

## **Word Power:**

### **The Impact of News Media on Corporate Pollution Practices**

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**ABSTRACT**

Sequences of individual words make up media reports. And sequences of media reports constitute the power of the news media to influence corporate practices. In this paper, we develop the priming aspects of agenda setting in news reports to elaborate how an atmosphere of negative news reports following an initial exposure of corporate pollution activity can help stop such activity through their impact on corporate managers. We extend our understanding of the corporate governance effect of news media by considering two new aspects of reports – one, the proportion of words in negative reports relative to the total number of words in all reports; and two, the geographical provenance of such reports. Our study of pollution activities of listed Chinese firms from 2004 to 2012 provides strong support for our hypotheses. These findings have valuable implications for the handling of pollution issues in transitional economies.

## **Word Power**

# **The Impact of News Media on Corporate Pollution Practices**

### **INTRODUCTION**

The news media continues to play a very important role in affecting corporate business practices by means of their dominant position as information intermediaries in our society (Bednar, 2012; Core, Guay, & Larcker, 2008). Stakeholders, who control scarce resources vital for corporate survival, access information about firms primarily via news media conduits (Dyck, Volchkova, & Zingales, 2008; Pollock, & Rindova, 2003). Consequently, the news media function as a disciplining force regulating corporate practices through their influence on corporate stakeholder perceptions of focal firms (Bednar, Boivie, & Prince, 2012; Dyck et al., 2008). Previous studies have supported the notion that media reports (e.g., coverage and tenor) influence various aspects of corporate business, including stock performance (Bhattacharya, Galpin, Ray, & Yu, 2009), CEO compensation and dismissal (Core et al., 2008), corporate acquisition (Liu & McConnell, 2013), financial fraud (Miller, 2006), and strategic change (Bednar et al., 2012). Recently, several studies have focused on the disciplining power of media on corporate social practices, such as corporate philanthropy (Chiu & Sharfman, 2009; Gan, 2006).

Our paper improves on these studies in various ways: first, we have known since the 1970s from the agenda-setting literature (McCombs & Shaw, 1972) that the priming effect of news media provides an important theoretical framework to analyze the impact of news reports on public opinion (McCombs, 2005). According to Scheufele and Tewkesbury

(2007), agenda setting “refers to the idea that there is a strong correlation between the emphasis that mass media place on certain issues (e.g., based on relative placement or amount of coverage) and the importance attributed to these issues by mass audiences”. Agenda-setting theory generally proposes that the choice of topics by the news media affects whether and how they think about an issue (Scheufele & Tewksbury, 2007; Weaver, 2007). The priming aspect of agenda setting emphasizes the mental accessibility of news reports to readers/viewers of those news reports; such accessibility affects the ease with which the public can retrieve an issue in their mind when making a judgment regarding an object (e.g., politician or issue). According to the proponents of the priming story, when studying the impact of news reports, it is important to incorporate various priming aspects of the news reports, since such priming variables affect the influence of the reports. On the one hand, our paper provides further evidence on the importance of the priming effect; on the other hand, the use of priming variables enables us to better test for media influence on the cessation of corporate pollution activity.

Second, previous studies have measured media coverage primarily by counting the number of media reports in a given period (e.g., Bednar, 2012; Pollock & Rindova, 2003). However, the level of media coverage following an initial pollution event is better measured by the change in media coverage from before the initial pollution event to after the pollution event. The public is likely to react to the change in coverage rather to the level of coverage.

Third, news media use specific words to indicate their opinion about a focal corporation (Jegadeesh & Wu, 2013; Tetlock, Saar-Tsechansky, & Macskassy, 2008). Words matter and different words matter differently. Thus, assuming that every news report is the same as every

other is incorrect; similarly, assuming every negative report is equal to every other negative report is also misguided. For example, audiences perceive a report that narrates a story in a dramatic fashion with a lot of details to be more useful and more reliable compared to a brief report (e.g., Martens, Jennings, & Jennings, 2007).

Fourth, not all news media are equal; stakeholders have preferences over information sources (e.g., Barnett, 2013). Previous studies have failed to take the geographic location of news media into consideration. This generates at least two biases: on the one hand, studies based on the nation-wide newspapers ignore the impact of local news media, such as the NanFang Daily in southern China, on regional stakeholders; local newspapers actually possess a strong influence on the local public. For example, Engelberg and Parsons (2011) find that local newspaper reports have a stronger influence on the trading of local stocks.

Finally, although previous studies have studied whether news reports facilitate corporate social responsibility, such as corporate philanthropy (Chiu & Sharfman, 2009; Gan, 2006), what has not been fully studied is whether and how news media affect corporate misbehavior, such as eliminating or reducing corporate pollution practice.

We propose to fill the gaps discussed above by looking at how a) the change in negativity of news reports (after versus before an initial corporate pollution event) and b) the geographic provenance of news reports affects subsequent corporate pollution. Our study is similar to that of Tang and Tang (2013, henceforth TT) in that both of us examine the news media's governance effect on corporate pollution practices in China. However, there are several significant differences between our study and that of TT: first of all, TT take a traditional approach to measuring media coverage by using the absolute number of media reports during

the exposure of corporate pollution events; as mentioned above, we use the *change* in coverage. Second, TT assume homogeneity among news reports; we look at the quality of verbiage in the news reports. Third, TT only target a very small number of nationwide newspapers to portray the media coverage and ignore the local news media. Actually there are more than 600 newspapers in China, most of which are regional and dominate the local public's information sources. Finally, TT focus on examining the impact of media coverage of corporate responses to the exposure of their pollution practices in a single year (2009). However, the immediate corporate cessation of pollution activity following news reports might simply be tactical; in contrast, we look at subsequent corporate pollution events to examine whether the news media actually prevents corporate pollution practice over a much longer period (from 2004 to 2012).

The article proceeds as follow: we first describe the research setting and elaborate our arguments regarding the relationship between the *change* of media coverage and subsequent corporate pollution practice as well as the moderating effect of local news media. We then describe our methodology and empirical results, following with a discussion of our findings.

