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Some factors affecting environmental accounting in pharmaceutical listed enterprises on the Vietnamese stock market

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Abstract

In the context of globalization and increasing awareness of environmental issues, the pressure on businesses to manage and minimize negative impacts on the environment is becoming increasingly urgent. Environmental accounting has emerged as an important management tool, providing information on costs and benefits related to environmental activities, supporting businesses in making more sustainable and effective business decisions. In particular, the pharmaceutical industry, with its complex production processes, the use of many chemicals, and the generation of special types of waste, including hazardous medical waste, has the potential to cause significant impacts on the environment if not strictly managed. The effective application of environmental accounting not only helps pharmaceutical companies control environmental costs and comply with legal regulations, but also enhances the corporate image and better manages risks. In Vietnam, the pharmaceutical market is growing strongly, with many companies listed on the stock exchange. The implementation of environmental accounting in these enterprises is not only an increasing requirement from investors and stakeholders but also an important factor in enhancing transparency, accountability, and competitiveness. However, the implementation of environmental accounting in the Vietnamese pharmaceutical industry still faces many challenges in terms of awareness, capacity, and legal framework. Therefore, this study focuses on exploring and analyzing the main factors affecting the implementation of environmental accounting in pharmaceutical companies listed on the Vietnamese stock exchange. Identifying these factors will provide insights, serving as a basis for proposing solutions to promote the widespread and effective application of environmental accounting in the pharmaceutical industry, contributing to the sustainable development of both enterprises and the Vietnamese economy. This study is expected to make practical contributions to both academics, business managers, and policymakers in the field of environmental accounting and management, towards building a sustainable and environmentally responsible pharmaceutical industry. Potential factors considered include business characteristics, pressure from stakeholders, internal capacity of the business, and external factors. Clarifying the impact of each of these factors will help managers make appropriate decisions to promote the implementation of environmental accounting in their businesses.

Keywords: Environmental accounting, Influencing factors, Listed pharmaceutical companies.

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1. Introduction

In the era of globalization and the significant increase in awareness of environmental issues, sustainability has become a key element in the business strategies of enterprises around the world. Increasing pressure from stakeholders, including governments, investors, communities, and consumers, requires organizations to be more transparent about the environmental impacts of business operations and actively implement effective environmental management measures. Environmental Accounting (EA), with its role in providing quantitative and qualitative information on the costs and benefits related to environmental activities, has emerged as a strategic management tool, supporting enterprises in making more informed business decisions towards sustainable development and enhancing accountability.

Particularly, the pharmaceutical industry, a sector playing a crucial role in safeguarding public health, while also harboring significant environmental impacts due to the specifics of its manufacturing processes, chemical usage, and medical waste treatment, further underscores the necessity of adopting advanced environmental management tools such as environmental accounting. Effectively managing environmental aspects not only assists pharmaceutical companies in complying with increasingly stringent legal regulations but also contributes to building a reputable corporate image, minimizing risks, and creating a competitive edge in the market.

In Vietnam, the pharmaceutical market is witnessing strong growth, with a growing number of companies listed on the stock exchange, attracting the attention of both domestic and foreign investors. In the context of international economic integration and the increasing emphasis on environmental, social, and governance (ESG) criteria, the implementation of environmental accounting by listed pharmaceutical companies is not merely a trend but an inevitable requirement to meet the expectations of stakeholders and ensure sustainable development.

However, the deployment and application of environmental accounting in listed pharmaceutical companies in Vietnam still face numerous challenges, ranging from awareness of its importance and professional capacity to the legal framework and specific guidance. Therefore, researching the factors influencing the implementation of environmental accounting within the specific context of the Vietnamese pharmaceutical industry is extremely important and urgent.

