



Impact of official assessment and political connections on corporate environmental information disclosure: evidence from state-owned enterprises in China's heavy-polluting industries

Zhichao Li¹ · Bojia Liu² · Yingjie Wei¹

Received: 31 January 2022 / Accepted: 25 March 2023 / Published online: 7 April 2023
© The Author(s), under exclusive licence to Springer Nature B.V. 2023

Abstract

The disclosure of information is a necessary tool for the management of severe environmental problems, revealing how resources are used and pollution managed. This article examines the connections between corporate executives' political connections and the quality of the environmental information their enterprises disclose. It also explores the regulatory role of the assessments of officials' environmental performance. Using panel data of 236 state-owned enterprises in heavy-polluting industries listed on the Shanghai and Shenzhen stock exchanges from 2012 to 2016, the results show that the political connection has a significant positive effect on improving the quality of the environmental information disclosure at the 5% confidence level, and every one level increase in the political connection will improve the level of corporate environmental information disclosure by 17.8%. And also, taking environmental performance as an evaluation category for promotion purposes had a significant positive adjustment effect on the relationship between the political connections of the leader of a state-owned enterprise and the quality of environmental information that enterprise disclosed at the 10% confidence level. As our findings suggest, the evaluation of the environmental information disclosed by enterprises in emerging economies such as China requires caution. The leaders of these companies are affected by economic incentives, but are also focused on the political incentives brought about by mandatory regulations. The research provides an empirical basis for the effectiveness of environmental regulation on environmental information disclosure and also helps to understand the impact of official assessment mechanism in China's environmental development.

Keywords State-owned enterprises · Official assessment · Political promotion · Political connection · Environmental information disclosure

✉ Bojia Liu
2013040958@ecupl.edu.cn

¹ School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai 200030, China

² School of Political Science and Public Administration, East China University of Political Science and Law, Shanghai 201620, China

1 Introduction

The disclosure of information is one of the most important mechanisms of environmental governance. It provides a direct channel for the government to obtain corporate information, and it is also a means by which the public can supervise the performance of corporate responsibility (Hassan et al., 2012). Since the 1970s, government departments in most countries have begun to intervene in the production and operation activities of enterprises and to use economic and legal means to monitor environmental behaviors. Since the 1990s, most European countries and the USA have successively established mandatory environmental information disclosure systems for industry, which has been proved to be an effective environmental regulation tool (Barbu et al., 2014). In recent years, developing countries, especially emerging economies such as Brazil and India, have also issued regulations on corporate environmental information disclosure (CEID) (Da Silva Santos et al., 2019, Pedron et al., 2017). This regulatory tool requires companies to disclose higher levels of environmental information, which is not only an important part of corporate social responsibility (Kolk et al., 2010), but also conducive to improving environmental governance by the government and to improved environmental quality.

The literature on environmental information disclosure mainly focuses on the relations among CEID, environmental performance and economic performance, oftentimes taking listed companies as the research object (Burritt et al., 2016; Jaggi et al., 2017). There has also been a growing body of research on the factors affecting environmental information disclosure. Cormier (2005) pointed out that the factors affecting environmental disclosure are multidimensional and are driven by multiple forces. They include external pressures such as public opinion (Luo et al., 2019) and institutional constraints (Geoffrey, 2007) as well as internal factors such as risks, ownership (Cormier et al., 2005), company size (Zeng et al., 2010), and governance structure among others (Brammer et al., 2006).

However, politics and commerce are often intertwined. Faccio (2006) found that in economic development, enterprises and governments generally have a political bond. China is no exception. In China, political connections are an important type of institutional capital; in that they can help companies overcome their weak positions (Li et al., 2015). First, the Chinese government has the power to nominate, appoint, and review the senior management personnel of all state-owned enterprises and has some control over resource allocations (Kato et al., 2011). If it has political relationships among officials and its executives, an enterprise will have a much easier time raising the funds needed for production and operation (Li et al., 2008). If that enterprise is unable to pay its debts, those connections make it easier to obtain government subsidies or allowances compared to those without established political relationships (Faccio, 2006; Zhang et al., 2014). Second, if a pollution accident occurs, those with political connections can often avoid punishment. As may be expected, this business–government relationship can even affect the disclosure of corporate environmental information. Using the principal-agent perspective, Rahman (2016) proposed that government ownership is a means of political connection, which has a positive and significant impact on corporate social responsibility disclosures. Huang (2018) came to a similar conclusion after studying the relationship between global corporate political connections and voluntary environmental disclosures; political connections will reduce the company's proprietary costs and prompt related companies to disclose more information. However, information quality

is sometimes more important than quantity. Cheng et al. (2017) found that the political relationship between the government and executives can help companies to more actively disclose their environmental information, but the availability and reliability of that information is unknown.

Compared with developed countries where a company is largely owned by diversified shareholders (Chau et al., 2002), Chinese state-owned enterprises are controlled by the central government or local governments for investment and participation. And their executives are appointed or nominated by the State-owned Assets Supervision and Administration Commission (SASAC). Although senior executives of state-owned enterprises are professional enterprise managers, they are more like government officials and have the characteristics of “quasi-officials.” Studies have shown that the incentive system is expected to improve the quality of environmental information disclosure. If target assessments are met, these executives can obtain promotions to serve in better state-owned enterprises or higher-level government departments (Cao et al., 2019). These political incentives are effective. The publicizing of promotion tournaments not only significantly improves corporate performance, but also incentivizes noneconomic goals and promotes corporate social responsibility (Kitzmueller et al., 2012). In line with stakeholder theory, Bebchuk (2002) proposes that a board of directors incentivizes its executives to achieve further social and environmental goals through increasing their salaries. On this basis, Mahoney (2006) found that a specific executive compensation structure effectively promotes the quality of environmental information disclosure in enterprises. However, previous studies mostly used data in the context of developed countries to link environmental information disclosure with economic performance. Regarding the influence mechanism between fiscal decentralization and the environment, environmental protection is becoming increasingly important component of an official’s professional assessment (Najaf et al., 2021; Shan et al., 2021). Executives with political connections tend to take greater risks to increase their opportunities to obtain political promotion (Ye et al., 2021).

