Research on the Relationship between Government Subsidies and ESG Performance of Medicine Manufacturing Enterprises: Based on the Perspective of Internal Control

Zhuo Sun*[1], Shangjin Li[2], Mengqiu Wang[3]

{sunzhuo@zisu.edu.cn[1], luvsuga0427@163.com[2], 67343237@qq.com[3]}

Zhejiang International Studies University, 299 Liuhe Road, Hangzhou, China

Abstract. High quality economic development cannot be achieved without the fulfillment of government and corporate responsibilities. ESG is highly in line with global development requirements, and promoting ESG concepts has important strategic significance. Based on this, this article selects pharmaceutical manufacturing listed companies from 2018 to 2022 as the research object, and uses regression analysis methods to explore the impact of government subsidies on the ESG performance of pharmaceutical manufacturing enterprises from the perspective of internal control. government subsidies can improve corporate ESG performance, and internal controls play a partial mediating role. Besides that, government subsidies have a more significant promoting effect on the ESG performance of non-state-owned pharmaceutical manufacturing enterprises.

Keywords: Government subsidies; ESG performance; Internal control; Pharmaceutical manufacturing industry

1 Introduction

Environmental, Social, Governance (ESG) is a sustainable development concept that emphasizes the coordinated development of environment, society, and governance, which is highly in line with global sustainable development requirements. Under the traditional goal of maximizing profits, how to encourage enterprises to incorporate environmental, social responsibility, and corporate governance into their development strategy decisions has become a focus of social attention. The pharmaceutical industry is an entity that gathers knowledge and technology, and government subsidies and other financial support can partially meet its innovation and research and development needs. However, there are differences in the level of internal control among enterprises, leading to differences in their understanding and implementation of policies, which in turn affects the relationship between government subsidies and corporate ESG performance.

According to the Enterprise Accounting Standards, government subsidies mainly account for economic resources related to the direct transfer of assets, such as fiscal appropriations, fiscal interest subsidies, and fiscal incentive funds. Most scholars use the natural logarithm of

MSEA 2024, May 24-26, Jinan, People's Republic of China

DOI 10.4108/eai.24-5-2024.2350113

government subsidies in the annual non operating income of enterprises to evaluate. (Chu，2016[1]；Qian，2022[2]).

In terms of internal control, Chen and Huang (2019) constructed an internal control index from the perspective of the "process" of internal control, which mainly measures the degree of perfection and effectiveness of the internal control system.[3] Cao (2021) believes that using the DiBo internal control index to evaluate the internal control quality of listed companies is more appropriate.[4]

ESG performance is usually calculated using subjective judgments such as indicator analysis and expert ratings. Mahmood et al. （2020） chose to establish a fuzzy comprehensive evaluation model for corporate social responsibility from the perspective of employees. [5] Zhang et. al (2017) combined internal customer data of Industrial and Commercial Bank of China with third-party authoritative data to construct an ESG green rating system. [6]

For analyzing the impact of government subsidies on ESG performance of enterprises, Xie and Zou (2021) verified that government environmental subsidies incentivize and guide enterprises to govern and repair polluted environments, thereby improving the level of environmental governance.[7] Jiang and Chen (2022) believe that government subsidized enterprises can obtain more resources and have stronger capabilities to undertake environmental and social responsibilities, thereby enhancing their ESG performance.[8]

As to analyzing the impact of internal control quality on corporate ESG performance, Yang et al. (2016) analyzed the Glaxo Smith Kline bribery case and believed that good internal control would enhance the level of corporate social responsibility fulfillment. [9] Amran et al. (2014) found through empirical testing that high-quality internal control not only promotes the fulfillment of corporate social responsibility, but also supervises the fulfillment of corporate social responsibility.[10] Junaidi (2022) believes that high-quality internal management can improve a company's social responsibility level and operational management capabilities.[11]

2 Hypotheses

Firstly, government subsidies can support the environmental activities of enterprises, which not only enhances their environmental strength, but also enhances government supervision, improves environmental information disclosure. Therefore, the first hypothesis (H1) of this article is proposed: government subsidies have a positive incentive effect on ESG performance, and the second hypothesis (H2) is that there is a causal relationship between government subsidies and ESG performance.