2. Literature Review

In a context where sustainable development has become a central strategy in global corporate governance, pharmaceutical companies with their production inherently linked to biological environmental factors and public health are facing increasing pressure to fulfill commitments regarding social responsibility, legal compliance, and environmental disclosure. Within the Environmental, Social, and Governance (ESG) management system, the environmental (E) factor plays a pivotal role, not only reflecting a company's ability to control ecological impacts but also serving as a crucial indicator of transparency, regulatory compliance capacity, and potential for attracting sustainable capital. Therefore, the implementation of Environmental Accounting (EA) in listed pharmaceutical companies is not merely a compliance requirement but also an indispensable part of a long-term ESG strategy.

International research has emphasized the dominant role of the institutional framework and legal requirements in the level of EA implementation within the pharmaceutical sector. Frost et al. [1], through a survey of listed companies in Australia, indicated that pressure from regulatory bodies, particularly mandatory environmental disclosure requirements, has led to a significant increase in the quality of environmental reporting. Dixon [2] also reached similar conclusions through quantitative research in the UK, suggesting that the level of legal compliance in the pharmaceutical industry has a linear relationship with the extent of environmental information disclosure, due to stringent legal specificities and close monitoring by securities organizations and health authorities. Jenkins [3] provided further evidence from a brand management perspective, emphasizing that pharmaceutical companies are compelled to maintain transparency in environmental reporting to protect corporate reputation, especially given that incidents related to biosafety can quickly lead to a crisis of consumer trust.

The history of EA development began with theoretical works in the 1970s–1990s. Gray [4] and Mathews [5] were among the first scholars to build the theoretical foundation of EA, where EA was seen not only as a tool for recording environmental costs but also as a communication mechanism with stakeholders. Gray and Bebbington [6] expanded this concept by emphasizing the role of comprehensively assessing both environmental costs and benefits, including positive impacts (e.g., renewable energy, emission reduction) and negative impacts (pollution, resource depletion), thereby laying the groundwork for the development of sustainable accounting models. These studies affirm that EA needs to be integrated into financial and non-financial reporting systems as an essential component to promote effective ESG implementation.

A notable study in the context of developing countries is the work of Rahaman et al. [7] published in PLOS ONE. The study surveyed 35 listed companies in the pharmaceutical and textile industries in Bangladesh during the period 2017–2021. Using a multivariate linear regression model and disclosure indices based on GRI standards, the authors examined the impact of variables such as firm features, operating efficiency, institutional pressure, and the involvement of independent auditors on the level of green accounting and reporting practices (GARPs). The results showed that the pharmaceutical industry had a higher level of GARPs adoption than the textile industry, attributed to stringent legal specificities and ESG transparency requirements in the sector related to public health. The theoretical framework combined stakeholder theory, institutional theory, and voluntary disclosure theory, thereby elucidating the dynamic mechanisms driving EA in a complex and less standardized legal environment.

In Vietnam, research on EA is still in its developmental stage, but has seen diverse approaches. Nguyen and Pham [8], using a multivariate regression method, demonstrated that the level of EA adoption in listed companies is primarily influenced by institutional factors, especially the clarity and effectiveness of environmental policies and legal regulations. Meanwhile, Nguyen [9] analyzed data from 87 listed industrial companies during 2009–2019, indicating that firm size, operating duration, and the involvement of Big 4 audit firms have a significant impact on the quality and extent of EA information disclosure. The research findings suggest that independent auditing not only plays a role in ensuring information but also encourages companies to comply with environmental reporting responsibilities.

At the local level, Nguyen and Pham [8] conducted a survey of 295 manufacturing enterprises in Hung Yen province and used SPSS 24 to test a regression model. The study found that factors such as the production sector, financial resources, management awareness, and stakeholder pressure strongly influence the application of EA. Notably, the production sector and corporate finance were the two factors with the highest regression coefficients, reflecting the core role of internal capabilities in the decision to implement EA in industries with high levels of resource consumption and emissions, such as pharmaceuticals.