Previous studies have preliminarily explored some relationships of the above three entities. Nevertheless, there are still some practical problems to be solved. First, few of the studies were able to consider the factors that affect the quality of the environmental information disclosure of state-owned enterprises from the perspective of political connection. Additionally, existing studies failed to analyze the impact mechanism of environmental protection assessment, ignoring the role of official assessment in promotion incentive, target setting and policy implementation. Therefore, this study aims to provide empirical evidence and specific policy implications for China to improve the quality of environmental information disclosure and environmental governance level and contributes to the literature in several ways. First, expanding the focus of enquiry into the political factors of information disclosure, this study tries to fill the literature gap by taking both of the official assessment and political connection as the explanatory variables. Meanwhile, taking the empirical analysis helps this study to reveal the complex relationships among official assessment, political connections and environmental information disclosure, which will help enrich the relevant research in the theoretical explanation of the internal impact transmission mechanism based on political factors.

In view of that, this empirical research investigated the factors promoting the level of CEID. Using data from 236 state-owned enterprises in China’s heavy-polluting industries, this study matched the political connections with the “implied political incentives” of the executives of these state-owned enterprises. The study fills a gap in the research on the impact mechanisms of CEID and has practical significance for both enterprise managers and policymakers. We first present the study’s underlying theoretical support and

hypotheses, and we then explain the study's research design, review our empirical analysis, and conclude by presenting our conclusions.

2 Theory and hypothesis

2.1 Political connection and corporate environmental information disclosure

Lindblom suggests that companies can obtain or maintain legitimacy in four ways (Gray et al., 1995).① By Informing the public about performance and activities through appropriate channels; ② By changing the public perceptions of corporate behavior without making actual changes; ③ By enhancing related activities to divert attention from controversial behaviors; ④ By changing public expectations of corporate performance. As environmental pollution becomes more serious, environmental protection is becoming a more important component of the performance assessments of government officials. In response, government departments will have to strengthen environmental supervision, reduce the importance of economic growth, and enforce more stringent environmental requirements. Therefore, publishing environmental information has become a way for enterprises to respond to the pressure for public legitimacy (Chen et al., 2010). To meet the government's environmental protection needs and maintain their own legitimacy, companies will inevitably highlight their "quasi-governmental" natures by increasing the quality of their disclosures to obtain and maintain organizational legitimacy. By focusing on a positive public image, these companies seek to gain the trust and support of the public. Chinese state-owned enterprises are hyper-conscious of how they are perceived by the public.

They must also protect their political connections (Wu et al., 2012). Compared to private enterprises, state-owned enterprises have more political relations, weaker budget constraints and easier access to government support. State-owned enterprises have natural political gene, first is government accounts for 51% or more in company ownership structure; second is that executives of state-owned enterprises are part of government structure, and they have political identity who are almost always former government officials or members of the National People's Congress and the China People's Political Consultative Conference (CPPCC) (Szamosszegi et al., 2011). Therefore, state-owned enterprise itself reflects the willingness of government. In addition to profitability goals, state-owned enterprises have many social goals like social management, solving unemployment etc., which are sometimes in conflict with efficiency ones. Executives with political connections are more concerned about the "political product" rather than economic interests. Hence, state-owned enterprises tend to disclose more environmental information to show incentives of environmental protection to meet the local officials' performance objectives and executives' personal promotion. Given the research background of this article, we believe that the level of environmental information disclosure of state-owned enterprises is subject to the influence of political relationships among the top executives of those enterprises and government officials.

In this context, among state-owned enterprises, two positions are important for our analysis: chairman and general manager. Their work functions, rights, and obligations are quite different. The chairman of the state-owned enterprise is mainly nominated by SASAC, which is part of the State Council. This body make major national decision on many issues; the general manager is mainly responsible for specific enterprise affairs (Goldeng et al., 2008).

Based on the above discussion, the first hypothesis is:

H1 Under the same conditions, a chairman of a state-owned enterprise with comparatively higher political relevance in a heavy-polluting industry will provide higher-quality CEID.

2.2 Official assessment and the quality of corporate environmental information disclosure

The theory of legitimacy posits that meaningful research on corporate issues must consider the political, social, and institutional framework in which corporate activity occurs (Gray et al., 1995). Regarding the quality of CEID, there have been studies that regard environmental disclosure under mandatory regulations as a legal means rather than an accountability mechanism (Patten, 2005). Environmental disclosures aim to meet the legitimate needs of stakeholders and to meet the government's growing concern about environmental issues. This theory has been doubly argued regarding China's state-owned enterprise system.

In 2016, the central government made environmental stewardship a component of the comprehensive evaluation of party and government officials and the appointment and removal of officials' awards and punishments (Wang et al., 2020). Various local governments have successively incorporated environmental protection assessments into the performance evaluation system of government officials, which has increased the weight of environmental protection assessments and determined the careers of officials (Wu et al., 2011). Consequently, firm disclosures are no longer limited to traditional accounting information. Companies have gradually disclosed more relevant environmental information to meet stakeholders' demands. The state-owned enterprises in heavy-polluting industries are no exception. Therefore, it can be said that the state-owned enterprises' disclosure of environmental information is a mandatory result. When government departments are included in environmental performance assessments, not only will state-owned enterprises themselves face greater pressure on environmental protection, but also state-owned enterprise executives will also face more direct political promotion pressures. To meet the needs of stakeholders and protect their ability to advance politically, state-owned enterprise executives will pay more attention to corporate environmental protection and disclose more detailed environmental information.

At this time, the legitimacy pressure is not only derived from environmental protection supervision. The greater the government's supervision of state-owned enterprises is, the greater the legal pressure faced by state-owned enterprises is. In addition, the government needs state-owned enterprises to protect the environment and take responsibility for governance. Therefore, once a province or a city includes environmental management in its performance assessments for its officials, these state-owned enterprises are likely to increase the level of environmental information disclosure and publicly reveal their environmental record. Meanwhile, to increase the possibility of political promotion, the chairmen of state-owned enterprises will significantly increase the level of CEID.