## **RESEARCH FRAMWORK AND HYPOTHESIS DEVELOPMENT**

We assume that the nature of news media coverage changes after the exposure of an initial corporate pollution event. News media are generally profit-driven in that they prefer to report news that would attract public attention (Dyck et al., 2008). A negative report exposing a firm engaging in pollution activity is newsworthy because it contributes to setting up the agenda for the attitude of the public toward that firm. Furthermore, how the news media

prime public attitudes after the initial exposure of the corporate pollution event is likely to influence managers' evaluation of the desirability of continued pollution practices. We predict that a media-generated atmosphere of negative news after the initial pollution exposure would motivate managers to cease corporate pollution; moreover, when the focal firm is the focus of local news media, the managers would perceive cessation of pollution activity to be much more desirable. Figure 1a presents our research framework.

**INSERT FIGURE 1a and 1b ABOUT HERE**

**Media-Generated Negative News Atmosphere following Initial Pollution Exposure and Subsequent Corporate Pollution Practices**

After an initial exposure of corporate pollution events, the general public pays more attention to the events pertaining to the focal firm. Generally, individuals tend to pay more attention to negative information perceiving it to be more informative, relying on it to a greater extent to form judgments, and responding to it more strongly than to positive information (Pfarrer et al., 2010). News media, therefore, are more likely to pursue negative news about the focal firm and to report news with a negative tenor. Figure 1b shows the time-line of the generation of a negative news atmosphere and subsequent corporate pollution.

The priming aspect of agenda setting theory suggests that news media determine what the public should think about the firm (McCombs & Shaw, 1972; McCombs, 2005). In such a situation, the public would be more receptive to negative reportage (e.g., news words) regarding the focal firm and will be more likely to evaluate the firm negatively based on that negative reportage.

Managers of the focal firm, in turn, are likely to respond to such negative reporting for several reasons. For one thing, the negative atmosphere created by the media towards the focal firm can damage managerial reputations; managers are expected to take responsibility for corporate misbehavior. Public disapproval of the firm is likely to harm managerial careers. For example, Bednar (2012) finds that negative news reports are associated with a reduction in CEO compensation and CEO dismissal. Consequently, the negative news media priming of the public will lead managers to fear a negative impact on their own reputation. Thus, the negative atmosphere engendered by the media increases the costs of continuing to pollute. For another, the media coverage is likely to draw unwanted government attention and supervision (Tang and Tang, 2013).

Consequently, ceasing corporate pollution practices is incentive compatible not only in terms of helping the corporation regain news media and stakeholder support, but also in maintaining managers' reputations. Based on these arguments, we put forward the following hypothesis:

*Hypothesis 1: Following an initial exposure of corporate pollution, the greater the proportion of words in negative reports compared to all reports about a focal firm, the lower the propensity of the firm to continue polluting.*



## **The Role of the Local News Media**

Local news media reports about local corporations strongly influence the trading of local stocks (Engelberg & Parsons, 2011). Although news media in a given region do report on news in other regions, nevertheless, local news reports are more likely to influence managers in terms of how they believe the local public is likely to view their actions; consequently, local news media are more likely to have an impact on the likelihood of corrective actions that firms might take to rectify their corporate misdeeds or desist from such misdeeds. For this reason, we match news media with firms by comparing the issuance zone of the news media with the registered office location of the firm to screen out the local news media and national-wide news media. In this way, we would get how many local news media among the whole news media report on the focal firm.

There are several reasons why local news reports are more likely to impact corporate actions. First, the local news media has better access to internal corporate information compared to news media in other regions; it is much more difficult for firms to conceal their pollution practices from local news media. There is another reason why local news media would take active steps to learn about corporate pollution in their area. Circulation numbers and viewership for media publications depend strongly on public trust. Failure to remain informed and failure to report on local events would harm the public's trust in that news outlet, particularly if it were to be scooped by a non-local news outlet. This, obviously, would have negative economic implications for the news outlet. Competition among news media for readership/viewership also increases the exposure probability of corporate pollution events.

One could argue, as well, that such competition is likely to minimize co-optation of media by corporations, but this effect is ambiguous.

Second, the local public generally relies on local news agencies to acquire information rather than browse a wide range of media. Thus, local news media have an important influence in terms of priming local attitudes toward a local corporation. Corporate pollution events are much more likely to harm local stakeholders of the focal firm rather than stakeholders located elsewhere; hence the local public are much more likely to read and be influenced by local media that are more likely to report on issues of greater relevance to them. However, local stakeholders generally possess scarce resources essential for corporate survival. As a result, corporate managers would pay more attention to the change of news reports after initial corporate pollution exposure when they are also the focus of local news reports.

Finally, local managers of firms are likely to take their local reputations seriously. Generally, they have complex personal relationships with individuals in the local region. Managers of listed firms, in particular, are likely to be well known to the local public. As such, managers would not want to risk the loss of social recognition and prestige in the local community. This, again, would lead them to pay more attention to local media reports. For example, previous studies show that managers in family firms would even give up economic profits to protect their reputation in the local region (e.g., Berrone, Cruz, Gomez-Mejia, & Larraza-Kintana, 2010; Gomez-Mejia, Haynes et al., 2007). Following hypothesis 1, we measure the degree of negativity of the atmosphere created by the media as the proportion of words in negative reports about the focal firm, compared to the total number of words in all reports about the firm. Then, based on the above arguments, we have the following hypothesis:

*Hypothesis 2: Given the atmosphere of negativity created by the media about a focal firm, the greater the local news media coverage, the greater the likelihood of subsequent corporate cessation of pollution activities.*

## **RESEARCH DESIGN AND METHODOLOGY**

### **Sample and Data Collection**

We study Chinese listed firms categorized as polluting industries by the China Securities Regulatory Commission (classification codes B, C0, C1, C2, C3, C4, C6, C8, and D). The total initial sample consisted of 1040 listed companies. According to the Environmental Protection Law of the People's Republic of China (PRC)<sup>1</sup>, we define the scope of environmental pollution behaviors to include the following elements: excessive emission over the legal level, announcement from regulatory bodies regarding rectification of corporate pollution practices, improper dealing with wastes, administrative punishment for corporate environmental pollution, official disclosure of environmental pollution, and other corporate practices in violation of regulations. Because pollution is a sensitive issue at the local government level, we are only able to identify the quarter in which the violation event took place – a more precise identification of the timing is, unfortunately, not possible.

