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VAS and ESG score: a correlational analysis of oil companies listed on B3

DVA y puntuación ESG: un análisis correlacional en empresas petroleras que cotizan en la B3

DVA e score ESG: uma análise correlacional em empresas petrolíferas listadas na B3

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Abstract

Purpose: This study aims to analyze the relationship between value distribution indicators reported in the Value Added Statement (VAS) and ESG *scores* of Brazilian oil and gas companies listed on B3, covering the period from 2018 to 2022.

Methodology: The research is classified as descriptive, documentary, and quantitative. Data were collected from companies' financial statements and the Refinitiv Eikon database. The analysis was conducted using descriptive statistics, Pearson and Spearman correlation tests, and multiple linear regression models, including control variables related to firm size, leverage, and financial performance.

Results: The results indicated statistically significant associations in bivariate analyses, particularly in the environmental and social dimensions, which proved to be more limited when examined in multivariate models. A positive relationship was identified between internally generated value and ESG performance, as well as between value distribution to government and ESG indicators. Conversely, value distribution to shareholders showed a negative relationship with ESG *scores*. No significant associations were found between VAS indicators and the governance dimension.

Contributions of the Study: This study contributes to the literature by integrating accounting-based value distribution metrics with ESG indicators, grounded in stakeholder, legitimacy, and voluntary disclosure theories. Additionally, it advances empirical research by focusing on a high environmental impact sector, providing evidence that may support managers and investors in understanding the interaction between financial performance and sustainability practices.

Keywords: ESG; Value Added Statement; Sustainability; Corporate Governance; Socio-environmental Accounting.

Resumen

Objetivo: Analizar la relación entre los indicadores de distribución de valor evidenciados en el Estado de Valor Agregado (EVA) y los puntajes ESG de las empresas petroleras brasileñas listadas en la B3, en el período de 2018 a 2022.

Metodología: La investigación se caracteriza como descriptiva, documental y cuantitativa. Los datos fueron recolectados a partir de los estados financieros de las empresas y de la base Refinitiv Eikon. El análisis se realizó mediante estadísticas descriptivas, correlación de Pearson y Spearman, además de modelos de regresión lineal múltiple, con inclusión de variables de control relacionadas con el tamaño, endeudamiento y desempeño financiero.

Resultados: Los resultados evidenciaron asociaciones estadísticamente significativas en los análisis bivariados, especialmente en las dimensiones ambiental y social, las cuales se mostraron más limitadas cuando se analizaron en modelos multivariados. Se observó una relación positiva entre la generación interna de valor y el desempeño ESG, así como entre la distribución al gobierno y los indicadores ESG. Por otro lado, la distribución de valor a los accionistas presentó una relación negativa con los puntajes ESG. No se identificaron relaciones significativas entre los indicadores del EVA y la dimensión de gobernanza.

Contribuciones del Estudio: El estudio contribuye a la literatura al integrar métricas contables de distribución de valor con indicadores ESG, bajo la perspectiva de las teorías de los stakeholders, de la legitimidad y de la divulgación voluntaria. Asimismo, aporta evidencia empírica en un sector de alta relevancia ambiental, contribuyendo a la comprensión de la relación entre desempeño financiero y prácticas de sostenibilidad.

Palabras clave: ESG; Estado de Valor Agregado; Sostenibilidad; Gobernanza Corporativa; Contabilidad Socioambiental.

Resumo

Objetivo: Analisar a relação entre os indicadores de distribuição de valor evidenciados na Demonstração do Valor Adicionado (DVA) e os *scores* ESG das empresas petrolíferas brasileiras listadas na B3, no período de 2018 a 2022.

Metodologia: A pesquisa caracteriza-se como descritiva, documental e quantitativa. Os dados foram coletados a partir das demonstrações financeiras das empresas e da base Refinitiv Eikon. A análise foi realizada por meio de estatísticas descritivas, correlação de Pearson e Spearman, além de modelos de regressão linear múltipla, com a inclusão de variáveis de controle relacionadas ao tamanho, endividamento e desempenho financeiro das empresas.

Resultados: Os resultados indicaram associações estatisticamente relevantes em análises bivariadas, especialmente nos pilares ambiental e social, as quais se mostraram mais limitadas quando consideradas em modelos multivariados. Observou-se relação positiva entre a geração interna de valor e o desempenho ESG, bem como entre a distribuição ao governo e os indicadores ESG. Por outro lado, a distribuição de valor aos acionistas apresentou relação negativa com os *scores* ESG. Não foram identificadas relações significativas entre os indicadores da DVA e o pilar de governança.

Contribuições do Estudo: O estudo contribui para a literatura ao integrar métricas contábeis de distribuição de valor com indicadores ESG, sob a perspectiva das teorias dos stakeholders, da legitimidade e da divulgação voluntária. Adicionalmente, avança ao analisar essa relação em um setor de alta relevância ambiental, oferecendo evidências empíricas que podem auxiliar gestores e investidores na compreensão das interações entre desempenho financeiro e práticas socioambientais.

Palavras-chave: ESG; Demonstração do Valor Adicionado; Sustentabilidade; Governança Corporativa; Contabilidade Socioambiental.

