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Does corporate social responsibility matter in the food industry? Evidence from a nature experiment in China

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ABSTRACT

Using the melamine contamination incident in China as an exogenous shock, this paper studies how the investors respond to corporate social responsibilities (CSRs) of listed firms in food industry. We find that investors' or consumers' concerns for CSR in the food industry could be significantly influenced by the mounting attention given to CSR-related events. This study offers important policy implications. First, the government, as well as supervisors, should release appropriate policies to improve various firms' activities on CSR, especially in the food industry. Second, firms, particularly those in the food industry, can obtain long-term benefits by strengthening their CSR-related activities.

Introduction

One of the most significant corporate trends of the last decade is the rapid growth in activities associated to corporate social responsibility (CSR). According to Business for Social Responsibility (BSR), CSR is defined as "achieving commercial success in ways that honor ethical values and respect people, communities, and the natural environment". McWilliams and Siegel (2000) and McWilliams and Siegel (2001) describe CSR as "actions that appear to further some social good, beyond the interest of the firm and that which is required by law." Although definitions of CSR vary, the term generally refers to actions taken by firms beyond their legal duties, with respect to their employees, communities, and the environment.

Recently, a large number of companies worldwide have engaged in efforts to integrate CSR into all aspects of their businesses. Meanwhile, with the current financial scandals, investment losses, and reputational damage to listed companies, an increasing number of shareholders, analysts, regulators, employees, and news media outlets are focusing more on CSR-related issues. Although debates are still ongoing on whether a good CSR performance indeed contributes to a firm's success (e.g., Posnikoff, 1997; Wright and Ferris, 1997), the damage of a deficient response to CSR is indubitable. The cases of Toyota and BP are two recent examples.

Food safety is a key issue for any society and economy as it requires the attention and awareness of the government and all stakeholders in the industry. Consistent with the goal of ensuring food safety, *CSR* in the food industry is particularly important due to its wide range of potential benefits. Though CSR issues associated to the food industry are complicated, food safety rises as the ultimate CSR concern, and thus, receives the most attention. Using data collected from 333 food handlers at agricultural food-processing companies or restaurants in Taiwan, Ko (2010) points out that food safety exposes consumers to diseases and even death, prompting the public's increasing concern with food quality and food safety in recent years. In the 2010 Annual Corporate Social Responsibility Perceptions Survey released by Penn Schoen Berland, Landor Associates, and Burson-Marsteller, more than 75% of consumers say that examining companies' CSR strategies is important.[1] This survey also shows that consumers prioritize social responsibility across business sectors, and 55% are more likely to purchase a product with added social benefit. Moreover, 70% of respondents are willing to pay a premium on products from a socially responsible company.

Given its importance in the food industry, there is a need for a study that shows how CSR affects the reaction of investors or consumers in food companies. The analysis of this relation could shed light on the channel through which CSR affects asset returns, market reaction, and shareholder wealth, so we believe this research has important implications for regulators, listed firms, consumers, and capital market participants. However, there are limited established empirical research studies on the relation of CSR and the reactions of the capital market.

In this paper, we use China's melamine contamination incident in 2008 as the springboard for the study of the above issues. The

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[1] http://www.slideshare.net/BMGlobalNews/csr-branding-survey-2010-final.

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2008 melamine contamination crisis in China, which we will describe in detail in the next section, significantly promotes the importance of CSR in the food industry among regulators, investors, and the public. Lots of investors learned the lesson the hard way when stocks of listed companies involved fell at least 30% within the next two months after the crisis. The Shanghai Stock Exchange launched its CSR index in 2009 for heavily traded stocks to help investors monitor firms' CSR performances. According to a recent survey conducted by China Academy of Social Science, (2009), China's investors are now expressing their concerns regarding firms' social responsibilities. Hence, the melamine contamination crisis provides a valuable opportunity for researchers to observe investors' responses in the emerging market, which are the necessary elements for a financial system to evolve into maturity.

Our sample consists of all the 43 firms in the food industry listed on China's stock market. We use the social responsibility scores of China's listed firms issued by the Shanghai National Accounting Institute's (SNAIs) on December 24, 2008, which is the first available CSR index for China's listed firms, to obtain the CSR levels of our samples. We obtain the stock price, size-weighted stock market return, and control variables from CCER Database, a widely used database for research of China's listed firms, to estimate investor reaction to the exogenous shock.

By introducing China's melamine incident, which is an exogenous shock, we use the approach event study to investigate the impact of CSR on investors' responses in listed firms from the country's food industry. We conduct the empirical analysis as follows. First, we use the event study approach to assess impacts of the milk accident on financial performances of food-related firms listed in the stock market. Our results indicate that the incident has significant negative impact on financial performances of listed firms in the food industry, subsequent to its market-wide control. In particular, buying the firms' stocks in the food industry prior to the incident had cumulative abnormal returns (CAR) of nearly −5% in a 10-day holding period and −3% in a 5-day holding period after the event. Second, by employing a regression of CAR on CSR levels of food companies, we investigate how CSR influences the impact of the incident to firms' prices. We find a significantly positive relation between CSR and CAR after controlling firm characteristics. Third, by splitting our sample period into pre-event and post-event, we repeat the above regression to further explore different patterns before and after the milk accident. We find that the influence of CSR on CAR is only significant in the post-event period. This result indicates that CSR positively affects investors' behaviors only after they recognize its importance.

We contribute to the literature in two ways. First, with the exogenous melamine contamination incident, a natural experiment in China, we assess whether capital markets react to the CSR levels of food-related firms. To the best of our knowledge, this is the first paper indicating clear results that investors in capital markets significantly react to a firm's social responsibility level upon recognition of the importance of food safety. Our results offer timely empirical evidence to the government, the primary party concerned on food safety, as well as provide critical insight for regulators to assist them in issuing appropriate policies for the enhancement of firms' CSR activities, which will ultimately protect the consumers.

Second, our findings also shed light on socially responsible investments (Sparkes and Cowton, 2004). Our results show that investors regard food companies' CSR activities as important factors in their investment decisions. Investors' trades can affect firm price, so as a primary concern of shareholders, we suggest that socially responsible investment funds, at least in the food industry, should integrate firms' CSR levels in their portfolio constructions to acquire long-term benefits.

The remainder of the paper is structured as follows. The next section presents the detail of industry background. The following section reviews related literature and presents testable hypotheses. Then, we describe the research methodology and data sources. Empirical results are presented in Section 5. Section 6 concludes.

Institution background

CSR in the US and China[2]

In a bibliometric analysis of 30 years of research and theory on CSR, De Bakker et al. (2005) point out that the CSR have been discussed since the 1950s at least in the US. Formally, Gerde and Wokutch (1998), in their 25-year analysis of the proceedings published of social issues in management, distinguish four CSR-related phases: "gestation and innovation" in the 1960s, "development and expansion" in 1972–1979, "institutionalization" in 1980–1987, and "maturity" in 1988–1996. In the early period, the purpose of research on CSR is "to describe the situation and perhaps to develop theories of the dimensions of corporate social responsibility or the specific relationship between business and society and between the firm and its employees" (Gerde and Wokutch, 1998). However, regarding the later periods, "one would expect that there would be more theory testing in the latter part of the 25 years because there are more developed theories to test and the methodology has improved (or become more refined)".