We identify the initial pollution event by looking at the following sources. We first search the prominent Chinese newspaper database, China National Knowledge Infrastructure

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<sup>1</sup>The source of information is <http://www.envir.gov.cn/law/envir.htm>.

(CNKI), by choosing specific keywords<sup>2</sup> combined with the corporate name to find the relevant news of a listed firm's pollution behavior from 2004 to 2012. In addition, we look up the database provided by the Institution of Public and Environmental Affairs (IPE),<sup>3</sup> which collects many details of corporate pollution events. Finally, we combine the above two sources of information to manually code pollution events regarding each target firm, including the timing of the initial pollution event. Using these sources, we were able to collect 932 pollution events conducted by the target listed firms from 2004 to 2012. Consistent with prior research (Mishina et al., 2010), we do not look at the severity of different pollution events. Moreover, there are firms engaging in many times of pollution events in a given quarter. Of the pollution events we found, 338 of them referred to multiple pollution occurrences for the same firm. After removing these, we obtained 596 unique firms with pollution event reports in the period 2004-2012.

We delete firms who rank in the top ten percent of listed firms in polluting industries, in terms of total assets. This is because such large firms with monopoly power are unlikely to care much about negative media exposure (e.g., China Petroleum). There were 155 observations which fell within this category. We also delete firms with initial pollution events in 2012, to allow for at least four subsequent quarters to measure the firm's reaction to media exposure of

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<sup>2</sup> Numerous keywords are used in Chinese to portray the characteristics of corporate pollution events including: contaminate, damage, pollution discharge, underlying discharge, waste water, out of limitation, leak, explode, death, accident, safe, violation, smoke dust, oil leak, dam break, loss, gas, carcinogenic, poison, blacklist, deforestation, investigation, waste gas, waste residue, dirty, reorganize, revamp. (In Chinese, these terms are 污染、破坏、排污、偷排、废水、超标、泄露、爆炸、死亡、事故、安全、违规、烟尘、溢油、漏油、溃坝、损失、瓦斯、致癌、毒、黑名单、毁林、违法、调查、废气、废渣、黑榜、恶、脏、整顿、整改).

<sup>3</sup>The Institution of Public and Environmental Affairs (IPE) is a registered non-profit organization based in Beijing. Since the establishment in May 2006, the IPE has developed two pollution databases (water & air) to monitor corporate environmental performance and to facilitate public participation in environmental governance.

initial pollution reports. There were 39 such events. We also deleted observations with missing data on institutional investor shareholding ratio, total assets, and the growth rate of gross operating income. Finally, we ended up with 355 observations.<sup>4</sup>

## Measures

**Dependent Variables.** To measure the focus firm's reaction to the media, we define a dummy variable called *subseq*. It takes the value 1 if there is any kind of pollution from that firm in subsequent quarters<sup>5</sup> following the quarter *t* in which the initial exposure occurs and zero otherwise. We also measure subsequent pollution practices in an alternative way by defining the variable *subseq1* where the dummy variable takes 1 if there is pollution from the focal firm in the *four* quarters following the quarter in which the initial pollution report occurs.

**Independent Variable.** We introduce the variable *atmosneg* as an independent variable to measure the atmosphere of negative words after the initial pollution exposure. This variable is intended to capture some of our improvements in the measurement of media coverage. First, we look at the volume of current news coverage in comparison to the previous period. Second, instead of simply counting the number of negative news reports, we look at the length of negative articles (measured as the number of words in the article) compared to the total length of all articles; in this way, we consider the degree of negativity of the atmosphere created by the media. Allowing for the degree of negativity of the media atmosphere permits us to capture the extent of priming induced by the article in its readers; a

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<sup>4</sup> We also deleted observations with abnormal values for the controls.

<sup>5</sup> Until the end of our time period.

more negative media atmosphere is likely to trigger recall in readers when making judgments about corporate executives and as such is more likely to influence management to curtail corporate pollution.

We use the news service provider, WISERS, arguably the most complete news source ([wisearch.wisers.net](http://wisearch.wisers.net)), to search for news reports regarding pollution. To determine whether a news report is to be considered meaningful or not, we introduce the following standards (e.g., Qi, Yang, & Tian, 2013): the name of firm must appear on the title or in the first paragraph of the news report, the length of the report must be larger than 50 words, and no more than 4 corporations must be mentioned by the report. After this initial screen, we get a total of 19362 distinct news reports.

We then go on to evaluate the tenor of each report. Previous studies on report tenor rely mainly on the computer-based support of Text Contents Analysis (e.g., LIWC). A technique widely used by English-language studies of news reports is to identify the attitude of each report (positive or negative) by counting the frequency of negative and positive words using a large keywords database (e.g., Tetlock, 2007; Bednaret al.,2013). However, such an automated technique is less appropriate to analyze Chinese-language news reports, since Chinese words often have different meanings depending upon the context. As a result, a researcher must read the reports directly to measure the negativity of the article. In order to ensure reliability of this technique, 300 reports were chosen randomly and were read and independently evaluated by two different authors. Similar to previous studies such as Pollock et al. (2008), we calculate the inter-coder reliability using Cohen's kappa (Cohen, 1968). We found a Cohen's kappa value of 0.89, indicating high inter-coder agreement.

We end up with a final tally of 3409 negative reports. Based on the number of words in each negative news reports provided by WISERS database, we calculate the value of *atmosneg* using the following formula:

$$Atmosneg_t = \frac{(\text{Negative words}_t + \text{Negative words}_{t+1}) - (\text{Negative words}_{t-1} + \text{Negative words}_{t-2})}{(\text{Words}_{t-1} + \text{Words}_{t-2} + 1)} \quad (1)$$

where *t* represents the quarter of initial exposure of corporate pollution events; *t-2*, *t-1*, *t+1* represent two quarters prior to, one quarter prior to, and one quarter after the initial corporate pollution exposure. For example, *Negative words*<sub>*t-1*</sub> (*Words*<sub>*t-1*</sub>) represents the total number of words in negative articles (words in all articles) in the one quarter before the initial exposure of corporate pollution. We add 1 to the denominator for all firms because for several firms there is no news coverage before the initial exposure of corporate pollution.

