

**STAKEHOLDER PRESSURE, SOCIAL TRUST, GOVERNANCE AND THE  
DISCLOSURE QUALITY OF ENVIRONMENTAL INFORMATION**

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# **STAKEHOLDER PRESSURE, SOCIAL TRUST, GOVERNANCE AND THE DISCLOSURE QUALITY OF ENVIRONMENTAL INFORMATION**

## **Abstract**

This paper studies the relationship between stakeholder pressure, social trust, corporate governance, and the environmental information disclosure quality of listed Chinese companies. The evidence shows that stakeholder pressure and corporate governance have a positive relationship with the disclosure quality of environmental information. Higher pressure from government and creditors, and better corporate governance, results in higher disclosure quality of environmental information. Over different industries, the correlation between social trust and disclosure quality of environmental information is different. We find that social trust is negatively related with environmental information disclosure quality for companies that are not heavy polluting, and positively related to heavy polluting companies. Finally, we propose several suggestions for the improvement of disclosure quality of environmental information in China.

**Key words:** Environmental information; Stakeholder pressure; Social trust; Corporate governance

## 1. Introduction

With the rapid development of society and the economy, the environmental pollution brought about by the industrial economy is becoming increasingly critical. Industrial emissions may cause greenhouse effects, water pollution, environmental damage and bring harm to humanity. As a result, people began to probe sustainable development and eco-economic construction, which place equal emphasis on both industrial development and environmental protection. Governments and the public are paying close attention to corporate social responsibility and environmental protection. Since 1979, China has promulgated the “Environmental Protection Law”, “Water Pollution Prevention Law”, “Law for the Protection of Air Pollution” and other relevant laws and regulations. In 2006 the government for the first time issued a warning about polluted water, indicating that 360 million citizens lack access to safe drinking water (Zhang, 2007).<sup>1</sup> Furthermore, the pollution of Beijiang River in Guangdong province<sup>2</sup> and the Taihu Lake events<sup>3</sup> triggered the government’s concern about environmental protection.

Researchers have also shown a growing interest in the disclosure of corporate environmental information. The disclosure of environmental information has many advantages. It can reduce information asymmetry between external users and enterprises. It can exercise an effective supervision over the improvement of environmental conditions, and fulfil the social responsibilities of enterprises. However, the fact is that not all enterprises are willing to disclose environmental information. Many studies in the literature have focussed on environmental information disclosure issues, such as the determining factors for disclosure and the ways to improve the disclosure quality of environmental information. For example, Deegan (1996) and Deegan and Rankin (1996) studied environmental information disclosure in Australia. Deegan (1996) explained disclosure patterns using legitimacy theory. Deegan and Rankin (1996) showed that companies disclose environmental information with the aim to improve their image, in line with legitimating objectives. Halme and Huse (1997) studied the environmental information disclosure in Sweden, Finland, Norway, Spain and other European countries. They found that the disclosure of environmental information is significantly related to industry variables, ownership structure and size of the board. In addition, large companies are more inclined to disclose environmental information than small ones. Cormier and Magnan (1999) found from a Canadian study that information costs and finance conditions are the main factors influencing disclosure quality. Ahmad, Hassan and Mohammad (2003) in a Malaysian study, found that annual report voluntary disclosure of environmental information is negatively related to the company’s financial leverage, and positively related to the audit being performed by “Big Five” audit firm. Cormier, Magnan and Velthoven (2005) showed that risk, company size, ownership and fixed assets determine the disclosure quality of environmental information in German companies. Gamble et al. (1995) found industry differences in

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<sup>1</sup> By the end of March 2005, the Chinese government issued the first official warning of water pollution. According to official figures released that year, 90% of rivers and lakes in China were polluted, and an estimated 360 million people lacked safe drinking water. Water has become China’s most important environmental issue.

<sup>2</sup> The North River (Beijiang River) Shaoguan, Guangdong province had heavy metal cadmium pollution exceeding nearly 10 times previous recorded limits. The length of river pollution was close to 100 km. The Guangdong Provincial Environmental Protection Bureau determined that the contamination was due to equipment maintenance at the Shaoguan smelter resulting in the excessive discharge of cadmium-containing waste water.

<sup>3</sup> The Taihu Lake blue-green algae outbreak accumulated quickly and led to water quality deterioration and eventually resulted in a wide range of city tap water with a stink phenomenon. The accumulation of the blue algae growth is generally believed to be caused by chemical and agricultural pollution into the lake. During May 2007, Wuxi city urban residents rushed to buy purified water and caused the outbreak of the largest water supply crisis in history.

environmental information disclosure quality in the U.S. with the disclosure quality of petroleum, iron and steel industries higher, and showing a significant increase since 1989. Basalamah and Jermias (2005) found in a study in Indonesia that the disclosure of social and environmental report is related to serious threats the company faces, such as the loss of reputation and survival crisis.

In China, Geng and Jiao (2002) found that over the period 1992 to 1999 heavy polluting companies have gradually disclosed more environmental information in IPO prospectuses and also disclosed the information more fully while Xiao and Hu (2004) found that among listed companies environmental information disclosure in the annual report is not increasing, but among heavy polluting industries, there is a gradual improvement. Tang et al. (2006) compared 60 companies disclosing environmental information in the Directors' Report with 60 non-disclosing companies. Their research showed that company size and company performance are the main influencing factors of the disclosure quality of environmental information. Xiao and Zhang (2008) researched the changes of A-share<sup>4</sup> stock prices and environmental disclosure behaviour of 79 chemical industry companies after the Songhuajiang River event.<sup>5</sup> They discovered cumulative abnormal returns to be significant negative, and after two years the disclosure of environmental information increased significantly. Wang (2008) found that external pressure and industry differences had a profound effect on information disclosure.

We analyse the effect of stakeholder pressure, social trust and corporate governance on the disclosure quality of environmental information of Chinese companies. We find that pressures from the government, foreign shareholders and creditor banks are significant factors, promoting companies in heavy polluting industries to improve the quality of environmental information disclosure. Corporate governance is a significant factor enhancing the disclosure quality of companies that are not heavy polluting. Social trust has a significant impact on the disclosure quality of non-food industry heavy polluting companies. Our study makes a number of important contributions to the literature. The first is that we study Chinese companies over a five year period (2002 – 2006), which is a relatively long time period in disclosure analysis studies. China has become a very important country, both in terms of its influence on world economics and politics and its impact on the natural environment as the most populous country in the world. While there are studies that examined environmental reporting of Chinese companies, very few of these studies have been published in English outside of China. Second our study explores the impact of three influences (stakeholder pressure, social trust and corporate governance) on environmental information quality at the same time while we control for other influences that has been significant in the extant literature. Thirdly, our large sample and long time period allows us to observe the different pressures playing a role in heavy polluting industries and other industries.

