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The Relationship Between Environmental Accounting Disclosure and Financial Performance and Heterogeneity Analysis: Evidence From Chinese Pharmaceutical Manufacturing Industry

Hao Zhang

College of Economics & Management

Nanjing University of Aeronautics and Astronautics

Nanjing 211106, China

Yiyuan Sun

College of Economics & Management

Nanjing University of Aeronautics and Astronautics

Nanjing 211106, China

Peifeng Zhu (Corresponding author)

School of Health Economics & Management

Nanjing University of Chinese Medicine

Nanjing 210023, China

E-mail: 280702@njucm.edu.cn

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Abstract

Previous empirical evidence provides mixed results on the relationship between the level of environmental disclosures and corporate financial performance. We revisited this relationship using a more rigorous research design with a mediator + moderator model, as well as

heterogeneity analysis and robustness tests. By introducing two variables, financial constraints and media attention, the changes in the relationship are examined in terms of mediating and moderating effects, respectively. Meanwhile. By introducing heterogeneity analysis, we can more accurately understand the differences within the data, select appropriate models and methods, and thereby enhance the reliability and interpretability of the research results. Through robustness tests, we can demonstrate the reliability of the conclusions under different circumstances, which in turn strengthens the persuasiveness of the research findings. The study highlights the necessity of enhancing environmental accounting disclosure by Chinese firms and strategically leveraging the same to boost their financial performance. The empirical analysis data in this paper are derived from the panel data of 281 Chinese pharmaceutical listed companies from 2010 to 2023.

Keywords: Environmental accounting disclosure, Financial performance, Mediator moderator model, Heterogeneity analysis, Chinese pharmaceutical listed companies

1. Introduction

With the concept of sustainable development taking root in people's minds in recent years, the corporate social responsibility of heavily polluting industries that have a great impact on the environment has been taken more and more seriously by the public, who are not only concerned about the economic benefits of enterprises, but also pay much attention to the effectiveness of their ecological and environmental protection policies and measures. This requires enterprises, as influential social organizations, to invest more resources and energy to balance corporate benefits and social interests; requires relevant government departments and regulatory agencies to improve policy guidance and constraints; and requires external stakeholders to more fully understand and appreciate the environmental pollution and governance practices of enterprises, so as to make prudent judgments and decisions. Therefore, the disclosure of corporate environmental accounting information must be true, positive and reliable, and really help the public and the government to monitor and control. Of course, because environmental pollution control and information disclosure require enterprises to invest additional huge costs, consume more resources and financial support, so it is easy for enterprises to find ways to false disclosure, so as to avoid the negative impact of the disclosure of this aspect of the enterprise's financial performance, to avoid the supervision and punishment of the relevant government departments. However, in the long run, whether the quality of disclosure of environmental accounting information by enterprises affects their financial performance, as well as whether the standardized disclosure behavior of enterprises is likely to bring about economic benefits, thus promoting heavy polluters to pay more attention to and invest in the prevention and control of pollution, which will be beneficial to sustainable development and market efficiency.

Since the launch of the 14th Five-Year Plan, active responses to climate change, improved environmental risk management mechanisms, and sustained improvements in environmental quality have also reached a new level. High-quality green development of various industries has become an important measure to achieve the goal of carbon emission peaking by 2030 and carbon neutrality by 2060, and the implementation of the ‘dual-carbon strategy’ and

'low-carbon green road' has become the main theme of China's current high-quality economic development. The Third Plenary Session of the 18th CPC Central Committee stated that China will gradually seek to establish a sound environmental accounting measurement and accounting system adapted to national conditions and make effective use of natural resources. Low-carbon green development has become the main theme and an important initiative, how to effectively mobilize the power of enterprises to reduce carbon emissions has also become a core concern of pharmaceutical manufacturing enterprises. Better corresponding to the national policy, providing data support and guidance for sustainable development has also become one of the motivations for corporate environmental accounting.

The pharmaceutical manufacturing industry, as a matter of national health, its standardized development has received increasing attention since the new crown epidemic. On the one hand, its manufacturing process of water, electricity, gas, fuel and other resources consume a huge amount. On the other hand, with the rapid development of China's pharmaceutical manufacturing industry, its production and operation process involve chemical-biological double pollution, which brings a serious burden to the environment. Based on this, the pharmaceutical manufacturing industry is selected as the object of study to explore if pharmaceutical companies actively take responsibility, fulfil their environmental obligations, and make high-quality environmental accounting disclosure, to contribute to the development of a green economy and alleviate the current severe ecological situation. It also proposes assistance to the management and supervision to guarantee the orderly and healthy development of the industry towards the goal of development, so that the market can be effectively governed while developing rapidly without chaos.

Prior studies on the relationship between environmental accounting disclosure (EAD) and corporate financial performance (CFP) have yielded mixed results, potentially due to varying methodologies and sample selections. Most research has focused on specific industries or regions, limiting generalizability, and often overlooks the mediating or moderating effects of factors such as financing constraints and media attention. Additionally, the role of external and internal factors in shaping this relationship has not been thoroughly explored.

This study addresses these limitations by adopting a more comprehensive research design that includes mediating and moderating variables, conducting heterogeneity analyses, and focusing on the Chinese pharmaceutical manufacturing industry. By incorporating factors like media attention and financing constraints, and by examining the specific context of the Chinese pharmaceutical industry, this research provides a more nuanced understanding of how EAD can impact CFP. This approach not only contributes to the existing literature but also offers practical insights for stakeholders in the pharmaceutical sector and other industries.

2. Literature Review and Hypothesis

2.1 Environmental Accounting Disclosure and Corporate Financial Performance

Previous literature on the relationship between green accounting disclosure and corporate financial performance is divided into three main categories: negative, irrelevant and positive.

The first view is that environmental disclosure is negatively related to corporate financial performance. Ingram& Frazier (1980), through a survey of 188 manufacturing companies in Canada, concluded that the disclosure of a company's environmental information will draw public attention to the fact that the company has environmental problems, which leads to lower corporate performance. Wu et al. (2010) choose 100 Standard & Poor's rated companies from 2004-2008 as the subjects of his study. The results of the study show that if companies publish more environmental information, they will reveal more environmental problems, which will lead to the deterioration of their business conditions. Qin et al. (2004) collects and organizes the environmental information of the paper industry in the Netherlands, Italy and China, and examines the correlation between environmental information and company value through the linkage equation. The empirical results show that the green accounting information disclosure of enterprises will adversely affect the company's business performance, and the improvement of environmental protection technology and other means after the enterprise is regulated by the government and the public will increase the environmental cost, which further reduces the profit of the enterprise. Xiao & Zhang (2008) used the event analysis method to study how the occurrence of a major environmental accident will have an impact on the enterprise. It was found that the adverse reaction was stronger regardless of whether the company had made relevant environmental disclosure before the accident or not. Moreover, companies were willing to disclose their information after the incident. The results of Zhou et al. (2017) experiment on 350 FTSE subsidiaries in the UK showed an inverse relationship between a company's carbon emissions and its financial performance.

