Identifying Causal Relations between Corporate Social Responsibility and Financial Reporting Quality

PROPOSAL FOR THE XIV INTERNATIONAL ACCOUNTING SYMPOSIUM.

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Abstract

We study how firms within the industries that experience CSR-disasters (treated firms) react to these events, and whether this reaction depends on the pre-disaster period firm characteristics. We proxy CSR-disasters as a set of technological disasters that were caused not by the formal violation of the law or malice, but rather because of a complex of failures in meeting technological, environmental and ethical standards. We propose that firms can react to the disasters at least in two ways: through corporate social responsibility (CSR) or (and) through financial reporting quality (FRQ). We apply earnings management (through discretionary accruals and through real activities manipulation) and textual disclosure as two alternative proxies for FRQ.

Using as set of three CSR-disasters and a difference-in-difference methodology, we show that after the disasters firms improve their CSR performance and FRQ through textual quality (proxied by length and size of the disclosure and Bog Index). We do not find evidence that treated firms decrease earnings management. Not all the firms equally respond to the disasters. We show that improvement in CSR performance is mainly driven by the firms with low pre-disaster CSR. Further, we show that these firms also decrease earnings management. This result is consistent with the prior literature that claims positive association between CSR and FRQ (Kim et al., 2012).

Keywords: Corporate Social Responsibility, Financial Reporting Quality, Earnings Management.

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1 Introduction

Firms' desirability to engage in socially responsible behavior has long been debated among researchers and business experts (Ferrell et al., 2016). In their recent paper Hart and Zingales (2017) emphasize that not all the public firms should have a single objective of profit maximization. Specifically, the authors argue that when money-making and ethical activities are inseparable, Friedman's (Friedman, 1970) conclusions do not hold and shareholders' welfare becomes a function of both social and financial performances. Despite the fact that for some firms social performance is at least as important as financial one, the question what happens when firms fail to meet their social obligations is relatively unexplored in the prior literature. Introducing the concept of CSR-disasters, referring to the severe consequences resulting from these failures, we extend our understanding of how firms respond to these events, and whether this response depends on the pre-disaster firm characteristics.

Following prior studies, we define CSR as voluntary actions that improve social conditions that are not required by the law and extend beyond firm's profit maximization (McWilliams and Siegel, 2000; Godfrey et al., 2009). We use a set of technological disasters as a proxy for CSR-disasters. By definition, technological disaster refers to a failure of a technological structure or/and human error in controlling or using the technology[1]. Example of technological disasters can be explosions, chemical spills, or gas leaks[2]. We focus on major technological disasters that were caused not by the formal violation of the law or malice, but rather, because of a complex of failures in meeting technological, environmental and ethical standards. Consider the case of garment factory collapse in Rana Plaza, Dhaka on

[1]Following the definition proposed by The Institute of Food and Agricultural Sciences (IFAS) a technological disaster "...Is an event caused by a malfunction of a technological structure and/or some human error in controlling or handling the technology. The effects of a disaster on families and individuals may be long lasting and can endure for years. However, symptoms may appear gradually, and impacts may not be seen immediately". For more details follow `http://edis.ifas.ufl.edu/`. In this study terms "disaster", "disaster event", and "catastrophe" are used interchangeably.

[2]For example, Pek et al. (2018) classify the following events as technological disasters: chemical spills, collapses, explosions, fires, gas leaks, poisonings, radiation leaks, and large-scale transportation accidents. Perhaps the most famous technological disasters are The BP oil spill on April 20, 2010 and The Fukushima Daiichi nuclear incident on March 11, 2011.

April 24th, 2013[3]. If closing companies that operate in the Bangladesh factory (as Primark and Canada's Loblaw) went further than their formal obligations the collapse could be prevented. For instance, instead of blindly accept building certificate for a Bangladesh factory the clothing firms have to send "people to check every pillar". In this study, we determine CSR-disasters as technological disasters that could be possibly prevented or mitigated if a firm could go further than just satisfaction of formal obligations that are imposed by the law.

As a result of these CSR-disasters, same-industry firms (treated firms) (1) are exposed to a negative reaction from the investors (negative shock) and (2) may undertake efforts to mitigate the harm (Blacconiere and Patten, 1994; Desai, 2011; Diestre and Rajagopalan, 2014; Pek et al., 2018). We first document that treated firms experience decrease in ROA, ROE, and sales growth after the CSR-disasters. Our results are consistent with the previous event studies (Blacconiere and Patten, 1994; Heflin and Wallace, 2017; Pek et al., 2018). Next, we argue that CSR-disaster is a negative shock for the relationship between a firm and its stakeholders.

Given that stakeholder's positive attitude in the form of firm's social capital has a positive effect on firm's financial performance (Lev et al., 2010; Cheng et al., 2014; Shiu and Yang, 2017), managers have to undertake actions to restore this relationship. First, we argue that firms improve CSR performance in the post-disaster period. We propose two possible mechanisms why strengthening in CSR performance may lead to strengthening in the relationship between a firm and its stakeholders. First, because high CSR performance can help to differentiate treated firms from the guilty firm by signaling the low operational risk and high preparation for the possible regulatory changes associate with the disaster (Heflin and Wallace, 2017). Second, an increase in CSR performance can signal firms' social awareness and high environmental and social standards that do not necessarily mitigate firms' risk. Prior literature suggests that CSR helps to build social capital and to form stakeholders' positive attitude, which mitigates negative market reaction at the time of disaster (Godfrey, 2005; Godfrey et al., 2009). We find strong evidence that treated firms improve CSR performance in the post-disasters periods.

[3]The Economist (May 4th, 2013). https://www.economist.com/leaders/2013/05/04/disaster-at-rana-plaza.

Next, we study whether treated firms change financial reporting quality (FRQ) in the post-disaster period. We argue that affected firms can improve the relationship with their stakeholders by properly disclosing possible future losses, preparedness for possible regulatory changes and, overall, by decreasing information asymmetry regarding the firm-specific consequences of the CSR-disaster. Prior literature shows that high-quality financial reporting can mitigate market imperfections, increase investment efficiency (Bushman and Smith, 2001; Healy and Palepu, 2001; Easley and O'hara, 2004; Lambert et al., 2007; Biddle et al., 2009), and improve firm performance and earnings persistence (Li, 2008). Further, misreporting can lead to reputational losses, increase litigation risk, and provoke greater attention on the part of the regulator and the governments (Ball and Shivakumar, 2006). On the other hand, under adverse conditions of negative market reaction on the CSR-disaster, manager may choose to engage in earnings management which would help to achieve important financial targets (Roychowdhury, 2006; Cohen et al., 2008).

We apply earnings management and textual disclosure as two alternative proxies for financial reporting quality (FRQ). We measure earnings management through discretionary accruals (Jones, 1991; Subramanyam, 1996; DeFond and Subramanyam, 1998; Kothari et al., 2005) and through real activities manipulation (Roychowdhury, 2006). We employ three proxy for the quality of textual disclosure: length of the 10-k, net 10-k file size, and the Fog Index (Li, 2008; Loughran and McDonald, 2011). In addition, we measure how optimistic is disclosure in the treated industries in the post-disaster periods (Loughran and McDonald, 2011). We find evidence that after disasters, treated firms disclose less information and this information is less readable and optimistic. However, we do not find evidence that treated firms significantly change the level of earnings management in the post-disaster periods.

Finally, we address whether firms' response to the CSR-disaster is sensitive to the pre-disaster level of CSR. Prior literature suggests that firms with previously accumulated social capital in the form of high CSR performance in the previous period can mitigate negative market reaction because (1) market participants expect that these firms have less costs associated with the disaster (Godfrey et al., 2009) and (2) because these firms have social trust and stakeholders' loyalty (Godfrey, 2005; Shiu and Yang, 2017). Further, incremental increase in CSR performance may not be equally useful for firms with different pre-disaster CSR performance. For instance, Clarkson et al. (2004) show that in the pulp and paper industry only low-polluting firms extract incremental economic benefit from environmental expenditures. We show that only firms with low pre-disaster CSR improve CSR in the post-treatment periods. Specifically, firms in the low pre-treatment CSR quintiles add (eliminate) two strength (concerns) dimensions to (from) the total CSR score. This coefficient is insignificant for the firms with high pre-disaster CSR. Second, we show that firms with low pre-disaster CSR have lower earnings management in the post-treatment periods.

To test our hypotheses we exploit a set of major industrial catastrophes, according to The International Disaster Database[4] (EM-DAT) that occurred between 2003 and 2013 in the US. We measure CSR performance using KLD database. Using a research design similar to Flammer (2015), we apply a differences-in-difference approach to estimate the effect of the disasters on FRQ and CSR. More specifically, if a firm operates in an industry that is exposed to technological disaster, we compute the difference in FRQ (CSR) before and after the catastrophe. Then we compare this difference with the corresponding difference in industries that are not affected by the catastrophe. We find that change in CSR and FRQ depends on the pre-disaster level of CSR.

This paper contributes to the literature in several ways. First, we add to the literature that studies how technological disasters shape firms behavior (Desai, 2011; Diestre and Rajagopalan, 2014; Heflin and Wallace, 2017). Specifically, we show that FRQ and CSR are at least two channels thorough which firms can respond to the disasters. Second, our paper extends prior research that attempts to establish the link between CSR and FRQ (Kim et al., 2012). A set of technological disasters provides us with the settings in which we can study simultaneous change in CSR and FRQ. We differ from prior research on this field by showing that past CSR has an impact on the change in both CSR and FRQ in the post-treatment periods. Finally, our results contribute to the literature that attempts to explain why in the change periods some firms suffer less than their industry- peers (Godfrey et al., 2009; Lins et al., 2017).

[4] http://www.emdat.be/ EM-DAT, 2018 EM-DAT is widely used in the literature (e.g. Evan et al., 2011; Lutz et al., 2014; Lesk et al., 2016) and well-known as one of the most comprehensive databases on disaster events in the world (Voigt et al., 2015).

The paper proceeds as follows. In Section II we discuss the related literature and develop our hypothesis. In section III we describe the data and methodology, while we present results in Section IV. We conclude in Section V.

2 Literature Review and Hypothesis Development

To derive theoretical predictions on the firms' reaction to the CSR disasters, we draw from different strands of literature. We begin this section by describing the phenomenon of negative spillover effect. Next, we analyze prior literature to argue that affected firms can use CSR and FRQ as a response to CSR-disaster. Finally we hypothesize how pre-disaster level of CSR influence the response to this disaster.

2.1 Negative Spillover Effect

As a result of CSR-disasters, proxied by technological disasters, same-industry firms (treated firms) are exposed to a negative consequences such as negative abnormal stock returns (Diestre and Rajagopalan, 2014; Heflin and Wallace, 2017) and higher scrutiny from regulators (Desai, 2011). Negative spillover effect refers to the phenomenon that negative consequences of the disaster are more pronounced for the same-industry firms.

