



Research on the Influence Mechanism of Government Regulation and Media Attention on Corporate Water Information Disclosure

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Abstract: Enterprises as an important component of modern economy and society, on the one hand is the direct creator of the social wealth, promoted the rapid development of our industrial economy. On the other hand, it is also the main producer of environmental pollution, which has caused serious ecological problems, which forces human beings to explore the road of common development of economic construction and environmental governance. The full disclosure of environmental management results is a prerequisite for environmental governance. Enterprises make selective disclosure for the purpose of satisfying external legitimacy, so external environmental supervision has become an important driving factor for corporate water information disclosure. On the basis of relevant research results, this paper combines related concepts of environmental information disclosure and basic theories such as organizational legitimacy theory, signal transmission theory, information asymmetry theory and stakeholder theory. Firstly, in the theoretical analysis part, from the perspective of government, media and enterprise utility, based on the principle of utility maximization, this paper introduces the following methods: A mixed game theoretical framework of government supervision, media reports and corporate water information disclosure was constructed to clarify the heterogeneous disclosure behavior of enterprises under the pressure of external environmental supervision. Secondly, A-share listed companies in water-sensitive industries in Shanghai and Shenzhen from 2015 to 2019 are selected as samples to construct mandatory and selective disclosure content indicators of corporate water information, and empirically analyze the influence of external pressures of government supervision and media reports on the disclosure content of heterogeneous water information of enterprises. Finally, according to the relevant theories and empirical analysis results, the research conclusions and relevant suggestions are put forward.

Key words: government regulation, number of media reports, tendency of media reports, corporate water information disclosure



1 Introduction

In recent years, with the rapid development of national economy and the increasing improvement of residents' living standards, people's expectations for environmental quality have also increased, and governments around the world have paid more attention to environmental issues. Today, more than 2.1 billion people in the world cannot access safe drinking water, and more than 1/3 of the world's population is affected by water shortage. The concept of "green governance" has attracted much attention. In this context, since 2013, China has put forward environmental protection strategies such as "Marine power", "Jinshan Yinshan" and "Yangtze River Protection", and promulgated specific policy documents such as "Water Ten" and "Water pollution Prevention and Control Action Plan" in 2015, sounding the horn of the "defense war" of water environment governance. According to law on time and truthfully, and the multi-party cooperative management mechanism will be effectively operated, and supervision and punishment measures will be strictly implemented. However, in reality, the information disclosure behavior of enterprises is mandatory and voluntary. In the periodic reports of enterprises, the content of environmental information disclosed is mainly "soft information", while the "hard information" of environmental performance indicators is less^[1]. For example, in the red well incident in Cangxian County in 2013, there was an aniline test in the water quality sample, and its highest content was 73.3 times that of the drinking water standard (0.1mg/l), but the company claimed that it was qualified by the environmental protection department. This shows that the content of enterprise information disclosure has great subjective selectivity, and the disclosure content is divided into mandatory and selective, which determines the quality of water information disclosure.

In February 2021, the United Nations Environment Program reported that the water crisis has become one of the three major environmental crises of nature, and China also proposed the goal of solidly promoting the protection of blue water in the 2022 ecological environment protection work conference. However, water pollution continues to be prohibited repeatedly, and there are still problems such as water supply shortage, scale diffusion of water pollution and excessive discharge of industrial wastewater caused by production behaviors of enterprises^[2]. The motivations for enterprises to disclose water information mainly include: coping with the pressure of legitimacy, preventing reputation loss and fulfilling environmental responsibility^[3-4]. Water information disclosure is helpful for the government and the public to fully understand the water behavior of enterprises and give full play to their external governance role. Help enterprises reduce water risks, gain the trust of the government and society, and establish a positive image; It is also conducive to the disclosure of resource trading market information



and optimization of water resource allocation^[5]. How can enterprises "justify" their environmental behavior through the disclosure of water management information to resolve business risks? In-depth research on the mechanism of external environmental supervision on the content of heterogeneous water information disclosure is of great practical significance for promoting enterprises' standardized and rational water use.

2 Theoretical analysis and research hypothesis

This paper divides the content of water information disclosure into two dimensions: selective and mandatory^[6-7], and studies the impact of government regulation, the number of media reports and the tendency of reports on the disclosure content of enterprises.

2.1 Game between government and enterprise

It is assumed that in order to maintain social reputation, the actual level of water management violations is not lower than the level regulated by the government, and the enterprise "justifies" its own legitimacy to the outside world in the way of water information disclosure. Suppose that the government supervises the water behavior of enterprises through the environmental control policy of imposing fees and fines on the water management behavior of units, and the enterprises need to pay environmental fees according to the water pollution behavior of the current period, and pay fines for the water behavior of the current period. Due to the limitation of government resources and the asymmetry of internal and external information of enterprises, only some enterprises' water behavior can be regulated by the government. α is used to represent the government's supervision of enterprises' water environment behavior, and the proportion of the number of enterprises regulated by the government in each period in the total number of enterprises in the industry/region is calculated. There is certain information asymmetry between enterprises and governments. Companies have complete knowledge of their own behavior and that of the government, but the government does not have complete knowledge of the behavior of companies. Therefore, the game between the enterprise and the government belongs to the dynamic game process under the incomplete information. The optimal decision of enterprises and governments is to maximize the utility under the existing external environment.

Based on the assumptions, the government utility function is established from the perspective of social welfare maximization as follows:

$$\pi_g = T - R_{(\alpha)} + t * \bar{e} + \alpha[t * (e - \bar{e}) + f(e - \bar{e})] - A_{(\alpha)} \quad (1)$$



Where, T is the revenue brought by the enterprise to the local government; The government regulatory cost R is a function of α , $\frac{dR}{d\alpha} > 0$, indicating that the greater the government regulatory intensity, the higher the regulatory cost; \bar{e} is the amount of water pollution reported by the enterprise; e is the actual amount of water pollution by the enterprise; t is the unit cost of government control policy, $t * \bar{e}$ is the cost of water pollution behavior that enterprises should disclose and $t * (e - \bar{e})$ is the cost of water pollution behavior that enterprises should pay. $f(e - \bar{e})$ refers to the fines paid by enterprises after they falsely reported water pollution activities were regulated by the government. $f' > 0$, $f'' > 0$, $f(e - \bar{e})$ is a strictly convex function, that is, the penalty increases marginal with the amount of false reporting. $A_{(\alpha)}$ represents the loss caused by unfavorable government regulation, and $A_{(\alpha)}$ is negatively correlated with α .

According to the assumed conditions, the utility function of the enterprise is established as:

$$\pi_e = R - C_{(e)} - t * \bar{e} - \alpha[t * (e - \bar{e}) + f(e - \bar{e}) + h(e - \bar{e})] - W(e - \bar{e}) \quad (2)$$

Where, R stands for the economic profit of the enterprise; $C_{(e)}$ represents the cost of the actual water pollution behavior of the enterprise, $C_{(e)}' < 0$, $C_{(e)}'' > 0$, the cost paid by the enterprise is a strictly decreasing convex function for the water pollution behavior; $h(e)$ represents the cost of water information disclosure by enterprises in response to government supervision, $h_{((e - \bar{e}))}' > 0$. The disclosure cost of enterprises is an increasing function for the water pollution behavior that is under-reported; $W(e - \bar{e})$ reputational loss caused by enterprises' misrepresentation of environmental information content; $W' > 0$, $W'' > 0$, indicating that reputational loss is a convex function increasing with the amount of misrepresentation.

Through rational analysis on the government behavior: $-\frac{d\alpha}{dt} > 0$, $\frac{d\alpha}{df} > 0$, $\frac{d\alpha}{de} > 0$, $\frac{d\alpha}{dA} > 0$, $\frac{d\alpha}{dR} < 0$, namely: The greater the intensity of environmental supervision, the higher the penalty for false reporting of water violations, the greater the water pollution behavior of enterprises, the greater the loss caused by adverse supervision, the higher the regulatory intensity of the government.