Currently, there are four CSR evaluating systems widely used in the literature. Griffin and Mahon (1997) present an excellent review and identify multiple CSR sources into four categories: (1) the Domini Social Index, which is a hybrid measure of perceptual and multiple dimensions of CSR and is developed by Kinder, Lydenberg, Domini (KDL). This index has created a series of widely acknowledged social responsibility criteria which gradually became an international standard (e.g. Becchetti et al., 2005). The Domini social criterion includes eight big domains: community, corporate governance, diversity, employee relations, environment, human rights, product quality, and controversial business issues; (2) the *Fortune* reputation survey (a purely perceptual measure). Using questionnaires on eight attributes of firms' reputation, the *Fortune* creates an overall corporate reputation index; (3) the self-reported measure, i.e. the Toxics Release Inventory (TRI). It consists of information on environmental discharges to the water, air, and landfills, and disposal of hazardous waste and is mandated by Emergency Planning and Community Right-to-Know Act (EPCRA-1986). Thus, this CSR measure is often used by the government and special interest groups; and (4) corporate philanthropy. Some studies also use philanthropy as the CSR measure, e.g. Griffin and Mahon (1997) and Godfrey et al. (2006).

However, in China, the CSR evaluating systems are still in their nascent period. To our knowledge, there are only two CSR related indexes. One is China's CSR Development Index, which was published since 2009 by the CSR Research Center of Chinese Academy of Social Sciences (CASSs). However, this index only covers China's top 100 state-owned enterprises, top 100 private enterprises and top 100 foreign-invested enterprises. The index integrates companies' responsible governance, economic performance, social contribution and environmental protection. The other one is CSR index for China's listed companies, which was issued since 2008 by the SNAI. This SNAI index was formulated according to the standard of SA8000 (the first international certification on social responsibility) issued by Social Accountability International (SAI).

Meanwhile, there are also several nationwide CSR awards in China coming into sight recently. For example, (1) the China CSR Annual Conference is co-sponsored by the China Association of Enterprises with Foreign Investment (CAEFI), the China Charity

[2] We thank one of the referees for pointing out this issue.

Federation (CCF), and the *China Enterprises News*. Since 2008, it grants awards to 50 companies operating in China according to their performances in moral value, employee right, environment protection, product quality management, consumer benefit, supply chain management, science and technology development, tax contribution and the public image; (2) the China CSR International Forum is co-sponsored by the *China Newsweek* and the Chinese Red Cross Foundation (CRCF). Since 2006, it grants awards to 12 CSR leaders every year on the basis of public voting, media rating and expert evaluation. This is a high-profile authoritative platform to recognize CSR in China; and (3) the *Hurun Report*, released by Rupert Hoogewerf since 2005, publish Top 50 CSR companies in China every year. This ranking is a weighted result of expert assessment, companies' employment and tax payment and companies' charitable donations and environmental protection efforts.

Melamine incident in China

Melamine is a chemical rich in nitrogen and has been used by milk producers to boost the detected amount of nitrogen (as a proxy for protein content) in milk quality tests. Melamine is usually used in plastics and lethal to infants. It is also harmful to adults if a large dose is taken. The most common chronic diseases caused by melamine-contaminated food are bladder and kidney stones, which can lead to bladder cancer. As a result, the US Food and Drug Administration allow amounts less than 2.5 ppm in adult foods and zero in infant foods. Melamine has been used as an adulterant in milk to boost the nitrogen content in diluted or poor quality raw milk (melamine is about 66% nitrogen), since many milk quality tests rely on the detected amount of nitrogen to infer the amount of protein, the most important attribute of raw milk. Previously, the chemical had also been used in pet foods that were exported to the United States and Canada, causing the death of more than 4000 dogs and cats and resulting in a large number of product recalls (Weise and Schmit, 2007).

The most important consequence of the melamine contamination was that more than 290,000 people (most of them infant children) were poisoned. It was confirmed as a cause of death for six infants who consumed the melamine contaminated infant milk powder, and more than 800 infants were hospitalized (McDonald, 2008; Xiu and Klein, 2010). Though melamine can be detected from urine and blood in laboratories, consumers cannot detect melamine when it is added to milk.

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 contain the chemical. The fear was confirmed two 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. This disclosure further angered both consumers and regulators. These dairy companies were accused of intentional delay of product recall, making the incident the most serious *CSR* crisis in China.

Through the rapid and extensive media coverage, the incident soon became a catastrophe that plagued the whole dairy industry and, to some extent, extended to all the food industry. In the month following the incident, the total sales went down by 20% in powdered milk, and 19% in liquid milk (ACNielsen, 2009). It took more than a year for sales to return to pre-incident levels. The incident also led to the bankruptcy of Sanlu Corporation, with its CEO sentenced to life imprisonment plus a personal fine of 2468 million RMB (about 3.6 million USD). Therefore, the magnitude of the impact of the 2008 melamine incident on the industry exceeds that of the 1997 strawberry incident (Calvin et al., 2004) and the spinach incident (Calvin, 2007) in the US. This incident finally causes a new Food Safety Law went into effect on June 1, 2009 in China. Though the Food Safety Law had been under development for several years as a result of previous food safety incidents, the new law was given increased urgency following the melamine problem (Xiu and Klein, 2010).

Literature review and hypothesis development

To our knowledge, there is no academic paper focusing on the relation between *CSR* and firms' performance in food industry. Actually, studies on *CSR* and general firms' performance report mixed findings (McWilliams and Siegel, 1997) even though some specific investors (e.g., socially responsible investment funds) explicitly favor firms that are socially responsible. Some researchers detect a positive relationship between a firm's profit margin and CSR performance (e.g., Waddock and Graves, 1997; Posnikoff, 1997), some discover a negative relationship (e.g., Wright and Ferris, 1997), and others find no relationship (e.g., Teoh et al., 1999). Recently, Hill et al. (2007) examine the relationship between CSR and stock valuation across three regions of the world. They find that European investors appear to value CSR, and that Asian investors may be trending to mirror US investors.

While most researches focusing on developed markets, there are several recently studies investigate the CSR performance in emerging markets. For instance, Cheung et al. (2010) address whether CSR matters in Asian Emerging Markets. They find that the positive relation between CSR and market is significantly and Asian firms are rewarded by the market for improving their CSR practice. Wang et al. (2010) examine the different investors' preferences on CSR and find that only institutional investors' behaviors are significantly influenced by firms' CSR performance that exceeds a certain threshold, and firms' CSR performance and investors' behaviors jointly affect firms' stock prices.

In addition, previous studies also document links between CSR and profitability, corporate governance, ownership structure, firm size, leverage, employees, industry, and environmental pressures (Deniz-Deniz and Garcia-Falcon, 2002; Graves and Waddock, 1994; Li and Zhang, 2010; Johnson and Greening, 1999; Stanwick and Stanwick, 1998; Zu and Song, 2009).

Since a firm's financial performance is directly affected by investors' buying and selling behaviors, to understand how investors perceive *CSR* is critical in understanding the relationship between a firm's *CSR* activities and its financial performance. Nevertheless, given its importance, this area is quite underexplored.

There are some papers examining the investor behavior on *CSR*. Proponents of socially responsible investments argue that social screens are filters to select firms with higher quality of management, and firms with high level *CSR* will benefit from improved performance in the long run (e.g., Hill et al., 2007). Ruf et al. (2001) highlight a positive link among *CSR*, growth in sales, and returns on sales.