**Moderating Variables.** We introduce the variable *localfocus* to measure the intensity of local news media reporting on the firm. *Localfocus* was calculated using the following formula:

$$Localfocus_t = \frac{\text{Number of local newspapers reporting on a focal firm}_t}{\text{Number of newspapers reporting on a focal firm}_t} \quad (2)$$

WISERS includes more than 600 newspapers as news sources. We first search the newspaper's website to decide the issuance zone of each newspaper. For example, a local newspaper's website might clearly define its mission as providing information for a specific region. We categorized 141 newspapers as providing national-wide coverage (e.g. People's Daily) and 497 as local newspapers. For example, Guangdong province has the largest number of local newspaper around China.

For a given firm, we match the issuance region of local news media with the registered location of each firm, and then determine the set of local news media for each firm. Next, based on the records of news reports on the firm in the quarter of initial exposure, we count the number of local newspapers which report on the focal firm. We also define an additional variable *Localfocust1*, which looks at the proportion of local media in the period prior to the initial exposure of corporate pollution.

**Controls.** We include some important control variables. First, similar to Bednar et.al(2013), we control for firm size, since it is likely to impact the incidence of environmental pollution events (Mishina et al., 2010). *Firm size* is measured by the log of total assets of the focal firm. Menon and Pfeffer (2003) report that independent directors pay much attention to information from external sources (newspaper, magazine and so on). We also know from existing research that negative news damages the reputation of independent directors (Arthaud-Day et al., 2006, Cowen & Marcel, 2011, Srinivasan, 2005). Therefore, we control for the percentage of independent directors on corporate board (*percentind*), which we measure by the number of independent directors divided by the total number of directors. Following McGuire, Sundgren, and Schneeweis (1988), we use the growth rate of total operating income (*opincgr*) to control for the influence of the firm's financial condition. Generally, whether a firm chooses to pollute the environment is related to its financial condition. *Opincgr* is calculated using the following formula:

$$\frac{\text{total operating income in current year}}{\text{total operating income in previous year}} - 1 \quad (3)$$



Similar to Walls, Berrone, and Phan (2012), we introduce the percentage of institutional shareholding (*Percentinst*), which might have a positive effect on the cessation of corporate pollution practices. Following Liu and Lu (2007), we introduce a control variable which checks for whether the firm issues either B or H shares (*BorH*). If a focal firm has issued either B or H shares, it would gain much attention from outside investors and news media, which has an influence on subsequent corporate pollution practices. If the focal firm has issued either B share or H shares, we code *BorH* as 1; else, it equals 0. Following Desai (2011), we also control for firm age. Finally, we include several year dummies and industrial dummies to control for the year- and industry-level factors that homogenous across years and industries. The definitions of all variables are summarized in table 1.

### **INSERT TABLE 1 ABOUT HERE**

#### **Analysis**

Whether societal agencies (e.g., news media and government agencies) expose a firm's pollution practices is not random chosen but influenced by many factors. For example, Core et al. (2008) find that the news media have a greater tendency to report negative news about large firms. To deal with the potential sample selection bias, we use a Heckman two-stage regression model. Based on our sample of firms with pollution exposures, we match the focal firm with another exposure-free corporation (without any exposure of pollution events from 2004 to 2012) in the same industry, and most similar in terms of total assets in the given fiscal year. The originally sample of pollution events (932 cases) pertains to 490 unique listed firms. In the first-stage probit model, we use a matching sample of another 490 firms to explore the factors determining the initial exposure of corporate pollution events.

## INSERT TABLE 2 ABOUT HERE

Table 2 shows the results of the first-stage Heckman selection model, a probit regression of corporate pollution exposure against factors thought to influence whether societal agencies expose corporate pollution of a given firm. The dependent variable is a dummy variable indicating whether a firm's pollution practices are exposed or not. The independent variables consist of the following variables: the three highest managerial salaries, shareholding concentration, firm size, debt-asset ratio, and industry and year dummies. Following this regression, we calculate the *Inverse Mills ratio*, which we include in the second-stage model as selection correction parameter (e.g., Wang, Choi, & Li, 2008). We use the following equation to test our hypotheses in the second-stage regression:

$$\text{Subseq}_t = a_0 + b_1 \text{atmosneg}_t + b_2 \text{localfocus}_t + b_3 \text{localfocus}_t * \text{atmosneg}_t + b_4 X_t + \varepsilon_t \quad (4)$$

In equation (4),  $X$  is a set of control variables that are expected to have an influence on corporate pollution practices. The subscript  $t$  represents the quarter of initial exposure of corporate pollution, and  $\varepsilon$  is an error term. We use the robust cluster code provided by STATA 12.0 to control for heteroscedasticity.

## **Results**

### INSERT ABOUT 3 ABOUT HERE

Table 3 presents descriptive statistics and pairwise correlations for the variables in this study. *Subseq* averages 58.51%, which shows that more than a half of the corporations continue to pollute after the initial pollution exposure. *Atmosneg* averages 20.61%, indicating an increased negativity of media coverage. The *localfocus* variable has a mean of 15.48%,

which shows that local news media amounts to a small proportion of the total news media reporting on a focal firm. *Percentinst*, the percentage of institutional shareholding has a mean of 38.51%; *opincgr* (growth rate of total operating income) averages 28.05%, *percentind* (percentage of independent directors on corporate boards) averages 35.40%, and *BorH* (issuance of B or H shares) averages 11.94%.

In table 3, the correlation between *subseq* and *atmosneg* is negative (-0.1273) and significant, which accords with hypothesis 1. Some variables are significantly correlated, such as *firm size*, *percentinst* (percentage of institutional shareholding), *inverse mills ratios*, *percentind*, and *BorH*. Hence, we further examine whether there is a multicollinearity problem by calculating variance inflation factors (VIFs). A further inspection of the correlations does not reveal any serious multicollinearity, showing a maximum VIF of 1.30 (for *BorH*) and a mean variance inflation factor (VIF) of 1.11---substantially less than the cutoff of 10 for regression models(Ryan 1997). Therefore, multicollinearity is not an important issue in this study.