Take the first derivative of formula (2) with respect to e and e^- respectively:



$$\frac{d\pi_e}{de} = -C'_{(e)} - \alpha * t - \alpha f'(e - \bar{e}) - \alpha h'(e - \bar{e}) - w'(e - \bar{e}) \quad (3)$$

$$\frac{d\pi_e}{d\bar{e}} = -t + \alpha * t + \alpha f'(e - \bar{e}) + \alpha h'(e - \bar{e}) + w'(e - \bar{e}) \quad (4)$$

By setting the derivative to 0, we get:

$$\alpha = \frac{-C'_{(e)} - w'(e - \bar{e})}{t + f'(e - \bar{e}) + h'(e - \bar{e})} \quad (5)$$

$$\alpha = \frac{t - w'(e - \bar{e})}{t + f'(e - \bar{e}) + h'(e - \bar{e})} \quad (6)$$

When the actual water pollution behavior of enterprises and the amount of false report $(e - \bar{e}) = 0$, at this time, the supervision intensity of the government is minimal, and the maximum utility of the government and enterprises reaches the equilibrium state. According to the above analysis, it can be concluded that:

$$\bar{e}(t, \alpha, f, h, w) = \{\bar{e} | t - \alpha * t - \alpha f'(e - \bar{e}) - \alpha h'(e - \bar{e}) - w'(e - \bar{e}) = 0\} \quad (7)$$

Let $E = (e - \bar{e})$, indicating the enterprise's manipulation of water information management, then:

$$\frac{dE}{d\alpha} = \frac{t + f'(E) + h'(E)}{\alpha f''(E) + \alpha h''(E) + w''(E)} \neq 0 \quad (8)$$

Therefore, it can be seen that the intensity of government supervision has an impact on the water information manipulation behavior of enterprises. Taking the derivative of equation (8) with respect to α , we get:

$$\frac{d^2E}{d\alpha^2} = - \frac{f''(e - \bar{e}) + h''(E)}{[\alpha f''(e - \bar{e}) + \alpha h''(E) + w''(e - \bar{e})]^2} \neq 0 \quad (9)$$

By synthesizing equations (8) and (9), it can be seen that there is a nonlinear correlation between government supervision and enterprise water information manipulation behavior, and the linear relationship between enterprise water information manipulation behavior E and enterprise water



information disclosure $f(e - \bar{e})$, so there is a nonlinear relationship between government supervision and enterprise water information disclosure.

This nonlinear relationship is also reflected in institutional theory. According to institutional theory, whether an enterprise will disclose environmental information is determined by institutional regulations^[8]. As an important part of environmental information, it can be inferred that an enterprise will take the initiative to disclose water information under external institutional pressure. As the policy maker of the system, the continuous increase of the government's supervision will inevitably put pressure on the disclosure behavior of enterprises. On the one hand, enterprises with good environmental performance will show the government that they actively fulfill their environmental responsibility by increasing the content of mandatory disclosure by the government; on the other hand, enterprises with poor environmental performance can reduce the legitimacy risk by increasing information disclosure without changing their business model. Under the increasingly strict government supervision, water pollution enterprises cannot obtain more profits through disclosure. As a rational economic person, enterprises will reduce disclosure to reduce costs. However, the cost of disclosing "soft information" is smaller and the risk of information resource spilt is smaller. In the face of government supervision, enterprises will give priority to the disclosure of "soft information", but the resulting legitimacy risk will increase. Therefore, in the face of stricter government supervision, enterprises have to choose to disclose more water information to avoid being penalized for not meeting environmental protection requirements. From the perspective of social welfare, the government pays more attention to "hard information" such as the environmental performance of enterprises, and wants to know whether the actual environmental behavior of enterprises is consistent with their expected development goals. Therefore, for enterprises to increase the disclosure of "hard information" will reduce the legitimacy risk, but with the enhancement of supervision intensity, the disclosure cost and potential competition risk will be greater, and enterprises will reduce the disclosure of core information to avoid potential knowledge and technology spillover risk. Based on the above analysis, this paper proposes the following hypothesis:

Hypothesis 1a: Government regulation has a positive correlation with selective water information disclosure



Hypothesis 1b: The influence of government regulation on mandatory water information disclosure by enterprises is inverted U-shaped

2.2 Game between media and enterprises

It is assumed that the media supervise the disclosure of corporate environmental information in the form of attention and reporting, with β indicating the media's attention to enterprises, and γ indicating the media's emotional tendency to report on enterprises. Other assumptions are the same as 2.1.

According to the assumed conditions, the media utility function is established as:

$$\pi_m = I - R_{(\beta,\gamma)} + \beta * I(e - \bar{e}) - A_{(\beta,\gamma)} \quad (10)$$

According to the assumed conditions, the utility function of the enterprise is established as:

$$\pi_e = R - C_{(e)} - t * \bar{e} - \beta\{\alpha * [t * (e - \bar{e}) + f(e - \bar{e})] + g(e - \bar{e})\} - \gamma * w(e - \bar{e}) - \beta * j(e - \bar{e}) - \gamma * k(e - \bar{e}) \quad (11)$$

Where, the intensity of media coverage β can be calculated by the proportion of the number of enterprises reported in the current period in the total number of enterprises in the industry/region, $\beta \in (0,1)$; The emotional tendency reported is $\gamma \in (-1,1)$, and $\gamma \rightarrow 1$, indicating that the media is more inclined to report positively. $I(e - \bar{e})$ represents the revenue generated by the publicity generated by media coverage; $g(e - \bar{e})$ and $w(e - \bar{e})$ respectively represent the cost of water information disclosure by enterprises in response to the quantity and tendency of media reports; $j(e - \bar{e})$ and $k(e - \bar{e})$ indicate the reputation loss caused by the quantity and tendency of media reports. The other variables are the same as 2.1.

Through rational analysis on the media supervision behavior: $\frac{d\beta}{dA} > 0$, $\frac{d\gamma}{dA} > 0$, $\frac{d\gamma}{de} > 0$, $\frac{d\beta}{de} > 0$, $\frac{d\beta}{dR} < 0$, namely: The higher the cost of media supervision, the greater the intensity of supervision; The greater the water pollution behavior of enterprises, the greater the loss caused by improper media supervision, and the higher the intensity of media supervision.



Take the first derivative of equation (11) with respect to e and e^- respectively, and set the derivative to 0 to obtain:

$$\beta = \frac{-C'_e - \gamma * w'(e - \bar{e}) - \gamma * k'(e - \bar{e})}{\alpha * t + \alpha * f'(e - \bar{e}) + g'(e - \bar{e}) + j'(e - \bar{e})} \quad (12)$$

$$\beta = \frac{t - \gamma * w'(e - \bar{e}) - \gamma * k'(e - \bar{e})}{\alpha * t + \alpha * f'(e - \bar{e}) + g'(e - \bar{e}) + j'(e - \bar{e})} \quad (13)$$

When the difference between the enterprise's actual water pollution behavior and the supervised water pollution behavior $(e - \bar{e}) = 0$, that is, when the enterprise does not conceal the water pollution behavior, the media pays the least attention, the media's reporting tendency tends to be more true, and the maximum utility between the media and the enterprise reaches an equilibrium state. According to the above analysis:

$$\bar{e}(t, \alpha, \beta, \gamma, f, w) = \{\bar{e} | \alpha * t - \alpha * \beta * t - \alpha * \beta f'(e - \bar{e}) - \beta g'(e - \bar{e}) - \gamma * w'(e - \bar{e}) - \beta * j'(e - \bar{e}) - \gamma * k'(e - \bar{e}) = 0\} \quad (14)$$

$$\frac{dE}{d\beta} = \frac{\alpha * t + \alpha * f'E + g'E + j'E}{\alpha * \beta f''E + \beta g''E + \gamma * w''E + \beta j''E + \gamma * k''E} \neq 0 \quad (15)$$

$$\frac{dE}{d\gamma} = \frac{w'(e - \bar{e}) + k'(e - \bar{e})}{\alpha * \beta f''E + \beta g''E + \gamma * w''E + \beta j''E + \gamma * k''E} \neq 0 \quad (16)$$

It can be seen that the intensity and tendency of media reports have an impact on the water information manipulation behavior of enterprises. By obtaining second derivative of equation (15) and (16) with respect to β , we can obtain:

$$\frac{d^2E}{d\beta^2} = - \frac{\alpha * f''E + g''E + j''E}{[\alpha * \beta f''E + \beta g''E + \gamma * w''E + \beta j''E + \gamma * k''E]^2} \neq 0 \quad (17)$$

$$\frac{d^2E}{d\gamma^2} = - \frac{w''E + k''E}{[\alpha * \beta f''E + \beta g''E + \gamma * w''E + \beta j''E + \gamma * k''E]^2} \neq 0 \quad (18)$$

According to equation (17) and (18), there is a positive linear relationship between enterprise water information manipulation behavior E and enterprise water information disclosure $g(e - \bar{e})$ and



$w(e - \bar{e})$. Therefore, there is a nonlinear relationship between media public opinion supervision and enterprise water information disclosure.