Based on the above discussion, the second hypothesis is proposed:

H2 After environmental assessment is included in the official performance assessment system, heavy-polluting state-owned enterprises with political connections will significantly improve the quality of CEID.

3 Research design

3.1 Sample selection and data sources

3.1.1 Sample selection

In this study, we chose the balanced, short-panel data from heavy-polluting state-owned enterprises listed on the Shanghai and Shenzhen stock exchanges from 2012 to 2016 as the research sample. Using as guides the “Catalog of Environmental Management Industry Classification Management for Listed Companies” and the “Guidelines for Industry Classification of Listed Companies” issued by the China Securities Regulatory Commission in 2012, we divided the heavy-polluting industries into 14: thermal power, steel, cement, electrolytic aluminum, coal, metallurgy, building materials, mining, chemical, pharmaceutical, light industry, textile, leather and petrochemical. The samples were screened as follows: We excluded nonstate-owned enterprises; we excluded the special treatment *ST, ST, SST* sample companies; to ensure the balance of panel data, we excluded those state-owned enterprises with incomplete data for the period 2007–2011; and we excluded state-owned enterprises with incomplete data on other variables. In the end, data from 236 state-owned enterprises were obtained for the period 2012–2016, with a total of 1,180 observations.

3.1.2 Data source

The Environmental Information Disclosure Quality Index (EID) provided data for each company’s environmental information disclosures. The environmental information of Chinese enterprises was mainly derived from the annual reports and social responsibility reports of state-owned enterprises. A small amount of data was supplemented by environmental reports and sustainable development reports. The data related to political connections and control variables came from the China Stock Market and Accounting Research Database (CSMAR). The dates when provinces and cities began incorporating environmental performance into the official assessment system were obtained through the local governments’ websites and Baidu.

3.2 Variable design

3.2.1 The explained variables

The data for the explained variables was derived through content analysis, the most commonly used method in the field of environmental information disclosure. With those results, the disclosure quality index of the sample companies was calculated. To use a disclosure-scoring methodology derived from content analysis, it is necessary to define what items are included and how they will be judged. By referring to the scoring standards and measurement ideas provided by Cormier and Magnan (2005), the environmental information was divided into ten major categories, such as corporate environmental technology development and environmental protection concepts and goals, and scored according to the qualitative and quantitative situation of the ten major categories of environmental information disclosure (Cheng et al., 2017). The specific scoring methods are shown in Table 1.

The calculation of the state-owned enterprise environmental information disclosure quality index EID is as follows:

Table 1 State-owned enterprise environmental information disclosure quality evaluation indicators and judging rules

Disclosure items	Disclosure of item content	Judging rules
I1	Enterprise environmental protection investment and environmental technology development	The enterprise's score in a certain project is calculated according to the following rules: 3—Monetary information; 2—Specific nonmonetary information; 1—General nonmonetary information; 0—Undisclosed. The total score of the company's disclosure quality is equal to the sum of the scores
I2	Policy grants, fiscal subsidy and tax reduction related to environmental protection	
I3	Emissions of corporate pollutants and their mitigation	
I4	Correlation of ISO environmental system certification	
I5	Ecological environment improvement measures	
I6	The impact of government environmental protection policies on enterprises	
I7	Environmental protection loans	
I8	Legal actions, compensation, fines and rewards related to environmental protection	
I9	The concept and goal of enterprise environmental protection	
I10	Other items related to income and expenditure related to the environment	

$$EID_{xy} = \sum_{i=1}^n SCID_{xiy} \quad (1)$$

Among them, EID_{it} is the total score of various environmental information disclosed by the state-owned enterprise x in the y -year. $SCID_{xiy}$ is the score of state-owned enterprise x in category i environmental information in year y ($i = 1, 2, \dots, 10$).

3.2.2 The explanatory variables

Political connections. In view of China's social and political circumstances, state-owned enterprises have direct political connections due to the ownership and management system (Zhang et al., 2019). Thus, we defined a state-owned enterprise as having political connections if its chairman has political experience. Since the chairman of state-owned enterprises are directly appointed by the government, this study adopted the assignment method (Cheng et al. 2017). That is, based on the political identity and administrative level of the chairman of the state-owned enterprise, the corresponding score is given to obtain the

degree of political connection (PC) of the state-owned enterprise every year. Among them, the political backgrounds of the chairmen of the state-owned enterprises can be divided into two categories. The first includes nongovernment officials who are or have served as deputies to the People's Congress (NPC deputies), members of the China People's Political Consultative Conference (CPPCC), and party representatives. The second category includes their current or former positions in the central, provincial, or local governments (Ahmad et al., 2019). The specific assignment methods are as follows:

For nongovernment officials.

- (a) Local NPC deputies, CPPCC members, party representatives—1 point;
- (b) county level—2 points;
- (c) municipal level—3 points;
- (d) provincial level—4 points;
- (e) national level—5 points for government officials.

One point for local department level, 2 points for county department level, 3 points for municipal department level, 4 points for ministerial level, and 5 points for country level. If the executive level of the current position of the chairman of the state-owned enterprise is lower than the administrative level of the previous position, the current year will be given a score for the administrative level of the highest position.

Official assessment. In 2012, provinces and cities incorporated environmental protection assessments into their official performance review system and included the scope of responsibilities of governments at all levels. Therefore, this article uses the specific year in which the relevant province began including this assessment for the sample state-owned enterprises. Data were obtained from either the official websites of various provincial governments or through Baidu News. A dummy variable, *inv*, was generated by year. For inclusion in year *t*, *inv* was 1, otherwise 0.

