variables** | | | | | | | | | | | | | | |
| Size | 7.503 | 1.500 | 7.333 | 7.887 | 1.670 | 7.773 | 0.384*** | 7.569 | 1.556 | 7.448 | 8.280 | 1.595 | 8.166 | 0.711*** |
| MTB | 2.975 | 3.386 | 2.215 | 3.269 | 4.098 | 2.167 | 0.294** | 2.735 | 3.445 | 2.022 | 3.456 | 4.487 | 2.174 | 0.721*** |
| Leverage | 0.223 | 0.207 | 0.184 | 0.276 | 0.175 | 0.286 | 0.053*** | 0.231 | 0.214 | 0.184 | 0.306 | 0.172 | 0.306 | 0.075*** |
| ROS | 0.050 | 0.204 | 0.060 | -0.040 | 0.442 | 0.067 | -0.089*** | 0.050 | 0.197 | 0.059 | -0.036 | 0.434 | 0.071 | -0.085*** |
| SaleGrowth | 0.113 | 0.232 | 0.084 | 0.131 | 0.322 | 0.073 | 0.018* | 0.075 | 0.204 | 0.058 | 0.110 | 0.294 | 0.068 | 0.034*** |
| Log(Age) | 2.800 | 0.781 | 2.773 | 3.212 | 0.864 | 3.434 | 0.413*** | 3.000 | 0.646 | 2.996 | 3.377 | 0.734 | 3.466 | 0.377*** |
| Dividend | 0.012 | 0.022 | 0.003 | 0.017 | 0.022 | 0.012 | 0.005*** | 0.014 | 0.024 | 0.003 | 0.016 | 0.020 | 0.013 | 0.002*** |
| InstOwner | 0.695 | 0.220 | 0.732 | 0.656 | 0.212 | 0.680 | -0.040*** | 0.747 | 0.226 | 0.804 | 0.694 | 0.236 | 0.736 | -0.053*** |
| Litigation | 0.307 | 0.340 | 0.149 | 0.262 | 0.312 | 0.110 | -0.046*** | 0.257 | 0.312 | 0.108 | 0.257 | 0.305 | 0.114 | -0.001 |
| Governance | -0.053 | 0.304 | 0.000 | -0.058 | 0.263 | 0.000 | -0.004 | -0.048 | 0.260 | 0.000 | -0.003 | 0.270 | 0.000 | 0.045*** |
| Capex | 0.056 | 0.086 | 0.033 | 0.171 | 0.208 | 0.087 | 0.115*** | 0.048 | 0.075 | 0.029 | 0.187 | 0.219 | 0.094 | 0.139*** |
| SG&A | 0.239 | 0.216 | 0.209 | 0.193 | 0.278 | 0.090 | -0.046*** | 0.239 | 0.202 | 0.211 | 0.190 | 0.265 | 0.096 | -0.049*** |
| R&D | 0.040 | 0.090 | 0.000 | 0.085 | 0.192 | 0.000 | 0.045*** | 0.038 | 0.082 | 0.000 | 0.080 | 0.184 | 0.000 | 0.043*** |
| Impairment | 0.001 | 0.006 | 0.000 | 0.001 | 0.005 | 0.000 | -0.000 | 0.001 | 0.005 | 0.000 | 0.002 | 0.007 | 0.000 | 0.001*** |
| TotExpense | 0.353 | 0.340 | 0.285 | 0.597 | 0.716 | 0.308 | 0.244*** | 0.341 | 0.302 | 0.282 | 0.588 | 0.674 | 0.316 | 0.248*** |
| Observations | 56,412 | | | 2,122 | | | 58,534 | 81,265 | | | 2,701 | | | 83,966 |

This table reports the descriptive statistics of the variables used in the main analysis. In Columns (1) to (8) the descriptive statistics relates to period [-5, -1] around the technological disaster at period t=0. In Columns (9) to (15) the descriptive statistics relates to period [0, 5] around the technological disaster at period t=0. All continuous variables are winsorized at the 99% and 1% levels. Variable definitions are in Appendix A.