2.2.1 Number of media reports and corporate water information disclosure

As one of the important media of external supervision, the media has the function of collecting, processing and disseminating the water resources management information of enterprises. To a certain extent, media reports can supplement the lack of government supervision and bring certain pressure to the production and operation of enterprises^[9]. Therefore, with the increase of the number of media reports, enterprises will increase the disclosure of mandatory water information text amount. When the number of media reports reaches a certain level, the water behavior disclosed by enterprises will meet the requirements of stakeholders. In order to avoid the overflow of information resources, the disclosure of mandatory content text amount will be reduced.

Stakeholder theory holds that enterprises should not only focus on maximizing the accumulation of shareholder wealth, but also balance the interests of all stakeholders. In other words, companies should not only focus on their own financial performance, but also on their social responsibility, including environmental responsibility^[10]. According to the stakeholder theory, the influence of stakeholders on managers' decisions is not only an ethical requirement, but also a prerequisite for resource allocation, both of which are conducive to enhancing the competitiveness of enterprises. With the increase in the frequency of media reports and the amount of mandatory disclosure of environmental protection regulations by enterprises, the public's expectation on the water information management behavior of enterprises has also increased. However, due to limited corporate water environmental initiatives, repeated reports of the same content will not continue to improve public awareness of corporate water environmental protection^[11]. If the enterprise judges that the outside world's perception of enterprise water information management behavior is greater than expected, the enterprise may reduce the amount of disclosure in order to avoid the risk of technical information disclosure. With the increase of the frequency of media reports, when the number of reports reaches a certain level, if the amount of mandatory disclosure text of enterprises decreases, the external perception of enterprises' water information management behavior may be lower than expected. Based on the stakeholder theory,



enterprises will consider disclosing more water environmental protection information to eliminate the problem of information asymmetry.

Hypothesis 2a: The influence of the number of media reports on the selective water information disclosure of enterprises is positively U-shaped

Hypothesis 2b: The influence of the number of media reports on mandatory water information disclosure by enterprises is positive U-shaped

2.2.2 Media reporting tendency and corporate water information disclosure

The tendency of media to report affects the management behavior of enterprises through the reputation mechanism and can guide the direction of public opinion. In the reputation community, as the ultimate responsible person, the enterprise shall not only pay the cost of reputation damage for itself, but also bear the part of reputation loss transferred to itself by other members^[12]. Positive media coverage has a positive impact on the business activities of enterprises, helping enterprises to establish a good social reputation and accumulate intangible assets. As for mandatory disclosure content, as media reports tend to be more positive, increasing the amount of mandatory disclosure content can convey to the public a signal that enterprises are law-abiding and well-run. For the voluntary disclosure content of enterprises, negative media reports will damage the corporate image and take responsibility for the reputation community. In order to maximize the recovery of established earnings, enterprises increase the disclosure content of mandatory water information to inform the changes in the actual environmental behavior of social enterprises and change the public's inherent understanding of enterprises. However, with the increase of positive reports, the reputation loss of enterprises will decrease. In addition, if the media excessively reports the environmental protection achievements of enterprises in a positive way, the public will have higher expectations of enterprises, which will bring greater operating cost pressure to enterprises. Therefore, when the established income is not greater than the reputational damage cost, the enterprise does not need to increase the mandatory disclosure content, and the continuous increase of positive reports may lead to the public's misjudgment of the enterprise, or even have the opposite effect, and the enterprise will be more inclined to use selective disclosure content instead of mandatory



disclosure content. It can not only maintain the existing good social image of the enterprise but also avoid too much attention from the outside world.

Hypothesis 3a: The influence of media reporting tendency on selective water information disclosure by enterprises is positive U-shaped

Hypothesis 3b: The influence of media reporting tendency on mandatory water information disclosure by enterprises is inverted U-shaped

3 Research design

3.1 Sample selection and data source

Referring to the practice of Zhou et al.^[13], 305 Chinese A-share listed enterprises in water-sensitive industries from 2015 to 2019 were selected as primary samples. First, we excluded the samples that were declared as *ST and ST during 2015-2019, and then excluded the samples that lacked financial data. The samples that did not disclose the Social Responsibility Report or the Environmental Report were also excluded. So we ended up with 1525 valid observations.

In this study, texts such as Social Responsibility Report, Annual Report and Environmental Report released by listed companies from 2015 to 2019 were used as data sources for water information disclosure, word frequency method was adopted to extract water information text and word frequency of strategic and energy consumption disclosure, and the information content of water information disclosure strategy and energy consumption text was calculated. The data for government regulation comes from the Urban Pollution Sources Supervision and Disclosure Index (PITI) published by IPE, while the data for media coverage comes from the Listed Company News Database of CSMAR. In addition, we used other relevant data from the CNRDS database and the CSMAR database.

3.2 Variable Setting

3.2.1 Explained variables

With reference to the method of Wang Hua and Liu Huifen^[14], the text disclosure of strategy and energy consumption information is measured by the matching word frequency of the keyword table, and the self-built strategy and energy consumption lexeme is used as the matching basis. The strategic lexeme



includes 444 keywords such as "environmental friendly", "energy saving" and "recycling". The energy consumption thesaurus includes 207 keywords such as "energy consumption", "electricity consumption" and "water consumption". The specific measurement is as follows:

First, content of selective water information disclosure - Strategy: measures the water information disclosure behavior of enterprises from the perspective of quantity, specifically referring to the proportion of disclosure word frequency. The measurement method is as follows: (total word frequency of strategic disclosure/total word number of water information disclosure) *100, the larger the Strategy value, the more detailed the water information disclosure content of the enterprise's strategy.

Second, the content of mandatory water information disclosure - Energy: The behavior of water information disclosure of enterprises is measured from the perspective of quantity, specifically referring to the proportion of disclosure word frequency. The measurement method is as follows: (total word frequency of Energy consumption disclosure/total word number of water information disclosure) *100, the larger the value of energy, the more detailed the water information disclosure of energy consumption.

3.2.2 Core explanatory variables

Gov: The index calculates the score and overall ranking based on the disclosure of pollution source regulatory information in each city, which objectively reflects the local government's supervision of water information disclosure by enterprises.

Media_amount: A measure of a company's exposure to media coverage. Specifically, the study screened environment-related stories from the CSMAR news database, then searched for stories that contained the company name and code, and counted the number of related stories for each company. Finally, we use the logarithm of "media coverage +1" as a proxy variable to measure media coverage intensity.

Media_trend: Media reports are categorized based on their inclination into neutral, negative, and positive coverage. The Janis-Fadner (J-F) coefficient is utilized to measure the Media_trend of media reporting. The J-F coefficient ranges from -1 to 1, where a higher prevalence of positive reports on environmental performance approaches a value close to 1, indicating lower public opinion supervision pressure on the company; conversely, a higher prevalence of negative reports on environmental performance approaches a value close to -1, indicating greater public opinion supervision pressure on the company.



3.2.3 Other control variables

Corporate Size (Size), asset-liability ratio (Lev), profitability (ROA), proportion of independent directors (In_director), ownership concentration (Top), heavy polluters (Pollution), corporate nature (State), environmental performance (EP), and whether to disclose social responsibility report (SR). (See Table 3-1 for details.)

