The Effects of Corporate Ownership Structure on Environmental Information Disclosure—Empirical Evidence from Unbalanced Penal Data in Heavy-pollution Industries in China

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Abstract: - This paper empirically examines the content and degree of environmental information disclosure for 671 corporate in eight heavy-pollution industries in the period from 2008 to 2012. The means and standard deviations of corporate EID exhibit an increasing trend, and corporate in heavy-pollution industries have greater divergent standpoint in voluntary environmental information disclosure. Corporate with more institutional investors-owned ownership and ownership concentration have significantly positive effects on voluntarily environmental information disclosure at the 95%confidence level. Our empirical results exhibit that Corporate with greater institutional owners-owned ownership and ownership concentration should voluntarily disclose more environmental information, should communicate with institutional owners and minority controlling shareholders firms' environmental achievements and then strengthen their investment confidence and improve shareholders' interests.

Key-Words: - environmental information disclosure; ownership structure; ownership concentration; institutional owner; top managers

1 Introduction

In recent year, environmental information disclosure (EID) has a hot topic to discuss with increasingly severe deterioration of ecological environment. With the frequent exposure of fatally environmental pollution incident, such as Longjiang cadmium pollution in Guangxi province, Zijin mining corporate in Fujian province and ConocoPhillips pollution leakage, corporate environment-protection responsibility has been paid much attention by media and public. How to timely disclose more environmental information and carry out environmental responsibility is an avoidable public problem. Chinese government had issue a serial of laws and rules, such as the guidance of strengthening corporate environmental supervision and management issued by the State Environmental Protection Administration (SEPA) in China, policy guideline of corporate environmental information disclosure issued by Shanghai Stock Exchange Platform in China. Stakeholders strengthen corporate environmental performance estimation and require more environmental information disclosure with an increase of environmental risk and political pressures.

Current research results of environmental information disclosure reflect environmental performance estimation, behaviour motivation of EID, driving factors of EID and the related effects of EID on financial performance etc. A few foreign scholars study environmental performance estimation. Deegan and Gordon (1996) find that corporate environmental information disclosure is

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qualitative disclosure [1]. Zhang et al. (2010) present an implementation assessment of Chinese environmental information disclosure degree [2]. Several scholars study driving factors of EID Gray et al. (1996) argue that legislation, ethics, personal obligations and legitimacy are driving factors of environmental information disclosure [3]. Stephan et al. (2002) discuss the role of information disclosure programs in environmental policy and motivating factors for improved environmental performance [4]. Qu (2007) verifies that Market orientation is the most significant predicator of corporate social responsibility (CSR) while ownership structure has little effect on CSR [5]. Zeng et al. (2010), Zeng et al. (2012) verify that industry type, corporate size, marketization and ownership type have significant impacts on EID [6-7]. Liu and Anbumozhi (2009) identify the determinant factors affecting the corporate environmental information disclosure, such as industry type, shareholders shares, assets size, asset liability ratio, return on equity and listed age [8]. Montabon et al.(2007), Yu et al. (2010) find that sufficient environmental information disclosure has better effect on economic performance. Many scholars verify the effect of EID on financial performance [9-10]. Earnhart and Lizal (2006), Monevan and Ortas (2010) verify successful financial performance undermines good environmental performance [11-12]. Cohen and Santhakumar (2007), Lee (2010) examine that useful environmental regulation has direct and indirect impact on environmental information disclosure [13-14]. Sueyoshi and Goto (2010), Rassier and Earnhart (2011) verify that environmental regulation policy effectively affect corporate environmental management practices and technology innovation, and then improve potential financial performance [15-16]. A few scholars find environmental performance has negative impact on financial performance. Konar and Cohen (2001), Sueyoshi and Goto (2009), Lioui and Sharma (2012) find that environmental information disclosure (waste, environmental cost etc) is negatively related with return on equity and Tobin's Q value [17-19]. Cai and Xu (2011) analyze the relationship between commercial bank loan decisions and environmental information disclosure after considering the effect of the nature of property rights and different marketization [20]. Tu and Xiao (2013) verify that environmental regulations have a significantly positive influence on the sample firm performance for six water pollution-intensive industries in China, this influence in state-owned firms is higher than that in non-state-owned firms, the influence in central and western region firms is higher than that in eastern region firms [21]. Different corporations in different countries have divergent political system, legislation, economic development and marketization etc, corporations in different industries have greater divergence in undertaking environmental responsibility.

