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Corporate Social Responsibility, Investor Behaviors, and Stock Market Returns: Evidence from a Natural Experiment in China

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ABSTRACT. This article studies how financial investors respond to firms' corporate social responsibility (CSR) performance in terms of their investing behaviors, and how such behaviors change contingent on an event that provokes their attention and concerns to CSR. Using the melamine contamination incident in China as a natural experiment, it is found that neither the individual investors' nor the institutional investors' behaviors are influenced by firms' CSR performance before the incident. Nevertheless, in the post-event period, institutional investors' behaviors are significantly influenced by firms' CSR performance that exceeds a certain threshold. Furthermore, such an effect diminishes for a better CSR performance. In comparison, the authors do not find any effects of CSR performance on individual investors, either before the event or after the event. Finally, firms' performance and investors' behaviors jointly affect firms' stock returns after the event but not before the event. This article reconciles the mixed findings in the literature on the effect of firms' CSR performance on their financial performance by showing that such an effect exists in a contingent manner. Furthermore, the authors show that a too low or a too high CSR performance could lead to undesirable responses from investors. Therefore, managers should pay attention to optimizing firms' CSR activities.

KEY WORDS: corporate social responsibility, financial performance, stock markets, event study, investors' behaviors, emerging markets, Chinese stock market

Introduction

The reconciliation of a firm's commercial success, and its responsibilities to honor ethical values and respect individuals, society, and the natural environment, has greatly grabbed the attention of researchers since the 1980s. The extant literature in this field – the so-called corporate social responsibility (CSR) – supports the notion that going beyond profit maximization and caring about the interests of society, consumers, and employees are beneficial to a firm's long-term performance in operations (e.g., Luo and Bhattacharya, 2009; McWilliams and Siegel, 2001; Pava and Krausz, 1996; Solomon and Hansen, 1985; Whetten et al., 2002).

Nevertheless, studies on CSR and firms' performance on the financial market report mixed findings (McWilliams and Siegel, 1997) even though some investors (e.g., socially responsible investment funds) explicitly favor firms that are socially responsible. Some researchers detect a positive relationship (e.g., Posnikoff, 1997), some discover a negative relationship (e.g., Wright and Ferris, 1997), and others find no relationship (e.g., Teoh et al., 1999). One plausible explanation for the discrepant results is the time frame of CSR activities: the costs of CSR are immediate, whereas many of its benefits are not realized promptly; therefore, investors with different timeframes value firms' CSR performance differently (Tsoutsoura, 2004).

Since a firm's financial performance is directly affected by investors' buying and selling behaviors, to understand how investors perceive CSR is critical to understanding the relationship between a firm's CSR activities and its financial performance. Nevertheless, despite its importance, this area is quite underexplored. In this article, such a relationship via the event-study approach is investigated. Specifically,

how the influence of CSR on investors' behaviors changes upon an event that potentially affects investors' attention to CSR is examined. It is hypothesized that CSR only influences investors in a contingent manner, i.e., the influence is manifested only after an event and not before it. It is also proposed that the influence of CSR on investors varies depending on the type of investors (institutional investors versus individual investors). Finally, the authors postulate that a firm's CSR performance affects its short-term financial performance after the event but not before it.

Using China's melamine contamination incident in 2008 as a natural experiment, the authors find strong support for the above hypotheses. In addition, the authors detect two effects of CSR on investors' behaviors *ex post* the event. Specifically, a firm's CSR performance positively affects investors' buying and selling of its stocks only when the CSR performance exceeds a lower bound. On the other hand, the effect of CSR demonstrates a diminishing pattern on investors' behaviors.

This article makes three contributions. First, it enhances our understanding of the role played by CSR in investors' behaviors at large, which is found to be contingent on investors' attention to firms' CSR performance, which was triggered by a CSR event. Hence, this article offers one explanation that reconciles the contradicting findings in the literature regarding firms' CSR and financial performance. Second, this article documents the varied responses of different investors to CSR. It is found that institutional investors are more sensitive to CSR performance than individual investors. Third, it is observed that the positive effects of CSR performance on investors' behaviors occur only when CSR performance stays above a certain threshold. These findings offer a critical insight for optimizing CSR performance.

The remainder of the article is structured as follows. "Literature review" section reviews related literature. "Empirical procedure" section introduces the background information of the study and describes the methodology and the data. Empirical results are presented in "Analysis and results" section. In the final section "General discussion and concluding remarks" conclusions are summarised.

Literature review

This article is related to two streams of literature. The first stream is on the effect of CSR on investment performance, which is an interesting topic to both practitioners and academia. An extant literature uses social screens as main filters for evaluating CSR performance. Given the tension between modern portfolio theory and CSR performance (Derwall et al., 2005; Kurtz, 2005), the relationship between investment strategies and CSR is a critical issue. There are two competing theories explaining the impact of incorporating social screens in investors' decisions. On the one hand, arguments based on portfolio theory argue that the construction of portfolios on the basis of a restricted universe of stocks will compromise the benefits of full diversification (Rudd, 1981). Furthermore, the additional costs of monitoring social performance will also cause lower returns. Accordingly, investment portfolios based on CSR (the so-called SRI funds) should exhibit underperformance relative to conventional peers. On the other hand, proponents of socially responsible investments argue that social screens are filters to select firms with higher quality of management. Consequently, portfolios composed of socially responsible stocks will benefit from improved performance in the long run (e.g., Hill et al., 2007). Empirical studies find no statistical differences between the average performance of SRI and conventional funds in the U.S.[1] (e.g., Benson et al. 2006; Hamilton et al., 1993). The empirical evidence for international markets provides mixed findings about underperformance of SRI funds relative to conventional ones (e.g., Bauer et al. 2005, 2006, 2007; Jones et al., 2008; Kreander et al., 2005).

