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New Solutions for Assessing Corporate Social Responsibility in Pharmaceutical Companies: A Mathematical Modelling Approach

Abstract. *The paper aims to identify the influencing factors of social performance in the pharmaceutical sector (from a sample of 6 companies listed on the Bucharest Stock Exchange during 2011-2020). The research methods refer to identifying the non-financial and financial information whose reporting by pharmaceutical companies produces significant effects on social performance based on the analysis of the database and the econometric model. Our primary findings are that, while raising the rate of return on equity – the primary financial indicator – causes social performance to decline, human capital development, and company size are believed to boost social performance. When it comes to social performance, non-financial factors are more important than financial ones. Spending on the environment has the greatest impact on social performance. Also, the econometric model demonstrates how variations in gender within the board of directors may either boost or decrease social performance.*

Keywords: *corporate social responsibility, global performance, social performance, sustainability, environmental expenses.*

JEL Classification: C02, C11, C45, C46, C63.

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1. Introduction

Corporate strategies and regulations increasingly require companies to improve their social and environmental performance achieved through the implementation of corporate social responsibility or corporate social responsibility (CSR) practices. This aspect is particularly relevant in the pharmaceutical sector, where the current global health crisis has led to an increasing involvement of pharmaceutical companies in CSR practices.

The industrial sector has made a significant contribution to solving social and environmental problems, and its sustainable impact on the business level has attracted much attention in recent years. Thus, Javed et al. (2020) states that the creation of a Sustainable Development Committee will increase the effectiveness of CSR strategies and that companies with CSR strategies will demonstrate better social and environmental indicators. Also, gender diversity contributes to improving CSR and strengthening the bond between the board sustainability committee, demonstrating that women in director positions maintain a stronger attitude towards environmental sustainability (Monteiro & García-Sánchez, 2022).

In this context, the research focuses on identifying the influencing factors of social performance in the pharmaceutical sector by using the non-financial and financial data of Romanian companies whose reporting produces significant effects on social performance. Both financial and non-financial information is needed to determine the overall performance of companies. This is investigated based on statistical data from 2011-2022.

Furthermore, we applied the least squares method to investigate the variables that influence the execution of CSR activities in the Romanian pharmaceutical business. This approach is widely used in academic studies that demonstrate how, in addition to economic factors, CSR activity in these fields of activity is also influenced by social responsibility and a company's ethical commitment (Liopa et al., 2023), largely resolving issues with costs and corporate culture.

The current study makes a number of contributions to the literature on CSR. Our study examines social and environmental performance by examining the relationship between CSR policy allocation and various non-financial factors such as CEO structure, human capital expenditure, and research and development expenditure, unlike previous research (Yang et al., 2019; Lita, 2020) that examined the association between CSR disclosure and financial performance (the variable most frequently associated with the ROE indicator), produced contradictory results. In addition to the existing literature analysing the impact of CSR on social indicators, the study also contributes to a better understanding of how women in management positively influence the financial performance of the company. At the same time, the study supports regulatory efforts to increase the proportion of women at the senior management level by providing empirical evidence of better social outcomes with gender diversity of leadership (Monteiro & García-Sánchez, 2022). Finally, unlike previous studies (Shabbir et al., 2020) that looked at specific indicators to assess the effectiveness of a company's CSR, this study uses an econometric model for each

CSR measurement to assess the importance of a particular measurement in terms of its impact on the company's financial and non-financial performance.

This study is structured as follows: firstly, a brief review of the literature on the relationship between CSR and social performance is presented; next, the methodology used is presented; then, the results of the statistical and econometric analyses performed and the results are discussed; in the final section, the conclusions and recommendations for future studies are described.

2. Literature Review and Hypothesis Development

Growing stakeholder interest in non-financial information to better understand how an economic entity creates, manages and sustains value has required the creation of a mechanism, applicable to listed economic entities, to assess the level of overall performance and its interdependence with a competitive advantage.

Tarquinio & Posadas's (2020) study, highlights the scholars' perceptions of the meaning of non-financial information, indicating that they are viewed from seven perspectives. They affirm that information about business performance, corporate social responsibility, environmental, social, and governance issues, strategy, and value creation are examples of non-financial information (NFI). It also includes information about diversity and risk disclosure.

