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Corporate social responsibility and investor relationship management

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Abstract

Following the Fukushima Daiichi nuclear disaster, utilities firms increase their commitments to corporate social responsibility (CSR), emphasizing on addressing environmental concerns over non-environmental ones. The intensified focus on CSR is especially significant in utilities firms with substantial institutional ownerships. Concurrent to the increase in CSR, utilities firms also exhibit a decline in advertising expenditures, a trend more pronounced in firms facing more financial constraints. Our findings suggest that utilities firms substitute CSR for advertising following the Fukushima accident. This shift appears driven by investors' heightened focus on environmental issues in the aftermath of the accident.

KEYWORDS
advertising, corporate social responsibility, investor relation

1 | INTRODUCTION

Corporate social responsibility (CSR) compels firms to not only focus on enhancing shareholder value but also on their accountability to non-shareholding stakeholders. A growing trend towards an elevated commitment to CSR is evident in the current business landscape. Many academic studies have examined this trend. They propose that CSR can enhance firm value through multiple channels. For instance, a firm's commitment to CSR can signal trustworthiness to outsiders, reduce information risk, or win support from diverse stakeholders. Our study aligns with this literature and proposes an additional channel. We suggest that CSR allows firms to integrate with advertising to improve the effectiveness of their investor relations (IR) management during crises.

Both CSR and advertising can serve as potent tools for managing investor relations. Institutional investors have consistently exerted pressure on publicly traded firms to advance their CSR agenda (e.g., Chen et al., 2020; Dimson et al., 2015; Dyck et al., 2019). In response, a growing number of firms, including major industry players, regularly issue CSR reports to manage their relations with institutional investors. On the other hand, several academic studies have

demonstrated that advertising can also impact investors in financial markets. For instance, Grullon et al. (2004) show that advertising enhances stock liquidity. Chemmanur and Yan (2009) and Lou (2014) show that firms strategically utilize advertising to influence investor behavior in the lead-up to initial public offerings, seasoned equity offerings, and insider sales. More recently, Madsen and Niessner (2019) find that firms strategically employ advertising to sway investors, particularly around periods of positive earnings surprises. Liaukonyte and Zaldokas (2022) show that TV advertising can prompt investors to seek information in real-time, consequently sparking a surge in trading activities. Various marketing articles also link advertising to investor communication (see, e.g., Aspara & Amitav, 2015, Ernst et al., 2011, Joshi & Hanssens, 2010, etc.). Hence, both advertising and CSR can target investors in financial markets. Yet, it remains unclear whether CSR and advertising operate as independent policies within a firm, or whether they are integrated in managing investor relations. Our paper seeks to shed light on this intriguing question.

In the paper, we propose that firms could strategically utilize CSR alongside advertising to manage investor relations during crises. When an ESG-related shock happens so that a firm needs to cater more to socially responsible investors, it can substitute CSR for advertising to communicate more effectively with these investors. However, a challenge in studying the relationship between CSR and advertising is that both could be endogenously driven by factors such as new marketing campaigns or financial constraints. To address this potential endogeneity, we use in our study the Fukushima Daiichi nuclear accident in Japan in March 2011 as an exogenous shock to a sample of U.S. publicly traded firms.[1] The Fukushima Daiichi nuclear accident is an unfortunate and exogenous event that resulted in a widespread contamination with serious public health and environmental consequences. We argue that this accident heightens investors' awareness of environmental issues, which induces firms to substitute CSR for advertising to manage investor relations more effectively.

Specifically, consider a framework where firms can bolster investor relations either by directly navigating CSR challenges or by using advertising as a diversionary tactic. Addressing CSR challenges, like resolving environmental issues, demands significant investment, both in monetary and human capital. It could also be costlier than advertising. Hence, firms need to balance the benefits and costs before determining their CSR commitment strategy. Prior to the Fukushima accident when investors did not pay adequate attention to CSR issues, it is feasible for firms to use advertising to obfuscate their CSR inadequacies rather than addressing them. However, the Fukushima catastrophe shifts the landscape. Post-Fukushima, the increased investor focus on environmental issues leads investors to value tangible CSR actions over mere promotional content like advertising. Given this shift, the efficacy of advertising in managing CSR concerns diminishes. Firms would find it optimal to substitute the potentially costlier but more effective CSR actions for advertising.[2]

To test the substitution argument, we study the changes in CSR and advertising around the Fukushima accident. Ideally, we would focus on nuclear power firms as they were directly impacted by the Fukushima accident. However, due to the data limitations pertaining to nuclear power firms, we expand our sample to include all firms in the utilities industry. We argue that the Fukushima accident could amplify investor consciousness regarding environmental risks in non-nuclear-power utilities firms, though not as significantly as in nuclear power firms. For example, the Fukushima accident has invoked discussions about the optimal mix of power generation and the environmental trade-offs between nuclear power and other forms of electricity generation, such as fossil fuels. Moreover, the accident underscores the necessity for robust preparation for severe accidents – those with low probability but potentially

[1] Many finance and economics studies use the Fukushima accident as an exogenous shock. See, for example, Bonetti et al. (2023), Bialkowski and Starks (2018), Tanaka and Zabel (2018), Goebel et al. (2015), Fink and Stratmann (2015), etc. Other studies also use a similar methodology, though they focus on different environmental accidents or natural catastrophes. For example, Heflin and Wallace (2017) and Bialkowshi and Starks (2018) use the BP oil spill in 2010 as an exogenous shock and Pattern (1992) use the Exxon Valdez oil spill in 1989.

[2] It is worth noting that advertising and CSR are not perfect substitutes. For example, CSR initiatives can reduce return skewness (Nofsinger et al., 2019), whereas advertising often targets product markets as opposed to financial markets. Consequently, CSR and advertising could serve diverse functions and are not perfectly overlapping or interchangeable. In our paper, however, we do not need CSR and advertising to be perfect substitutes. We conjecture that firms might strategically reallocate resources from advertising to CSR to mitigate the heightened CSR concerns triggered by crises like the Fukushima accident. In this specific context, we consider CSR and advertising substitutable, although the substitutability only applies to crisis management and to the aspects relating to addressing CSR concerns.

severe environmental and societal consequences. This heightened awareness is especially relevant for the utilities industry, which has the potential to cause significant environmental and health damage. Based on these considerations, we argue that the Fukushima accident could heighten investor awareness about the environmental risks in the utilities industry. As investor scrutiny increases, utilities firms would strategically substitute CSR for advertising to better manage investor relations. In other words, we conjecture that utilities firms increase their engagement in CSR activities and decrease their advertising expenditures in response to the Fukushima accident. They do this to manage investor relations and to mitigate investors' elevated environmental concerns spurred by the accident.

Using a difference-in-difference approach, we test this conjecture by comparing changes between utilities and non-utilities industries from pre- to post-accident periods. We find supporting evidence that utilities firms increase their CSR performance following the Fukushima accident relative to non-utilities firms. The change targets primarily at mitigating environmental concerns as opposed to improving CSR strengths or addressing non-environmental concerns. We also find that the improvement in CSR performance and the associated reduction in environmental concerns are more pronounced in utilities firms with higher institutional investor ownerships and more pre-accident environmental concerns. Collectively, these results imply that environmental concerns are paramount in shaping utilities firms' CSR strategy after the Fukushima incident. They also align with the well-established literature underscoring the pivotal role that institutional investors play in pressuring firms to prioritize CSR (e.g., Chen et al., 2020; Dimson et al., 2015; Dyck et al., 2019). In this context, institutional investor pressure might prompt utilities firms to prioritize resolving environmental concerns after the accident.

Finally, our findings also show that utilities firms concurrently reduce their advertising expenditures following the Fukushima accident. The decline in advertising expenditures is particularly linked to the reduction in environmental concerns. In contrast, the linkage does not exist in non-utilities firms. Moreover, we find that the simultaneous increase in CSR performance and the decline in advertising expenditures are more pronounced in firms confronted with greater financial constraints. These findings support our conjecture that utilities firms strategically substitute CSR initiatives for advertising in response to the Fukushima accident. They also suggest that the substitution could be caused by financial constraints.

Our paper is organized as follows. Section 2 discusses the literature and how our paper relates to it. In Section 3, we detail sample construction and variable definition. Section 4 examines the changes in CSR post-Fukushima. Section 5 tests the substitution argument by correlating changes in advertising with those in CSR. We conclude in Section 6.

2 | LITERATURE REVIEW

Our paper contributes to the CSR literature by studying how firms strategically use CSR and other business policies to manage investor relations. Several studies argue that firms can increase value by using CSR as a public relations tool (Scherer & Palazzo, 2011; Seele & Lock, 2015). Moreover, a few recent studies pinpoint that firms increase CSR commitments under the pressure from institutional investors. For example, Chen et al. (2020) find that institutional investors pressure firms through shareholder proposals. Dimson et al. (2015) show that the pressure is from engagement and active ownership by institutional investors (see also Dyck et al., 2019). Similar to these studies, our results confirm that firms change CSR activities in response to the pressure from institutional investors. However, most studies in the literature treat CSR policy as a stand-alone firm policy that is independent from other firm policies. In contrast to these studies, we demonstrate that firms simultaneously coordinate their CSR and advertising strategies to optimize investor relations.

A subset of the CSR literature has explored the interplay between CSR and advertising. For example, in Schuler and Cording's (2006) model, firms advertise CSR activities to improve customer awareness (see also McWilliams & Siegel, 2001). Thus, CSR and advertising are complements in their model. In comparison, our findings suggest that CSR and advertising could be substitutes for firms to bolster investor relations in crisis management. Furthermore, Servaes and Tamayo (2013) find a positive relation between advertising and the value creation of CSR (see also Fisman et al., 2008).

They interpret the findings as the evidence that CSR can create value in firms with high customer awareness. Luo and Bhattacharya (2006) also suggest customer satisfaction as the mediating channel for the CSR effect. Recently, Nishi and Peabody (2023) show that firms increase efforts to reduce emission due to public scrutiny from consumers. We, however, emphasize on investor awareness rather than customer awareness.

Additionally, our research aligns with studies examining the role of advertising in financial markets. Grullon et al. (2004) study the impact of advertising on stock liquidity in the secondary market. Chemmanur and Yan (2009) and Lou (2014) show an increase in advertising prior to initial public offerings, seasoned equity offerings, and/or insider sales. We add to this discussion by proposing that firms could also mix CSR with advertising to influence investors in financial markets.

Finally, our paper is broadly related to the literature on CSR and firm value. This literature breaks into two views on whether CSR creates or destroys value. The negative view argues that CSR helps managers enhance their personal utility at the expense of shareholders' value. On the other hand, the positive view believes that CSR can enhance shareholders' value by signaling trustworthiness, reducing risk, or improving business operations.[3] Yet, empirical evidence remains mixed on whether CSR can create shareholders' value due to the endogeneity between CSR and firm value. Recently, various studies try to address this endogeneity problem, e.g., by using CSR events (Kruger, 2015), regression discontinuity on CSR shareholder proposals (Flammer, 2015), instrumental variables (Ferrell et al., 2016), mergers and acquisitions (Deng et al., 2013), etc.