This article is also related to the studies on firms' motivation to conduct CSR activities. Traditional economic studies suggest that CSR is not part of managerial duties and may cause cash flow waste and, consequently, lead to a violation of the fiduciary relationship of managers with shareholders (Friedman, 1962). Nevertheless, advocates of the stakeholder theory argue that shareholder wealth maximizing behavior may be in accordance with social optimum in a framework in which well

functioning institutions set proper rules and fiscal incentives to reconcile individual and social optimum. However, that behavior does not hold in an economic environment riddled by conflicts of interest, agency costs and informational asymmetries in which weak or missing institutions cannot perform their task. Freeman (1984) argues that CSR may be the optimal strategy for minimizing transaction costs with stakeholders (e.g., creditors, employees, suppliers, customers, and the society at large) in such a framework. Tirole (2001) points out that the concept of stakeholder value recognizes that corporate activity may create negative externalities which need to be counterbalanced, either by institutional rules or by corporations themselves. In such a scenario, the ultimate value of shareholders' wealth may be linked to "maximizing the sum of various stakeholder surpluses," The proponents of the stakeholder theory argue that sometimes the interests of other important stakeholders should supersede the interests of a firm's shareholders in managerial decision-making, even if this reduces the present value of a firm's cash flows (Clarkson, 1995; Donaldson and Preston, 1995; Mitchell et al., 1997; Wood and Jones, 1995). Empirically, Solomon and Hansen (1985) observe that costs of CSR in terms of higher care for stakeholders are more than compensated by positive changes in employee morale and productivity; Pava and Krausz (1996) and Preston and O'Bannon (1997) find that positive synergies exist between corporate performance and good stakeholder relationships; Ruf et al. (2001) highlight a positive link among CSR, growth in sales, and returns on sales. Considering the costs and benefits of CSR activities, their relationship with corporate performance becomes an empirical question, but the results are mixed (Margolis and Walsh, 2003).

Empirical procedure

In this section, the empirical procedure that is used in this study is introduced. "Background" section introduces the industry background of the natural experiment. "Data" section explains the sources of our data. "Event study, abnormal returns, and net order flow" section details the event-study methodology.

Background

The melamine contamination incident in China

It was secret that had been kept from the public: raw milk producers had been adding melamine, a chemical rich in nitrogen, into milk to boost the detected amount of nitrogen (as a proxy for protein content) in milk quality tests. Owing to the shortage of raw milk caused by the fast-growing demand for dairy products, dairy-product manufacturers in China had remained silent to the issue to compete for the raw milk they needed. Melamine is lethal to infants, and is also harmful to adults if a large dose is taken. The U.S. Food and Drug Administration allows amounts less than 2.5 parts per million in adult foods and zero in infant foods.

The melamine contamination incident broke out on September 11, 2008, when Sanlu Corporation, one of China's largest dairy manufacturers, announced that its products on sale had been contaminated by melamine. Sanlu immediately recalled all of its products from the market. Since melamine was added to raw milk, consumers suspected that all kinds of dairy products could potentially be contaminated. The fear was confirmed 2 days later when products of 22 brands (with total market shares exceeding 90% in liquid milk and 50% in powdered milk) were found to contain melamine (Chao, 2008). Later, in-depth reports revealed that the top management of the dairy companies involved knew that their products contained melamine long before the incident, but they were afraid that product recalls would heavily hurt their reputations and market shares. These dairy companies were accused of poorly managing their supply chain system, losing quality control, intentionally delaying product recall, and hiding recall from public. Hence, the melamine contamination incident is a typical CSR event.

From the investors' perspective, the consequence of the incident was severe. Sanlu went bankrupt 5 months following the incident, and all the publicly traded dairy companies that were found faulty experienced a drastic decline (at least 30%) in stock prices.

CSR in China

The first CSR report in China was released by Shell China in 1999. Since then, the number of public-traded companies that voluntarily report their CSR

activities has been growing (Kolk et al. 2007). With rapid economic growth in China, the issue of how to balance economic growth and social development is receiving growing attention by the general public, media, as well as government agencies at the various levels. CSR has also gained growing awareness among Chinese entrepreneurs. According to a survey of 4586 Chinese companies conducted by the China Enterprise Survey System in 2007, nearly 55% of respondents said they have become familiar with CSR activities. Another survey conducted by the Social Science Academy of China in 2008 suggests that the majority of investors in China care about firms' CSR activities. Shenzhen Stock Exchange, one of the two stock exchanges in China, encourages listed companies to regularly disclose their CSR activities. The other stock exchange, Shanghai Stock Exchange, launched a new CSR index in 2009.

Data

The authors sample all the firms listed on China's stock markets with sales over 10 billion RMB (approximately 1.5 billion USD) in the 2007 fiscal year. The initial sample includes 118 firms. Three firms have subsequently been dropped given that their shares were in trading suspension and there were no trading activities during the period of study. To mitigate sample selection bias, one dairy industry firm was also dropped. Our final sample consists of 114 firms. Trades and quotes data come from the RESSET Financial Database. The database is developed and maintained by Beijing Gildata RESSET Data Tech and is publicly available. Other information collected from the RESSET Financial Database includes market capitalization, daily return, percentage of shares held by mutual funds, and other financial variables.