As for the food industry, to the best of our knowledge, there are only two related researches. Maloni and Brown (2006) developed a framework of *CSR* in the food supply chain which consisted of eight categories: health and safety, animal welfare, biotechnology, community, environment, financial practices, labor, and procurement. Few studies have focused on *CSR* in the food industry. Based on a case study of the United Kingdom's top 10 food retailers, Jones et al. (2008) examined *CSR* as a tool to communicate with their

customers and to build retail brand awareness within stores. Obviously, these two studies are very different with the points of our study.

Another important strand of research related to our study focuses on stock market reaction to product recalls and food safety. Several studies examine the impact of product recalls on firm value, but results are mixed. For example, Jarrell and Peltzman (1985) find that automobile and drug recalls are companied with negative abnormal stock returns. Hoffer et al. (1988) reexamine the same data and find that, after controlling for potential confounding events, these recall announcements do not significantly affect firm value. Bromiley and Marcus (1989) find that the stock market reaction is small and is a weak instrument of social control to deter producing hazardous automobiles. Davidson and Worrell (1992) examine the impact of different types of non-automobile recall announcements on stock prices. They show the stock market has a significant negative reaction to recall announcements. By conducting a cross-industry event study, Chu et al. (2005) find that the drugs and cosmetics industries suffer more loss, while the rubber and automotive industries are less affected. Jin and Kim (2008) study the case of Bovine Spongiform Encephalopathy (BSE) in 2003 in the United States, and they find that the beef industry was significantly, negatively affected, but other meat industries benefited significantly. For the sectors not immediately involved with beef products, the effects were small or negligible. Chen et al. (2009) identify proactive and passive recall strategies and find that proactive recall strategies had more negative share losses than passive strategies.

While most studies focus on automobile recall,[3] there are two papers investigating recalls of food companies. Thomsen and McKenzie (2001) examine the shareholder losses when publicly traded food companies are involved in a serious food recall of different hazard levels. They find that the recalls of more serious hazards suffer significant negative losses, while the recalls of less serious hazards have no negative impact. Based on a sample of 29 product recall announcements by China's listed companies during the period 2002–2008, Zhao et al. (2009) investigate the impact of a recall on shareholder. They find a significant negative abnormal return in the China's stock market, and these companies suffer greater financial losses from product recalls. They further describe the case of the melamine tainted milk crisis in China and investigate the stock market reaction. Their results show that all of the affected companies suffer from significant negative financial losses, while their competitors benefitted from the recall.

In this paper, we introduce the event-study approach to examine how the influence of CSR on investors' behaviors changes upon an event that potentially affects investors' attention to CSR in food industry. This approach uses changes of stock prices to measure the impact of a specific event on the values of firms. According to Fama (1970), a stock market is efficient if all the event information (i.e. all currently available information) can be reflected immediately in stock prices. Using stock prices over a relatively short time period, the economic impact of an event can be measured (see Brown and Warner, 1985; MacKinlay, 1997).

We hypothesize that *CSR* influences significantly investor reaction in the food industry within the event period. Since the melamine contamination crisis in China significantly promotes the importance of *CSR* in food industry among regulators, investors and the general public. We expect that the investors will express their concerns regarding *CSR* with the incident. This intuition leads to our first hypothesis:

Hypothesis 1. The reaction of the investor (or financial market) is positively related to the level of CSR in food industry.

Furthermore, considering the fact that the general public in this emerging market only begin to pay attention to *CSR* after the crisis, we postulate the influence is manifested after the event date (i.e. September 11, 2008) and not before it. Namely, the relation between *CSR* and firm's financial performance will be significantly only after the event. The underlying intuition is, a firm's *CSR* performance should be positively affecting investors' buying or selling only after the investor recognize the important of *CSR*. Thus, we propose that:

Hypothesis 2. The relation between the firm's level of CSR in food industry and the reaction of the investor (or financial market) is different before and after the event date. Specially, there is no significant relation before the event date and there is a significantly positive relation after the event date.

Data and methodology

Data

Our sample consists of all the 43 firms in food industry listed on China's stock market in the 2008 fiscal year. We obtain the data from CCER Database, a widely used database for research of China's listed firms. We collect variables of firm size, daily return, and book-to-market ratio and market return from CCER Database. There are only three firms out of our sample related to milk production (our results are robust removing these three firms). Most of our sample firms do not directly involve in the milk accident. Given that our sample firms are not involved in melamine accident and this exogenous accident is *CSR*-related, we believe that our results show that the investments in *CSR* generally can partially immunize non-offending firms from guilt-by-association when one member of an industry does something very bad.

Our *CSR* variable comes from Shanghai National Accounting Institute's (SNAIs) listed-firms' social responsibility ranking. SNAI issues a set of indexes that provided scores and ranking of *CSR* for China's listed firms on December 24, 2008. It is the first set of *CSR* indexes covering all China's listed firms, totally more than 1000 firms. Thus, our sample can include all China's listed firms in food industry. The SNAI system of *CSR* index was formulated according to the standard of SA8000 issued by Social Accountability International (SAI).[4] SNAI argued that the general motivation of issuing the *CSR* index was to encourage listed firms to make more *CSR* disclosure and improve the firm value. The system groups the 36 questions into eight categories: environment, energy saving, employees, employment and promotion, social problems, consumer satisfaction, other stakeholders, law and business ethics. Table 1 presents the full list of questions of SNAI *CSR* index, see also Li and Zhang (2010).[5]

It is worth to note that CSR measures are released on December 24, 2008, and this is more than three months after the event date of melamine contamination incident (i.e. September 11, 2008). One concern is that CSR measures may reflect contamination event.[6]

[3] Product recalls in the automobile industry are more frequent than in other industries. Davidson and Worrell (1992) point out that the number of recalls from the automakers of "big three" is larger than all other recalls combined.

[4] As a global social accountability standard for decent working conditions, SA8000 is developed and overseen by Social Accountability International.

[5] One concern with the CSR measure is that it is inherently subjective. The CSR categories and weights assigned to each are probably influenced by the agenda and political goals of the released institutions. Thus, it is not too surprising prior studies only get mixed relationship between performance and CSR. On the other hand, our finding that high CSRs mitigate adverse market reactions to a highly publicized event would suggest that the CSR measure, despite being open to criticism, is meaningful in the marketplace. We thank one of the referees for pointing out this issue.

[6] We thank both referees for pointing out this issue.

Table 1
Corporate social responsibility score rating criteria.

1. Environmental problems, including curbing polluted environment; recycling waste harmful to environment; producing products good to environment protection; using other means to control pollution
2. Energy saving, including making use of old and waste materials; great effort to reduce energy consuming; continuously improving energy saving of products; pushing research on energy saving
3. Employee problems, including caring healthy and safety of employee; training employee; reemployment of laid-off employees; reasonably arrangement of working time and positions; establishment and enforcement of standards on overtime; no employment of child labor; providing employee benefit
4. Employment and fair promotion, including employment and promotion of minorities; employment and promotion of female; employment and promotion of the handicapped; employment and promotion of veterans
5. Social problems, including donation to community; donation to education institutes; donation to medical activities; donation to arts and sports; donation to disaster areas; attention to public safety; opening company facilities to the public
6. Consumers problems, including delivery on time; improvement of products quality; attaching importance to safe use of products; bettering after service; attention to interests of specific consumers
7. Other stakeholders, including respect to interests of creditors; consideration on interests of suppliers
8. Abidance by law and business ethics, including anti-corruption, extortion, bribery; operating faithfully and lawfully

If a milk firm (in food industry) receives a bad CSR evaluation for its role as the primary culprit in the melamine adulteration, it would explain a lot of the relationship between CSR and magnitude of the market response. Thus, a potential endogenous issue may bring estimation bias in our test.