Tab.3-1 Main variables

	symbol	name	Measurement method
Explained variable	Strategy	Selective disclosure	(Strategic disclosure word frequency/total water information disclosure)*100
		Mandatory disclosure content	(Word frequency of energy consumption disclosure/total water information disclosure)*100
Explanatory variable	Gov	Government supervision intensity	PITI
		Media supervision strength	ln(Number of media coverage +1)
		Media reporting tendency	J-F
Control variable	Size	Enterprise scale	The natural logarithm of the firm's total assets at the end of the year
	Lev	Asset-liability ratio	Ending total liabilities/ending total assets
	ROA	profitability	Net profit rate on total assets
	In_director	The proportion of independent directors	Total number of independent directors/Board members
	Top	Ownership concentration	Number of shares held by the largest shareholder/total number of shares
	EP	Environmental performance	CNRDS database of enterprise ESG environmental governance advantages disclosure and sum
	Pollution	Heavy polluting enterprise	Heavy polluting enterprises are marked as 1, otherwise 0
	State	Nature of enterprise	State-owned enterprises are marked as 1, otherwise 0
	SR	Whether there is a social responsibility report	The disclosure of social responsibility report is 1, otherwise 0



ID	Enterprise dummy variable	305 enterprise dummy variables were set to control for individual influencing factors
Year	Annual dummy variable	5 annual dummy variables are set to control the annual influence factors

3.3 Model Design

Based on the previous research hypothesis, in order to verify the impact of government supervision on the content of heterogeneous water information disclosure of enterprises, the following benchmark model is constructed:

$$Strategy_{it}/Energy_{it} = \alpha_0 + \alpha_1 lnGov_{it} + \alpha_2 lnGovsq_{it} + Controls_{it} + Company_i + Year_t + \varepsilon_{it} \quad (19)$$

$Strategy_{it}$ represents the selective disclosure behavior of water information in the year of i enterprise; $Energy_{it}$ represents the mandatory disclosure behavior of water information in the year of i enterprises. $lnGov_{it}$ indicates the intensity of government supervision faced by enterprises in 2013; $lnGovsq$ is the second term of $lnGov$. $Controls$ indicates the control variables, $Company_i$ and $Year_t$ are fixed enterprises and years, respectively, and ε_{it} indicates the random disturbance term.

In order to verify the impact of media coverage intensity on the content of heterogeneous water information disclosure of enterprises, the following benchmark model test was constructed:

$$Strategy_{it}/Energy_{it} = \alpha_0 + \alpha_1 Media_amount_{it} + \alpha_2 Media_amountsq_{it} + Controls_{it} + Company_i + Year_t + \varepsilon_{it} \quad (20)$$

Where, $Media_amount_{it}$ indicates the intensity of government media coverage faced by i enterprises in the year of t ; $Media_amount_{it}$ is the quadratic of $Media_amount$. The other variables are defined in the same way as model (19).

In order to verify the influence of media reporting tendency on the content of heterogeneous water information disclosure of enterprises, the following benchmark model test was constructed:

$$Strategy_{it}/Energy_{it} = \alpha_0 + \alpha_1 Media_trend_{it} + \alpha_2 Media_trendsq_{it} + Controls_{it} + Company_i + Year_t + \varepsilon_{it} \quad (21)$$



Where, $Media_trend_{it}$ indicates the media reporting tendency faced by enterprises in the year t ; $Media_trendsq$ is the second term of $Media_trend$. The other variables are defined in the same way as model (19).

4 Empirical results and analysis

4.1 Descriptive statistics and correlation analysis

4.1.1 Descriptive statistical results

Table 4-1 below shows the descriptive statistics of each variable. There are obvious differences among the variables, indicating that there is a certain imbalance between the selective and mandatory water information disclosure of enterprises, the intensity of government supervision, the intensity of media coverage and the tendency of media coverage. The median and average of selective disclosure content were 0.455 and 0.467, respectively, and the median and average of mandatory disclosure content were 0.505 and 0.569, respectively, indicating that the water information disclosure content of the selected sample companies was relatively average and the overall level of disclosure content was low. In general, compared with the strategic information disclosed selectively, enterprises are more inclined to disclose the water environmental energy consumption information that the government and the public are actually concerned about. Compared with the intensity of government supervision and the tendency of media reports, there are great differences in the pressure of sample companies under the intensity of media reports. Specifically, the maximum value of media coverage intensity is 10.06, the minimum value is 2.079, the standard deviation is 1.259, and the mean value is greater than 1. These indicators indicate that there may be large differences in the exposure degree of enterprises in media coverage.

Tab.4-1 Descriptive statistics

variable	Sample size	Mean value	Standard deviation	Minimum value	Maximum value	median
Strategy	1525	0.467	0.172	0.112	0.882	0.455
Energy	1525	0.569	0.361	0	2.553	0.505
InGov	1260 ^a	4.093	0.237	2.960	4.412	4.174
Media amount	1525	5.554	1.259	2.079	10.06	5.529
Media trend	1525	0.592	0.445	-0.125	1	0.796
EP	1525	3.294	1.727	0	8	3
Pollution	1525	0.424	0.494	0	1	0



State	1525	0.555	0.497	0	1	1
ROA	1525	0.0800	0.114	-0.998	0.630	0.0760
In director	1525	0.370	0.0510	0.231	0.667	0.333
Lev	1525	0.459	0.180	0	1.352	0.470
Top	1525	0.356	0.148	0.0300	0.774	0.349
Size	1525	23.14	1.280	20.32	27.47	23.03
SR	1525	0.984	0.127	0	1	1

Note: a Due to the existence of samples that did not disclose the PITI index, we finally conducted statistics on the observed values of government regulatory data and obtained 1260 valid observations.

4.1.2 Correlation test among variables

Table 4-2 reports Pearson correlation coefficient among variables. Government regulation is significantly correlated with the amount of mandatory disclosure texts, but not with the amount of selective disclosure texts, which supports hypothesis 1b. The number of media reports is significantly correlated with the amount of selective disclosure texts, but not with the amount of mandatory disclosure texts, which supports hypothesis 2a. Media reporting propensity is significantly correlated with the amount of selective disclosure texts, but not with the amount of mandatory disclosure texts, which supports hypothesis 3a.

Considering the significant correlation between some variables, we conducted further tests to determine whether there is a multicollinearity problem. Specifically, we test the variance inflation factor (VIF) of the dependent and control variables in models (1), (2) and (3) respectively. The results show that all of them are less than 3, so it is determined that there is no serious multicollinearity problem in the model.

Tab.4-2 Pearson inspection

Variab les	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Strateg y	1.00												
(2) Energy	0.14	1.00											
	0**	0											
	*												
(3) lnGov	-	-	1.00										
	0.04	0.11	0										
	0	5**											
(4) Media _amou nt	0.11	-	-	1.00									
	5**	0.02	0.07	0									
	*	6	3**										
			*										
(5) Media _trend	0.12	-	-	0.17	1.00								
	9**	0.00	0.07	2**	0								
	*	3	2**	*									
(6) EP	0.22	-	0.11	0.20	0.01	1.00							
	1**	0.16	4**	1**	7	0							
	*	6**	*	*									
		*											
(7) Polluti on	-	0.13	0.08	-	-	0.17	1.00						
	0.01	7**	9**	0.06	0.09	5**	0						
	6	*	*	3**	8**	*							
					*								
(8) State	0.03	0.11	-	0.01	0.04	-	0.06	1.00					
	5	2**	0.15	2	3*	0.00	0**	0					
		*	7**			2							
			*										
(9) ROA	-	-	0.14	0.15	0.03	0.09	-	-	1.00				
	0.01	0.04	1**	9**	1	7**	0.00	0.09	0				
	9	9**	*	*		*	4	4**					
								*					
(10) In_dire	-	-	-	0.10	-	-	-	-	-	1.00			
	0.01	0.08	0.10	2**	0.00	0.04	0.00	0.04	0.01	0			



ctor	4	9*	8**	*	8	5*	9	0	0				
			*										
(11)	0.17	-	-	0.13	0.05	0.12	0.11	0.14	-	0.03	1.00		
Lev	0**	0.05	0.03	2**	1**	0**	0**	8**	0.21	4	0		
	*	8**	9	*		*	*	*	8**				
		*							*				
(12)	-	-	0.04	0.11	0.06	0.06	0.06	0.27	0.10	0.05	0.05	1.00	
Top	0.02	0.08	1	1**	4**	4**	5**	2**	8**	6**	1**	0	
	9	2**		*				*	*				
		*											
(13)	0.16	-	0.10	0.46	0.10	0.35	0.21	0.23	0.11	0.08	0.47	0.18	1.0
Size	3**	0.08	3**	4**	8**	4**	6**	1**	8**	2**	3**	8**	00
	*	9**	*	*	*	*	*	*	*	*	*	*	
		*											
(14)	0.10	-	-	0.04	0.05	-	-	0.07	0.08	0.05	-	-	0.0
SR	6**	0.09	0.00	4*	2**	0.14	0.09	1**	3**	6**	0.08	0.00	55*
	*	6**	1			9**	8**	*	*		0**	6	*
		*				*	*				*		