The remainder of the paper is structured as follows. In section 2, we discuss the theoretical basis and hypothesis development. In section 3, we describe the research design including the variable definitions, the model and the sample selection. Section 4 discusses the results and section 5 the

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<sup>4</sup> Chinese listed companies issue A shares and B shares. A shares are for domestic (Chinese) investors who use RMB (Renminbi - people's money) to buy these shares. The B-share markets in China were originally for foreign investors who only use foreign currency (US\$ or HK\$) to buy these shares. The B-share markets were opened to local investors in 2001.

<sup>5</sup> On 13 November 2005, PetroChina Jilin Petrochemical Company experienced a benzene plant explosion, causing a large amount of benzene to spill into the Songhua River. Approximately 100 tons of benzene, nitrobenzene and aniline spilled into the Songhua River, forming a pollution zone of nearly one hundred kilometers along the Songhua River and triggering a major water pollution incident. The direct economic loss was 69.08 million yuan. The "Songhua River pollution incident" had a serious impact on the major cities along the river, in particular on people's living standards and economic development.

conclusion and limitations.

## **2. Theoretical basis and hypothesis development**

### **2.1 Stakeholder pressure and environmental information disclosure**

Stakeholder theory is based on the premise that the organisation has many stakeholders (“any human agency that can be influenced by, or can itself influence, the activities of the organisation...” Gray, Owen and Adams, 1996, 45). Information disclosed by the company is the basis for stakeholders’ decision-making. In order to make the right decisions and maintain their own rights and interests, stakeholders will often put pressure on the company, asking it to disclose information consistent with their requirements. However, for various reasons, not all companies are willing to fully disclose the information stakeholders expect. In fact, the voluntary disclosure of information has become a resource that management can deploy or use to obtain societal support (Suchman, 1995). The same is true for environmental information disclosure.

Stakeholder theory argues that the voluntary disclosure of social and environmental information is a means to deal with stakeholder pressure. According to this theory, differences in the quality of information disclosure between companies and periods are due to the stakeholder pressure faced by the company. Changes in stakeholder pressure will lead to changes in the level of information disclosure. Walden and Swartz (1997) and Deegan and Rankin (1996) found that improvements in the level of information disclosure is the result of increased stakeholder pressure.

The stakeholders that bring pressure to bear on the company include the government, shareholders, creditors, the public and other interest groups. Stakeholder pressure is due to stakeholders’ dissatisfaction with the current state of affairs (Walden and Swartz, 1997). For example, the government may not be satisfied with the company’s environmental policy and implementation; the public could be dissatisfied with the pollution of natural resources caused by the company; shareholders and creditors be unhappy with the contingent liabilities and major crises caused by undisclosed environmental information, and so on. These sentiments eventually turn into stakeholder pressure, prompting the company to implement better environmental policies and disclose environmental information. Based on the needs of sustainable economic development, government (especially the environmental management agencies as well as the Securities and Exchange bodies) will put pressure on the company to improve environmental protection measures and provide environmental information. In China, the State Environmental Protection Administration has released a public announcement of business environmental information disclosure, which requires listed enterprises (mainly the state-owned enterprises with heavy pollution) to disclose environmental pollution information. In order to avoid lending mistakes caused by information asymmetry, banks may ask the company to provide environmental information in order to prevent problems due to the decrease of solvency in the event of environmental pollution compensation by the company or an ultimate loan recovery crisis.

There is therefore evidence that company environmental information disclosure is related to stakeholder pressure. In other words, companies disclose environmental information in the annual financial reports in the hope of responding to, and easing, stakeholder pressure and to maintain good relationships with the government, creditors, shareholders and other parties. This could avoid various crises, for example, being boycotted by the public, government punishment, creditors’ stopping cooperation and opposition from shareholders. Environmental information disclosure

could therefore improve the image of the company and reduce stakeholder pressure. Accordingly, we propose hypothesis 1:

*Hypothesis 1: Greater stakeholder pressure on public companies will result in increased quality environmental information disclosure.*

## **2.2 Social trust and environmental information disclosure**

Social trust refers generally to a set of ‘general and similar attitudes’ existing in members of the society towards public affairs, public organizations, interpersonal relationships, and other social activities or institutional operations (Bai, 2006). Social trust has an important impact on human economic activities. As early as in “Theory of Moral Sentiments”, Adam Smith (Smith, 1759) pointed out that human economic activity is based on social habits and morality without which trading activities will shake the social foundation and have a great impact on economic activities. Fukuyama (1996) also argues that trust between the members of the society directly influence and even determine economic efficiency. Research by Zhang and Ke (2002) shows that social trust has a significant relationship with regional economic development, enterprise performance and the introduction of foreign capital.

Social trust is based on personal trust. But it is a reflection upon the groups’ awareness network formed objectively in the society through mutual influence and cohesion of personal trust, rather than the simple sum of personal trust. In the process of mainstream trust (social trust) being created by a great number of centralized personal trust, non-mainstream personal trust will be assimilated by social trust. As a member of the society, the company will certainly be affected by the ‘general and similar attitudes’, and be subject to, and assimilated by, the mainstream trust. That is, in an area (or province) where the degree of social trust is higher, companies will have a higher degree of integrity as the social contract<sup>6</sup> and the laws and regulations will operate better. The responsibility of protecting the environment is required not only by laws and regulations as dominant contract norms, but also by social responsibility and business ethics. Voluntary disclosures will be made to show that the organisations are conforming to the expectations and values of the society within which they function (Van Staden, 2003). High integrity companies will abide more strictly by the social contract, thus the quality of their environmental information disclosure will be better. Accordingly, we propose hypothesis 2:

*Hypothesis 2: The higher the degree of social trust experienced by the company, the higher the quality of environmental information disclosure.*

## **2.3 Corporate governance and environmental information disclosure**

The literature on the relationship between corporate governance and more transparent information disclosure shows that corporate governance has a significant influence on information disclosure (see for example, Klein, 2002; Dechow, Sloan and Sweeney, 1996; Weisbach, 1988; Fan and Wong, 2002; Wang and Zhang, 2007). Independent directors are an important force in corporate governance. A high proportion of independent directors and strong independence of the board

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<sup>6</sup> Legitimacy theory assumes that there is a ‘social contract’ between organisations and society (Matthews, 1993). This is based on the premise that society provides corporations with their legal standing, attributes and the authority to own and use natural resources and to hire employees. Society therefore has a legitimate expectation that the organisation will operate within acceptable norms. Society may revoke the ‘social contract’ by, for example, consumers not buying the company’s products or the labour force withholding the supply of labour to the company by way of strike action.

contribute to better supervision of management, management being more consistent with the interests of shareholders and other stakeholders resulting in the disclosure of information being more transparent. Klein (2002) found that the higher the proportion of independent directors on the board, the higher the quality of financial information disclosure. Similarly, Dechow, Sloan and Sweeney (1996) found that the higher the proportion of internal directors on the board, the lower the quality of financial information disclosure. Based on Chinese data, Cui (2004) found that independent directors can improve the transparency of information.