1 Introduction

In a context of increasing pressure for transparency and socio-environmental accountability, companies have come to be assessed not only based on their financial performance, but also regarding their environmental, social, and governance (ESG) practices. In this scenario, investors, regulators, and other stakeholders demand information that enables an understanding not only of wealth creation, but also of how such wealth is distributed within society.

The Value Added Statement (VAS) emerges as an important accounting instrument in this context, as it highlights how the wealth generated by organizations is distributed among different stakeholders, such as employees, government, capital providers, and shareholders. In parallel, ESG indicators have become established as relevant metrics for assessing companies' commitment to sustainable and responsible practices.

Despite the relevance of both approaches, a gap in the literature can be observed regarding the relationship between the distribution of economic value and companies' ESG performance, particularly in sectors with high environmental impact, such as the oil industry. Previous studies, such as Checon and Santana (2022), have explored this relationship in broader contexts; nevertheless, there remains room for more sector-specific and in-depth investigations.

From a theoretical perspective, the relationship between the Value Added Statement (VAS) and ESG can be understood in light of Stakeholder Theory, which emphasizes the importance of value generation and distribution among diverse stakeholder groups, as well as Legitimacy Theory, which suggests that firms operating in environmentally sensitive sectors tend to adopt ESG practices as a means of legitimizing their operations before society. This relationship can also be framed within the logic of voluntary corporate disclosure.

Considering this context, the following research question is proposed: **What is the relationship between the value distribution indicators reported in the Value Added Statement (VAS) and the ESG scores of Brazilian oil companies listed on B3?**

Based on this research question, the main objective of this study is to examine this relationship in the context of Brazilian oil companies listed on B3 over the period from 2018 to 2022. Specifically, the study seeks to identify the existence and strength of correlations between these variables, as well as to discuss possible explanatory factors for the observed results.

The relevance of this study lies in its contribution to the literature by integrating traditional accounting metrics with sustainability indicators, offering an applied analysis of a sector with high economic and environmental relevance. Moreover, the results may assist managers and investors in understanding the relationships between value creation and ESG practices, thereby contributing to decision-making processes that are more closely aligned with sustainable development.

This article is structured into five sections. Following this introduction, the literature review is presented, followed by the methodological procedures. Subsequently, the research results are discussed, and finally, the concluding remarks are provided.

2 Literature Review

2.1 Value Added Statement (VAS)

The Value Added Statement (VAS) constitutes an important accounting instrument aimed at disclosing the wealth generated by organizations and its corresponding distribution among various stakeholders. Unlike traditional financial statements, the VAS allows for an analysis not only of profit generation, but also of how this value is appropriated by employees, government, capital providers, and shareholders.

According to Tinoco and Kraemer (2011), value added represents the firm's net contribution to the economy, reflecting its capacity to generate wealth through its productive activities. Complementarily, Santos et al. (2022) emphasize that the VAS enables the assessment of both the generation and the distribution of such wealth, highlighting the participation of different economic agents in the production process.

In this context, indicators derived from the VAS allow for the measurement of the degree of internally generated wealth and its distribution among stakeholders, providing relevant inputs for analyses of economic and social performance. Thus, the VAS is configured as a relevant instrument for evaluating the role of organizations in the creation and distribution of value within society, especially in studies that seek to integrate economic and socio-environmental dimensions.

2.2 ESG and Corporate Performance

The concept of ESG (Environmental, Social and Governance) has become established as an important metric for assessing companies' socio-environmental and governance performance. These indicators reflect corporate practices related to sustainability, social responsibility, and organizational transparency, and are widely used by investors and other stakeholders in decision-making processes.

According to Filho and Cierco (2022), the adoption of ESG practices may contribute to the generation of sustainable competitive advantages by strengthening corporate reputation, reducing risks, and improving operational efficiency. Furthermore, companies with stronger ESG practices tend to exhibit greater alignment with societal expectations, which may positively affect their long-term performance.

Recent international literature has reinforced the relevance of ESG indicators in the corporate context. Berg, Kölbel, and Rigobon (2022) highlight the existence of divergences among ESG metrics, pointing to challenges related to the measurement and comparability of such information. From an informational perspective, Christensen, Serafeim, and Sikochi (2022) argue that the quality of ESG information is associated with the credibility of corporate disclosures, contributing to the reduction of information asymmetry.

Additionally, empirical evidence indicates that firms with stronger ESG practices exhibit greater financial resilience and lower exposure to risk, particularly in environmentally intensive sectors (Broadstock et al., 2022; Dorfleitner et al., 2022). From a stakeholder perspective, Flammer (2023) suggests that the adoption of ESG practices strengthens relationships with different stakeholder groups, thereby contributing to long-term value creation.

Thus, ESG indicators not only reflect sustainable practices but also influence economic performance, risk perception, and corporate transparency in the market.

2.3 Theoretical Foundations of the Relationship Between VAS and ESG

The relationship between the VAS and ESG indicators can be understood from different theoretical perspectives that explain organizational behavior with respect to value generation and distribution.