The phenomenon that one firm's deviant behavior can result in the punishment of other (not responsible) firms in the same industry is discussed in prior studies (Desai, 2011; Diestre and Rajagopalan, 2014; Liang and Renneboog, 2017). Diestre and Rajagopalan (2014) suggest that in the short run, market participants tend to form their beliefs, based on the highly visible and available information, such as belonging to one industry. The authors provide two reasons for spillover. First, firms in one industry may have the same third party relationship (e.g. relationship with suppliers) which may cause the accident. Second explanation goes through sociocognitive literature. In short, external audiences predict organizations' future behavior based on the other firms' behavior in the same industry[5]. In our framework, if one firm in the industry neglects CSR standards in environmental,

[5] For more details, please follow Diestre and Rajagopalan (2014), p. 1130-1131.

safety or technological performance other firms in the same industry are also suspect to violate these norms. Further, in the context of negative spillover effect, we study how firms respond to CSR disasters.

2.2 Corporate Social Responsibility

Prior literature documents that natural disasters generate a huge wave of corporate donations and subsequent increase in CSR performance (Muller and Kräussl, 2011; Madsen and Rodgers, 2015). In this section we ask whether CSR-disasters provoke subsequent improvement in CSR performance in firms that are exposed to the negative spillover effect. The results from archival studies suggest that social capital, that is associated with CSR, and financial performance are positively related. For instance, for firms that are highly sensitive to consumer perception, Lev et al. (2010) show positive relationship between CSR performance and further revenue. Cheng et al. (2014) argue that CSR facilitates access to finance. For the post-disaster period, Madsen and Rodgers (2015) show that in the presence of stakeholders' awareness, there is a positive relationship between CSR and financial performance. Further, the authors show that the most profitable CSR actions are urgent, in-kind and in the partnership with NGOs. Using a set of 1384 firm-related negative events, Shiu and Yang (2017) show that in the time of these events, CSR engagement has insurance-like protection on both the stock and bond prices of a firm, however this effect disappears in the occurrence of the subsequent negative events. CSR-disaster is plausibly a negative shock for the relationship between the firm and its stakeholders. Next we propose two possible mechanisms that explain why improvement in CSR performance in the post-disaster period may lead to improvement in the firm-stakeholders relationship.

First, firms may improve CSR performance to signal that they are less risky with high quality of operational process and, overall, to differentiate themselves from the guilty firm in terms of safeness. Heflin and Wallace (2017) propose that huge technological disasters update investors' expectations on the likelihood of the recurrence of the disaster and the following regulatory changes. Further, the authors study the case of BP oil spill in 2010 and show that firms in the oil and gas industry improve their environmental performance in the post-disaster period. Heflin and Wallace (2017) argue, that firms improve their CSR performance in the post-disaster period to signal their readiness for possible regulatory changes.

Second, firms can improve CSR performance to signal their social awareness and high environmental and social standards that are not necessary contribute to the reduction of overall risk of CSR-disasters. Using a risk management model, Godfrey (2005) shows that CSR helps to build a moral capital among stakeholders, and this capital can contribute to shareholders' wealth in the time of disasters. Uzzi (1997) and Godfrey et al. (2009) argue that CSR performance creates the moral capital that helps to convince stakeholders that there was no bad intention that caused the disaster. And if there is an uncertainty over the reason that led to the disaster, stakeholders are more willing to assign firms with social capital as riskless and unrelated to the accident.

Based on prior literature, our prediction is that after the CSR-disaster, affected firms (treated firms) increase CSR to signal their operational quality and social awareness and, thus, to improve the relationship with stakeholders and subsequent financial performance. This hypothesis, stated in its alternative form, as:

H1: Firms in the industry that experience a CSR-disaster improve their CSR in the post-disaster period.

2.3 Financial Reporting Quality

Prior literature suggests that financial disclosure is an important communication channel between firms and its stakeholders (Li, 2008; Loughran and McDonald, 2014). Given that CSR-disaster is a negative shock for a firm-stakeholders relationship, we argue, that affected firms can improve FRQ to mitigate this harm. Specifically, firms may improve FRQ to facilitate disclosure of their possible future losses, preparedness for possible regulatory changes and, overall, to decrease information opacity regarding the firm-specific consequences of the disaster. A number of studies show that high-quality financial reporting can mitigate market imperfections and increase investment efficiency (Bushman and Smith, 2001; Healy and Palepu, 2001; Easley and O'hara, 2004; Lambert et al., 2007; Biddle et al., 2009).

Further, given that firms experience negative market reaction, high FRQ can improve firm performance and earnings persistence (Li, 2008). Low FRQ and misreporting may increase corporate default risk (Sadka, 2006; McNichols and Stubben, 2008; Kedia and Philippon, 2007; Kumar and Langberg, 2009) and discount stock prices (Jin and Myers, 2006; Bleck and Liu, 2007; Hutton et al., 2009). Misreporting can lead to reputational losses, increase litigation risk, and provoke greater attention on the part of the regulator and the governments (Ball and Shivakumar, 2006). Overall, we expect that affected firms increase their FRQ in the post-disaster period to facilitate the communication channel with stakeholders which would lead to subsequent improvement in financial performance.

On the other hand, given that affected firms suffer from negative market reaction to CSR-disaster, managers may undertake opportunistic actions and try to achieve short-term goals through decreasing FRQ. For instance, Roychowdhury (2006) and Cohen et al. (2008) show that managers engage in earnings management to meet or beat earnings targets. Johnson et al. (2012) show that managers are more willing to engage in earnings management if they assume that this misbehavior may lead to favorable outcome for the organization. In other words, managers tend to believe that "ends justify the means". Given that firms in the affected industries already suffer from the negative spillover effect, managers may undertake opportunistic actions to achieve important financial targets or to hide unfavorable information regarding the disaster consequences. These actions would lead to decrease in FRQ.

Due to the ambiguity about whether firms improve or reduce financial reporting quality after the CSR-disasters, we lay out the second hypothesis in a null form as follows:

H2: Firms in the industry that experience a CSR-disaster change their FRQ in the post-disaster period.

2.4 Difference in the Response of Treated Firms through CSR and FRQ Based on a Pre-disaster Level of CSR

In this section we argue, that firms with different pre-disaster level of CSR may improve their CSR at the different extent in the post-disaster period. First argument is that firms with high pre-disaster CSR performance do not suffer from negative market reaction. And, thus, these firms are not incentivized to change their CSR performance. Godfrey (2005) and Godfrey et al. (2009) introduce the term "insurance-like effect" which refers to the situation in which CSR performance can prevent any potential negative impact on stock price in the time of a negative event related to the corporate operations of a firm. In other words, CSR expenditures can be consider as insurance premium that the firm pays to avoid market losses in the case of a negative event. Firms with strong reputation for CSR suffer less because (1) they expected to have less costs associated with the disaster in the future (Godfrey et al., 2009) and (2) because they have accumulated "moral reputational capital" (Godfrey, 2005; Shiu and Yang, 2017).

Lins et al. (2017) argue that high CSR performance accumulates firm-specific social capital in the form of trust between a firm and both, its stakeholders and investors. This social capital pays off during a period when the overall level of trust in corporations is low. Further, the authors show that firms with high CSR performance outperform peers during the 2008-2009 financial crises. Muller and Kräussl (2011) show that the more firm is known for socially irresponsibility the greater is the negative impact of Hurricane Katrina on stock and greater the probability that this firm will improve its CSR performance in the post-Katrina period (thought corporate philanthropic disaster response).

Heflin and Wallace (2017) argue that firms in the oil and gas industry with high environmental disclosure before the BP oil spill in 2010 experience less negative equity share price change because market expects that the consequence cost of the disaster will be lower for these firms. Further, the authors show that firms with poor environmental disclose in the pre-spill period improve their disclosure in the post-disaster period. Heflin and Wallace (2017) show that this improvement in the disclosure is not entirely window dressing and is associated with improvement in environmental performance.

Second, we argue that incremental increase in CSR performance may be not equally useful for firms with different pre-disaster CSR performance. For instance, Clarkson et al. (2004) show that market does not equally value environmental expenditure for different firms in the pulp and paper industry. Specifically, only low-polluting firms extract incremental economic benefit from environmental expenditures. Market does not value environmental expenditures for high-polluting firms and further assess them by the existence of unbooked environmental liabilities.

Based on prior literature we assume that firms with lower-CSR performance before the disaster have more incentives to improve the firm-stakeholders relationship and, thus, they will improve their CSR and FRQ more in the post-treatment period. Given these, our third hypothesis is:

H3: Firms in the industry that experience a CSR-disaster and with lower pre-disaster CSR performance improve more their CSR and FRQ in the post-disaster period.

3 Data and Sample Selection

3.1 The International Disaster Database

To construct a set of CSR-disasters we use major technological disasters in US we use The International Disaster Database (EM-DAT). This database provides information about natural (geophysical, meteorological, hydrological, etc.) and technological (industrial, transport, and miscellaneous) disasters. Each event is accompanied by information on date and type of the event, country name, location, total deaths, total number of people affected, and total damage (USD)[6]. Each event in EM-DAT meets at least one of the following criteria: over 10 deaths, over 100 people affected (and/or injured, homeless), and a request for international assistance and/or declaration by the government of a state of emergency. For the period from 2004 to 2012 EM-DAT provides three major (classified by total damage) technological disasters[7]. The most harmful disaster is BP oil spill on April 20, 2010. The rig explosion was owned by Transocean and drilling for BP. This explosion killed eleven people and caused a damage over $20,000,000,000. After the oil well explosion, 4.9 million barrels of oil and gas leaked into Gulf of Mexico. Following prior studies (Heflin and Wallace, 2017), we consider industries with SIC codes 13 (Oil and Gas Extraction) and 29

[6]Total deaths (definition considered in EM-DAT): " [...] it is the sum of deaths and missing". Total affected (definition considered in EM-DAT): " [...] it is the sum of the injured, affected and left homeless after a disaster" (http://www.emdat.be).

[7]The search result is presented in Appendix B

(Petroleum Refining and Related Industries) as saytreated.

According to EM-DAT, the second largest technological disaster is Georgia Sugar Refinery Explosion. On February 7, 2008, a dust exploded on the Imperial Sugar refinery (SIC Code 2062 – Cane Sugar Refining) in Port Wentworth, Georgia. The accident caused deaths of 13 people, injuries of 40, and damage over $323000000. According to the investigation by Occupational Safety and Health Administration (OSHA) and the Bureau of Alcohol, Tobacco, Firearms and Explosives sugar dust was the fuel for the fire. The disaster occurred in 2062 SIC code industry and was directly caused by the process of sugar refinery. Other industries (except 2062) within SIC code 20 do not relate to refinery process, what was the reason of the disaster. Therefore we do not expect that any industry except 2062 will be affected by the disaster. Given that observations with SIC code 2062 are missing in our sample we do not include this disaster in our event study[8] .