The frequency of the board meetings represents its activeness. Lipton and Lorsch (1992) pointed out that the common problems facing the board of directors is the lack of time to perform their duties, thereby suggesting that the extension of time is conducive to improving corporate performance. Conger, Finegold and Lawler III (1998) hold the same view that the board of directors' meeting time is an important resource to improve the effectiveness of the board operation. The study of Vafeas (1999) also found that the operating performance of the subsequent years will improve as a result of the board being more active in the previous year. These conclusions show that the increased frequency of meetings of the board of directors helps to improve the efficiency of its governance.

The literature indicates that corporate governance affect voluntary information disclosure (e.g. Eng and Mak, 2003; Haniffa and Cooke, 2005). Although we infer from this that voluntary information disclosure will include environmental information disclosure, there is not much research linking corporate governance to environmental disclosures. Cormier, Ledoux and Magnan (2009) found board size related to environmental disclosures, but not board independence, while Halm and Huse (1997) found the size of the board (number of board members) positively related to environmental disclosure. Kent and Monem (2008) find that triple bottom line reporting is significantly related certain corporate governance measures, being the frequency of audit committee meetings and the existence of an environmental committee.

It therefore seems reasonable to expect that board characteristics could influence the quality of environmental information disclosure and we use board independence and the frequency of board meetings as governance variables in this study. Accordingly, we propose hypothesis 3:

*Hypothesis 3: Better corporate governance, results in higher quality environmental information disclosure.*

### **3. Research design**

#### **3.1 Variable definitions**

##### **3.1.1 Disclosure quality of environmental information**

At present, there are no unified standards to measure the disclosure quality of environmental information. Early scholars like Wiseman (1982) developed a scoring method. She used economic factors, environmental litigation, pollution reduction and other environmental matters in four classes of 18 items to evaluate the disclosure quality of environmental information. Each information item was scored according to its disclosure extent. If the item has monetary information or quantitative description, it received a score of 3 points, specific description received a score of 2 points, while general description received a score of 1 point. This evaluation method was widely used (see for example, Freedman and Wasley, 1990; Cormier and Magnan, 1999; Hughes, Anderson and Golden, 2001; Cormier, Magnan and Velthoven, 2005). Cormier, Magnan and Velthoven

(2005) used this method for reference and designed more detailed evaluation criteria. Their evaluation items included expenditures and risks, legal and regulatory, pollution mitigation, sustainable development disclosure, land restoration and pollution, environmental management; altogether 6 classes with 37 items. Scholars in China used a similar approach to study environmental information disclosure issues. Xiao and Zhang (2008) used seven classes with 36 items to score the disclosure quality of environmental information. Wang (2008) used 22 items. Xiao and Hu (2004) classified listed companies' environment information into 11 items.

We also apply a sub-item scoring method using content analysis methodology (Guthrie and Abeysekera, 2006; Krippendorf, 1980). In accordance with the specific circumstances of environmental information disclosure of listed companies, we classify environmental information into 10 classes. According to the disclosure levels of each item we give each item a score from 0 - 3, see Table 1 for more details. In order to ensure consistency, reliability and validity of data over time and across firms, two researchers determine the environmental information score of the listed companies independently. All the disagreements were subsequently reviewed and resolved.

<< Insert Table 1 >>

### ***3.1.2 Stakeholder pressure***

For the company, stakeholder pressure from outside includes government pressure, pressure from shareholders, creditors and public pressure. Generally speaking, the greater the proportion of state owned shares, the stronger government control of the enterprises and the higher the probability that the government can achieve the implementation of policy and advocate its stand. That is to say, the greater the opportunity for government to intervene in the company's behaviour, the greater the pressure on the company. Therefore, we use the proportion of state owned shares to total shares as a proxy for the pressure that government can put on companies.

Since the establishment of the domestic capital market in China is a recent event, local investor maturity is still relatively low and local shareholders (excluding the government) are not yet exerting pressure on Chinese companies. Therefore, in order to reflect shareholder pressure on the supervision of enterprises, we use the proportion of foreign held shares as a proportion of total shares as a measure of foreign shareholder supervision over Chinese enterprises, and use this as a proxy for shareholder pressure.

For pressure from creditors we use banks to present all creditors. Chinese companies are reliant on banks (after shareholders) for much of their financing needs as they generally do not issue debt instruments. We therefore use bank loans as a proportion of total liabilities as our proxy for pressure by creditors.

Public pressure is mainly from the media. With the guidance from the media and government propaganda, public safety and environmental protection awareness is increasing. Environmental pollution caused by heavy industry waste water and waste gas emission caused wide public concern. In 2004 Sichuan Tuojiang River was seriously polluted by industrial waste water. In 2005 Guangdong Shaoguan Smelting Plant discharged cadmium waste water exceeding the provided standard, and caused cadmium pollution in Beijiang River. In 2006 arsenic pollution by Yueyang in Hunan created a great sensation. Three chemical companies in the upper reaches of the river caused large industrial discharges of contamination into the river. All of these events have great social



impacts. The public and the media widely discussed the environmental protection for heavily polluting industries. Heavily polluting industries are receiving greater pressure from the public and the media. Therefore, we use heavy polluting industries as a proxy for public pressure, and propose that companies operating in heavily polluting industries experience greater public pressure. The delineation of heavily polluting industries is accordance with the “Listed Company Classification Guidelines” promulgated by the Chinese Securities Regulatory Commission in 2001 and the “Notice on the Environmental Protection Verification for Listing Companies and for Refinancing Listed Companies” promulgated by the State Environmental Protection Administration. In the latter, metallurgical, chemical, petrochemical, coal, thermal power, building materials, paper making, brewing, pharmaceutical, fermentation, textile, leather and mining industries were classified as heavily polluting industries. Combined with the classification in “Listed Company Classification Guidelines”, extractive industries, food, beverages, textiles, clothing, paper and printing, petroleum, chemical, rubber, plastics, metals, non-metallic manufacturing, medicine, biology, electricity, steam and water production and supply industries are also defined as heavily polluting industries. Furthermore, as described by Watts and Zimmerman’s (1978) political cost theory, size could also be an indication of public pressure and we include size as a control variable.