Secondly, the improvement of internal controls can compensate for the shortcomings in ESG, and enhance the ESG performance of enterprises. Internal control can supervise the behavior of executives and suppress their short-sighted behavior, which helps to reshape the development philosophy of employees, shape a good corporate culture, and improve ESG performance of the enterprise. Therefore, the third hypothesis (H3) of this article is proposed: internal control has a positive motivating effect on ESG performance.

Thirdly, government subsidies can alleviate the financial pressure on enterprises, allowing them to have more resources to improve the quality of internal control and promote more

active on improving corporate governance, thereby enhancing the ESG performance of enterprises. Therefore, the fourth hypothesis (H4) of this article is proposed: Internal control plays a mediating role in the impact of government subsidies on ESG performance.

3 Methodology

3.1 Data

This paper selected pharmaceutical manufacturing listed companies from 2018 to 2022 as the research objects. After excluding samples with abnormal data, ST and ST * companies, and missing data, 1104 sample values were obtained. The data in this article comes from Wind database and CSMAR database. This article uses Stata17.0 for data processing and empirical analysis.

3.2 Variables

Dependent variable. The Huazheng Index divides the ESG performance of enterprises into 9 levels, from the highest AAA level to the lowest C level. This article assigns the above levels to 9-1 points, and uses numbers to represent the annual ESG performance of enterprises. In the robustness testing section, the ESG assignment is replaced by the average ESG score of pharmaceutical manufacturing listed companies over the past five years.

Independent variable. Government subsidies are specifically subdivided into government subsidies in advance, tax incentives, research and development funding support, innovation achievement rewards, government donations, loans, and financial subsidies. This article measures the level of government subsidies received by enterprises by adding one to the total amount of government subsidies and taking the logarithm.

Table 1. The perfection of internal control system index system

Objective	Primary indicators	Secondary indicators
Comprehensive internal control index	Internal environment	Corporate governance
		Corporate culture
	Risk assessment	Risk identification
		Risk analysis
		Risk reaction
	Control activities	Accounting control
		Performance control
	Information communication	Information selecting
		Information system
	Internal supervision	Internal inspection
		Disclosure of internal control information

Mediating variablel. For measuring the perfection of enterprise internal control system, we refer to the internal control evaluation system by Chen and Huang (2019) [3]. Based on the five elements of internal control in the COSO framework, five primary evaluation indicators and 11 secondary indicators have been determined (see Table 1). Secondly, we assign weights to primary and secondary indicators using the coefficient of variation method. Thirdly, we collect data and score indicators at all levels of the enterprise based on regular announcements, temporary announcements, company rules and regulations, penalties, and major events.

Forthly, we obtain the score of the first level indicator by gradually weighting and averaging the indicators at each level. Finally, we could obtain an comprehensive index to evaluate perfection of internal control system.

Control variables. This article refers to existing literature and uses enterprise size, asset return on investment, asset liability ratio, and enterprise age as the control variables used in this article.

The variables and their definitaion are shown in Table 2.

Table 2. Variables

Varibles		Symbles	Definations
Dependent variable	ESG performance	ESG	ESG ratings are mainly divided into nine levels, with values ranging from 9 to 1
Independent variable	Government subsidies	Sub	ln(government subsidies + 1)
Mediating variables	Internal control	IC	Comprehensive internal control index (Table 1)
Control variables	Enterprise size	Size	ln(total asset)
	Return of assets	ROA	net profit/total assets
	Asset return rate	Lev	debt/asset
	Revenue growth rate	Growth	growth rate of revenue
	Proportion of independent directors	Indratio	Number of independent directors/number of directors
	Enterprise age	Age	year of establishment of the enterprise

3.3 Model

This article uses multiple linear regression to construct the following three models to test the relationship between government subsidies, internal control, and corporate ESG performance.