The third largest event is San Bruno Gas Pipeline Explosion. On September 9, 2010, natural gas pipeline, owned by Pacific Gas and Electric (PG&E, primary SIC Code 4931 – Electric and other Services Combined) company, exploded in San Bruno, California. The explosion killed eight people. In 2012, an independent audit from the State of California issued a report claiming that PG&E illegally used over $100 million from a fund used for safety operations. The company spent this money for executive compensation and bonuses. PG&E is not able to approach the source of the explosion and find out the cause of the accident. In 2014 federal grand jury in U.S. District Court, San Francisco, indicted PG &E for violations of the Natural Gas pipeline Safety Act of 1968. We consider all firms with 49 SIC code as "treated" because the source of explosion was not found.

Finally, we include one event that is not presented in the EM-DAT as technological disaster, but to our knowledge, perfectly suits to our research settings. Our third event is Fukushima

[8] Industries within SIC code 20 (Food and Kindred Products): 201 – Meat products; 202 – Dairy Products; 203 – Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties; 204 – Grain Mill Products; 205 – Bakery Products; 206 – Sugar and Confectionery Products; 207 – Fats and Oils; 208 – Beverages; 209 – Miscellaneous Food Preparations and Kindred Products. Within SIC code 206 only industry 206 only industry 2062 relates to sugar refinery. Rest industries are the following: 2061 – Cane Sugar, except Refinery; 2063 – Beet Sugar; 2065 – Candy and other Confectionery Products; 2066 – Chocolate and Cocoa Products; 2067 – Chewing Gum; 2068 – Salted and Roasted Nuts and Seeds.

Daiichi Nuclear Disaster that occurred on March 11, 2011 in Japan. EM-DAT does not classify this event as "technological" U.S. for the following reasons. First, this event occurred in Japan. However, the consequences of the disaster affected energy sector all over the world. Second, initially, it was caused by the tsunami which, in turn, was caused by The Great East Japan earthquake. However, according to the Fukushima Nuclear Accident Independent Investigation Commission, the nuclear accident was foreseeable. The plant operator, Tokyo Electric Power Company (TEPCO) failed to take basic security measures. Further, Naomi Hirose, TEPCO president, admit that "even if a tsunami caused the accident, we are the operator of the Fukushima nuclear power plant and we do take responsibility"[9]. Thus, this event meets our two necessary conditions that are a) to be caused by business entities, and b) to be sufficiently large. We consider all firms with 49 SIC code as "treated".

3.2 Firm-level Data

The CSR data is obtained from (Research and Analytics (2006), KLD) . KLD covers the largest 3000 U.S. publicly traded companies by market capitalization[10]. KLD rating is well known and widely used in the CSR literature (Godfrey et al., 2009; Barnett and Salomon, 2012; Flammer, 2015; Lins et al., 2017). KLD provides information on how firms address the needs of their stakeholders along different social dimensions, such as environment, community, human rights, employee relations, diversity, products, corporate governance, and controversial business issues, including alcohol, gambling, firearms, military, nuclear power, and tobacco. Each social dimension is twofold and has both strength and concern components.

We obtain accounting data from Compustat. We obtain finance data from CRSP. Textual disclosure data is coming from Loughran and McDonald (2011) and Bog index from Bonsall et al. (2017). Consistent with the previous research (Kim et al., 2012), we exclude financial firms (SIC codes 6000-6999). All continuous variables are winsorized at the top and bottom

[9]How Can Companies Take Responsibility for Major Accidents? (2015, August 4). Yale Insights. https://insights.som.yale.edu/insights/how-can-companies-take-responsibility-for-major-accidents.

[10]Prior 2003 the composition of the covered firms was different. For more details follow Appendix C

1 percent of their distributions. After matching Compustat data with the KLD database, we obtain an initial sample of 17259 firm-year observations covering 2003 - 2013.

3.3 Measurement of CSR and FRQ

3.3.1 CSR Score

To construct our CSR proxy (CSR_SCORE), we follow Kim et al. (2012) and subtract concern-related measures from strength-related ones among five social dimensions: environment, community, employee relations, diversity, and product.

The use of the aggregate proxy for CSR performance (CSR_SCORE) has been widely criticized (Entine, 2003; Godfrey et al., 2009). The primary criticism stresses that the information value in the individual social categories can be destroyed as a result of subtracting concerns from strengths, as well as summing different social dimensions. We attempt to alleviate concern using individual proxies for each dimension (ENVIRONMENT, COMMUNITY, EMPLOYEE, DIVERSITY, and PRODUCT).

3.3.2 Financial Reporting Quality

We apply earnings management and textual disclosure as two alternative proxies for FRQ.

3.3.3 Earnings management

We measure earnings management through discretionary accruals (Jones, 1991; Subramanyam, 1996; DeFond and Subramanyam, 1998; Kothari et al., 2005) and through real activities manipulation (Roychowdhury, 2006). Earnings management occurs when manager use judgment in financial disclosure either to mislead some stakeholders about firm's performance or to influence contractual outcomes that depend on the disclosed information (Healy and Wahlen, 1999). Roychowdhury (2006) defines real activities manipulation (RAM) as “management actions that deviate from normal business practices, undertaken with the primary objective of meeting certain earnings thresholds”.

Following Kothari et al. (2005) we measure earnings management through discretionary accruals and employ a cross-sectional version of the modified Jones model with the past-year return on asset (ROA). To address the issue that earnings management can be based on income-increasing or income-decreasing accruals (Warfield et al., 1995; Klein, 2002), we use absolute value of discretionary accruals for our analysis (ABS_DA).

Following prior studies (Roychowdhury, 2006; Kim et al., 2012; Cohen et al., 2008) we measure RAM through (1) abnormal cash flow from operations (AB_CFO), (2) abnormal production costs (AB_PROD), (3) abnormal discretionary expenses (AB_EXP), and a liner combination of RAM proxies (COMBINED_RAM).

3.3.4 Textual Disclosure

Lexical properties, or readability, of disclosure is an important dimension of FRQ (Li, 2008). The term "readability" refers to how complex is the text and how difficult to read it and extract necessary information[11]. In 1998 SEC issued the handbook promoting companies to use plane English in writing all publicly disclosed documents. SEC encourage to use short sentences, everyday words and active voice. Authors should be confident that the final version of a document captures the original meaning, and it is written in the easiest possible way. With this document SEC emphasizes importance of lexical properties of financial disclosure and the effect it may have on investors and markets. We use three proxies for readability: length of the text, size of the file, and Bog Index.

Following Li (2008) we apply natural logarithm of the length of the disclosure as a proxy for readability. Specifically, if market participants react less to poorly understandable information, managers have incentives to complicate discloser when company performs poorly. Longer texts take more time to read and analyze, thus length of the discloser is an inverse proxy for readability.

Following Loughran and McDonald (2014) we use 10-k document file size (number of

[11] The Cambridge dictionary suggests the following meaning: "Easy and enjoyable to read" (http://dictionary.cambridge.org/dictionary/english/readable). The Oxford dictionary offers a similar, but slightly different definition: "The quality of being legible or decipherable" (http://www.oxforddictionaries.com/definition/english/readability).

megabytes) as recorded on the EDGAR filing system as second proxy for readability. The authors argue that file size is an exceptionally easy to determine proxy for readability that is free of measurement errors associated with parsing the document. File size is inverse proxy for readability.

Our third proxy for readability is Bog Index (Bonsall et al., 2017). This index captures the processing costs associated with the type of language used in financial disclosure. Bog Index captures linguistic attributes such as sentence length, passive voice, weak verbs, overused words, complex words, and jargon (Bonsall et al., 2017). In contrast to Fog Index (Li, 2008; Loughran and McDonald, 2011), which counts all multi-syllabic words as complex, Bog Index measures words familiarity base on a proprietary list of over 200,000 words. A higher value of Bog Index refers to a lower level of financial disclosure readability.

3.4 Empirical Models

First, we validate whether firms experience deterioration in profitability and growth opportunity. Heflin and Wallace (2017) document that firms in oil and gas industries after the BP oil spill in 2010 experienced a negative stock price reaction (proxied by cumulative abnormal returns). Muller and Kräussl (2011) find that majority of US firms experience negative abnormal stock returns after Hurricane Katrina in 2005. The negative impact is stronger for firms with low CSR performance (irresponsible firms) before the hurricane. To capture the market reaction on the treated firms, we estimate the following model:

$$\begin{aligned} REACTION_t = {} & \beta_0 + \beta_1 aftertreat\_sic2\_\sharp + \beta_2 SIZE_{t-1} + \beta_3 MB_{t-1} + \beta_4 LEV_{t-1} + \beta_5 CH_{t-1} \\ & + \beta_6 COMBINED\_RAM_{t-1} + \beta_7 ABS\_DA_{t-1} + \beta_8 RD\_INT_{t-1} \\ & + \beta_9 AD\_IND\_INT_{t-1} + \beta_{10} BIG4_{t-1} + \beta_{11} FIRM\_AGE_{t-1} + \epsilon_t, \end{aligned} \tag{1}$$

where, $REACTION$ is ROA, ROE or sales growth rate (SALE_G); $aftertreat\_sic2\_\sharp$ ($aftertreat\_sic2\_0$ or $aftertreat\_sic2$) is a dummy variable that equals to 1 for treated industries in the year of a disaster (years after the disasters (including the years of the disasters)). The rest of the variables are as described in Appendix A. We use firm and year fixed effects and cluster standard errors at the two-digit SIC level. The coefficient of interest is β_1, which measures the difference in market reaction between treated and control firms after the technological disasters. If our tests support the hypothesis that treated firms suffer from the negative consequences of the disasters, the coefficient β_1 is expected to be negative.