The link between ESG and financial performance has also been verified by many scholars. Tran and Nguyen [10] surveyed 105 Vietnamese companies and indicated that the “Governance” factor had the highest correlation with financial performance, while the “Environment” factor had a positive but uneven impact across industries. In the healthcare sector, closely related to pharmaceuticals in terms of operational characteristics, research by Al Haetami and Bayu [11] showed that ESG disclosure, especially under the supervision of high-quality auditors, helps increase investor confidence and improve financial performance. Additionally, Oso et al. [12] developed an advanced financial model to measure the impact of ESG initiatives on healthcare investment, concluding that sustainable strategies can help optimize long-term costs and enhance corporate competitiveness.

In their research, Chang et al. [13] used fixed and random effects regression models to analyze data from 172 manufacturing enterprises in developing countries during the period 2001–2022. The study found that the use of equity capital and concentrated ownership structure had a positive impact on the level of green accounting disclosure, while the use of debt capital reduced transparency. This conclusion reflects that companies with stable and proactive financial strategies are often more willing to invest in ESG and EA initiatives consistently and long-term. Furthermore, the use of SDG and GRI-based scales also helps standardize the assessment of EA compliance with global standards.

Synthesizing findings from domestic and international research, it can be concluded that the implementation of environmental accounting in listed pharmaceutical companies is not only the result of an institutional mandate but also reflects the internal management capacity and ESG commitment of the enterprise. Given the industry's characteristics related to the biological environment, pharmaceutical companies need to build a robust environmental accounting system to meet compliance requirements, minimize risks, and enhance strategic competitiveness. In the context of Vietnam's deep integration and orientation towards sustainable development, further research on the factors influencing environmental accounting in the pharmaceutical industry is necessary. This will not only help complete the theoretical and practical basis for the field of environmental accounting but also provide a scientific foundation for policy planning, standard setting, and guiding sustainable development in the Vietnamese pharmaceutical industry.

3. Research model and Method

This study utilizes secondary data, with a research sample of 40 pharmaceutical companies listed on stock exchanges in Vietnam, out of a total of 59 listed pharmaceutical companies (accounting for 67.8%), indicating a significant representativeness of the sample. Information on environmental accounting was extracted from sustainability reports, annual reports, and corporate governance reports published by the enterprises. The study employs OLS, FEM, and REM regression models to assess the impact of each factor on the environmental accounting of listed pharmaceutical companies.

To achieve the research objective regarding the factors influencing the implementation of environmental accounting, the research team proposes the following research model:

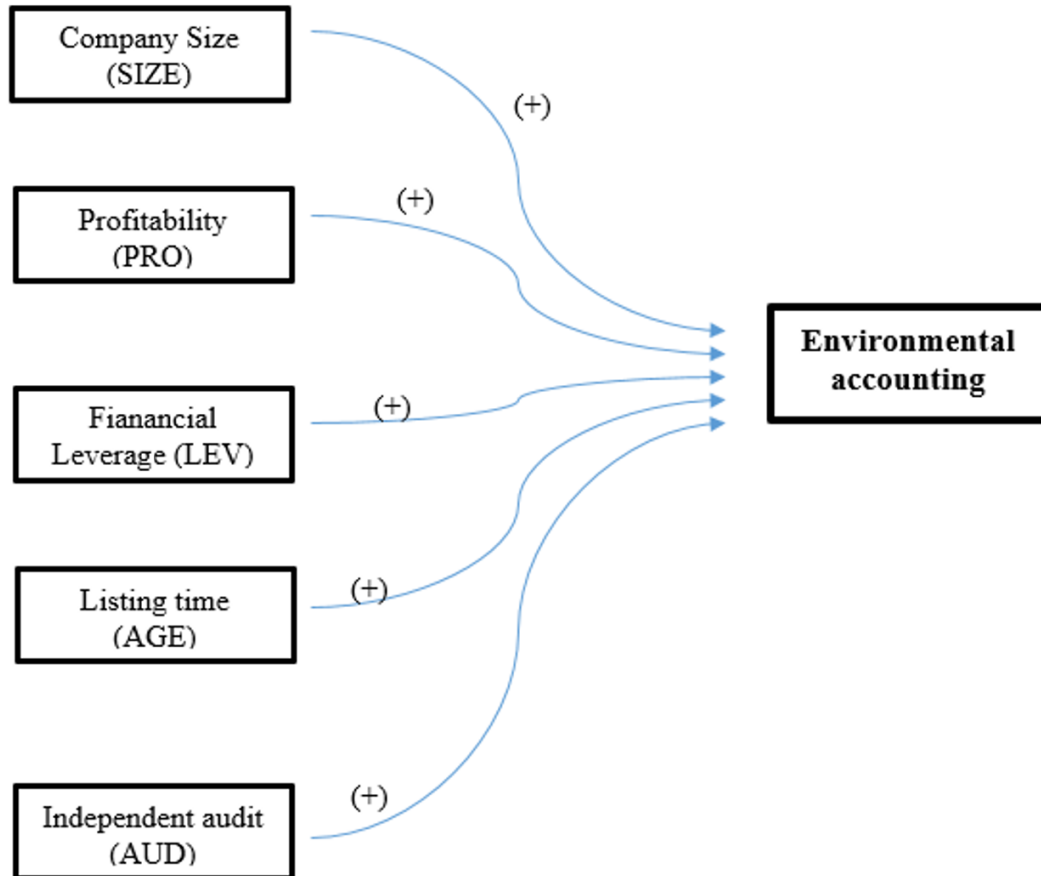
$$CSS = \beta_0 + \beta_1 SIZE + \beta_2 PRO + \beta_3 LEV + \beta_4 AGE + \beta_5 AUD + e$$

Table 1.

The research team hypothesized the direction of impact of the independent variables in the model.

Independent variable	Symbol	Impact
Company Size	SIZE	(+)
Profitability	PRO	(+)
Financial Leverage	LEV	(-)
Listing time	AGE	(+)
Independent Audit	AUD	(+)

The authors propose a research model comprising six factors, as depicted in Figure 1.

**Figure 1.**

Research model proposed by the research team

Note: Included:

* Dependent Variable: Environmental Accounting in pharmaceutical companies listed on the Vietnam stock exchange.

* Independent Variables include:

3.1. Company size (SIZE)

Firm size is a significant factor influencing the level and scope of environmental accounting implementation. Larger enterprises tend to adopt more complex and comprehensive environmental accounting systems compared to small and medium-sized enterprises (SMEs) due to facing greater pressure from stakeholders such as institutional investors, regulatory bodies, the community, and non-governmental organizations regarding transparency and environmental responsibility. This pressure drives them to invest in environmental accounting systems to systematically and professionally monitor, measure, and report environmental impacts.

Furthermore, larger enterprises typically possess stronger financial and human resources, facilitating the deployment of modern information technology systems and the hiring of highly qualified experts in environmental accounting and environmental management. These resources enable them to collect, process, and analyze complex environmental data, providing valuable information for decision-making and environmental risk management. Moreover, implementing environmental accounting can yield more economic benefits for larger enterprises, including optimizing resource utilization, reducing waste treatment costs, enhancing energy efficiency, and building a competitive advantage through a green and sustainable corporate image. Simultaneously, large companies often have more complex organizational structures with dedicated departments for environment and sustainable development, creating favorable conditions for integrating environmental accounting into business operations.