4.2 Analysis of regression results

4.2.1 Regression analysis of government supervision intensity and water information disclosure content

According to columns (1) - (2) of Table 4-3, the primary item of government supervision intensity (lnGov) is significantly positively correlated with selective disclosure content (Strategy) at 5% level, and the secondary item (lnGovsq) is significantly negatively correlated with selective disclosure content (Strategy) at 5% level. In other words, the influence of government supervision on the content of enterprises' selective disclosure shows an inverted "U" pattern, which firstly increases and then decreases, indicating that government supervision has an impact on enterprises' selective disclosure behavior of water information, and hypothesis 1a has not been verified. This is because strategic information belongs to the "soft information" in water information disclosure, which has the advantages of high fault tolerance and large room for manipulation, and most strategic information is the development vision such as environmental governance planning and environmental protection resolutions. Therefore, when enterprises are faced with the government's environmental protection supervision, enterprises will first disclose and selectively disclose content information. To communicate their own advocacy and efforts



on environmental governance to stakeholders, while not revealing their real pollution situation, with minimal cost and risk to obtain recognition from the government and the public. With the continuous enhancement of government supervision, when the influence of government supervision on enterprises' selective water information disclosure rises to an inverted "U" shaped turning point, the government enters a state of strong supervision. The government no longer only encourages and advocates enterprises to disclose water information, but has relatively clear disclosure standards and strict environmental penalties for supervision. At this time, enterprises are faced with huge external legitimacy pressure. It is no longer possible to avoid legitimacy risks through excessive disclosure of "soft information", blindly publicizing determination and planning will attract the attention of relevant departments and the public, so enterprises will consider taking other measures to avoid potential business risks, such as choosing to disclose more mandatory information (energy consumption), rather than continue to "pull the flag", "high profile", "hidden".

The primary term of government supervision intensity (InGov) has a significant positive correlation with the mandatory disclosure content (Energy) at 1% level, and the secondary term (InGovsq) has a significant negative correlation with the mandatory disclosure content (Energy) at 1% level. In other words, the influence of government supervision intensity on enterprises' mandatory water information disclosure shows an inverted "U" shape, which increases first and then decreases. It shows that the intensity of government supervision has an impact on the mandatory water information disclosure behavior of enterprises, and hypothesis 1b is verified. This is because energy consumption belongs to the disclosure content clearly required for enterprises in government documents, and belongs to the environmental information that the government and the public are more concerned about, especially for water-sensitive industries, and the public's concern about energy consumption of sewage treatment has continued to rise in recent years. In the early stage of external supervision by the government, the supervision is weak and the punishment is light. According to the theory of information asymmetry, if an enterprise can actively disclose the mandatory disclosure information that the outside world pays more attention to, the information gap can be effectively eliminated and the accuracy of government and investors' cognition of the enterprise can be improved. At the same time, establish a good social image to bring reputation capital and financial benefits, so even if there is a violation of water pollution, enterprises will make a decision to disclose mandatory water information in the initial stage. With the continuous enhancement of government supervision, the influence of government supervision on mandatory water information disclosure of enterprises has increased to the inverted "U" -shaped inflection point, at which time the supervision is strong and the punishment is heavier. Enterprises must



weigh the cost and potential risks of continuing to carry out mandatory water information disclosure, which is different from the "warning" and "fine" when the supervision is lighter. At this time, the government is likely to make "rectification within a time limit" and "shut down according to law" for the water violations of the enterprise. At this time, the potential benefits and costs of the enterprise's active mandatory information disclosure cannot be balanced, so it will tend to reduce the willingness to mandatory information disclosure, and turn to "wrangle" and "hide and seek" with the government.

4.2.2 Regression analysis of the number of media reports and the content of water information disclosure

According to columns (3) and (4) of Table 4-3, there is a significantly negative correlation at the 1% significance level between the linear term of media coverage (Media_amount) and selective disclosure content (Strategy), while the quadratic term (Media_amountsq) shows a significantly positive correlation at the 1% significance level with selective disclosure content (Strategy). This indicates that the impact of media coverage on selective disclosure content follows a positive "U-shaped" pattern, characterized by an initial decrease followed by an increase. It shows that the number of media reports has an impact on the selective disclosure behavior of water information of enterprises, and hypothesis 2a is verified. This is because with the disclosure of mandatory information, stakeholders' perception of corporate water behavior is higher than expected, and the problem of environmental information asymmetry inside and outside enterprises is alleviated. At this time, enterprises will reduce the proportion of selective water information disclosure in order to save more disclosure costs and avoid more social concerns. However, as the number of media reports increases to the "inflection point", the expectations of stakeholders are further enhanced, and the demand for the quantity and quality of environmental information disclosure is increased, and the requirements are more stringent. Thus, enterprises are guided to improve stakeholders' perception of corporate water behavior by increasing the amount of selective disclosure information, so as to avoid the loss of the reputation of the community of interests.

However, as the number of media reports increases to the "inflection point", at this time, enterprises are in a highly exposed state, and the role of selective water information disclosure decreases. Only relying on relatively empty selective information disclosure and limited mandatory disclosure cannot meet the needs of the public. At this time, enterprises will increase the number of mandatory disclosure texts and improve the quality of mandatory water information disclosure. To show their investment and achievements in environmental protection work, convey its legitimacy signal to the outside world, establish a good social image, and enhance the public's positive cognition.



4.2.3 Regression analysis of media reporting tendency and water information disclosure content

According to columns (5) - (6) of Table 4-3, the primary media reporting tendency (Media_trend) is negatively correlated with selective disclosure content (Strategy), while the secondary media reporting tendency (Media_trendsq) is positively correlated with selective disclosure content (Strategy). This suggests that media reporting tendency has no promoting effect on the selective disclosure behavior of water information, and hypothesis 3a has not been verified. This is because strategy is a "soft" information disclosure content that is easy to manipulate, and it is mostly positive and positive information such as determination and planning. Due to the principle of objectivity, media reports tend to only praise and publicize the determination of enterprises to protect environmental protection. Meanwhile, strategy is a homogeneous content that cannot be repeated in depth. Therefore, the media reporting tendency has no significant effect on the amount of text selectively disclosed.

The first item (Media_trend) is significantly positively correlated with the mandatory disclosure content (Energy) at 5% level, and the second item (Media_trendsq) is significantly negatively correlated with the mandatory disclosure content (Energy) at 10% level. That is, the influence of media reporting tendency on pollutant discharge increases first and then decreases in an inverted "U" shape. This indicates that media reporting tendency has an impact on the amount of mandatory water information disclosure texts, and hypothesis 3b has been verified. This is because negative environmental reports will affect the social reputation of enterprises and thus reduce the established earnings, while positive environmental reports will compensate for the social reputation and bring excess earnings. Meanwhile, the mandatory disclosure content is the disclosure content clearly required by the government, so the media has a clear tendency to report. At this time, enterprises will disclose water information under the pressure of external legitimacy. Enterprises will choose to actively increase mandatory information disclosure to show their investment and achievements in environmental protection. However, with the arrival of the "turning point" of tendentious reporting, on the one hand, the potential excess income of enterprises is no higher than the cost of improving environmental protection and energy consumption, in this case, in order to avoid the market pressure brought by excessive reporting and the leakage of internal information resources, enterprises may take measures to reduce mandatory water information disclosure. On the other hand, excessive mandatory information disclosure is likely to lead to negative reports of enterprises, bring reputational losses to enterprises, and affect stakeholders' investment decisions. Therefore, enterprises will choose to reduce mandatory water information disclosure information to calm the storm of negative media reports and avoid losses.