3 | SAMPLE CONSTRUCTION AND VARIABLE DEFINITION

3.1 | Data and sample construction

We obtain information on firms' CSR ratings from MSCI's ESG Stats Database. This database provides annual environmental, social, and governance ratings for U.S. publicly traded companies. The database covers around 650 firms before 2003 and increases its coverage to include approximately the largest 3000 firms starting from 2003. To ensure the consistency of our sample, we restrict our analysis to the period of 2003–2013.

We match the CSR sample to Standard & Poor's Compustat to extract financial statement information and to Thomson-Reuters Institutional Holdings (13F) to extract information on institutional investor holding. Our final sample consists of 5331 publicly traded firms and 28,784 firm-years. In the following tests, we may lose some observations due to missing values from various lagged variables.

3.2 | Construction of variables

The ESG Stats Database classifies environmental, social, and governance performances into seven major dimensions: community, corporate governance, diversity, employee relations, environment, human rights, and product issues. It summarizes information on concerns and strengths for each of the seven dimensions. We calculate firm CSR following Lins et al. (2017). Specifically, we use five dimensions by excluding corporate governance and product issues from the major dimensions. We first scale the number of strengths (concerns) of each dimension in each firm-year by the maximum number of strengths (concerns) possible for the dimension in that year. As a result, the scaled

[3] The agency cost view is supported by Tirole (2001), Benabou and Tirole (2010), Ge and Ting (2022), etc. The studies on the positive view include Dowell, Hart, and Yeung (2000), Edmans (2011), Dimson, Karakas, and Li (2013)

, Flammer (2013), Servaes and Tamayo (2013), Cheng, et al. (2014), Ioannou and Serafein (2015), Flammer and Luo (2017), Dunbar, et al. (2021), etc.

strengths (concerns) of each dimension range from 0 to 1. We then calculate *Strength* (*Concern*) as the sum of scaled strengths (concerns) across the five dimensions. *CSR* is the difference between *Strength* and *Concern*. To differentiate between the environmental and non-environmental dimensions, we also calculate environmental concerns *EConcern* based on scaled CSR concerns in the environmental dimension and non-environmental concerns *NEConcern* based on the four non-environmental dimensions, namely, community, diversity, employee relations, and human rights.

We also calculate alternative measures of *Strength* and *Concern* based on the unscaled numbers of strengths and concerns, rather than the scaled numbers. In particular, we calculate alternative measures of *Strength* and *Concern* as the logarithm of (1 + the unscaled number of total strengths) and the logarithm of (1 + the unscaled number of total concerns), respectively. In our paper, we use these alternative unscaled measures to check the robustness of our results.

We use two advertising variables in our tests. The first variable is *LOG(ADV)*, the logarithm of (1 + the amount of advertising expenditures). The second is *ADS*, advertising scaled by sales revenue. Many studies in the literature use the sales-scaled variable to assess the effectiveness of advertising in boosting sales in product markets. However, unlike these studies, we intend to examine advertising from the perspective of investors in financial markets. Consequently, the unscaled advertising variable arguably aligns better with our research design compared to the sales-scaled advertising. Nevertheless, we will use both unscaled and sales-scaled advertising variables in our tests. In unreported findings, we have also experimented with advertising expenditures scaled by the book value of assets. Results based on this alternative scaling are statistically more significant compared to those using sales-scaled advertising. The results based on asset-scaled advertising are available upon requests by interested readers.

We also calculate several dummy variables. The dummy variable *Utilities* equals one if a firm belongs to the utilities industry with a two-digit SIC code starting at 49; otherwise, it equals zero. *Shock* equals zero for the years before 2011 (the year of the Fukushima nuclear accident) and one for 2011 and the following years. *Crisis* equals one for the years after the 2008 financial crisis (including 2008) and zero otherwise. Additionally, we compute several year-specific dummy variables, *Y2008–Y2012*, representing the years of 2008–2012.

Finally, we construct the following control variables. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. The book value of equity is calculated as stockholders' equity plus deferred taxes and investment tax credit (if available), minus the book value of preferred stock at the end of the latest fiscal year. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. Institutional investor holding (*Holding*) is the fraction of total outstanding shares owned by institutional investors. Number of institutional investors (*NInvestors*) is the logarithm of the number of institutional investor owners. *WW* is the Whited-Wu index as in Whited and Wu (2006). $WW = -0.091CF - 0.062DIVPOS + 0.021LDR - 0.044TA + 0.102ISG - 0.035SG$. In this equation, *LDR* is the ratio of long-term debt to total assets; *DIVPOS* is a dummy variable equal to one if a firm pays cash dividends; *SG* is firm sales growth; *TA* is the logarithm of total assets; *ISG* is three-digit industry sales growth; and *CF* is the ratio of cash flow to total assets, where cash flow is the sum of income before extraordinary items and depreciation and amortization. All the control variables are measured at the end of the prior year.

We present in Table 1 the annual distribution of our sample, alongside the annual averages of firm *CSR* and advertising intensity *ADS*, categorized by the utilities and non-utilities industries. As observed, before year 2011 (the year of the Fukushima accident), the average firm CSR in the utilities industry is lower compared to other industries. Conversely, after 2011, the average firm CSR in the utilities industry increases and surpasses that of other industries. Regarding average advertising, it is consistently lower in the utilities industry compared to other industries throughout all sample years. We present the summary statistics of the variables used in the paper in Table 2.

TABLE 1 Sample distribution.

	Utilities industry			Non-utilities industry		
Year	# of firms	Avg. CSR	Avg. ADS	# of firms	Avg. CSR	Avg. ADS
2003	588	−0.260	0.0033	28,920	−0.127	0.0248
2004	588	−0.367	0.0033	28,920	−0.245	0.0290
2005	588	−0.340	0.0027	28,920	−0.242	0.0297
2006	588	−0.305	0.0023	28,920	−0.223	0.0266
2007	588	−0.285	0.0023	28,920	−0.237	0.0270
2008	588	−0.250	0.0025	28,920	−0.235	0.0247
2009	588	−0.239	0.0028	28,920	−0.228	0.0256
2010	588	−0.133	0.0032	28,920	−0.331	0.0274
2011	588	0.060	0.0025	28,920	−0.275	0.0251
2012	588	0.464	0.0021	28,920	0.014	0.0238
2013	588	0.662	0.0023	28,920	0.072	0.0280

Note: This table presents the sample size, averages of firm CSR and advertising intensity (*ADS*, advertising/sales), categorized by the utilities and non-utilities industries in each year in 2003–2013. The utilities industry consists of those firms with two-digit SIC codes starting at 49. *CSR* is the sum of the scaled differences between strengths (positives) and concerns (negatives) along five dimensions.

TABLE 2 Summary statistics.

Variable	# of obs.	Mean	Median	Standard deviation
CSR_t	29,508	−0.190	−0.250	0.547
CSR $Concern_t$	29,508	0.409	0.333	0.412
CSR $Strength_t$	29,508	0.219	0	0.447
$EConcern_t$	29,508	0.341	0	0.116
ADS_t	9,684	0.027	0.013	0.070
$Log(ADV_t)$	9,684	0.025	0.006	0.055
MBE_{t-1}	25,150	2.856	2.054	4.035
ME_{t-1}	25,157	7.113	6.961	1.537
LDR_{t-1}	25,142	0.560	0.551	0.285
$SALE_{t-1}$	25,219	6.644	6.632	1.870
ROA_{t-1}	24,174	0.094	0.106	0.197
WW_{t-1}	24,174	−0.411	−0.388	0.970
$Holding_{t-1}$	28,431	0.201	0.197	0.106
$NInvestors_{t-1}$	28,431	4.62	4.65	0.76

Note: This table presents the sample statistics of the key variables used in our tests. The sample consists of all firms in 2003–2013. *CSR* is the sum of the differences between scaled strengths and scaled concerns across five dimensions. *CSR Concern* and *Strength* are scaled concerns and strengths, respectively, across five dimensions. *EConcern* is scaled concerns in the environmental dimension. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity at the year end. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. *Log(ADV)* is the logarithm of (1 + the amount of advertising expenditures). *ADS* is advertising expenditures scaled by sales revenue. Institutional investor holding (*Holding*) is the fraction of equity held by institutional investors. Number of institutional investors (*NInvestors*) is the number of institutional investor owners. *WW* is the Whited and Wu (2006) index.

4 | CHANGE IN CSR AROUND THE FUKUSHIMA NUCLEAR ACCIDENT

In this paper, we conjecture that firms utilize CSR and advertising as substitutes to manage investors' concerns regarding CSR. The Fukushima incident constitutes our empirical context, serving as an exogeneous event that intensifies investors' scrutiny toward corporate environmental and social responsibilities. Such heightened sensitivity is particularly pronounced in the utilities industry, attributed to its significant environmental and public health implications. As investors grow increasingly discerning about environmental risks, their focus shifts from mere corporate rhetoric to tangible actions. Consequently, relying on advertising campaigns to downplay or obscure shortcomings in CSR may no longer suffice. Instead, companies are more likely to benefit from directly enhancing their CSR practices. Considering the above argument, we hypothesize that, in the wake of the Fukushima accident, utilities firms would improve their CSR performances while simultaneously reducing advertising expenditures.

In the ensuring sections, we test this hypothesis by first studying how firm CSR changes around the Fukushima nuclear accident. We will subsequently analyze the change in advertising and establish the connection between these two changes in Section 5.

4.1 | CSR and Fukushima nuclear accident

We first study how firm CSR differs between utilities and non-utilities firms in each sample year. In particular, we run the following benchmark regression for each year around the accident:

$$\Delta CSR = a_0 + a_1 CSR_{t-1} + a_2 Utilities + a_3 Shock + a_4 Control + \varepsilon, \quad (1)$$

where *DCSR* is the change in *CSR* from year *t−1* to year *t*. The control variables consist of ME_{t-1}, MBE_{t-1}, LDR_{t-1}, $SALE_{t-1}$, and ROA_{t-1}, all measured in the prior year *t−1*. We run ordinary least square (OLS) regressions for Equation (1).

We present the results from the above regressions in Table 3, with each regression pertaining to a sample year in 2008–2012. Our results show that the coefficients of *Utilities* are insignificant in years 2008–2010, while they are statistically significant in 2011 and 2012. Thus, in the years preceding the 2011 Fukushima accident, utilities firms demonstrate similar CSR performance compared to non-utilities firms. In contrast, after the Fukushima accident, utilities firms surpass non-utilities firms in CSR performance. These findings suggest a post-Fukushima shift in the CSR policies of utilities firms.

We further study the CSR trend by using a difference-in-difference (DID) approach with the Fukushima accident as an exogenous shock. The approach computes the difference in *CSR* between the utilities and non-utilities industries and between the pre- and post-accident periods. The difference between the pre- and post-accident periods helps purge the permanent effect in the utilities industry and isolate the effect related to the accident. The difference between the utilities and non-utilities industries helps purge confounding factors that are not specific to the utilities industry. As demonstrated in Table 3, both the treatment group (utilities firms) and the control group (non-utilities firms) exhibit parallel CSR trends prior to the Fukushima accident. These parallel trends validate our use of the Fukushima accident in the DID approach.