This study investigates whether the atmosphere of negativity created by the media after an initial pollution exposure influences subsequent corporate pollution, and also the moderating effect of the local news media in that relationship. Table 4 presents the results of the main and moderating effects. Model 1 includes the moderating variable, *localfocus*, and the control variables *percentinst*, *firm size*, *opincgr*, *firm age*, *BorH*, year dummies, and industry dummies.

**INSERT TABLE 4 ABOUT HERE**

The independent variable in Model 2 is *atmosneg*, as before, and it is negatively associated with *subseq* ( $\beta=-0.260$ ,  $P<0.05$ ), which supports hypothesis 1. Model 3 includes the moderating variable *localfocus*. Hypothesis 2 predicts that *localfocus* would have a negative moderating effect on the relationship between *atmosneg* and *subseq*. As model 3 shows, the interaction term between *localfocus* and *atmosneg* is negative and significant ( $\beta=-2.147$ ,  $P<0.05$ ), which accords with hypothesis 2. We also look at the change in log-likelihood, a chi-square test of model significance, to confirm this moderating effect (Guadagni and Little, 1983). As shown in table 4, when including the interaction term between independent variable and *localfocus*, the change in model log-likelihood (-2LL) is significant.

### **Robustness Test**

**A short-term effect.** The definition of *subseq* is potentially problematic because not all firms have the same length of time to react to the initial media exposure. For example, firms for which the initial exposure event took place in 2004, , have 8 years to stop (or continue pollution), whereas firms that originally polluted in 2011 only have one year (until 2012) to desist from polluting (or continue polluting). Consequently, the effect of the negative media-atmosphere after the initial pollution exposure could vary among different perpetrators. To deal with this issue, we look at the a short-term effect by introducing the dependent variable of *subseq1*, as mentioned before. We code *subseq1* as 1 if the corporation engages in pollution practices within one year (or four quarters) after initial pollution exposure, else it equals 0.

**INSERT TABLE 5 ABOUT HERE**

Table 5 presents the results of this test. Model 2 shows that the independent variable of *atmosneg* is negatively associated with *subseq1* ( $\beta=-0.352$ ,  $P<0.05$ ), which also accords with hypothesis 1. Moreover, compared with the coefficient in table 4, *atmosneg* has a much stronger impact on the cessation of corporate pollution practices within one year after the initial corporate pollution exposure. Furthermore, model 3 shows the coefficient on the interaction term between the *localfocus* and *atmosneg* is also negative and significant ( $\beta=-1.785$ ,  $P<0.10$ ), which supports hypothesis 2. Consequently, the issue of allowing different lengths of time for corporations to react may not be an issue, after all.

**Alternative measure of focus of local media (*localfocus1*).** As a robustness measure, we defined the variable *localfocus1*, as mentioned above, which measures the proportion of local media in the quarter prior to the quarter of exposure. :

$$localfocus1 = \frac{\text{Number of local newspapers report on a focal firm}_{t-1}}{\text{Number of newspapers report on a focal firm}_{t-1}} \quad (4)$$

### **INSERT ABOUT 6 ABOUT HERE**

The results shown in table 6 are highly consistent with our main tests. Consequently, the prevalence of local media in the quarter before or in the quarter of the initial exposure of corporate pollution has a similar negative moderating effect on the impact of media negativity on continuing corporate pollution.

## **DISCUSSION**

The governance role of news media on corporate business has received enormous attention. This study focuses on how the atmosphere of negative words after an initial exposure of corporate pollution events influences subsequent corporate pollution practices. Previous

studies on news media mostly assume homogeneity among news reports and introduce the number of news reports to portray the news coverage. Furthermore, even though the public have specific preferences over different information sources, scholars have largely ignored geographic differences among local news media and take the effect of news media on audiences to be homogenous.

In fact, each news report differs from others in their use of words. The public makes sense of news reports not only based on what they currently know but also based on what they have known before. Moreover, local media generally dominate the information sources of the local public and have a much stronger impact on local stakeholders compared with other news media. Consequently, we extend previous studies by introducing a comparative element in the evaluation of news media effect, by calculating the change in the proportion of negative words in news reports to portray an atmosphere of negative attitude toward a focal firm in a specific period, and also by considering the geographic location of the local news media in our context.

We propose that the atmosphere of negative words after the exposure of initial pollution events helps to reduce subsequent corporate pollution practices. Moreover, a local media focus strengthens the power of news media to reduce subsequent corporate pollution practices. We use empirical analysis of listed Chinese firms' pollution practices during 2004-2012 to support our arguments. We elaborate the theoretical contributions and practical implications below.

### **Theoretical Contributions**

**Enriching the agenda setting theory.** Agenda setting theory is widely used to analyze how news media influence public making opinion (e.g., Bednar et al., 2013). According to McCombs, Weaver and Shaw (2004) and McCombs (2005), the first level of agenda setting theory focuses on the relative salience of an *issue* (e.g., perceived importance), which emphasizes how news media make certain issues or objects more easily accessible to the public when it makes decisions on *what* to think about. The second level of agenda setting theory examines the relative salience of *attributes* of issues; this focuses on the manner in which news media influence *how* the public thinks about the issue.

Priming of agenda means that news reports increase the salience of a specific attribute, which the public can easily retrieve from their memory when forming opinions on an issue. Recent studies propose enriching the agenda setting theory, by exploring how news media shape public opinion in the real world (Scheufele & Tewksbury, 2007). We contribute to the filling of this gap. We propose that whether the public thinks about an object (managers, in our case) with a particular attitude (priming effect of news agenda) influences how the object views the consequences of its intended future conduct.

According to our study, an increase in negative words after an initial exposure of corporate pollution events constitutes a priming factor, which generates an atmosphere of negativity in the general public toward the focal firm. The atmosphere of negativity influences how managers perceive the public's reaction to their subsequent pollution practices. We propose that the priming of a negative attitude toward a focal firm among the public influences managers to fear personal losses if they were to continue corporate pollution activities. Managers recognize that reducing subsequent corporate pollution is

incentive-compatible because it not only means corporate survival but it also preserves their personal reputations.