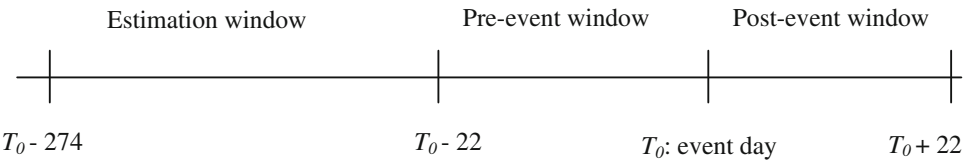
The authors measured firms' CSR performance in 2007 using the CSR scores compiled in 2008 by *Southern Weekend*, China's leading weekly newspaper targeting emerging middle-class readers with over 1.4 million circulation (*Southern Weekend* is the only news agency that had exclusively interviewed the U.S. President Barrack Obama during his 2009 visit to China.), A detailed description of the methodology used by *Southern Weekend* is provided in Appendix B.

Out of the 114 firms in our sample, 86 firms were rated by *Southern Weekend* with a CSR score, and the remaining 28 firms were not rated. In Table I, summary statistics of the key financial measures for the two groups are presented. A between-group *t*-test indicates that there are significant differences between the firms with CSR scores and those without CSR scores in terms of the fundamental measures such as total market capitalization, sales revenues, and return on equity. Hence, the authors control for the effects of heterogeneity in firms' fundamental characteristics in the following regression tests.

Event study, abnormal returns, and net order flow

The authors use event-study methodology to investigate how CSR affects investors' behaviors and stock prices before and after the melamine contamination incident. The event study was first proposed by Fama et al. (1969), and since then it has been widely used in the fields of economics, finance, accounting, and marketing (for more information regarding the event study, please refer to MacKinlay (1997) for a summary). Described below is how the event study for this study is employed.

The authors begin with the analysis by defining the event day and the related periods for our study. The event day (T_0) is the first trading day after September 11, 2008, when the melamine contamination incident was made public nationally. The *estimation window* is the period over which how a stock normally relates to the market is estimated. Information in this window serves as a control condition; the *event window* is the period over which the investors' response to the event is studied. A 22-day post-event window is used in this study since there are 22 trading days in one calendar month. For comparison purposes, a 22-day pre-event window is also chosen. As a robust check, the authors also use event windows of different lengths (estimate windows are changed accordingly), and the results are similar.



The authors obtain the *cumulative abnormal returns* (CAR) and the *cumulative abnormal net order flow* (CANOF) for each firm in the sample for the pre-event and post-event windows, respectively. The two variables are the main variables of interest. Specifically, CAR is the cumulative change in a stock price across the event window that accounts for all the effects resulting from both industry and market-wide influences. CAR measures the overall financial market responses to the event. CANOF measures investors' cumulative net cash flow into (or out of) a firm's stocks during the event window by investors. Thus, CANOF measures investors' trading activities: a positive (negative) CANOF suggests that investors buy (sell) one stock over other stocks in the market in the event window.

The authors calculate the CAR and CANOF for stock i over an event window $[T_S, T_E]$ as follows:

$$\mathrm{CAR}_i = \sum_{t=T_S}^{T_E} \mathrm{AR}_{i,t}, \tag{1}$$

$$\mathrm{CANOF}_i = \sum_{t=T_S}^{T_E} \mathrm{ANOF}_{i,t}, \tag{2}$$

where T_S and T_E are the starting and ending days of the window, respectively: for pre-event window, $T_S = T_0 - 22$, and $T_E = T_0 - 1$; for post-event window, $T_S = T_0$, and $T_E = T_0 + 22$. $\mathrm{AR}_{i,t}$ ($\mathrm{ANOF}_{i,t}$) is the abnormal returns (the abnormal net order flow) for stock i at trading day t. The procedures on how to derive $\mathrm{AR}_{i,t}$ and $\mathrm{ANOF}_{i,t}$ are detailed in Appendix A.

Since the authors cannot directly observe investor types, i.e., individual investors versus institutional investors, the authors follow Lee and Radhakrishna (2000) and assume that small (large) trades are originated mostly by individual (institutional) investors. Accordingly, the authors compute $\mathrm{CANOF}^{\mathrm{Small}}$ and $\mathrm{CANOF}^{\mathrm{Large}}$ based on the volume per trade: orders less than 100,000 are categorized as small, orders between 100,000 and 500,000 are categorized as medium, and orders greater than 500,000 are categorized as large. Hence, $\mathrm{CANOF}^{\mathrm{Small}}$ and $\mathrm{CANOF}^{\mathrm{Large}}$ measure the behaviors of individual and institutional investors, respectively.

Analysis and results

Model specifications

To examine and compare the CANOF for different firms around the event, the following specification is used:

$$\mathrm{CANOF}_i = \gamma_0 + D_i\left(\gamma_1 + \gamma_2 \mathrm{CSR}_i + \gamma_3 \mathrm{CSR}_i^2\right) + \varphi X_i + \varepsilon_i, \tag{3}$$

where, D_i is a dummy variable indicating whether or not firm i was given a CSR score by *Southern Weekend* (1 = yes; 0 = no); CSR_i is the actual score of social responsibility index computed by *Southern Weekend*, multiplied by 100 to scale the reported estimates. CSR_i^2 is the quadratic term of CSR_i which measures the second-order effect. X_i includes two controlling variables: $\mathrm{Ln(size)}_i$ is the logarithm of market capitalization (prices multiply outstanding shares) of firm i; $\mathrm{InstHolding}_i$ is the percentage of shares held by institutional investors to the total tradable shares.