3.2.3 Control variables

Cormier (2005), Liu (2017), Wang (2019) and other scholars have confirmed that the size of the company is positively related to the quality of the company's disclosures. The profitability and debt level of an enterprise will also affect the quality of the disclosed information; but the research from China and abroad has not reached a consistent conclusion. For example, Bowman (1976), Elshabasy (2018), Ahmad (2019) and other studies found that environmental information disclosure is positively correlated with profitability; Freedman and Jaggi (1982) proved that the two are negatively correlated. With regard to the level of debt, companies with more debt are more motivated to disclose higher quality environmental information to obtain the trust of creditors and shareholders (Fonseka et al., 2019), but may also reduce environmental risks that negatively affect the company to reduce financial risks (Andrikopoulos et al., 2013), (Déjean et al., 2009). Studies have shown that profitability has no significant relationship with the level of environmental information disclosed (Hackston et al., 1996). Zeng (2010) and Rupley (2012) confirmed that board size and the proportion of independent directors have significant effects on environmental information disclosure. In addition, other company characteristics, such as ownership concentration (Li et al., 2017) and executive shareholding ratio (Nagar et al., 2003), will also affect the quality of corporate environmental information disclosures. To verify the assumptions in

Table 2 Description of study variables

Variable type	Variable name	Variable symbol	Variable definitions
Explained variable	Quality of corporate environmental information disclosure	EID	Using content analysis
Explanatory variables	Political connection	PC	Sample company chairman's political background rank assignment method
	Official assessment	inv	Dummy variable of time (when the provinces and cities where <i>i</i> sample state-owned enterprises are located include environmental performance in the promotion mechanism of officials, inv is 1, otherwise it is 0)
Control variable	CEO duality	same	The value of the concurrent chairman and CEO is 2, otherwise it is 1
	Company Size	scale	Logarithm of total assets at the end of the period
	Return on Equity	roe	Net profit at the end of the period/total assets at the end of the period
	Independent director ratio	idp	Number of independent directors/number of boards
	Assets and liabilities	rlta	Total liabilities at the end of the period/total assets at the end of the period
	Board size	board	Number directors on the board
	Shareholding of large block holder	top	Number of shares held by the largest shareholder/total shares

H1 and H2, this study controlled for the influence of the above factors. See Table 2 for a description of relevant research variables and their calculations.

3.3 Model Design

Based on the above ideas, this article designed the following two models:

The regression model of H1 to be tested is as follows:

$$EID_{it} = \alpha_i + \beta_1 PC_{it} + \beta_2 same_{it} + \beta_3 scale_{it} + \beta_4 roe_{it} + \beta_5 idp_{it} + \beta_6 rlta_{it} + \beta_7 board_{it} + \beta_8 top_{it} + \varepsilon_{it} \quad (2)$$

The regression model of H2 to be tested is as follows:

$$EID_{it} = \alpha_i + \beta_1 PC_{it} + \beta_2 PC_{it} \times inv_{it} + \beta_3 same_{it} + \beta_4 scale_{it} + \beta_5 roe_{it} + \beta_6 idp_{it} + \beta_7 rlta_{it} + \beta_8 board_{it} + \beta_9 top_{it} + \varepsilon_{it} \quad (3)$$

Table 3 Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum value	Maximum
EID	1,180	6.72	4.17	0	20
PC	1,180	0.98	1.73	0	5
same	1,180	1.88	0.33	1	2
scale	1,180	22.75	1.42	19.91	28.51
Roe	1,180	0.03	0.06	-0.28	0.31
idp	1,180	0.37	0.05	0.25	0.67
rlta	1,180	0.47	0.19	0.04	0.93
Board	1,180	9.35	2.00	3	18
top	1,180	0.39	0.16	0.04	0.94

Table 4 State-owned enterprise executive political connection

Political relevance score	Observed value	Percentage (%)
0	859	72.80
1	10	0.85
2	62	5.25
3	74	6.27
4	71	6.02
5	104	8.81
sum	1180	100

4 Results and discussion

4.1 Descriptive statistics

Table 3 displays the results after statistical analysis of each variable. The maximum value of the EID index of the sample state-owned enterprises is 20, the minimum value is 0, the standard deviation is 4.17, and the average value is 6.72. This shows that there are significant differences in the quality of environmental information and disclosure of different state-owned enterprises, and the overall level of environmental information disclosed by the sample state-owned enterprises is low. In addition, the maximum value of political correlation is 5, the minimum value is 0, the standard deviation is 0.33, and the average value is 0.98. Whether this association will affect the quality of the corporate environmental information disclosed is the research question of this article. The collinearity among variables shows that the variance inflation factor (VIF) was much smaller than 10, indicating there was no significant collinearity between variables. Table 4 shows the political connection ratio of state-owned enterprise executives. As seen from the table, 72.80% of the sample state-owned enterprise executives have no political relationship. However, among the state-owned enterprises with political connections, most executives are at a higher administrative level, are located at the department level, city level, and above (3 points and above), and have strong political connections. They account for 15.1% of the total sample.

Table 5 Regression results of the main effect and adjustment effect

The quality of environmental information disclosure as a dependent variable	Model 1	Model 2
Pc	0.178** (0.023)	0.169** (0.037)
Pc × inv		0.198* (0.082)
same	0.058 (0.833)	0.034 (0.905)
roe	-3.006 (0.149)	-2.984 (0.158)
scale	2.711*** (0.004)	2.732*** (0.005)
idp	-0.787 (0.621)	-1.021 (0.470)
rlta	-1.691 (0.171)	-1.737 (0.164)
board	-0.251** (0.028)	-0.257** (0.022)
top	-3.493*** (-0.003)	-3.460*** (0.004)
Constant	-50.384 (0.010)	-50.650 (0.010)
N	1180	1180
Adj_R ²	0.09	0.09

The regression coefficient is outside the brackets, and the standard error is inside the brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.2 Regression results and analysis

In Table 5, we present the results for hypothesis H1 and H2. To test for hypothesis H1, the balanced short-panel regression method was selected. For the adjustment effect test, that is, hypothesis H2, we chose to add interactive items to the model. To avoid multicollinearity, the interaction items were centralized before they were added. That is, the low-order items are subtracted from the sample mean before constructing the interactive items. Meanwhile, the generational regression model of the low-order items was constructed after subtracting the mean. In terms of model selection, first through the random effects test and then the Hausman test, the final test results indicate that the fixed effects model should be used. To overcome possible heteroscedasticity, sequence correlation and cross-section correlation were used during the panel regression. Based on the work of He and Xu, we used the fixed effect estimation method of the Driscoll-Kraay standard error for estimations (He et al., 2016).

