Executive compensation, Over-indebtedness and Corporate environmental performance

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Abstract. This paper presents empirical evidence on corporate governance and performance with aid of Bootstrap program. The significance of this paper lies in that the paper explores for the first time the direct mechanism of executive compensation on corporate environmental performance, and from the empirical research results, complete mediation is established. Data from A-share listed companies in China from 2010 to 2020 are utilized to arrive at several findings: (1) executive compensation has a negative effect on corporate environmental performance in general; (2) over-indebtedness mediates the relationship between executive compensation and environmental performance; (3) better internal control could inhibit the contribution of executive compensation to over-indebtedness. The third result adds to our contribution that moderated mediation channel is supported. In addition, this paper uses the Bootstrap program to get a Bootstrap sample and then conducts regression to get the concerned coefficient. The product of the coefficients of concern was sorted by value to get the confidence interval at the 95% level, and then the mediation effect was tested. Further implications are provided.

Keywords: executive compensation; environmental performance; over-indebtedness; internal controls

1 Introduction

As the country's environmental condition worsens, the government and society in China are paying increasingly greater attention to ecological and environmental protection. In the 20th National Congress report, President Xi Jinping put up the idea of "enhancing green growth and peaceful coexistence between man and nature." Corporate environmental performance has grown to be a significant problem.

The primary focus of this article is the process through which executive compensation affects the environmental performance. While Adu Douglas (2022) hypothesized that an increase in executive remuneration would decrease the company environmental performance[2], Chang Yuan, Xiao Lan, and Liu Yiqing (2022) hold the opposite view[1]. The academic community has not come to a consensus regarding the exact mechanism through which executive compensation affects corporate environmental performance. Hence, this research intends to provide a novel perspective on the previous problems

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by integrating corporate governance and business performance through empirical investigation and adopting a more in-depth mechanism analysis.

This research finds that, generally, higher executive compensation lowers corporate environmental performance using samples of Chinese A-share listed businesses from 2010 to 2020. The probable explanation is that executives may overextend their businesses in order to improve their financial success and overlook environmental performance due to excessive reward based on financial performance. In addition, this paper finds that the negative effect of executive compensation on environmental performance is dampened when internal control comes better, which may result from the monitoring effect brought about by the internal control system.

The next sections of the paper will be organised as follows. The second portion reviews the existing literature and formulates the hypotheses; the third section presents the variables, sample and methodology of the paper; and the fourth section offers a conclusion.

2 literature review and hypotheses development

2.1 The impact of executive compensation on corporate environmental performance and the mediating role of over-indebtedness

Early research on the subject of executive compensation and firm performance (Li Zengquan, 2000; Wei Gang, 2000) came to the conclusion that there is no meaningful correlation between the two[3,4]. However, more and more studies in recent years (Fang Junxiong, 2009; Liu Shaofei & Wan Dayan, 2013) have found a positive relationship between executive compensation and firm business performance[5,6], in addition to studies (Wu Yuhui, 2010) showing that there is a clear self-serving behaviour of executives in the compensation setting process[7]. Thus we can infer that an increase in executive pay will encourage executives to raise more money to engage in ventures that will boost financial performance by boosting financial leverage or even self-serving over-indebtedness. At the same time, funds are tied up in profitable economic activities so that the funds for environment become more limited, leading to a possible reduction in the environmental performance of the firm. Based on the above analysis, we propose Hypothesis 1 and Hypothesis 1a.

Hypothesis 1: Executive compensation has a negative effect on a firm's environmental performance.

Hypothesis 1a: Over-indebtedness mediates the relationship between executive compensation and environmental performance.

2.2 The moderating role of internal controls

Under a principal-agent system, a conflict of interest relationship arises between a firm's principal and the agents[8]. (Wenwu, X., Khurram, M. U., Qing, L., & Rafiq, A, 2023). Regarding the relationship between inefficient investment and internal control, some studies (Fang, H. & Jin, Y. N., 2013) suggest that under a principal-agent system, corporate agents make decisions with more "self-interest" than "corporate interest"[10].