However, our data and empirical design should not be substantially influenced by this problem. This argument is based on the following facts: (1) The firms' CSR scores, released by SNAI in 2008, are constructed with the firms' data of year 2007. To get CSR scores, SNAI needs detailed data disclosed in listed firms' annual reports. Since the disclosure period of listed firms' annual report is from 01/January to 30/April in China, therefore, in the year 2008, only data of year 2007 are available for evaluating firm's CSR. (2) The scandal firm, Sanlu, is not listed in the stock market. Thus, there is no direct market reaction to Sanlu. (3) In our sample, there are only three milk firms in food industry and removing these milk firms from analysis does not qualitatively change any of the results.

Methodology

We 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 Brown and Warner (1985) and MacKinlay (1997) for a summary). Below, we briefly describe how we employ the event study for our study.

We 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 we estimate how a stock normally relates to the market by the capital asset pricing model (CAPM). The *event window* is the period over which we study the investors' response to the event. We use a $[T_0 - 5, T_0 + 5]$ as event window, which is a typical event window in practice, since a longer window cannot distinguish the investor reaction from other events or market noise. As a robust check, we also use event windows of different lengths (estimate windows are changed accordingly), and the results are similar.

We obtain the *cumulative abnormal returns* (*CARs*) for each firm in the sample for the event, pre-event and post-event windows. This variable is the main variable of interest for test Hypotheses 1 and 2. Specifically, *CAR* is the cumulative change in a stock price across the event window that accounts for all the effects resulting from market-wide influences. *CAR* measures the overall financial market responses to the event.

To calculate the *CAR* for stock *i* over an event window $[T_S, T_E]$, we use the following equation:

$$CAR_i = \sum_{t=T_S}^{T_E} AR_{i,t} \tag{1}$$

where T_S and T_E are the starting and ending days of the window, respectively: for pre-event window, $T_S = T_0 - 5$, and $T_E = T_0 - 1$; for post-event window, $T_S = T_0 + 1$ and $T_E = T_0 + 5$. $AR_{i,t}$ is the abnormal returns for stock *i* at trading day *t*. The procedures on how to derive $AR_{i,t}$ are detailed in *Appendix A*.

As for Hypothesis 1, to examine the relation between *CAR* and *CSR* for different firms around the event, we use the following specification:

$$CAR_i = a + b_1 CSR_i + b_2 Ln(Size)_i + b_3 Ln(M/B)_i + \varepsilon_i \tag{2}$$

where CAR_i is estimated as Eq. (1). CSR_i is the actual score of social responsibility index issued by SNAI. $Ln(Size)_i$ is the logarithm of market capitalization (prices multiply outstanding shares) of firm *i* in the end of last fiscal year. $Ln(M/B)_i$ is the logarithm of market-to-book ratio of firm *i* in the end of last fiscal year. In this regression, following Dimson and Marsh (1986), Fama and French (1992) and Fama and French (1993), we take $Ln(Size)_i$ and $Ln(M/B)_i$ as control variables to eliminate the size effects and book-to-market effect. If Hypothesis 1 is correct, we expect the coefficient of b_1 is positive and significant.

To further compare the difference relation for Eq. (2) before and after the event day (for Hypothesis 2), we use the following specification:

$$CAR_i^{pre-} = a' + b_1' CSR_i + b_2' Ln(Size)_i + b_3' Ln(M/B)_i + \varepsilon_i' \tag{3a}$$

$$CAR_i^{post-} = a'' + b_1'' CSR_i + b_2'' Ln(Size)_i + b_3'' Ln(M/B)_i + \varepsilon_i'' \tag{3b}$$

where CAR_i^{pre-} and CAR_i^{post-} are the *CAR* in pre-event window and post-event window, respectively. The other control variables are the same with equation (2). If Hypothesis 2 is correct, we expect the coefficient of b_1' is not significant and b_1'' is significantly positive.

Empirical analysis and results

In this section, we present the corresponding results as our hypotheses in Section 2. Table 2 presents summary statistics of the key variables for our sample. The average *CSR* score of food companies, CSR_{food}, is 0.3621. Given the range of *CSR* score is less than 1 and the average *CSR* score of all listed firms, CSR_{all}, is 0.3385, it means that the level of *CSR* in food industry is a little better than the average level of all listed firm. The standard deviation of food industry is 0.1027, less than 0.1359, the standard deviation of all listed firms. Besides, the minimum *CSR* score of food industry is 0.15, which is far larger than the minimum *CSR* score of all listed firms, −0.016.

The average $CAR_{[T0-5,T0+5]}$ and $CAR_{[T0-10,T0+10]}$ for food companies are −2.61% (*t*-ratio = 1.701) and −4.5% (*t*-ratio = 2.08), respectively. These significantly negative *CAR*s mean stock prices of firms in food industry decreases heavily around the event. Considering

Table 2
Summary statistics.

Variables	Obs.	Mean	Std. Dev.	Min	Max
CSR_{food}	43	0.3621	0.1027	0.1500	0.6070
CSR_{all}	1494	0.3385	0.1359	−0.0160	0.9260
$CAR_{food,[T0-5,T0+5]}$	43	−0.0261	0.1006	−0.2655	0.1806
$CAR_{food,[T0-10,T0+10]}$	43	−0.0450	0.1419	−0.3381	0.3876
$Ln(Size)_{food}$	43	21.8548	1.1345	20.1759	25.2647
$Ln(M/B)_{food}$	43	1.9324	0.5960	0.6577	3.4530

the *CAR* roughly is firm's return minus the market return, the negative *CAR* in food industry means that investors tend to sell the stock in their hands on average.

Table 3 lists all the sample firms' primary business focusing, $CAR_{[T0-5,T0+5]}$, $CAR^{Pre}_{[T0-5,T0-1]}$, and $CAR^{Post}_{[T0+1,T0+5]}$ as Jin and Kim (2008). For these 43 firms, there are three dairy firms (Bright Dairy & Food, Yili and Sanyuan) in all.

Since the scandal is only limited in dairy industry, it is reasonable to expect dairy firms will experience stronger market responses than firms in other segments of the food system. Actually, we do find firms in the dairy industry, on average, to have experienced a stronger market response than firms in other segments of the food system. As for two listed dairy firms involved in melamine contamination incident (Bright Dairy&Food and Yili), their stock prices show stronger negative market responses (CARs are −8.69% and −14.64% in $[T_0-5, T_0+5]$, respectively). However, Sanyuan, the only innocent dairy firm in China, shows stronger positive market responses with a 8.97% *CAR* in $[T_0-5, T_0+5]$. To a certain extent, the positive and negative market reaction counteracts each other.