The second column in Table 5 displays the regression result of the H1 model. The political connection and the quality of the environmental information disclosure are significant at the level of 5%; and there is a positive correlation between the two. These results corroborate H1 of the present study; when other conditions are the same, the chairman of the state-owned enterprise with higher political connections in a heavy-polluting industry will provide higher quality of CEID. In other words, according to the results, with the strengthening of the governmental supervision over environmental regulation, the heavy-polluting state-owned enterprises with political connections are more inclined to improve the quality of their information disclosures under the specific institutional environment. The relationship is as follows: the stronger the degree of political connection, the higher the quality of disclosure.

Table 5's third column presents the regression results of the H2 model. We proposed that there was a relationship between the political connections of the chairmen of the sample state-owned enterprises and the level of disclosure when environmental assessment

Table 6 Robustness test

Dependent variable	Model 1	Model 2
Pc1	0.824** (0.023)	0.774** (0.039)
Pc1 × inv		1.159* (0.055)
same	0.060 (0.832)	0.024 (0.934)
Roe	-2.931 (0.157)	-2.863 (0.171)
scale	2.685*** (0.005)	2.717*** (0.005)
idp	-0.973 (0.555)	-1.202 (0.408)
rlta	-1.687 (0.174)	-1.767 (0.165)
Board	-0.257** (0.027)	-0.265** (0.019)
top	-3.630*** (0.003)	-3.592*** (0.005)
Constant	-49.647** (0.011)	-50.134** (0.011)
N	1180	1180
Adj_R ²	0.09	0.09

The regression coefficient is outside the brackets, and the standard error is inside the brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

was included in the evaluation system. After adding the interactive item “political connection × official assessment,” and although the significance of the main effect was weakened to a certain extent, the interactive item is significant at the 10% level. This result can be explained by noting that after the environmental performance, assessment was included in the assessment process, the state-owned enterprises with political connections significantly improved their disclosure levels, at least at the 10% level in Model 2, suggesting that assessment pressure had a moderating effect, and the relationship between the political association and the quality of corporate environmental information disclosure is a significant positive adjustment. The result provide evidence to H2. H2 is therefore confirmed. It can be interpreted from the results that the new official assessment and its effect on promotion pressure have played an important role. Based on this result, it is important to note that the chairmen of the state-owned enterprise with political affiliation can get promotion incentives from the assessment mechanism. Improving the quality of the environmental information the company discloses can improve assessment results and expand political promotion opportunities. This mechanism may improve cooperation between government and industry so that environmental information can also be improved.

In addition, our control variables revealed some interesting results. In Table 5, except the CEO duality and the asset-liability ratio, other control variables show significant effects on environmental information disclosure. In terms of the organizational type, there is revealed a positive correlation between company size and state-owned enterprise disclosure quality at the level of 1%. Among financial factors we considered, the coefficients of size of the board of directors and the shareholding ratio of the largest shareholder, are significantly negatively correlated to the quality of disclosure.

4.3 Robustness test

Results reported in Table 6 provide a further test, the robustness of the results; we used the dummy variable method to measure political connections. For state-owned enterprises with political relevance, 1 point was assigned, and for state-owned enterprises without political relevance, 0 points were assigned. The balanced short-panel regression was then

performed again. As shown in Table 6, the results are basically consistent with the results in Table 5. The results of this study are therefore robust. This results also reinforce the fact that political connections can effectively improve the level of information disclosure under the appropriate performance assessment mechanism.

5 Conclusion

By using political connections and official assessment as explanatory variables, our research reveals the subtle details of mandatory disclosure considerations from 236 heavy-polluting state-owned enterprises listed on the Shanghai and Shenzhen stock exchanges from 2012 to 2016. The key results are as follows: First, it verified that the relationship between government and business has a positive effect on environmental disclosure at the 5% significance level. Compared with enterprises without political connections, enterprises with political connections improve the level of information disclosure by 17.8% for each level of political connection. Government mandatory performance appraisal will also have an effect on corporate environmental disclosure at the 10% significance level. In the context of increasing attention to environmental protection, the government's integration of environmental protection into the performance evaluation mechanism of local officials is conducive to improving the level of corporate environmental information disclosure. Second, among the chairpersons of heavy-polluting state-owned enterprises, there is much more concern about political promotion. Under this pressure, they tend to engage in behaviors that are conducive to environmental protection and disclose more full and detailed environmental information to protect the reputation of the company and their own careers. However, the previous literature has rarely considered this factor. The findings of this study enhance our understanding of the impact of political factors such as political connections and official assessment in corporate's environmental behaviors. Political connections are common in developed and developing countries, and extensive incentives exist to adjust enterprises' decision. Our findings indicate that the measures need to be taken to improve the level of environmental information disclosure. We believe that these findings can provide implications for countries with state-owned enterprises.

Based on the above findings, this study provides guidance for both the government and state-owned enterprises and puts forward the following implications. First, environmental information disclosure and compliance guidance should be strengthened for state-owned enterprises. Existing studies on the internal nature of companies and environmental information disclosure are mostly concentrated on companies in developed countries; they focus on company size, proportion of independent directors, and shareholding ratio of executives, all of which have certain effects on the level of environmental information disclosure (Zheng et al., 2020, Rupley et al., 2012). In this study, the state-owned enterprises are dominated by government ownership; company size, board size, and shareholding by a large block holder have significant, positive effects on the quality of environmental information they disclose. This explains why state-owned enterprises disclose a higher level of environmental information. Their leaders are under political pressure to protect the environment. If they have few political connections; there is less pressure and the quality of information they disclose is lower. However, it was also found that the proportion of independent directors had no significant effect on state-owned enterprises. Research of enterprises in developed countries found the opposite. Therefore, we believe that the independent director system of state-owned enterprises in China is different from developed countries such

as Britain and the USA. Most developed countries do not require mandatory disclosures of environmental information. However, the recent changes in environmental regulations in China require such mandatory disclosure, and our research provides supporting evidence that state-owned enterprises in China lack a certain degree of independence; the incentive mechanism is relatively simple; and it is unlikely to have a significant impact on corporate behavior. Furthermore, heavy-polluting industries ought to be guided to play a leading role in implementing environmental responsibility. Environmental incentives such as certain tax reductions and diversified assessment should be provided to encourage companies to further enhance their disclosure level.