Additionally, this study also extends the agenda setting theory to a new arena which enriches the implications of that theory. Previous studies introduce the agenda setting theory to understand the impact of news reports on corporate reputation (e.g., Carroll & McCombs, 2003), corporate philanthropy (e.g., Brammer & Millington, 2005), and similar practices. We add to this stream of research by considering the relationship between news media coverage and corporate pollution practices. Agenda setting theory contributes to our understanding of the governance role of news media on various corporate behaviors in modern society, which accord with the social norm of promoting media social responsibility.

**Extension to literature of media governance.** An important aspect of the study of the governance effect of media on corporate business is to design a proper measure of media coverage. Previous studies assume that each news report has an identical influence on audiences because they generally lump the reports together (e.g., Pollock and Rindova, 2003; Pollock et al., 2008). We relax this assumption by modifying the measurement of media coverage in two ways. First, *changes* in news tenor would arouse individuals' attention to certain issues. We therefore introduce a relative measurement to capture the dynamic aspect of news media reporting about a focal firm. Second, among the negative news reports, a long report would provide more details than a short report, which primes the public's attitude. We thus introduce the concept of word-level to replace of the concept of report-level to capture the differences among negative reports.



Moreover, in regard to the reality that local news media has stronger impacts on local stakeholders (e.g., Engelberg & Parsons, 2011), we use a very comprehensive source of news media reports in China and divide the news media into local issuance media and nation-wide issuance media. Then we match the registered region of the focal firm with the issuance zone of the local media to examine the impact of the focus of local news media on a given firm. Our results strongly support the notion that the geographic location of news media matters when we study the governance effect of news media on corporate business (hypothesis 2).

**Extension to literature of corporate misconducts.** Previous studies of corporate misconduct pay much attention to exploring the antecedents and the consequences of these misbehaviors (e.g., a thorough literature review can be found in Greve, Palmer & Pozner, 2010). The antecedents of corporate misconducts include the firm-, industry- and country-level factors. Recent studies suggest studying the watchdog role of news media in influencing corporate misconduct (e.g., Bednar, 2012; Dyck et al., 2008). We add to this literature by emphasizing the important role of an atmosphere of news reports in trying to contain corporate pollution practices.

### **Practical Implications**

The serious extent of corporate pollution in China warrants consideration of additional conduits to help mitigate corporate misconduct. This study makes two suggestions to help achieve this goal. One, we emphasize the importance of the creation of an atmosphere of negativity following the initial pollution event. For instance, we emphasize the importance of using more words in these negative news reports (according to the equation 1), such as providing details and dramatic narrative. Simply citing or reprinting other news papers'

negative reports also helps in achieving these goals. And second, it is important to use local media to highlight the negative effects of corporate pollution, for the reasons that we have outlined above. Through the cooperation among local and national news media, an effective negative atmosphere can be created that would pressure managers following their own self-interest to cease polluting activities. Presumably, such a strategy could also help in the disciplining of other types of corporate misbehaviors.

### **Suggestions for Future Research**

One, in this study, we looked only at the negativity of news media reports. It is also important to look at positive media reports, since they might offset other negative media reports. It is also possible that positive media coverage of pro-social behavior might affect corporate behavior differently from negative media coverage of antisocial corporate behavior. This would be worth investigating further. Two, we did not investigate the financial and political connections of media; these might very well affect reporting of antisocial corporate events in the first place and shield firms from negative coverage following initial exposure. Further study along these lines would enrich our understanding of the impact of media coverage on corporate behavior.

### **CONCLUSION**

In this paper, we extended previous studies by introducing a measure of the negativity of the news media, which captures the change in news reportage following exposure of an initial corporate pollution event. We also examined the role of local versus national media in

influencing corporate behavior. Our study provides strong support for our two hypotheses – one that increasing of length of negative media reports is likely to reduce repeat corporate pollution; and two, that local media are important than non-local media in bringing about this reduction.

Our study suggests specific ways in which the media can be utilized to discipline corporate misbehavior without increasing administrative and governmental regulation.

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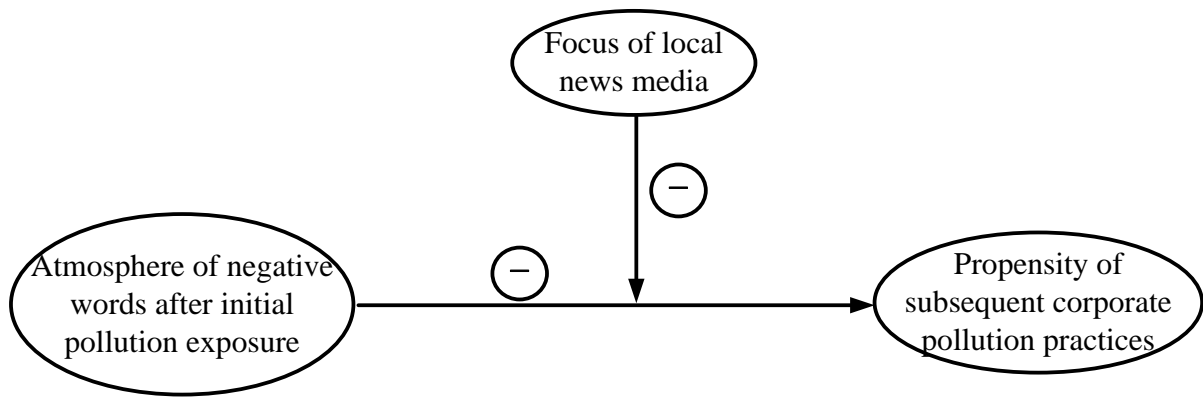