Many scholars verify that good corporate governance structure affect environmental information disclosure. Based on agency theory, information disclosure alleviates external and internal information asymmetry, and then reduces corporate agency costs. Cormier and Gordon (2001) [22], Earnhart and Lizal (2006) [11] consider that corporate with different ownership type undertake different environmental responsibility and have significant divergence in disclosing environmental information, corporate with state ownership disclose more environmental information than private ownership. Karim et al. (2006) verify that corporate with higher foreign ownership disclose less environmental information because of involving sensitive areas in environmental information disclosure [23]. Manuel et al. (2009) test that shareholder power and dispersed ownership structure has an important effect on disclosing corporate social responsibility information [24]. Li and Zhang (2010) suggest that non-state owned corporate with ownership dispersion is positively associated to corporate social responsibility, while state-owned corporate with controlling shareholder is negatively associated to corporate social responsibility [25]. Dam and Scholtens (2012) find that the ownership owned by employees, individuals and corporate is associated with poor corporate social responsibility, while the ownership owned by banks, institutional investors and state appear to be neutral [26]. Li et al.(2013) identify that the link between firm performance and corporate social responsibility disclosure is found to be weaker among state-owned enterprises compared with non-state-owned ones [27]. Paek et al. (2013) investigate that managerial ownership has a significantly negative effect on employee dimension, and has an insignificant impact on the community, environment and product dimensions [28]. Meng et al. (2013) examine that the ownership and economic performance have the significantly interactive impacts on EID from voluntary disclosure to mandatory disclosure. Ownership type has a significant impact on corporate social responsibility and environmental information disclosure [29]. Cormier and Magnan (2003) believe that ownership concentration motivates controlling shareholders effectively supervise managers' EID, and reduces agency costs by improving the quality of environmental information disclosure [30]. Brammer and Pavelin (2006) find that larger, less indebted corporate with dispersed ownership characteristics are significantly voluntary environmental information disclosures, and EID quality is positively associated with corporate size [31]. Much attention of environmental management induced by independent directors and managers promote more environmental information disclosure. Walls et al. (2012) examine that corporate owners, managers, and boards of directors have significant influences on environmental performance [32]. Taysir and Parzarcik (2013), Iatridis (2013) find that higher quality of environmental information discloser display effective corporate governance and would tend to face less difficulty in accessing capital markets [33-34]. Chang (2013) presents the empirical evidence of the effects of ownership and capital structure on environmental information disclosure, his empirical results show that state legal-person ownership, non-state ownership, ownership concentration, financial leverage, long-term debts and short-term debts have significantly positive impacts on environmental information disclosure [35]. Chang (2013) proposes the market behaviour of convenience yields and examine the options feature of convenience yields for emission allowances [36-37]. Ramos et al. (2010) find that these automated systems are characterized mainly by the necessity of acquisition and information sending of one or more operational control centers to remote stations located in the most several locations [38]. Amaury et al. (2010) verify that classification of this set of data can be solved using the combination of these methods among rough sets, fuzzy logic, neural networks and entropy [39]. Luiz and Mario(2010) present that modern administration requires efficient tools to perform information management that enables the manager to make decisions to solve problems or even prepare government programs [40]. Julio-Carrido et al.(2010) propose a traceability information model for spread e-manufacturing environments, the objective is to address common traceability data management problems in spread supply chain networks[41]. The corporate governance features such as ownership type, ownership concentration, independent directors and foreign ownership etc have significant impacts with environmental information disclosure.

Based on the above empirical results, this paper has two main contributions. Firstly, different ownership types are significantly related with EID, including top managers-owned ownership, institutional investors-owned ownership and ownership concentration. Secondly, we take into account corporate attributes such as corporate size, leverage corporate growth, capital intention and Tobin's Q value associated with EID, and then we propose the estimated methodology using unbalanced panel data in eight heavy-pollution industries in China.

The remainder of this paper is organized as follows. The next section presents theory analysis and hypotheses development. The third section proposes the research methodology. The empirical results are reported in the fourth section, and the fifth section concludes the paper.