3.2. Profitability (PRO)

Profitability plays a pivotal role in motivating pharmaceutical companies to implement environmental accounting. Abundant profits provide the necessary financial resources to invest in environmental accounting systems, including technology, personnel, and training costs. Simultaneously, high profitability attracts the attention of investors, especially those who prioritize ESG (Environmental, Social, and Governance) factors, creating pressure for pharmaceutical companies to be transparent about environmental information. Furthermore, stable profits help pharmaceutical companies adopt a longer-term perspective, become more aware of environmental risks and opportunities, and consequently view environmental accounting as a strategic management tool. Implementing environmental accounting also assists pharmaceutical companies in complying with stringent industry regulations, avoiding penalties, and enhancing brand reputation, thereby creating a competitive advantage. Although, in some cases, prioritizing short-term profits or competitive pressures may slow down the investment process in environmental accounting. However, overall, robust profitability is a significant driver for pharmaceutical companies to implement environmental accounting effectively and comprehensively.

3.3. Financial leverage (LEV)

Financial leverage can present both opportunities and challenges for environmental accounting in pharmaceutical companies. On one hand, the effective use of borrowed capital can create more abundant financial resources, allowing businesses to invest in green technologies, cleaner production processes, and initiatives to minimize environmental impacts. This not only helps improve operational efficiency but also enhances the company's image and reputation in the context of increasing awareness of sustainable development. On the other hand, the pressure of debt repayment and interest expenses when using high financial leverage can lead companies to prioritize short-term profits, resulting in cost-cutting for environmental accounting and management activities, reduced transparency in environmental reporting, and limited long-term investment in sustainable solutions. Especially in the pharmaceutical industry, where there are specific environmental impacts, balancing profit optimization through financial leverage and the serious implementation of environmental responsibility through effective environmental accounting is crucial to ensure the sustainable development of the business and the entire industry.

3.4. Listing time (AGE)

When a pharmaceutical company goes public, the pressure for transparency and compliance with regulations, including environmental issues, increases significantly from investors and regulatory bodies. Disclosing detailed information about environmental operations, related costs, and potential impacts becomes a crucial factor in building trust in the stock market. Therefore, newly listed companies often begin to focus more on establishing basic environmental accounting systems to meet these requirements.

Over the period of listing, pharmaceutical companies face increasingly stringent scrutiny from the investment community, social organizations, and stakeholders regarding environmental performance. The growing interest in ESG factors drives long-established listed companies to invest more extensively in environmental accounting. They develop more sophisticated systems to track, evaluate, and report environmental information in a detailed and reliable manner, while also integrating environmental factors into business strategies and accounting systems more comprehensively. This indicates that the duration of listing is often directly proportional to the sophistication and importance of environmental accounting in listed pharmaceutical companies.

3.5. Independent audit (AUD)

The independent audit factor plays a pivotal role in enhancing the reliability and transparency of environmental accounting in listed pharmaceutical companies. Independent auditors, adhering to auditing standards and professional ethics, conduct an objective assessment of the environmental-related information disclosed by the company. This audit process includes reviewing environmental policies, environmental costs and liabilities, as well as compliance with environmental protection laws.

The opinion of independent auditors on financial statements and accompanying environmental information provides assurance to investors, regulatory bodies, and other stakeholders regarding the truthfulness and reasonableness of this information. A positive independent audit report will strengthen confidence in the company's environmental commitments and performance, while adverse or qualified opinions may indicate potential issues that need to be addressed. Therefore, independent auditing not only helps to enhance the transparency of environmental accounting but also encourages listed pharmaceutical companies to pay more attention to managing and reporting environmental issues fully and accurately.

4. Research Results

4.1. Descriptive statistics of the data

This study utilizes data collected from 40 pharmaceutical companies listed on the Vietnam stock market over a 5-year period, from 2019 to 2023, forming a dataset of 200 observations. With this sample size, we believe it is sufficiently large to conduct robust regression analysis, and the results obtained will have high reliability, allowing for meaningful conclusions to be drawn for the research paper based on these 200 observations.

Table 2.

Descriptiv statistics by the research team.