To test H1, the positive incentive effect of government subsidies on ESG performance, construct Model 1 (equation 1).

$$ESG_{it} = \alpha_0 + \beta_1 Sub_{it} + \beta_2 Size_{it} + \beta_3 ROA_{it} + \beta_4 Lev_{it} + \beta_5 Growth_{it} + \beta_6 Indratio_{it} + \beta_7 Age_{it} + \varepsilon_{it} \quad (1)$$

To test H3, internal control has a positive motivating effect on ESG performance, construct Model 2 (equation 2).

$$ESG_{it} = \alpha_0 + \beta_1 IC_{it} + \beta_2 Size_{it} + \beta_3 ROA_{it} + \beta_4 Lev_{it} + \beta_5 Growth_{it} + \beta_6 Indratio_{it} + \beta_7 Age_{it} + \varepsilon_{it} \quad (2)$$

To test H4, construct model 3 to examine the mediating effect of internal control on the impact of government subsidies on ESG performance, see equation 3.

$$ESG_{it} = \alpha_0 + \beta_1 Sub_{it} + \beta_2 IC_{it} + \beta_3 Size_{it} + \beta_4 ROA_{it} + \beta_5 Lev_{it} + \beta_6 Growth_{it} + \beta_7 Indratio_{it} + \beta_8 Age_{it} + \varepsilon_{it} \quad (3)$$

Where, i denotes individual listed firm, t is time series, and α denotes constant term, β is the intercept term for individual effect heterogeneity, ε represents the residual term.

4 Empirical analysis

4.1 Descriptive statistics

Descriptive statistics were conducted on the data of listed companies in the pharmaceutical manufacturing industry, and the results are shown in Table 3. The analysis results show that the average ESG performance is 3.967 (lower than level B), indicating that the ESG performance level of most pharmaceutical manufacturing enterprises in China needs to be improved. The average government subsidy is 7.494, reflecting the government's emphasis on the pharmaceutical manufacturing industry. The standard deviation of the internal control index of enterprises is 0.853, indicating that there is a small difference in the quality of internal control among listed pharmaceutical manufacturing companies.

Table 3. Descriptive statistics.

Indicator	No.	Mean	Min	Max	Std.
ESG	1104	3.967	1	7	1.132
Sub	1104	7.494	2.518	11.10	1.283
IC	1104	6.143	5.409	6.732	0.853
Size	1104	12.93	10.26	16.19	0.963
ROA	1104	0.0680	-0.826	0.709	0.101
Lev	1104	0.244	0.00100	0.900	0.159
Growth	1104	0.184	-1.290	32.96	1.325
Indratio	1104	37.39	30	60	4.873
Age	1104	11.05	1	30	8.091

4.2 The impact of government subsidies on ESG performance

The regression coefficient between government subsidies and ESG performance of pharmaceutical manufacturing enterprises is 0.147, which is significant at the 1% level (see Table4(1)). This indicates that obtaining government subsidies for pharmaceutical manufacturing enterprises can indeed improve their ESG performance, and H1 has been validated. Government subsidies can help pharmaceutical manufacturing enterprises have more funds to undertake social responsibilities in environmental protection, pollution control, and other aspects, and improve their ESG performance.

Table 4. Regress results, robust test and heterogeneity test results.

	ESG						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sub	0.147***		0.115***	0.706***		0.162***	0.0641
	(0.0352)		(0.0337)	(0.171)		(0.0388)	(0.0839)
IC		2.461***			12.23***		
		(0.225)			(1.085)		
Size	0.195***	0.295***	0.185***	1.036***	1.511***	0.176***	0.250**
	(0.0512)	(0.0368)	(0.0488)	(0.248)	(0.178)	(0.0573)	(0.114)
ROA	1.660***	0.646*	0.628*	8.455***	3.405**	1.160***	5.302***
	(0.330)	(0.330)	(0.329)	(1.598)	(1.595)	(0.352)	(0.950)

