Environmental Information Disclosure, Executive Gender and Principal-Agent Cost

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Abstract—**Information disclosure is one of the important mechanisms for the effective operation of the capital market, among which environmental information disclosure has an important impact on the principal-agent cost. This paper takes a-share listed companies in all heavy polluting industries in Shanghai and Shenzhen stock exchanges as research samples, and empirically tests the logic of the effect of environmental information disclosure on the principal-agent cost. The results show that there is a significant negative correlation between environmental information disclosure and principal-agent cost. In addition, executive gender has a positive moderating effect on the negative correlation between environmental information disclosure and principal-agent cost, indicating that the disclosure of environmental information by enterprises with female chairmen is more conducive to reducing principal-agent cost.**

Keywords—environmental information disclosure; executive gender; implicit agency cost; explicit agency cost

I. INTRODUCTION

Since the Reform and Opening, China's economy has been developing rapidly and people's living standards have been improving constantly. But behind the high growth, there is a huge environmental crisis. According to the state of China's ecological environment bulletin 2017 released by the ministry of ecological environment, among the 5,100 water quality monitoring points nationwide in 2017, nearly 70% of the groundwater is of poor grade. However, due to the specialty and concealment of environmental information, investors are at a disadvantage in information disclosure, so it is difficult for them to know exactly how enterprises fulfill their environmental responsibilities. Therefore, under the institutional background of emphasizing environmental protection and launching a series of environmental information disclosure policies, it is necessary to study the impact of environmental information disclosure on the principal-agent cost.

II. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

A. Environmental Information Disclosure and Principal-Agent Cost

At present, there are few literatures studying the relationship between environmental information disclosure and principal-agent cost. Du Xingqiang and Zhou Ze (2009)

believe that information disclosure can enable owners to better supervise operators and avoid operators from deviating from the goal of maximizing enterprise value, thus reducing agency cost [1]. Yang Yufeng, Wang Huoxin and Cao Qiong (2010) found that information disclosure can reduce the principal-agent cost from the perspective of internal control [2]. Generally speaking, on the one hand, environmental information disclosure can improve the quality of non-financial information to a certain extent, help to alleviate the information asymmetry of external investors, curb the official embezzlement of managers, and thus reduce the principal-agent cost. On the other hand, according to the signal transmission theory, enterprises' disclosure of environmental information transmits an image of managers with a sense of social responsibility, which reduces investors' distrust of managers, changes investors' preference, and helps to reduce agency cost. In addition, according to Jensen, the principal-agent cost is composed of implicit agency cost and explicit agency cost [3]. Therefore, this paper also divides the principal-agent cost into implicit agency cost and explicit agency cost. The following hypotheses are proposed:

Hypothesis 1a: The level of environmental information disclosure is negatively correlated with the implicit agency cost.

Hypothesis 1b: The level of environmental information disclosure is negatively correlated with the explicit agency cost.

B. The Moderating Effect of the Executive Gender

According to the theory of high echelon team, personal characteristics always affect the strategic decisions of enterprises. As an important influencing factor of the characteristics, executive gender has always been the focus of domestic and foreign scholars. For example, Fukukawa (2007) pointed out that compared with male members, female executives are more concerned about environmental issues, and they are more inclined to take actions to reduce environmental hazards [4]. Meng Xiaohua (2012) found that the higher proportion of female executives, the more environmental information will be disclosed [5]. The moderating effect of female executives can be explained from three aspects: first, female executives are more inclined to undertake social responsibility. Women generally pay more attention to environmental issues than men, spend more time and energy on environmental information disclosure, and make more decisions that are conducive to the environmental performance

of enterprises. Second, female executives are more risk-averse. Female executives tend to be more cautious when making decisions, more inclined to comply with national policies, choose a positive way to disclose environmental information and avoid additional risks [6]. Third, due to the prudence of female executives, the authenticity and reliability of the disclosure content are increased, and the interest difference caused by the separation of powers is reduced, which is conducive to reducing the principal-agent cost. Therefore, the following hypothesis is proposed:

Hypothesis 2: female executives have a positive moderating effect on the negative effect of environmental information disclosure and principal-agent cost.

III. RESEARCH DESIGN

A. Sample Selection and Data Sources

We select the a-share listed companies in the heavy polluting industries of Shanghai and Shenzhen stock exchanges in China from 2015 to 2017 as the research samples. Excluding the listed companies with missing data and issuing A and B shares at the same time, a total of 867 observations were obtained from 289 companies in 3 years. Environmental information disclosure data are obtained by manually collecting annual reports and social responsibility reports issued by listed companies, and other data are obtained from CSMAR. In addition, to avoid the influence of extreme values, the top and bottom 1% of continuous variables were truncated.