When $D_i = 1$, (3) becomes

$$\mathrm{CANOF}_i = \gamma_0 + \gamma_1 + \gamma_2 \mathrm{CSR}_i + \gamma_3 \mathrm{CSR}_i^2 + \varphi X_i + \varepsilon_i, \tag{4}$$

When $D_i = 0$, (3) becomes

$$\mathrm{CANOF}_i = \gamma_0 + \varphi X_i + \varepsilon_i, \tag{5}$$

The specification in Eq. 3 has two merits. First, it allows the comparison between firms with and without assigned CSR scores, which is reflected through the estimate of D_i. If D_i is zero, then investors demonstrate similar behaviors to the stocks of firms with and without CSR ratings. Second, the

TABLE I

Summary statistics of the firms under study

	All 114 firms in the dataset				86 firms with CSR scores				28 firms without CSR scores			
	Mean	STD	Min	Max	Mean	STD	Min	Max	Mean	STD	Min	Max
Market cap[a]	94.791	276.150	1.337	2419.11	116.295	313.220	1.337	2419.11	26.297	36.944	1.406	176.614
Tradable cap[a]	19.387	29.845	0.474	169.700	22.487	33.006	0.474	169.700	9.514	11.934	0.533	47.789
Trading volume[a]	43.128	54.308	2.288	364.212	5.027	59.892	2.715	364.212	21.152	17.864	2.288	81.463
Sales[a]	57.717	14.567	1.270	1204.84	69.454	16.195	1.270	1204.84	21.668	1.963	1.393	49.739
Net profit[a]	6.305	17.475	-0.435	134.574	7.938	19.854	0.018	134.574	1.291	1.597	−0.435	6.109
Return on Equity (%)	15.757	1.747	−27.440	66.160	16.492	9.334	0.210	62.150	13.501	14.217	−27.440	66.160
CSR Score	37.069	8.067	27.735	79.572	37.069	8.067	27.735	79.572	N/A	N/A	N/A	N/A

The above table reports summary statistics for the full sample and two subsamples. The full sample includes all 114 firms that had sales of over 10 billion Yuan (approximately 1.5 billion USD) in 2007. The Scored sample includes 86 firms that were given a CSR score by *Southern Weekend*, and the Non-score sample includes 28 firms without an assigned CSR score. *Market Capitalization, Tradable Capitalization,* and *Trading Volume* are obtained on June 30, 2008. *Sales, Net Profit*, and *Return on Equity* come from fiscal reports of 2007. N/A means missing value.

[a]In billion RMB.

specification allows the comparison among firms with different CSR performance, and tests whether a diminishing return of CSR performance is present. Since a single regression that tests the presence and the linear and nonlinear effects of CSR performance on investors' behaviors is conducted, the estimation is more efficient than running two separate regressions of (4) and (5) (Kennedy 2003).

The specification in Eq. 3 can also be used to test the influence of CSR performance on the behaviors of individual investors, as well as those of institutional investors, by replacing CANOF with $\text{CANOF}^{\text{Small}}$ or $\text{CANOF}^{\text{Large}}$.

The relationship between CAR and CANOF is examined via the following empirical model:

$$\begin{aligned} \text{CAR}_i &= \alpha_0 + \alpha_1 \text{CANOF}_i^{\text{Small}} + \alpha_2 \text{CANOF}_i^{\text{Large}} \\ &+ D_i\left(\alpha_3 + \alpha_4 \text{CSR}_i + \alpha_5 \text{CSR}_i^2\right) \\ &+ \text{CANOF}_i^{\text{Small}} * D_i\left(\beta_1 + \beta_2 \text{CSR}_i + \beta_3 \text{CSR}_i^2\right) \\ &+ \text{CANOF}_i^{\text{Large}} * D_i\left(\lambda_1 + \lambda_2 \text{CSR}_i + \lambda_3 \text{CSR}_i^2\right) \\ &+ \mu Y_i + \nu_i, \end{aligned} \tag{6}$$

where Y_i includes two controlling variables: Ln $(\text{size})_i$ and $\text{Ln}(\text{M/B})_i$. $\text{Ln}(\text{size})_i$ is as defined above and $\text{Ln}(\text{M/B})_i$ is the logarithm of firm i's market capitalization divided by its book value. In keeping with asset-pricing literature (e.g., Acharya and Pedersen, 2005; Fama and French, 1992), $\text{Ln}(\text{size})_i$ and $\text{Ln}(\text{M/B})_i$ are introduced to control for the idiosyncratic differences across different firms.

The specification in Eq. 6 allows us to test three potential effects of firms' CSR performance on their financial performance in a short period of time before and after the event. The first effect is the *indirect* effect, which is through investors' behaviors, i.e., $\text{CANOF}^{\text{Small}}$ and $\text{CANOF}^{\text{Large}}$. The second effect is the *direct* effect, which is examined to establish both the presence and the linear and nonlinear impacts of CSR. The third effect is the *interaction* effect of CSR performance and investors' behaviors. Table II presents summary statistics of the variables under investigation.

The authors plot the average $\text{CANOF}^{\text{Small}}$ and $\text{CANOF}^{\text{Large}}$ for the firms with and without a CSR score, respectively, during the event window in Figure 1. The authors find that there are no significant differences between the group means of firms with and without a CSR score during the event window for $\text{CANOF}^{\text{Small}}$ and $\text{CANOF}^{\text{Large}}$, respectively.[2] The reason is that in the group of firms with a CSR score, the effect on the firms by a high CSR score offsets that on the firms by a low CSR score, resulting in the insignificant difference in the mean comparison.