Second, steps need to be taken to move environmental regulation from compulsory to voluntary development. The government regards the disclosure of environmental information as a legitimate tool and an effective method. It imposes legal controls on state-owned enterprises and forces state-owned enterprises to disclose some quantitative environmental information. However, in this empirical study, we found that the sample state-owned enterprises emphasized different information. Most companies selectively disclosed that information with good environmental performance and avoided anything negative that might trigger regulatory penalties. In terms of disclosure methods, there are still some state-owned enterprises that have not issued separate social responsibility reports, and most state-owned enterprises only publish this type of information in their annual reports. Generally, the level of disclosure of environmental information varies in state-owned enterprises in heavy-polluting industries. This validates Patten (2017)'s "soft" information. This reflects the true state of environmental management. The disclosure of environmental information in China is still in its infancy; enterprises' disclosure activities still need to be regulated and guided. In fact, such a mandatory practice increases information uncertainty and adversely affects the confidence of customers and investors. In developed countries, the interest-driven model promotes voluntary disclosure to enhance the accuracy of relevant information to attract more investments so that enterprise value increases. But in developing countries, laws and regulations related to environmental information, corporate environmental accounting standards, and implementation are inconsistent and rely heavily on mandatory regulations. The political demands of corporate executives and moving from compulsory to voluntary development are the next steps for research.

Additionally, central government should pay more attention to the optimization of official assessment. As the results showed earlier, to expand the positive interactive effect of official assessment, the most efficient way to improve the quality of environmental information disclosure in a certain local region is to link environmental performance with promotions since both local officials and the chairman of an enterprise who has political connections need to respond to promotion incentives by this pressure conduction mechanism. By improving the performance evaluation for local officials, the balance between incentive effect and social utility may be formed. Thus, the priority for central government is formulate evaluative indicators for measuring the level of environmental information disclosure to make local governments and enterprises pay greater attention on it. To ensure the operation of this measure, the central government should also continue to optimize the performance evaluation criteria for officials and establish the right incentives to enable effective implementation of environmental regulations and continuous improvement in the reliability and truthfulness of government performance. Furthermore, officials should be guided to play the role of leaders in social governance, which requires that officials not only pay attention to the economic performance under the short-term incentive effect, but also take action to regulate and supervise environmental information disclosure.

Nevertheless, limitations remain in this study. First, the sample data comes from heavy-polluting state-owned enterprises. Other A-share listed companies that were also heavy

polluters were not considered. Also, for regulatory purposes, the environmental information disclosed by this industry is more detailed than other industries. Therefore, the environmental information disclosure index used in this article is not representative of the quality or the amount of information disclosed by enterprises in all industries. Second, the content composition and weight setting of the variable EID index required subjective judgment because the content analysis method was used. Meanwhile, we only analyzed the environmental information disclosed in the annual reports and social responsibility reports of the sample state-owned enterprises. Environmental information could also be obtained through independent environmental reports, company websites, prospectuses, and temporary announcements. This may affect the accuracy of the disclosure quality calculation of the sample state-owned enterprises to a certain extent.

Given this study's limitations and the complex nature of business environment, it is reasonable to have the following recommendations for further study. First, this study provides the ground for further research in which listed state-owned enterprises in China are examined for their levels of EID. Therefore, future research can consider using a larger range of data. Starting from corporate survey data or other sources, it is worth exploring the quality of environmental information disclosure by region and industry. Meanwhile, it is also recommended that taking multi-theoretical lens such as economic incentives and institutional theory to seek more initial factors and study other impact paths of environmental information disclosure to improve the quality of environmental information disclosure.

Author contributions All authors read and approved the current version of manuscript for publication.

Funding This work was funded by the National Natural Science Foundation of China [Grant No.71974057] and 'Shu Guang' project [Grant No. 21SG49] supported by Shanghai Municipal Education Commission and Shanghai Education Development Foundation.

Data availability Data set(s) associated with the manuscript will be available on request.

Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Ahmad, N., Li, H. Z., & Tian, X. L. (2019). Increased firm profitability under a nationwide environmental information disclosure program? Evidence from China. *Journal of Cleaner Production*, 230, 1176–1187. <https://doi.org/10.1016/j.jclepro.2019.05.161>
- Andrikopoulos, A., & Krikliani, N. (2013). Environmental disclosure and financial characteristics of the firm: The case of Denmark. *Corporate Social Responsibility and Environmental Management*, 20(1), 55–64. <https://doi.org/10.1002/csr.1281>
- Barbu, E. M., Dumontier, P., Feleagă, N., & Feleagă, L. (2014). Mandatory environmental disclosures by companies complying with IASs/IFRSs: The cases of France, Germany, and the UK. *The International Journal of Accounting*, 49(2), 231–247. <https://doi.org/10.1016/j.intacc.2014.04.003>
- Bebchuk, L. A., Fried, J. M., & Walker, D. I. (2002). Managerial power and rent extraction in the design of executive compensation (No. w9068). *National Bureau of Economic Research*. <https://doi.org/10.3386/w9068>