The nexus between sustainability, corporate social responsibility, non-financial reporting, and performance has come up more frequently in recent years. Recent studies have examined how incentives, pressures, and barriers affect sustainability, non-financial reporting on performance, and the mediating role of CSR. The findings indicate that sustainability affects CSR and non-financial reporting favourably even at the SMEs level. Various industries, including those involved in food, banking, mining, forestry, and clothing, evaluate the effects of corporate social performance (CSP). Accordingly, with the previous findings mentioned above, we state the following hypothesis in addressing our first research question:

H1 – Reported non-financial information (i.e., environmental spending; human capital development expenditures; company size; the number of women managers; the number of men managers; research development expenses) positively and efficiently influences the allocation of CSR policies.

The last decade has been characterised by the rapid development of "socially responsible" investments. Thus, in the current context, the increasing share of investments in intangible assets generating economic benefits in companies' assets, justified by technological progress, has led to a change in the way stakeholders perceive performance, with companies having to work with stakeholders to integrate social, environmental, and economic concerns into their core strategies. Adopting a social responsibility system has been an important strategic tool for some of them to improve their reputation.

Another point of interest was the correlation between financial performance and CSR. In this respect, the literature classifies an entity's economic performance into classic and modern financial performance indicators. Therefore, simply by using this

type of indicator, we can say that these entities achieve performance only by using existing value, but do not create additional value. Modern indicators are related to the concept of value creation, and for this reason, they are considered more relevant than classical indicators. Through this type of indicator, performance can be more easily expressed in terms of shareholder interest, but the results achieved are not so relevant to other stakeholders. Many previous researchers have investigated the effect of firm visibility on the association between CSR and corporate financial performance.

For these reasons, we can affirm that performance measurement plays a role in the coordination, monitoring, and diagnosis of the activity of the economic entity, which constitutes the premise of formulating our second hypothesis, namely:
H2 – There is a significant correlation between financial performance and CSR.

A point of interest within the present topic is discussed earlier in Melo's article (2012), results of the study indicate that a humanistic culture has a positive impact on CSP, as well as management tenure and slack resources to a lesser degree. A recent study by Lin et al. (2022) shows that managerial and foreign ownership are positively related to CSR, because various types of owners may have different ways of thinking about CSR matters.

In light of this brief review, our third hypothesis can be formulated as follows:
H3 – Management structures influence social performance.

Regarding the more complex definition of global performance, some studies analyse social performance as an indispensable component, concluding that one of the determining factors that generate it is gender differences; more precisely, performance is positively influenced by women managers (Jouber et al., 2022). For instance, Cheon et al. (2022) held that "female managers are more likely to adopt innovations compared to male managers, especially when they perform better than they have in recent years". If the global performance elements are analysed separately, then female managers positively influence the management of social actions by involving them in the evolution of the company and recycling the waste generated by the company (Gull et al., 2023). Also, in this sense, Alonso-Almeida et al. (2017) states that female managers more easily accept the interests of stakeholders, giving particular importance to CSR actions, to strengthen business and sustainability. Moreover, it has been demonstrated that female managers achieve exceptional results both in terms of financial performance and CSR (Jouber et al. (2022; Yang et al., 2019). The positive influence of female managers on CSR practices is explained by their psychological nature, because they are much more concerned with the economic and social future, but also more receptive to social and environmental practices (Gull et al., 2023). Thus, based on this gap in the literature and the unknown relationship between global performance and the influence of female managers on CSR practices, we formulate the following hypothesis, namely:
H4 – The prevalence of women managers in management structures generates positive effects on the increase of social and financial performance, implicitly of global performance and business sustainability.

Given the growing interest both the academic community and practitioners to CSR, it is crucial to examine the key issues that we believe might be explored in further detail in subsequent research and advance this line of inquiry.

3. Materials and Methods

To fulfil the purpose of the research, the data were collected manually, from the website of the Bucharest Stock Exchange (BSE) (https://bvb.ro/), from the annual reports of the administrators, made available to the public on the websites of each individual and their financial statements. The sample consists of Romania's top 6 pharmaceutical companies, listed on the BSE, between 2011-2020.

Empirical and analytical research methods are used in this research based on statistical data for the analysed period. The general form of the estimated equation of the multiple regression model is:

$$Y = \alpha + \sum_{i=1}^{7} \beta_i * X_i + \varepsilon;\ \alpha, \beta, i = 1, \dots, 7, \quad (1)$$

where $Y = (y_1, y_2, \dots, y_{k)}$ represents the dependent variable of the model about the independent variables; and $X_i = (x_{i1}, x_{i2}, \dots, x_{ik)}$ represents the correlation coefficients; and ε – represents the residual variable.