Then we study how firms adjust their FRQ after the CSR-disasters. We estimate the following regressions:

$$\begin{aligned} ABS\_DA_t = {} & \beta_0 + \beta_1 aftertreat\_sic2\_\sharp + \beta_2 COMBINED\_RAM_{t-1} + \beta_3 SIZE_{t-1} + \beta_4 MB_{t-1} \\ & + \beta_5 ADJ\_ROA_{t-1} + \beta_6 LEV_{t-1} + \beta_7 RD\_INT_{t-1} + \beta_8 AD\_IND\_INT_{t-1} \\ & + \beta_9 GOVERNANCE_{t-1} + \beta_{10} BIG4_{t-1} + \beta_{11} FIRM\_AGE_{t-1} + \epsilon_t, \end{aligned} \tag{2}$$

$$\begin{aligned} RAM\_PROXY_t = {} & \beta_0 + \beta_1 aftertreat\_sic2\_\sharp + \beta_2 ABS\_DA_{t-1} + \beta_3 SIZE_{t-1} + \beta_4 MB_{t-1} \\ & + \beta_5 ADJ\_ROA_{t-1} + \beta_6 LEV_{t-1} + \beta_7 RD\_INT_{t-1} + \beta_8 AD\_IND\_INT_{t-1} \\ & + \beta_9 GOVERNANCE_{t-1} + \beta_{10} BIG4_{t-1} + \beta_{11} FIRM\_AGE_{t-1} + \epsilon_t, \end{aligned} \tag{3}$$

$$\begin{aligned} READABILITY_t = {} & \beta_0 + \beta_1 aftertreat\_sic2\_\sharp + \beta_2 EARN_{t-1} + \beta_3 RET_{t-1} + \beta_4 SIZE_{t-1} \\ & + \beta_5 BM_{t-1} + \beta_6 STD\_RET_{t-1} + \beta_7 AGE_{t-1} + \beta_8 BUSSEG_{t-1} \\ & + \beta_9 GEOSEG_{t-1} + \beta_{10} D\_EARN_{t-1} + \beta_{11} AFE_{t-1} + \beta_{12} AF_{t-1} \\ & + \beta_{13} LOSS_{t-1} + \epsilon_t, \end{aligned} \tag{4}$$

where, RAM_PROXY is AB_CFO, AB_PROD, AB_EXP, or $COMBINED\_RAM$; $READABILITY$ is $TONE$, $NUMWORDS$, $NFileSize$, or *bogindex*; $aftertreat\_sic2\_\sharp$ ($aftertreat\_sic2\_0$ or $aftertreat\_sic2$) is a dummy variable that equals to 1 for treated industries in the year of a disaster (years after the disasters (including the years of the disasters)). The rest of the variables are as described in Appendix A. The set of control

variables is consistent with the previous research (Kim et al., 2012). We cluster standard errors at the two-digit SIC level and use firm and year fixed effects. In the equations 2, 3, and 4, as in Equation 1, the coefficient of interest is β_1. Given the inconsistent evidence from prior research we do not have a prediction about the sign of the coefficient β_1.
We measure how firms adjust their CSR after the disasters. We estimate the following regressions:

$$CSR_t = \beta_0 + \beta_1 aftertreat\_sic2\_\sharp + \beta_2 SIZE_{t-1} + \beta_3 ROA_{t-1} + \beta_4 MB_{t-1} + \beta_5 LEV_{t-1} + \beta_6 CH_{t-1} + \epsilon_t, \quad (5)$$

where, $aftertreat\_sic2\_\sharp$ ($aftertreat\_sic2\_0$ or $aftertreat\_sic2$) is a dummy variable that equals to 1 for treated industries in the year of a disaster (years after the disasters (including the years of the disasters)); CSR is alternatively one of the following proxies: CSR_SCORE, ENVIRONMENT, COMMUNITY, DIVERSITY, EMPLOYEE, PRODUCT, GOVERNANCE, STRENGHTS, INTERNAL, EXTERNAL, HUMAN, OR CONCERNS. These are as previously defined. The rest of the variables are as described in Appendix A. The set of control variables is consistent with the previous research (Flammer, 2015). We use year and firm fixed effects and cluster standard errors at the two-digit SIC level. The coefficient of interest is β_1, which measures the difference in CSR performance between treated and control firms after the technological disaster. If our tests support the hypothesis that firms boost CSR performance after the catastrophes, the coefficient β_1 is expected to be positive.

Finally, we test how firms with a given pre-disaster level of CSR change their CSR performance and FRQ in the post-treatment period. We estimate the following equations:

$$CSR_t = \beta_0 + \beta_1 CSR\_DUM + \beta_2 CSR\_DUM\_EVENT\_\sharp + \beta_3 SIZE_{t-1} + \beta_4 ROA_{t-1} + \beta_5 MB_{t-1} + \beta_6 LEV_{t-1} + \beta_7 CH_{t-1} + \epsilon_t, \quad (6)$$

$$\begin{aligned} ABS\_DA_t = {} & \beta_0 + \beta_1 CSR\_DUM + \beta_2 CSR\_DUM\_EVENT\_\sharp + \beta_3 CSR\_SCORE \\ & + \beta_4 COMBINED\_RAM_{t-1} + \beta_5 SIZE_{t-1} + \beta_6 MB_{t-1} \\ & + \beta_7 ADJ\_ROA_{t-1} + \beta_8 LEV_{t-1} + \beta_9 RD\_INT_{t-1} + \beta_{10} AD\_IND\_INT_{t-1} \quad (7) \\ & + \beta_{11} GOVERNANCE_{t-1} + \beta_{12} BIG4_{t-1} + \beta_{13} FIRM\_AGE_{t-1} + \epsilon_t, \end{aligned}$$

$$\begin{aligned} RAM\_PROXY_t = {} & \beta_0 + \beta_1 CSR\_DUM + \beta_2 CSR\_DUM\_EVENT\_\sharp + \beta_3 CSR\_SCORE \\ & + \beta_4 ABS\_DA_{t-1} + \beta_5 SIZE_{t-1} + \beta_6 MB_{t-1} + \beta_7 ADJ\_ROA_{t-1} \\ & + \beta_8 LEV_{t-1} + \beta_9 RD\_INT_{t-1} + \beta_{10} AD\_IND\_INT_{t-1} \quad (8) \\ & + \beta_{11} GOVERNANCE_{t-1} + \beta_{12} BIG4_{t-1} + \beta_{13} FIRM\_AGE_{t-1} + \epsilon_t, \end{aligned}$$

where, CSR_DUM is a dummy variable that equals to 1 if pre-disaster CSR performance is less than p(25) (between p(25) and p(75); or more than p(75)) of the distribution; $CSR\_DUM\_EVENT\_\sharp = CSR\_DUM * aftertreat\_sic2\_\sharp$ The rest of the variables are as described in Appendix A. We cluster standard errors at the two-digit SIC level and use firm and year fixed effects.

4 Results

4.1 Descriptive Statistics

In Table 1, we present the sample distribution by the two-digit SIC code industry. The most heavily represented industry is Business Services (SIC code 73, 13.57%), followed by Chemical and Allied Products (SIC code 28, 11.32%), and Electronic and Other Electronic

Equipment (SIC code 36, 8.69%). Industry distribution in the sample is consistent with prior research (Kim et al., 2012).

Table 2 reports descriptive statistics for selected variables. All variables are defined in Appendix A. On average, firms in the sample are socially irresponsible and have CSR_SCORE less than 0 (CSR_SCORE mean is -0.17). By the construction, the means of earnings management proxies are 0.

The mean value of ADJ_ROA is 0.03, indication that that on average our sample firms are profitable than their industry peers. 90% of the firms is audited by the Big 4 accounting firms. On average, firms' R&D (advertising) expenditures are 17% (1%) of their net sales. FIRM_AGE 2.64 means, that the average age of the firms in our sample is 13 years.

Table 3 presents Pearson correlations. CSR_SCORE has negative correlation with the absolute value of discretionary accruals and abnormal production costs. There is positive correlation between CSR proxy and abnormal cash flow from operations (AB_CFO), abnormal discretionary expenses (AB_EXP), and COMBINED_RAM. Overall, our descriptive statistics and correlations are consistent with the prior research (Kim et al., 2012).

4.2 Market Reaction and the Relation between CSR and FRQ

Table 4 presents market reaction on the technological disasters. Both, in the short and long run treated firms experience decrease in ROA, ROE, and sales growth. The effect is strong for the long run. These results supports the idea that firms in the treated industries experience a negative spillover effect.

Tables 5 and 6 report how treated firms change their FRQ in the post-disasters period. We do not find evidence that treated firms change their earnings management in response to the disasters (Table 5). On the other hand, firms change the readability of their financial disclosure in the post-treatment period. Specifically, they decrease the amount of disclosure (proxied by NUMWORDS and NFileSize) and decrease readability (proxied by bogindex).

Table 7 tabulates results for the change in CSR performance after the disasters. On average, firms improve CSR performance by increasing (decreasing) one strength (concern) dimension. The result is more pronounced in the long run and mainly driven by environment, diversity, and community dimensions (coefficients are 0.412, 0,244, and 0,194, respectively). The results support the hypothesis that treated firms respond to the technological disasters by increasing CSR performance.

4.3 Pre-Disaster CSR and Firms' Reaction

Tables 8 and 9 presents firms' response depending on the pre-disaster level of CSR (equations 6-8). We have three groups: firms with CSR performance that is less than p (25); firms with CSR performance between 25 and 75 quintiles; and firms with CSR performance higher than p (75) (comparing with the industry peers in the year before the disaster). The results in Table 8 show that the results in Table 7 are mainly driven by the firms with low pre-disaster CSR. On average, in the long run firms with pre-disaster CSR performance lower than p (25) increase (decrease) CSR performance for 3 strength (concern) dimensions. Again, firms improve CSR_SCORE through environment, diversity, and community dimensions. Firms with high pre-disaster CSR (greater than p (75)).

5 Robustness Checks

Table 10 and Figure 1 provide evidence to check the robustness of the main results of the paper. Following prior studies (Atanasov and Black, 2015; Flammer and Kacperczyk, 2015) we construct leads and lags model. Table 10 presents treatment dynamics of the technological disasters on the change in CSR performance. The results show that treatment is not anticipated by the firms (coefficients before the treatment are insignificant and close to zero).

To further enhance the credibility of our results, we next conduct a placebo test. For each year of the events we randomly assign treated industry. Then we estimate equation 5. We repeat this exercise 1000 times and plot the discretized probability density of the placebo coefficients in Figure 1. The graph shows that the placebo coefficient largely follows a normal distribution centered at zero (mean = -0.14).

6 Conclusion

This paper extends understanding of how firms respond to the CSR-disasters. We propose a set of technological disasters as a proxy for CSR-disasters. We show that firms in the industries that are involved in the disasters react to these events through improvement in CSR performance and textual disclosure. However, these firms decrease readability (proxied by Bog Index) in the post-treatment period. Further, we show that pre-disaster level of CSR affects firms' behavior in the post-disaster period. Firms with low pre-disaster CSR performance improve their CSR performance and FRQ in the post-treatment period. In contrast, firms with high CSR before the disasters, decrease their CSR performance in the following disaster period.

Overall, our results are consistent with "transparent financial reporting" hypothesis (Kim et al., 2012). According to this hypothesis managers with high ethical standards improve CSR performance which leads to higher quality of financial reporting.