The second view, on the other hand, argues that environmental disclosure is not related to a company's financial performance. Anderson & Frankle's study shows that firms' green accounting disclosure has no significant correlation with financial performance, thus firms do not need to make environmental accounting disclosure. Similarly Jiang(2010) selected 139 A-share companies for the study, and the results of the study showed that the awareness of environmental protection is generally weak at present, and therefore there is a low correlation between environmental accounting disclosure of listed companies and the value of the company.

The third view is that environmental disclosure is positively related to corporate financial performance. Denis and Michel (2007) show that both in France and Canada, corporate environmental information disclosure improves corporate business performance. Clarkson et al. (2013) show that the performance of those firms that turn over information on toxic substances to the Environmental Protection Agency improves instead, i.e., the degree of disclosure of environmental information is positively. Wankeun and Seungho (2015) conducted a survey of 139 firms, using Korean firms as an example and applying the generalized momentum estimation method, the study showed that environmentally responsible firms have a positive impact on their business performance. Kong &Ni (2016) selected 647 listed companies in China's A-share market as a sample by empirically analyzing green accounting information disclosure and financial performance, and the study showed that the degree of green accounting information disclosure of enterprises is positively related

to their financial performance. As the degree of disclosure of environmental information increases, the degree of distrust of the company will decrease, which will reduce the company's lending rate.

By combing through the literature, although the results are different, most of them agree that there is a positive correlation between green accounting disclosure and corporate performance. Based on this, the first hypothesis of this paper is proposed.

H1: The increase in the level of environmental accounting disclosure has a significant contribution to corporate financial performance.

2.2 Environmental Accounting Disclosure Quality and Financing Constraints

According to stakeholder theory, the behaviors of companies affect the investment decisions of investors and creditors. Listed companies that are socially responsible and disclose environmental information are more likely to be favoured by investors because they reduce the risk of violations and better protect investors. Dhaliwal et al. (2011) showed that firms that engage in good disclosure of socially responsible information reduce the cost of obtaining equity capital and attract professional institutional investors, and that firms that disclose socially responsible information raise significantly higher amounts in equity financing is significantly higher than the amount raised by firms that do not disclose relevant information. According to the information asymmetry theory, high-quality environmental information disclosure can reduce the information asymmetry to a certain extent, increase the investors 'knowledge of the company, reduce the investors' perceived risk and information decision-making cost, reduce the cost of equity capital, and at the same time, avoid the problem of adverse selection. Grossman (1981) believes that the corporate managers who have the information advantage are likely to take advantage of the information asymmetry to transfer the risk to the investors to obtain more benefits, and therefore, in such a case, the information asymmetry can be exploited by the corporate management. more benefits, thus in this case, when investors believe that there is a situation where the enterprise conceals information, the concealed information will be judged as negative information, so they will ask the enterprise to ask for a higher risk premium to provide more risk discounts, which will make the financing cost of the company rise, and the financing constraints faced by the enterprise will also be enhanced.

Requirements on environmental and social responsibility were added to the 'Guidelines on the Content and Format of Information Disclosure by Companies Issuing Public Securities No. 3 - Content and Format of Semi-Annual Reports (Revised in 2021)' to highlight the current status of listed companies' work in the field of environmental protection and social responsibility; and in the Reform Programme issued in 2021, mandatory disclosure of environmental information was incorporated into the enterprise credit management, and information on relevant administrative penalties will be counted in the enterprise's credit record.

Under the policy of green finance, financial institutions will pay attention to the audit of corporate environmental information, and in the context of the establishment of the legal

disclosure system of environmental information, the relevant enterprises with good performance are more likely to obtain government support and pass the qualification audit of banks.

To sum up, the improvement of environmental information disclosure quality is conducive to the improvement of enterprise financing status quo, therefore, the second hypothesis of this paper,

H2: the quality of environmental accounting information disclosure is negatively related to financing constraints.

2.3 The Mediating Role of Financing Constraints

The financial performance of firms is affected by a number of factors, financing constraints being one of them. When firms face lower financing constraints, they are usually able to obtain lower financing costs and more abundant capital. This enables the enterprise to invest its resources in a direction more favourable to its own development, thus improving its financial performance; on the contrary, when the enterprise is subject to higher financing constraints, the cost of financing is usually higher and the source of capital may be insufficient, which forces the enterprise to give up some investment opportunities. This is especially true for projects that require substantial capital support. This can also result in firms not being able to obtain sufficient equity financing, limiting the diversity of their capital structure thus affecting financial performance. According to Li and Xu (2011), financing constraints are one of the most important factors restricting the development of firms as it limits their ability to expand, make technological innovations and respond to market changes. Meanwhile, financing constraints may make equity issuance difficult, limiting diversified financing channels and affecting firms' financial flexibility. Thus, by affecting capital structure, financing constraints indirectly weaken firms' financial performance and increase financial risk and market uncertainty.

R&D and innovation are key factors for an enterprise to achieve long-term development, but innovation has the risks of time-consuming and high failure rate, high sunk costs, and requires a large amount of financial support. Zhang et al. (2012) argue that external funding is an important source of funding for firms to innovate, as it would be difficult to meet the demand if only relying on the firm's internal funding, and thus the lack of financing for firms would greatly limit the firm's investment in innovation. Financing constraints may expose firms to insufficient investment in R&D and discourage investment in innovation. Lack of sufficient financial support reduces the ability to carry out cross-disciplinary collaboration, attract high-quality talent, and bear the risks of technological innovation, which in turn constrains the long-term competitiveness and innovation capacity of firms. Yu et al. (2019) found that due to facing serious financing constraints, firms are forced to abandon better innovation investment projects, which makes the firm's level of innovation decline and ultimately affects the firm's performance. Xu and Han (2013) argued that in a financing-constrained environment, firms miss important development opportunities because of the difficulty in achieving set innovation goals. The lack of capital not only prevents enterprises from making optimal business decisions and resource allocation, but also reduces

productivity and may lead to inefficient investment, which together impede the high-quality development of enterprises.

From the perspective of foreign economic activities, in terms of trade activities, export trade is an important way for enterprises to expand the scale of income, however, entering the international market requires enterprises to have sufficient export competitiveness and need to pay high initial costs. Yang (2012) found that improving the financing environment of the company can effectively reduce the fixed costs required by the company in the international market, increase the company's export opportunities, and expand the company's scale. Furthermore, firms with high productivity are more likely to participate in OFDI. Firms need sufficient capital to support their increased production, and limited capital constrains firms 'production, which in turn affects the likelihood of firms' outward investment, and thus affects firms 'performance, i.e., financing constraints can limit firms' foreign economic activities.

It has been pointed out previously that there is a positive effect of environmental disclosure quality on financial performance and a negative effect on financing constraints. This leads to the hypothesis

H3: Financing constraints mediate the relationship between environmental disclosure quality and corporate financial performance.