Thus, the general model proposed for the analysis of the sample takes the form:

$$y_j = \alpha + \sum_{i=1}^{7} \beta_j * x_{ij} + \varepsilon_j,\ j = 1, \dots, k \quad (2)$$

with matrix shape:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_k \end{bmatrix} = \begin{bmatrix} \alpha \\ \alpha \\ \vdots \\ \alpha \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{bmatrix} \begin{bmatrix} x_{11} & x_{21} & \cdots & x_{71} \\ x_{12} & x_{22} & \cdots & x_{72} \\ \vdots & \vdots & \dots & \vdots \\ x_{1k} & x_{2k} & \cdots & x_{7k} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_k \end{bmatrix} \quad (3)$$

When determining the coefficients is the method of the smallest squares by minimising the sum of the smallest squares. Values of the coefficients α, β_i, i=1,...,7 will be denoted by α^, β^_i, i=1,...,7, thus the model adjusted for forecasting will have the form:

$$\hat{Y} = \hat{\alpha} + \sum_{i=1}^{7} \hat{\beta}_i * X_i,\ i = 1, \dots, 7 \quad (4)$$

Therefore, the model determined by the method of the smallest squares on the determined sample has the shape:

$$\hat{y}_j = \hat{\alpha} + \sum_{i=1}^{7} \hat{\beta}_j * x_{ij},\ j = 1, \dots, k \quad (5)$$

From the relations (1) and (4) the prediction error is determined with the formula ε=Y-Y^. We focus on the distance between observed and corrected data, given by the equation:

$$S(Y, \hat{Y}) = \sum_{j=1}^{k} \varepsilon_j^2 = \sum_{j=1}^{k} \left(y_j - \hat{y}_j\right)^2 \quad (6)$$

In data analysis, the given function in relation (6) is used to evaluate the performance of the model proposed for analysis. According to the method of the smallest squares, its value must be the lowest:

$$S(Y,\hat{Y}) = \sum_{j=1}^{k}\left(y_j - \hat{\alpha} - \sum_{i=1}^{7}\hat{\beta}_j \cdot * x_{ij}\right)^2 \to min, \quad j = 1,\ldots,k \tag{7}$$

We consider the function:

$$S(\alpha,\beta_1,\beta_2,\beta_3,\beta_4,\beta_5,\beta_6,\beta_7) = \sum_{j=1}^{k}\left(y_j - \alpha - \beta_1 * x_{1j} - \beta_2 * x_{2j} - \beta_3 * x_{3j} - \beta_4 * x_{4j} - \beta_5 * x_{5j} - \beta_6 * x_{6j} - \beta_7 * x_{7j}\right)^2 \tag{8}$$

Deriving the function S given by the relation (8) in relation to the 8 variables we get:

$$\frac{\partial S}{\partial \alpha} = -2\sum_{j=1}^{k} y_j + 2\alpha\ k + 2\beta_1\sum_{j=1}^{k} x_{1j} + 2\beta_2\sum_{j=1}^{k} x_{2j} + 2\beta_3\sum_{j=1}^{k} x_{3j} + 2\beta_4\sum_{j=1}^{k} x_{4j} + 2\beta_5\sum_{j=1}^{k} x_{5j} + 2\beta_6\sum_{j=1}^{k} x_{6j} + 2\beta_7\sum_{j=1}^{k} x_{7j};$$

$$\frac{\partial S}{\partial \beta_1} = -2\sum_{j=1}^{k} x_{1j} * y_j + 2\alpha\ \sum_{j=1}^{k} x_{1j} + 2\beta_1\sum_{j=1}^{k} x_{1j}^2 + 2\beta_2\sum_{j=1}^{k} x_{1j} * x_{2j} + 2\beta_3\sum_{j=1}^{k} x_{1j} * x_{3j} + 2\beta_4\sum_{j=1}^{k} x_{1j} * x_{4j} + 2\beta_5\sum_{j=1}^{k} x_{1j} * x_{5j} + 2\beta_6\sum_{j=1}^{k} x_{1j} * x_{6j} + 2\beta_7\sum_{j=1}^{k} x_{1j} * x_{7j};$$

$$\frac{\partial S}{\partial \beta_2} = -2\sum_{j=1}^{k} x_{2j} * y_j + 2\alpha\ \sum_{j=1}^{k} x_{2j} + 2\beta_1\sum_{j=1}^{k} x_{1j} * x_{2j} + 2\beta_2\sum_{j=1}^{k} x_{2j}^2 + 2\beta_3\sum_{j=1}^{k} x_{2j} * x_{3j} + +2\beta_4\sum_{j=1}^{k} x_{2j} * x_{4j} + 2\beta_5\sum_{j=1}^{k} x_{2j} * x_{5j} + 2\beta_6\sum_{j=1}^{k} x_{2j} * x_{6j} + 2\beta_7\sum_{j=1}^{k} x_{2j} * x_{7j};$$