As primary tests, we adopt the event study methodology to plot the average *CAR* for companies in the food industry around the event date in Fig. 1. It shows the investors' reaction to the incident around the event day (September 11, 2008). We find that there is significant downward sloping during the event window. Our null hypothesis here is that there is no price pattern in the investor reaction to the event and thus there is no abnormal return existing. However, Fig. 1 supports the alternative hypothesis. The cumulative abnormal returns show a clear downward sloping pattern in food industry and the food companies' financial performance below the average return in the stock market. This finding indicates that, indeed, the relatively low performance of food industry reflect the incident negatively impact the food-related companies. If we buy the firms' stocks in food industry before the event day (no matter in T_0-5 or T_0-10), the cumulative abnormal returns (i.e. roughly equal to raw return minus market return) are nearly −5% in a 10 days holding period and −3% in a 5 days holding period after the event. Besides, we also report the *t*-ratios for *CAR*s in different event date. Obviously, as time goes by, the significance of *CAR*s is goes up.

As for Fig. 1, there are two big market drops in the period of $[T_0-4, T_0-3]$ and $[T_0+4, T_0+7]$. These patterns indicate that the market received information prior to T_0 and received additional information several days after the event. In fact, even though the incident formally breaks out on September 11, 2008, there were already many related-reports disclosed by newspapers, local TV channels, and websites. The time line of 2008 China's milk scandal in Appendix B shows this is true. The first drop on the day of T_0-4 (i.e. 5 September) is corresponding with that the New Zealand Fonterra Co-operative Group, which owns 43% of Sanlu shares, reports information to the New Zealand government after a failure of trying to persuade the China local government recall of toxic Sanlu milk powder. The second drop is in the calendar period from 17 September to 22 September (including no-trading days in weekend). In this event window, the impact of this incident even is more severe. The toll of ill babies in this incident rises to 53,000 (with the death toll to at least four), two other famous milk firms in China, Mengniu and Yili, are involved into this incident.

Collectively, these results indicate that, as for food industry, the incident has significant negative impact on firm financial performance in stock market.

Our next question is how different CSRs of food companies affect the sensitivity of event impact on the stock prices. Basically, this is the intuition of our Hypothesis 1. Fig. 2 presents the pattern roughly, and there is an obviously upward sloping relation between CSR and CAR. Despite the clear pattern shown in Fig. 2, it possibly comes from the bias without control the common variables in literature such as firm size or book-to-market ratio. Table 4 reveals that this is not the case.

Table 4 presents estimation results of Eq. (2) with robust standard errors adjusted by sample size (MacKinnon and White, 1985). Overall, all regressions show significant *F-stat*s and significantly reject the null hypothesis that independent variables cannot explain the dependent variables, no matter we use all samples or sub-sample excluding three dairy firms. It means that *CSR* does affect investor reaction in the market. We take both *CAR*s in the event window $[T_0-5, T_0+5]$ and $[T_0-10, T_0+10]$ as the dependent variable in test. Since results with different dependent variables are very similar, we only focus on the result with *CAR* in $[T_0-5, T_0+5]$.

The first two columns in Table 4 show the estimation with and without control variables for the whole sample. The coefficients of *CSR*, b_1, are positively significant, which reject the null hypothesis (i.e. $b_1 = 0$) in 1% significant level. When we exclude dairy firms in columns 5 and 6, results still stay the same.

Jointly, these two estimates suggest that *CSR* performance in food industry positively affects investors' behaviors and investors have greater interests in buying stocks of firms with a high level of *CSR* scores than those of the firms receiving low *CSR* scores. This suggests that firms with poor *CSR* performance alienate their investors and implies that investors tend to worry that low *CSR* performance will undermine firms' performance or operation finally. Taken together, our result supports Hypothesis 1.

To test the Hypothesis 2, we conduct regressions as Eqs. (3a) and (3b). Table 5 provides the estimation results. Since results in Table 4 show our tests are robust to *CAR*s with different event windows, thereafter, we only report results with $[T_0-5, T_0+5]$ for brevity.

As shown in *Panel A* of Table 5, for the pre-event window (columns 1 and 2), the coefficients of *CSR* are not significant whether we include control variables or not. Thus, we cannot reject the null hypothesis that coefficient of *CSR* is different with zero in the pre-event window. Based on this result, it is easy to conclude that investors in general do not respond to food companies' *CSR* performance before the crisis. This is consistent with our Hypothesis 2.

The results of post-event window are reported in columns 3 and 4. Since we conjecture the general public in China only begins to pay attention to *CSR*, especially in food industry, after the crisis, we postulate the influence is manifested after the event. Consistent with our expectation, the coefficients of *CSR* are significant at 5% significant level and far more than zero no matter we regress with or without control variables. This result supports our intuition: firms' *CSR* performances are positively affecting investors' buying or selling only after they recognize the important of *CSR*.

Considered together, the results in Table 5 suggest that the effects of *CSR* are evident only after the incident, and perfectly support our Hypothesis 2.

Additional test[7]

We thus far show that *CSR* is vital for strengthening the food safety in the food industry, especially in emerging markets. Given our limited sample size, it is reasonable to combine the event study

[7] We thank one of the referees for suggesting to conduct this section.

Table 3
Listed firms in food industry and their cumulative abnormal returns.

#	Company name	Main business	$CAR_{[-5,+5]}$	$CAR^{Pre}_{[-5,+5]}$	$CAR^{Post}_{[+1,+5]}$
1	Bright Dairy & Food	Dairy products	−0.0869	0.0196	−0.1065
2	Sanyuan Foods	Dairy products	0.0897	−0.0526	0.1423
3	Yili Industrial	Dairy products	−0.1464	0.0696	−0.1304
4	Mogao Industrial Development	Barley malt and farming	0.0237	−0.1403	0.1572
5	Huanghe Enterprise	Barley malt, beer, drinks	−0.2655	−0.1988	−0.1067
6	Beijing Yanjing Brewery	Beer	0.1806	0.1009	0.1217
7	Chong Qing Brewery	Beer	−0.0217	−0.0164	−0.0053
8	Tibet Galaxy Sci&Tech Development	Beer	−0.0944	−0.0992	0.0048
9	Tsingtao Brewery	Beer	−0.0546	−0.103	0.0484
10	Yanjing Huiquan Brewery	Beer	0.0322	0.0093	0.0229
11	Jinjian Cereals Industry	Cereals and flour	−0.0466	−0.0985	0.052
12	Zhengbang Technology	Complete feed, concentrate feeds	−0.0956	−0.0614	−0.0343
13	Ningbo Tech-bank	Feeds production	−0.1552	−0.1482	−0.007
14	Zhenghong Sci&Tech Development	Feeds sales and protein feeds	−0.0677	−0.0235	−0.0442
15	New Hope Agribusiness	Feeds, dairy, slaughtering and meat production	0.019	−0.0183	0.0373
16	Tecon Animal Science Bio-technology	Feeds, veterinary drug	−0.0632	0.0664	−0.1297
17	Ronghua Industry	Food and feed	−0.0179	−0.0143	−0.0037
18	Shanghai Maling Aquarius	Food and meat productions	−0.2655	−0.1784	−0.0871
19	Lianhua Gourmet Powder	Gourmet powder and flour	−0.0913	−0.0598	−0.0316
20	Tonghua Grape Wine	Grape wine	0.0396	0.0341	0.0054
21	Changyu Pioneer Wine	Grape wine, brandy, healthy wine, champagne	0.1135	0.0898	0.0238
22	Xinghuacun Fen Wine	Liquor series	0.0665	0.0029	0.0636
23	Gaojin Food	Pork sales	−0.0065	0.0203	−0.0268
24	Haitong Food	Quick frozen/dehydration product and canned goods	−0.0150	0.0176	−0.0326
25	Anhui Gujing Distillery	Spirits alcoholic	−0.1228	−0.1183	−0.0044
26	Huazi Industry	Sugar	0.0257	0.0370	−0.0127
27	Shenbao Industrial	Teas, condiments, and soft drinks	−0.0399	−0.0052	−0.0347
28	Cofco Tunhe	Tomato products and beets products	−0.0450	−0.0874	0.0424
29	Xingjiang Chalkis	Tomato products and fruits juice	−0.1153	−0.1658	0.0504
30	Cheng De Lolo	Vegetable, protein drinks	0.0873	0.0342	0.0531
31	Hengshun Vinegar	Vinegar and other condiments	−0.0429	0.0517	−0.0888
32	Nanning Sugar	White crystal sugar, brown granulated sugar	−0.0280	−0.0748	0.0468
33	Guyuelongshan	Wine	0.0887	0.0126	0.0761
34	Huangtai Wine-Marketing	Wine	−0.1755	−0.107	−0.0686
35	Jiuguijiu Company	Wine	−0.1654	−0.1194	−0.046
36	Kweichow Moutai	Wine	0.1146	0.0962	0.0184
37	Luzhoulaojiao	Wine	0.0326	0.027	0.0056
38	Wuliangye	Wine	0.1201	−0.0249	0.145
39	Golden seed Winery	Wine	0.0470	0.0455	0.0015
40	Hainan Yedao	Wine and drinks	−0.0882	−0.1082	0.02
41	Yilite Industry	Wine and fruit juice	0.0002	−0.0252	0.0253
42	VV Food & Beverage	Wine, soybean milk powder, vegetable protein drinks	0.1000	0.0198	0.0802
43	Angel Yeast	Yeast	0.0138	−0.0048	0.0186