- Blanc, R., Islam, M. A., Patten, D. M., & Branco, M. C. (2017). Corporate anti-corruption disclosure: An examination of the impact of media exposure and country-level press freedom. *Accounting, Auditing and Accountability Journal*, 30(8), 1746–1770. <https://doi.org/10.1108/AAAJ-02-2015-1965>
- Bowman, E. H., & Haire, M. (1976). Social impact disclosure and corporate annual reports. *Accounting Organizations and Society*, 1(1), 11–21. [https://doi.org/10.1016/0361-3682\(76\)90004-0](https://doi.org/10.1016/0361-3682(76)90004-0)
- Brammer, S., & Pavelin, S. (2006). Voluntary environmental disclosures by large UK companies. *Journal of Business Finance & Accounting*, 33(7–8), 1168–1188. <https://doi.org/10.1111/j.1468-5957.2006.00598.x>
- Burritt, R. L., Christ, K. L., & Omori, A. (2016). Drivers of corporate water-related disclosure: Evidence from Japan. *Journal of Cleaner Production*, 129, 65–74. <https://doi.org/10.1016/j.jclepro.2016.04.119>
- Cao, X., Lemmon, M., Pan, X., Qian, M., & Tian, G. (2019). Political promotion, CEO incentives, and the relationship between pay and performance. *Management Science*, 65(7), 2947–2965. <https://doi.org/10.1287/mnsc.2017.2966>
- Chau, G. K., & Gray, S. J. (2002). Ownership structure and corporate voluntary disclosure in Hong Kong and Singapore. *The International Journal of Accounting*, 37(2), 247–265. [https://doi.org/10.1016/S0020-7063\(02\)00153-X](https://doi.org/10.1016/S0020-7063(02)00153-X)
- Chen, J. C., & Roberts, R. W. (2010). Toward a more coherent understanding of the organization–society relationship: A theoretical consideration for social and environmental accounting research. *Journal of Business Ethics*, 97(4), 651–665. <https://doi.org/10.1007/s10551-010-0531-0>
- Cheng, Z., Wang, F., Keung, C., & Bai, Y. (2017). Will corporate political connection influence the environmental information disclosure level? Based on the panel data of A-shares from listed companies in shanghai stock market. *Journal of Business Ethics*, 143(1), 209–221. <https://doi.org/10.1007/s10551-015-2776-0>
- Cormier, D., Magnan, M., & VelthovenVan, B. (2005). Environmental disclosure quality in large German companies: Economic incentives, public pressures or institutional conditions? *European Accounting Review*, 14(1), 3–39. <https://doi.org/10.1080/0963818042000339617>
- Da Silva Santos, L. M., Glauco Lopes, L. W., Da Silva, W. V., Bach, T. M., & Da Veiga, C. P. (2019). Explanatory factors of the environmental disclosure of potentially polluting companies: Evidence from Brazil. *SAGE Open*, 9, 1–14.
- Déjean, F., & Martinez, I. (2009). Environmental disclosure and the cost of equity: The French case. *Accounting in Europe*, 6(1), 57–80. <https://doi.org/10.1080/17449480902896403>
- Elshabasy, Y. N. (2018). The impact of corporate characteristics on environmental information disclosure: an empirical study on the listed firms in Egypt. *Journal of Business and Retail Management Research*, 12(2), 232–241.
- Faccio, M. (2006). Politically connected firms. *American Economic Review*, 96(1), 369–386. <https://doi.org/10.1257/000282806776157704>
- Fonseka, M., Rajapakse, T., & Richardson, G. (2019). The effect of environmental information disclosure and energy product type on the cost of debt: Evidence from energy firms in China. *Pacific-Basin Finance Journal*, 54, 159–182. <https://doi.org/10.1016/j.pacfin.2018.05.001>
- Freedman, M., & Jaggi, B. (1982). Pollution disclosures, pollution performance and economic performance. *Omega*, 10(2), 167–176. [https://doi.org/10.1016/0305-0483\(82\)90051-2](https://doi.org/10.1016/0305-0483(82)90051-2)
- Geoffrey, R. F. (2007). The introduction of mandatory environmental reporting guidelines: Australian evidence. *ABACUS-A Journal of Accounting Finance and Business Studies*, 43, 190–216. <https://doi.org/10.1111/j.1467-6281.2007.00225.x>
- Goldeng, E., Grünfeld, L. A., & Benito, G. R. (2008). The performance differential between private and state owned enterprises: The roles of ownership, management and market structure. *Journal of Management Studies*, 45(7), 1244–1273. <https://doi.org/10.1111/j.1467-6486.2008.00790.x>
- Gray, R., Kouhy, R., & Lavers, S. (1995). Corporate social and environmental reporting: A review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing and Accountability Journal*, 8(2), 47–77. <https://doi.org/10.1108/09513579510146996>
- Hackston, D., & Milne, M. J. (1996). Some determinants of social and environmental disclosures in New Zealand companies. *Accounting, Auditing & Accountability Journal*, 9(1), 77–108. <https://doi.org/10.1108/09513579610109987>
- Hassan, A., & Ibrahim, E. (2012). Corporate environmental information disclosure: Factors influencing companies' success in attaining environmental awards. *Corporate Social Responsibility and Environmental Management*, 19(1), 32–46. <https://doi.org/10.1002/csr.278>
- He, Z. X., Xu, S. C., Shen, W. X., Long, R. Y., & Chen, H. (2016). Factors that influence corporate environmental behavior: Empirical analysis based on panel data in China. *Journal of Cleaner Production*, 133, 531–543. <https://doi.org/10.1016/j.jclepro.2016.05.164>