$$\frac{\partial S}{\partial \beta_7} = -2\sum_{j=1}^{k} x_{7j} * y_j + 2\alpha\ \sum_{j=1}^{k} x_{7j} + 2\beta_1\sum_{j=1}^{k} x_{1j} * x_{7j} + 2\beta_2\sum_{j=1}^{k} x_{2j} * x_{7j} + 2\beta_3\sum_{j=1}^{k} x_{3j} * x_{7j} + +2\beta_4\sum_{j=1}^{k} x_{4j} * x_{7j} + 2\beta_5\sum_{j=1}^{k} x_{5j} * x_{7j} + 2\beta_6\sum_{j=1}^{k} x_{6j} * x_{7j} + 2\beta_7\sum_{j=1}^{k} x_{7j}^2 \tag{9}$$

According to the algorithm for determining local extremes, we have the equations $\frac{\partial S}{\partial \alpha} = \frac{\partial S}{\partial \beta_1} = \frac{\partial S}{\partial \beta_2} = \frac{\partial S}{\partial \beta_3} = \frac{\partial S}{\partial \beta_4} = \frac{\partial S}{\partial \beta_5} = \frac{\partial S}{\partial \beta_6} = \frac{\partial S}{\partial \beta_7} = 0$ and that is how we get the Gauss system:

$$\begin{cases} \alpha\ k + \beta_1 \sum_{j=1}^{k} x_{1j} + \beta_2 \sum_{j=1}^{k} x_{2j} + \beta_3 \sum_{j=1}^{k} x_{3j} + \beta_4 \sum_{j=1}^{k} x_{4j} + \beta_5 \sum_{j=1}^{k} x_{5j} + \beta_6 \sum_{j=1}^{k} x_{6j} + \beta_7 \sum_{j=1}^{k} x_{7j} = \sum_{j=1}^{k} y_j \\ \alpha \sum_{j=1}^{k} x_{1j} + \beta_1 \sum_{j=1}^{k} x_{1j}^2 + \beta_2 \sum_{j=1}^{k} x_{1j} \cdot x_{2j} + \beta_3 \sum_{j=1}^{k} x_{1j} \cdot x_{3j} + \beta_4 \sum_{j=1}^{k} x_{1j} \cdot x_{4j} + \beta_5 \sum_{j=1}^{k} x_{1j} \cdot x_{5j} \\ \quad + \beta_6 \sum_{j=1}^{k} x_{1j} \cdot x_{6j} + \beta_7 \sum_{j=1}^{k} x_{1j} \cdot x_{7j} = \sum_{j=1}^{k} x_{1j} \cdot y_j \\ \alpha \sum_{j=1}^{k} x_{2j} + \beta_1 \sum_{j=1}^{k} x_{1j} \cdot x_{2j} + \beta_2 \sum_{j=1}^{k} x_{2j}^2 + \beta_3 \sum_{j=1}^{k} x_{2j} \cdot x_{3j} + \beta_4 \sum_{j=1}^{k} x_{2j} \cdot x_{4j} + \beta_5 \sum_{j=1}^{k} x_{2j} \cdot x_{5j} + \\ \quad \beta_6 \sum_{j=1}^{k} x_{2j} \cdot x_{6j} + \beta_7 \sum_{j=1}^{k} x_{2j} \cdot x_{7j} = \sum_{j=1}^{k} x_{2j} \cdot y_j \\ \vdots \\ \alpha \sum_{j=1}^{k} x_{7j} + \beta_1 \sum_{j=1}^{k} x_{1j} \cdot x_{7j} + \beta_2 \sum_{j=1}^{k} x_{2j} \cdot x_{7j} + \beta_3 \sum_{j=1}^{k} x_{3j} \cdot x_{7j} + \beta_4 \sum_{j=1}^{k} x_{4j} \cdot x_{7j} + \beta_5 \sum_{j=1}^{k} x_{5j} \cdot x_{7j} \\ \quad + \beta_6 \sum_{j=1}^{k} x_{6j} \cdot x_{7j} + \beta_7 \sum_{j=1}^{k} x_{7j}^2 = \sum_{j=1}^{k} x_{7j} \cdot y_j \end{cases} \quad (10)$$

System solving (10) leads to obtaining correlation coefficients for multiple linear regression. Thus, using the method of the smallest squares and determining the best adjustment function to predict the social and environmental performance for this study. This analysis is performed using IBM SPSS Statistics, version 26 software.