and regression analysis. However, a more effective and simpler approach in regression is to conduct the following empirical specification:

$$CAR_{ij} = a + b_1 CSR_{ij} + b_2 Crisis_i + b_3 Age_{ij} + b_4 SOE_{ij} + b_5 Ln(Size)_{ij} + b_6 Ln(M/B)_{ij} + e_{ij} \quad (4)$$

where CAR_{ij} is CAR of the ith firm in the jth month. CSR_{ij} is the actual score of social responsibility index issued by SNAI and it is not vary across month. $Crisis_i$ is the dummy variable for dividing into pre- and post-crisis. Age_{ij} is the age of the ith firm in the jth month since the firm was established. The SOE_{ij} is a dummy variable to index if the firm is controlled by the government. If the firm is state-owned, $SOE = 1$; otherwise, $SOE = 0$. $Ln(Size)_{ij}$ and $Ln(M/B)_{ij}$ are the same with Eq. (2).

By this manner, we can consider a relatively long time horizon to examine the mid-term or long-term impacts of the milk scandal. Although the crisis was disclosed on September 11, 2008, most of the policy interventions were announced months later on. Using Eq. (4), we can further address the long-term impacts.

It is worth to note that, in Eq. (4), we also introduce two new variables: *Age* (to measure how many years the firm has been established) and *SOE* (to measure if the firm is owned by the state). Both of these two variables help us to address a much larger issue under the institution environment of China. As a matter of fact,

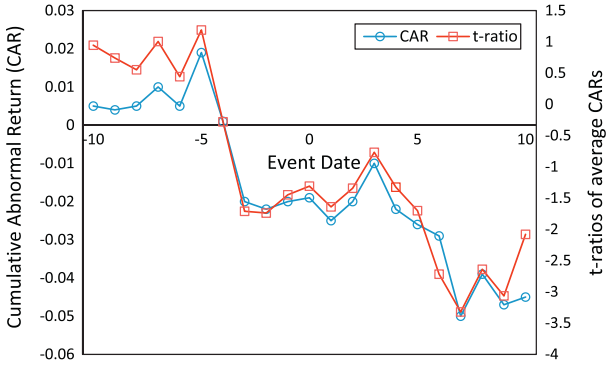

Fig. 1. The market reaction of food industry in the event windows.

many of the dairy firms (which were disclosed for manipulating the safety and quality of raw milk and dairy products) were quasi-state-owned and/or had fame for a long time in. Lots of SOE firms were even exempt from inspection before the crisis. The dairy scandal reveals that China's food industry was poorly governed and coordinated.

Table 6 presents our estimation results. *Panel A* and *Panel B* report results with the dependent variables of *CAR* in months [−5,+12] and *CAR* in months [−5,+24], respectively. Since it is hard

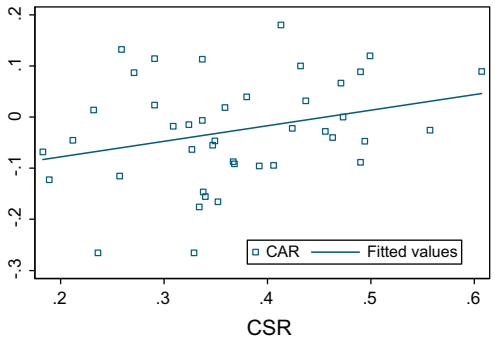

Fig. 2. The relation between $CAR_{[T0-5,T0+5]}$ and *CSR*.

to decide the estimated windows for *CAR* in different months from $T_0 - 5$ to $T_0 + 24$, we simplify the estimation of AR as individual stock's monthly return minus monthly market return. Based the ARs, we can easily compute the *CAR*s as Eq. (1).

The results in *Panel A* and *Panel B* are similar, we thus only illustrate in *Panel A* for brevity. For the coefficients of *CSR*, the signs of all these three models are positive and two-thirds are significant. This confirms our early regression results, i.e. the *CSR* has a positive effect on firm performance. Since our dependent variables are long-term performances, this result further means the *CSR* has a persistent impact. As for the dummy variable of *Crisis*, Table 6 shows a very consistent and significant pattern. After the event, as a whole, the China's food industry faces strongly negative impacts. Basically speaking, the coefficient of *Age* is negative, and it means that the firms' long operation record cannot bring them a positive market reaction. Actually, most (no-listed) milk firms in China involved in this scandal have a long history. It is very interesting to note that the *SOE* is negative and significant. Most famous firms in China are state-owned and these firms have good relationship with the government and the supervisors. However, our results show that this political-connection is harmful to the firms' performance, especially after an exogenous accident shock, the investors in stock market voting by their foot to show their distrust on the state-owned firms.

Given that the scandal promotes academies and the policy makers pay more and more attention to consider the mechanism of enhancing food safety in China's food industry, we believe the regression results in Table 6 can offer useful implications on how the institution characteristics take effect in China.

Table 4
Regression of CAR on CSR in food industry.