### **3.1.3 Social trust**

Economic development in the different regions of China is unbalanced. Different regions have formed different characteristics. According to Zhang and Ke’s (2002) inter-provincial investigation, different regions have different levels of social trust. In 2000 they commissioned the “Chinese Entrepreneurs Survey System” to conduct a national survey. This survey entailed sending questionnaires to more than 15,000 companies. They received more than 5,000 valid responses. Their survey covered 31 provinces, autonomous regions and municipalities. The main target of the investigation was enterprises and their leaders, involving 13 industries and companies with all kinds of ownership structure. They calculated a social trust indicator and ranked areas accordingly. The social trust indicator was based on the degree of trust according to the proportion of people thinking that the area (or region) is the most trustworthy.<sup>7</sup> We use their data and ranking as indicator of social trust. Table 2 shows the indicator of social trust in all provinces, ranging from 22.7 to 0.1 and showing that the five regions with the highest social trust have indicators above 5 while the rest received fairly low scores. We allocate a social trust indicator to each company according to the province in which it operates.

<< Insert Table 2 >>

### **3.1.3 Corporate governance**

We have already discussed the motivation for the inclusion of corporate governance variables in our model. We find from the literature that the proportion of independent directors on the board and the number of directors meetings are uncontroversial corporate governance variables. We therefore use these variables as proxy for corporate governance without any further discussion. Specifically we regard a higher proportion of independent directors and a higher frequency of directors meetings as indicative of better corporate governance.

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<sup>7</sup> The question about confidence was “Based on your experience, in which five regions do the enterprises keep promises (in order)?”

### 3.2 Model

In order to study influence the influence of stakeholder pressure, social trust and corporate governance on disclosure quality of environmental information, we adopt the following OLS linear regression model.

$$EDI = \alpha + \beta_1 SOE + \beta_2 FSHARE + \beta_3 CRED + \beta_4 IND + \beta_5 STRUST + \beta_6 OUTSIDE + \beta_7 DMEET + \beta_8 PERF + \beta_9 LEV + \beta_{10} LNSIZE + \beta_{11} YR + \varepsilon$$

EDI refers to the disclosure quality index of environmental information. It is the dependent variable, which was calculated according to the information provided in Table 1. The independent variables are SOE (the proportion of state-owned shares), FSHARE (the proportion of foreign-owned shares), CRED (loans as a proportion of total liabilities), IND (whether in heavy polluting industries), STRUST (extent of social trust), OUTSIDE (the proportion of independent directors), and DMEET (the number of board meetings). SOE, FSHARE, CRED and IND are the alternative variables for stakeholder pressure, while STRUST is the variable for the extent of social trust. OUTSIDE and DMEET are the corporate governance variables. The control variables are PERF (representing company performance), LEV (financial leverage – which could also be a proxy for pressure by creditors), LNSIZE (company size – which could also be a proxy for public pressure on the basis that bigger companies will face more public pressure) and YR (the annual dummy variable). The calculation and detail of each variable is further described in Table 3.

Many studies have found a relationship between disclosure levels and financial performance. Lang and Lundholm (1993) and Cormier and Magnan (2003) find a positive relationship between earnings and environmental disclosures. We use principal component analysis to combine four measures of performance, being, return on equity (ROE) return on assets (ROA) operating income over assets (CROA) and operating income over equity (CROE), to determine our financial performance measure (PERF). Firms with higher leverage are expected to report more (Francis et al., 2008). Clarkson et al. (2008) found a significant positive effect between environmental disclosures and leverage. We calculate leverage as total liabilities divided by owners' equity. Leverage could also proxy for pressure by creditors which is one of our variables of interest for stakeholder pressure.

Size is an important determinant in disclosure studies and most voluntary disclosure studies control for firm size (e.g. Lang and Lundholm, 1993). Larger firms have more resources to devote to issues such as environmental disclosure and prior research indicates that firm size influences the level of environmental disclosure (see for example, Hackston and Milne, 1996; Patten, 1992; 2002; Al-Tuwaijri et al., 2004; Clarkson et al., 2008). We use the natural log of total assets as our size measure. Large firms are also more likely to attract attention from stakeholders and size could therefore also proxy for public pressure which is one of our variables of interest for stakeholder pressure. Because our sample period covers five years, we use a year variable to control for any systematic impacts arising in a specific year.

The literature suggests that firms in environmentally sensitive industries (heavy polluting) will disclose more environmental information in response to greater scrutiny by stakeholders (see for example, Deegan and Gordon 1996; Halme and Huse 1997; Patten 2002). To control for industry effects, we identify firms from heavy polluting industries and analyse the results of the firm

observations from these industries separately from those of other industries in additional tests (see tables 7, 8 and 9).

<< Insert Table 3 >>

### 3.3 Sample selection

We select A-share listed companies on Shenzhen Stock Exchange from 2002 to 2006. We selected the sample as follows: a) listed companies in the finance and insurance industry are removed as their characters are special; b) considering that the performance of listed companies have great extremes, we deleted the outliers exceeding three times the standard deviation of return on total assets, return on equity, total assets over operating income, and equity over operating income, as well as the companies that have negative equity; c) we remove the companies having missing data. This results in a final sample of 2152 listed companies.

Data on environmental information disclosure were obtained by reading the annual report<sup>8</sup> of each company, identifying the items in our index and scoring them in accordance with the scoring scale in Table 1. The social confidence index is from Zhang and Ke's (2002) survey data. The financial data, data for independent directors, board meetings, proportion of state-owned shares are all from the CSMAR database.<sup>9</sup>

Table 4 shows the number of companies in our sample by sector as well as their environmental information disclosure statistics. It can be seen from Table 4 that the disclosure of environmental information in Chinese listed companies is still not adequate. Of the 2,152 sample companies, only 566 companies disclosed environmental information, and the proportion is just 26.30 percent. Relatively speaking, heavy polluting industries such as food, beverage, paper, printing, petroleum and chemicals industries have a greater proportion of disclosure, and the disclosure quality is much higher than for other companies.

<< Insert Table 4 >>

## 4. Results and analyses

### 4.1 Descriptive results

Table 5 shows the descriptive statistics. As can be seen from Table 5, the coefficient of environmental information disclosure quality (EDI) averages at 1.027, with a maximum of 14 and a minimum as well as median of 0. Clearly, the overall quality of environmental information disclosure is not high. The fact that the mean for state-owned shares (SOE) is 32.5 percent and the mean for foreign owned shares (FSHARE) is 3 percent illustrates that state-owned shares of listed companies still remains high and the state will be exerting more pressure than foreign shareholders. The average proportion of bank borrowings (CRED) is 46.2 percent, the maximum is 96.2 percent, these figures show that the proportion of bank loans is very high and the liabilities of some

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<sup>8</sup> Websites are a fairly recent phenomena in China and for the duration of our study, very few Chinese companies had websites and/or reported financial and non-financial performance data on their websites.