The following section presents the results of the empirical study. Thus, we mention that unlike previous studies that use as a proxy variable for CSR scores announced by specific organisations or the donation amount or donation ratios (Wang et al., 2022), KEJI index or KLD CSR performance data (Lopatta et al., 2022), the present study, in order to construct the proxy of the dependent variable, considers the following elements and methodology. Thus, the exogenous dependent variable includes the presence of information on the firm's vision and mission; the presence of policies and strategies for business sustainability; information on the need to build a resilience and recovery plan in conditions of prolonged crisis; implementation and application of business ethics principles, and last but not least information on the concern of the companies under study to allocate funding sources for digitisation in projects aimed at acquiring digital competences in business innovation, in parallel with the awareness of the role of smart technology in solving social problems. All this information was searched for in the sustainability report, on the companies' website under general information and public relations, in the explanatory notes to the annual financial reports and in the administrator's report. The presence of the information has been marked with 1 and its absence with 0.

4. Results

The present research aims to analyse the social and environmental performance of the top 6 companies in the pharmaceutical field in Romania, which are listed on the BSE for over a 10-year period, between 2011 and 2020. The general model is applied to the analysis and has the form (Eq. 11):

$$CSR = \alpha + \beta_1 * ROE + \beta_2 * ES + \beta_3 * HCDE + \beta_4 * CS + \beta_5 * NWM + \beta_6 * NMM + \beta_7 * RDE + \varepsilon \quad (11)$$

where CSR – Corporate Social Responsibility disclosures; ROE – Return on equity; ES – is environmental spending; HCDE - human capital development expenditures; CS – company size; NWM – number of women managers; NMM – the number of men managers and RDE – research development expenses. The variables of the analysed model are shown in Table 1.

Table 1. Model variables

Model	Variables Entered		Variables Removed	Method
1	RDE, NMM, ROE, CS, ES, NWM, HCDE[b]		.	Enter

[a] Dependent Variable: CSR

[b] All requested variables entered.

Source: Authors' processing.

Furthermore, Table 2 shows the values of the Pearson correlation coefficients between the analysed indicators. By analysing the values of the Pearson correlation coefficients, we can observe their low values. The strongest correlation is between CSR and ES. Environmental spending has a positive and effective impact on CSR. In this model, a good correlation between CRS and CS stands out, as well as between CRS and HCDE. With the rest of the indicators, we have low correlations, but it is observed that the Pearson correlation coefficient value between CRS and NWM is higher than between CRS and NMM, so women managers have a greater influence on CRS than male managers do. Therefore, management structures have a practical impact on social performance.

Table 2. Pearson Correlation Coefficients

		CSR	ROE	ES	HCDE	CS	NWM	NMM	RDE
Pearson Correlation	CSR	1.000	.032	.549	.491	.499	.293	.070	-.323
	ROE	.032	1.000	.315	-.140	-.020	.094	-.235	.022
	ES	.549	.315	1.000	.204	.228	.403	.294	-.108
	HCDE	.491	-.140	.204	1.000	.658	-.259	-.070	-.484
	CS	.499	-.020	.228	.658	1.000	.223	.157	-.296
	NWM	.293	.094	.403	-.259	.223	1.000	.591	.233
	NMM	.070	-.235	.294	-.070	.157	.591	1.000	.021
	RDE	-.323	.022	-.108	-.484	-.296	.233	.021	1.000

Source: Authors' processing.

Table 2 contains the values of the coefficients of the correlation and determination ratio that confirm the strong link between the analysed indicators in the pharmaceutical field for the determined model. According to Table 3, the value of the correlation ratio is 0.773, which shows that the determined model has a high statistical representability. CSR is influenced by the 7 indicators analysed at the level of pharmaceutical companies. The ratio of determination is worth 0.597, so 59.7% of the CSR variation is explained by the variation of the ROE, ES, HCDE, CS, NWM, NMM, and RDE indicators (see Table 3).

Table 3. Summary of the model

Model	R	R^2	Adjusted R^2	Std. The error of the Estimate	Durbin-Watson
1	.773[a]	.597	.527	.47211	1.408

[a] Predictors: (Constant), RDE, NMM, ROE, CS, ES, NWM, HCDE
[b] Dependent Variable: CSR

Source: Authors' processing.

CSR values have changed throughout the period 2011-2020 due to the change of European legislation in the field of social and environmental policies, uncertainties and associated risks in the economic, social, and political environment, investments made in innovation, attempts by firms to strengthen their position on the market, the existence of limited budgets at the level of corporations for activities specific to the CSR department, difficulties in determining causes that determine the actions of social responsibility correlated with the company's values, difficulties in communicating CSR actions to customers, employees, and public opinion.