Figure 1a Research framework

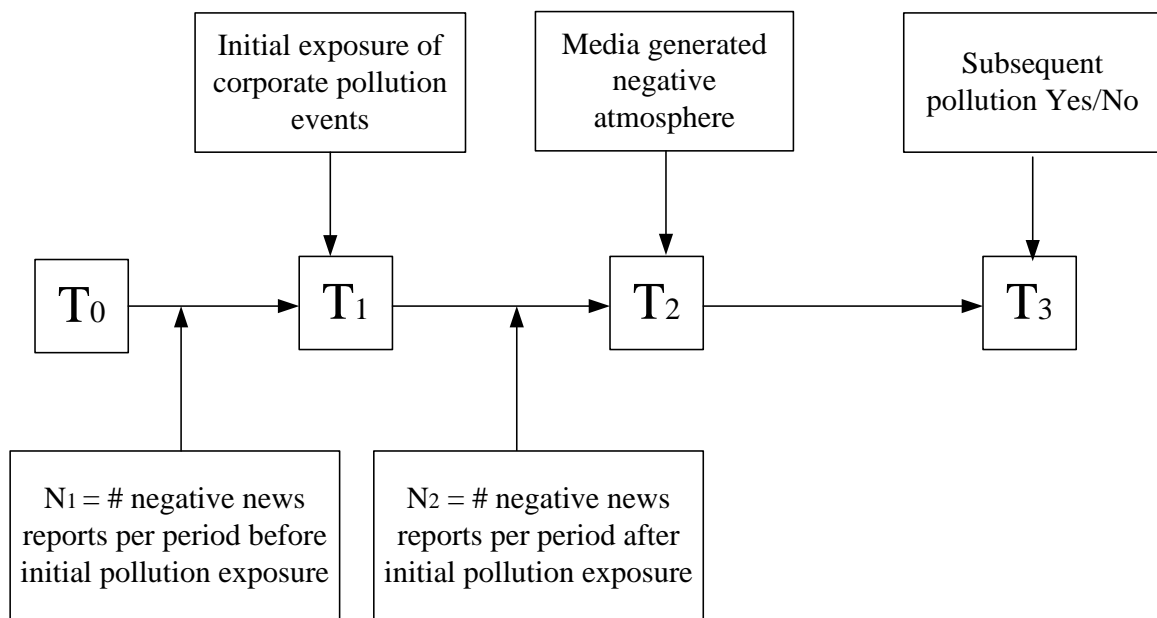


Figure 1b Time-line of events



Table1 Definition of variables

Variables	Description	Source
Subseq	It equals 1 firm pollutes environment again after firm polluted environment in certain(t) quarter, it equals 0 otherwise.	D
Atmosneg	Atmosneg <sub>t</sub> = $\frac{(\text{Negative words}_t + \text{Negative words}_{t+1}) - (\text{Negative words}_{t-1} + \text{Negative words}_{t-2})}{(\text{Words}_{t-1} + \text{Words}_{t-2} + 1)}$	D
Percentinst	Percentage of share held by institutional investors We calculated it based on the formula:	C
Localfocus	$\frac{\text{Num of local newspapers}_t}{\text{Num of newspapers}_t}$	D
Firm size	Logarithm of the sum of assets We calculated it based on the	C
Opincgr	formula: $\frac{\text{total operating income}}{\text{total operating income in previous year}} - 1$	C
Inverse Mills ratios	It was calculated in the Heckman first-stage probit model which was included in the second stage to control for selection bias problems	A,B,C
Percentind	The number of independent directors divided by the total number of directors	A,B
Firm age (until 2013)	Age of firm until 2013	B
BorH	It equals 1 if firm was issuing either B or H shares. It equals 0 otherwise.	B

Note: this table reports the variables used in the regression analyses and their descriptions. Data source: A =annual reports;

B=GTA data stream(<http://www.gtarsc.com/>);

C=Genius Finance data stream(<http://terminal.chinaef.com/>);

D=the China National Knowledge Infrastructure newspaper database (<http://epub.cnki.net/>), and WiseSearch (<http://cn.wisearch.wisers.net>).

Table 2 First-stage probit model

Independent variables	Dependent variable Initial exposure of corporate pollution events
Top three highest salaries of managers	0.001** (0.000)
Concentration of shareholding	-0.001 (0.007)
Firm size	-0.028 (0.044)
Asset-debtratio	0.006* (0.003)
Industry	Control
Year	Control
Constant	-0.221 (1.073)
Pseudo- $R^2$	0.034
N	980

Notes: \*\*\*Statistic significant at the 0.001 level, two-tailed test. \*\*Statistic significant at the 0.01 level, two-tailed test. \*Statistic significant at the 0.05 level, two-tailed test. +Statistic significant at the 0.1 level, two-tailed test. Standard errors were in parentheses

Table 3 Descriptive statistics and correlations

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9
1. Subseq	0.5851	0.4934	1.0000								
2. Atmosneg	0.2061	0.9819	-0.1273*	1.000							
3. Localfocus	0.1548	0.1541	0.0877	-0.0233	1.0000						
4.Firm size <sup>a</sup>	22.1671	1.2168	0.0737	-0.1325*	0.0804	1.0000					
5. Percentinst	38.5101	24.3129	-0.0758	-0.0547	0.0968	0.1886*	1.0000				
6. Opincgr	28.0505	45.2782	-0.0612	-0.0101	-0.0338	-0.0163	0.0416	1.0000			
7. Percentind	0.3540	0.0486	-0.0943	0.0361	0.0516	0.0450	0.0589	0.1754*	1.0000		
8. BorH	0.1194	0.3247	0.1154*	-0.1287*	0.2844*	0.3515*	0.0974	-0.0876	0.0732	1.0000	
9.Firm age (until 2013)	14.0388	4.2470	0.2052*	-0.0666	0.0521	0.1801*	0.0713	-0.0168	0.0514	0.2078*	1.0000
10.Inverse Mills ratios	0.7738	0.1888	-0.2319*	0.0993	-0.0971	-0.2105*	-0.0076	-0.0348	-0.0130	-0.2456*	-0.1482*

Note: N=335; \*Statistic significant at the 0.05 level.