<sup>9</sup> The CSMAR (China Stock Market & Accounting Research) series database is developed by the GTA Information Technology Co. Ltd. This is a professional financial and economic database system used by colleges and universities, financial and securities institutions, social research institutions, experts and scholars to analysis China's financial and economic data (including the macro-economic), listed companies, stock markets, fund markets, bond markets, futures markets, foreign exchange and gold markets data.

companies basically all come from bank loans. The mean of the number of heavy polluting industry companies is 45.7 percent which shows that on average, 45.7 percent of the sample companies are heavy polluting. For the social trust index (STRUST) the average is 4.202, with a minimum of 0.1 and a maximum of 16.6. This shows that there are large differences between the various provinces. In addition, from Table 5 we see that the average proportion of independent directors is 31.9 percent and that the board of directors of listed companies hold meetings on average 7-8 times per year. The performance indicator control variables show that the average return on net assets is 1.3 percent, the operating margin on net assets averages 3.1 percent, return on total assets average 2.6 percent and operating margin on total assets average 2.3 percent, and that liabilities are 1.4 times owner's equity.

<< Insert Table 5 >>

Table 6 lists the Pearson correlation coefficient between variables. We can see from this that the environmental information disclosure index variable (EDI) has a positive correlation with SOE, CRED, IND, all being significant at the level of 1 percent, consistent with the expected hypothesis direction. Although EDI has negative correlation with the social trust index (contrary to what our hypothesis indicates) this is not significant. EDI is also positively correlated with FSHARE, OUTSIDE and DMEET, but again this is not significant. These results preliminarily show that companies with greater stakeholder pressure have higher quality of information disclosure. This confirms our first hypothesis. As far as the control variables are concerned, Table 6 also shows that the information disclosure index (EDI) has a positive correlation with company performance (PERF) and company size (LNSIZE), being significant at the levels of 5 percent and 1 percent respectively. This shows that companies with better performance and bigger size disclose higher quality environmental information.

While none of the correlations between variables are high enough to cause concerns for multi-collinearity, the significance of some of the correlations gives further motivation for including them in a multiple regression model as control variables.<sup>10</sup> The results in Table 6 are therefore preliminary, for more robust results multiple regression analysis needs to be done.

<< Insert Table 6 >>

## 4.2 Multiple regression analysis

The results for the multiple regression is shown in Table 7. Model 1 in Table 7 shows the results without controlling for the year variable while model 2 controls for the year variable and model 3 controls for the year variable and excludes companies with qualified audit opinions. From the three models we can see that state ownership (SOE), creditors pressure (CRED) and public pressure (IND) has positive and very significant relationships with disclosure quality (EDI). Foreign shareholding (FSHARE) is not significant. The results indicates that government pressure, the pressure coming from banks as creditors and public pressure are important factors which compel companies to disclose high quality environmental information. This confirms our first hypothesis that stakeholder

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<sup>10</sup> For example, SOE has significantly negative correlation with FSHARE, CRED, OUTSIDE, DEMEET and so on, and is positively and significantly correlated with PERF and LNSIZE.

pressure will result in increased quality environmental information disclosure.

Surprisingly independent directors (OUTSIDE) is not significant while the number of directors meetings (DMEET) is positive and significant at the 5% level. The social trust indicator is not significant. None of the control variables are significant, again a surprising finding as size is almost always significant. We therefore find no support for our second hypothesis that social trust improves disclosure quality and some support for our third hypothesis that better corporate governance improves disclosure quality.

<< Insert Table 7 >>

Since we noticed that companies in the heavy polluting industries apparently disclose higher quality environmental information, we regress the results of heavy polluting industries and other industries separately as a further test. In Table 8 we show the results for industries that are not heavy polluting, using the same three models that we used before. For these companies, independent directors (models 2 and 3) and the number of directors meetings are positive and significant at the 5% level. Non-heavy-pollution companies with a higher proportion of outside directors and frequent board meetings therefore have a higher quality of environmental information disclosure. This is consistent with the regression results of all companies and our hypotheses. However, the coefficient of social trust (STRUST) is negative and significant at 5 percent level in all the three models, which means that for non-heavy polluting industries, social trust is contrary to what the hypotheses expect. In other words, the lower the degree of social trust the higher the disclosure quality. None of the control variables are significant.

<< Insert Table 8 >>

In Table 9 we show the results for companies that are heavy polluting, using the same three models that we used before. SOE is significant at the 1% level for all three models while foreign shareholding and creditors are significant at the 5% level for model 3. This result suggests that the government, foreign owners and banks have an impact on heavy polluting companies to disclose high quality environmental information, companies with higher pressure from the government, foreign owners and banks will deal better with environmental information disclosure. Size is also significant at the 1% level, i.e. bigger companies have better quality information disclosure. The regression results for the other independent variables are not significant.

The results from Table 8 and Table 9 show that the contributing factors of heavy polluting industries and non-heavy-polluting industries are different. Stakeholder pressure mainly impacts the environmental information disclosure quality of heavy pollution companies, while corporate governance factors mainly impact that of companies that are not heavy polluting.

<< Insert Table 9 >>

Because of the importance to the national economy and people's livelihood, the food and beverage industry probably attracts more attention from the public. The environmental impacts arising from food and beverage manufacturing not only concerns the environment of the enterprise itself, but also the surrounding environment and companies nearby. The disclosure practices and

characteristics of the food and beverage industry could therefore be different from other heavy pollution industries. Therefore, we analyse the food and beverage companies separately from the other heavy polluting companies and report this in table 10. INDRANK, in table 10, is a rank variable. It is 2 for food and beverages industry and 1 for non-food-and-beverage industry heavy polluting firms, otherwise it is 0.<sup>11</sup> The regression results for the food and beverage industry shows that SOE and CRED are positively significant at the 1% level. Foreign shareholders therefore do not affect the food and beverage industry and performance rather than size is significant. From these results we can see that the pressure from the government and creditors are the key factors urging companies to improve environmental information disclosure quality in the food and beverage industry and that companies with higher performance tend to disclose such information better.

After excluding the food and beverage industry, the regression results for the remaining heavy pollution companies in Table 10 show that, aside from the positive and significant coefficient of SOE and FSHARE, the STRUST indicator is positive and significant at the 5 % level, which is different with the result of Table 9. This shows that both stakeholder pressure and social trust impact on the environmental information disclosure of heavy pollution companies which do not belong to the food and beverage industry. Companies operating in high social trust provinces will therefore have better environmental information disclosure quality. Another difference is that for food and beverage the government and creditor influences are significant while for the remaining heavy industries this changes to the government and foreign shareholders (but not creditors). Foreign shareholders therefore seem to have a bigger influence on heavy industries, excluding the food and beverage industry.