2 Theory analysis and hypothesis development

Corporate environmental problems cannot be solved using economic ways because of significant externalities, corporate should pay much attention to environmental information disclosure in order to achieve excellent long-run strategy development and market competitiveness. Different ownership types exhibit greater divergence in corporate management decision and governance efficiency. Corporate managers have to coordinate conflicting interests with several stakeholders. The ownership structure affects the incentives to pursue value-maximizing strategies and private ownership provides strong incentives to exploit revenue-enhancing and cost reducing options (see [11] [42]). Stakeholder theory debates that corporate require stakeholders' supports and recognitions when continually improving financial performance and environmental performance, and tell stakeholders firms' supporting standpoint, trying efforts and acquiring achievements in executing environmental responsibility [43]. More environmental information disclosure is helpful for corporate to communicate with stakeholders about carrying out environmental responsibility and reduce stakeholders' misunderstanding of environment-protection practices, and then improve their relationship between stakeholders and corporate.

Hypothesis 1 Top management ownership is negatively associated with corporate EID.

Ownership types exhibit divergent motivation for controlling shareholders, institutional investors and managerial owners. Different types of owners have divergent preferences regarding various corporate decisions and investments. Varying shares owned by specific types of investors have a differential effect on the corporate decisions on environmental information disclosure. Managerial owners are corporate executives or directors owned stock ownership. Managerial ownership structure is a major influential factor associated with management efficiency. Top managers have the power to allocate resources among a broad range of stakeholders in a way that assures support from them and have a strong incentive to reduce agency conflicts between shareholders and managers by aligning other stakeholders' interests. If top managers own significant equity, they are more likely to make corporate decisions maximizing the shareholders' value. Top managers may be more likely to pursue short-term strategies that boost the firms' profits and endow the managers with greater power to make decisions in their own interests. Traditional environment theory basis argues that environmental management activities in heavy-pollution industries increase research and development expenses of environmental technology and assets investment of environmental facilities. As a result, those behaviours increase depreciation and administration fee of environmental assets, enhance related cost of EID and waste disposal costs etc, and then increase environmental management cost and market operating risks. Managerial owners believe that environmental information disclosure is a tool to establish a better relationship between corporate and stakeholders, excellent EID promote corporate social image in environment-protection responsibility.

Hypothesis 2 Institutional ownership is positively associated with corporate EID.

Institutional investor ownership relates to stock market investments of institutional investors (bank, corporate, pension funds, insurance companies, mutual funds and corporate etc). Institutional owners are influential in organizational decisions by exercising substantial voting power and having asymmetric information advantages than other shareholders. Using their power and information advantages, institutional owners tend to be more actively involved in firms' decision than non-institutional owners. Different shareholders may have different preferences regarding investment of corporate environmental assets, long-run shareholders are more likely to support environmental management practices than short-run shareholders. Short-run investors may view environmental investment as risky and uncertain, long-run investors may be more supportive of environmental investment than short-run investors. The effect of ownership structure of environmental information disclosure should vary depending on the shares of the total stock owned by various shareholders.

Hypothesis 3 Ownership concentration is positively associated with corporate EID.

Appropriate ownership concentration endows that larger shareholders have effectively supervise managerial incentive and improve managerial ability. More concentrated ownership may improve the owners' ability to control operating costs including environment-related costs by enhancing monitoring ability of larger shareholders. Controlling shareholders have more strong incentive to correct more information including environmental information, to actively monitor managerial behaviours and to effectively reduce managers' opportunistic behaviours with an increase of ownership concentration, and then managers have more pressures to disclose more favourable information. Ownership concentration has a significant impact on environmental information disclosure. Potentially larger agency costs between majority and minority shareholders are argued to be involved due to the simultaneous presence of nonaligned interests. Majority shareholders have an important interest in the long-term corporate strategy development and in the importance of maintaining their own reputation. The dominant shareholders in comparison with other types of owners will be more likely to adopt decisions that maximize the firm's economic, social and environmental behaviour. More environmental information disclosure is an appropriate communication of corporate environmental management behaviour to stakeholders in order to achieve long-term interests.