The specifics of the approach are as follows:

$$\Delta CSR = b_0 + b_1 CSR_{t-1} + b_2 Utilities + b_3 Shock + b_4 Utilities \times Shock + b_5 Control + \varepsilon. \quad (2)$$

Again, *DCSR* is the change in *CSR* from year *t−1* to *t*. The control variables consist of ME_{t-1}, MBE_{t-1}, LDR_{t-1}, $SALE_{t-1}$, and ROA_{t-1}. In the regressions where the sample period covers the 2008 financial crisis, we also control for the dummy

TABLE 3 Firm CSR in different years around Fukushima Daiichi accident.

	(1)	(2)	(3)	(4)	(5)
Constant	−0.120***	−0.064***	−0.987***	−0.565***	−0.557***
	[3.80]	*[3.51]*	*[17.08]*	*[11.22]*	*[7.11]*
CSR_{t-1}	−0.136***	−0.071***	−0.482***	−0.231***	−0.578***
	[10.07]	*[4.30]*	*[19.21]*	*[12.08]*	*[24.39]*
Utilities	−0.055	0.005	−0.095	0.089**	0.110*
	[1.42]	*[0.43]*	*[1.37]*	*[2.25]*	*[1.78]*
ME_{t-1}	0.013**	0.007**	0.064***	0.071***	0.074***
	[2.33]	*[2.23]*	*[5.99]*	*[9.23]*	*[5.68]*
MBE_{t-1}	−0.000	0.000	−0.000	−0.000	−0.000**
	[0.29]	*[0.46]*	*[0.46]*	*[0.45]*	*[2.45]*
LDR_{t-1}	0.058***	0.008	−0.009	0.015	0.109***
	[2.98]	*[0.90]*	*[0.28]*	*[1.07]*	*[2.73]*
$SALE_{t-1}$	−0.004	0.000	0.060***	0.006	0.019*
	[0.72]	*[0.02]*	*[6.17]*	*[0.92]*	*[1.74]*
ROA_{t-1}	−0.045	−0.001	−0.063	−0.076**	−0.340***
	[1.20]	*[0.08]*	*[1.00]*	*[1.98]*	*[3.71]*
Sample year	2008	2009	2010	2011	2012
R^2	0.08	0.10	0.32	0.28	0.40
N	1953	1770	1706	1662	1437

Note: This table presents the results from OLS regressions on the change in CSR from year $t-1$ to t. The sample in each column spans a years in 2008–2012. *CSR* is the sum of the scaled differences between strengths and concerns along five dimensions. *Utilities* is the dummy of the utilities industry. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

of financial crisis (*Crisis*) and its interaction with *Utilities*. The latter two controls ensure that our results are not driven by any confounding effect stemming from the 2008 financial crisis (Lins et al., 2017).

In Equation (2), the coefficient of *Utilities* × *Shock*, b_4, captures the change in *CSR* from the pre- to post-accident periods in the utilities industry relative to the corresponding change in non-utilities industries. In other words, b_4 captures the effect that results from the Fukushima accident and is specific to the utilities industry. According to the discussions earlier, we expect b_4 to be positive.

We first run OLS regressions.[4] We present the results in columns (1) and (2) of Table 4. The sample in column (1) spans the years from 2003 to 2013. However, a potential concern could emerge from using the full 2003–2013 sample, as observations from years distant from the Fukushima accident may be noisy and influenced by potential confounding factors. To address this concern, in column (2), we use a sample covering the years of 2009–2013, that is, from 2 years before to 2 years after the accident. In both regressions and the OLS regressions in the later studies, we allow correlated residuals within each firm and calculate heteroscedasticity-consistent standard errors.

[4] In Section 5, we will also utilize seemingly unrelated regressions (SUR) for both the CSR equation and the advertising equation (discussed later). In the SUR method, we view both CSR and advertising equations as structural equations and use the correlations between the errors from both equations to improve the estimates.

TABLE 4 Impact of the Fukushima Daiichi accident on firm CSR.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−0.370***	−0.575***	−0.244***	−0.432**	−0.414***	−0.605***
	[25.93]	*[24.14]*	*[3.97]*	*[2.47]*	*[14.37]*	*[16.29]*
CSR_{t-1}	−0.271***	−0.358***	−0.551***	−0.681***	−0.213***	−0.268***
	[39.62]	*[34.46]*	*[56.16]*	*[44.19]*	*[20.57]*	*[19.84]*
Utilities	−0.072***	−0.060*			−0.068***	−0.079**
	[4.80]	*[1.70]*			*[4.14]*	*[2.07]*
Shock	0.103***	0.110***	0.119***	0.132***	0.100***	0.104***
	[14.62]	*[13.60]*	*[15.74]*	*[14.12]*	*[8.37]*	*[7.48]*
Shock × Utilities	0.190***	0.183***	0.240***	0.233***	0.204***	0.193***
	[4.55]	*[3.99]*	*[5.46]*	*[5.02]*	*[4.43]*	*[3.83]*
ME_{t-1}	0.042***	0.045***	0.016***	−0.012	0.050***	0.054***
	[15.83]	*[10.47]*	*[2.61]*	*[0.89]*	*[9.66]*	*[7.21]*
MBE_{t-1}	−0.000***	−0.000	−0.000***	0.000	−0.000	−0.000
	[3.28]	*[0.57]*	*[3.49]*	*[0.82]*	*[0.32]*	*[0.38]*
LDR_{t-1}	0.032***	0.033***	−0.038	−0.103**	0.053***	0.041*
	[4.00]	*[2.79]*	*[1.50]*	*[2.03]*	*[3.33]*	*[1.87]*
$SALE_{t-1}$	−0.003	0.022***	0.001	0.059**	−0.007	0.020***
	[1.18]	*[5.51]*	*[0.08]*	*[2.29]*	*[1.59]*	*[2.96]*
ROA_{t-1}	−0.007	−0.067***	0.054	−0.004	0.004	−0.076
	[0.43]	*[2.60]*	*[1.56]*	*[0.06]*	*[0.10]*	*[1.27]*
Crisis	0.005		0.018***		−0.035*	−0.045
	[0.96]		*[2.82]*		*[1.95]*	*[1.63]*
Utilities × Crisis	0.027		0.013		0.022**	
	[0.95]		*[0.39]*		*[2.12]*	
Regression	OLS	OLS	FE	FE	OLS	OLS
Sample years	2003–2013	2009–2013	2003–2013	2009–2013	2003–2013	2009–2013
Sample firms	All firms	All firms	All firms	All firms	Utilities and benchmarks	
R^2	0.19	0.26	0.31	0.37	0.14	0.19
N	18,426	7,546	18,426	7,546	6,437	3,189

Note: This table presents the results from OLS regressions in columns (1), (2), (5), and (6) and from fixed effect regressions in columns (3) and (4). The dependent variable is the change in CSR from year *t−1* to *t*. The sample consists of firms in either 2009–2013 or 2003–2013. The benchmark non-utilities firms in column (6) are matched based on propensity scores to corresponding utilities firms. *CSR* is the sum of the scaled differences between strengths and concerns along five dimensions. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for the years after 2011. *Crisis* equals 1 for the years after 2008. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In both columns (1) and (2), the coefficients of *Shock* are positive and highly significant, indicating that firms in our sample, on average, improve their CSR performance after the Fukushima accident. More importantly, the coefficients of *Utilities* × *Shock* are positive and highly significant at the 1% level. For instance, the coefficient of *Utilities* × *Shock* in column (2) is 0.18 and it is statistically significant. This coefficient, combined with the coefficient of *Shock* being 0.11 in the same regression, implies that the post-accident increase in CSR is approximately 164% (0.18/0.11) higher in utilities firms compared to non-utilities firms. Similarly, the results in column (1) also show significant economic and statistical magnitudes concerning the post-accident CSR increase in utilities firms.

To check the robustness of our results, we also run fixed-effect regressions. We present the results in columns (3) and (4) of Table 4, with the samples covering 2003–2013 and 2009–2013, respectively. The coefficients of *Utilities* × *Shock* remain positive and significant.[5] Lastly, we use propensity score matching to create a control group, as opposed to using all non-utilities firms as control firms as in the previous regressions. Specifically, we estimate propensity scores for all utilities and non-utilities firms in 2009, a year before the Fukushima accident, considering firm characteristics such as firm size, market-to-book, leverage, sales, profitability, and CSR. Based on the propensity scores, we match each utilities firm to a non-utilities firm using nearest neighbor matching. These utilities firms and their matched control firms are then used to run OLS regressions as in Equation (2). We present the new results in columns (5) and (6) of Table 4. Once again, the coefficients of *Utilities* × *Shock* are positive and highly significant. Overall, our findings in Table 4 show that utilities firms increase their CSR performances after the Fukushima accident.

A potential concern on the above regressions is whether our results are indeed tied to the Fukushima accident, as opposed to influences from other years. To address this concern, we control for the dummy of year 2009, 2010, or 2012, as well as the interaction of each year dummy with *Utilities*. We present the results with these new controls in columns (1)–(3) of Table 5. The sample used in these three columns covers 2003–2013. In column (4), we also use the sample of 2009–2013 to run a regression with the year dummy of 2012 and its interaction as the new control variables. In all four columns, the coefficients of *Utilities* × *Shock* remain positive and significant, similar to the results in Table 4.

In addition, we conduct a pseudo-event placebo test. Here, we substitute the 2011 accident year (as defined in *Shock*) with a randomly chosen pseudo-event year (*Pseudo*) for each sample firm. We present the results in columns (5) and (6). The coefficients of *Utilities* × *Pseudo* are insignificant in both columns. The insignificant results produced by the placebo tests, combined with the significant results in Table 4, suggest that the documented CSR changes are directly attributable to the Fukushima accident, rather than other coincidental events.

4.2 | CSR strengths and concerns

Firms could improve CSR performances by either addressing CSR concerns or improving CSR strengths. It is interesting to know which strategy utilities firms use after the Fukushima accident. To study, we run similar regressions as in Equation (2), substituting the CSR variable with either the strength or concern variable. We present the new results in Table 6.

In the first two columns, the dependent variable is either *ΔConcern* or *ΔStrength*, that is, the change in scaled CSR concerns or strengths from year $t-1$ to t. For brevity, we report only the results based on the sample covering the period immediately surrounding the Fukushima accident from 2009 to 2013. As can be seen, the coefficient of *Utilities* × *Shock* is negative and statistically significant in the *ΔConcern* regression, while being insignificant in the *ΔStrength* regression. These results show that utilities firms reduce CSR concerns after the Fukushima nuclear accident. In contrast, their CSR strengths do not change significantly.

[5] In an unpublished study, we also follow Coles and Li (2023) and calculate how each component of our regression contributes relatively to the variation of change in CSR. We find that observable firm attributes have the highest explanatory power, while firm fixed effects do not contribute as much. These findings lend support to our argument that firms could manage CSR dynamically over time, such as after the Fukushima accident. We thank an anonymous referee for suggesting this study.