2.4 The Moderating Effect of Media Attention

In the pharmaceutical industry, enterprises bear a more significant social responsibility than other industries, because this industry is directly related to the health and well-being of human life, so its production and operation activities naturally become a hotspot for all levels of society, as well as the media focus. By reporting on negative developments in pharmaceutical companies, the media can effectively monitor the ability of companies to strengthen their self-regulation; on the other hand, positive media coverage of pharmaceutical companies can also greatly enhance the public reputation of the company, and effectively speed up the dissemination of information and expand its scope of influence, as well as improve the speed of stakeholders to obtain the necessary data. In addition, the role of the media is to attract a high degree of attention from the government and society, which can lead to the formulation or improvement of relevant policies by the relevant authorities, and Solomon (2012) suggests that there is a correlation between media attention, social responsibility, and corporate value. Ye et al. (2015) argues that to some extent, there is a correlation between public disclosure of environmental information and media monitoring and the effectiveness of external governance, which shows a positive correlation. Wang et al. (2013) suggest that when enterprises show a strong willingness to actively disclose environmental information, the quality of the environmental information they release shows a tendency to improve in the face of increased media attention. The environmental information publicly disclosed by enterprises is an important criterion for the media to assess whether enterprises have effectively assumed their social responsibility, especially whether they have taken actions at the level of environmental protection. Enterprises that respond negatively or lack practical action in environmental protection tend to be easy targets for media spotlight

when their environmental information disclosure is insufficient or when they try to avoid responsibility by excessive use of qualitative rather than financial environmental information. At the same time, firms with excellent environmental performance in terms of their social responsibility and fulfilment of their commitment to sustainable development tend to be publicized through diversified media channels. Fang and Guo (2018) showed that the higher the media attention lagged by a few cycles, the higher the quality of environmental information released by companies to the public. Based on this, we propose hypothesis:

H4: Media attention has a positive moderating effect on the impact of environmental accounting disclosure on financial performance.

Based on the above four assumptions a research model diagram for this paper is constructed as shown below: Figure 1.

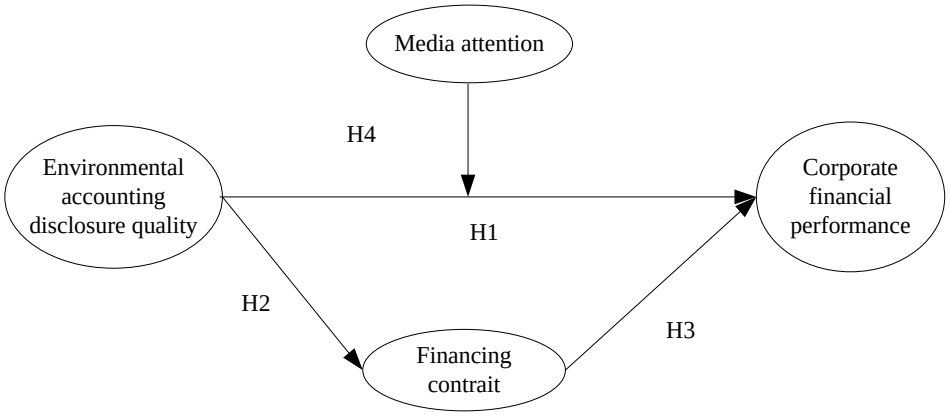

Figure 1. Conceptual Model

3. Methodology

3.1 Sampling and Data Source

A total of 195 samples of 281 listed companies in the pharmaceutical industry from 2010-2023 are selected to examine the specific relationship between the environmental disclosure data and the financial data. The selection of samples follows the following principles to ensure the authenticity, comprehensiveness and effectiveness of the selected data: (1) Delete ST and ST* listed companies and listed companies without going concern in 2020-2022; (2) Delete the companies with incomplete index data during the selection process to ensure the prudence of the results of this study. Data from the following three databases: CSMAR, CNINF and EASTMONEY.

The screening of samples removes ST and ST* listed companies as well as listed companies without going concern and excludes companies lacking data on some indicators to ensure that the final selection of data is complete and comprehensive, true and reliable, and to ensure that the results of the study are as prudent and accurate as possible.

3.2 Variable Setting

3.2.1 Explained Variable

The explained variable of this paper is financial performance. The financial performance of a firm is reflected in various aspects such as profitability, operational capacity, growth capacity, market risk and return. Measures of financial performance such as the rate of return on net assets (ROE), return on total assets (ROA) and so on. Among them, ROE can be subdivided into sales margin, which reflects the profitability of the enterprise; asset turnover, which is used to represent the operating ability of the enterprise; and equity multiplier indicator, which represents the capital structure. In this paper, ROA is used as an explanatory variable to assess the return on investment and operational effectiveness of the company. The profitability reflected by ROE is used to measure the financial performance of the enterprise with reference to the net assets. Return on total assets (ROA) can be decomposed into four indicators: sales margin, which reflects the profitability of the firm; value-added ratio, which represents value-added capacity; sales efficiency; and production efficiency, which considers production capacity. In this paper, the robustness test to return on total assets (ROA) instead of return on equity (ROE), which reflects the profitability depends on the company's total assets, the higher the net interest rate on total assets, the stronger the profitability. Return on Equity (ROE) = Net Profit / Average Owners' Equity.

3.2.2 Explanatory Variables

This paper constructs an evaluation system for environmental accounting disclosure in accordance with the content analysis method, i.e., first determining the evaluation indicators and scoring rules, and then constructing an evaluation system for environmental accounting disclosure by finding and analyzing the specific content of environmental information disclosure in locations such as the annual report of the enterprise. For monetized information, such as environmental liabilities and environmental performance and other indicators, a value of 2 is assigned if they are disclosed in a combination of quantitative and qualitative ways, a value of 1 is assigned to qualitative disclosure only, and a value of 0 is assigned to nondisclosure; for non-monetized information, a value of 2 is assigned to indicators of disclosure, and a value of 0 is assigned to nondisclosure, for example, disclosure related to environmental protection management such as environmental objectives and concepts, and disclosure of indicators such as environmental certifications, environmental information disclosure carriers and other indicators. There are a total of 25 scoring indicators, and by scoring and summing the indicators, and further using logarithmic conversion, we calculate the Environmental Accounting Disclosure Index (EDI). The higher the value, the better the quality of environmental accounting disclosure of the enterprise.

3.2.3 Mediating Variable

According to the previous analysis, we choose the financing constraint as the mediating variable. There are three main ways to measure financing constraints, among which a single variable such as leverage ratio is more limited to measure financing constraints, so this paper chooses the KZ index established by Kaplan et al. (1997) to comprehensively consider the

financial status of the enterprise, using a number of indicators including cash flow and liabilities to assess the enterprise's financing constraints, in order to measure the financing constraints of the enterprise in a more detailed and complete and comprehensive manner. Generally speaking, a higher KZ index often indicates that a company is experiencing a more severe financing constraint.