	Panel A: all firms				Panel B: excluding dairy firms			
	$CAR_{[-5,+5]}$	$CAR_{[-5,+5]}$	$CAR_{[-10,+10]}$	$CAR_{[-10,+10]}$	$CAR_{[-5,+5]}$	$CAR_{[-5,+5]}$	$CAR_{[-10,+10]}$	$CAR_{[-10,+10]}$
CSR	0.355***	0.345***	0.645***	0.573**	0.332**	0.287**	0.453**	0.311*
	(0.111)	(0.112)	(0.220)	(0.242)	(0.124)	(0.123)	(0.168)	(0.164)
Ln(Size)		0.036**		0.030		0.048***		0.052***
		(0.015)		(0.022)		(0.013)		(0.017)
Ln(M/B)		−0.000		−0.072		−0.021		−0.110***
		(0.031)		(0.043)		(0.029)		(0.036)
Constant	−0.154***	−0.935***	−0.279***	−0.777*	−0.143***	−1.137***	−0.214***	−1.089***
	(0.047)	(0.287)	(0.079)	(0.406)	(0.050)	(0.238)	(0.064)	(0.330)
Obs.	43	43	43	43	40	40	40	40
Adj-R^2	0.110***	0.239***	0.199***	0.221***	0.0831***	0.282***	0.106***	0.253***

Note: This table reports estimated results based in Eq. (2). Robust standard errors are in parentheses. *Panel A* and *Panel B* report results of whole sample and sub-sample excluding dairy firms, respectively. $CAR_{[-5,+5]}$ and $CAR_{[-10,+10]}$ are estimated with the event windows $[T_0 - 5, T_0 + 5]$ and $[T_0 - 10, T_0 + 10]$ as Eq. (1). *CSR* is the actual score of social responsibility index issued by SNAI. *Ln*(*Size*) and *Ln*(*M*/*B*) are the logarithm of market capitalization (prices multiply outstanding shares) and market-to-book ratio in the end of last fiscal year.

* Statistical significance at the 10% significance level.
** Statistical significance at the 5% significance level.
*** Statistical significance at the 1% significance level.

Table 5
Regression of *CAR* on *CSR* in pre- and post-event windows.

	Panel A: all firms				*Panel B*: excluding dairy firms			
	$CAR^{Pre}_{[5,-1]}$	$CAR^{Pre}_{[5,-1]}$	$CAR^{post}_{[1,5]}$	$CAR^{post}_{[1,5]}$	$CAR^{Pre}_{[5,-1]}$	$CAR^{Pre}_{[5,-1]}$	$CAR^{post}_{[1,5]}$	$CAR^{post}_{[1,5]}$
CSR	0.113	0.099	0.242**	0.236**	0.150	0.141	0.189**	0.146*
	(0.105)	(0.115)	(0.090)	(0.090)	(0.116)	(0.131)	(0.090)	(0.079)
Ln(Size)		0.023*		0.020		0.018		0.033***
		(0.013)		(0.012)		(0.014)		(0.008)
Ln(M/B)		−0.009		−0.002		0.000		−0.025
		(0.024)		(0.022)		(0.026)		(0.017)
Constant	−0.071	−0.559**	−0.082**	−0.504**	−0.087*	−0.471*	−0.058*	−0.720***
	(0.044)	(0.253)	(0.035)	(0.225)	(0.048)	(0.273)	(0.034)	(0.164)
Obs.	43	43	43	43	40	40	40	40
Adj-R^2	0.000	0.044	0.109**	0.168***	0.010	0.028	0.066**	0.278***

Note: This table reports estimated results based on Eqs. (3a) and (3b). Robust standard errors are in parentheses. *Panel A* and *Panel B* report results of whole sample and sub-sample excluding dairy firms, respectively. $CAR^{Pre}_{[-5,-1]}$ and $CAR^{post}_{[1,5]}$ are estimated with the event windows $[T_0 - 5, T_0 - 1]$ and $[T_0 + 1, T_0 + 5]$ as Eq. (1). *CSR* is the actual score of social responsibility index issued by SNAI. *Ln*(*Size*) and *Ln*(*M*/*B*) are the logarithm of market capitalization (prices multiply outstanding shares) and market-to-book ratio in the end of last fiscal year.

* Statistical significance at the 10% significance level.
** Statistical significance at the 5% significance level.
*** Statistical significance at the 1% significance level.

Table 6
Regression of long term *CAR* on *CSR* and firms' characteristics.

	Panel A: CAR in months [−5,+12]			Panel B: CAR in months [−5,+24]		
	Model(1)	Model(2)	Model(3)	Model(1)	Model(2)	Model(3)
CSR	0.065	0.113*	0.189**	0.047	0.109*	0.197**
	(0.085)	(0.061)	(0.078)	(0.086)	(0.058)	(0.078)
Crisis	−0.064***	−0.067***	−0.033*	−0.089***	−0.087***	−0.032*
	(0.016)	(0.016)	(0.018)	(0.015)	(0.015)	(0.018)
Age		−0.002	−0.012***		0.001	−0.011***
		(0.003)	(0.003)		(0.003)	(0.003)
SOE		−0.153***	−0.136***		−0.166***	−0.140***
		(0.022)	(0.022)		(0.021)	(0.021)
Ln(M/B)			0.139***			0.157***
			(0.020)			(0.020)
Ln(Size)			0.032***			0.036***
			(0.010)			(0.010)
Constant	0.012	−0.027	−0.767***	0.020	−0.066	−0.880***
	(0.032)	(0.051)	(0.204)	(0.032)	(0.052)	(0.199)
Obs.	1376	1376	1376	1548	1548	1505
Adj-R^2	0.001***	0.055***	0.103***	0.009***	0.051***	0.151***

Note: This table reports estimated results based on Eq. (4). Robust standard errors are in parentheses. *Panel A* and *Panel B* report results with the dependent variables of *CAR in months* [−5,+12] and *CAR in months* [−5,+24], respectively. *CAR* is estimated based on the simplified AR (stock return minus the market return). *CSR* is the actual score of social responsibility index issued by SNAI. *Age* is the age firm since it was established. *SOE* is a dummy variable to index if the firm is controlled by the government. If the firm is state-owned, *SOE* = 1; otherwise, *SOE* = 0. *Ln*(*Size*) and *Ln*(*M*/*B*) are the logarithm of market capitalization (prices multiply outstanding shares) and market-to-book ratio in the end of last fiscal year.

* Statistical significance at the 10% significance level.
** Statistical significance at the 5% significance level.
*** Statistical significance at the 1% significance level.

Conclusion

This paper presents the influences of CSR level on investors' behaviors in the food industry. Although CSR is an important issue, and in a recent survey by China Academy of Social Science, investors have expressed their concerns regarding firms' CSR activities, we do not find any significant pattern between the level of firms' CSR and investors' trading behaviors in the pre-event window. Nevertheless, in the post-event window, we detect significant effects of CSR on investors' behaviors. Our findings suggest that *CSR* can influence investors' trading behaviors at least in a short period of time after the event, but not before it.

This study offers three important policy implications. First, we find that in China, investors in the food industry significantly react negatively to the melamine contamination incident. Our findings directly suggest that the Chinese government, as well supervisors, should release appropriate policies to strengthen the current food safety laws, enact new and stricter laws on food safety, and enhance the tolerance standards in the food industry. Policies along this channel would ensure the safety and quality of food, and ultimately, protect the consumers.

Second, we also find that when facing shock, the firms' CSR levels significantly mitigate the negative investors' responses in the food industry, thereby providing another channel for the Chinese government to prevent the emergence of catastrophic consequences, namely, improving the firms' activities on CSR. Given the profit motivation of those in the private sector, we suggest that supervisors and monitors release appropriate policies and efficient mechanisms to strength firms' incentives to participate in CSR activities, especially in the aspects of production, marketing, and product consumption. For instance, Holleran et al. (1999) point out that financial incentives are important for all participants in the supply chain to provide clean, safe, and healthy products.