Lev	-1.321***	-1.151***	-1.259***	-6.601***	-5.778***	-1.420***	-0.883*
	(0.211)	(0.200)	(0.201)	(1.023)	(0.964)	(0.240)	(0.453)
Growth	-0.0369	-0.0302	-0.0312	-0.234**	-0.201*	-0.0346	0.0797
	(0.0240)	(0.0230)	(0.0229)	(0.116)	(0.111)	(0.0243)	(0.229)
Indratio	0.00832	0.00964	0.00952	0.0394	0.0459	0.00724	0.0234
	(0.00654)	(0.00626)	(0.00623)	(0.0317)	(0.0302)	(0.00727)	(0.0145)
Age	-0.0182***	-0.0165***	-0.0147***	-0.0880***	-0.0795***	-0.0273***	-0.00829
	(0.00449)	(0.00428)	(0.00429)	(0.0218)	(0.0207)	(0.00539)	(0.0111)
cons	0.449	-15.66***	2.394***	54.19***	-25.79***	0.733	-0.601
	(0.566)	(1.493)	(0.224)	(2.744)	(7.215)	(0.630)	(1.307)
N	1104	1104	-14.65***	1104	1104	892	212
R^2	0.147	0.219	(1.514)	0.158	0.233	0.144	0.263

4.3 The impact of internal control on ESG performance

As shown in Table4(2), the regression coefficient between internal control and ESG performance of pharmaceutical manufacturing enterprises is 2.461, which is significant at the 1% level. This indicates that improving the internal control quality of pharmaceutical manufacturing enterprises can indeed improve their ESG performance, and H3 has been validated. After the internal control of pharmaceutical manufacturing enterprises is strengthened, it can improve the level of corporate governance, develop higher quality future plans for enterprises, and enhance the ESG performance of enterprises.

4.4 The mediating effect of internal control

The correlation coefficient between government subsidies and ESG performance of pharmaceutical manufacturing enterprises has changed, decreasing to 0.115 and significant (see Table4(3)). Moreover, the correlation coefficient between the mediating variable IC and the ESG performance of enterprises is 2.394, which is significant. This result proves the mediating effect of internal control between government subsidies and the ESG performance of pharmaceutical manufacturing enterprises. Government subsidies can improve the quality of internal control in pharmaceutical manufacturing enterprises to enhance the ESG performance level of enterprises, and H4 has also been successfully verified. Government subsidies can provide enterprises with more abundant funds to improve the quality of internal control, thereby improving corporate governance and enhancing ESG performance.

4.5 The causal relationship between ESG performance and government subsidies

To verify H2, this article uses Granger causality test to examine the causal relationship between ESG performance and government subsidies. The test results are shown in Table 5. The results show that government subsidies are the Granger cause of ESG performance, but ESG performance is not the Granger cause of government subsidies. That is to say, government subsidies will affect ESG performance, but ESG performance will not affect government subsidies, which indicates that H2 has also been successfully verified..

Table 5. Granger causality test results.

	F value	P value	Results
Government subsidary does not Granger case ESG performance	8.00643	0.0004	Decline
ESG performance does not Granger Cause Government subsidary	0.34152	0.7111	Accept

4.6 Robust test

This article uses the method of replacing explanatory variables for robustness testing, replacing ESG rating with ESG rating to further examine the impact of government subsidies and internal control on corporate ESG performance. The results are shown in Table4(4) and (5). The regression coefficient of government subsidies on the ESG performance of the pharmaceutical manufacturing industry is significant positive and passes the robustness test. The regression coefficient of internal control on ESG performance in the pharmaceutical manufacturing industry is significant positive, and the robustness test is passed.

4.7 Heterogeneity test

The relationship between government subsidies and ESG performance of pharmaceutical manufacturing enterprises may be influenced by different ownership properties. This article divides the sample into two groups based on the nature of enterprise ownership: state-owned enterprises and non-state-owned enterprises. The analysis results show that the regression coefficient between government subsidies and ESG performance of state-owned pharmaceutical manufacturing enterprises is not significant, while the regression coefficient between government subsidies and ESG performance of non-state-owned pharmaceutical manufacturing enterprises is significantly positive(see Table4). This indicates that government subsidies have a more significant promoting effect on the ESG performance of non-state-owned pharmaceutical manufacturing enterprises.