TABLE 5 Impact of the Fukushima Daiichi accident on firm CSR: Robustness checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−0.349***	−0.342***	−0.348***	−0.558***	−0.325***	−0.517***
	[20.80]	*[20.93]*	*[21.72]*	*[21.77]*	*[20.40]*	*[19.94]*
CSR_{t-1}	−0.210***	−0.210***	−0.214***	−0.288***	−0.209***	−0.280***
	[30.32]	*[30.32]*	*[30.07]*	*[26.64]*	*[29.77]*	*[26.77]*
Utilities	−0.078***	−0.076***	−0.069***	−0.076**	−0.037*	−0.002
	[5.12]	*[5.10]*	*[4.63]*	*[2.07]*	*[1.93]*	*[0.05]*
Shock	0.116***	0.143***	0.057***	0.050***		
	[13.08]	*[9.96]*	*[8.73]*	*[6.28]*		
Utilities × Shock	0.173***	0.149*	0.166***	0.143***		
	[3.40]	*[1.79]*	*[3.56]*	*[2.81]*		
Y2009	0.001					
	[0.16]					
Utilities × Y2009	0.039					
	[1.00]					
Y2010		−0.030**				
		[2.17]				
Utilities × Y2010		0.061				
		[0.78]				
Y2012			0.100***	0.107***		
			[8.21]	*[8.62]*		
Utilities × Y2012			0.060	0.073		
			[0.84]	*[1.04]*		
Pseudo					−0.003	−0.011
					[0.55]	*[1.26]*
Utilities × Pseudo					0.032	0.058
					[1.06]	*[0.94]*
Sample	2003–2013	2003–2013	2003–2013	2009–2013	2003–2013	2009–2013
R^2	0.13	0.13	0.13	0.19	0.11	0.16
N	18,426	18,426	18,426	7,546	18,426	7,546

Note: This table presents the results from OLS regressions on the change in CSR from year *t−1* to *t*. *CSR* is the sum of the scaled differences between strengths and concerns along five dimensions. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for years after 2011. *Crisis* equals 1 for the years after 2008. *Y2009*, *Y2010*, and *Y2012* are the dummies equal to one for years 2009, 2010, and 2012, respectively. *Pseudo* is a random year variable equal to one for the years after a randomly assigned year. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, and *SALE* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

TABLE 6 Impact of the Fukushima nuclear accident on CSR strengths and concerns.

	ΔConcern (1)	ΔStrength (2)	ΔConcern (3)	ΔStrength (4)	Concern>0 (5)	Strength>0 (6)
Constant	0.092***	−0.402*	0.265***	−0.651***	0.867***	−5.598***
	[4.50]	*[2.17]*	*[10.44]*	*[32.04]*	*[6.17]*	*[33.21]*
Utilities	0.058*	−0.032*	0.020	0.018	0.456*	0.163
	[1.74]	*[2.49]*	*[0.64]*	*[0.64]*	*[1.70]*	*[0.82]*
Shock	−0.156***	−0.021	−0.219***	0.061***	−0.850***	−0.408***
	[22.47]	*[0.73]*	*[25.39]*	*[7.95]*	*[15.66]*	*[9.05]*
Shock × Utilities	−0.090**	0.117	−0.075**	0.035	−0.630**	0.106
	[2.17]	*[1.67]*	*[2.16]*	*[1.03]*	*[2.50]*	*[0.56]*
Strength/Concern	Scaled	Scaled	Unscaled	Unscaled	Unscaled	Unscaled
Regression	OLS	OLS	OLS	OLS	Logit	Logit
Pseudo R^2	0.16	0.21	0.27	0.20	0.04	0.20
N	7,546	7,546	8,396	8,396	8,396	8,396

Note: This table presents the results from OLS regressions on the change in CSR strengths or concerns from year *t*−*1* to *t* in columns (1)–(4). In columns (5) and (6), results are from logit regressions on positive CSR concerns and strengths, respectively. The sample covers 2009–2013. *Strength* and *Concern* in columns (1) and (2) are scaled CSR strengths and concerns, respectively, along the five dimensions. They are the sum of unscaled concerns and strengths in columns (3)–(6). Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for the years after 2011. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, *SALE*, and the lagged values of *Strength* and *Concern* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

To demonstrate the robustness of the above results, we construct two alternative strength and concern variables. First, we sum up the numbers of unscaled strengths/concerns in the five CSR dimensions and calculate the changes in the unscaled sums. We present the results based on the unscaled variables in columns (3) and (4) of Table 6. Second, we run logit regressions on the existence of any CSR strengths or concerns. The results are presented in columns (5) and (6). The results in columns (3)–(6) are similar to those presented in columns (1) and (2). The coefficients of *Utilities* × *Shock* remains significantly negative in the concern regressions while being insignificant in the strength regressions. Overall, our results in this subsection suggest that utilities firms engage more in CSR after the accident with an intention to address CSR concerns.

4.3 | Environmental and non-environmental concerns

In this subsection, we disaggregate CSR concerns into environmental and non- environmental concerns. Given the environmental ramifications of the Fukushima accident, one might infer a heightened investor sensitivity specifically toward environmental risks. Thus, if our results are indeed driven by the Fukushima accident, we would expect a more pronounced effect on environmental concerns compared to non-environmental concerns.

To verify this expectation, we run regressions as in Equation (2) with the dependent variable being $\Delta EConcern_{t-1,t}$, that is, the change in environmental concerns from year *t*−*1* to *t*. We present the results from these regressions in Panel A of Table 7. The results in columns (1) and (2) are from OLS regressions, and the results in columns (3) and (4) are from fixed effect regressions. The coefficients of *Shock* × *Utilities* are negative and significant in columns (1), (3),

TABLE 7 Change in environmental concerns.

Panel A: Change in environmental concerns following the Fukushima accident.

	$\Delta EConcern_{t-1,t}$		$\Delta EConcern_{t-1,t}$		$\Delta NEConcern_{t-1,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−0.02***	−0.03***	−0.04***	−0.02	0.10**	0.45***
	[10.33]	*[7.52]*	*[3.39]*	*[0.46]*	*[2.02]*	*[3.18]*
Utilities	0.02***	0.00				
	[4.32]	*[0.08]*				
Shock	−0.01***	−0.01***	−0.01***	−0.01***	−0.10***	−0.13***
	[7.52]	*[4.42]*	*[8.36]*	*[6.07]*	*[17.28]*	*[16.32]*
Shock × Utilities	−0.02**	0.01	−0.05***	−0.03***	−0.03	−0.10**
	[2.04]	*[0.83]*	*[4.07]*	*[2.92]*	*[1.34]*	*[2.10]*
Sample year	2003–2013	2009–2013	2003–2013	2009–2013	2003–2013	2009–2013
Regression	OLS	OLS	FE	FE	FE	FE
R^2	0.07	0.15	0.27	0.16	0.17	0.11
N	18,429	7,546	18,429	7,546	18,429	7,546

Panel B: Impact of pre-existing environmental concerns on the post-accident CSR change: OLS regressions.

	$\Delta CSR_{09,t}$		$\Delta Concern_{09,t}$		$\Delta EConcern_{09,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−1.317***	−1.187***	0.327***	0.323***	−0.057***	−0.059***
	[27.68]	*[26.03]*	*[8.43]*	*[8.20]*	*[6.55]*	*[6.55]*
Utilities	−0.014	0.117	0.085	−0.076	0.049***	0.019
	[0.21]	*[1.62]*	*[1.61]*	*[1.34]*	*[3.28]*	*[1.06]*
$EConcern_{2009}$	−0.297***		0.919***		−0.522***	
	[2.67]		*[7.58]*		*[13.43]*	
$EConcern_{2009}$ × Utilities	0.640**		−0.749***		−0.199**	
	[2.55]		*[3.47]*		*[2.34]*	
$NEConcern_{2009}$		0.281***		−0.777***		0.011
		[6.23]		*[6.79]*		*[1.54]*
$NEConcern_{2009}$ × Utilities		−0.051		0.052		−0.016
		[0.30]		*[0.39]*		*[0.48]*
Sample year	2011–2013	2011-2013	2011–2013	2011–2013	2011–2013	2011–2013
R^2	0.39	0.41	0.37	0.37	0.43	0.42
N	4,377	4,377	4,377	4,377	4,377	4,377

Note: This table presents the results from OLS and fixed effect regressions. The dependent variable is the change in firm CSR, CSR concerns, or environmental concerns from 2009 to a post-accident year *t* or from year *t−1* to *t*. *Concern*, *EConcern*, and *NEConcern* are scaled concerns in the five dimensions, the environmental dimension, or the non-environmental dimension, respectively. *CSR* is the difference between scaled strengths and concerns in the five dimensions. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for the years after 2011. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, and *SALE* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

and (4), while the coefficient is insignificant in column (2). Thus, the magnitude of environmental concerns decreases in utilities firms after the Fukushima incident. To compare, we also run fixed effect regressions on the change in non-environmental concerns $\Delta NEConcern_{t-1,t}$. The results are presented in columns (5) and (6) of Panel A. The coefficient of *Shock* × *Utilities* in column (5) is insignificant, while it is negative and weakly significant in column (6). Notably, the coefficients of *Shock* × *Utilities* in the non-environmental regressions are statistically weaker than those in the environmental regressions. These results align with our expectation that the post-Fukushima CSR management by utilities firms is predominantly geared towards environmental matters.

To further link the post-accident change in CSR to environmental concerns, we also examine the role of pre-existing environmental concerns in shaping utilities firms' post-accident CSR strategies. Specifically, we create a variable capturing the change in CSR from a pre-accident year, 2009, to a post-accident year in 2011–2013. We then run the following regression to check whether the change in CSR around the accident is influenced by the pre-accident environmental concerns in 2009:

$$\Delta CSR_{09,t} = f_0 + f_1 EConcern_{09} + f_2 Utilities + f_3 Utilities \times EConcern_{09} + f_4 Control + \varepsilon. \quad (3)$$

Here, $\Delta CSR_{09,t}$ is the change in *CSR* from 2009, a year before the Fukushima accident, to a post-accident year *t*. The environmental concern variable $EConcern_{09}$ represents the extent of environmental concerns in 2009. As discussed earlier, investors have become sensitive to environmental risks following the Fukushima accident. The heightened sensitivity is likely more pronounced and more impactful in utilities firms that were already dealing with more environmental concerns prior to the accident. Therefore, if utilities firms indeed manage CSR in response to the Fukushima accident, their CSR management would be stronger for those firms with greater pre-existing environmental concerns. In other words, we expect the coefficient of $Utilities \times EConcern_{09}$ in Equation (3), f_3, to be positive.

We report the new results in column (1) of Panel B, Table 7. The coefficient of $Utilities \times EConcern_{09}$ is positive and highly significant. This result is consistent with our expectation, suggesting that utilities firms manage CSR after the Fukushima accident to a larger degree when they face more pre-accident environmental concerns. To compare, we also run a similar regression with environmental concerns $EConcern_{09}$ replaced by non-environmental concerns $NEConcern_{09}$. We present the results in column (2). The coefficient of $Utilities \times NEConcern_{09}$ is insignificant in column (2), suggesting that the improvement in post-accident CSR is unrelated to the pre-existing non-environmental concerns.

Next, we also replace the dependent variable $\Delta CSR_{09,t}$ in Equation (3) with $\Delta Conern_{09,t}$, that is, the change in CSR concerns. We present the new results in columns (3) and (4). The new results are consistent with those in columns (1) and (2). The coefficient of $Utilities \times EConcern_{09}$ is negative and significant, while the coefficient of $Utilities \times NEConcern_{09}$ is insignificant. Finally, we also run a regression with the dependent variable being $\Delta EConcern_{09,t}$, that is, the change in environmental concerns. We present the results in columns (6) and (7). Similarly, the coefficient of $EConcern_{09} \times Utilities$ is negative and significant, while the coefficient of $NEConcern_{09} \times Utilities$ is insignificant. These results confirm that the enhanced CSR management after the Fukushima accident is related to the management of environmental concerns rather than non-environmental concerns.