Tab.4-3 Model estimation result

variable	(1) Stategy	(2) Energy	(3) Stategy	(4) Energy	(5) Stategy	(6) Energy
InGov	0.617** (0.314)	2.096*** (0.592)				
InGovsq	-0.0837** (0.0407)	-0.280*** (0.0798)				
Media_amount			-0.0455*** (0.0164)	-0.0844** (0.0348)		
Media_amountsq			0.00424*** (0.00158)	0.00865*** (0.00292)		
Media_trend					-0.0343 (0.0234)	0.119** (0.0608)
Media_trendsq					0.0317 (0.0200)	-0.104* (0.0540)
EP	0.00578*** (0.00178)	-0.00241 (0.00411)	0.00630*** (0.00173)	0.000541 (0.00354)	0.00658*** (0.00184)	0.00109 (0.00366)
Pollution	-0.0124** (0.00609)	-0.00788 (0.0181)	-0.0117*** (0.00417)	-0.00772 (0.0154)	-0.0117*** (0.00433)	-0.00924 (0.0153)
State	0.0232 (0.0266)	-0.0127 (0.0518)	0.00558 (0.0202)	-0.0174 (0.0424)	0.00454 (0.0207)	-0.0224 (0.0463)
ROA	-0.0804*** (0.0226)	-0.211** (0.0835)	-0.0641*** (0.0212)	-0.224*** (0.0776)	-0.0613*** (0.0216)	-0.215*** (0.0699)
In_director	-0.0987 (0.0825)	-0.396*** (0.139)	-0.0569 (0.0694)	-0.364*** (0.114)	-0.0565 (0.0668)	-0.352*** (0.119)
Lev	0.0102 (0.0306)	0.0899 (0.0756)	0.000904 (0.0231)	0.0860 (0.0563)	-0.00374 (0.0222)	0.0947 (0.0598)
Top	-0.101* (0.0578)	-0.203* (0.106)	-0.0794 (0.0519)	-0.0269 (0.119)	-0.0781 (0.0571)	-0.0385 (0.123)
Size	0.00741 (0.00568)	-0.0582** (0.0263)	0.0137* (0.00725)	-0.0519** (0.0221)	0.0118 (0.00734)	0.0582*** (0.0218)
SR	0.0851** (0.0378)	-0.322** (0.161)	0.0420* (0.0241)	-0.0891* (0.0536)	0.0396 (0.0243)	-0.108** (0.0541)
Constant	-0.629 (0.668)	-1.213 (1.346)	0.490** (0.211)	2.443*** (0.437)	0.427** (0.191)	2.384*** (0.460)
Observations	1,260	1,260	1,525	1,525	1,525	1,525
R-squared	0.883	0.801	0.883	0.784	0.882	0.785



Number of ID	252	252	305	305	305	305
Company FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.3 Further Analysis

4.3.1 The moderating effect of media reporting tendency on government supervision

Media, as a representative of social public forces, undertake social responsibility to follow up and report on enterprises, which may cause reputational pressure on enterprises. Meanwhile, according to the signal transmission theory, the spread of media reports to a large extent alleviates the information asymmetry between investors and enterprises. Therefore, media reports on enterprises' environment will directly affect their performance in the capital market. Encourage enterprises to improve environmental governance, correct environmental violations, and increase the amount of water information disclosure text. Relevant studies have shown that when government supervision is relatively low or relevant environmental control policies are not sound, media's attention to and reporting on enterprises can effectively protect the stakeholders of enterprises. At this time, media reporting tendency can play a governance role similar to government supervision to a certain extent^[15,16]. In addition, media reports can widely report and disseminate information about relevant government systems and regulations, thereby raising social requirements for the legitimacy of enterprises and enhancing their risk awareness. Therefore, this paper holds that media reporting tendency may have complementary (promoting), substitute (inhibiting) or no regulating effect on government regulation. Based on this, with reference to the conic adjustment effect model proposed by Lin Weipeng^[17], a benchmark model (22) is constructed to test the adjustment effect of media reporting tendency on government regulation.

$$\frac{Strategy_{it}}{Energy_{it}} = \alpha_0 + \alpha_1 lnGov_{it} + \alpha_2 lnGovsq_{it} + \alpha_3 Media_{amount_{it}} + \alpha_4 lnGovsq_{it} * Media_{amount_{it}} + \alpha_5 lnGov_{it} * Media_{amount_{it}} + Controls_{it} + Company_i + Year_t + \epsilon_{it} \tag{22}$$

Where, $lnGov_{it} * Media_{amount_{it}}$ represents the cross term between primary government supervision and media reporting intensity, and $lnGovsq_{it} * Media_{amount_{it}}$ represents the cross term between secondary government supervision and media reporting intensity. Other variables are defined in the same way as model (1). The regression results are shown in Table 4-4 (1) - (2).



In the analysis of the text volume of selective disclosure content in column (1), the cross between the first item of government supervision and the tendency of media to report, the cross between the second item of government supervision and the tendency of media to report and the content of enterprises' selective water information disclosure are not significant, indicating that there is no moderating effect between the tendency of media to report and the influence of government supervision on the amount of text volume of enterprises' selective disclosure. This is because the selective water information disclosure information, such as environmental protection strategy and environmental protection determination, is already "soft" information with greater maneuverability, and media reports tend to promote and respect such information in a positive way. At the same time, such information does not have the depth and breadth of repeated reports, and the tendentious media reports will not reveal the real water pollution situation of enterprises. Nor will it give legal pressure to enterprises to increase investment in environmental governance, so the tendency of media reports will not have a significant moderating effect on the regulatory effect of selective disclosure by the government on enterprises.

Specifically, the critical point of curve inversion: $-\alpha_2/\alpha_5=2.027$ is outside the range of media reports ([2.960,4.412]), so the original inverted U-shaped curve will not flip. The inflection point discriminator $\alpha_1\alpha_5 - \alpha_2\alpha_4=0.757 (>0)$ indicates that the inflection point of the original inverted "U" curve is delayed due to the adjustment of intonation in media reports. The α_5 coefficient is $0.222 > 0$ at the significance level of 10%, that is, the original inverted "U" curve becomes flat. In the above analysis of government regulation and mandatory disclosure, it is pointed out that enterprises make the choice to increase mandatory information disclosure in order to meet the information needs of external stakeholders to attract investment and expand market competitiveness. With the continuous increase of government supervision, when enterprises judge that the potential benefits of continuing to increase mandatory information disclosure are equal to or less than environmental penalties, the "inflection point" will come. Based on the principle of pursuing maximum benefits, enterprises will reduce the proportion of mandatory information disclosure such as energy consumption. As a third-party supervision platform, the media has the property of information exchange. At the same time, positive media reports can enhance the confidence of external investors in corporate environmental governance and offset the economic losses caused by potential environmental penalties, so the inverted "U" curve between government supervision and mandatory water information disclosure by enterprises becomes smooth.



4.3.2 The moderating effect of media reporting tendency on the number of reports

The limited attention theory holds that investors' time and energy are limited, but the amount of market information is huge and changes rapidly. Therefore, investors will only analyze and judge the information that attracts their attention^[18]. Although the amount of environment reported by the media alone cannot directly determine the public's view of the enterprise, it can arouse the attention of the society to a certain extent, and then influence the public's decision and opinion. While media reports tend to guide the direction of public opinion, positive media reports have a positive impact on corporate image, while negative media reports will damage the reputation of enterprises and at the same time face a legitimacy crisis, thus forcing enterprises to disclose high-quality environmental information. The intensity of media reporting arouses the focus of the public and the tendency of media reporting guides the direction of public opinion, which complement each other and form a media supervision mechanism. Based on this, the benchmark model (24) is constructed to test the moderating effect of media reporting tendency on the number of media reports.

$$Y_{it} = \alpha_0 + \alpha_1 Media_amount_{it} + \alpha_2 Media_amountsq_{it} + \alpha_3 Media_trend_{it} + \alpha_4 Media_amount_{it} * Media_trend_{it} + \alpha_5 Media_amountsq_{it} * Media_trend_{it} + Controls_{it} + Company_i + Year_t + \varepsilon_{it} \quad (24)$$

Where, $Media_amount_{it} * Media_trend_{it}$ represents the cross between the primary term and the tendency of media reports, and $Media_amountsq_{it} * Media_trend_{it}$ represents the cross between the secondary term and the tendency of media reports. Other variables are defined in the same way as models (2) and (3). The regression results are shown in Table 4-4 (3) - (4).