However, companies with higher quality internal controls have a better and more rigorous monitoring and review system, ensuring the control and balance of power within the company. Thus we can infer that effective internal controls should be able to reduce the potential for executives to undermine shareholders' rights and interests through increased leverage and investment. Based on the above analysis, we propose Hypothesis 1b.

Hypothesis 1b: Internal controls inhibit the contribution of executive compensation to over-indebtedness.

3 Methodology

3.1 Data sources, variable definitions and descriptive statistics

Data sources and variable definitions.

Since the beginning of the 11th Five-Year Plan, the Chinese government has placed higher demands on companies to save energy and reduce emissions. Therefore, we use the data of Chinese A-share listed companies from 2010-2020 as a sample to examine the impact of executive compensation on the environmental performance of companies and its impact mechanism.

In this study, the sample was treated as follows: Excluding all samples with missing environmental performance indicators, financial performance indicators (e.g. R&D expenditure) and over-indebtedness indicators. The final sample involved 1045 companies with a total of 9747 observations.

The data sources are as follows: (1) Environmental performance data is obtained from the environmental score in the ESG score provided by Shanghai Huazheng Index Information Service Co. (2) Other Data is obtained from the China Stock Market Accounting Research (CSMAR). Table 1 shows the variable definitions.

Table 1. Variable Definition

Variable	Definition
Environment	Environmental score in ESG score from Sino-Securities Index Information Service(Shanghai) Co.Ltd
LnTotalPay	The total annual salary of directors, supervisors and executive taken as the natural logarithm
Over-indebtedness	Actual debt ratio - target debt ratio
ICRatings	Disclosing the internal control evaluation report takes 1, otherwise take 0; The conclusion of the internal control evaluation report is 1, otherwise it is 0; Effective internal control takes 1, otherwise it takes 0; Taking corrective measures takes 1, otherwise take 0; Disclosing the internal control audit report takes 1, otherwise take 0; The sum of the scores of various indicators is used as the internal control quality score
Concurrency	The concurrently serving of the chairman and general manager;0 = same person; 1 = different person
LnFirmSize	The total assets of the enterprise taken as natural logarithms
DARatio	Liabilities /Total assets
RDRatio	R&D expenditure/operating income
ROA	Net profit/total asset balance

Descriptive statistics.

The mean value of environmental performance is 59.94, the minimum value is 29.46 and the maximum value is 95.16, with a large difference and a standard deviation of 7.773, indicating that the distribution of environmental performance in the sample is relatively dispersed; the mean value of executive compensation (after taking the natural logarithm) is 15.55, the minimum value is 10.44 and the maximum value is 19.31.

Table 2. Descriptive statistical analysis of each variable

variable	N	mean	sd	min	max
Environment (E)	30625	59.94	7.773	29.46	95.16
LnTotalPay (EC)	32588	15.55	0.802	10.44	19.31
Over-indebtedness (OI)	29057	-0.0005	0.163	-0.802	0.951
ICRatings (IC)	32632	4.150	1.166	0	5
Concurrency	32632	0.277	0.448	0	1
LnFirmSize	32632	22.16	1.523	13.08	31.14
DARatio	32632	0.461	1.161	-0.195	178.3
RDRatio	24948	52.63	5079	-1494	767718
ROA	32632	0.0104	0.0594	-8.235	5.317

3.2 Empirical analysis

Baseline regression.

To examine the association between corporate environmental performance (E) and executive compensation (EC), we estimate the following regression model:

$$E_{it} = \theta_0 + \theta_1 EC_{it} + \theta_2 Over\_indebttedness_{it} + \theta_3 ICRatings_{it} + \theta_4 Concurrency_{it} + \theta_5 LnFirmSize_{it} + \theta_6 DARatio_{it} + \theta_7 RDRatio_{it} + \theta_8 ROA_{it} + \varepsilon_{it} \quad (1)$$

The results of the baseline regressions are shown in Table 2. Column (1) indicates the regression results without the inclusion of any other variables, which shows that executive compensation (LnTotalPay) does not have a significant effect on environmental performance (Environment); column (2) indicates the regression results after the inclusion of control variables unrelated to liabilities, showing that the coefficient of executive compensation becomes negative, but still not statistically significant; column (3) indicates the regression results after adding the control variables related to liabilities and the coefficient of executive compensation is significantly negative. In conclusion, higher executive compensation does have a negative impact on environmental performance and that the variables related to debt may be a potential channel of influence.