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Table 1 Sample Description: Distribution of Firm-Year Observations by Industry

Two-Digit SIC	**# of Obs.**	**% of Sample**	**Cumulative Percent**
10	80	0.46	0.46
13	739	4.28	4.75
15	146	0.85	5.59
16	69	0.4	5.99
20	481	2.79	8.78
23	192	1.11	9.89
24	120	0.7	10.59
25	120	0.7	11.28
26	207	1.2	12.48
27	208	1.21	13.69
28	1,954	11.32	25.01
29	95	0.55	25.56
30	167	0.97	26.53
31	10	0.06	26.58
32	99	0.57	27.16
33	278	1.61	28.77
34	245	1.42	30.19
35	1,208	7	37.19
36	1,500	8.69	45.88
37	561	3.25	49.13
38	1,224	7.09	56.22
39	164	0.95	57.17
42	171	0.99	58.16
44	11	0.06	58.22
45	138	0.8	59.02
48	601	3.48	62.51
49	917	5.31	67.82
50	389	2.25	70.07
51	228	1.32	71.39
53	176	1.02	72.41
54	129	0.75	73.16
55	170	0.98	74.15
56	328	1.9	76.05
57	33	0.19	76.24
58	307	1.78	78.02
59	367	2.13	80.14
72	10	0.06	80.2
73	2,342	13.57	93.77

(Continued on the next paper)

78	21	0.12	93.89
79	211	1.22	95.12
80	361	2.09	97.21
82	80	0.46	97.67
87	392	2.27	99.94
99	10	0.06	100
Total	**17,259**	**100**	

Table 2 Descriptive Statistics of Selected Variables

VARIABLES	(1) N	(2) mean	(3) sd	(4) p25	(5) p50	(6) p75
CSR_SCORE	17,259	-0.17	2.17	-2.00	0.00	1.00
ABS_DA	17,065	0.05	0.06	0.01	0.03	0.07
AB_CFO	17,259	0.00	0.10	-0.05	0.00	0.05
AB_PROD	17,259	0.00	0.18	-0.09	0.00	0.08
AB_EXP	17,259	0.00	0.19	-0.09	0.00	0.06
COMBINED_RAM	17,259	0.00	0.36	-0.19	-0.02	0.17
SIZE	17,239	7.12	1.53	6.00	6.92	8.04
MB	17,186	3.13	4.16	1.45	2.24	3.68
ADJ_ROA	17,259	0.03	0.15	0.01	0.05	0.10
LEV	17,188	0.21	0.20	0.01	0.18	0.33
RD_INT	17,166	0.17	0.76	0.00	0.00	0.08
AD_IND_INT	17,166	0.01	0.03	0.00	0.00	0.01
CH	17,259	0.21	0.22	0.04	0.13	0.30
ROA	17,259	0.02	0.14	0.01	0.05	0.08
ROE	17,256	0.07	0.43	0.02	0.11	0.20
SALE_G	17,143	0.14	0.32	0.00	0.09	0.21
BIG4	17,259	0.90	0.30	1.00	1.00	1.00
FIRM_AGE	17,259	2.64	0.97	2.08	2.71	3.33

Table 3 Correlations among CSR, Earnings Management Proxies, and Other Selected Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	ABS_DA	1															
2	AB_CFO	-0.0594*	1														
3	AB_PROD	0.0234*	-0.4643*	1													
4	AB_EXP	0.0975*	-0.0448*	-0.5798*	1												
5	COMBINED_RAM	0.0220*	0.4806*	-0.9146*	0.7856*	1											
6	SIZE	-0.2002*	0.1737*	-0.1251*	0.0752*	0.1473*	1										
7	MB	0.0852*	0.0772*	-0.1149*	0.1424*	0.1495*	0.1329*	1									
8	LEV	-0.0700*	-0.1096*	0.0624*	-0.0529*	-0.0889*	0.1078*	-0.0673*	1								
9	RD_INT	0.1951*	-0.1851*	0.1440*	0.0701*	-0.0847*	-0.1222*	0.1015*	-0.0389*	1							
10	AD_IND_INT	0.0153	-0.0106	-0.1597*	0.2713*	0.2128*	0.0469*	0.0632*	0.0033	-0.0291*	1						
11	CH	0.2745*	0.0126	-0.0745*	0.1820*	0.1344*	-0.2097*	0.1924*	-0.3583*	0.4444*	0.0472*	1					
12	ROA	-0.3329*	0.4568*	-0.2331*	-0.0923*	0.1965*	0.3091*	-0.0058	-0.1051*	-0.5356*	0.0023	-0.3173*	1				
13	ROE	-0.1766*	0.2408*	-0.1112*	-0.0454*	0.0953*	0.1956*	-0.0423*	-0.0593*	-0.2508*	0.0135	-0.1707*	0.5093*	1			
14	SALE_G	0.1852*	-0.0339*	0.0174	0.1285*	0.0525*	-0.0153	0.1456*	-0.0396*	0.0630*	-0.0006	0.1655*	-0.0123	0.0276*	1		
15	CSR SCORE	-0.0703*	0.0929*	-0.1227*	0.0979*	0.1353*	0.3790*	0.0705*	-0.0271*	-0.0209*	0.1271*	-0.0001	0.0935*	0.0622*	-0.0612*	1	
16	FIRM_AGE	-0.1926*	0.0338*	-0.0007	-0.0754*	-0.0279*	0.3155*	-0.0902*	0.0483*	-0.1175*	-0.0492*	-0.2654*	0.1519*	0.0873*	-0.2173*	0.1642*	1

* Indicate significance at the 0.01 level, based on a two-tailed test.

Table 4 Market reaction on the accidents

VARIABLES	(1) ROA	(2) ROE	(3) SALE_G	(4) ROA	(5) ROE	(6) SALE_G
aftertreat_sic2_0	-0.00826	-0.0489**	-0.0349			
	(0.00692)	(0.0210)	(0.0338)			
l_SIZE_w	0.0250***	-0.00554	0.0397**	0.0252***	-0.00422	0.0410**
	(0.00323)	(0.0207)	(0.0153)	(0.00319)	(0.0206)	(0.0153)
l_MB_w	0.00191***	0.0238*	0.00377**	0.00190***	0.0238*	0.00374**
	(0.000428)	(0.0140)	(0.00152)	(0.000427)	(0.0140)	(0.00151)
l_LEV_w	0.0209	0.0311	0.0666	0.0210	0.0311	0.0667
	(0.0192)	(0.0948)	(0.0642)	(0.0193)	(0.0956)	(0.0643)
l_CH_w	0.0547**	-0.00670	0.0634	0.0544**	-0.00743	0.0623
	(0.0260)	(0.0779)	(0.0447)	(0.0261)	(0.0776)	(0.0457)
l_COMBINED_RAM	0.0397***	0.0543	-0.0198	0.0396***	0.0541	-0.0201
	(0.00574)	(0.0345)	(0.0164)	(0.00569)	(0.0344)	(0.0165)
l_ABS_DA	0.0395**	0.192	-0.0123	0.0400**	0.193	-0.0114
	(0.0170)	(0.175)	(0.0774)	(0.0169)	(0.175)	(0.0779)
l_RD_INT_w	-0.0262***	-0.0266***	0.203***	-0.0261***	-0.0264***	0.203***
	(0.00407)	(0.00843)	(0.00659)	(0.00407)	(0.00842)	(0.00659)
l_AD_IND_INT_w	-0.288*	1.179*	1.421	-0.285*	1.185*	1.427
	(0.154)	(0.616)	(0.902)	(0.154)	(0.615)	(0.899)
l_BIG4	-0.0144*	0.0311	0.00971	-0.0140*	0.0324	0.0110
	(0.00755)	(0.0351)	(0.0187)	(0.00757)	(0.0354)	(0.0179)
l_FIRM_AGE_w	0.00140	0.0211	-0.0733***	0.000621	0.0179	-0.0767***
	(0.00765)	(0.0180)	(0.0212)	(0.00769)	(0.0187)	(0.0209)
aftertreat_sic2				-0.0146***	-0.0666***	-0.0629***
				(0.00482)	(0.0171)	(0.0155)
Constant	-0.153***	-0.0742	-0.00651	-0.153***	-0.0775	-0.00966
	(0.0185)	(0.100)	(0.140)	(0.0185)	(0.0996)	(0.135)
Observations	13,776	13,775	13,776	13,776	13,775	13,776
Adjusted R-squared	0.584	0.271	0.310	0.584	0.271	0.311
r clust sic2	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES
i.gvkey	YES	YES	YES	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Variables are defined in Appendix

Table 5 Accrual-based earnings management and real activities manipulation in the post-disaster period