Table 4. Coefficients of the model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.892	3.121		.286	.777
	ROE	-.946	.668	-.171	-1.415	.165
	ES	2.995E-7	.000	.412	3.119	.003
	HCDE	.258	.141	.338	1.835	.074
	CS	.084	.183	.075	.457	.650
	NWM	.128	.046	.465	2.788	.008
	NMM	-.120	.047	-.350	-2.540	.015
	RDE	-6.589E-7	.000	-.190	-1.620	.113

[a] Dependent Variable: CSR

Source: Authors' processing.

Analysing Table 4 we can see that the biggest influence on CSR is the ES and it is observed that the increase in environmental expenditures will lead to an increase in CSR. The firm's commitment to the environment must be perceived not as an

option, but as an obligation of behaviour adapted to current requirements for commercial, moral, and economic reasons. Customers demand the recycling of used appliances. We must leave future generations with a world that offers them the best possible environmental conditions. From an economic point of view, respect for the environment leads to the reduction of material consumption, the elimination of waste, and the reduction in the number of accidents.

After applying the model to the sample composed of the 6 pharmaceutical companies, the following regression equation is obtained (Eq. 12):

$$CSR = 0.892 - 0.946 * ROE + (2.995E^{-7}) * ES + 0.25 * HCDE + 0.084 * CS + 0.128 * NWM - 0.120 * NMM - RDE \quad (12)$$

An important influence on CSR is exercised by the management structures within these pharmaceutical companies in Romania. It is noticed that women influence CSR more than men, because they are also interested in the social aspect of companies and thinking about the future. According to Eq. (12), the increase in the number of women managers within pharmaceutical companies leads to increased CSR, due to maternal instinct they think about future generations, and a cleaner world protecting the environment; instead, the increase in the number of men managers leads to a decrease in CSR because they are thinking about increasing financial performance and less social performance. Men managers will want to invest in something concrete to get a profit that contributes to the profitability of the firm and less to the social performance.

According to Figure 1, the histogram and the distribution of the CSR-dependent variable is right-facing, with a standard deviation of 0.923. As for the distribution on the trend line of the P-P Plot graph, the dependent variable is inhomogeneous. Deviations from the forecast line are significant during the analysis period for companies that do not invest in research and development and environmental actions.

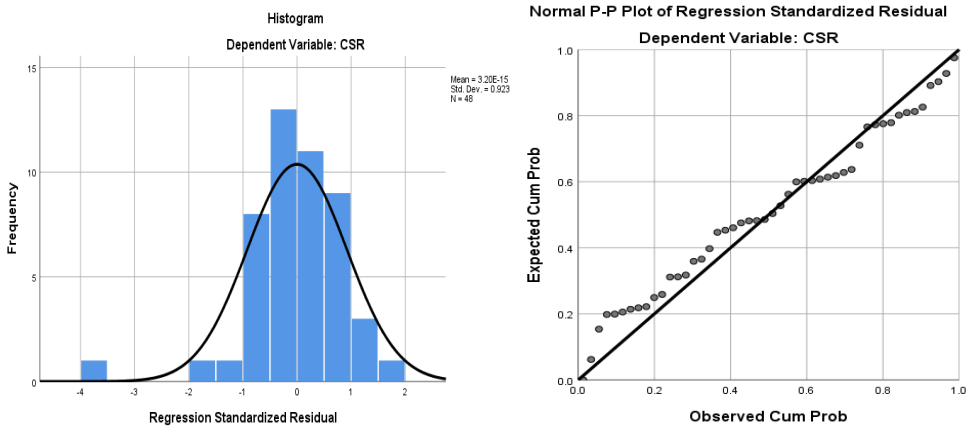

Figure 1. Histogram and distributional representation of the dependent variable of model 1; Source: IBM SPSS Statistics, version 26

Source: Authors' processing.

Because financial and non-financial factors are contained in overall performance, the econometric model confirms that respect for the natural environment considerably influences social performance.

The way the proposed hypotheses are validated or refuted is presented in the following section, which is based on statistical correlations between the independent variables and the dependent variable.