In the analysis of text volume of selective disclosure content in column (3), there is a significant positive correlation between the second term of media report quantity and the cross-multiplication term of media report tendency at the level of 1%, indicating that media report tendency has a positive moderating effect on media report quantity. Specifically, the inflection point discriminator $\alpha_1\alpha_5 - \alpha_2\alpha_4 = 0.001 (>0)$ indicates that the inflection point of the original positive "U" curve is slightly delayed due to the adjustment of media intonation. The α_5 coefficient is $0.0075 > 0$ at the significance level of 10%, so the original positive "U" curve becomes flat. The critical point of curve inversion: $-\alpha_2/\alpha_5 = 0.0060$ is outside the value range of media reports ($[2.076, 10.06]$), so the original positive "U" curve will not flip. This is because the content of the enterprise's selective water information disclosure is highly manipulable, so the media will not expose the potential violations of the enterprise even if it



repeats the report. At the same time, enterprise stakeholders can predict that most media reports tend to be positive. When media reports tend to be clear, enterprises will not easily change their decision on selective water information disclosure. Therefore, the number of media reports and selective water information disclosure maintain a positive "U-shaped" curve, that is, as the number of media reports increases, The degree of selective water information disclosure of enterprises decreases first and then increases. Because strategic information is "soft" information that is difficult to verify, and the tendency of media reports plays a role in guiding public cognition, enterprises tend to adjust the decision of selective disclosure of content and information to a small extent to avoid excessive attention from the media and the public, which shows that under the adjustment effect of media reporting tendency, the original positive "U-shaped" curve tends to be smooth.

In the analysis of the text volume of mandatory disclosure content in column (4), the cross-multiplication item of the first media report quantity and the media report tendency, the cross-multiplication item of the second media report quantity and the media report tendency and the mandatory water information disclosure content of enterprises are not significant. It shows that there is no moderating effect between the media reporting tendency and the number of media reports and the amount of mandatory disclosure texts. This is because the mandatory disclosure of energy consumption information by enterprises is a legal requirement, which belongs to the "hard" information with greater difficulty and high cost to manipulate. Under the single and repeated reports by the media, the benefits obtained by enterprises from information disclosure will not be higher than their cost input, so the mere increase in the number of media reports will not significantly affect the disclosure decisions of enterprises in response to the pressure of legitimacy. However, when there is a tendency of the media, for example, the media may criticize the enterprise for excessive pollution discharge or praise the enterprise for low pollution discharge, which will quickly arouse public attention and bring reputational impact to the enterprise. Therefore, when the tendency of media report and the number of media reports exist at the same time, the enterprise will choose a more conservative water information disclosure decision based on risk management.

Tab.4-4 The moderating effect results

variable	(1)	(2)	(3)	(4)
	Strategy	Energy	Strategy	Energy
lnGov	7.155 (4.211)	3.412*** (0.294)		
lnGovsq	-0.997 (0.536)	-0.450*** (0.0346)		
Media_trend	5.543 (14.44)	3.235 (1.708)		
GovMedia_trend	-3.338 (7.382)	-1.696 (0.815)		
GovsqMedia_trend	0.481 (0.941)	0.222* (0.0968)		
Media_amount			-0.0374 (0.161)	-0.0552 (0.0563)
Media_amountsq			0.00467 (0.0175)	0.00555 (0.00462)
Media_trend			2.264*** (0.373)	0.0835 (0.154)
Media_trendMedia_amount			-0.865*** (0.147)	-0.0385 (0.0571)
Media_trendMedia_amountsq			0.0775*** (0.0143)	0.00449 (0.00507)
EP	0.0512*** (0.00980)	-0.00502* (0.00203)	0.0562*** (0.00902)	0.000695 (0.00353)
Pollution	-0.117 (0.0665)	-0.0138 (0.00824)	-0.0960* (0.0379)	-0.00769 (0.0152)
State	0.321** (0.0757)	-0.0240 (0.0358)	0.160 (0.0827)	-0.0160 (0.0421)
ROA	-0.757** (0.184)	-0.220*** (0.0430)	-0.629** (0.178)	-0.225*** (0.0777)
In_director	-1.192 (0.714)	-0.431*** (0.0691)	-0.485 (0.719)	-0.351*** (0.113)
Lev	0.173 (0.164)	0.136** (0.0469)	0.0754 (0.149)	0.0878 (0.0574)
Top	-1.123** (0.276)	-0.239** (0.0789)	-0.661** (0.177)	-0.0339 (0.117)



Size	0.0676*	-0.0491	0.131**	-0.0513**
	(0.0245)	(0.0286)	(0.0397)	(0.0223)
2016.Year	-0.0732**	0.0199*	-0.137***	0.00338
	(0.0165)	(0.00768)	(0.0177)	(0.0147)
2017.Year	-0.0406	0.0518***	-0.159***	0.0244
	(0.0232)	(0.0104)	(0.0275)	(0.0232)
2018.Year	-0.248***	0.0180	-0.354***	-0.00345
	(0.0362)	(0.0142)	(0.0381)	(0.0266)
2019.Year	-0.288***	0.0195	-0.447***	0.0139
	(0.0331)	(0.0163)	(0.0489)	(0.0354)
Constant	-8.614	-4.119**	2.965**	2.349***
	(7.906)	(1.249)	(0.910)	(0.445)
Observations	1,260	1,260	1,525	1525
Number of groups	252	252	305	305
Company FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

5 Conclusions and suggestions

5.1 Research Conclusions

(1) Public opinion supervision has a heterogeneous non-linear effect on the amount of water information disclosure texts in different dimensions. With the increase of the number of media reports, the number of selective and mandatory water information disclosure texts of enterprises decreases first and then increases in a positive "U" shape. Media reporting tendency has no significant effect on the amount of text of selective water information disclosure, but it has an inverted U-shaped relationship with the amount of text of mandatory water information disclosure, which decreases first and then increases.

(2) Considering the interaction between government regulation and media reports on enterprises' water information disclosure, it is found that media reporting tendency has a positive moderating effect on the influence of government regulation on enterprises' mandatory water information disclosure.



5.2 Policy Recommendations

First of all, in order to improve the quality of enterprise water information disclosure, the relevant departments such as the CSRC and the Environmental Protection Bureau should formulate the scope, format and content standards for water information disclosure applicable to the industry according to the characteristics of different industries, and establish a unified water information disclosure standard for the industry. Secondly, the form of corporate water information disclosure should be clarified, which can adopt sustainable development report or environmental report, board of directors report, notes to financial statements, and Board of supervisors report. Finally, it is necessary to clarify mandatory disclosure provisions, encourage voluntary disclosure policies, introduce and improve relevant laws and regulations as soon as possible, establish a water information disclosure system from the legislative level, and guide enterprises to standardize water information disclosure. At the same time, in terms of daily supervision and punishment implementation, the government needs to carry out effective supervision according to the water information disclosure reward and punishment system by refining the assessment index system. The government can also develop additional environmental incentive mechanisms to compensate for the potential risk costs of knowledge and technology spillover brought by corporate information disclosure, and improve the enthusiasm of corporate water information disclosure.