3 Research methodology

3.1 Data source

The State Environmental Protection Administration in China (SEPA) had issued that the notice of environmental protection verification on applying for initial public offering and corporate refinancing (SEPA [2003],No.101) and the notice of environmental protection verification on further regulation of applying for initial public offering and corporate refinancing in heavy-pollution industries (SEPA [2007], No.105). Those notices stipulate that heavy-pollution industries are comprise of 13 industries, such as thermal electric, steel, non-ferrous metals, chemical, coal-mining, petrochemical, construction, building materials, papermaking, brewing, pharmaceutical, textile, leather etc. This paper select thermal-electric, steel, nonferrous metals, chemical, coal-mining and petrochemical, building materials, pharmaceutical and textile-garment-leather industries, corporate in eight industries disclose the most intensively environmental information using social responsibility reporting and sustainable environment reporting. Considering the continuity and comparability of social responsibility reporting and environmental reporting, we choose social responsibility reporting and environmental reporting issued from 2008 to 2012 as unbalanced panel data samples, including 23 corporate in thermal-electric industry, 16 corporate in steel industry, 19 corporate in nonferrous metals industry, 20 corporate in chemical industry, 13 corporate in coal-mining and petrochemical industry, 13 corporate in construction and building-materials industry, 23 corporate in pharmaceutical industry, and 12 corporate in textile-garment-leather industry. We eliminate missing data samples of social responsibility reporting and environmental reporting induced by individual corporate, and then we identify 671 social responsibility reports and environmental reports. All social responsibility reporting and environmental reporting are sourced from syntao-sustainability solutions network and CNINFO network in China. Based on 30 environmental performance indicators in sustainability reporting guidelines issued by global reporting initiative (GRI) in 2006, we collect and estimate EID score. Controlling variables such as Tobin's Q value, corporate size and leverage, , independent variables such as ownership concentration, institution-owned and manager-owned ownership are all from CSMAR database, CNINFO database and GENIUS finance database in China.

3.2 Methodology estimation

Manufacturing corporate have strong motivation to disclose more environmental information, outstanding environmental performance significantly improve corporate financial performance, such as returns of assets (ROA), Tobin's Q value, assets size, leverage etc (see Konar and Cohen, 2001; King and Lenox, 2002; Earnhart and Lizal, 2006; Nokao et al. 2007; Iwata and Okada, 2011; Lioui and Sharma, 2012). The score of environmental information disclosure (EID) is measured by environmental disclosure content and degree in detail, which reflects the level of corporate EID. The dependent variable is expressed in a score of environmental information disclosure, the independent variables are expressed in top managers-owned ownership, institutional investors-owned ownership and ownership concentration, controlled variables are expressed in corporate assets size, Tobin's Q value, leverage, corporate growth and capital intention. In order to examine the effects of ownership structure on environmental information disclosure (EID), we propose the following estimated model on basis of above hypothesis development.

$$EID_{ijt} = \alpha_0 + \alpha_1 MO_{ijt} + \alpha_2 IO_{ijt} + \alpha_3 SIZE_{ijt} + \alpha_4 Q_{ijt} + \alpha_5 LEV_{ijt} + \alpha_6 CG_{ijt} + \alpha_7 CI_{ijt} + \mu_t + \varepsilon_{it}$$

$$EID_{ijt} = \beta_0 + \beta_1 CO_{ijt} + \beta_2 SIZE_{ijt} + \beta_3 Q_{ijt} + \beta_4 LEV_{ijt} + \beta_5 CG_{ijt} + \beta_6 CI_{ijt} + \mu_t + \varepsilon_{it} \quad (2)$$

Where i denotes the firm, j denotes heavy-industries, t indicates the year, μ_t is the industry-specific fixed effects, and ε is the standard error term. Dependent variable EID represents the score of environmental information disclosure, independent variables MO indicates the holding-shares ratio owned by top managers, IO indicates the holding-shares ratio owned by institutional investors, CO indicates the ownership concentration which is the sum of holding-share ratio owned by three largest shareholders. Controlled variables SIZE is measured by the natural logarithm of year-end book value of total assets, Tobin's Q is interpreted as the market value of intangible and tangible assets, LEV is defined as the year-end total liabilities deflated by the year-end total assets, CG is the corporate revenues growth, and CI is measured as year-end total revenues deflated by year-end equity.