3.2.4 Moderating Variable

Based on scholars' research results, this study selected the number of online media reports plus one and took the natural logarithm as a measure of media attention (ME). The number of online media reports was achieved by systematically collecting information from over four hundred key online media outlets, including more than twenty online financial media outlets. The process involved detailed data extraction and analysis of news coverage for various types of listed companies over different years. Media attention (ME) = Ln (1 + number of online media reports).

3.2.5 Control Variables

Referring to the study of Jiang et al. (2017), this paper puts the six factors that will correlate the level of corporate environmental information disclosure and corporate performance, namely, firm size (SIZE), corporate growth (GROW), financial leverage (LEV), shareholding concentration (TOP), percentage of independent directors (IND), and age of the firm (LNAGE), which will that cause a significant effect are used as control variables.

Table 1. Measurement

Variable type	Abbreviation	Measure
Explained variable	ROE	Net profit/average owner’s equity
Explanatory variable	EDI	The 25 indicator scores were summed and logarithmically processed (AMLDEEI)
Mediating variable	KZ	KZ index
Moderating variable	ME	Ln (1+ Number of online media reports)
Control variable	SIZE	Ln (total assets at the end of the period)
	GROW	Year-on-year growth rate of operating income
	LEV	asset-liability ratio
	TOP	Shareholding ratio of the largest shareholder
	IND	Ratio of the number of independent directors to the total number of directors
	LNAGE	Ln (age of business)

3.3 Construction of Models

First, when studying the impact of environmental accounting information disclosure on corporate financial performance, we choose the individual, time double-fixed model, and the specific model is set as follows:

$$ROE_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 GROW_{it} + \beta_5 TOP_{it} + \beta_6 IND_{it} + \beta_7 LNAGE_{it} + \gamma_i + u_t + \varepsilon \quad (3.1)$$

Second, the mediating role of financing constraints (3.2, 3.3) and the moderating role of media attention (3.4) are explored, and the specific models are set up as follows, respectively:

$$KZ_{it} = \alpha_0 + \alpha_1 EDI_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 GROW_{it} + \alpha_5 TOP_{it} + \alpha_6 IND_{it} + \alpha_7 LNAGE_{it} + \gamma_i + u_t + \varepsilon \quad (3.2)$$

$$ROE_{it} = \delta_0 + \delta_1 EDI_{it} + \delta_2 KZ_{it} + \delta_2 SIZE_{it} + \delta_3 LEV_{it} + \delta_4 GROW_{it} + \delta_5 TOP_{it} + \delta_6 IND_{it} + \delta_7 LNAGE_{it} + \gamma_i + u_t + \varepsilon \quad (3.3)$$

$$ROE_{it} = \beta_0 + \beta_1 EDI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 GROW_{it} + \beta_5 TOP_{it} + \beta_6 IND_{it} + \beta_7 LNAGE_{it} + \beta_8 ME_{it} + \beta_9 EDI_{it} \times ME_{it} + \gamma_i + u_t + \varepsilon \quad (3.4)$$

In the above formula, where i is the sample object and t is the year, the explained variable is ROE; and the explanatory is EDI; KZ, ME and Pay; the control variables are SIZE, LEV, GROW, TOP , IND, and LNAGE. γ_i is individual fixed effect, u_t is the time fixed effect, and ε is the random error term.

4. Results

4.1 Descriptive Results

We use STATA software to carry out descriptive analyses of the data collected, as shown in Table 2 below.

Table 2. Descriptive statistics

Variables	N	Mean	SD	Min	Max
ROE	2178	9.751	9.243	-24.500	40.357
EDI	2178	2.378	0.846	0.000	3.689
KZ	2178	0.366	2.320	-7.592	5.580
ME	2178	5.190	0.901	3.045	7.542
SIZE	2178	21.965	0.937	20.151	24.308
LEV	2178	30.198	16.842	4.087	78.187
GROW	2178	13.544	25.398	-45.178	121.076
TOP	2178	33.065	13.464	8.500	68.990
IND	2178	37.084	4.817	33.330	50.000
LNAGE	2178	19.520	6.152	7.000	39.000

From Table 2, we can see that the maximum value of ROE is 40.357, which indicates that some of the pharmaceutical manufacturing firms in the sample have very high profitability and capital utilization efficiency. The minimum value of -24.5, on the other hand, indicates that there are pharmaceutical manufacturing enterprises in the sample may face great financial risks and losses. As a whole, the mean value of financial performance is 9.751, with a positive average profitability level, which indicates that the enterprises in this sample have some profitability. The standard deviation is 9.243, indicating that there are large differences in profitability and risk tolerance among different enterprises. The maximum value of EDI is 3.689, indicating that some pharmaceutical manufacturing enterprises in the sample attach great importance to environmental protection and sustainable development, and actively provide detailed environmental accounting information to the public. The minimum value of 0 indicates that some enterprises have obvious deficiencies in environmental accounting information disclosure and fail to fulfil their due environmental responsibilities. As a whole, the mean value of EDI is 2.378, indicating that most enterprises have achieved a certain level of environmental accounting information disclosure. The standard deviation is 0.846, indicating that there are some differences in the level of EDI of most enterprises.

4.2 Correlation Analysis

In order to explore the complex interconnections between the variables in depth, this paper also conducts Pearson correlation analyses of the variables, the results of which are shown in Table 3 below.

Table 3. Variables of Pearson correlation coefficient

Variable	ROE	EDI	KZ	ME	SIZE	LEV
ROE	1					
EDI	0.111***	1				
KZ	0.451***	0.074***	1			
ME	0.203***	0.095***	-0.004	1		
SIZE	0.069***	0.380***	0.081***	0.410***	1	
LEV	-0.238***	0.0340	0.648***	0.086***	0.265***	1
GROW	0.403***	-0.073***	-0.153***	0.122***	-0.0260	-0.0200
TOP	0.156***	0.072***	-0.180***	0.078***	0.080***	-0.107***
IND	-0.054**	0.0230	0.039*	0.0120	0.0160	0.075***
LNAGE	-0.049**	0.149***	0.102***	-0.046**	0.285***	0.094***
variable	GROW	TOP	IND	LNAGE		
GROW	1					
TOP	0.0100	1				
IND	-0.0180	0.038*	1			
LNAGE	-0.094***	-0.060***	0.0290	1		

Note: The value in the brackets is T-value; ***, **, * indicate significance at the level of 1%, 5% & 10%.

The results of the correlation analysis only reflect the possible relationship between two or two variables, but the mechanism of influence between multiple variables needs to be demonstrated by further regression analysis. Before regression, in order to avoid biased results due to possible strong correlations between variables, the variables were tested for multicollinearity and the results are shown in Table 4.