4.4 | CSR management and investor relations

In the following, we link the CSR changes following the Fukushima accident to the investor relationship management. As we conjectured earlier, utilities firms implement CSR strategies following the Fukushima accident in response to investors' intensified focus on CSR. Institutional investors are more proactive and outspoken in pressuring firms to improve CSR (e.g., Chen et al., 2020; Dimson et al., 2015; Dyck et al., 2019). Thus, we expect that utilities firms with a

more significant share of institutional investor ownership will exhibit a more pronounced enhancement in their CSR performance following the accident.

In the paper, we use $Holding_{t-1}$, the proportion of equity owned by institutional investors, and $NInvestors_{t-1}$, the count of distinct institutional investors holding a stake in the firm, to gauge institutional investor ownership. Firms with higher levels of $NInvestors_{t-1}$ or $Holding_{t-1}$ could face more pressure from their institutional investors to address CSR concerns. We create three-way interactions among *Utilities*, *Shock*, and each of the two investor variables. We then regress $\Delta CSR_{t-1,t}$ or $\Delta Concern_{t-1,t}$ against each three-way interaction, while controlling for all two-way interactions. In these regressions, the coefficient of the two-way interaction *Utilities* × *Shock* measures how utilities firms improve CSR performance after the Fukushima accident relative to firms in other industries. The coefficients of the three-way interactions, $Holding_{t-1} \times Utilities \times Shock$ and $NInvestors_{t-1} \times Utilities \times Shock$, measure how the post-accident change in CSR varies among utilities firms under different levels of pressure from their institutional investors. In line with our earlier discussions, we predict the coefficients of the three-way interactions to be positive in the CSR regressions and negative in the concern regressions.

We report in Panel A of Table 8 the results with $Holding_{t-1}$ as the investor variable. The sample period covers either 2003–2013 or 2009–2013. In columns (1) and (2), the dependent variable is ΔCSR. In both columns, the coefficients of *Utilities* × *Shock* are insignificant. The coefficients of $Holding_{t-1} \times Utilities \times Shock$ are positive and significant. These coefficients together show that the post-accident increase in CSR is primarily observed in utilities firms with high levels of institutional investor holdings. Conversely, the post-accident increase in CSR is insignificant in utilities firms with low institutional investor holdings. In columns (3) and (4), the dependent variable is the change in CSR concerns, $\Delta Concern$. The findings in these two columns align with those in the first two. The coefficients of *Utilities* × *Shock* remain insignificant, while the coefficients of $Holding_{t-1} \times Utilities \times Shock$ are negative and statistically significant. These results suggest that CSR concerns decrease after the Fukushima accident in utilities firms with high institutional investor holdings. In contrast, CSR concerns do not exhibit significant changes in firms with low institutional investor holdings.

Next, we run four robustness checks to demonstrate the robustness of the above results. First, we control for the interactions between $Holding_{t-1}$ and other firm characteristics including ME_{t-1}, MBE_{t-1}, LDR_{t-1}, $SALE_{t-1}$, and ROA_{t-1}. The results are reported in Panel B of Table 8. Second, we measure institutional investor holding either in 2008 or as the average between 2003 and 2008, rather than in year *t−1*. This way, by measuring institutional ownership in the year(s) before our sample period (2009–2013), we can mitigate the concern that the relation between institutional ownership and change in CSR might be driven by the confounders that occur in the sample period. The results of this robustness check are presented in Panel C. Third, we also use fixed effect regressions to control for time-invariant confounders. The results of this approach are presented in Panel D. Fourth, we run regressions with the change in environmental concerns (*DEConcern*) as the dependent variable. The results are presented in Panel E. In all four robustness checks, our findings remain consistently aligned with those reported in Panel A.

Finally, in Panel F of Table 8, we also report the results using $NInvestors_{t-1}$ as the investor variable. The coefficients of $NInvestors_{t-1} \times Utilities \times Shock$ are positive and highly significant in the first two columns where D*CSR* is the dependent variable. They are negative and significant in the two columns where D*Concern* is the dependent variable. Once again, these coefficients show that the post-accident increase in overall CSR or decrease in CSR concerns predominantly occurs in utilities firms with high institutional investor holdings. In summary, our findings in Table 8 suggest that the CSR strategies implemented by utilities firms after the Fukushima accident are influenced by their relationships with institutional investors. They are consistent with the literature, underscoring the pivotal role of institutional investors in pressuring utilities firms to commit to CSR.[6]

[6] To further link CSR changes to the pressure from institutional investors, we also construct additional variables to measure the CSR preference of a firm's mutual fund investors. These variables are calculated as the weighted average of the CSR ratings of a firm's mutual fund investors, with the weights in proportion to mutual funds' investments in the firm (see Huang, Titman, and Wang, 2023). Using these variables, we find that utilities firms' post-accident CSR enhancement is positively linked to the CSR preference of their mutual fund investors. We discuss the tests and the results in detail in unpublished appendix b, which is available in the online version of the paper.

TABLE 8 The Fukushima accident and CSR: Interaction with institutional investor holding.

Panel A: the investor variable is institutional investor holding.				
	ΔCSR		**ΔConcern**	
	(1)	**(2)**	**(3)**	**(4)**
Constant	−0.359***	−0.578***	0.088***	0.359***
	[22.22]	*[22.83]*	*[5.33]*	*[13.60]*
CSR_{t-1}	−0.210***	−0.279***		
	[30.25]	*[27.05]*		
$Concern_{t-1}$			−0.356***	−0.483***
			[56.77]	*[49.41]*
Utilities	0.029	0.104	−0.001	−0.142**
	[1.15]	*[1.54]*	*[0.02]*	*[2.32]*
Shock	0.202***	0.233***	−0.245***	−0.338***
	[14.34]	*[12.97]*	*[13.45]*	*[16.11]*
Shock × Utilities	−0.003	−0.037	0.124	0.155
	[0.03]	*[0.34]*	*[1.38]*	*[1.54]*
$Holding_{t-1}$	0.019	0.094	−0.093***	−0.548***
	[0.64]	*[1.62]*	*[2.69]*	*[8.68]*
$Holding_{t-1}$ × Utilities	−0.732***	−1.038***	0.698***	0.828***
	[4.28]	*[3.07]*	*[4.29]*	*[2.65]*
$Holding_{t-1}$×Shock	−0.388***	−0.518***	0.208***	0.569***
	[7.34]	*[7.28]*	*[3.01]*	*[6.78]*
$Holding_{t-1}$ × Utilities × Shock	1.017***	1.208**	−1.154***	−1.144**
	[2.68]	*[2.43]*	*[2.96]*	*[2.51]*
Crisis	0.011**		0.008	
	[2.02]		*[1.47]*	
Utilities × Crisis	0.040		−0.095***	
	[1.40]		*[3.71]*	
Sample	2003–2013	2009–2013	2003–2013	2009–2013
R^2	0.13	0.19	0.22	0.27
N	18,331	7,468	19,936	8,301
Panel B: the interactions between institutional investor holding and all control variables are controlled for. The coefficients of these additional controls are not reported.				
	ΔCSR		**ΔConcern**	
	(1)	**(2)**	**(3)**	**(4)**
$Holding_{t-1}$	−0.456***	−0.589**	0.266	0.525**
	[2.83]	*[2.24]*	*[1.49]*	*[1.98]*
$Holding_{t-1}$ × Utilities	−0.792***	−1.138***	0.755***	0.985***
	[4.55]	*[3.26]*	*[4.50]*	*[3.00]*
$Holding_{t-1}$ × Shock	−0.401***	−0.551***	0.220***	0.605***
	[7.58]	*[7.25]*	*[3.18]*	*[6.87]*

(Continues)

TABLE 8 (Continued)

Panel B: the interactions between institutional investor holding and all control variables are controlled for. The coefficients of these additional controls are not reported.				
	ΔCSR		**ΔConcern**	
	(1)	**(2)**	**(3)**	**(4)**
$Holding_{t-1}$ × Utilities × Shock	1.046***	1.249**	−1.182***	−1.200***
	[2.78]	*[2.50]*	*[3.05]*	*[2.60]*
Sample	2003–2013	2009–2013	2003–2013	2009–2013
R^2	0.13	0.19	0.23	0.28
N	18,331	7,468	19,936	8,301
Panel C: the investor variable is an alternative measure of institutional investor holding, with controls for the interactions between institutional investor holding and all control variables.				
	ΔCSR	**ΔConcern**	**ΔCSR**	**ΔConcern**
	(1)	**(2)**	**(3)**	**(4)**
LagHolding	−1.513***	−0.777**	−1.909***	−0.981**
	[4.19]	*[2.21]*	*[4.19]*	*[2.21]*
LagHolding × Utilities	−0.815***	2.644***	−1.029***	3.336***
	[3.91]	*[2.62]*	*[3.91]*	*[2.62]*
LagHolding × Shock	−0.862***	0.711***	−1.088***	0.897***
	[6.16]	*[4.01]*	*[6.16]*	*[4.01]*
LagHolding × Utilities × Shock	1.540***	−2.863***	1.943***	−3.613***
	[3.21]	*[3.05]*	*[3.21]*	*[3.05]*
LagHolding Calculation	$Holding_{2008}$		$Holding_{2003-2008}$	
Sample	2009–2013	2009–2013	2009–2013	2009–2013
R^2	0.19	0.27	0.19	0.27
N	7,546	8,396	7,546	8,396
Panel D: the investor variable is institutional investor holding in fixed effect regressions				
	ΔCSR		**ΔConcern**	
	(1)	**(2)**	**(3)**	**(4)**
$Holding_{t-1}$	0.081	0.139	−0.142***	−0.090
	[1.35]	*[0.80]*	*[2.87]*	*[0.66]*
$Holding_{t-1}$ × Utilities	−0.716**	−0.817	0.805***	1.332*
	[2.07]	*[0.86]*	*[2.84]*	*[1.78]*
$Holding_{t-1}$ × Shock	−0.496***	−0.590***	0.489***	0.591***
	[6.44]	*[4.61]*	*[7.76]*	*[5.90]*
$Holding_{t-1}$ × Utilities × Shock	1.157***	1.658**	−0.781**	−0.933*
	[2.74]	*[2.46]*	*[2.26]*	*[1.77]*
Sample	2003–2013	2009–2013	2003–2013	2009–2013
R^2	0.03	0.03	0.04	0.07
N	18,331	7,468	18,334	7,468

(Continues)

TABLE 8 (Continued)