4 Empirical Results Discussion

4.1 Environmental information disclosure estimation

Environmental information disclosure (EID) is measured as the actual score of EID indicators are divided by optimal score of EID indicators. Based on 30 environmental performance indicators issued by global reporting initiative (GRI), we provide a combinative estimation of quantitative and qualitative methodology, including 17 core indicators and 13 supplementary indicators. Estimated benchmarks are defined as following methodology. Measured the core indicators, we propose a combination of quantitative and qualitative estimation. Detailed information disclosure is marked 5 score, however inadequate disclosure is marked 3 score in quantitative and qualitative disclosure. Only qualitative description is marked 1.5 score, undisclosed environmental information is marked 0 score. Measured the supplement indicators, detailed information disclosure is marked 3 score, inadequate disclosure is marked 1 score and undisclosed environmental information is market 0 score.

Table 1 Statistical description of corporate environmental information disclosure in heavy-pollution industries in China

period	*mean*	*maximum*	*minimum*	*Standard deviation*
2008	0.16851	0.45161	0.02419	0.11261
2009	0.18439	0.60081	0.02016	0.12345
2010	0.18485	0.50807	0.01613	0.12378
2011	0.19861	0.62903	0.01613	0.13549
2012	0.2055	0.58871	0.00807	0.13677

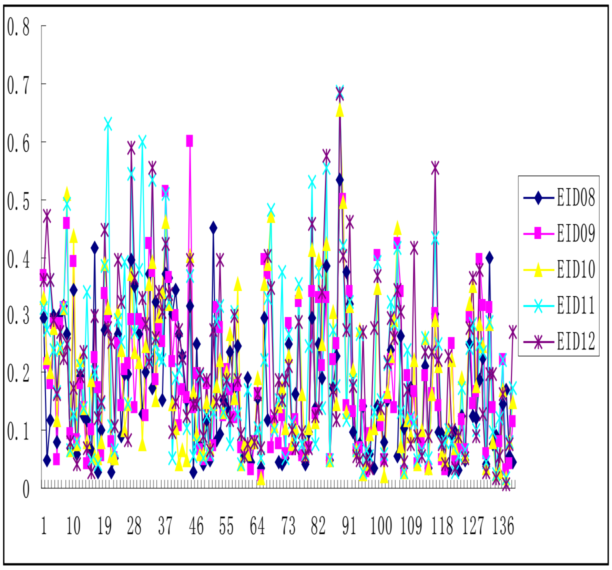

Fig. 1 Corporate environmental information disclosure in heavy-pollution industries

Seen from the figure 1, corporate in heavy-pollution industries have greater divergence in the content and degree of environmental information disclosure. From the table 1, the mean of EID in heavy-pollution industries are 0.168506, 0.184387, 0.184847, 0.198606 and 0.205504 from 2008 to 2012, the overall score of corporate EID in heavy-pollution industries is lower. However the mean of corporate EID exhibit an increasing trend, these signs show that corporate in heavy-pollution industries gradually pay attention to disclosing more environmental information and environment - protection practices. The standard deviations of corporate EID are 0.112605, 0.123453, 0.123777, 0.135486 and 0.136768 from 2008 to 2012, and standard deviation of EID exhibits an enlarging trend. These signs show that corporate in heavy-pollution industries have greater divergence in voluntary environmental information disclosure, and their divergence in EID exhibit an increasing trend from 2008 to 2012.

4.2 Empirical Evidences Analysis and Discussion

Table 2 presents the empirical effects of ownership structure on environmental information disclosure using unbalanced panel data samples in heavy-pollution industries from 2008 to 2012. Different ownership type exhibit greater divergence in corporate governance efficiency, corporate with different ownership structure have obviously significant impacts on environmental information disclosure. From table 2, the related coefficient between institutional owners-owned ownership and EID is 0.047, and t-statistical value exhibits a higher value, accordingly corporate with more holding-shares ratio owned by institutional investors have significantly positive impacts on environmental information disclosure at the 95% confidence level. This empirical result significantly support hypothesis 2. While corporate with more holding-shares ratio owned by top managers have non-significantly negative effects on environmental information disclosure, this result cannot significantly support hypothesis 1. Top managerial owners have enough power to allocate resources and to make corporate decisions maximizing the shareholders' value, and have a strong incentive to reduce agency conflicts between shareholders and managers. Top managers may be more likely to pursue short-term strategies that boost their maximum interests. Top managerial owners argue that more environment-protection practices and activities increase environmental facilities investment, enhance depreciation and administration fee of environmental assets and related environmental costs including waste and polluted-water disposal costs, environmental protection and recovery costs, environmental information disclosure costs and political risk costs etc.