Results and discussions

Regression of CANOF on CSR

Table III presents estimation results of Eq. 3 with robust standard errors adjusted by sample size (MacKinnon and White, 1985). In the first column, are reported the results for the post-event window. It is found that the coefficient of D_i is negatively significant ($\hat{\gamma}_1 = -0.050$, $p < 5\%$), and that the coefficient of CSR_i is positively significant ($\hat{\gamma}_2 = 0.237$, $p < 1\%$). Jointly, these two estimates suggest that CSR performance positively affects investors' buying behaviors only when the CSR score is above a certain level; otherwise, investors have greater interests in buying stocks of firms without CSR scores than those of the firms receiving low CSR scores. This suggests that firms with poor CSR performance alienate their investors. In fact, the minimum CSR performance needed for a positive effect can be computed, which is given by $100 * (-\hat{\gamma}_1/\hat{\gamma}_2) = 21.23$. A 95% confidence interval for the minimum CSR performance is [16.69, 25.77]. In addition, a negative second-order effect of CSR performance is found: ($\hat{\gamma}_3 = -0.244$, $p < 1\%$). The negative second-order effect suggests a diminishing marginal effect for CSR activities on investors' behaviors. This finding is consistent with the literature, implying that investors tend to be less responsive to high CSR performance, as they worry it will undermine firms' financial performance (Wright and Ferris, 1997).

As reported in Table III, the authors do not find any significant effects from CSR variables (either D_i or CSR_i) in the pre-event window. The result supports our hypothesis that CSR performance influences investors' behaviors in a contingent manner.

The two separate regressions of $\text{CANOF}^{\text{Small}}$ and $\text{CANOF}^{\text{Large}}$ further reveal how firms' CSR performance affects different types of investors differently. As presented in Table III, the behaviors of

TABLE II

Summary statistics and correlation matrix

Variables	CAR	CANOF	$CANOF^{Small}$	$CANOF^{Large}$	*D*	CSR	Ln(size)	Ln(M/B)
Panel A: Description statistics								
No. of obs.	114	114	114	114	114	86	114	114
Mean	−0.010	−0.003	−0.001	−0.001	0.754	37.069	23.959	0.886
STD	0.124	0.022	0.004	0.018	0.432	8.067	1.394	0.519
Min	−0.313	−0.116	−0.017	−0.118	0.000	27.735	22.261	0.195
Max	0.383	0.119	0.014	0.100	1.000	79.572	27.850	2.340
Panel B: Correlation matrix								
CAR	1.000	0.186★★	−0.116	0.165★	−0.015	0.199★	0.105	0.070
CANOF		1.000	0.109	0.910★★★	−0.018	0.110	0.073	−0.004
$CANOF^{Small}$			1.000	−0.164★	0.173★	0.180★	0.378★★★	0.249★★★
$CANOF^{Large}$				1.000	−0.043	0.009	−0.092	−0.148
D					1.000	N/A	0.240★★	−0.054
CSR						1.000	0.674★★★	0.040
Ln(size)							1.000	0.196★★
Ln(M/B)								1.000

The above table reports summary statistics for the main variables in our regression. Panel A reports the main description statistics of the main variables; Panel B reports their correlation coefficients. CAR is the cumulative abnormal returns during the period [0, +22] after the event date. CANOF is the cumulative abnormal net order-flow. $CANOF^{Small}$ is the cumulative abnormal net order-flow of small trades, and $CANOF^{Large}$ is the cumulative abnormal net order-flow of large trades. *D* is a dummy variable. $D = 1$ if the firm belongs to the scored sample; $D = 0$ if the firm belongs to the non-scored sample. CSR is the CSR score of the firm, if any. Ln(size) is the natural logarithm of market capitalization (prices times shares outstanding) of the firm on June 30, 2008. Ln(M/B) is the natural logarithm of market capitalization of the firm divided by its book value on June 30, 2008.

Notes: ★$p < 5\%$, ★★$p < 1\%$, and ★★★$p < 0.1\%$ based on one-tail tests.

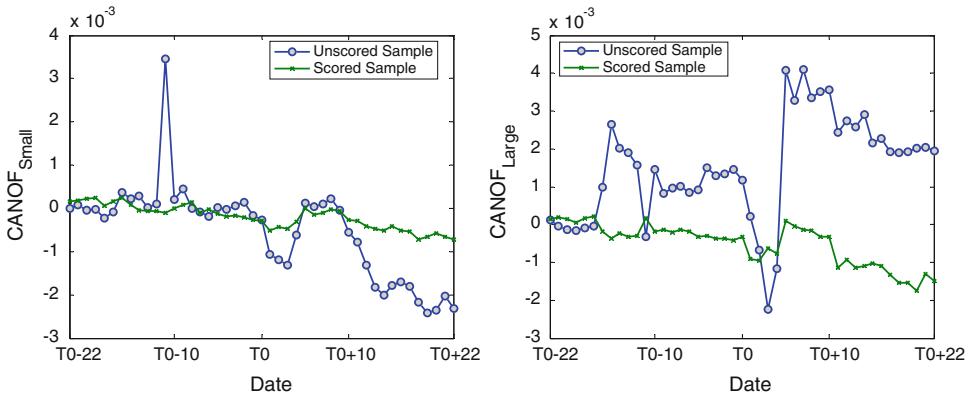


Figure 1. The plots of means of $CANOF^{Small}$ and $CANOF^{Large}$ by trading day. This figure plots average values of $CANOF^{Small}$ and $CANOF^{Large}$ for the scored sample stocks and un-scored sample stocks during the event window. $CANOF^{Small}$ is the cumulative abnormal net order-flow of small trades. $CANOF^{Large}$ is the cumulative abnormal net order-flow of large trades.