Variable	Obs	Mean	Std. Dev.	Min	Max
CSSadjusted	200	7.974623	2.641348	4.963148	39.90727
SIZE	200	11.77029	0.5353113	10.83953	12.8877
PRO	200	0.5672982	5.834776	-1.090555	81.92394
LEV	200	0.0290115	0.0732606	-1.66e-10	0.8865429
AGE	200	8.7	4.411041	1	17
AUD	200	2.22	1.846251	1	5

Descriptive statistics show that the dependent variable CSS (Composite Sustainability Score) has a mean value of 7.97 with a standard deviation of 2.6, ranging from a minimum of 4.96 to a maximum of 39.9. Regarding the independent variables, firm size (SIZE) has a mean of 11.7 (standard deviation 0.5), ranging from 10.8 to 12.8. Profitability (PRO) has a mean of 0.5 (standard deviation 5.8), with significant variation from -1 to 81.92. Financial leverage (LEV) is at a relatively low average of 0.029 (standard deviation 0.07), ranging from the lowest value to 0.89. Listing age (AGE) averages 8.7 years (standard deviation 4.4), with companies having been listed for 1 to 17 years. Finally, the independent audit variable (AUD) has a mean of 2.22 (standard deviation 1.8), ranging from 1 to 5.

The descriptive statistical analysis reveals several noteworthy characteristics of the research variables. Notably, the average financial leverage of listed pharmaceutical companies is only 0.01, indicating their relative independence from borrowed capital.

The composite CSS variable, which measures the level of sustainable development implementation based on the average score of indicators, presents a diverse picture. While some companies achieve a comprehensive level of information disclosure according to GRI standards (maximum value of 39.9), the overall average value for listed companies remains low to moderate. This is reinforced by the rather low minimum value (4.96), indicating that a significant portion of enterprises disclose information superficially or even provide almost no data related to sustainable development according to international standards. This differentiation highlights a significant gap between companies in adopting and making transparent information about sustainable development.

4.2. Correlation Analysis

The correlation coefficient indicates the trend of relationships between the variables in the model. Table 3 below presents the correlation coefficient matrix between the variables in the research model.

Table 3.

Correlation Matrix between Variables.

	CSS adjusted	SIZE	PRO	LEV	AGE	AUD
CSSadjusted	1.0000					
SIZE	0.2455 0.0005	1.0000				
PRO	0.8661 0.0000	0.0138 0.8464	1.0000			
LEV	0.0296 0.6773	0.0332 0.6406	0.1431 0.0433	1.0000		
AGE	0.3166 0.0000	0.2087 0.0030	-0.1172 0.0985	-0.1731 0.0142	1.0000	
AUD	0.2891 0.0000	0.3152 0.0000	-0.0317 0.6556	-0.1108 0.1182	0.2056 0.0035	1.0000

The correlation matrix shows that the dependent variable has a statistically significant linear correlation with four independent variables: size (SIZE), profitability (PRO), listing age (AGE), and independent audit (AUD), as evidenced by the low p-values (sig. < 0.05). Specifically, the independent variables SIZE, PRO, AGE, and AUD are all positively correlated with the dependent variable CSS. Notably, profitability (PRO) has the strongest correlation with CSS (coefficient 0.8661), while size (SIZE) has the weakest correlation (coefficient 0.2455). Furthermore, the correlation coefficients between the independent variables are all below 0.9, indicating that the risk of multicollinearity may exist but is not overly severe.

4.3. Regression Analysis

4.3.1. Model Selection: OLS, FEM, and REM Estimation

Table 4.

Test for Model Selection: OLS, FEM, and REM Estimation.

	Constant	SIZE	PRO	LEV	AGE	AUD	R – Squared
OLS	-0.097 (0.818)	0.451 (0.000)	0.414 (0.000)	-0.682 (0.009)	0.214 (0.000)	0.305 (0.000)	0.9905
FEM	-4.260 (0.304)	0.804 (0.026)	0.412 (0.000)	-0.625 (0.045)	0.190 (0.000)	0.400 (0.000)	0.9894
REM	-0.089 (0.839)	0.450 (0.000)	0.414 (0.000)	-0.671 (0.010)	0.213 (0.000)	0.306 (0.000)	0.9887

Table 4 presents the regression results obtained using the Ordinary Least Squares (OLS) method, the Fixed Effects Model (FEM), and the Random Effects Model (REM). Observing the differences between the results of the three methods, we conducted two tests to determine the most appropriate model.