**Table 2:** Association between the Disasters and CSR Performance

| | (1) CSRScore | (2) Strengths | (3) Concerns | (4) CSRScore | (5) Strengths | (6) Concerns |
|---|---|---|---|---|---|---|
| Disaster | 0.119*** | 0.128*** | 0.010 | 0.116*** | 0.122*** | 0.006 |
| | (3.42) | (4.49) | (0.44) | (3.40) | (4.24) | (0.27) |
| Size | | | | -0.006 | 0.014* | 0.020*** |
| | | | | (-0.70) | (2.03) | (3.00) |
| MTB | | | | -0.000 | -0.002** | -0.002*** |
| | | | | (-0.03) | (-2.41) | (-3.33) |
| Leverage | | | | 0.076 | 0.086** | 0.010 |
| | | | | (1.63) | (2.77) | (0.36) |
| ROS | | | | 0.001 | -0.014 | -0.015 |
| | | | | (0.08) | (-1.36) | (-1.07) |
| SalesGrowth | | | | -0.008 | -0.017* | -0.009 |
| | | | | (-0.66) | (-2.04) | (-0.77) |
| Log(Age) | | | | -0.032 | -0.031 | 0.001 |
| | | | | (-0.93) | (-1.10) | (0.02) |
| Dividend | | | | 0.670** | 0.447** | -0.224 |
| | | | | (2.81) | (2.66) | (-1.50) |
| InstOwner | | | | 0.041 | -0.036 | -0.077*** |
| | | | | (1.43) | (-1.40) | (-3.24) |
| Litigation | | | | -0.034** | -0.009 | 0.025** |
| | | | | (-2.61) | (-1.07) | (2.48) |
| Governance | | | | 0.176*** | 0.158*** | -0.018 |
| | | | | (3.17) | (3.61) | (-0.87) |
| Constant | -0.089*** | 0.285*** | 0.374*** | 0.015 | 0.293*** | 0.278*** |
| | (-197.02) | (723.34) | (1348.51) | (0.12) | (3.02) | (3.36) |
| Firm Controls | No | No | No | Yes | Yes | Yes |
| Observations | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 |
| Adjusted $R^2$ | 0.601 | 0.745 | 0.603 | 0.606 | 0.751 | 0.604 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |

This table presents the results of estimating difference-in-differences regressions as in Model (1) based on a stacked event estimation with 12 cohorts. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

**Table 3:** Dynamic Difference-in-Differences

| | (1) CSRScore | (2) Strengths | (3) Concerns | (4) CSRScore | (5) Strengths | (6) Concerns |
|---|---|---|---|---|---|---|
| Treated × $Indicator_{t-5}$ | 0.006 | -0.043 | -0.049 | 0.008 | -0.037 | -0.046 |
| | (0.10) | (-0.90) | (-1.64) | (0.13) | (-0.84) | (-1.59) |
| Treated × $Indicator_{t-4}$ | -0.004 | -0.053 | -0.049* | 0.000 | -0.045 | -0.046* |
| | (-0.06) | (-1.00) | (-1.86) | (0.00) | (-0.89) | (-1.84) |
| Treated × $Indicator_{t-3}$ | 0.023 | 0.009 | -0.014 | 0.021 | 0.008 | -0.013 |
| | (0.38) | (0.18) | (-0.41) | (0.37) | (0.18) | (-0.38) |
| Treated × $Indicator_{t-2}$ | 0.018 | 0.038 | 0.020 | 0.012 | 0.035 | 0.023 |
| | (0.40) | (1.35) | (0.61) | (0.27) | (1.41) | (0.73) |
| Treated × $Indicator_{t0}$ | 0.062 | 0.050** | -0.012 | 0.056 | 0.046* | -0.011 |
| | (1.60) | (2.25) | (-0.47) | (1.41) | (1.87) | (-0.43) |
| Treated × $Indicator_{t+1}$ | 0.039 | 0.023 | -0.016 | 0.033 | 0.018 | -0.015 |
| | (0.96) | (0.96) | (-0.46) | (0.90) | (0.72) | (-0.46) |
| Treated × $Indicator_{t+2}$ | 0.139** | 0.147*** | 0.009 | 0.130** | 0.135*** | 0.006 |
| | (2.35) | (3.31) | (0.24) | (2.29) | (3.41) | (0.17) |
| Treated × $Indicator_{t+3}$ | 0.181** | 0.202*** | 0.020 | 0.175** | 0.194*** | 0.019 |
| | (2.53) | (3.82) | (0.55) | (2.47) | (3.62) | (0.53) |
| Treated × $Indicator_{t+4}$ | 0.150** | 0.153*** | 0.003 | 0.150** | 0.152*** | 0.001 |
| | (2.44) | (3.30) | (0.09) | (2.51) | (3.25) | (0.04) |
| Treated × $Indicator_{t+5}$ | 0.214** | 0.169** | -0.045 | 0.213** | 0.164** | -0.049 |
| | (2.42) | (2.38) | (-1.37) | (2.44) | (2.31) | (-1.60) |
| Constant | -0.090*** | 0.285*** | 0.374*** | 0.012 | 0.290*** | 0.278*** |
| | (-78.74) | (474.34) | (546.65) | (0.09) | (2.97) | (3.38) |
| Firm Controls | No | No | No | Yes | Yes | Yes |
| Observations | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 |
| Adjusted $R^2$ | 0.601 | 0.746 | 0.603 | 0.606 | 0.751 | 0.604 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |

This table reports the results of testing the dynamic effects of the technological disasters on firms' CSR performance. All regressions are based on a stacked event estimation with 12 cohorts. We use treatment indicator variables for all years of the estimation window (*Indicator*), except for the year before the technological disaster, $t-1$, which serves as the base year and is omitted from the regressions. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

**Table 4:** Identifying Substantive *versus* Symbolic Actions

| | Potentially Substantive | | | Potentially Symbolic | | | |
|---|---|---|---|---|---|---|---|
| | | Expected Symbl. | Expected Subst. | | | | |
| | (1) Environment | (2) EnvirStrength | (3) EnvirConcerns | (4) Community | (5) Diversity | (6) Employee | (7) Human |
| Disaster | 0.015 | 0.011 | -0.004 | 0.002 | 0.036** | 0.013 | 0.049*** |
| | (1.08) | (1.34) | (-0.29) | (0.15) | (2.29) | (1.32) | (2.84) |
| Constant | 0.130*** | 0.109*** | -0.021 | 0.082 | -0.158* | -0.116** | 0.078*** |
| | (4.67) | (3.54) | (-1.25) | (1.63) | (-1.89) | (-2.33) | (2.90) |
| Firm Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 | 142,500 |
| Adjusted $R^2$ | 0.575 | 0.646 | 0.739 | 0.382 | 0.583 | 0.515 | 0.333 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

This table presents the results of estimating difference-in-differences regressions as in Model (1) based on a stacked event estimation with 12 cohorts. The table identifies potentially substantive (subst.) *versus* potentially symbolic (symbl.) CSR actions. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

**Table 5:** Costs and Effects of Symbolic *versus* Substantive actions

**Panel A:** Costs of Symbolic *versus* Substantive Actions

| | (1) CAPEX | (2) SG&A | (3) R&D | (4) Impairment | (5) TotExpense | (6) ROS |
|---|---|---|---|---|---|---|
| SubstantiveCSR | 0.044*** | -0.010 | -0.001 | 0.000 | 0.055*** | -0.044** |
| | (4.10) | (-1.57) | (-0.40) | (0.83) | (2.92) | (-2.56) |
| SymbolicCSR | 0.001 | 0.003 | -0.014* | 0.001** | -0.078* | 0.034 |
| | (0.13) | (0.17) | (-2.03) | (2.57) | (-1.87) | (0.89) |
| NoSubstSymbCSR | 0.010 | -0.007 | 0.004* | 0.001*** | 0.004 | -0.027 |
| | (1.21) | (-1.25) | (1.72) | (3.49) | (0.19) | (-1.44) |
| Constant | 0.038** | 0.329*** | 0.045*** | 0.005** | 0.461*** | -0.694*** |
| | (2.22) | (13.85) | (6.08) | (2.59) | (10.35) | (-8.88) |
| Firm Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 141,961 | 142,500 | 142,500 | 142,500 | 141,961 | 142,500 |
| Adjusted $R^2$ | 0.753 | 0.898 | 0.912 | 0.126 | 0.862 | 0.488 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes |

**Panel B:** Stock Returns, Firm Risk and CSR Funds

| | CSR Funds | | Stock Returns and Firm Risk | | |
|---|---|---|---|---|---|
| | (1) ESGFunds | (2) SRI | (3) BHR | (4) Std(Return) | (5) Rating |
| SubstantiveCSR | -0.003 | -0.162 | -0.073* | 0.037** | -0.026** |
| | (-0.54) | (-0.43) | (-1.72) | (2.35) | (-2.00) |
| SymbolicCSR | -0.001 | 0.163 | 0.031 | 0.046*** | -0.019* |
| | (-0.06) | (0.41) | (0.77) | (3.32) | (-1.65) |
| NoSubstSymbCSR | -0.018* | 0.360 | -0.056 | 0.034*** | -0.001 |
| | (-1.84) | (1.52) | (-1.69) | (4.35) | (-0.13) |
| Constant | 0.005 | 4.639*** | 2.406*** | 1.153*** | 3.249*** |
| | (0.19) | (3.74) | (7.47) | (11.04) | (49.55) |
| Firm Controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 127,087 | 142,500 | 142,500 | 142,493 | 68,718 |
| Adjusted $R^2$ | -0.010 | 0.510 | 0.287 | 0.734 | |
| Pseudo $R^2$ | | | | | 0.172 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes |

This table presents the results of estimating difference-in-differences regressions as in Model (2) based on a stacked event estimation with 12 cohorts. Panel A analyzes operating performance. We drop ROS as a control variable in column (6). Panel B studies stock return performance, firm risk and tracks the shareholding of socially responsible institutions ($SRI$) together with ESG-oriented mutual funds ($ESGFunds$). Given that *rating* (column (3)) is a discrete count variable, we use poisson model. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

**Table 6:** Determinants of the Choice between Symbolic *versus* Substantive Actions

**Panel A:** Corporate Governance

| | (1) EnvirStrength | (2) EnvirConcerns | (3) StrengthNoEnvir | (4) ConcernNoEnvir |
|---|---|---|---|---|
| Disaster×Above | 0.033 | -0.060** | 0.313** | 0.005 |
| | (0.94) | (-2.15) | (2.71) | (0.11) |
| Disaster×Below | 0.008 | 0.005 | 0.077*** | 0.011 |
| | (1.06) | (0.41) | (3.14) | (0.63) |
| Constant | 0.113*** | -0.020 | 0.186** | 0.296*** |
| | (3.56) | (-1.16) | (2.17) | (3.70) |
| $\beta^{Above} = \beta^{Below}$ (p-value) | 0.471 | 0.015 | 0.041 | 0.883 |
| Firm Controls | Yes | Yes | Yes | Yes |
| Observations | 140,610 | 140,610 | 140,610 | 140,610 |
| Adjusted $R^2$ | 0.646 | 0.739 | 0.717 | 0.546 |
| Year-cohort FE | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes |

**Panel B:** Government Monitoring

| | | | | |
|---|---|---|---|---|
| Disaster×Above | 0.029* | -0.029* | 0.128** | 0.026 |
| | (1.90) | (-1.76) | (2.36) | (0.96) |
| Disaster×Below | -0.003 | 0.015 | 0.096*** | -0.001 |
| | (-0.29) | (1.05) | (3.30) | (-0.07) |
| Constant | 0.113*** | -0.021 | 0.190** | 0.295*** |
| | (3.56) | (-1.18) | (2.21) | (3.69) |
| $\beta^{Above} = \beta^{Below}$ (p-value) | 0.082 | 0.020 | 0.580 | 0.460 |
| Firm Controls | Yes | Yes | Yes | Yes |
| Observations | 140,610 | 140,610 | 140,610 | 140,610 |
| Adjusted $R^2$ | 0.646 | 0.739 | 0.717 | 0.546 |
| Year-cohort FE | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes |

**Panel C:** CSR-oriented Institutional Investors

| | | | | |
|---|---|---|---|---|
| Disaster×Above | 0.014 | -0.027** | 0.131** | -0.001 |
| | (1.06) | (-2.09) | (2.60) | (-0.03) |
| Disaster×Below | 0.003 | -0.016 | 0.102*** | 0.011 |
| | (0.34) | (-1.50) | (2.98) | (0.46) |
| Constant | 0.113*** | -0.026 | 0.195** | 0.249*** |
| | (3.59) | (-1.45) | (2.13) | (3.04) |
| $\beta^{Above} = \beta^{Below}$ (p-value) | 0.510 | 0.386 | 0.626 | 0.684 |
| Firm Controls | Yes | Yes | Yes | Yes |
| Observations | 127,751 | 127,751 | 127,751 | 127,751 |
| Adjusted $R^2$ | 0.639 | 0.729 | 0.705 | 0.546 |
| Year-cohort FE | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes |

Table 6 - Continued

**Panel D:** Salience of a Disaster

| | (1) EnvirStrength | (2) EnvirConcerns | (3) StrengthNoEnvir | (4) ConcernNoEnvir |
|---|---|---|---|---|
| Disaster×Above | -0.000 | -0.045*** | 0.143*** | -0.003 |
| | (-0.04) | (-3.89) | (3.16) | (-0.14) |
| Disaster×Below | 0.051* | 0.037* | 0.144** | 0.047 |
| | (1.77) | (2.07) | (2.38) | (1.03) |
| Constant | 0.100*** | -0.042** | 0.181* | 0.241** |
| | (3.15) | (-2.32) | (1.81) | (2.71) |
| $\beta^{Above} = \beta^{Below}$ (p-value) | 0.124 | 0.001 | 0.982 | 0.334 |
| Firm Controls | Yes | Yes | Yes | Yes |
| Observations | 111,132 | 111,132 | 111,132 | 111,132 |
| Adjusted $R^2$ | 0.628 | 0.709 | 0.689 | 0.539 |
| Year-cohort FE | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes |

This table reports the results of estimating cross-sectional differences using difference-in-differences regressions as in modified version of Model (1), where *Disaster* is replaced by two non-overlapping indicators (*Disaster* × *Above* and *Disaster* × *Below*) based on a stacked event estimation with 12 cohorts. All the cross-sectional differences are estimated at a disaster year (except the government monitoring that uses a cumulative dollar amount of government subsidies over a period [-5, 0] relative to a disaster) and are split into *Above* (*Below*) groups if the variable is above (below) sample median estimated within a cohort. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

# **Table 7:** Robustness Tests

**Panel A:** Textual Analysis and Political Contributions

| | Textual Analysis | | | | Contributions |
|---|---|---|---|---|---|
| | (1) EmployWord | (2) EnvirWord | (3) HumanWord | (4) SocialWord | (5) PACs |
| SubstantiveCSR | -0.027 | 0.086** | -0.035 | 0.047 | 0.096 |
| | (-0.47) | (2.48) | (-1.00) | (1.59) | (1.42) |
| SymbolicCSR | 0.062** | -0.022 | 0.028 | 0.055** | 0.066 |
| | (2.76) | (-0.91) | (1.33) | (2.22) | (0.99) |
| NoSubstSymbCSR | 0.025 | -0.004 | 0.001 | 0.031 | 0.138* |
| | (1.05) | (-0.12) | (0.05) | (1.37) | (1.92) |
| Constant | 4.072*** | 3.019*** | 3.082*** | 3.558*** | 0.216 |
| | (42.13) | (51.00) | (40.09) | (40.10) | (1.11) |
| Firm Controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 131,738 | 131,738 | 131,738 | 131,738 | 142,500 |
| Adjusted $R^2$ | 0.865 | 0.855 | 0.813 | 0.861 | 0.885 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes |

**Panel B:** Entropy Balancing

| | (1) CSRScore | (2) Strengths | (3) Concerns | (4) EnvirStrength | (5) EnvirConcerns | (6) StrengthNoEnvir | (7) ConcernNoEnvir |
|---|---|---|---|---|---|---|---|
| Disaster | 0.093** | 0.107*** | 0.014 | 0.001 | -0.003 | 0.106*** | 0.017 |
| | (2.42) | (3.05) | (0.71) | (0.17) | (-0.26) | (2.94) | (0.97) |
| Constant | 0.339 | 0.492 | 0.153 | 0.186** | -0.112* | 0.306 | 0.265 |
| | (0.82) | (1.52) | (0.89) | (2.65) | (-1.90) | (1.02) | (1.70) |
| Firm Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 136,975 | 136,975 | 136,975 | 136,975 | 136,975 | 136,975 | 136,975 |
| Adjusted $R^2$ | 0.629 | 0.747 | 0.730 | 0.689 | 0.780 | 0.681 | 0.629 |
| Year-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-cohort FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

This table presents the results of estimating difference-in-differences regressions as in Model (2) based on a stacked event estimation with 12 cohorts. Panel A uses total number of CSR-related words in 10-K filings relative to total number of words and total dollar value of donations toward political action committee (PAC) contributions. Panel B uses the weights from the entropy balancing that are estimated within each cohort using all the control variables as in Table 2. All regressions control for year-by-cohort as well as firm-by-cohort fixed effects. All continuous variables are winsorized at the 99% and 1% levels. The ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The t-stats in brackets are derived from robust standard errors clustered at the firm and year level. Variable definitions are in Appendix A.

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