individual investors are not influenced by firms' CSR performance during the post-event window; rather, individual investors are affected by firms' characteristics, such as firms' market capitalization (as reflected by Ln(size)) and the behaviors of institutional investors (as reflected by InstiHolding). In

TABLE III

Regression results of CANOF on CSR

Dep. var.	CANOF	$CANOF^{Small}$	$CANOF^{Large}$
Panel A: Post-event window [0, +22]			
Intercept	−0.042 (0.034)	−0.030*** (0.007)	0.022 (0.023)
D	−0.050** (0.023)	−0.001 (0.005)	−0.033* (0.019)
CSR	0.237*** (0.089)	0.012 (0.021)	0.152** (0.076)
CSR^2	−0.244*** (0.081)	−0.018 (0.019)	−0.146** (0.069)
Ln(size)	0.154 (0.146)	0.111*** (0.030)	−0.097 (0.097)
InstiHolding	−0.307 (1.089)	0.685** (0.271)	−1.020 (0.952)
Obs.	114	114	114
R^2	0.056	0.248	0.032
Panel B: Pre-event window [−22, −1]			
Intercept	−0.019* (0.012)	−0.003 (0.005)	−0.008 (0.011)
D	0.010 (0.007)	−0.002 (0.004)	0.006 (0.006)
CSR	−0.042 (0.027)	0.005 (0.015)	−0.023 (0.022)
CSR^2	0.032 (0.024)	−0.004 (0.014)	0.015 (0.021)
Ln(size)	0.082* (0.045)	0.008 (0.021)	0.039 (0.047)
InstiHolding	−0.598* (0.356)	0.420*** (0.145)	−0.749*** (0.235)
Obs.	114	114	114
R^2	0.042	0.086	0.093

The above table reports the cross-sectional regression results of cumulative abnormal net order-flows before and after the event date. The results of Panels A and B are based on different event windows. The dependent variables are CANOF, $CANOF^{Samll}$ and $CANOF^{Large}$, respectively, all of which are defined in the text. D is a dummy variable. If the firm belongs to the scored sample, $D = 1$; If the firm belongs to the non-scored sample, then $D = 0$. CSR is the CSR score of sample stocks. CSR^2 is the square of score. $Ln(size)_i$ is the natural logarithm of market capitalization (prices times shares outstanding) of firm *i* on June 30, 2008. InstiHolding is the percentage of shares held by mutual funds to total tradable shares on June 30, 2008. Robust standard errors (adjusted by sample size) are reported in parentheses.

Notes: *$p < 5\%$, **$p < 1\%$, and ***$p < 0.1\%$ based on one-tail tests.

comparison, firms' CSR performance significantly affects the behaviors of institutional investors in a similar fashion, as in the regression of CANOF. The regression also yields a minimum CSR performance required to have a positive effect on institutional investors. Finally, it is found that CSR performance does not influence either type of investors in the pre-event window.[3]

Considered together, the results in Table III suggest that the effects of CSR are evident only after the incident, and that such effects are only on the institutional investors for CSR performance above a certain threshold.

Regression of CAR on CANOF and CSR

Table IV presents estimation results for the influence of CSR and investors' behaviors on stocks' cumulative abnormal returns (CAR), as specified in Eq. 6. Only in the post-event window was found a negative effect for D_i ($\hat{a}_3 = -0.440$, $p < 5\%$) and a positive effect for CSR_i ($\hat{a}_4 = 1.899$, $p < 5\%$). These findings imply that the direct effect of firms' CSR performance on their financial performance is also contingent on the event.

Furthermore, in the post-event window, significant interactions between $CANOF^{Small}$ and CSR variables, as well as between $CANOF^{Large}$ and CSR variables are found (please refer to Table IV for specific estimates). These results suggest that the effect of CSR on a firm's financial performance is greater when the investors buy more volume of shares and the CSR score of the pertinent firm is higher.

What is the impact of increasing CSR performance by one point? The authors find that such a marginal impact of an improved CSR performance

TABLE IV
Regression results of CAR on CANOF and CSR

	The event window	
	CAR [0, +22]	CAR [−22, −1]
Intercept	−0.274 (0.288)	0.098 (0.258)
$CANOF^{Small}$	−0.735 (6.708)	−11.719 (11.108)
$CANOF^{Large}$	1.211 (0.959)	3.489⋆ (2.055)
D	−0.440⋆ (0.238)	−0.094 (0.199)
CSR	1.899⋆ (1.108)	0.645 (0.921)
CSR^2	−1.948 (1.260)	−0.810 (1.050)
$D \star CANOF^{Small}$	−245.350⋆⋆ (105.280)	3.577 (12.575)
$D \star CSR \star CANOF^{Small}$	12.768⋆⋆ (5.796)	−1.503 (6.291)
$D \star CSR^2 \star CANOF^{Small}$	−0.167⋆⋆ (0.079)	0.014 (0.081)
$D \star CANOF^{Large}$	−39.730⋆⋆ (16.462)	−43.128 (105.622)
$D \star CSR \star CANOF^{Large}$	1.754⋆⋆ (0.751)	2.423 (5.456)
$D \star CSR^2 \star CANOF^{Large}$	−0.017⋆⋆ (0.008)	−0.034 (0.069)
Ln(size)	0.011 (0.012)	−0.002 (0.011)
Ln(M/B)	0.017 (0.025)	−0.070⋆⋆⋆ (0.019)
Obs.	114	114
R^2	0.170	0.303

The above table reports the regression results of CARs on CANOF and CSR performance. The dependent variables are CARs in the pre-event window [−22, −1] and the post-event window [0, +22]. Robust standard errors (adjusted by sample size) are reported in parentheses.
Notes: ⋆$p < 5\%$, ⋆⋆$p < 1\%$, and ⋆⋆⋆$p < 0.1\%$ based on one-tail tests.

is more likely to come from the behaviors of institutional investors. Hence, the regression disentangles the effects of firms' CSR performance on their financial performance, which otherwise are difficult to discern.