B. Variable Definition and Econometric Model

The dependent variable is the principal-agent cost. The total asset turnover is used to represent the implicit agency cost, because the total asset turnover represents the utilization efficiency of assets, and the total asset turnover has an inverse relationship with the agency cost. The ratio of management cost to main business income (referred to as management cost ratio) represents the explicit agency cost, because managers' salaries and company-paid consumption generate management cost. The higher the management cost ratio, the higher the agency cost.

The independent variable is environmental information disclosure. At present, there is no authoritative institution in China to evaluate the level of environmental information disclosure of enterprises. Therefore, we review the annual reports and the social responsibility reports, divide the environmental information into 11 aspects by content analysis method and scores them, and adds the scores to obtain the level of environmental information disclosure. The specific scoring criteria are shown in TABLE I.

The moderator variable was the executive gender. In this paper, the chairman of the board is used to replace the enterprise managers, because the legal representative of China is the chairman of the board, and the chairman of the board is the supreme manager of the fact and has higher decision-making power in the enterprise. If the chairman gender is female, the value is 1, if the gender of the chairman is male, the value is 0.

Control variables are also introduced in this paper, and the specific variable definitions are shown in TABLE II.

TABLE I.   ENVIRONMENTAL INFORMATION DISCLOSURE LEVEL RATING

Projects	Quantitative Disclosure	Qualitative Disclosure	No Disclosure
Environmental protection technology development, equipment purchase	2	1	0
Environmental subsidies and financial incentives	2	1	0
Sewage charges, environmental protection labor expenditure	2	1	0
Litigation and administrative penalty	2	1	0
Concentration, type and quantity of pollution discharge	2	1	0
Consume resources and save resources	2	1	0
Environment system, policy, goal	2	1	0
List of environmental penalties and heavy pollution	2	1	0
Environmental risk prevention situation, emergency system situation	2	1	0
Pollution discharge standards	2	1	0
Operation of environmental protection facilities	2	1	0

TABLE II.   DEFINITION AND INTERPRETATION OF VARIABLES

Name	Code	Definitions
Implicit agency cost	TAT	Total asset turnover
Explicit agency cost	MER	Management cost ratio
Environmental information disclosure	EDI	Collected from annual reports and social responsibility reports
Executives gender	GENDER	Dummy variable, female =1, male =0
Earning management	EA	Calculated according to the modified JONES model
The company size	SIZE	The log of the total assets
Debt paying ability	LEV	Asset-liability ratio
Growth ability	GROWTH	Growth rate of operating income
profitability	ROA	Net profit/total assets
Equity concentration	TOP1	The largest shareholding ratio
year	YEAR	Dummy variable
industry	IND	Dummy variable

To test the impact of environmental information disclosure on the principal-agent cost, the following model is constructed:

$$TAT_{i,t} = \alpha_0 + \alpha_1 EDI_{i,t} + \alpha_i Controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$MER_{i,t} = \alpha_0 + \alpha_1 EDI_{i,t} + \alpha_i Controls_{i,t} + \varepsilon_{i,t} \quad (2)$$

To test the interactive influence of executive gender and environmental information disclosure on the principal-agent cost, the following model is constructed:

$$TAT_{i,t} = \alpha_0 + \alpha_1 EDI_{i,t} + \alpha_2 GENDER_{i,t} + \alpha_3 EDI_{i,t} * GENDER_{i,t} + \alpha_t Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$MER_{i,t} = \alpha_0 + \alpha_1 EDI_{i,t} + \alpha_2 GENDER_{i,t} + \alpha_3 EDI_{i,t} * GENDER_{i,t} + \alpha_t Controls_{i,t} + \varepsilon_{i,t} \quad (4)$$

IV. EMPIRICAL TEST AND ANALYSIS

A. Descriptive Statistics

Descriptive statistics are shown in TABLE III. The lower quartile of the total asset turnover was 0.41 and the mean value was 0.68, and the difference between the mean value and the lower quartile (0.27) was greater than the difference between the mean value and the upper quartile (0.14), showing a significant left-skewed distribution, indicating that the total asset turnover of the sample companies was generally low, and the implicit agency cost was high. The maximum value of environmental information disclosure is 16, the minimum value is 1, and the standard deviation is 4.18, indicating that the level of environmental information disclosure varies greatly among enterprises. From the mean, standard deviation and median of

other variables, the difference between the median and the mean is very small, and the difference between the upper, lower quartile and the median of each indicator is also small, indicating that the data is normally distributed.