VARIABLES	(1) ABS_DA	(2) COMBINED_RAM	(3) AB_CFO	(4) AB_PROD	(5) AB_EXP	(6) ABS_DA	(7) COMBINED_RAM	(8) AB_CFO	(9) AB_PROD	(10) AB_EXP
aftertreat_sic2_0	-0.00490	-0.0110	-0.000239	0.00629	-0.00421*					
	(0.00543)	(0.0107)	(0.00522)	(0.00473)	(0.00225)					
l_SIZE_w	-0.00547**	-0.0150	0.00359	0.00442	-0.0129**	-0.00547**	-0.0149	0.00364	0.00441	-0.0129**
	(0.00202)	(0.0103)	(0.00264)	(0.00504)	(0.00620)	(0.00202)	(0.0105)	(0.00265)	(0.00511)	(0.00627)
l_ADJ_ROA_w	-0.00183	0.163***	0.119***	-0.0802***	-0.0444	-0.00185	0.163***	0.118***	-0.0801***	-0.0446
	(0.00837)	(0.0322)	(0.0101)	(0.00963)	(0.0285)	(0.00839)	(0.0326)	(0.0102)	(0.00987)	(0.0286)
l_MB_w	0.000401	0.00378**	0.000650	-0.00105	0.00176***	0.000400	0.00378**	0.000649	-0.00105	0.00176***
	(0.000341)	(0.00172)	(0.000603)	(0.000927)	(0.000556)	(0.000342)	(0.00172)	(0.000604)	(0.000928)	(0.000556)
l_LEV_w	-0.0129	-0.115**	-0.00107	0.0264	-0.0811***	-0.0129	-0.115**	-0.00104	0.0265	-0.0811***
	(0.00890)	(0.0491)	(0.0128)	(0.0233)	(0.0257)	(0.00888)	(0.0493)	(0.0128)	(0.0233)	(0.0258)
l_COMBINED_RAM	-0.00769					-0.00769				
	(0.00788)					(0.00788)				
l_RD_INT_w	0.000467	-0.00474**	-0.00211	0.00315**	-0.000401	0.000465	-0.00474**	-0.00210	0.00315**	-0.000398
	(0.000939)	(0.00196)	(0.00165)	(0.00133)	(0.00276)	(0.000941)	(0.00197)	(0.00166)	(0.00134)	(0.00275)
l_AD_IND_INT_w	0.105	0.939***	-0.142	-0.185	1.087***	0.105	0.939***	-0.142	-0.185	1.087***
	(0.135)	(0.301)	(0.108)	(0.172)	(0.196)	(0.135)	(0.301)	(0.108)	(0.172)	(0.196)
l_BIG4	0.00701***	-0.000705	-0.00839	0.00142	0.0135	0.00702***	-0.000572	-0.00834	0.00139	0.0135
	(0.00213)	(0.0258)	(0.00515)	(0.0132)	(0.0129)	(0.00213)	(0.0257)	(0.00512)	(0.0132)	(0.0129)
l_FIRM_AGE_w	-0.00664**	-0.00187	-0.00475	-0.00124	0.00327	-0.00660**	-0.00203	-0.00487	-0.00127	0.00319
	(0.00298)	(0.00879)	(0.00451)	(0.00567)	(0.00515)	(0.00295)	(0.00913)	(0.00464)	(0.00580)	(0.00512)
l_GOVERNANCE_w	0.000202	0.0103**	0.000784	-0.00282	0.00642**	0.000212	0.0103**	0.000795	-0.00283	0.00644**
	(0.000805)	(0.00415)	(0.00161)	(0.00180)	(0.00260)	(0.000797)	(0.00410)	(0.00160)	(0.00178)	(0.00260)
l_ABS_DA		0.0881**	0.0628***	-0.0418***	-0.0116		0.0882**	0.0628***	-0.0418***	-0.0115
		(0.0417)	(0.0107)	(0.0134)	(0.0280)		(0.0415)	(0.0107)	(0.0133)	(0.0279)
aftertreat_sic2						-0.00132	-0.00674	-0.00191	0.00187	-0.00275
						(0.00402)	(0.0145)	(0.00548)	(0.00661)	(0.00358)
Constant	0.0930***	0.108	-0.00535	-0.0279	0.0667	0.0929***	0.108	-0.00547	-0.0278	0.0666
	(0.0181)	(0.0709)	(0.0266)	(0.0355)	(0.0479)	(0.0182)	(0.0714)	(0.0266)	(0.0356)	(0.0480)
Observations	13,779	13,776	13,776	13,776	13,776	13,779	13,776	13,776	13,776	13,776
Adjusted R-squared	0.267	0.791	0.507	0.754	0.814	0.267	0.791	0.507	0.754	0.814
r clust sic2	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.gvkey	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Variables are defined in Appendix A

Table 6 Readability in the post-disaster period

VARIABLES	(1) TONE	(3) NUMWORDS	(6) NFileSize	(7) bogindex	(8) TONE	(10) NUMWORDS	(13) NFileSize	(14) bogindex
aftertreat_sic2_0	0.000547***	-0.147***	-0.144***	0.139				
	(0.000142)	(0.0451)	(0.0400)	(0.0843)				
l_EARN	0.00109***	-0.136**	-0.132**	-0.462**	0.00110***	-0.139**	-0.135**	-0.447**
	(0.000383)	(0.0573)	(0.0518)	(0.189)	(0.000384)	(0.0571)	(0.0516)	(0.186)
l_RET	0.000527***	-0.0489***	-0.0469***	-0.225***	0.000527***	-0.0495***	-0.0474***	-0.213***
	(8.68e-05)	(0.0109)	(0.0105)	(0.0605)	(8.81e-05)	(0.0110)	(0.0107)	(0.0581)
l_SIZE	-6.71e-05	0.0377**	0.0367**	0.206**	-7.25e-05	0.0403**	0.0393**	0.184*
	(0.000129)	(0.0165)	(0.0164)	(0.0977)	(0.000128)	(0.0157)	(0.0156)	(0.0990)
l_BM	-0.000103***	0.0104	0.0107	0.0747**	-0.000103***	0.0106	0.0109	0.0718**
	(3.85e-05)	(0.00822)	(0.00792)	(0.0346)	(3.87e-05)	(0.00810)	(0.00780)	(0.0351)
l_STD_RET	-0.00409***	0.387**	0.381**	1.152*	-0.00412***	0.398**	0.392**	1.106*
	(0.000937)	(0.191)	(0.188)	(0.626)	(0.000945)	(0.192)	(0.189)	(0.599)
l_AGE	0.000190	0.0417	0.0481	0.0260	0.000194	0.0400	0.0464	0.0413
	(0.000190)	(0.0328)	(0.0319)	(0.147)	(0.000188)	(0.0336)	(0.0327)	(0.148)
l_BUSSEG	0.000209	-0.0113	-0.0110	0.0433	0.000180	-0.00181	-0.00166	0.00504
	(0.000361)	(0.0529)	(0.0519)	(0.220)	(0.000356)	(0.0508)	(0.0498)	(0.217)
l_GEOSEG	0.000168	0.0115	0.0141	-0.401**	0.000210	-0.00271	9.19e-05	-0.339**
	(0.000173)	(0.0378)	(0.0376)	(0.166)	(0.000177)	(0.0364)	(0.0359)	(0.163)
l_D_EARN	-0.000325**	0.0427	0.0390	0.167*	-0.000330**	0.0442	0.0404	0.161*
	(0.000159)	(0.0381)	(0.0346)	(0.0908)	(0.000158)	(0.0378)	(0.0343)	(0.0893)
l_AFE	0.000888	0.134	0.141	0.691	0.000912	0.128	0.135	0.692
	(0.000838)	(0.0991)	(0.0959)	(0.474)	(0.000840)	(0.0998)	(0.0965)	(0.473)
l_AF	-0.00104**	0.0313	0.0336	-0.0382	-0.00102**	0.0246	0.0269	0.00885
	(0.000410)	(0.0792)	(0.0762)	(0.263)	(0.000413)	(0.0777)	(0.0748)	(0.265)
l_LOSS	-0.000737***	0.0396*	0.0356*	0.324***	-0.000733***	0.0392*	0.0352*	0.317***
	(0.000123)	(0.0211)	(0.0207)	(0.0902)	(0.000122)	(0.0209)	(0.0205)	(0.0923)
aftertreat_sic2					0.000341	-0.131***	-0.129***	0.758**
					(0.000498)	(0.0484)	(0.0452)	(0.305)
Constant	-0.00916***	9.366***	11.42***	82.74***	-0.00914***	9.356***	11.41***	82.82***
	(0.00101)	(0.123)	(0.119)	(0.688)	(0.00100)	(0.119)	(0.115)	(0.695)
Observations	19,315	19,315	19,315	19,219	19,315	19,315	19,315	19,219
R-squared	0.577	0.368	0.368	0.891	0.577	0.368	0.368	0.891
r clust sic2	YES	YES	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES	YES	YES
i.cusip	YES	YES	YES	YES	YES	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test.
Variables are defined in Appendix A

Table 7 CSR in the post-disaster period

VARIABLES	(1) CSR_SCORE	(2) ENVIRONMENT	(3) COMMUNITY	(4) DIVERSITY	(5) EMPLOYEE	(6) PRODUCT	(7) CSR_SCORE	(8) ENVIRONMENT	(9) COMMUNITY	(10) DIVERSITY	(11) EMPLOYEE	(12) PRODUCT
aftertreat_sic2_0	0.821**	0.474*	-0.000810	0.197**	-0.114***	0.165**						
	(0.343)	(0.265)	(0.0357)	(0.0761)	(0.0410)	(0.0774)						
l_SIZE_w	0.0240	-0.0205	-0.00436	0.0284	0.0106	0.00731	0.00251	-0.0269	-0.00841	0.0242	0.00870	0.00503
	(0.0516)	(0.0175)	(0.00951)	(0.0223)	(0.0214)	(0.0110)	(0.0599)	(0.0201)	(0.00891)	(0.0231)	(0.0216)	(0.0110)
l_ROA_w	0.141	0.0624	-0.0159	-0.146**	0.254***	0.0108	0.210	0.0827	-0.00252	-0.132**	0.260***	0.0180
	(0.178)	(0.0751)	(0.0337)	(0.0629)	(0.0808)	(0.0327)	(0.193)	(0.0858)	(0.0298)	(0.0639)	(0.0795)	(0.0319)
l_MB_w	-0.00160	0.00184	0.000433	-0.00193	-0.00263	0.000662	-0.00116	0.00201	0.000493	-0.00184	-0.00262	0.000721
	(0.00441)	(0.00158)	(0.000530)	(0.00194)	(0.00265)	(0.000985)	(0.00443)	(0.00159)	(0.000482)	(0.00192)	(0.00265)	(0.000987)
l_LEV_w	0.0595	0.00451	0.0788*	0.0630	-0.129	0.0596	0.0684	0.00750	0.0802	0.0647	-0.129	0.0606
	(0.194)	(0.0682)	(0.0440)	(0.0911)	(0.0896)	(0.0447)	(0.197)	(0.0673)	(0.0487)	(0.0899)	(0.0893)	(0.0456)
l_CH_w	0.130	0.151*	0.0388	-0.00756	-0.0678	0.0189	0.142	0.150*	0.0443	-0.00608	-0.0629	0.0185
	(0.283)	(0.0749)	(0.0361)	(0.124)	(0.126)	(0.0655)	(0.274)	(0.0747)	(0.0392)	(0.124)	(0.124)	(0.0648)
aftertreat_sic2							1.207**	0.412*	0.194***	0.244***	0.0660	0.145
							(0.597)	(0.216)	(0.0329)	(0.0624)	(0.203)	(0.122)
Constant	-0.534	-0.0403	0.0202	-0.109	-0.227	-0.173**	-0.399	0.000925	0.0456	-0.0820	-0.216	-0.159**
	(0.337)	(0.119)	(0.0580)	(0.133)	(0.154)	(0.0720)	(0.400)	(0.143)	(0.0523)	(0.140)	(0.156)	(0.0732)
Observations	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790
Adjusted R-squared	0.617	0.482	0.485	0.698	0.488	0.513	0.622	0.483	0.489	0.699	0.488	0.513
r clust sic2	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.gvkey	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Variables are defined in Appendix A

Table 8 CSR in the post-disaster period for firms with different pre-disaster CSR performance