Table 3. Baseline regression

VARIABLES	(1) m1 Environment (E)	(2) m2 Environment (E)	(3) m3 Environment (E)
LnTotalPay (EC)	0.15738	-0.13296	-0.34944**
	(1.35)	(-1.13)	(-2.35)
Concurrency		-0.12274	-0.11721
		(-0.91)	(-0.75)
LnFirmSize		0.58697***	0.52245***
		(5.74)	(3.48)
DARatio			-0.42755
			(-0.88)
RDRatio			0.00001
			(1.09)
DARatio×R DRatio			-0.00005
			(-1.63)
ROA		0.65917	31.25299***
		(0.88)	(9.52)
Constant	57.47308***	48.98254***	54.38641***
	(31.67)	(19.35)	(14.63)
Observations	30,253	30,253	23,152
R-squared	0.685	0.686	0.693

Regression analysis with over-indebtedness as a mediating effect.

The results of the baseline regression point the channel of influence between the main variables to the debt-related variables. It has been shown that an increase in executive compensation promotes higher corporate performance[9](Wu Qian, 2022), and management tends to increase debt to carry out operational activities and thus improve financial performance, which may lead executives to adopt an aggressive debt strategy and focus heavily on financial performance at the expense of investing in non-profit activities. The results in Table 3 demonstrate that over-indebtedness is a mediating mechanism through which executive compensation affects environmental performance.

Equation(2) is established to test H1 the impact of the Excecutive compensation (EC) on Corporate environmental performance (E) as shown in Fig.1. Equation(3) -(4)are testing the mediating role of Over-indebtedness (OI).Control variables consider firm size, debt-to-assets ratio, concurrency, ROA, RDratio, i represents individual enterprise, and t represents year.

$$E_{it} = \alpha_0 + \alpha_1 EC_{it} + \sum \alpha_j Control_{it} + \varepsilon_{it} \tag{2}$$

$$OI_{it} = \beta_0 + \beta_1 EC_{it} + \sum \beta_j Control_{it} + \varepsilon_{it} \tag{3}$$

$$E_{it} = \gamma_0 + \gamma_1 EC_{it} + \gamma_2 OI_{it} + \sum \gamma_j Control_{it} + \varepsilon_{it} \tag{4}$$

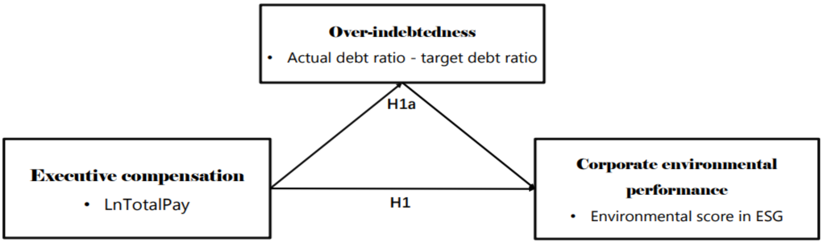

Fig. 1. Mediation effect of Over-indebtedness

The mediating effect test is conducted in traditional steps. As Table 4 shows,the coefficients comprehended from three columns indicate that the total negative effect of executive compensation on environmental performance is achieved entirely by the mediating effect, i.e. over-indebtedness plays a fully mediating role between executive compensation and environmental effects, which is supported by the bootstrap test. The bootstrap method is a method of repeated sampling from a sample. The usual sampling method is to repeat the sample with retracting. In this paper, a sample with a sample size of 500 was taken as the Bootstrap population, from which repeated sampling was performed to obtain a Bootstrap sample), and then regression was performed to obtain the coefficient of concern. Ranking the product of the coefficients of interest in order of magnitude, the 2.5 percentile and 97.5 percentile sites form the confidence interval for the product of the coefficients at the 95% statistical level to determine whether the product of the coefficients is significantly different from 0.