<sup>a</sup>Logarithms

Table 4 Logit Estimates of Subsequent Corporate Pollution Practices (*Subseq*) after initial corporate pollution exposure

Independent variables	Subseq		
	Model 1	Model 2	Model 3
Atmosneg		-0.260*(0.115)	-0.280*(0.141)
Localfocus*Atmosneg			-2.147*(1.020)
Localfocus	1.662 <sup>+</sup> (0.851)	1.698*(0.832)	1.824*(0.817)
Percentinst	-0.013*(0.005)	-0.013*(0.005)	-0.013*(0.005)
Firm size <sup>a</sup>	0.068(0.129)	0.035(0.133)	0.057(0.134)
Opincgr	-0.001(0.003)	-0.001(0.003)	-0.001(0.003)
Inverse Mills ratios	-2.148*** (0.634)	-2.090*** (0.628)	-1.959** (0.636)
Percentind	-4.111(2.577)	-3.755(2.737)	-3.672(2.759)
Firm age (until 2013)	0.102*** (0.030)	0.101*** (0.030)	0.100*** (0.029)
BorH	0.050(0.413)	-0.008(0.408)	-0.086(0.405)
Year	Control	Control	Control
Indus	Control	Control	Control
Constant	1.634(3.112)	2.191(3.139)	1.519(3.149)
N	335	335	335
pseudo R <sup>2</sup>	0.171	0.179	0.185
Log likelihood	-188.54686	-186.77023	-185.28584
Log likelihood for model change	-	3.55 <sup>+b</sup>	2.97 <sup>+b</sup>

Notes: \*\*\*Statistic significant at the 0.001 level, two-tailed test. \*\*Statistic significant at the 0.01 level, two-tailed test. \*Statistic significant at the 0.05 level, two-tailed test. +Statistic significant at the 0.1 level, two-tailed test. Standard errors were in parentheses

<sup>a</sup>Logarithms

<sup>b</sup> Change of model log-likelihood was calculated based on different of log Pseudo-likelihood of Model 1 to Model 3 over the previous models

Table 5 Logit Estimates of Subsequent Corporate Pollution Practices within One Year after Initial Corporate Pollution Exposures (*Subseq1*)

Dependent variables Independent variables	Subseq1		
	Model1	Model2	Model3
Atmosneg		-0.352*(0.162)	-0.437*(0.176)
Localfocus *Atmosneg			-1.785 <sup>+</sup> (1.043)
Localfocus	-0.030(0.925)	-0.025(0.914)	-0.069(0.954)
Percentinst	-0.011 <sup>+</sup> (0.006)	-0.011*(0.005)	-0.011 <sup>+</sup> (0.005)
Firm size <sup>a</sup>	0.102(0.129)	0.069	0.084(0.129)
Opincgr	-0.006*(0.003)	-0.006*(0.003)	-0.006*(0.003)
Inverse Mills ratios	-3.308*** (0.736)	-3.225*** (0.699)	-3.149*** (0.705)
Percentind	-3.082(2.570)	-2.854(2.841)	-2.831(2.902)
Firm age (until 2013)	0.054 <sup>+</sup> (0.032)	0.054 <sup>+</sup> (0.032)	0.052(0.032)
BorH	-0.049(0.465)	-0.114(0.444)	-0.180(0.440)
Year	Control	Control	Control
Industry	Control	Control	Control
Constant	-13.206*** (3.088)	-13.596*** (3.046)	-12.773*** (3.025)
N	335	335	335
pseudo R <sup>2</sup>	0.173	0.183	0.188
Log likelihood	-186.76631	-184.41701	-183.49111
Log likelihood for model change		4.70 <sup>*b</sup>	1.85 <sup>+b</sup>

Notes: \*\*\*Statistic significant at the 0.001 level, two-tailed test. \*\*Statistic significant at the 0.01 level, two-tailed test. \*Statistic significant at the 0.05 level, two-tailed test. +Statistic significant at the 0.1 level, two-tailed test. Standard errors in parentheses

<sup>a</sup> Logarithms

<sup>b</sup> Change of model log-likelihood was calculated based on different of log Pseudo-likelihood of Model 1 to Model 3 over the previous models

Table 6 Logit Estimates of Subsequent Corporate Pollution Practices with an alternative measurement of focus of local news media (*localfocus1*)

Independent variables	Subseq		
	Model1	Model2	Model3
Atmosneg		-0.228 <sup>+</sup> (0.133)	-0.313 <sup>+</sup> (0.164)
Localfocus1* Atmosneg			-2.065 <sup>*</sup> (1.052)
Localfocus1	1.930 <sup>*</sup> (0.783)	1.922 <sup>*</sup> (0.774)	1.960 <sup>*</sup> (0.795)
Percentinst	-0.013 <sup>*</sup> (0.005)	-0.013 <sup>*</sup> (0.005)	-0.014 <sup>*</sup> (0.005)
Firmsize <sup>a</sup>	0.056(0.130)	0.030(0.133)	0.038(0.134)
Opincgr	-0.001(0.003)	-0.001(0.003)	-0.001(0.003)
Inverse Mills ratios	-2.041 <sup>**</sup> (0.654)	-2.008 <sup>**</sup> (0.651)	-1.886 <sup>**</sup> (0.659)
Percentind	-3.617(2.588)	-3.390(2.729)	-3.137(2.763)
Firm age (until 2013)	0.099 <sup>**</sup> (0.030)	0.099 <sup>***</sup> (0.030)	0.097 <sup>**</sup> (0.031)
BorH	0.026(0.422)	-0.022(0.417)	-0.064(0.419)
Year	Control	Control	Control
Industry	Control	Control	Control
Constant	1.521(3.111)	1.978(3.139)	1.662(3.161)
N	330	330	330
pseudoR <sup>2</sup>	0.171	0.176	0.181
Log likelihood	-185.15337	-183.9813	-182.73886
Log likelihood for model change		2.34 <sup>+b</sup>	2.48 <sup>+b</sup>

Notes: Due to missing value, the samples reduce to 330. \*\*\*Statistic significant at the 0.001 level, two-tailed test. \*\*Statistic significant at the 0.01 level, two-tailed test. \*Statistic significant at the 0.05 level, two-tailed test. +Statistic significant at the 0.1 level, two-tailed test. Standard errors were in parentheses.

<sup>a</sup> Logarithms.

<sup>b</sup> Change of model log-likelihood was calculated based on different of log Pseudo-likelihood of Model 1 to Model 3 over the previous models.