VARIABLES	(1) CSR_S CORE	(2) ENVIRONME NT	(3) COMMUNI TY	(4) DIVERSIT Y	(5) EMPLOY EE	(6) PRODUC T	(7) CSR_SCO RE	(8) ENVIRONME NT	(9) COMMUNI TY	(10) DIVERSIT Y	(11) EMPLOY EE	(12) PRODUC T
CSR < P(25)												
CSR_DUM_EVENT_0	1.677**	0.856**	0.0264	0.638***	-0.457**	0.351						
	(0.644)	(0.364)	(0.144)	(0.0791)	(0.175)	(0.256)						
CSR_DUM_EVENT							3.121***	0.779***	0.332***	0.666***	0.536*	0.469
							(0.803)	(0.218)	(0.0647)	(0.110)	(0.294)	(0.314)
P(25)<=CSR < =P(75)												
CSR_DUM_EVENT_0	0.973**	0.528	-0.00424	0.226**	0.0134	0.120**						
	(0.455)	(0.347)	(0.0370)	(0.101)	(0.0583)	(0.0552)						
CSR_DUM_EVENT							1.082	0.425	0.172*	0.234*	0.0842	0.0633
							(0.915)	(0.310)	(0.0920)	(0.128)	(0.286)	(0.0902)
CSR > P(75)												
CSR_DUM_EVENT_0	-0.146	0.0447	0.0241	-0.0734	-0.296***	0.132***						
	(0.189)	(0.0685)	(0.0209)	(0.119)	(0.0456)	(0.0272)						
CSR_DUM_EVENT							-0.672**	-0.0644	0.0505	-0.223	-0.560***	0.118*
							(0.279)	(0.0565)	(0.0715)	(0.218)	(0.0417)	(0.0682)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790	16,790
r clust sic2	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.gvkey	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Variables are defined in Appendix A

Table 9 Accrual-based earnings management and real activities manipulation in the post-disaster period for firms with different pre-disaster CSR performance

VARIABLES	(1) ABS_DA	(2) COMBINED_RAM	(3) AB_CFO	(4) AB_PROD	(5) AB_EXP	(6) ABS_DA	(7) COMBINED_RAM	(8) AB_CFO	(9) AB_PROD	(10) AB_EXP
CSR < P(25)										
CSR_DUM_EVENT_0	-0.000680*	0.0108**	0.00311*	-0.00919***	-0.00143					
	(0.000389)	(0.00412)	(0.00156)	(0.00190)	(0.000867)					
CSR_DUM_EVENT						-0.00180	0.0230*	0.00814	-0.0153**	-0.000433
						(0.00202)	(0.0132)	(0.00493)	(0.00753)	(0.00103)
P(25)<=CSR < =P(75)										
CSR_DUM_EVENT_0	0.00104	-0.00201	-0.00199	0.000832	0.00115					
	(0.00251)	(0.00805)	(0.00360)	(0.00471)	(0.000824)					
CSR_DUM_EVENT						0.00141	-0.0126	-0.00388	0.00749	-0.00144
						(0.00321)	(0.0135)	(0.00575)	(0.00713)	(0.00109)
CSR > P(75)										
CSR_DUM_EVENT_0	-0.00365**	-0.00602	-0.000371	0.00544**	0.000202					
	(0.00150)	(0.00365)	(0.00182)	(0.00220)	(0.00162)					
CSR_DUM_EVENT						-0.00253*	-0.000502	-0.000415	0.00102	0.000736
						(0.00139)	(0.00604)	(0.00131)	(0.00339)	(0.00335)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	13,779	13,776	13,776	13,776	13,776	13,779	13,776	13,776	13,776	13,776
r clust sic2	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.fyear	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
i.gvkey	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

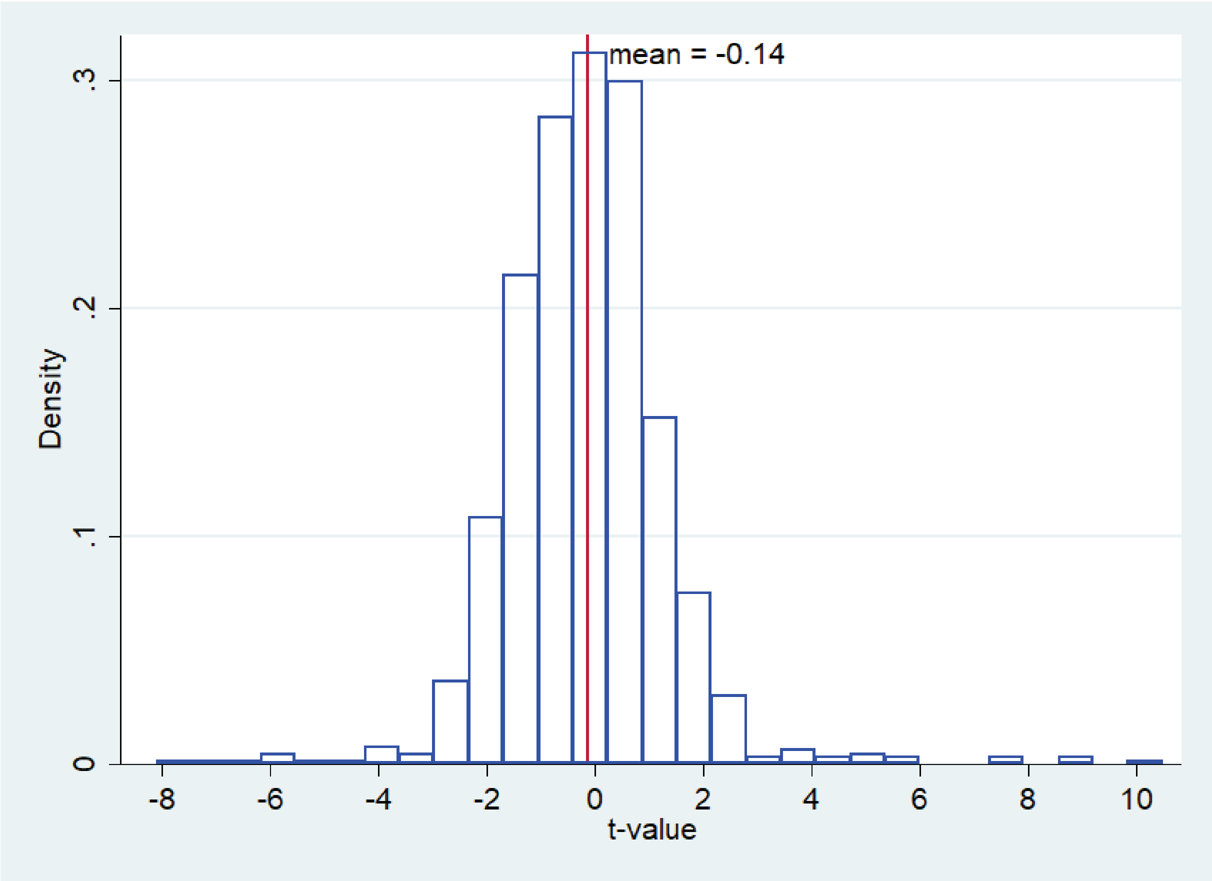
*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Variables are defined in Appendix A

Table 10 Leads and lags model

VARIABLES	(1) CSR_SCORE	(2) CSR_SCORE	(3) CSR_SCORE
aftertreat_sic2_-3	-0.0173	-0.0162	-0.0482
	(0.0682)	(0.0644)	(0.0441)
aftertreat_sic2_-2	0.0670	0.0710	0.0342
	(0.0721)	(0.0724)	(0.111)
aftertreat_sic2_-1	-0.0249	-0.0208	-0.0591
	(0.0726)	(0.0728)	(0.112)
aftertreat_sic2_0	1.053**	1.024**	0.781***
	(0.481)	(0.462)	(0.132)
aftertreat_sic2_+1	0.406	0.468	
	(0.302)	(0.282)	
aftertreat_sic2_1+			1.082**
			(0.426)
aftertreat_sic2_+2	1.393**		
	(0.565)		
aftertreat_sic2_2+		1.204*	
		(0.614)	
aftertreat_sic2_3+	0.483**		
	(0.203)		
l_SIZE_w	0.00795	0.00657	0.00737
	(0.0580)	(0.0587)	(0.0583)
l_MB_w	-0.00145	-0.00127	-0.00121
	(0.00441)	(0.00444)	(0.00443)
l_LEV_w	0.0877	0.0771	0.0699
	(0.189)	(0.194)	(0.194)
l_CH_w	0.135	0.133	0.137
	(0.274)	(0.274)	(0.273)
Constant	-0.433	-0.423	-0.429
	(0.387)	(0.393)	(0.390)
Observations	16,790	16,790	16,790
Adjusted R-squared	0.623	0.622	0.622
r clust sic2	YES	YES	YES
i.fyear	YES	YES	YES
i.gvkey	YES	YES	YES

*, **, *** Indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively, based on a two-tailed test. Aftertreat_sic2_-3 (aftertreat_sic2_-2 or aftertreat_sic2_-1) is a dummy variable that equals to 1 for the treated industries three (two or one) years before the disaster and 0 otherwise. aftertreat_sic2_+1 (aftertreat_sic2_+2) is a dummy variable that equals to 1 for the treated industries one (two) year(s) after the disaster and 0 otherwise. aftertreat_sic2_1+ (aftertreat_sic2_2+ or aftertreat_sic2_3+) is a dummy variable that equals to 1 for the treated industries for all years except the first one (the firms two; or the first three) after the disaster and 0 otherwise. The rest of the variables are as described in Appendix A.

Figure 1 Placebo test. Probability density function of the placebo coefficients (random industries)