Table 4. Multicollinearity test

Variables	VIF	1/VIF
SIZE	2.144	0.467
LEV	1.957	0.511
KZ	1.882	0.531
ME	1.274	0.785
EDI	1.259	0.794
LNAGE	1.147	0.872
GROW	1.072	0.933
TOP	1.066	0.938
IND	1.012	0.988
Mean VIF	1.446	-

From the table, it can be seen that the variance inflation factor (VIF) of each variable is less than the critical value of 10, with a mean value of 1.446, which shows that the variables do not have serious multicollinearity with each other, and regression analysis can be carried out to further demonstrate this.

4.3 Regression Analysis

4.3.1 Main Effect

We conducted fixed-effects regression analyses in two waves. Column 1 is a fixed time, individual and without controlling the effects of other factors. Column 2 is a fixed period of time, individually, and controlling for the effects of other factors.

Table 5. The regression results of the fixed effect

Variable	(1)	(2)
	ROE	ROE
EDI	0.6202**	0.7075**
	(1.997)	(2.474)
SIZE		1.3532***
		(2.790)
LEV		-0.1128***
		(-7.457)
GROW		0.1155***
		(18.371)
TOP		0.0938***
		(2.957)
IND		-0.0736
		(-1.599)
LNAGE		0.1598
		(1.348)
Constant	12.1093***	-18.0976*
	(13.875)	(-1.718)
Individual FE	YES	YES
Year FE	YES	YES
Observations	2,178	2,178
R-squared	0.055	0.227
F	7.763	27.49

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

We can see from above Table 5, the regression coefficient of Environmental Accounting Disclosure (EDI) on financial performance (ROE) without controlling for other factors and fixing only for time and individuals is 0.6202, which passes the test of significance at the 5

per cent level. The regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.7075, which passes the test of significance at the 5 per cent level, when individuals are fixed in time and controlling for the effect of other factors.

In summary, the above analysis shows that environmental accounting information disclosure (EDI) has a significant positive impact on financial performance (ROE), and the regression results are highly consistent with the previous hypothesis.

From the impact of control variables on financial performance, the regression coefficient of SIZE on ROE is 1.3532, which passes the test of significance at the 1% level, which shows that enterprise size has a positive impact on financial performance. LEV on ROE regression coefficient of -0.1128, through the 1% level of significance test, it can be seen that the financial leverage on financial performance has a negative impact, high financial leverage may make the enterprise's profitability is under pressure. The regression coefficient of GROW on ROE is 0.1155, which passes the significance test at the 1% level, which shows that growth has a positive impact on financial performance, and enterprises with high growth usually have more market opportunities and development space, and they can continue to expand their business scale and increase their market share, which helps them to increase their sales revenue and profit level, thus improving their financial performance. The regression coefficient of TOP on ROE is 0.0938, which passes the significance test at the 1% level, which shows that TOP has a positive impact on financial performance (ROE). In a highly concentrated shareholding structure, the majority or controlling shareholders can make decisions more quickly, and such an efficient decision-making mechanism can help enterprises grasp market opportunities and adjust business strategies in a timely manner, thus enhancing financial performance.

4.3.2 Mediating Effect

From column (1), the regression coefficient of EDI on KZ is -0.1289, which passes the test of significance at the 5% level, which shows that environmental accounting disclosure has a significant negative effect on financing constraints. As shown in column (2), the regression coefficient of KZ on ROE is -1.3688, which passes the significance test at 1% level. And the regression coefficient of EDI on ROE is 0.5310, which passes the significance test at 10% level.

Table 6. The mediating effects of financing constraints

variable	(1)	(2)
	KZ	ROE
EDI	-0.1289**	0.5310*
	(-2.239)	(1.929)
KZ		-1.3688***
		(-12.417)
SIZE	-0.7395***	0.3410
	(-7.573)	(0.720)
LEV	0.0974***	0.0205
	(31.985)	(1.136)
GROW	-0.0092***	0.1029***
	(-7.267)	(16.788)
TOP	-0.0154**	0.0728**
	(-2.404)	(2.383)
IND	0.0252***	-0.0391
	(2.718)	(-0.882)
LNAGE	-0.0955***	0.0291
	(-4.002)	(0.254)
Constant	14.2706***	1.4358
	(6.728)	(0.140)
Individual FE	YES	YES
Year FE	YES	YES
Observations	2,178	2,178
R-squared	0.473	0.285
F	84.08	35.66

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

It can be seen that after adding the mediating variable financing constraints, environmental accounting disclosure is still positive and significant on financial performance, indicating that

financing constraints play a mediating role in the impact of environmental accounting disclosure on corporate financial performance. This result is mainly due to the fact that environmental accounting disclosure can reflect the compliance of enterprises with environmental regulations and potential environmental risks, which is an important reference value for financial institutions in assessing the credit risk of enterprises. Through the disclosure of environmental accounting information, financial institutions can more accurately judge the environmental risks and sustainable development ability of enterprises, so as to make more reasonable credit decisions, which to a certain extent alleviates the financing constraints of enterprises. The alleviation of financing constraints provides enterprises with more financial support and financial flexibility, enabling them to invest more effectively in R&D and innovation, market expansion and capacity expansion, thus promoting the improvement of their financial performance.

4.3.3 Moderating Effects

As shown in Table 7, the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.728, which passes the test of significance at the 5 per cent level. The regression coefficient of the interaction term between environmental accounting disclosure (EDI) and media attention (ME) is 0.5392, which passes the test of significance at the 5 per cent level, which indicates that as media attention continues to increase, the stronger the enhancement effect of environmental accounting disclosure on financial performance is, i.e., the media attention plays a positive moderating role in the impact of environmental accounting disclosure on corporate financial performance. This is mainly because the increase in media attention enhances investors' consideration of environmental factors. Specifically, investors will increasingly tend to choose those firms with good environmental performance and transparent disclosure in the investment decision-making process in order to avoid potential environmental risks. This market selection mechanism further strengthens the positive impact of environmental accounting disclosure on the financial performance of enterprises, enabling those enterprises that actively fulfil their environmental responsibilities to gain more market recognition and resource support, thus promoting the improvement of their financial performance.

Table 7. The moderating effect of media attention

variable	(1)	(2)
	ROE	ROE
EDI	0.7515***	0.7280**
	(2.630)	(2.549)
ME	0.8782***	0.9205***
	(2.982)	(3.122)
EDI*ME		0.5392**
		(2.193)

SIZE	1.1460**	1.0642**
	(2.344)	(2.172)
LEV	-0.1144***	-0.1144***
	(-7.573)	(-7.581)
GROW	0.1142***	0.1147***
	(18.155)	(18.247)
TOP	0.0953***	0.0969***
	(3.010)	(3.063)
IND	-0.0796*	-0.0787*
	(-1.732)	(-1.713)
LNAGE	0.1528	0.1475
	(1.292)	(1.247)
Constant	-17.6703*	-16.3447
	(-1.681)	(-1.554)
Individual FE	YES	YES
Year FE	YES	YES
Observations	2,178	2,178
R-squared	0.230	0.232
F	26.71	25.77

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

To further analyze the moderating effect of media attention, this paper plots the moderating effect of media attention as shown in Figure 2. It can be seen that the slope of the high media attention line is greater, so the stronger the effect of environmental accounting disclosure on financial performance is at this level.