First, the F-test was used to compare FEM and OLS. With a p-value = 0.000 (less than 0.05), the results indicate that the FEM model is more suitable.

Next, the Hausman test was performed to choose between FEM and REM. The Prob > chi2 value = 0.0125 (greater than 0.05) suggests that the FEM model continues to be preferred.

Therefore, we conclude that the regression results from the FEM model are the most appropriate in this case. According to the FEM model, the variables firm size, profitability, financial leverage, listing age, and independent audit all have an impact on the level of environmental accounting information disclosure of listed pharmaceutical companies on the Vietnam stock market. The variation in these independent variables explains 98.94% of the change in the level of environmental accounting information disclosure. The specific regression equation is presented as follows:

$$CSS = -4.260 + 0.804*SIZE + 0.412*PRO - 0.625*LEV + 0.190*AGE + 0.400*AUD + e$$

4.3.2. Model Fit Assessment

4.3.2.1. Multicollinearity Test

To assess the level of multicollinearity among the independent variables, the study used the Variance Inflation Factor (VIF) test through auxiliary regressions. The VIF test results presented in Table 5 show that the average VIF value is 3.4. With all variables having a VIF coefficient less than 10, it can be concluded that the research model generally does not suffer from a serious multicollinearity problem, indicating that the independent variables are relatively distinct and there is little overlap of information.

Table 5.

VIF Test Results for Multicollinearity Detection.

	VIF	1/VIF
SIZE	6.67	0.149986
AGE	5.41	0.184706
AUD	2.64	0.379388
LEV	1.23	0.815428
PRO	1.04	0.961057
Mean VIF	3.40	

4.3.2.2. Heteroskedasticity Test

To test for heteroskedasticity in the Fixed Effects Model (FEM), the Modified Wald test was performed using the xttest3 command. The results show a Prob > chibar2 value = 0.00, which is less than the significance level of 0.05. This leads to the conclusion that the FEM model exhibits heteroskedasticity.

Table 6.

Heteroskedasticity Test Result.

Modified Wald test for groupwise heteroskedasticity in fixed-effect regression model	
H0: $\sigma^2(i) = \sigma^2$	σ^2 for all i
chi2 (40) =	1339.98
Prob > chi2 =	0.0000

4.3.2.3. Wooldridge Test for Serial Correlation

To test whether the model exhibits serial correlation, the authors used the Wooldridge test.

H0: The model has no serial correlation

H1: The model has serial correlation

The Wooldridge test is used to examine serial correlation in the model. According to the rule, if the p-value of the Wooldridge test is greater than 0.05, we accept the null hypothesis H_0 , meaning that the model has no serial correlation. Conversely, if the p-value is less than 0.05, the model is concluded to have serial correlation.

In this case, the Prob > F value obtained from the Wooldridge test is 0.5963, which is greater than the significance level of 0.05. Therefore, we accept the null hypothesis H_0 and conclude that serial correlation does not exist in the model.

Table 7.

Wooldridge Test Results for Serial Correlation.

Wooldridge test for autocorrelation in panel data	
F (1, 39) =	0.285
Prob > F =	0.5963

4.3.3. Addressing Model Deficiencies with Generalized Least Squares (GLS) Regression

Table 8.

Generalized Least Squares (GLS) Regression Results.