APPENDIX A

Definitions of Variables

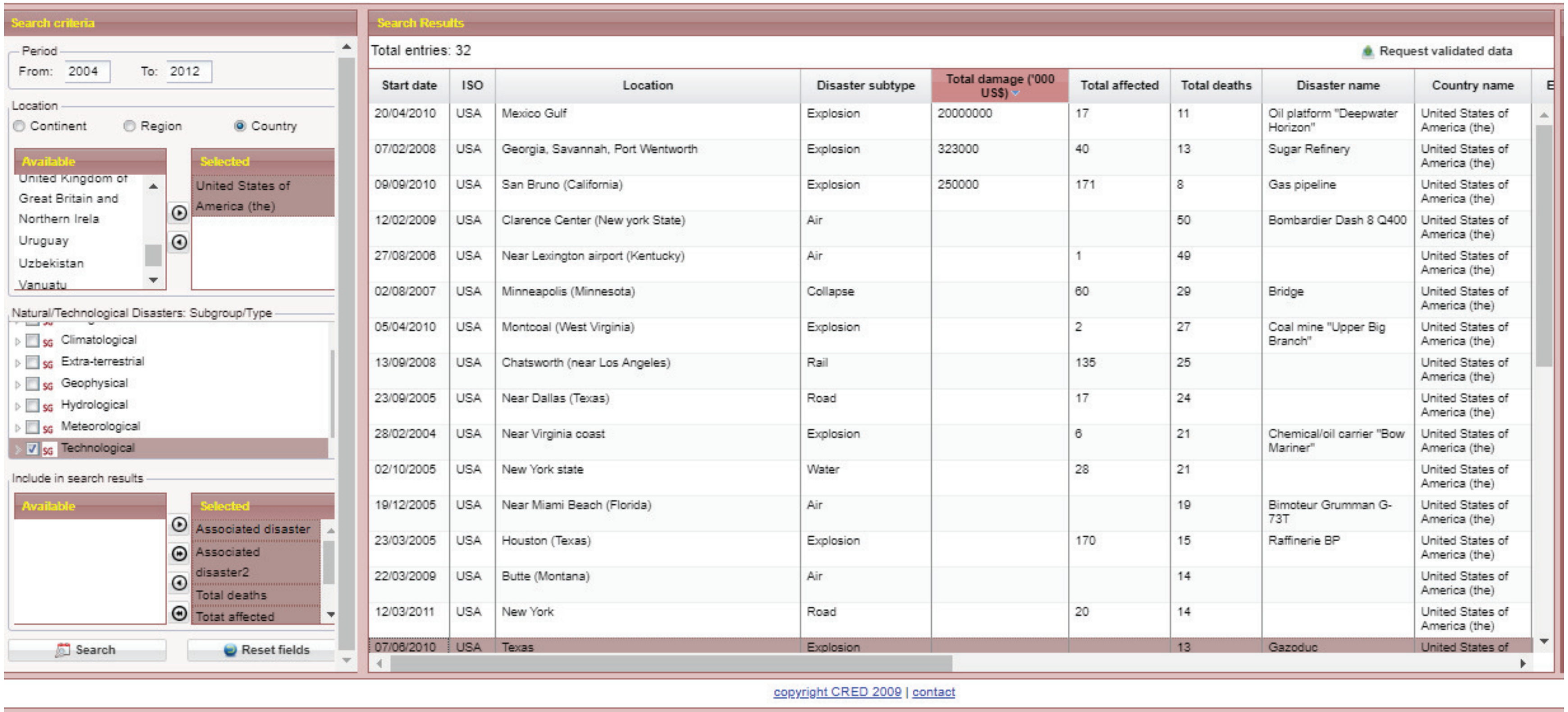
VARIABLE	DEFINITION
aftertreat_sic2_0	Is a dummy variable that equals to 1 for the treated industries in the year of the disaster and 0 otherwise.
aftertreat_sic2	Is a dummy variable that equals to 1 for the treated industries in the years after the disasters (including the year of the disaster) and 0 otherwise.
CSR_SCORE	Net score of CSR ratings, measured as total strengths minus total concerns in five social rating categories of KLD ratings data: community, diversity, employee relations, environment, and product.
ENVIRONMENT	Net score of CSR ratings, measured as environment strength minus environment concerns of KLD rating data.
COMMUNITY	Net score of CSR ratings, measured as community strength minus community concerns of KLD rating data.
DIVERSITY	Net score of CSR ratings, measured as diversity strength minus diversity concerns of KLD rating data.
EMPLOYEE	Net score of CSR ratings, measured as employee relations strength minus employee relations concerns of KLD rating data.
PRODUCT	Net score of CSR ratings, measured as product strength minus product concerns of KLD rating data.
GOVERNANCE	Net score of CSR ratings, measured as governance strength minus governance concerns of KLD rating data.
STRENGHTS	Net score of CSR ratings, measured as sum of total strengths in five social rating categories of KLD ratings data: community, diversity, employee relations, environment, and product.
INTERNAL	Net score of CSR ratings, measured as total strengths minus total concerns in two social rating categories of KLD ratings data: diversity and employee relations.
EXTERNAL	Net score of CSR ratings, measured as total strengths minus total concerns in three social rating categories of KLD ratings data: community, human rights, and environment.
HUMAN	Net score of CSR ratings, measured as human strength minus human concerns of KLD rating data.
CONCERNS	Net score of CSR ratings, measured as sum of total concerns in five social rating categories of KLD ratings data: community, diversity, employee relations, environment, and product.
AAC	Signed discretionary accruals, where discretionary accruals are computed through the cross-sectional modified Jones model adjusted for performance (Kim et al., 2012).
ABS_DA	Absolute value of discretionary accruals, where discretionary accruals are computed through the cross-sectional modified Jones model adjusted for performance (Kim et al., 2012).

(Continued on the next paper)

SIZE	Natural logarithm of the market value of equity (MVE) (Kim et al., 2012).
MB	Market-to-book equity ratio, measured as MVE/BVE, where BVE is the book value of equity (Kim et al., 2012).
ADJ_ROA	Industry-adjusted ROA, where ROA is measured as income before extraordinary items, scaled by lagged total assets (Kim et al., 2012).
LEV	Long-term debt scaled by total assets (Kim et al., 2012).
RD_INT	R&D intensity (R&D expense/net sales) for the year (Kim et al., 2012).
AD_IND_INT	Advertising intensity for the two-digit SIC code industry for the year (Kim et al., 2012).
AB_CFO	The level of abnormal cash flows from operations (Kim et al., 2012).
AB_PROD	The level of abnormal production costs, where production costs are defined as the sum of cost of goods sold and the change in inventories (Kim et al., 2012).
AB_EXP	The level of abnormal discretionary expenses, where discretionary expenses are the sum of R&D expenses, advertising expenses, and SG&A expenses (Kim et al., 2012).
COMBINED_RAM	COMBINED_RAM = AB_CFO - AB_PROD + AB_EXP (Kim et al., 2012).
CH	Cash holding is the ratio of cash and short-term investments to the book value of assets (Flammer, 2015).
ROA	Is the ratio of income before extraordinary items to the book value of assets (Flammer, 2015).
ROE	Is the ratio of income before extraordinary items to the lagged Common/Ordinary Equity-Total
Ln_Q	Natural logarithm of Tobin's Q. Tobin's Q is proxied by market value of equity, total debt, preferred stock, and deferred taxes scaled by total assets.
RET_COMPUS	Market returns using Compustat data. (prcc_f-l.prcc_f)/l.prcc_f
SALE_G	Sales growth. (sale-l.sale)/l.sale
st_AF	Audit fees scaled by total fees.
St_NAF	Non audit fees scaled by total fees.
OPTIMISM	Positive number of words scaled by the total number of words in 10-k (n_positive/ n_words) (Loughran and McDonald, 2011)
TONE	The difference between total number of positive and negative words, scaled by the total number of words in 10-k(n_positive - n_negative)/ n_words (Loughran and McDonald, 2011)
NUMWORDS	Natural logarithm of the count of all words, where a word is any token appearing in the Master Dicitonary (Loughran and McDonald, 2011)
LITIGIOUS	Number of litigious words (Loughran and McDonald, 2011)
GFileSize	The total number of characters in the original filing (Loughran and McDonald, 2011).
NFileSize	the total number of characters in the filing after the Stage One Parse (Loughran and McDonald, 2011)
bogindex	The Bog Index (Bonsall et al., 2017)

APPENDIX B

EM-DAT Output



Start date	ISO	Location	Disaster subtype	Total damage ('000 US$)	Total affected	Total deaths	Disaster name	Country name
20/04/2010	USA	Mexico Gulf	Explosion	20000000	17	11	Oil platform "Deepwater Horizon"	United States of America (the)
07/02/2008	USA	Georgia, Savannah, Port Wentworth	Explosion	323000	40	13	Sugar Refinery	United States of America (the)
09/09/2010	USA	San Bruno (California)	Explosion	250000	171	8	Gas pipeline	United States of America (the)
12/02/2009	USA	Clarence Center (New york State)	Air			50	Bombardier Dash 8 Q400	United States of America (the)
27/08/2006	USA	Near Lexington airport (Kentucky)	Air		1	49		United States of America (the)
02/08/2007	USA	Minneapolis (Minnesota)	Collapse		60	29	Bridge	United States of America (the)
05/04/2010	USA	Montcoal (West Virginia)	Explosion		2	27	Coal mine "Upper Big Branch"	United States of America (the)
13/09/2008	USA	Chatsworth (near Los Angeles)	Rail		135	25		United States of America (the)
23/09/2005	USA	Near Dallas (Texas)	Road		17	24		United States of America (the)
28/02/2004	USA	Near Virginia coast	Explosion		6	21	Chemical/oil carrier "Bow Mariner"	United States of America (the)
02/10/2005	USA	New York state	Water		28	21		United States of America (the)
19/12/2005	USA	Near Miami Beach (Florida)	Air			19	Bimoteur Grumman G-73T	United States of America (the)
23/03/2005	USA	Houston (Texas)	Explosion		170	15	Raffinerie BP	United States of America (the)
22/03/2009	USA	Butte (Montana)	Air			14		United States of America (the)
12/03/2011	USA	New York	Road		20	14		United States of America (the)
07/06/2010	USA	Texas	Explosion			13	Gazoduc	United States of

APPENDIX C

MSCI ESG KLD STATS

The MSCI ESG KLD STATS (KLD) data is started in 1991 and is based on the assessment how well firms perform in environmental, social, and governance issues. KLD covers five universes that are presented in the Table A1.

Data Set Universe	Time Series	Number of Companies**	Inclusion in the Current Study
Universe A MSCI KLD 400 Social Index + MSCI USA Index	1991 - present	650	From 2003
Universe B Largest 1000 U.S. companies by market capitalization	2008-2013	1000 (*discounted**)	No
Universe C MSCI KLD 400 Social Index + 1000 Largest U.S. Companies	2001-2013	1100 (*discounted**)	No
Universe D MSCI USA IMI Index	2003-present	2400	Yes
Universe E Non-U.S. Universe	2013 - present	2600	No

Table A1. KLD Universes.

* Universes B and C have been discounted as of STATS-2014 Data Set

** Number of firms is an approximate average for the time series

RiskMetrics acquired KLD in 2009 and Morgan Stanley Capital International (MSCI) acquired RiskMetrics in 2010.

In 2010 the industry-based key issue rating model was introduced to KLD. Prior 2010 all of the positive ESG performance indicators were searched for all of the companies. Starting from 2010, all companies are assessed for limited set of industry specific positive ESG indicators.

We admit that our results can be affected by the change in the methodology in 2010.We acknowledge this caveat as follows.

First, we apply difference in difference approach (DiD) which eliminates two main concerns. First, if the conclusion is done only based on the difference between treated and control groups in the post-disaster period. In this case, the final result may capture only the permanent difference between treatment and control. Second, if the conclusion is done only based on the difference between treatment group before and after the disaster. This result can be driven by the trends in the database. Thus, if in 2009 or (and) 2010 some methodological aspects of KLD were changed, this difference is captured by the DiD design.

Second, we are consistent with the prior literature that uses KLD databases before and after 2010 and (or) 2011. Some selected examples are presented in Table A2.

Paper with KLD data	Time Period
Flammer et al., 2017 Strategic Managemt Journal	1991-2013
Petrenko et al., 2016 Strategic Management Journal	1997-2012
Marano et al., 2016 Journal of Management Studies	2007-2011

Table A2 KLD database in prior literature