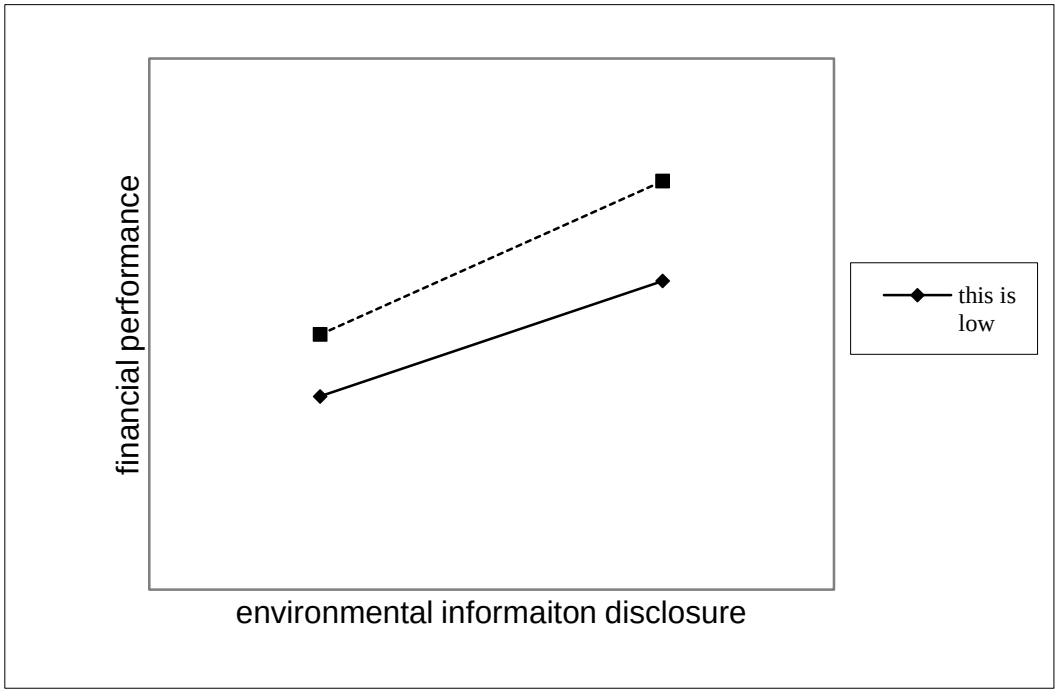

Figure 2. Moderating effects of media attention

4.4 Heterogeneity Analysis

4.4.1 Based on the Nature of Equity

There are significant differences between state-owned and non-state-owned enterprises in terms of governance structure, business objectives, and access to resources, which may lead to differences in their motivation, content, and methods of environmental accounting disclosure, and thus may lead to differences in the extent to which environmental accounting disclosure affects the financial performance of enterprises. Therefore, this paper analyses the sample enterprises by dividing them into state-owned enterprises(SOE) and non-state-owned enterprises(NSOE) according to the nature of their shareholdings.

Table 8. Heterogeneity analysis based on nature of equity

variable	(1)	(2)
	SOE	NSOE
EDI	0.4628	0.8328**
	(0.785)	(2.510)
SIZE	0.5867	1.5136***
	(0.515)	(2.757)
LEV	-0.1319***	-0.1117***
	(-4.261)	(-6.277)
GROW	0.1332***	0.1105***
	(8.986)	(15.705)
TOP	0.0470	0.1050***
	(0.676)	(2.869)
IND	-0.0627	-0.0849
	(-0.741)	(-1.529)
LNAGE	0.4734	0.1645
	(0.332)	(1.365)
Constant	-5.5992	-21.2512*
	(-0.184)	(-1.797)
Individual FE	YES	YES
Year FE	YES	YES
Observations	499	1,679
R-squared	0.230	0.231
F	6.412	21.40

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

Table 8 shows that in the group of state-owned enterprises, the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.4628, which does not pass the test of significance. In the non-state-owned enterprise group, the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.8328, which passes the significance test at the 5% level. It can be seen that compared with state-owned enterprises, the positive impact of environmental accounting information

disclosure (EDI) on financial performance (ROE) is stronger in non-state-owned enterprises, and this result may be due to the fact that state-owned enterprises, as an important pillar of the national economy, tend to enjoy more policy support and resource protection, which makes them relatively robust in financial performance and relatively less affected by environmental accounting information disclosure. In addition, although SOEs are very concerned about the fulfilment of their social responsibilities, in practice, environmental accounting disclosure may be regarded as a routine rather than an effective means of enhancing corporate value and market competitiveness. In contrast, non-state-owned enterprises usually face more intense market competition and need to continuously improve their brand image and market competitiveness. Environmental accounting disclosure, as an effective way of information disclosure, can show investors and the public the enterprise's environmental protection concept and practical actions, thus enhancing the enterprise's sense of social responsibility and brand image. This positive disclosure behaviour helps to enhance the market position of enterprises and investor trust, which in turn has a positive impact on financial performance. Therefore, the positive impact of environmental accounting disclosure (EDI) on financial performance (ROE) is stronger for non-state-owned enterprises.

Among the control variables, the effect of the size of non-state enterprises on financial performance is more significant than that of state-owned enterprises, indicating that smaller non-state enterprises are not conducive to the improvement of corporate financial performance due to fewer personnel and loose or unsystematic management structure. The state-owned enterprises, on the other hand, are usually more stable in terms of the level of enterprise scale due to their own development being supported by more over national policies, so the enterprise return is more influenced by other factors.

Based on the results of this analysis, there are also some insights about the policy. For enterprises with different ownership attributes, targeted strategic measures should be implemented. For state-controlled enterprises, there is an urgent need to establish a system of disclosure systems that covers a wide range of details in order to cultivate a healthy and transparent market environment for information disclosure. At the same time, it can also drive non-state-owned enterprises to actively correspond to and effectively implement national environmental protection policies, thus jointly promoting the vigorous development of environmental protection. For non-state-controlled enterprises, we need to guide their investment philosophy from a single profit-oriented to a green investment model that promotes both economic and environmental benefits. This change can not only effectively promote the sustainable and healthy development of enterprises, but also accelerate the transformation and upgrading of the entire socio-economic system to a greener, more environmentally friendly and efficient direction at the macro level.