Accordingly top managers owned greater share-holding ownership voluntarily disclose lower environmental information in heavy-pollution industries. Institutional owners have substantial voting power and asymmetric information benefits than other shareholders, and they tend to be more actively involved in corporate environmental management practices than non-institutional owners. Corporate with greater share-holding ratio owned by institutional owners have to voluntarily disclose more environmental information, and tell institutional owners firms' supporting standpoint, trying efforts and acquiring achievements in executing environmental responsibility, reduce institutional owners' misunderstanding in environment-protection practices, and then improve their institutional owners -corporate relationship.

Table 2 the effects of ownership structure on environmental information disclosure in heavy-pollution industries

Variables coefficients	*Equation (1)*	*Equation (2)*
intercept	-0.5220***	-0.4604***
	(-5.9259)	(-5.4021)
Top managers-owned ownership	-0.0009	
	(-0.8630)	
Institutional investors-owned ownership	0.0497**	
	(2.2041)	
Ownership concentration		0.1825***
		(5.4755)
Firm size	0.02999***	0.0239***
	(7.8876)	(6.1889)
Tobin's Q	-0.0078**	-0.0062**
	(-1.7711)	(-1.4836)
Leverage	0.0119	0.0137
	(0.7122)	(0.8496)
growth	-0.0062	-0.0066
	(-1.0042)	(-1.0740)
Capital intension	-0.0002	-0.0001
	(-0.3676)	(-0.2776)
	Fixed effects	
_08Y-C	-0.0160	-0.0169
_09Y-C	0.0006	0.0014
_10Y-C	0.0019	0.0009
_11Y-C	0.0053	0.0069
_12Y-C	0.0069	0.0092

*Note: ***,**,and * indicate 99%,95%,90% of significance level respectively, the numbers in parentheses are t-statistical value.*

The related coefficient between ownership concentration and EID is 0.1825, and t-statistic value exhibit a higher value, accordingly ownership concentration has a significantly positive impact on EID at the 99% confident level. Corporate in heavy-pollution industries voluntarily disclose more environmental information with an increase of ownership concentration, this empirical result significantly support hypothesis 3. More concentrated ownership implies minority larger shareholders improve the abilities of controlling and supervising operation costs and environment-related costs and then enhance firms' efficiency and profitability. In recent years, Chinese government and public media have paid much attention to ecological environment protection, corporate in heavy-pollution industries face higher environmental and political risks. Larger controlling shareholders require that corporate should disclose more environmental information with an increase of ownership concentration, and reduce political and environmental risk induced by asymmetric market information. As a result, corporate with greater ownership concentration voluntarily disclose more environmental information, and then incline minority controlled shareholders' misunderstanding in environment-protection practices.

5 Conclusion

Based on 30 environmental information disclosure indicators in the sustainability reporting guidelines issued by the Global Reporting Initiative (GRI), we propose a quantitative estimation of environmental information disclosure for 671 corporate in eight heavy-pollution industries from 2008 to 2012. Corporate in heavy-pollution industries have larger differences in the content and degree of environmental information disclosure. The means and standard deviations of corporate EID exhibit an increasing trend in the period from 2008 to 2012, these empirical results show that corporate in heavy-pollution industries have greater divergent standpoint in voluntary environmental information disclosure. We propose the empirical effects of ownership structure on environmental information disclosure using unbalanced panel data samples in heavy-pollution industries from 2008 to 2012. Corporate with more institutional investors-owned ownership and ownership concentration have significantly positive effects on voluntarily environmental information disclosure at the 95% confidence level, while top managers-owned ownership have non-significantly negative effects on voluntarily EID. Corporate with greater institutional owners-owned ownership have to voluntarily disclose more environmental information, and have strong incentive to communicate with institutional owners firms' environmental achievements and reduce institutional owners' misunderstanding, and then strengthen their institutional owners' investment confidence. Minority larger shareholders have strong incentives to pursuit top managers make appropriate decisions in improving firms' efficiency and profitability, and maximizing their own interests, Corporate with greater ownership concentration should voluntarily disclose more environmental information.

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