Comparing Table 8 and Table 10, it is clear that social trust has different correlations with the environmental information disclosure quality of various industries. As is shown in Table 8, social trust negatively correlates with the non-heavy-polluting industry environmental information disclosure quality. In provinces with low social trust, the environmental reporting quality is therefore higher. Whereas, from Table 10, we observe that, after excluding the food and beverage industry, social trust positively correlates with heavy pollution industry environmental information disclosure quality. In provinces with high social trust, the environmental reporting quality is therefore higher.

<< Insert Table 10 >>

### **4.3 Robustness tests**

In the study of Ahmad (2003) and others, they divide companies into two categories to find the determinants of the environmental information disclosure: the companies who have disclosed environmental information and those who did not. Therefore, when doing robustness tests, we also set the dependent variables of environmental information disclosure as a dummy variable, with 1 for those that disclose and 0 for others, using a LOGISTIC model for regression. Table 11 shows the results. For all three models SOE is positive and significant at the 1 percent level; similarly, CRED and IND are positive and highly significant. DMEET is also positive and significant at the 1 percent level. This shows that the results of the LOGISTIC regression have no substantive difference with

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<sup>11</sup> When industry variables are made sequential, the coefficient of OUTSIDE becomes 1.302, significant at a 10 percent level, other variables have no substantial difference with the previously mentioned regression results in table 7.

that of the OLS regression and, thus, the result of this study is robust.

<< Insert Table 11 >>

## 5. Discussion and Conclusion

In this paper, we test three hypotheses regarding the influences on the quality of environmental information disclosure of Chinese companies. We use a sample of 2,152 listed companies on the Shenzhen stock exchange from 2002 to 2006 to investigate the effect of stakeholder pressure, social trust and corporate governance on the quality of environmental information disclosure. With regards to stakeholder pressure we base our hypothesis on stakeholder theory and hypothesize that stakeholder pressure will improve disclosure quality. We find that pressures from the government, creditor banks and the public are significant factors leading to better quality environmental information disclosure. Furthermore, for heavy polluting industries, pressure from foreign shareholders is also significant. This confirms that stakeholder pressure improves the quality of environmental disclosure. Stakeholder pressure is not significant for companies that are not heavy polluting. We find that our second hypothesis regarding the influence of social trust on the quality of environmental disclosure is only confirmed for heavy polluting companies that are not food and beverage manufacturers. In fact for companies that are not heavy polluting we find that *less* social trust leads to *better* disclosure quality. Our third hypothesis regarding the influence of corporate governance on disclosure quality is confirmed for all companies and those that are not heavy polluting. For heavy polluting companies we find that corporate governance does not significantly impact disclosure quality, stakeholder pressure seems to be much more important.

Understanding these differences may require some understanding of the characteristics of Chinese culture, where people and corporations are inclined to be secretive and not willing to share private information with others. For industries that are not heavy polluting, there are no strict regulations about disclosing environmental information. This results in companies from these industries disregarding the environmental impact of enterprise operations and therefore the role of environmental information for stakeholder decision-making. Disclosing environmental information is not only costly but could reveal corporate business information that can be potentially damaging. In line with this argument,<sup>12</sup> Chinese companies prefer not to disclose environmental information. On the other hand, for companies from heavy polluting industries, the State Environmental Protection Administration and local government regulations are quite onerous, and requests for information are issued repeatedly requiring companies to focus on environmental protection. When an enterprise pursues credibility it may actively disclose environmental information and reduce the information asymmetry for outside information users.

Clearly, the quality of environmental information disclosure is affected by various factors, and different factors influence different industries. Heavily polluting industries are subject to a greater impact from supervision. With social development, environmental protection and corporate social responsibility more visible and important to the public, pressure from the government, creditors and

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<sup>12</sup> In the context of China, Chinese society is characterized as having high levels of collectivism and power distance and strong uncertainty avoidance. Chinese society tends to adhere to rules and regulations and disclose less information in their annual reports voluntarily. Therefore, it is argued that Chinese culture does not promote voluntary disclosure (Huafang and Jianguo, 2007). Chau and Gray (2001) confirm the secretive nature of Chinese reporting practices in their comparative studies between Hong Kong and Singapore and US and UK companies.

shareholders have enhanced the quality of environmental information disclosure in heavy polluting industries. However, these pressures do not have a significant impact on industries that are not heavy polluting. Our findings show that for non-polluting industries, environmental information disclosure has not attracted the attention of the various stakeholders yet. Stakeholder pressure is therefore not yet important for these companies. Those with good corporate governance have better quality disclosure, suggesting an important role for the board of directors. Furthermore, in the absence of stakeholder pressure, it would appear that companies in areas or regions with less social trust make better disclosures, and that these disclosures are quite possibly an effort to gain social trust.

Social trust and corporate governance therefore seems to be important in the absence of stakeholder pressure. Our results show that if companies face stakeholder pressure, this will be the most important determinant of the environmental information disclosure. Companies will therefore do everything to meet the demands of their important stakeholders. In the absence of stakeholder pressure, those companies with good corporate governance in place will have better disclosure quality, in line with our corporate governance based hypothesis. Furthermore, companies from regions with less social trust will have better disclosure. This could be a legitimating strategy to obtain social legitimacy despite operating in an area with low social trust.

In order to improve the environmental information disclosure quality for industries that are not heavy polluting, improved corporate governance measures and government supervision would be necessary. In order to better regulate environmental information disclosure, the Ministry of Finance and the Securities Regulatory Commission could consider introducing environmental accounting standards and information disclosure format and requirements which will encourage listed companies to improve the quality of environmental information disclosure. Furthermore, when listing and re-financing, enterprises should be required to undergo an environmental protection inspection in order to strengthen the government's regulation efforts.

### ***Limitations***

In this paper, we use the methods of Wiseman (1982) and other scholars to measure the quality of the environmental information disclosure. But inevitably there is some subjectivity when reading the annual report to access, classify and score information. In addition, the sample used in this paper focuses on the Shenzhen Stock Exchange. Further research could expand the sample size to include the environmental information disclosure of listed companies from the Shanghai Stock Exchange.

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**Table 1 Evaluation index for environmental information disclosure quality**

<b>Item number</b>	<b>Disclosure items</b>	<b>Scoring system</b>
1	Investment related to environmental protection equipment, etc.	Enterprises' score in a project can be calculated according to the following rules:  3 monetary information;  2 specific nonmonetary information;  1 general nonmonetary information; 0 undisclosed; The total score of an enterprise' disclosure quality is the sum of all the items
2	Government funding, financial subsidies and tax breaks related to environmental protection.	
3	Sewage charges for waste water, waste gas and solid waste.	
4	ISO environmental certification system related information.	
5	Measures to improve the ecological environment (such as afforestation fees, etc.).	
6	Impact of government's environmental policy on the enterprise.	
7	Loans related to environmental protection.	
8	Litigation, compensation, fines and incentives related to environmental protection.	
9	Corporate philosophy and goals for environmental protection.	
10	Other items related to the environment such as income and expenditure.	