Panel E: The dependent variable is the change in environmental concerns.				
	ΔEConcern		ΔEConcern	
	(1)	(2)	(3)	(4)
$Holding_{t-1}$	−0.018***	−0.031***	−0.006	0.009
	[4.15]	*[2.94]*	*[0.55]*	*[0.31]*
$Holding_{t-1} \times Utilities$	0.119***	0.225*	0.148**	0.175
	[2.61]	*[1.92]*	*[2.44]*	*[1.05]*
$Holding_{t-1} \times Shock$	0.011	0.019	0.032**	0.039*
	[1.27]	*[1.60]*	*[2.41]*	*[1.75]*
$Holding_{t-1} \times Utilities \times Shock$	−0.303***	−0.380***	−0.275***	−0.372***
	[3.13]	*[2.71]*	*[3.72]*	*[3.17]*
Sample	2003–13	2009–2013	2003–2013	2009–2013
Regression	OLS	OLS	FE	FE
R^2	0.07	0.16	0.01	0.01
N	18,334	7,468	18,334	7,468
Panel F: the investor variable is the number of institutional investors.				
	ΔCSR		ΔConcern	
	(1)	(2)	(3)	(4)
$NInvestors_{t-1}$	−0.008	0.030**	−0.002	−0.058***
	[1.18]	*[2.29]*	*[0.25]*	*[2.88]*
$NInvestors_{t-1} \times Utilities$	−0.092***	−0.107*	0.107***	0.194***
	[4.22]	*[1.72]*	*[11.98]*	*[9.74]*
$NInvestors_{t-1} \times Shock$	0.012	−0.039***	−0.069***	−0.030
	[1.11]	*[2.77]*	*[5.03]*	*[1.62]*
$NInvestors_{t-1} \times Utilities \times Shock$	0.249***	0.237***	−0.071***	−0.123***
	[3.83]	*[2.67]*	*[4.86]*	*[5.36]*
Sample	2003–2013	2009–2013	2003–2013	2009–2013
R^2	0.13	0.18	0.23	0.27
N	18,331	7,468	19,936	8,301

Note: This table presents the results from OLS regressions (in Panels A-C and E) and fixed effect regressions (in Panel D) on the change in firm CSR or CSR concerns from year *t−1* to *t*. The sample covers years 2003–2013. *CSR* is the sum of the differences between scaled strengths and scaled concerns along the five dimensions. *Concern* is scaled CSR concerns in the five dimensions. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for the years after 2011. *Crisis* equals 1 for the years after 2008. *MBE* is the ratio of the market value of equity to the book value of equity. *ME* is the logarithm of the market value of equity. *LDR* is the ratio of the book values of long-term debt to the book value of assets. *ROA* is net income divided by the book value of assets. *SALE* is the logarithm of sales revenue. *Holding* is the fraction of equity held by institutional investors. *LagHolding* is calculated either in 2008 or as an average in 2003–2008. *NInvestors* is the number of institutional investors investing in the firm's equity. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, *SALE*, and the interactions of these variables with *Holding* are unreported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

5 | SUBSTITUTION BETWEEN CSR AND ADVERTISING

In this section, we study how firms manage advertising expenditures in response to the Fukushima accident. We subsequently study the relation between the changes in CSR and advertising and test the substitution hypothesis that firms substitute between CSR and advertising following the Fukushima accident.

5.1 | Advertising and the Fukushima nuclear accident

First, we study how utilities and non-utilities firms modify their advertising strategies in response to the Fukushima accident. We run a regression similar to that specified in Equation (2), but with the dependent variable being the change in advertising from year $t-1$ to t, rather than the change in CSR. We also control for the change in sales in the advertising regressions to ensure that our results are not driven by sales.

We report the results from the advertising regressions in Table 9. In the first three columns, we measure advertising using the logarithm of advertising expenses. The sample covers years 2003–2013 in columns (1)–(2) and 2009–2013 in column (3). In all three columns, the coefficients of *Utilities* are negative and statistically significant. Thus, on average, utilities firms advertise less before the Fukushima accident compared to firms in other industries. In addition, the coefficients of *Shock* are positive and they are significant in columns (2) and (3). These results suggest that firms on average increase advertising expenditures after the Fukushima accident. More importantly, the coefficients of *Utilities* × *Shock* are negative and they are all significant at the 1% level. For example, in column (2), the coefficient of *Utilities* × *Shock* is statistically significant at −0.23. In comparison, the coefficient of *Shock* is 0.04. In unreported tests, we find that the sum of these two coefficients is significantly negative at the 1% level. Thus, while non-utilities firms on average increase their advertising expenditures after the Fukushima accident, utilities firms significantly decrease advertising expenditures during the same period.

Many studies in the literature also use advertising scaled by sales as the advertising variable. In the regressions reported in the first three columns, we control for lagged sales and change in sales, both of which are logarithmic variables. As such, these regressions are equivalent to those with the logarithm of advertising scaled by sales as the dependent variable. To further demonstrate the robustness of our results, we also run regressions using the non-logarithmic variable *ADV/SALE* as the dependent variable. We present these results in columns (4)–(6). The results in these three columns are qualitatively similar to those reported in the first three columns. The coefficients of *Utilities* × *Shock* remain negative and highly significant at the 1% level (Table 10).

5.2 | Link between the change in advertising and the change in CSR

In this subsection, we examine the relation between advertising and CSR activities post the Fukushima accident. Our objective is to empirically test the hypothesis that there is a substitution effect between advertising and CSR initiatives in response to the accident.

In the previous sections, we analyzed the CSR and advertising equations independently. To evaluate CSR and advertising as intertwined decisions, we use seemingly unrelated regression (SUR). In the context of our study, the Fukushima accident might concurrently affect CSR and advertising decisions, leading to correlated errors. By estimating the advertising and CSR equations together, the SUR method leverages these potential error correlations to mitigate bias and enhance efficiency. If firms genuinely prioritize CSR over advertising after the Fukushima incident, the coefficients of *Shock* in the CSR equation should be positive (suggesting an increase in CSR), whereas those in the advertising equation should be negative (suggesting a decrease in advertising).

We report the results from the SUR method in Panel A of Table 11. Columns (1) and (2) report the results for changes in CSR and advertising, represented by $DCSR_{t-1,t}$ and $DADS_{t-1,t}$, respectively. Both the CSR and advertising equations use identical control variables as used in the preceding regressions. As can be seen, the coefficient of *Utilities* × *Shock* in the CSR regression (in column 1) is positive and significant, indicating a post-accident increase in CSR

TABLE 9 Impact of the Fukushima Daiichi nuclear accident on advertising.

	ΔLog(ADV)			ΔADS		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−0.15***	−0.14***	−0.13***	0.74	1.11	−0.44
	[5.08]	[4.54]	[3.14]	[1.14]	[1.63]	[0.45]
$Log(ADV_{t-1})$ or ADS_{t-1}	−0.03***	−0.03***	−0.02***	−0.05***	−0.05***	−0.04***
	[5.13]	[5.14]	[3.08]	[4.99]	[4.95]	[3.56]
Utilities	−0.04**	−0.08***	−0.06*	−1.22***	−1.48***	−0.19
	[2.50]	[4.28]	[1.93]	[5.15]	[6.47]	[0.44]
Shock	0.01	0.04***	0.04***	0.26	1.15***	1.09***
	[0.90]	[3.48]	[3.20]	[1.11]	[3.83]	[3.57]
Shock × Utilities	−0.13***	−0.23***	−0.23***	−0.55**	−1.47***	−1.52***
	[8.58]	[7.25]	[7.42]	[2.04]	[2.93]	[3.59]
ME_{t-1}	0.02***	0.02***	0.02***	0.41***	0.34**	0.46***
	[3.89]	[3.44]	[3.97]	[2.60]	[2.22]	[2.73]
MBE_{t-1}	0.00	0.00	0.00**	0.00	0.00	0.01***
	[0.71]	[0.48]	[2.30]	[1.45]	[1.28]	[3.80]
LDR_{t-1}	0.01	0.01	−0.01	−0.09	−0.07	−0.55
	[0.81]	[0.86]	[0.37]	[0.16]	[0.12]	[0.61]
$SALE_{t-1}$	0.01	0.01*	−0.00	−0.48***	−0.42***	−0.45**
	[1.60]	[1.94]	[0.07]	[2.88]	[2.60]	[2.42]
ROA_{t-1}	0.22***	0.22***	0.11	11.61***	11.47***	10.65**
	[3.66]	[3.62]	[1.04]	[3.17]	[3.15]	[2.08]
$\Delta SALE_{t-1,t}$	0.53***	0.52***	0.47***	−6.33***	−6.65***	−6.54***
	[12.89]	[12.33]	[6.57]	[3.55]	[3.65]	[3.47]
Crisis		−0.04***			−1.15***	
		[3.73]			[3.72]	
Utilities × Crisis		0.14***			1.26***	
		[7.93]			[2.60]	
Sample	2003–2013		2009–2013	2003–2013	2009–2013	
R^2	0.14	0.14	0.15	0.06	0.06	0.08
N	7,990	7,990	2,874	7,990	7,990	2,874

Note: This table presents the results from OLS regressions on the change in advertising from year *t*−*1* to *t*. The sample covers years 2003–2013. The advertising variable is either *Log(ADV)*, the logarithm of (1+ advertising expenditures), or *ADS*, advertising scaled by sales revenue. *Utilities* is the dummy of the utilities industry. *Shock* equals 1 for the years after 2011. *Crisis* equals 1 for the years after 2008. Market-to-book ratio (*MBE*) is the ratio of the market value of equity to the book value of equity. Market capitalization (*ME*) is the logarithm of the market value of equity. Long-term debt ratio (*LDR*) is the ratio of the book value of long-term debt to the book value of assets. Return on assets (*ROA*) is the ratio of net income to the book value of assets. *SALE* is the logarithm of sales revenue. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

TABLE 10 CSR and advertising after Fukushima nuclear accident: Seeming unrelated regressions.

	$\Delta CSR_{t-1,t}$	$\Delta ADS_{t-1,t}$	$\Delta Concern_{t-1,t}$	$\Delta Strength_{t-1,t}$	$\Delta CSR_{t-1,t}$	$\Delta ADS_{t-1,t}$
	(1)	(2)	(3)	(3)	(4)	(4)
Utilities	−0.132	0.002	0.114	−0.016	−0.212	−0.006
	[0.38]	*[0.03]*	*[0.93]*	*[0.17]*	*[1.07]*	*[0.05]*
Shock	−0.057**	−0.029**	−0.070***	−0.003		
	[2.34]	*[0.01]*	*[3.48]*	*[0.84]*		
Shock × Utilities	0.557**	−0.217*	−0.443**	0.079		
	[2.19]	*[1.70]*	*[2.10]*	*[0.50]*		
Pseudo					0.021	0.004
					[0.74]	*[0.81]*
Pseudo × Utilities					0.232	0.019
					[0.74]	*[0.12]*
R^2	0.07	0.18	0.11	0.05	0.02	0.18
N	6,672	6,672	6,672	6,672	6,672	6,672

Note: This table presents the results from seemingly unrelated regressions on the changes in CSR and advertising. The sample covers years 2003–2013. *CSR* is the difference between scaled strengths and concerns in the five dimensions. *Concern* is scaled concerns. The advertising variable *ADS* is advertising expenditures scaled by sales. All changes are from year *t−1* to *t*. *Utilities* is the dummy variable of the utilities industry. *Shock* is the dummy of 2011 Fukushima accident. *Pseudo* is a random-year dummy variable equal to one for the years after a randomly assigned year. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, and *SALE* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

performance. Conversely, the coefficient is negative and significant in the advertising equation (in column 2), indicating a post-accident decrease in advertising expenditures. These results support our substitution argument, showing that utilities firms shift their emphasis to CSR initiatives while reducing advertising post the Fukushima accident. They are also consistent with our earlier findings obtained from OLS and fixed effect models.