Not surprisingly, the authors do not detect any significant effects involving CSR in the pre-event window. Hence, the estimation results are consistent with our predictions.

General discussion and concluding remarks

The analysis presents a case of contingent influence of CSR on investors' behaviors. Even though investors in China had expressed their concerns regarding firms' CSR activities in a recent survey by China Academy of Social Science, the authors do not find any significant relationship between firms' CSR performance and investors' buying/selling behaviors in the pre-event window. Nor is found any significant difference between investors' behaviors on the stock of firms with and without measured CSR performance. Nevertheless, in the post-event window, significant effects of CSR on investors' behaviors are detected. These findings suggest that investors' concerns for CSR could be influenced by the mounting attention due to some events. In other words, CSR influences investors' buying/selling behaviors at least in a short period of time after the event, but not before it.

Further analysis reveals that institutional investors, rather than individual investors, are more subject to the influence of CSR. Specifically, through the separate regressions on the behaviors of different types of investors, the authors find that institutional investors tend to care more about the CSR performance of listed firms than that of individual investors as they differentiated their investment strategies between firms with different CSR performances. This finding is consistent with literature on socially responsible investment (Solomon et al., 2002; Sparkes and Cowton, 2004) and offers important managerial insights to managers, i.e., that

institutional investors play a critical role in encouraging and promoting CSR activities.

The authors also find that investors favor the stocks of those firms' whose CSR performance is within a certain range. A low CSR score suggests a high possibility of crisis a firm may encounter, which will lead to a loss for investors. In comparison, a high CSR score may imply that a firm might potentially overinvest in CSR activities and could undermine its short-term financial performance. These findings of this study shed light on how firms choose the input to optimize their CSR activities from the perspective of financial performance, an area that gradually attracts firms' attention (Peloza, 2006; Porter and Kramer, 2002).

This study offers two important implications for managers. First, it is shown that institutional investors react to the CSR-related scandal more aggressively than individual investors, which rationalizes the development of SRI-oriented funds. This is because SRI-oriented funds can do a better job monitoring firms' CSR performance relative to common individual investors, which to some extent helps to prevent catastrophic consequences such as BP's oil leakage. Second, it is shown that there is an optimal CSR performance range and that the financial market can efficiently recognize this range and price stocks based on it. This result provides a rationale for optimizing CSR activities.

One limitation of this study is that the authors do not have direct access to investors' perception of, and attention to, CSR before and after the event. In view of this, the authors have to use investors' behaviors as a proxy, and measure the change of such activities caused by the event. On the other hand, owing to the methodology that is used, the authors only assess the impact of CSR performance in the short term. Therefore, how long the effects of CSR performance can last needs to be explored in future research.

Appendix A: Procedures to derive $AR_{i,t}$ and $ANOF_{i,t}$

The derivation of $AR_{i,t}$

The authors use the market model to estimate the expected stock returns for firm i at time t, denoted as $R_{i,t}$, over the estimation window $[T_0 - 274, T_0 - 23]$:

$$R_{i,t} = \alpha_i + \beta_i \mathrm{MR}_t + \varepsilon_{i,t} \tag{A.1}$$

where t is from day $T_0 - 274$ to day $T_0 - 23$ and MR_t is the expected return for the whole stock market on day t. Through regression on Eq. A.1, the estimated intercept coefficient is obtained. $\widehat{\alpha}_i$ (also called alpha value) and the estimated coefficient for MR_t which is $\widehat{\beta}_i$ (also called beta value). Then, the following equation is used to estimate the expected return for stock i, $E(R_{i,t})$ in the pre-event window $[T_0 - 22, \ T_0 - 1]$ and the post-event window $[T_0, \ T_0 + 22]$:

$$E\left(R_{i,t}\right) = \hat{\alpha}_i + \hat{b}_i \mathrm{MR}_t, \tag{A.2}$$

The abnormal return for stock i on day t is then computed as:

$$\mathrm{AR}_{i,t} = R_{i,t} - E\left(R_{i,t}\right). \tag{A.3}$$

Finally, the cumulative abnormal returns (CAR) for stock i over the window $[T_E, \ T_S]$ is:

$$\mathrm{CAR}_i = \sum_{t=T_S}^{T_E} \mathrm{AR}_{i,t}. \tag{A.4}$$

The derivation of $ANOF_{i,t}$

Based on the literature on market microstructure (Beber et al. 2009; Campbell et al. 2009; Chordia et al., 2000, 2001, 2002; Hvidkjaer, 2008), the authors use the CANOF for each firm in the sample for the pre-event and post-event windows to measure investors' behaviors regarding investing in a stock or a portfolio. In order to calculate CANOF, the authors need to compute the net order flow (NOF). NOFs for each stock and each day are computed via the following steps:

1. Several filters to eliminate trades and quotes that are non-standard or likely to contain errors to insure data integrity are used.[4]
2. The trade records before the open and after the close in accordance with the convention of the market microstructure literature are eliminated.
3. The algorithm proposed by Lee and Ready (1991) to sign each trade as being initiated by a buyer or a seller is employed.