- Hung, M., Kim, Y., & Li, S. (2018). Political connections and voluntary disclosure: Evidence from around the world. *Journal of International Business Studies*, 49(3), 272–302. <https://doi.org/10.1057/s41267-017-0139-z>
- Jaggi, B., Allini, A., Macchioni, R., & Zagaria, C. (2017). The factors motivating voluntary disclosure of carbon information: Evidence based on Italian listed companies. *Organization & Environment*, 31, 178–202.
- Kato, T., & Long, C. (2011). Tournaments and managerial incentives in China's listed firms: New evidence. *China Economic Review*, 22(1), 1–10. <https://doi.org/10.1016/j.chieco.2010.08.001>
- Kitzmueller, M., & Shimshack, J. (2012). Economic perspectives on corporate social responsibility. *Journal of Economic Literature*, 50(1), 51–84. <https://doi.org/10.1257/jel.50.1.51>
- Kolk, A., & TulderVan, R. (2010). International business, corporate social responsibility and sustainable development. *International Business Review*, 19(2), 119–125. <https://doi.org/10.1016/j.ibusrev.2009.12.003>
- Li, H., Meng, L., Wang, Q., & Zhou, L. A. (2008). Political connections, financing and firm performance: Evidence from Chinese private firms. *Journal of Development Economics*, 87(2), 283–299. <https://doi.org/10.1016/j.jdeveco.2007.03.001>
- Li, L., Liu, Q., Tang, D., & Xiong, J. (2017). Media reporting, carbon information disclosure, and the cost of equity financing: Evidence from China. *Environmental Science and Pollution Research*, 24(10), 9447–9459. <https://doi.org/10.1007/s11356-017-8614-4>
- Li, S., Song, X., & Wu, H. (2015). Political connection, ownership structure, and corporate philanthropy in China: A strategic-political perspective. *Journal of Business Ethics*, 129(2), 399–411. <https://doi.org/10.1007/s10551-014-2167-y>
- Liu, X., & Zhang, C. (2017). Corporate governance, social responsibility information disclosure, and enterprise value in China. *Journal of Cleaner Production*, 142, 1075–1084. <https://doi.org/10.1016/j.jclepro.2016.09.102>
- Luo, W., Guo, X., Zhong, S., & Wang, J. (2019). Environmental information disclosure quality, media attention and debt financing costs: Evidence from Chinese heavy polluting listed companies. *Journal of Cleaner Production*, 231, 268–277. <https://doi.org/10.1016/j.jclepro.2019.05.237>
- Mahoney, L. S., & Thorn, L. (2006). An examination of the structure of executive compensation and corporate social responsibility: A Canadian investigation. *Journal of Business Ethics*, 69(2), 149–162. <https://doi.org/10.1007/s10551-006-9073-x>
- Nagar, V., Nanda, D., & Wysocki, P. (2003). Discretionary disclosure and stock-based incentives. *Journal of Accounting & Economics*, 34(1–3), 283–309. [https://doi.org/10.1016/S0165-4101\(02\)00075-7](https://doi.org/10.1016/S0165-4101(02)00075-7)
- Najaf, I., Kashif, R., Riazullah, S., Wan, G., Munir, A., & Kai, T. (2021). Does exports diversification and environmental innovation achieve carbon neutrality target of oecd economies? *Journal of Environmental Management*. <https://doi.org/10.1016/j.jenvman.2021.112648>
- Patten, D. M. (2005). The accuracy of financial report projections of future environmental capital expenditures: A research note. *Accounting Organizations and Society*, 30(5), 457–468. <https://doi.org/10.1016/j.aos.2004.06.001>
- Pedron, M., Mishra, T., & Kalro, A. D. (2017). Environmental disclosure by Indian companies: An empirical study. *Environment, Development and Sustainability*, 19, 1999–2022. <https://doi.org/10.1007/s10668-016-9840-5>
- Rahman, K. S. (2016). Domination, democracy, and constitutional political economy in the new gilded age: Towards a fourth wave of legal realism?. *Texas Law Review*.
- Rupley, K. H., Brown, D., & Marshall, R. S. (2012). Governance, media and the quality of environmental disclosure. *Journal of Accounting and Public Policy*, 31(6), 610–640.
- Shan, S., Ahmad, M., Tan, Z., Adebayo, T., Li, R., & Kirikkaleli, D. (2021). The role of energy prices and non-linear fiscal decentralization in limiting carbon emissions: Tracking environmental sustainability. *Energy*. <https://doi.org/10.1016/j.energy.2021.121243>
- Szamosszegi, A., & Kyle, C. (2011). An analysis of state-owned enterprises and state capitalism in China. In *Capital Trade, Incorporated for US-China Economic and Security Review Commission*.
- Wang, J., & Zhang, B. (2019). Quality of environmental information disclosure and enterprise characteristics: Based on heavily polluted industries of A-share in the Shanghai Stock Exchange. *Management of Environmental Quality*, 30(5), 963–979. <https://doi.org/10.1108/MEQ-11-2018-0194>
- Wang, Y., Cao, H., Yuan, Y., & Zhang, R. (2020). Empowerment through emotional connection and capacity building: public participation through environmental non-governmental organizations. *Environmental Impact Assessment Review*, 80, 106319.1–106319.9. <https://doi.org/10.1016/j.eiar.2019.106319>
- Wu, J., Chang, I. S., Bina, O., Lam, K. C., & Xu, H. (2011). Strategic environmental assessment implementation in China - 5-year review and prospects. *Environmental Impact Assessment Review*, 31, 77–84. <https://doi.org/10.1016/j.eiar.2010.04.010>

- Wu, W., Wu, C., Zhou, C., & Wu, J. (2012). Political connections, tax benefits and firm performance: Evidence from China. *Journal of Accounting and Public Policy*, 31(3), 277–300. <https://doi.org/10.1016/j.jaccpubpol.2011.10.005>
- Ye, F., Quan, Y. B., He, Y. X., & Lin, X. F. (2021). The impact of government preferences and environmental regulations on green development of China's marine economy. *Environmental Impact Assessment Review*, 87, 106522. <https://doi.org/10.1016/j.eiar.2020.106522>
- Zeng, S. X., Xu, X. D., Dong, Z. Y., & Tam, V. W. (2010). Towards corporate environmental information disclosure: An empirical study in China. *Journal of Cleaner Production*, 18(12), 1142–1148. <https://doi.org/10.1016/j.jclepro.2010.04.005>
- Zhang, H., Li, L., Zhou, D., & Zhou, P. (2014). Political connections, government subsidies and firm financial performance: Evidence from renewable energy manufacturing in China. *Renewable Energy*, 63, 330–336. <https://doi.org/10.1016/j.renene.2013.09.029>
- Zhang, L., Ye, F., Yang, L., & Zhou, G. (2019). Impact of political connections on corporate environmental performance: From a green development perspective. *Sustainability*. <https://doi.org/10.3390/su11051317>
- Zheng, Y., Ge, C., Li, X., Duan, X., & Yu, T. (2020). *Journal of Environmental Management*, 270, 110671. <https://doi.org/10.1016/j.jenvman.2020.110671>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.