Next, we re-run SUR with $DCSR_{t-1,t}$ in the CSR regression replaced by either $DConcern_{t-1,t}$ or $DStrength_{t-1,t}$. Given the results for the advertising equation remain mostly unchanged, for brevity, they are unreported in the paper. Instead, we report the results from the concern and strength equations in columns (3) and (4). Here, the coefficient of *Utilities* × *Shock* in the concern regression (in column 3) is significantly negative, implying a reduction in CSR concerns for utilities firms post the accident. However, the same coefficient in the strength regression (in column 4) is statistically insignificant. These results reinforce our argument that, following the Fukushima incident, utilities firms prioritize mitigating CSR concerns over enhancing their CSR strengths.

In another robustness check, we also substitute the accident year, 2011, with a randomly generated pseudo-event year (*Pseudo*) for each firm in our sample. By using these imaginary event years, we want to ascertain whether the relation between CSR and advertising could persist without the influence of the Fukushima accident. As seen from columns (5) and (6), the coefficients of *Utilities* × *Shock* are insignificant. The lack of significant results in the placebo test underscores the pivotal role the Fukushima accident played in changing the dynamics between CSR and advertising in utilities firms. It shows that our findings on the post-accident changes in CSR and advertising are not a result of mere coincidental patterns or embedded time trends in the data.

In addition to the SUR method, we also run the following OLS regression to link the post-accident changes between CSR and advertising:

$$\Delta CSR_{09,t} = q_0 + q_1 Utilities + q_2 DADV_{09,t} + q_3 Utilities \times DADV_{09,t} + q_4 Control + \varepsilon. \quad (4)$$

TABLE 11 CSR and advertising after Fukushima nuclear accident: Direct linkage.

	$\Delta CSR_{09,t}$	$\Delta Concern_{09,t}$	$\Delta EConcern_{09,t}$	$\Delta Concern_{09,t}$	$\Delta EConcern_{09,t}$
	(1)	(2)	(3)	(4)	(5)
Constant	−1.395***	0.289***	−0.006	0.292***	−0.033***
	[17.99]	*[4.70]*	*[0.67]*	*[4.79]*	*[2.67]*
CSR_{2009}	−0.563***				
	[18.04]				
$Concern_{2009}$		−0.650***		−0.651***	
		[10.96]		*[11.07]*	
$EConcern_{2009}$			−0.585***		−0.587***
			[8.48]		*[8.50]*
Utilities	−0.591***	0.553***	0.031***	1.137***	0.146***
	[13.33]	*[9.81]*	*[3.01]*	*[11.94]*	*[3.61]*
$\Delta ADS_{09,t}$	−0.005*	0.001	0.001		
	[1.81]	*[0.43]*	*[1.29]*		
$\Delta ADS_{09,t} \times$ Utilities	−2.460***	3.369***	0.573***		
	[6.45]	*[9.02]*	*[3.79]*		
ADS_{09}				−0.003	0.0002
				[1.22]	*[0.60]*
$ADS_{09} \times$ Utilities				−2.752***	−0.542***
				[7.88]	*[3.82]*
R^2	0.49	0.41	0.42	0.41	0.41
N	1,337	1,337	1,337	1,337	1,337

Note: This table presents the results from OLS regressions on the changes in CSR variables. The sample covers the post-accident years of 2011–2013. *Concern* and *EConcern* are scaled concerns in the five dimensions and the environmental dimension, respectively. *CSR* is the difference between scaled strengths and concerns in the five dimensions. The advertising variable *ADS* is advertising expenditures scaled by sales. All changes are from 2009 to a post-crisis year. *Utilities* is the dummy variable of the utilities industry. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, and *SALE* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Our sample spans the post-accident years from 2011 to 2013. The change variables measure the changes from 2009, a year preceding the Fukushima accident, to a given post-accident year *t*.[7] Based on our substitution argument, utilities firms substitute advertising with CSR following the Fukushima accident. Thus, we expect q_3, the coefficient of $Utilities \times DADV_{09,t}$, to be negative.

We report the results from Equation (4) in column (1) of Table 11. As expected, the coefficient of $Utilities \times DADV_{09,t}$ is negative at −2.64, and it is highly significant. In comparison, the coefficient of $DADV_{09,t}$ is −0.05, which is economically and statistically weaker than the coefficient of $Utilities \times DADV_{09,t}$. Thus, changes in advertising and CSR around the Fukushima accident are more negatively correlated in utilities than non-utilities firms. This result supports our substitution argument.

In column (2), the dependent variable is the change in CSR concerns, denoted as $DConcern_{09,t}$, rather than the change in overall CSR performance. The coefficients of $DADV_{09,t}$ is insignificant, while the coefficient of

[7] In unreported regressions, we also use averages from either 2008–2009 or 2003–2009 as benchmarks and calculate changes based on these averages. The results with these alternative benchmarks (unreported) would remain qualitatively unchanged.

TABLE 12 Advertising after Fukushima nuclear accident and financial constraint.

	$\Delta ADS_{t-1,t}$	$\Delta ADS_{t-1,t}$	$\Delta ADS_{t-1,t}$	$\Delta ADS_{09,t}$	$\Delta ADS_{09,t}$
	(1)	(2)	(3)	(4)	(5)
Utilities	−0.564***	−0.443	−0.592*	0.084***	0.003
	[2.95]	*[1.45]*	*[1.80]*	*[2.79]*	*[0.16]*
Shock	0.388**	0.676***	0.381***		
	[2.09]	*[2.73]*	*[2.77]*		
Utilities × Shock	−2.033***	−2.098***	−2.554***		
	[4.82]	*[3.57]*	*[3.88]*		
$Constraint_{t-1}$	−0.788	−1.106	−0.024	0.008	0.001
	[1.36]	*[1.04]*	*[1.22]*	*[0.24]*	*[0.68]*
$Constraint_{t-1}$× Utilities	−1.095**	−1.143	0.086*	0.204***	−0.001
	[2.24]	*[1.49]*	*[1.77]*	*[2.75]*	*[0.20]*
Shock × $Constraint_{t-1}$	0.720*	1.360**	−0.039**		
	[1.78]	*[2.42]*	*[2.20]*		
Shock×Utilities×$Constraint_{t-1}$	−4.444***	−4.483***	0.323***		
	[4.48]	*[3.26]*	*[3.62]*		
$\Delta CSR_{09,t}$				−0.012	−0.007
				[1.46]	*[1.44]*
Utilities × $\Delta CSR_{09,t}$				−0.158**	−0.083**
				[2.57]	*[1.99]*
$\Delta CSR_{09,t}$ × $Constraint_{t-1}$				−0.022	0.001
				[1.30]	*[1.19]*
Utilities×$\Delta CSR_{09,t}$×$Constraint_{t-1}$				−0.386***	0.012**
				[2.60]	*[2.02]*
Constraint variable	WW_{t-1}	WW_{t-1}	$SALE_{t-1}$	WW_{t-1}	$SALE_{t-1}$
Sample	2003–2013	2009–2013	2009–2013	2011–2013	2011–2013
R^2	0.06	0.09	0.09	0.06	0.06
N	7,983	2,870	2,874	1,337	1,337

Note: This table presents the results from OLS regressions on the change in advertising intensity from year *t−1* or *2009* to *t*. The sample covers the post-accident years of 2011–2013. Advertising intensity *ADS* is advertising expenditures scaled by sales. *CSR* is the difference between scaled strengths and concerns in the five dimensions. *Utilities* is the dummy variable of the utilities industry. The financial constraint variable is either *WW*, the Whited-Wu (2006) index, or *SALE*, the logarithm of sales revenue. The coefficients of *MBE*, *ME*, *LDR*, *ROA*, and lagged *ADS* are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Utilities×$DADV_{09,t}$ is positive and significant. Thus, utilities firms appear to reduce advertising to address CSR concerns following the Fukushima accident. In contrast, this pattern does not exist in non-utilities firms. In column (3), we further run a regression with the dependent variable being $DEConcern_{09,t}$, that is, the change in environmental concerns. Similarly, the coefficient of $DADV_{09,t}$ is insignificant, and the coefficient of *Utilities*×$DADV_{09,t}$ is positive and significant. These results align with those reported in the earlier tables: the substitution between CSR and advertising following the Fukushima accident is driven by environmental concerns.

A potential concern regarding the regressions in columns (1)–(3) is that both changes in advertising and CSR are measured within the same timeframe. Consequently, it is possible that both changes are affected by some endogenous factors occurring in the timeframe. However, we argue that our research design could help mitigate this concern. We construct the change variables as the changes occurring around the Fukushima accident. These change variables capture the unique exogenous shock in the Fukushima accident that distinctly and substantially influences utilities firms. We also show that the post-accident changes in advertising and CSR are present only for utilities firms and absent for non-utilities firms. This differential effect supports our claim that utilities firms' post-accident changes in CSR and advertising are a consequence of the Fukushima accident and its implications on utilities firms.

To further address the potential endogeneity concern, we also modify our approach by replacing $DADV_{09,t}$, the change in advertising intensity from 2009 to year t, with ADV_{09}, the level of advertising intensity in 2009 (a year before the Fukushima accident). By doing so, we attempt to isolate our advertising variable from potential confounding effects that might be present during the measurement window of $DCSR_{09,t}$. In this study, we argue that, if a utilities firm had higher advertising expenditures in the year prior to the accident, it would possess more available resources to reallocate to CSR initiatives after the Fukushima accident. In line with this reasoning, we expect a positive association between the pre-accident level of advertising intensity and the post-accident change in CSR. Specifically, we expect the coefficient for $Utilities \times ADV_{09}$ to be positive.

To test, we conduct regressions with either $DConcern_{09,t}$ or $DEConcern_{09,t}$ as the dependent variable and $Utilities \times ADV_{09}$ as the independent variable of interest. We present the new regression results in columns (4)–(5). Consistent with our expectations, the coefficients of $Utilities \times ADV_{09}$ are positive and significant in both columns. These results again support our substitution argument.

5.3 | Substitution and financial constraint

Financial constraints can significantly influence a firm's expenditures in areas such as advertising and CSR. The literature, such as the study by Hong, Kubik, and Scheinkman (2012), underscores how financial constraints can impact a firm's capacity for CSR investments. Considering this, we conjecture that the substitution between advertising and CSR in the aftermath of the Fukushima accident is also influenced by financial constraints.

Specifically, as we discussed earlier, the Fukushima accident could heighten investors' awareness of environmental and safety issues in utilities firms. To address these heightened concerns, utilities firms would feel compelled to intensify their CSR activities. However, for firms already suffering from financial constraints, intensifying CSR efforts would necessitate a reduction in advertising expenditures to free up funds. Thus, we hypothesize that utilities firms with greater financial constrains experience a more pronounced reduction in advertising post-accident, opting instead to reallocate resources to CSR initiatives.