4. One trade each to a size category (small, medium, and large) for order flow specified in RMB is assigned. Cutoffs of order flows (in RMB) are as follows: orders less than 100,000 are small, orders between 100,000 and 500,000 are medium, and orders no less than 500,000 are large. This procedure results in a set of daily order flow series for each stock: small, medium, or large buys/sells.
5. NOF as the sum of all buyer-initiated volume minus the sum of all seller-initiated volume in the same trading day is computed. Likewise, NOF of small trades and NOF of large trades are computed accordingly.
6. Following Lee and Radhakrishna (2000), NOF of small (large) trades as the measure of the investing behaviors of individual (institutional) investors is labeled, since small (large) trades are mostly initiated by individual (institutional) investors (Lee and Radhakrishna 2000).

The market portfolio is composed of all the stocks in our data set, and the NOF to the stock market as a whole on each day is the sum of the NOF of each stock. The expected NOF, E[NOF], is defined as the size-weighted NOF. With E[NOF], abnormal net order flow (ANOF) can be constructed as follows:

$$\begin{aligned}\mathrm{ANOF}_{i,t} &= \frac{\mathrm{NOF}_{i,t} - E_{i,t}[\mathrm{NOF}]}{\mathrm{CAP}_{i,t}} \\ &= \frac{\mathrm{NOF}_{i,t} - \mathrm{NOF}_{\mathrm{Mkt},t} \times \mathrm{Weight}_{i,t}}{\mathrm{CAP}_{i,t}}.\end{aligned} \tag{A.5}$$

where $\mathrm{NOF}_{i,t}$ and $E_{i,t}$[NOF] are the total net order flow and expected net order flow of stock i on day t, respectively. $\mathrm{CAP}_{i,t}$ is the tradable capitalization of stock i on day t. $E_{i,t}$[NOF] is computed as $\mathrm{NOF}_{\mathrm{Mkt},t} \star \mathrm{Weight}_{i,t}$, where $\mathrm{NOF}_{\mathrm{Mkt},t}$ is the total net order flow of the stock market portfolio, which includes all of our sample stocks, on day t, and $\mathrm{Weight}_{i,t}$ is the percentage of the tradable capitalization of stock i in the market portfolio on day t. If ANOF is positive (negative), there is a higher proportion of cash flow into (out of) a stock than is the weight of this stock in the market portfolio. Obviously, the measure of ANOF intuitively reflects investors' intent to invest.

The authors further compute the cumulative ANOF (CANOF) of stock i over the period $[T_{\mathrm{E}}, T_{\mathrm{S}}]$ as:

$$\mathrm{CANOF}_i = \sum_{t=T_{\mathrm{S}}}^{T_{\mathrm{E}}} \mathrm{ANOF}_{i,t}. \tag{A.6}$$

CANOF also reflects an investor's cash flow into (out of) a stock during a specific period. A positive (negative) CANOF suggests investors tend to buy (sell) a certain stock over other stocks in the market during a specific period. Likewise, measures of cumulative abnormal net order flow of small trades ($\mathrm{CANOF}^{\mathrm{Small}}$) and cumulative abnormal net order flow of large trades ($\mathrm{CANOF}^{\mathrm{Large}}$) can be computed accordingly to reflect the intent of investing of individual and institutional investors.

Appendix B: How *Southern Weekend* compiled CSR scores

The CSR ranking system by *Southern Weekend* is a simplified version of the widely acknowledged CSR criteria developed by KLD Research & Analytics, Inc., which contain eight domains: community, corporate governance, diversity, employee relations, environment, human rights, product quality, and controversial business issues. As a first attempt in China, *Southern Weekend* tried to balance a firm's social responsibility and its economic responsibility. It also took public support into consideration in compiling its CSR rankings.

Based on the following four domains, *Southern Weekend* calculated the weighted average CSR score for each firm. The weight and detailed items in each domain are given as follows:

1. Social responsibility: 40%, including product safety and services quality (10%), environmental protection (10%), labor relations (10%) and communication relations (10%);
2. Operating performance: 30%, including sales (10%), equity (10%) and net profit (10%);
3. Social contribution: 20%, including taxation (10%), employee benefits (5%) and R&D expenses (5%);
4. Public image: 10%, including public online poll support (10%).

For each domain, the firm with the best performance received a score of 100, and the rest received scores based on their relative performance to the best-performed firm. *Southern Weekend* compiled a comprehensive CSR score for each firm using the weights given above.

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Notes

[1] See Renneboog et al. (2008) for a comprehensive survey of the literature on SRI.

[2] The test results are available from the author upon request.

[3] Considering the high correlation between firm's size and its CSR score ($\rho = 0.674$), a multicollinearity concern exists when using the CSR and Ln(size) jointly as independent variables. The authors implement the two-step regression model to address this concern. In the first step, the authors regress CANOF (or $CANOF^{Small}$ and $CANOF^{Large}$) on Ln(size) and InstiHolding, then get the regression residual term. In the second step, the authors regress the residual on dummy variable D_i and the intersection of dummy variable D_i and CSR, CSR^2. The authors find the significant effects of CSR, CSR^2, as predicted by the article (results are available upon request).

[4] Trades are omitted if they have negative trade prices or involve a price change (since the prior trade) greater than 10% in absolute value. Quotes are deleted if the bid or ask is non-positive, the bid–ask spread is negative, the change in the bid or ask price is greater than 10% in absolute value, or the bid or ask depth is non-positive. Because Chinese stock markets are computerized limit-order markets, the sequence of outstanding quotes have been matched with the sequence of trades when being displayed to the public.

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