Discussion of Research Results

4.1 Effect of Return on Equity on CSR Disclosures

According to this statistical finding, the independent variable ROE, does not appear to act as a variable that has a direct influence on CSR disclosure. Thus, even if we do not find empirical support for the second argument, how stands that high profitability calls for the allocation of CSR policies and, thus, greater social disclosure, this does not compel us to reject the H2. More specifically, Husnan & Pamudji (2013) claimed that ROE does not accurately reflect the quality of earnings attained by the company; hence, social responsibility has no impact on ROE. Because ROE is more reliant on the company's own capital holdings, it occasionally may not accurately represent the calibre of the profits.

In this sense, few research studies suggested that there is either no association or that CSR has no impact on business success, such as CSR has no impact on corporate financial performance (Respati & Oktaviani, 2022). One example would be that a company with increased profitability did not eliminate more middle-class and social-benefit activities. This underlines the fact that a company's primary goal is to maximise profits. Additionally, a different viewpoint explains the fact that CSR activities are only undertaken to legitimise and foster a positive image, so that when profitability rises, the company believes it is not important to discontinue social responsibility and other larger-scale activities.

Then again, when financial performance is poor, the company believes it is crucial to build a positive reputation to draw investors through the publication of exhaustive CSR information. There are conflicting views in the literature about this claim. Because of this, several researchers (Razafindrambinina et al., 2020) contend that the CSR disclosure is not significantly influenced by profitability, while other researches (Yang et al., 2019; Wang et al., 2022) are in contradiction with these results obtained showing a relationship between profitability and disclosure of CSR policies.

4.2 Effect of Environmental Spending on CSR Disclosures

Based on the results of calculations as shown in Table 4, the results of the t-test between environmental spending variables and the allocation of CSR policies where ES has a t count value of 3.119 and a significance level of 0.003. The results of the study obtained a significant value of 0.003 which is smaller than 0.05 and the t-count

value is greater than t-table (1.9965). It can be concluded that the hypothesis (H1) which states that reported non-financial information (i.e., environmental spending) influences CSR policies is accepted.

This study is consistent with previous research (Yang et al., 2019), which states that environmental spending has a significant positive effect on CSR disclosure, and is in contradiction to that research (Respati & Oktaviani, 2022) which found no significant relationship in testing the relationship between environmental performance and CSR disclosure.

4.3 Effect of Human Capital Development Expenditures on CSR Disclosures

In regard to hypothesis 1, it can be concluded that in the case of this study the link between CSR disclosure and human capital development spending is less strong, but this does not give us the basis to say that the H1 which states that non-financial reporting influences CSR policies is rejected.

This result is consistent with Ullah & Arslan (2022), findings, which stated that a firm can develop sustainable product and service attributes regardless of resource limitations by capitalising on R&D knowledge related to corporate social responsibility, and human capital complements the R&D contribution. Also, these results contradict other research (Istikhoroh et al., 2022), which states that human capital cannot mitigate the link between CSR and firm value, from which we infer that HCDE has no effect on the allocation of CSR policies.

4.4 Effect of Company Size on CSR Disclosures

Based on the results of calculations as shown in Table 4, the results of the t-test between the company size variables and CSR allocation policies where the company size has a t-count value of 0.457 and a significance level of 0.650. The results obtained a significance value of 0.457 which is greater than 0.05 and the value of t arithmetic is smaller than t table (1.9965), it can be concluded that the company size variable does not appear to act as a variable that has a direct effect on CSR disclosure.

These results are consistent with what was done by Multama et al. (2023), who stated that the main reasons in favour of adopting CSR do not necessarily depend on industries, ownership structure, or firm size and are in antithesis with study conducted by Agarwala et al. (2023), how believes that CSR disclosure can only be seen until the firms reach medium size, or become older i.e., the smaller the scale of operations, constraints on access to resources, and lower visibility, the less likely those firms are to participate in CSR initiatives.

4.5 Effect of Number of Women Managers on CSR Disclosures

Based on the results of calculations as shown in Table 4, the results of the t-test be-tween number of women managers variables and the allocation of CSR policies where NWM has a t count value of 2.788 and a significance level of 0.008. The

results of the study obtained a significant value of 0.008 which is smaller than 0.05 and a t-count value which is greater than t-table (1.9965). It can be concluded that the hypothesis (H4) which states that reported non-financial information (i.e., number of women managers) has an effect on the allocation of CSR policies is accepted.

These findings are in line with those of Jouber et al. (2022), who contends that while it is generally believed that women are more likely to engage in socially responsible activities, the study shows the positive aspects of women in leadership roles when they reach the positions of CEO, president, or both. In contrast, Monteiro et al. (2022) document the opposite finding. In particular, they showed that female managers do not play a direct role in labour practice, decent work, and human rights performance (LA&HR) and reporting, but exert their influence indirectly by affecting LA&HR performance.