TABLE III.   DESCRIPTIVE STATISTICS

VARIABLES	N	Mean	Sd	P25	P75	Min	Max
TAT	867	0.68	0.42	0.41	0.82	0.13	2.55
MER	867	0.08	0.04	0.04	0.1	0.01	0.22
EDI	867	6.96	4.18	4	10	1	16
EA	867	0.05	0.05	0.02	0.07	0	0.29
SIZE	867	22.58	1.21	21.68	23.5	20.4	25.97
LEV	867	0.41	0.2	0.25	0.58	0.05	0.83
GROWTH	867	0.13	0.26	0.04	0.25	0.42	1.07
ROA	867	0.04	0.05	0.01	0.07	0.12	0.2
TOP1	867	34.58	14.14	23.82	43.03	9.87	74.18

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TABLE IV.   REGRESSION RESULTS

VARIABLES	(1) TAT	(2) MER	(3) TAT	(4) MER	(5) TAT	(6) MER
EDI	0.0126***	-0.000192**	0.0107***	-0.00126***	0.00964***	-0.000946***
	(0.000238)	(0.0263)	(0.00221)	(0.000229)	(0.00679)	(0.00598)
GENDER					0.384***	-0.0333**
					(0.00491)	(0.0117)
GENDER*EDI					0.0307*	0.00686***
					(0.0676)	(0)
EA			1.285***	-0.0605**	1.247***	-0.0744***
			(0)	(0.0274)	(0)	(0.00637)
SIZE			-0.0749***	-0.00683***	-0.0725***	-0.00696***
			(0)	(0)	(0)	(0)
LEV			0.501***	-0.0668***	0.473***	-0.0630***
			(0)	(0)	(0)	(0)
GROWTH			0.132**	-0.0122**	0.126**	-0.0116**
			(0.0224)	(0.0308)	(0.0286)	(0.0367)
ROA			0.932***	-0.0992***	0.890***	-0.0939***
			(0.00317)	(0.00129)	(0.00469)	(0.00205)
TOP1			0.00428***	-0.000471***	0.00428***	-0.000440***
			(0)	(0)	(0)	(0)
YEAR	control	control	control	control	control	control
IND	control	control	control	control	control	control
Constant	0.749***	0.0818***	1.957***	0.278***	1.901***	0.280***
	(0)	(0)	(0)	(0)	(0)	(0)
Adjusted R²	0.0158	0.0125	0.1033	0.2153	0.1117	0.2360
N	867	867	867	867	867	867
F	5.626	3.416	12.08	27.40	10.90	25.32

Note: ***, *** and * represent significant at 1%, 5% and 10% confidence levels, respectively.

B. Regression Analysis

Model (1) and (2) were used to examine the impact of environmental information disclosure on implicit agency cost and explicit agency cost, respectively. The results are shown in columns (1) to (4) of TABLE V. Columns (1) only considers the influence of environmental information disclosure of implicit agency cost, the results showed that environmental information disclosure is positively correlated with total asset turnover at 1% and total asset turnover is negative proxy variables, so the quality of the environment information disclosure can significantly reduce the implicit agency cost. Column (2) finds that environmental information disclosure is significantly negatively correlated with the management cost ratio at the level of 5%, indicating that the higher the level of environmental information disclosure, the lower the management cost ratio and the lower the explicit agency cost. Column (3) and (4) add control variables, and it is found that the environmental information disclosure is still positive and negative with the total asset turnover and management cost ratio, and the adjusted R square is improved. Therefore, hypothesis 1 is verified.

Model (3) and (4) are used to test the interactive influence of executive gender and environmental information disclosure on the principal-agent cost. The results are shown in TABLE V Column (5) and (6). Column (5) shows that the interaction between executive gender and environmental information disclosure has a significant positive impact on the total asset turnover, indicating that the disclosure of environmental information by enterprises with female chairmen is more conducive to improve the total asset turnover, thus reducing the implicit agency cost. Column (6) shows that the interaction coefficient between executive gender and environmental information disclosure is significantly positive, indicating that the disclosure of environmental information by enterprises with female chairmen is more conducive to reducing explicit agency cost. Therefore, hypothesis (2) is verified.

V. ROBUSTNESS TEST

In order to ensure the reliability of the research results, the following robustness tests were conducted: (1) considering the possible deviation in the measurement of proxy variables, EDI was replaced by the enterprise environmental information disclosure index issued by Environmental Economics Research Center of Fudan University, and GENDER was replaced by the proportion of female executives. The conclusion remains unchanged. (2) considering that the environmental information disclosure in the current period may not have a timely impact on the principal-agent cost in the current period, the first-phase lag analysis of independent variables and control variables is made, and the conclusion remains unchanged.

VI. CONCLUSIONS

This paper selects a-share listed companies in all heavy polluting industries in Shanghai and Shenzhen stock exchanges as research samples to study the impact of environmental information disclosure on the principal-agent cost. The research findings are as follows: (1)Environmental information disclosure is significantly negatively correlated with the principal-agent cost, indicating that enterprises' active disclosure of environmental information can reduce the degree of information asymmetry, establish a good image and reduce the principal-agent cost; (2)Executives gender has a positive moderating effect on the negative correlation between environmental information disclosure and principal-agent cost, indicating that the disclosure of environmental information by enterprises with female chairmen is more conducive to reducing principal-agent cost.

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