**Table 2 Social Trust Ranking for China (Zhang and Ke, 2002)**

Rank	Province	Indicator of social trust
1	Shanghai	22.70
2	Beijing	16.60
3	Jiangsu	5.70
4	Guangdong	10.10
5	Shandong	6.40
6	Zhejiang	3.50
7	Tianjing	1.70
8	Liaoning	1.90
9	Hebei	1.40
10	Sichuan	0.90
11	Fujian	0.90
12	Yunnan	1.40
13	Heilongjiang	0.70
14	Xinjiang	1.10
15	Shanxi (陕西)	0.70
16	Jilin	0.70
17	Henan	0.60
18	Chongqing	0.50
19	Hubei	0.50
20	Guangxi	0.60
21	Anhui	0.40
22	Shanxi (山西)	0.60
23	Neimenggu	0.70
24	Hunan	0.40
25	Gansu	0.30
26	Jiangx	0.20
27	Guizhou	0.20
28	Qinghai	0.20
29	Ningxia	0.20
30	Hainan	0.10
31	Xizang	0.10

**Table 3 Variable definitions**

<b>Variables</b>	<b>Variable definitions</b>
<b>Dependent variable:</b>	
Disclosure quality index of environmental information (EDI)	Calculated according to Table 1
<b>Independent variables:</b>	
Proportion of state-owned shares (SOE)	State-owned shares divided by total shares
Ratio of foreign shares (FSHARE)	Foreign owned shares divided by total shares
Bank loans (CRED)	The sum of short-term borrowing and long-term borrowing divided by the total liabilities
Industry variable (IND)	1 if heavy polluting industries, and 0 otherwise
Social trust (STRUST)	Using Zhang and Ke's (2002) trust extent index
Independent directors (OUTSIDE)	The number of independent directors divided by the total number of directors
Directors meeting (DMEET)	Frequency of directors' meetings
<b>Control variables:</b>	
Company performance (PERF)	Calculated through principal component analysis on four performance measures: return on total assets, return on equity, operating income over total assets, operating income over equity
Financial Leverage (LEV)	Total liabilities divided by owner's equity
Company size (LNSIZE)	Natural logarithm of total assets
Year (YR)	Annual dummy variables

**Table 4 Environmental information disclosure by sample companies**

<b>Number</b>	<b>Industries</b>	<b>Heavy polluting industry</b>	<b>Number of sample companies</b>	<b>Disclosure number of companies</b>	<b>Disclosure proportion</b>	<b>Mean of disclosure quality</b>
1	Agriculture, forestry, animal husbandry and fisheries	no	45	13	28.89%	1.711
2	Extractive industry	yes	51	8	15.69%	0.451
3	Food, beverages industries	yes	90	30	33.33%	1.400
4	Textile, garment industries	yes	90	26	28.89%	0.944
5	Furniture manufacturing	no	3	1	33.33%	1.333
6	Paper, printing industries	yes	36	14	38.89%	1.806
7	Petroleum, chemical, rubber, plastics industries	yes	284	111	39.08%	1.680
8	Electronic components, electrical appliances, electronic equipment industries	no	69	19	27.54%	0.928
9	Metals, non-metallic industries	yes	217	70	32.26%	1.300
10	Machinery, equipment, instruments	no	340	62	18.24%	0.626
11	Chinese medicine, bio-industry	yes	123	50	40.65%	1.854
12	Other manufacturing industries	no	13	1	7.69%	0.231
13	Electricity, steam, hot water production and supply industries	yes	93	43	46.24%	1.732
14	Civil Engineering Construction	no	27	3	11.11%	0.481
15	Transportation	no	74	11	14.86%	0.486
16	Communications, computer industry	no	111	16	14.41%	0.324
17	Wholesale, retail and commercial brokerage industries	no	131	12	9.16%	0.374
18	Real estate development and management industry	no	124	23	18.55%	0.637
19	Catering, tourism, social services industry	no	83	27	32.53%	1.169
20	Publishing, communication and cultural industries	no	14	1	7.14%	0.214
21	Comprehensive Profession	no	134	25	18.66%	0.664
	Total	-	2152	566	26.30%	1.027



**Table 5 Descriptive statistics**

	obs	MIN	MAX	MEAN	median	STD
EDI	2152	0.000	14.000	1.027	0.000	2.024
SOE	2152	0.000	0.850	0.325	0.357	0.250
FSHARE	2152	0.000	0.537	0.030	0.000	0.093
CRED	2152	0.000	0.962	0.462	0.502	0.236
IND	2152	0.000	1.000	0.457	0.000	0.498
STRUST	2152	0.100	16.600	4.202	1.400	4.811
OUTSIDE	2152	0.000	0.667	0.319	0.333	0.073
DMEET	2152	2.000	34.000	7.960	7.000	3.319
ROE	2152	-1.825	0.446	0.013	0.040	0.187
CROE	2152	-1.631	0.734	0.031	0.050	0.175
ROA	2152	-0.267	0.264	0.026	0.027	0.067
CROA	2152	-0.255	0.281	0.023	0.022	0.060
PERF	2152	-12.058	5.624	0.000	0.150	1.854
LEV	2152	0.008	32.651	1.405	1.074	1.609
LNSIZE	2152	17.917	24.791	21.230	21.193	0.935

**Table 6 Pearson correlation coefficient**

	EDI	SOE	FSHARE	CRED	STRUST	OUTSIDE	DMEET	IND	PERF	LEV	LNSIZE
EDI	1.000	0.108*** (0.000)	0.010 (0.637)	0.079*** (0.000)	-0.039* (0.071)	0.015 (0.490)	0.032 (0.140)	0.202*** (0.000)	0.047** (0.029)	-0.003 (0.883)	0.079*** (0.000)
SOE		1.000	-0.073*** (0.001)	-0.049** (0.024)	-0.068*** (0.002)	-0.060*** (0.005)	-0.059*** (0.006)	0.161*** (0.000)	0.075*** (0.001)	-0.067 (0.002)***	0.148*** (0.000)
FSHARE			1.000	-0.103*** (0.000)	0.189*** (0.000)	0.046** (0.032)	-0.045** (0.036)	-0.003 (0.890)	0.066*** (0.002)	-0.039 (0.068)*	0.219*** (0.000)
CRED				1.000	-0.084*** (0.000)	-0.029 (0.186)	0.100*** (0.000)	0.152*** (0.000)	-0.131*** (0.000)	0.055 (0.010)**	0.011 (0.608)
STRUST					1.000	0.046** (0.035)	0.067*** (0.002)	-0.135*** (0.000)	0.070*** (0.001)	-0.027 (0.211)	0.127*** (0.000)
OUTSIDE						1.000	-0.007 (0.752)	-0.001 (0.960)	0.008 (0.700)	0.011 (0.601)	0.016 (0.452)
DMEET							1.000	-0.099*** (0.000)	-0.060*** (0.005)	0.044 (0.043)**	-0.032 (0.138)
IND								1.000	0.073*** (0.001)	-0.021 (0.340)	0.116*** (0.000)
PERF									1.000	-0.325 (0.000)***	0.284*** (0.000)
LEV										1.000	0.056*** (0.010)
LNSIZE											1.000