5 Conclusion

This paper uses data from Chinese pharmaceutical manufacturing listed companies from 2018 to 2022 to conduct empirical research on the relationship between government subsidies and corporate ESG performance, the relationship between internal control and corporate ESG performance, and whether using internal control as a mediator variable has other effects on the relationship between government subsidies and corporate ESG performance. The research conclusion is as follows: (1) Government subsidies have a promoting effect on the improvement of ESG performance of pharmaceutical manufacturing enterprises, and there is a causal relationship between government subsidies and ESG performance of enterprises; (2) Internal control has a promoting effect on the improvement of ESG performance in pharmaceutical manufacturing enterprises; (3) Internal control plays a certain intermediary role between government subsidies and corporate ESG performance. (4) Government subsidies have a more significant promoting effect on the ESG performance of non-state-owned pharmaceutical manufacturing enterprises.

Acknowledgments. This paper is supported by projects: Zhejiang Federation of Humanities and Social Sciences (2023N071). Zhejiang Province Research Center for Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era. Zhejiang Province College Student Science and Technology Innovation Activity Plan (2023R418008).

References

[1]CHU Y.D.,Yang S. & Song G.M. (2016). Financial subsidies, tax incentives, and innovation investment in strategic emerging industries. Research on finance and trade (05),83-89.doi:10.19337/j.cnki.34-1093/f.2016.05.010.

[2]Qian X. (2021). Research on the impact of government subsidies on innovation performance of new energy enterprises (Dissertation, Guizhou University of Finance and Economics). Mater. https://link.cnki.net/doi/10.27731/d.cnki.ggzcj.2021.000223doi:10.27731/d.cnki.ggzcj.2021.000223.

[3]Chen H.W., Huang H.H. (2019). Internal control index of Chinese listed companies: logic, construction, and verification. Audit Research, 01,55-63. doi:CNKI:SUN:SJYZ.0.2019-01-009.

[4]Cao M.D.(2021). Analysis of the current situation of unternal control quality in private listed companies - based on the DIB internal control index. China Management Informatization (07),44-46. https://xueshu.baidu.com/usercenter/paper/show?paperid=102n0xk06u6f02a0yx0f0p60ud 040586 &site=xueshu_se

[5] Mahmood, F., Qadeer, F., Abbas, Z., Muhammadi. (2020). Corporate social responsibility and employees' negative behaviors under abusive supervision: A multilevel insight. Sustainability, 12(7), 2647. https://doi.org/10.3390/su12072647

[6] Zhang H.L.,Zhou Y. Q., & Yin H.(2017). ESG Green Rating and Green Index Research.Financial Forum(09),3-14.doi:10.16529/j.cnki.11-4613/f.2017.09.002.

[7] Xie Y.Z., & Zou D.(2021). The Impact of Market Incentive Environmental Regulations on Enterprise Green Investment: An Empirical Study Based on High Pollution Listed Companies in Shanghai and Shenzhen A-shares. Journal of Yunnan Normal University (Philosophy and Social Sciences Edition) (06),75-83.https://xueshu.baidu.com/usercenter/paper/show?paperid=1s2u0050s1070m8003200ag0g8696197&site=xueshu_se

[8] Jiang R. M., Chen G.S. Government subsidies, corporate ESG performance, and green innovation. Resources and industries(06),90-102.doi:10.13776/j.cnki.resourcesindustries.20221024.003.

[9] Yang X.L.,Li X.Y., & Zeng J. Can internal control promote the fulfillment of corporate social responsibility: Investigation based on typical commercial bribery cases. Friends of Accounting(19),82-84.https://xueshu.baidu.com/usercenter/paper/show?paperid=31029dbf2eacdadfdbb007f7ef77a4c1&site=xueshu_se

[10] Amran, A., Lee, S.P. and Devi, S.S. (2014), The Influence of Governance Structure and Strategic Corporate Social Responsibility Toward Sustainability Reporting Quality. Business Strategy and the Environment, 23: 217-235. https://doi.org/10.1002/bse.1767

[11] Junaidi, J. (2022). The Effect of Corporate Governance, Integrated Quality Management and Social Responsibility on Competitiveness and Operational Performance . Golden Ratio of Marketing and Applied Psychology of Business, 2(2), 73 - 91. https://doi.org/10.52970/grmapb.v2i2.187