Our findings in this paper imply that investors, in the manner of "voting by foot", only partially monitor CSR after their recognition of the exogenous CSR shock. Although this mechanism works in the monitoring, it is insufficient to secure food safety and does not serve as a substitute to the roles of the government and the supervising organization.

Third, our findings also provide implication on socially responsible investments (Sparkes and Cowton, 2004). We show that investors take food companies' CSR activities as important factors in their investment decisions. Investor trades can affect firm price, which is the main concern of shareholders. Thus, we suggest that socially responsible investment funds, at least in the food industry, can acquire long-term benefits by integrating firms' CSR levels in their portfolio constructions.

This paper has two limitations: 1) We only focus on China's listed firms in the food industry. Although we can obtain significant results in this study, our findings should be cautiously applied to non-listed firms and to other countries. 2) Our research is based on cross-section data of 43 listed firms in China's food industry. The observation parameters may reduce our test power. Therefore, future studies can be conducted in two ways: 1) By offering international or non-listed firm facts, the effect of CSR on firm performances can be evaluated in a more general sense, and 2) with a time-series CSR measure, we can further investigate how CSR affects firm performance in the long run.

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Appendix A. Procedures to derive $AR_{i,t}$

We 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 $[T_0 - 155, T_0 - 6]$:

$$R_{i,t} = a_i + b_i MR_t + e_{i,t} \quad (A.1)$$

where t is from $T_0 - 155$ to $T_0 - 6$ and MR_t is the expected return for the whole stock market on day t. Through regression in Eq. (A.1), we

obtain the estimated intercept coefficient $\hat{a}_i$ (also called alpha value) and the estimated coefficient for MR_t which is $\hat{b}_i$ (also called beta value). Then we use the following equation to estimate the expected return for stock i, $E(R_{i,t})$ in the pre-event window $[T_0-5, T_0-1]$ and the post-event window $[T_0+1, T_0+5]$:

$$E(R_{i,t}) = \hat{a}_i + \hat{b}_i MR_t \tag{A.2}$$

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

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{A.3}$$

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

$$CAR_i = \sum_{t=T_S}^{T_E} AR_{i,t} \tag{A.4}$$

Appendix B. Timeline of the 2008 China's milk scandal

Date	The events
5 September	After the failure of trying to persuade the China's local government (i.e. Hebei province) recall of toxic Sanlu milk powder, the New Zealand Fonterra Co-operative Group, which owns 43% of Sanlu shares, had to report information to the New Zealand government
6 September	Complaint was delivered to General Administration of Quality Supervision, Inspection and Quarantine of China (AQSIQ) that several babies have got renal calculus (kidney stones) because a long time consumption of Sanlu milk powder
8 September	Officials of New Zealand were ordered to report this emergency to the China central government without permission of Local officials in Hebei province
9 September	New Zealand Government directed its embassy to inform China's food safety authorities in Beijing of the Sanlu milk contamination The government of Shijiazhuang (capital of Hebei) reported to the Hebei government on the quality problem of Sanlu milk powder
10 September	Sanlu claimed that Sanlu milk powder was free of quality problem More than 70 sick babies had kidney stones and Sanlu Milk powder was blamed to be the prime culprit. There were 59 cases (including one death) reported by Gansu province. 6 cases were reported by Shaanxi, Gansu and Ningxia provinces, and 10 cases by Nanjing City. Similar cases of illness were reported in Henan, Jiangxi, and Hubei provinces
11 September **(Event Date)**	A *Dongfang Daily* reporter, Jian Guangzhou, reported the connection between Sanlu's baby formula and infant kidney stones to the public. This was the first time that Sanlu was identified as being responsible for the cases on a public media The Ministry of Health warned people to stop consuming the polluted Sanlu milk powder immediately at 9:00 p.m. (Actually, even at 5:00 p.m., Sanlu still state that "we are of high social responsibility... we can surely say that all the Sanlu products have got no quality problem) Sanlu recalled some batches of milk powder had been polluted by melamine, the total quantity of which was around 700 tons at 10:00 p.m.
12 September	Sanlu admitted that its milk powder was contaminated with melamine AQSIQ issued a command to examine the quality of milk powder throughout the nation
13 September	Production halted at Sanlu Nineteen people are arrested Baidu, a China's top search engine, denied ever agreeing to bury Sanlu negative news
15 September	Vice-President of the Sanlu Group apologized to the public for the contaminated milk powder Sanlu was ordered to halt production, and to destroy all unsold and recalled products. Authorities reportedly seized 10,000 tons of products Beijing confirms two babies' death Ministry of Health claimed that: up to the present, there were 1353 sick babies
16 September	Milk powder from 22 China's companies tested positive for melamine, Sanlu tops the rankings
17 September	MD of Sanlu was detained on criminal charges; Shijiazhuang Mayor Chuntang Ji resigned Health Minister Chen Zhu declared toll of "more than 6200 children, and that more than 1300 others, mostly newborns, remain hospitalized with 158 suffering from acute kidney failure"
18 September	One case was sickbaby death was reported by Xinjiang Autonomous Region China revokes 'Inspection-Free' right of top dairy companies Yili products recalled in Hong Kong after testing positive for melamine Yili and Mengniu made public apology
19 September	Melamine found in ordinary milk from three well-known dairies One of the firms involved – Mengniu dairy issued blanket recall on all its products
21 September	Additional Hong Kong victim diagnosed China's Premier Wen Jiabao makes a visit

Appendix B (*continued*)

Date	The events
	to sick infants Nestlé pure milk contaminated, Taiwan's Mr. Brown Coffee is recalled following discovery of contamination Ministry of Health claimed that toll of ill babies who were receiving medical care was up to 12,892, of which 104 babies were severely ill
22 September	Toll of ill babies raised to 53,000, and the death toll to at least four Li Changjiang, minister in charge of the AQSIQ, is forced to resign after the State Council publishes inquest concluded that he was responsible for the "negligence in supervision" Local Party Secretary Wu Xianguo is dismissed Taiwan bans China's milk products
23 September	Other countries start to test China's dairy products or remove them from shops Malaysia bans China's milk candies and Tanzania suspends milk imports from China Two new Hong Kong victims diagnosed, and toll of victims mount to 54,000 children, four dead
24 September	Indonesia bans China's milk imports and Tesco withdraws China's *White-Rabbit* Candies Three more victims in Hong Kong and Macau diagnosed; The Fonterra Co-operative Group of New Zealand claimed that despite the great loss (around 95 million dollars) due to the Sanlu Milk powder event, it would continue its business in China

Note: This table presents the timeline of the 2008 China's milk scandal and documents how melamine events related to the China's dairy firms evolved. Though the scandal came to attention in 2008, its roots can be traced back to events prior to 2008. The data sources of this table come from following URLs: http://business.sohu.com/20080925/n259747335.shtml (in Chinses); http://news.bbc.co.uk/2/hi/asia-pacific/7720404.stm; http://en.wikipedia.org/wiki/Sanlu_ Group#cite_note-censor-22; http://www.sourcewatch.org/index.php?title=Fonterra_and_the_Chinese_contaminated_milk_scandal#cite_ref-Eaton_10-0; http://en.wikipedia.org/wiki/Fonterra; http://en.wikipedia.org/wiki/Timeline_of_the_2008_Chinese_milk_scandal.

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