Table 4. Mediation effect test

VARIABLES	(1) m4 Environment (E)	(2) m5 Over-indebtedness (OI)	(3) m6 Environment (E)
LnTotalPay (EC)	-0.34877**	0.00968***	-0.19919
	(-2.35)	(4.81)	(-1.32)
Over-indebted (OI)			-2.47692***
			(-3.24)
Concurrency	-0.11860	0.00557***	-0.23578
	(-0.76)	(2.69)	(-1.47)
LnFirmSize	0.52052***	-0.04476***	0.71719***
	(3.47)	(-20.49)	(4.44)
DARatio	-0.42938	0.81708***	1.99012**
	(-0.88)	(99.43)	(2.31)
RDRatio	-0.00001***	0.00000	-0.00001***
	(-3.55)	(0.34)	(-3.18)
ROA	31.24873***	1.61308***	-1.69973
	(9.52)	(16.69)	(-0.43)
Constant	54.41973***	0.48188***	46.98862***
	(14.65)	(9.79)	(12.01)
Observations	23,152	22,098	21,518
R-squared	0.693	0.876	0.721

Regression analysis with internal control as a moderating effect.

Equation(5) is established to test H1b the moderation effect of the internal control (IC) on the relationship between executive compensation (EC) and over-indebtedness (OI) as shown in Fig.2.

$$OI_{it} = \delta_0 + \delta_1 EC_{it} + \delta_2 IC_{it} + \delta_3 EC_{it} \times IC_{it} + Control_{it} + \delta_{it} \quad (5)$$

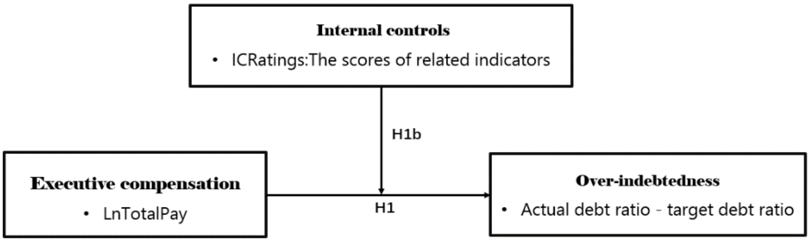

Fig. 2. Moderation effect of internal controls

The results of the moderating effect test are shown in Table 5, in which the interaction of executive compensation and internal control is generated, and the significance of the coefficient is tested to examine the moderating effect of internal control on the relationship between executive compensation and over-indebtedness degree. The coefficient of the interaction term is significantly negative, indicating that the moderating effect of internal control can inhibit the contribution of executive compensation to over-indebtedness.

Table 5. Moderating effects test

VARIABLES	m7 Over-indebtedness (OI)
LnTotalPay (EC)	0.02399*** (5.13)
ICRatings (IC)	0.06267*** (4.09)
ICRatings×L nTotalPay	-0.00376*** (-3.82)
Concurrency	0.00578*** (2.77)
LnFirmSize	-0.04192*** (-24.07)
DARatio	0.81145*** (98.00)
RDRatio	0.00000 (0.45)
ROA	1.55074*** (17.27)
Constant	0.18167** (2.47)
Observations	22,361
Number of symbol	3,451
R-squared	0.629

4 Conclusions

This paper explores the relationship between executive compensation and corporate performance in the context of listed companies, adding to the existing research on corporate performance and providing a reference for companies on executive compensation, internal control and performance management. The findings reveal that the level of executive compensation has a negative impact on corporate environmental performance; secondly, executive compensation has a negative impact on environmental performance through the complete intermediary of over-indebtedness negatively moderated by the quality of corporate internal control. Bootstrap tests support our hypotheses. Based on this, this paper provides new insights into the areas of corporate governance, corporate performance, and agency issues.

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