4.4.2 Area-based Heterogeneity Analysis

There are significant differences in the level of economic development, industrial structure, enforcement of policies and regulations, and public awareness of environmental protection in different regions, which may lead to different characteristics in the motivation, content, quality, and impact on the financial performance of enterprises in the disclosure of

environmental accounting information. Therefore, this paper analyses the heterogeneity of the sample according to the regions to which they belong, which are divided into the eastern region (Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan) and the central and western region (Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, Guangxi, and Inner Mongolia), and analyses the specific characteristics of the sample enterprises.) were analyzed for heterogeneity, as shown in Table 9 below.

Table 9. Area-based heterogeneity analysis

variable	(1)	(2)
	Eastern	Central and Western
EDI	0.2939	1.1329**
	(0.801)	(2.419)
SIZE	0.7968	2.1484***
	(1.328)	(2.602)
LEV	-0.1436***	-0.0656***
	(-7.491)	(-2.615)
GROW	0.1046***	0.1296***
	(13.433)	(12.254)
TOP	0.0573	0.1385***
	(1.414)	(2.708)
IND	-0.0376	-0.1208
	(-0.638)	(-1.615)
LNAGE	0.0815	0.2393
	(0.595)	(0.986)
Constant	-3.9367	-37.5393**
	(-0.303)	(-2.078)
Individual FE	YES	YES
Year FE	YES	YES
Observations	1,312	865
R-squared	0.230	0.245
F	16.74	11.97

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

Table 9 shows that in the eastern region group, the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.2939, which does not pass the test of significance. In the central and western region group, the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 1.1329, which passes the significance test at the 5% level. Compared with the eastern region, the positive effect of environmental accounting disclosure (EDI) on financial performance (ROE) is stronger in the central and western regions. Such a result may be due to the fact that, as the most economically developed region in China, pharmaceutical manufacturing enterprises in the eastern region tend to have a more mature market and advanced technological level, but at the same time, they also face a more intense competitive environment and higher regulatory requirements. Against this backdrop, although environmental accounting disclosure can play a positive role in enhancing corporate image and brand value, firms in the eastern region may view it more as a compliance requirement than as a key driver for improving financial performance. In contrast, pharmaceutical manufacturing enterprises in the central and western regions are at a relatively backward stage of economic development and face more urgent pressure for industrial upgrading and transformation. Environmental accounting disclosure in these regions may be regarded as an effective means of demonstrating corporate social responsibility and environmental protection image, which can help to attract external investment and consumer attention and thus enhance the market competitiveness and financial performance of enterprises. Therefore, the positive impact of environmental accounting disclosure (EDI) on financial performance (ROE) is stronger in the central and western regions.

4.5 Robustness Check

4.5.1 Endogenous Analysis

In this paper, when studying the impact of environmental accounting information disclosure on corporate financial performance in the pharmaceutical manufacturing industry, we consider that there may be a bidirectional causal relationship between environmental accounting information disclosure and corporate financial performance. On the one hand, by disclosing environmental accounting information, pharmaceutical manufacturing enterprises can demonstrate their efforts and achievements in environmental protection, thus enhancing their social image and reputation, which helps to increase consumers' trust and support, which in turn promotes the improvement of corporate financial performance. On the other hand, when the financial performance of an enterprise is better, the management may be more willing to take the initiative to disclose environmental accounting information in order to demonstrate the enterprise's environmental responsibility and sustainable development capability. Therefore, in order to avoid the impact of the endogeneity problem formed by this two-way relationship on the regression results, this paper intends to use the estimation of the model using the instrumental variable method to further test the endogeneity problem. Considering the availability of the data, this paper chooses one period of lagged disclosure of environmental accounting information as the instrumental variable for the analysis of endogeneity, and the specific analyses are shown in Table 10 below.

Table 10. Endogenous analysis

variable	(1)	(2)
	EDI	ROE
LEDI	0.3230***	
	(14.042)	
EDI		1.7333*
		(1.800)
SIZE	0.1795***	1.2983**
	(4.224)	(2.097)
LEV	0.0018	-0.1191***
	(1.348)	(-6.575)
GROW	0.0000	0.1166***
	(0.067)	(15.687)
TOP	0.0052*	0.1274***
	(1.931)	(3.504)
IND	-0.0066*	0.0073
	(-1.753)	(0.141)
LNAGE	-0.0187**	0.1748
	(-2.055)	(1.392)
Individual FE	YES	YES
Year FE	YES	YES
Observations	1,734	1,734
R-squared	-	0.165
F	-	43.89

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

As can be seen from Table 10 above, column (1) is the first stage, i.e. using environmental accounting disclosure (instrumental variable) of one period lagged as an explanatory variable and environmental accounting disclosure of the current period as an explanatory variable in the regression analysis so as to obtain a new fitted value of environmental accounting disclosure, the results of the analysis of the stage 1 show that there is a positive correlation between instrumental variable and endogenous variable, which passes the significance test at

the 1% level, indicating that the explanatory power of the instrumental variables and the endogenous variables is strong. Column (2) shows the second stage, which is a regression with the financial performance of the firms as an explanatory variable and the fitted value of environmental accounting disclosure obtained in stage one as an explanatory variable. From the regression results, it can be seen that the regression coefficient of environmental accounting information disclosure (EDI) on financial performance (ROE) is 1.7333, which passes the test of significance at the 10% level, and the result that environmental accounting information disclosure (EDI) has a positive impact on financial performance (ROE) has not changed, which means that the endogeneity problem does not affect the research conclusions above, and the test of endogeneity is passed by.

4.5.2 Substitution of Explanatory Variables

This paper adopts multiple regression analysis and empirically analyses the promotion effect of enhanced environmental accounting disclosure of listed companies in the pharmaceutical manufacturing industry on their overall financial performance. In order to ensure the validity and reliability of the model and to further confirm the stability of the constructed model, the dependent variable is replaced with the return on total assets (ROA), and the overall sample is subjected to a robustness test. The regression results are obtained as shown in Table 11 below.

Table 11. Regression analysis with replacement of explanatory variables

variable	(1)	(2)
	ROA	ROA-Z
EDI	0.4866***	0.3532**
	(2.793)	(2.154)
KZ		-1.0347***
		(-15.760)
SIZE	1.2970***	0.5319*
	(4.390)	(1.887)
LEV	-0.1386***	-0.0377***
	(-15.030)	(-3.503)
GROW	0.0776***	0.0680***
	(20.249)	(18.638)
TOP	0.0485**	0.0327*
	(2.511)	(1.795)
IND	-0.0229	0.0031
	(-0.818)	(0.119)
LNAGE	0.1105	0.0117

	(1.530)	(0.171)
Constant	-18.7837***	-4.0185
	(-2.927)	(-0.658)
Individual FE	YES	YES
Year FE	YES	YES
Observations	2,178	2,178
R-squared	0.307	0.388
F	41.60	56.67

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

As can be seen from Table 11 above, after replacing the measure of the explanatory variable corporate financial performance with return on total assets (ROA), the regression coefficient of the main effect environmental accounting disclosure (EDI) on financial performance (ROA) in Column (1) is 0. 4866, which passes the test of significance at the 1 per cent level. It can be seen that the result that environmental accounting disclosure (EDI) has a positive effect on financial performance (ROA) has not changed after replacing the measurement of the explanatory variables. In column (2), the regression coefficient of financing constraints (KZ) on financial performance (ROA) is -1.0347, which passes the test of significance at the 1% level, and the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROA) is 0.3532, which passes the test of significance at the 5% level. It also shows that with the inclusion of the mediating variable, financing constraints (KZ), environmental accounting disclosure is positively significant on financial performance and financing constraints play a mediating role. The regression results of the robustness test remain consistent with the previous paper, indicating that the overall robustness of this study is good.