**Table 7 OLS regression results for all companies**

	Model 1		Model 2		Model 3	
	coefficient	P-value	coefficient	P-value	coefficient	P-value
INTERCEPT	-1.866*	0.080	-2.063*	0.065	-1.921	0.112
SOE	0.642***	0.000	0.652***	0.000	0.634***	0.001
FSHARE	0.376	0.433	0.343	0.476	0.497	0.331
CRED	0.465**	0.013	0.494***	0.009	0.583***	0.004
IND	0.718***	0.000	0.713***	0.000	0.713***	0.000
STRUST	-0.008	0.370	-0.008	0.367	-0.012	0.237
OUTSIDE	0.578	0.322	1.244*	0.082	1.152	0.141
DMEET	0.033**	0.012	0.027**	0.038	0.032**	0.021
PERF	0.034	0.195	0.033	0.197	0.041	0.123
LEV	0.010	0.714	0.010	0.732	0.002	0.966
LNSIZE	0.080	0.111	0.085*	0.096	0.078	0.156
YR			controlled		controlled	
N	2152		2152		1953	
F-Value	12.65***		9.63***		8.92***	
Adj.R <sup>2</sup>	0.051		0.053		0.054	

**Table 8 Regression results for companies that are not heavy polluting**

	Model 1		Model 2		Model 3	
	coefficient	P-value	coefficient	P-value	coefficient	P-value
INTERCEPT	1.815	0.128	1.017	0.419	1.058	0.447
SOE	0.276	0.147	0.276	0.146	0.309	0.131
FSHARE	-0.567	0.305	-0.650	0.240	-0.650	0.281
CRED	0.199	0.334	0.188	0.367	0.247	0.267
IND	-	-	-	-	-	-
STRUST	-0.022**	0.023	-0.022**	0.020	-0.027***	0.008
OUTSIDE	0.747	0.249	1.816**	0.025	1.958**	0.030
DMEET	0.036***	0.007	0.032**	0.014	0.036**	0.012
PERF	0.030	0.275	0.032	0.247	0.033	0.256
LEV	-0.052	0.125	-0.047	0.166	-0.070	0.117
LNSIZE	-0.079	0.158	-0.060	0.287	-0.065	0.292
YR			controlled		controlled	
N	1168		1168		1045	
F-Value	3.17***		2.68***		2.89***	
Adj.R <sup>2</sup>	0.017		0.018		0.023	

**Table 9 Regression results for heavy polluting companies**

	Model 1		Model 2		Model 3	
	coefficient	P-value	coefficient	P-value	coefficient	P-value
INTERCEPT	-5.816***	0.002	-5.264***	0.007	-5.012**	0.014
SOE	1.165***	0.000	1.231***	0.000	1.195***	0.001
FSHARE	1.474*	0.066	1.492*	0.063	1.696**	0.042
CRED	0.601*	0.066	0.643*	0.050	0.777**	0.027
IND	-	-	-	-	-	-
STRUST	0.022	0.211	0.023	0.193	0.021	0.267
OUTSIDE	-0.248	0.807	-0.132	0.914	-0.326	0.802
DMEET	0.035	0.187	0.029	0.283	0.037	0.193
PERF	0.007	0.876	0.005	0.913	0.028	0.547
LEV	0.065	0.153	0.060	0.186	0.085	0.177
LNSIZE	0.289***	0.001	0.275***	0.002	0.262***	0.006
YR			controlled		controlled	
N	984		984		907	
F-Value	5.07***		3.95***		3.76***	
Adj.R <sup>2</sup>	0.036		0.038		0.038	

**Table 10 Regression results for heavy pollution industry segmentation**

	All companies		Food and beverage		Heavy polluting, non-food-and beverage	
	coefficient	P-value	coefficient	P-value	coefficient	P-value
INTERCEPT	-2.186*	0.051	-11.284	0.204	-5.678***	0.005
SOE	0.678***	0.000	3.904***	0.001	1.164***	0.001
FSHARE	0.328	0.495	-1.065	0.738	1.844**	0.029
CRED	0.538***	0.004	5.978***	0.000	0.133	0.700
STRUST	-0.010	0.302	-0.026	0.657	0.040**	0.036
OUTSIDE	1.302*	0.070	0.561	0.902	-0.016	0.990
DMEET	0.026**	0.046	-0.070	0.593	0.022	0.415
INDRANK	0.566***	0.000				
PERF	0.033	0.207	0.359**	0.016	-0.021	0.679
LEV	0.009	0.751	0.039	0.695	0.051	0.326
LNSIZE	0.091*	0.074	0.441	0.252	0.307***	0.001
YR	controlled		controlled		controlled	
N	2152		90		894	
F-Value	8.93***		2.9***		4.04***	
Adj.R <sup>2</sup>	0.049		0.217		0.043	

**Table 11 Results using logistic regression**

	Model 1		Model 2		Model 3	
	coefficient	P-value	coefficient	P-value	coefficient	P-value
INTERCEPT	-3.525***	0.006	-4.029***	0.003	-4.035***	0.004
SOE	0.632***	0.003	0.629***	0.003	0.581***	0.010
FSHARE	-0.027	0.962	-0.074	0.897	0.069	0.906
CRED	0.584**	0.010	0.592***	0.009	0.744***	0.002
IND	0.848***	0.000	0.846***	0.000	0.840***	0.000
STRUST	0.006	0.608	0.005	0.630	0.002	0.837
OUTSIDE	0.320	0.645	1.240	0.144	1.073	0.239
DMEET	0.045***	0.002	0.041***	0.007	0.052***	0.001
PERF	0.059*	0.061	0.059*	0.062	0.083***	0.010
LEV	0.040	0.214	0.041	0.207	0.029	0.514
LNSIZE	0.048	0.425	0.060	0.329	0.058	0.373
YR			controlled		controlled	
N	2152		2152		1953	
N=1	566		566		513	
Chi-square	115.737***		121.270***		120.626***	
Percent						
Concordant	64.8%		65.1%		65.8%	
Pseudo-R <sup>2</sup>	0.047		0.050		0.054	