To test this hypothesis, we measure financial constraints (denoted by *Constraint*) using either WW_{t-1} (the Whited-Wu index) and $SALE_{t-1}$ (sales revenue). A higher value of the Whited-Wu index or a lower sales revenue indicates more financial constraints. We first run regressions of the change in advertising intensity ($DADS_{t-1,t}$) against the three-way interaction of *Utilities*, *Shock*, and *Constraint*. The control variables include all two-way interactions. The key variable of interest in these new regressions is the three-way interaction, $Utilities \times Shock \times Constraint$. The coefficient of this interaction term captures how financial constraints affect advertising expenditures in utilities firms following the Fukushima accident. In alignment with our hypothesis, we anticipate that utilities firms under greater financial constraints — indicated by a higher WW_{t-1} or a lower $SALE_{t-1}$ —would exhibit a more pronounced reduction in advertising expenditures subsequent to the Fukushima incidents. As such, we predict a negative coefficient for $Utilities \times Shock \times WW_{t-1}$ and a positive coefficient for $Utilities \times Shock \times SALE_{t-1}$.

We present the results from the above regressions in Table 12. In columns (1) and (2), the financial constraint variable is WW_{t-1}, with samples covering 2003–2013 or 2009–2013, respectively. In column (3), the financial constraint variable is $SALE_{t-1}$ with the sample covering 2009–2013. Consistent with our hypothesis, the coefficients of $Utilities \times Shock \times WW_{t-1}$ are negative and the coefficient of $Utilities \times Shock \times SALE_{t-1}$ is positive. All three coefficients are

statistically significant at the 1% level. These results show that utilities firms experiencing greater financial constraints tend to decrease their advertising expenditures more substantially in response to the Fukushima accident.

As previously hypothesized, the resources saved from the reduction in advertising could be channeled into CSR initiatives. To study whether it is the case, we test how financial constraints affect the substitution between advertising and CSR. We run a regression similar to that in Equation (4), including as additional independent variables *Constraint* and its two-way and three-way interactions with *Utilities* and *Shock*. As before, *Constraint* is measured as either WW_{t-1} or $SALE_{t-1}$. If financial constraints do affect the substitution, we predict a negative coefficient for $Utilities \times Shock \times WW_{t-1}$ and a positive coefficient for $Utilities \times Shock \times SALE_{t-1}$.

We report the results from these new regressions in columns (4)–(5) of Table 12. In column (4), the coefficient of $Utilities \times Shock \times WW_{t-1}$ is negative, and in column (5), the coefficient of $Utilities \times Shock \times SALE_{t-1}$ is positive. Both coefficients are statistically significant. These results imply that financial constraints could drive utilities firms to reallocate resources from advertising to CSR following the Fukushima accident.

6 | CONCLUSION

Our study proposes that during crises, firms may strategically substitute advertising for CSR to effectively manage investor relations. Using the Fukushima incident as an exogenous shock, we explore the CSR dynamics in the utilities industry following the Fukushima accident and the relationship between the changes in CSR and advertising. Our findings reveal a surge in CSR activities by utilities firms following the Fukushima accident, concurrent with a decline in their advertising expenditures.

We suggest that the post-accident shift from advertising towards CSR is tied to an intensified need to manage investors' heightened environmental concerns after the Fukushima accident. We find supporting evidence. Our empirical evidence shows that the enhancement in CSR post-Fukushima is primarily a response to alleviating environmental concerns. The reduction in environmental concerns and the associated improvement in CSR performances are particularly more pronounced for utilities firms facing greater pressure from institutional investors and more pre-existing environmental concerns.

Additionally, we hypothesize that financial constraints contribute to the decline in advertising and the subsequent resource reallocation towards CSR. Consistent with our hypothesis, our findings show that utilities firms experiencing tighter financial constraints are more inclined to cut back on advertising and channel those resources to improve their CSR performances.

Our research sheds light on how environmental hazards, such as the Fukushima accident, influence corporate strategies, especially in the realm of CSR. It holds significant implications for industry practitioners. Specifically, entities, particularly those in high-risk sectors like utilities, should be ready to adjust their strategic focuses, such as CSR and advertising, when external shocks alter investor perceptions. For instance, adopting a proactive approach to genuine CSR actions and downplaying promotional content can help manage investor relations during the crises that intensify investors' focus on CSR.

However, as with all research, it is essential to consider both the specific context and potential limitations when interpreting and applying our findings. The substitution between CSR and advertising could apply only to the specific context of the Fukushima accident and the utilities industry. Subsequent research could examine broader external shocks to check whether our findings apply to other external events and other industries as well. Further, considering the global implications of events like the Fukushima accident, future inquiries could explore into the differential impacts of these events across countries. It could also be insightful to see how global conglomerates, catering to a diverse range of stakeholders from different regions, tailor their CSR and advertising strategies in response.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A: SUBSTITUTION AND VALUE CREATION

In this appendix, we provide preliminary evidence on whether the substitution between CSR and advertising creates firm value. We propose in the paper that substituting CSR for advertising after the Fukushima accident can improve the effectiveness in managing the enhanced environmental concerns triggered by the accident. Accordingly, we hypothesize that the substitution is value enhancing. One approach to test this hypothesis would be to study how the change in firm value from the pre- to post-accident period is related to the substitution between advertising and CSR. However, such a test could be susceptible to bias due to endogeneity since both the substitution and the value change might be influenced by confounding factors. For example, the Fukushima accident might enhance investors' awareness of environmental issues. This enhanced consciousness might prompt substitution between advertising and CSR, while simultaneously leading to a discount on firm value. To circumvent this endogeneity issue, we examine the post-accident change in firm value in response to the pre-accident CSR concerns. If firms with lower pre-accident CSR concerns experience a smaller decline in firm value following the Fukushima accident, then we could argue that the substitution, which aims to reduce CSR concerns, may help to mitigate loss in firm value.

To study, we use market-to-book ratio *MBE* to measure firm valuation. We run regressions as below:

$$\Delta MBE_t = \gamma_0 + \gamma_1 Utilities + \gamma_2 Concern\,(before) + \gamma_3 Utilities \times Concern(before) + \gamma_4 Control + \varepsilon \quad \text{(A1)}$$

Here, the dependent variable being the change in firm value from the average of pre-accident years of 2003–2010 to each post-accident year of 2011–2013 (denoted by *DMBE*). The CSR concern variable (*Concern*) is calculated based on either all concerns or environmental concerns. The investor variable is institutional investor holding (*Holding*).[8] *Concern(Before)* and *Holding(Before)* average *Concern* and *Holding*, respectively, in the pre-accident period of 2003–2010. The sample of the regressions covers the post-accident years of 2011–2013. The control variables are similar to those in the previous regressions. We present the results from these regressions in Appendix Table A1.

In the first column, we run a regression only against *Utilities*, controlling for *MBE(Before)* and other control variables. The coefficient of *Utilities* is negative and weakly significant at the 10% level, indicating weak evidence that the value of an average utilities firm declines after the Fukushima accident. In columns (2)–(3), we introduce interactions of *Utilities* with either *Concern (Before)* or *EConcern (Before)*. Both the coefficient of *Utilities* × *Concern (Before)* in column (2) and the coefficient of *Utilities* × *EConcern (Before)* in column (3) are negative and statistically significant. They suggest that post-accident value loss is less pronounced in utilities firms with fewer pre-accident CSR concerns, especially regarding environmental concerns. These results suggest that the substitution of CSR for advertising could help mitigate value loss for utilities firms post-accident.[9]

Finally, we also study the role of institutional investors in the value implication. In column (4), we run a regression against the pre-accident institutional investor holding *Holding(before)* and its two-way interaction with *Utilities*. The coefficient of *Utilities* × *Holding(before)* is negative and significant, suggesting that the decline in firm value is more pronounced in utilities firms with higher institutional investor ownerships. In columns (5)–(6), we introduce the three-way interaction, *Utilities* × *Concern(Before)* × *Holding(before)*, with all two-way interactions as control variables. The coefficients of the three-way interaction are negative and significant in both columns. These results show that the effect of CSR concerns, especially environmental concerns, on firm value is greater in utilities firms with higher institutional investor ownerships. They indicate that the substitution and the subsequent value creation could be driven by the pressure from institutional investors.

Appendix Table A1: Firm valuation and CSR concerns.

	(1)	(2)	(3)	(4)		
Constant	−1.422***	−1.468***	−1.307***	−1.440***	−0.895	−1.189**
	[2.88]	*[3.49]*	*[3.16]*	*[3.07]*	*[1.65]*	*[2.48]*
MBE_{t-1}	0.441***	0.432***	0.429***	0.443***	0.456***	0.441***
	[5.10]	*[4.28]*	*[4.41]*	*[4.40]*	*[4.32]*	*[4.38]*
Utilities	−0.517*	0.446	−0.024	1.009	0.908	0.896
	[1.67]	*[0.62]*	*[0.04]*	*[1.65]*	*[1.56]*	*[1.58]*

(Continues)

[8] The results based on the other investor variable, number of institutional investors, are qualitatively similar and they are available upon requests from readers.

[9] It is important to note that utilities firms on average seem to still experience value losses post-accident, even if they substitute CSR for advertising to address CSR concerns. Our explanation is as follows. The Fukushima accident increases investor awareness of CSR issues, which pressures utilities firms to address CSR concerns by substituting CSR for advertising. However, the substitution is costly, and firms may not be able to fully address all CSR concerns. Consequently, we observe two counteracting effects on firm value post-accident. On the one hand, the substitution could reduce CSR concerns and increase firm value. On the other hand, increased investor awareness coupled with unresolved CSR concerns could hurt firm value. The final post-accident firm value reflects the net effect of these two effects. Our results suggest that the effect of increased investor awareness and unresolved concerns could more than offset the beneficial effect of reduced CSR concerns, leading to a net decrease in post-accident firm value for utilities firms.

	(1)	(2)	(3)	(4)		
Concern(Before)		0.324	1.139**		−0.470	0.493
		[1.03]	*[2.10]*		*[0.95]*	*[0.55]*
Utilities × Concern (Before)		−0.970***	−1.787***		0.435	1.277
		[3.33]	*[3.81]*		*[0.86]*	*[1.30]*
Holding(Before)				0.033	−3.172*	−0.939
				[0.04]	*[1.91]*	*[0.95]*
Utilities × Holding(Before)				−8.033***	−4.962***	−6.362***
				[11.06]	*[2.90]*	*[6.48]*
Holding(Before)×Concern(Before)					4.656**	3.036
					[2.11]	*[1.05]*
Utilities × Holding(Before) × Concern(Before)					−4.516*	−9.277**
					[1.81]	*[2.41]*
Concern Variable	N.A.	All	Environ.	N.A.	All	Environ.
R^2	0.13	0.14	0.14	0.14	0.14	0.14
N	3,112	3,112	3,112	3,112	3,112	3,112

This table presents the results from OLS regressions on the change in market-to-book value of equity (*MBE*) from the average of pre-accident years to each post-accident year *t*. *MBE* is the ratio of the market value of equity to the book value of equity. The sample covers years 2011–2013. *Concern (before)* is scaled CSR concerns along the five dimensions. *Holding* is the fraction of equity held by institutional investors. *Utilities* is the dummy variable of the utilities industry. The coefficients of Market capitalization (*ME*), Long-term debt ratio (*LDR*), Return on assets (*ROA*), Sales (*SALE*), and Change in sales (D*SALE*) are not reported. Standard errors are adjusted for heteroskedasticity and firm clustering. *t*-statistics are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.