4.6 Effect of Number of Men Managers on CSR Disclosures

Based on the results of calculations as shown in Table 4, the results of the t-test be-tween number of men managers variables and the allocation of CSR policies where NMM has a t count value of -2,540 and a significance level of 0.015. The results of the study obtained a significant value of .015 is smaller than 0.05 and a t-count value which is smaller than t-table (1.9965). It can be concluded that the hypothesis (H3) which states that reported non-financial information (i.e. number of men managers) influences the allocation of CSR policies, is accepted.

Regarding the effect of number of men managers on CSR disclosures, the results of the present study suggest that corporate governance factors such as board size, female directors and free directors have an absolute impact on CSR dis-closure, which is consistent with the findings effected by Shabbir & Wisdom et al. (2020). Also in this regard, Alonso-Almeida et al. (2017) analysing leadership styles and perceptions towards CSR conclude that the dominant leadership style appears to be the most inappropriate leadership style for implementing a CSR strategy and is typically applied by man managers. Moreover, Shaukat et al. (2016) find that a company's CSR strategy is more proactive and holistic, and its social and environmental performance is higher, the more CSR-oriented its board is (as indicated by board independence and gender diversity).

4.7 Effect of Research Development Expenses on CSR Disclosures

Based on the results of calculations as shown in Table 4, it can be drawn that there is a statistically lower correlation between the independent variable RDE and CSR, but this fact does not lead us to conclude that the H1 which states that reported non-financial information (i.e., research development expenses) has an effect on CSR disclosure is rejected.

These findings are consistent with what was done by Ginești et al. (2023), where firms with a CSR committee exhibit lower levels of R&D investments and the very

nature of the firm's knowledge, which is highly specialised, makes the application of specific knowledge in different areas problematic. In contradiction to the statistical results of our study, research by Padgett et al. (2010) stated that both R&D and CSR activities can create assets that give firms a competitive advantage. Additionally, these activities can match stakeholder expectations, which may change depending on the area in which they operate, and enhance community well-being. The findings of the authors' study demonstrate that CSR is favourably influenced by demand and development intensity, and that this link is substantial in manufacturing industries while yielding a non-significant result in non-manufacturing industries. The relationship between CSR, R&D costs, and financial performance is frequently discussed in the literature, with most studies (Lin et al., 2009) pointing to a favourable correlation between these three factors.

5. Conclusions

Following the study, all the objectives initially proposed were achieved, thus the influence of financial and non-financial information on social performance was analysed. Studying the literature confirms the importance of social performance, as it contributes, in the long run, to meeting the needs of stakeholders, increasing sales and increasing the result, retaining current customers, and attracting new buyers. Social performance gives added value to the enterprise and competitive advantage. The financial variables with the greatest influence deducted from the econometric model are the development of human capital, the rate of return on equity, and the size of the firm. Although an increase in the rate of return on equity, as the main financial indicator, leads to a decrease in social performance, it is considered that the development of human capital and the size of the firm determine the increase in social performance. Non-financial variables have a more significant impact on social performance compared to financial variables. Environmental spending has the largest influence on social performance. The econometric model highlights how gender differences on the board of directors or not boost social performance.

Performance remains a controversial and constantly changing topic considering the speed with which the business environment changes. However, companies need to understand that now, social responsibility is the only way to bring customers and investors closer together, which, if they have quicker access to financial and non-financial information, will contribute to an increase in future performance.

This study correlates social and environmental performance data with financial performance, as does other empirical research on CSR evaluation. However, it is important to note that social and environmental problems cannot be compared over years because they are only detectable for a short time. One of the research's limitations in this regard is that, while financial information enjoys confirmatory and predictability values, the situation with environmental and social reported information is quite unusual and no longer meets these criteria. This can clearly have an impact on the evaluation methods' objectivity and accuracy over an extended period. Another limit that we faced was caused by the difficulty of measuring social

and environmental performance because the data provided by pharmaceutical companies do not contain quantifiable information or indicators to analyse their impact on the environment and society. In those circumstances, a recommendation for those companies would be to implement much more useful techniques in terms of measuring social and environmental actions.

The future line on research for the authors is that the model could be applied to other areas, not just pharmaceuticals, but it is best suited to those companies that are recurrent and adept at integrated reporting and are concerned with behaving as ethically and transparently as possible in relation to all stakeholders.

The final results can be useful for those companies interested in evaluating the contribution brought by social performance to the creation of value, but also to other categories of stakeholders directly involved in the investment policies of pharmaceutical companies, in protecting and ensuring social rights and freedoms.

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