Coefficients:	generalized least squares					
Panels:	homoskedastic					
Correlation:	no autocorrelation					
Estimated covariances	=	1	Number of obs	=	200	
Estimated autocorrelation	=	0	Number of groups	=	40	
Estimated coefficients	=	6	Time periods	=	5	
			Wald chi2 (5)	=	2819.85	
Log likelihood	=	-12.0538	Prob > chi2	=	0.0000	
CSS adjusted	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
SIZE	0.4515548	0.0364949	12.37	0	0.3800262	0.5230835
PRO	0.4147781	0.0031707	130.82	0	0.4085637	0.4209926
LEV	-0.6826673	0.2564126	-2.66	0.008	-1.185227	-0.1801079
AGE	0.2141278	0.0043544	49.17	0	0.2055933	0.2226623
AUD	0.3057781	0.0105743	28.92	0	0.2850529	0.3265034
_cons	-0.0975432	0.4179771	-0.23	0.815	-0.9167633	0.7216769

The results from Table 8 show that all independent variables in the model are statistically significant ($p < 0.05$), indicating that they all have a significant impact on the level of environmental accounting information disclosure. Specifically, the variables firm size (SIZE), profitability (PRO), listing age (AGE), and independent audit (AUD) have a positive impact, while financial leverage (LEV) has a negative impact, consistent with the initial expectations of the study. In terms of the magnitude of the impact, financial leverage (LEV) has the strongest effect on the implementation of environmental accounting, followed by firm size (SIZE), profitability (PRO), independent audit (AUD), and finally, listing age (AGE) has the weakest impact among the variables.

5. Conclusion and Policy Implications

The research findings indicate that firm size has a significant impact on the implementation of environmental accounting in listed pharmaceutical companies, while financial leverage does not have a strong influence. Larger enterprises generally implement environmental accounting better due to abundant resources. However, the average score of sustainable development indicators for listed companies is still low compared to GRI standards, revealing a deficiency in adhering to international benchmarks. Although the majority of companies disclose information according to GRI guidelines, this information is often incomplete, indicating a lack of transparency and up-to-date information. Correlation analysis identified a linear correlation between the dependent variable CSS and independent variables such as size (SIZE), profitability (PRO), financial leverage (LEV), listing age (AGE), and independent audit (AUD). This study has some limitations, including its focus solely on listed pharmaceutical companies, overlooking factors such as the influence of competitors and management's awareness of sustainable development, and relying only on secondary data. These are potential directions for future research, including conducting surveys and expert interviews to gain deeper insights into their perspectives and assessments of sustainable development information disclosure.

To improve the situation, the study proposes several important solutions. Firstly, companies need to enhance the quality and completeness of environmental information in their financial and sustainability reports, especially by fully complying with GRI standards in both form and content. This will not only strengthen the transparency, reputation, and social responsibility of businesses but also provide clear information for stakeholders and support companies in self-assessment and operational adjustments to minimize negative environmental impacts. Secondly, it is necessary to promote communication and training on environmental accounting for employees, especially those in finance and accounting departments, to raise awareness of the important role of environmental accounting in managing costs, resources, and promoting sustainable behavior within the enterprise. Businesses should facilitate employees in updating their knowledge and the latest international standards through training courses and participation in professional organizations. Thirdly, large-scale enterprises should be

encouraged to continue playing a leading role in adopting advanced environmental accounting methods and promoting sustainable development initiatives. State management agencies and industry associations need to have technical and financial support policies for small and medium-sized enterprises to facilitate their access to and implementation of environmental standards. Fourthly, the intervention of state management agencies is necessary to establish stronger policies on environmental accounting information disclosure requirements, including issuing clear regulations, incentive policies (such as tax breaks), and strengthening inspection and supervision of compliance. Finally, researchers and regulatory bodies need to continue researching and improving environmental accounting assessment methods, especially in the context of constantly changing international standards, to ensure up-to-date and accurate information, helping businesses easily adopt and meet new requirements while also supporting businesses in forecasting and managing environmental-related risks to build long-term sustainable development strategies.

With the above results, the study has provided important information for evaluating and proposing policy implications affecting environmental accounting at pharmaceutical companies listed on the stock market in Vietnam.

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