For the media, on the one hand, the intensity of media coverage has a significant negative impact on selective and mandatory water information disclosure at the beginning, because enterprises are worried that more information disclosure will cause too much public attention when facing media reports. With the increase of media coverage to the turning point, the influence of media coverage on corporate water information disclosure gradually shows the opposite effect. This is because the high media exposure means that the public has a great demand for information, and enterprises need to disclose the performance data of past environmental protection work and the planning of future environmental protection strategy at the same time to continue to obtain the support of stakeholders. Therefore, both selective information and mandatory information disclosure will be increased. Therefore, this paper proposes that the legitimate rights of the media should be protected vigorously. In the process of formulating laws and regulations, relevant departments should pay attention to the effectiveness of corresponding regulations, ensure the independence of media reports as third-party monitoring platforms, and prevent enterprises from questioning their objectivity. On the premise of adhering to the principle of objectivity and fairness, media reports should intensify their reporting on the environmental behavior of enterprises in water-sensitive industries, reduce the information asymmetry between the public and



enterprises, arouse public concern and enterprises' thinking, and promote enterprises to disclose water use information correctly and effectively. In this way, the media can maximize the role of its third-party supervision platform, correctly guide the direction of public opinion, and promote the construction of a civilized society under the rule of law. On the other hand, the tendency of media reports has no obvious impact on the disclosure of strategic information of enterprises. In the initial stage, enterprises may increase mandatory water information disclosure due to external legitimacy pressure, which may lead to an increase in resource expenditure such as energy consumption. As the tendency of media reports reaches an inflection point, the impact of the two is reversed, and companies begin to reduce "hard" information such as mandatory water information disclosure to avoid the risk of being found by the public and criticized by the media. The tendency of media reports is not only affected by the actual environmental behavior of enterprises, but also determined by the perception and value judgment of media practitioners. Therefore, for the media industry itself, it is necessary to increase the investment and intensity of training for media practitioners, especially in the aspect of moral cultivation. First of all, we should improve their ideological quality as media personnel, and make clear the bottom line of principle is not to "add vinegar", not to hide and connive, only to report the truth. Secondly, to improve their professional level, to ensure that on the basis of a fair and impartial objective attitude, with the rationality and correctness of social value judgment. Finally, the media should face up to the environmental behavior of enterprises, ensure the fairness and authenticity of each report through an overall understanding of the industry and in-depth visits to individual enterprises, and avoid misleading public opinion. In addition, based on the results of the research on the moderating effect of media reporting tendency on the number of reports, the media reporting tendency has a reverse moderating effect on the impact of the number of reports on the mandatory disclosure of water information. This paper proposes to realize self-supervision among media platforms by means of internal competition in the media industry, so as to alleviate the temporary lack of market supervision in the media industry, vigorously create a healthy and free media reporting environment, and provide a reasonable disclosure platform. In order to achieve objective and fair news reporting of enterprises, the media can freely report negative news of enterprises. And punish those media that carry out illegal reports, ensure the healthy development of the media industry, and let the media correctly play the role of public opinion guidance.

For enterprises, first of all, they should establish a correct awareness of environmental responsibility. Just like paying taxes according to law, water information disclosure should also become a part of enterprises' social responsibility obligations. In the short term, water information disclosure can effectively alleviate the legitimacy pressure brought by external supervision and ensure that enterprises



can survive. In the long run, a high degree of environmental protection work can improve the corporate image, build public trust, enhance investor confidence, and lay a solid foundation for the sustainable development of enterprises. Secondly, with the introduction of more and more environmental protection policies, the concept of green sustainable development should be the main tone that enterprises keep in mind when producing. As the new force of water pollution and the focus of environmental problems, enterprises should comply with the call of the government and society, follow relevant norms, legally and reasonably disclose their own environmental behavior, establish a positive environmental protection concept, take practical environmental protection measures, contribute to the realization of environmental and economic win-win, and obtain sustainable competitive advantages to balance the development of industrial economy and environmental governance. At present, China's water information disclosure is still in the initial stage, and the quantity and quality of water information disclosure need to be further improved. If enterprises can actively improve the water pollution treatment system, establish and improve the water information disclosure mechanism, actively communicate the environmental protection situation of enterprises, and continuously improve the level of environmental information disclosure while taking into account economic development, then they can gain the trust of the government and obtain more development resources and space. At last. Enterprises should abandon their aversion to the media industry and face up to the role and importance of media supervision. Media power is equivalent to the third-party environmental supervision system. Enterprises actively communicate with the media and disclose corporate water information to the media and the public. On the one hand, it can alleviate the problem of information asymmetry and keep stakeholders' investment confidence in enterprises; on the other hand, enterprises establish the social image of green production and environmental protection enterprises through positive media reports. Help to expand market share and enhance competitiveness. When the legitimacy of enterprises is questioned by the public, enterprises can also make use of the guidance of public opinion by the media to strengthen communication with the public and ensure that true and accurate corporate environmental information is disclosed in the first time, so as to avoid the economic impact that negative public opinion may have on enterprises.

Reference

- [1] Clarkson P M, Overell M B, Chapple L. Environmental Reporting and its Relation to Corporate Environmental Performance. *Abacus*, 2011, 47 (1) : 27-60.
- [2] Wang Kaitian, Jiang Yan, three yuan. Policy system, corporate characteristics and Social Responsibility Information Disclosure: Based on the research perspective of reducing financing costs [J]. *Industrial Economics Research*, 2016, (06) : 78-88+99.]



- [3] Lu Wenbin, Guan Feng, Zhang Peipei, et al. Media exposure, information disclosure environment and cost of equity capital [J]. *Accounting Research*, 2014, (12) : 66-71+96.
- [4] Lu Shan, Wu Peng, Jiang Yan, et al. Can Corporate Social media Disclosure Reduce information Asymmetry? -- A comparative study of GEM and Main board [J]. *Economic Problems*, 2021, (10) : 121-129.
- [5] Shen Hongtao, Liu Jianghong. The characteristics, motivation and function of environmental information disclosure of foreign enterprises [J]. *China Population, Resources and Environment*, 2010, 20(S1) : 76-80.
- [6] Zhu Wei, Sun Yuxing, Tang Qian. Substantive Disclosure or Selective Disclosure: The Impact of Corporate Environmental Performance on the Quality of Environmental Information Disclosure [J]. *Accounting Research*, 2019, (03): 10-17. (in Chinese)
- [7] Shen Hongtao, Huang Zhen. Confession or Defense: A Study on the Relationship between Corporate Environmental Performance and Environmental Information Disclosure [J]. *Nankai Management Review*, 2014, 17(02): 56-63+73. (in Chinese)
- [8] Clarkson P M, Li Y, Richardson G D, *et al.* Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis[J]. *Accounting, organizations and society*, 2008, 33 (4-5): 303-327.
- [9] He Pinglin, Sun Yulong, Ning Jing, et al. Executive Characteristics, Legal Environment, and Information Disclosure Quality [J]. *Chinese Soft Science*, 2019, (10): 112-128. (in Chinese)
- [10] Jiang Yaoming, Zheng Ying. "Herd Effect" and the Isomorphism of Social Responsibility Disclosure in Listed Companies [J]. *Contemporary Finance & Economics*, 2015, (12): 109-117. (in Chinese)
- [11] Li Shihui, He Shaoli, He Yixuan. A Review of Corporate Water Information Disclosure [J]. *Financial and Accounting Communication*, 2018, (19): 41-44. (in Chinese)
- [12] Yang Yulong, Sun Shuwei, Kong Xiang. Can Media Coverage Bridge the Information Gap in the Capital Market? An Empirical Examination from the Perspective of Social Relationship Networks [J]. *Management World*, 2017, (07): 99-119. (in Chinese)
- [13] Zhou Q, Wang Y, Zeng M, Jin Y, *et al.* Does China's river chief policy improve corporate water disclosure? A quasi-natural experimental[J]. *Journal of Cleaner Production*, 2021, 311: 127707.
- [14] Wang Hua, Liu Huifen. Product Market Competition, Agency Costs, and R&D Information Disclosure [J]. *Journal of Guangdong University of Finance and Economics*, 2018, 33(3): 52-64. (in Chinese)
- [15] Lu Shan, Wu Peng, Jiang Yan, et al. Can Corporate Social Media Disclosure Reduce Information Asymmetry? A Comparative Study between the ChiNext and Main Board [J]. *Economic Issues*, 2021, (10): 121-129. (in Chinese)
- [16] Zhou Kaiguo, Ying Qianwei, Zhong Chang. Can Media Supervision Play a Role in External Governance? Evidence from Violations of Listed Companies in China [J]. *Financial Research*, 2016, (06): 193-206. (in Chinese)



[17] Wei Peng, Feng Baoyi. Curvilinear Effects and Statistical Testing Methods in the Field of Management [J]. Nankai Management Review, 2022, 25(01): 155-166. (in Chinese)

[18] Meng X H, Zeng S X, Shi J J, *et al.* The relationship between corporate environmental performance and environmental disclosure: An empirical study in China[J]. Journal of Environmental Management, 2014, 145: 357-367. (in Chinese)

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