4.5.3 Removal of Samples From Anomalous Years

This paper considers the potential impact of the epidemic on the operation and financial position of pharmaceutical companies, which may conceal or distort the true relationship between environmental accounting disclosure and corporate financial performance in the pharmaceutical manufacturing industry. Therefore, the two years of 2020 and 2021 in the sample are excluded from the robustness test, resulting in the regression analysis shown in Table 12 below.

Table 12. Regression analyses excluding anomalous years

variable	(1)	(2)
	ROE	ROE-Z
EDI	0.6664**	0.5472*
	(2.170)	(1.839)
KZ		-1.2244***
		(-9.794)
SIZE	1.8216***	0.8271
	(3.338)	(1.537)
LEV	-0.1203***	0.0031
	(-7.317)	(0.151)
GROW	0.1164***	0.1082***
	(15.910)	(15.179)
TOP	0.0837**	0.0675**
	(2.443)	(2.032)
IND	-0.0783	-0.0401
	(-1.536)	(-0.810)
LNAGE	0.2391**	0.1161
	(1.976)	(0.986)
Constant	-28.2759**	-9.3739
	(-2.387)	(-0.806)
Individual FE	YES	YES
Year FE	YES	YES
Observations	1,715	1,715
R-squared	0.238	0.287
F	24.64	29.95

Note: ***, **, * indicate significance at the level of 1%, 5% & 10%.

It can be seen that the regression coefficient of the main effect Environmental Accounting Information Disclosure (EDI) on financial performance (ROA) in column (1) is 0. 6664, which passes the test of significance at the 5 per cent level, after excluding the two years of 2020 and 2021 from the sample. It can be seen that environmental accounting disclosure

(EDI) still has a positive effect on financial performance (ROE). In column (2), the regression coefficient of financing constraints (KZ) on financial performance (ROE) is -1.2244, which passes the test of significance at 1% level, and the regression coefficient of environmental accounting disclosure (EDI) on financial performance (ROE) is 0.5472, which passes the test of significance at 10% level. The results are also consistent with the regression results under the normal sample period, indicating that hypotheses H1, H2, and H3 of this paper have been tested.

5. Discussion

5.1 Conclusions and Policy Implications

Based on the relevant data of 281 listed companies in China's pharmaceutical manufacturing industry from 2010 to 2023, this paper analyses the relationship between the quality of environmental accounting disclosure and financial performance and further analyses the mediating effect of financing constraints and the moderating effect of media attention and executive compensation on the relationship.

The results of the study show that the improvement of environmental accounting disclosure quality significantly contributes to the financial performance of listed companies in the pharmaceutical manufacturing industry, indicating that the transparency and responsibility of companies in environmental protection not only help to build a good corporate image, but also can be directly translated into economic gains by enhancing investor confidence and market recognition.

Further analysis reveals that financing constraints play an intermediary role in the relationship between environmental accounting disclosure quality and financial performance, and that high-quality environmental disclosure helps to reduce the difficulty and cost of corporate financing, thus indirectly contributing to the improvement of financial performance. Media attention, as an external monitoring mechanism, plays a positive moderating role in the positive relationship between environmental information disclosure quality and financial performance, i.e. the higher the media attention, the more significant the positive impact of environmental information disclosure on financial performance. Meanwhile, executive compensation, as an internal incentive mechanism, also regulates the relationship between environmental information disclosure and financial performance to a certain extent, and a reasonable compensation structure can motivate executives to promote environmental information disclosure more actively, which in turn promotes the improvement of corporate financial performance.

In summary, this study not only reveals the positive association between environmental information disclosure quality and financial performance, but also explores the role of financing constraints, media attention and executive compensation, which provides theoretical basis and practical guidance for pharmaceutical manufacturing enterprises to optimize their environmental information disclosure strategy and improve their financial performance.

5.2 Policy Implications

The above findings deliver several policy implications. good disclosure of environmental accounting information helps to enhance corporate image and public trust in the enterprise, which may attract more investment, reduce the cost of capital, and thus improve financial performance. By disclosing environmental information, enterprises can not only demonstrate their commitment to environmental protection but also realize both economic and environmental benefits in the long term. Enterprises should establish an environmental accounting information disclosure system, build a professional environmental accounting talent team, and formulate and improve environmental accounting information disclosure guidelines to promote better fulfilment of their environmental responsibilities and improve financial performance.

While pursuing economic benefits, enterprises should pay more attention to environmental protection and social responsibility and show their commitment to environmental responsibility by strengthening environmental accounting information disclosure. Through the disclosure of environmental accounting information, enterprises can establish a positive environmental image and enhance the confidence of the public and investors, thus improving the market competitiveness and brand value of enterprises. Environmental accounting information disclosure helps enterprises identify and solve environmental problems in a timely manner, reduce potential environmental risks, and avoid economic losses and reputation damage caused by environmental problems. Through the disclosure of environmental accounting information, the coordination of environmental protection and economic development is achieved, and enterprises are promoted to take the road of sustainable development.

5.3 Limitations and Future Perspectives

The study may have only considered data from a specific time period, which may have limited the analysis of the long-term impact of environmental accounting disclosures. Future studies could extend the time span to observe long-term trends and impacts. The study was limited to the pharmaceutical manufacturing industry, which may have overlooked environmental accounting disclosure issues specific to other industries, and future research could be conducted across industries to compare differences between industries. The current study relied on publicly disclosed data, which may have limited in-depth analyses of internal environmental accounting practices, and future research could try to obtain more internal data from companies. Future research could combine both quantitative and qualitative research methods to gain a more comprehensive understanding.

Future research could expand the sample, especially for enterprises of different sizes and ownership structures, to improve the representativeness and generalizability of the findings. Future research could focus on the long-term effects of environmental accounting disclosure, including the impact on corporate reputation, market value and long-term financial performance. Future research could make comparisons between different industries to identify the characteristics and trends in environmental accounting disclosure in different industries. Future research could delve into in-house environmental accounting practices,

including environmental cost management and environmental risk assessment. Future research could combine quantitative and qualitative research methods to gain deeper insights and explore the motivations and influences behind environmental accounting disclosure. With the development of technologies such as big data and artificial intelligence, future research could explore how these technologies affect the collection, processing and disclosure of environmental accounting information.

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