Stakeholder Theory asserts that firms should generate value not only for shareholders, but for all stakeholder groups involved in their activities. In this regard, the VAS highlights how wealth is distributed among these stakeholders, while ESG indicators reflect the extent to which their demands are addressed, particularly with respect to the environmental, social, and governance dimensions.

Complementarily, Legitimacy Theory suggests that firms seek to align their operations with social and institutional expectations to maintain legitimacy within society. This aspect is particularly relevant in sectors with high environmental impact, such as the oil industry, in which the adoption of ESG practices may be interpreted as a strategy to mitigate external pressures and reinforce social acceptance.

Finally, Voluntary Disclosure Theory indicates that firms use the disclosure of socio-environmental information as a means of reducing information asymmetries and signaling quality to the market. In this context, ESG indicators function as transparency mechanisms that may influence investors' and other stakeholders' perceptions of corporate performance.

Thus, these theoretical approaches provide support for understanding the potential relationship between the distribution of value evidenced by the VAS and firms' ESG performance.

2.4 Empirical Evidence on VAS and ESG

The empirical literature investigating the relationship between accounting indicators and ESG practices has expanded in recent years, particularly about the integration of financial and socio-environmental metrics.

Previous studies, such as Checon and Santana (2022), analyzed the relationship between the Value Added Statement (VAS) and ESG indicators using techniques such as factor analysis and multiple regression. Their results indicated that variables related to the distribution of value added exhibit explanatory power for the environmental and social pillars of ESG, but not for the governance pillar.

In the international context, several studies have shown that ESG practices influence not only financial performance, but also the way firms manage risks, allocate resources, and interact with their stakeholders. Fatemi, Glaum, and Kaiser (2018) highlight that firms with stronger ESG performance tend to exhibit higher operational efficiency and better risk management, factors that may affect value generation and distribution.

Additionally, recent literature suggests that firms operating in sectors with high environmental impact are more exposed to regulatory and social pressures, which may influence both their ESG practices and their economic strategies. In this context, the measurement and comparability of ESG indicators still present limitations (Berg et al., 2022), and the relationship between corporate performance and socio-environmental practices appear complex and not necessarily linear (Christensen et al., 2022; Broadstock et al., 2022).

Therefore, the relationship between accounting indicators and ESG performance may not be straightforward, reinforcing the importance of employing multivariate approaches for more robust analyses.

Despite advances in the literature, studies that directly investigate the relationship between accounting value distribution indicators and ESG metrics remain scarce, particularly in sector-specific analyses. This gap underscores the relevance of the present study, which proposes an integrated analysis of the Value Added Statement and ESG scores in Brazilian oil companies.

3 Methodological Procedures

3.1 Research Design and Methodology

This study is characterized as descriptive, documentary, and quantitative in nature. According to Gil (2002), descriptive studies primarily aim to describe the characteristics of a given population or phenomenon, as well as to establish relationships among variables.

From the perspective of technical procedures, this research is classified as documentary, as it relies on data extracted from financial statements and secondary databases. As noted by Beuren (2006), this type of research involves the collection, processing, and interpretation of information that is already available, with the purpose of generating scientific knowledge.

Regarding the research approach, the study is quantitative, as it employs statistical techniques for data analysis, including descriptive measures, correlation analysis, and econometric models, as proposed by Richardson (1999).

3.2 Population, Sample and Data Collection

The population of this study comprises companies listed on B3 operating in the Oil, Gas, and Biofuels and Basic Materials sectors, specifically within the segments of exploration, refining, distribution, and petrochemicals.

The final sample was defined based on the availability of data related to the Value Added Statement (VAS) and ESG scores, resulting in a set of firms with complete information for the period under analysis.

Economic Sector	**Subsector**	**Industry segment**
Oil, Gas, and Biofuels	**Oil, Gas, and Biofuels**	**Exploration, Refining, and Distribution**
		COSAN PETROBRAS PETRORIO ULTRAPAR VIBRA
Basic Materials	**Chemicals**	**Petrochemicals**
		BRASKEM

Figure 1 *Companies selected for the sample, classified by sector*
Source: *Research data.*

The period of analysis covers the years from 2018 to 2022, totaling five years, which allows for greater consistency in the analyses, in accordance with recommendations from accounting studies (Marion, 2005).

Data related to the VAS were collected directly from the financial statements disclosed by the companies, while ESG data were obtained from the Refinitiv Eikon platform, which provides standardized indicators of environmental, social, and governance performance.

3.3 Variable Definition

The variables used in the study were organized into three groups: dependent, independent, and control variables.

The dependent variables correspond to ESG indicators, namely: Overall ESG, Environmental ESG, Social ESG, and Governance ESG.

The independent variables are represented by indicators derived from the Value Added Statement (VAS), as proposed by Almeida et al. (2009): Degree of Internally Generated Wealth (GPRP), Percentage of Value Added Distributed to Employees (PDVAE), Percentage of Value Added Distributed to Government (PDVAG), Percentage of Value Added Distributed to Shareholders (PDVAA), and Percentage of Value Added Distributed to Financial Institutions (PVAIF).

Initially, the Degree of Wealth Received through Transfers (GRRT) was also considered. However, during the model estimation stage, the presence of multicollinearity with the GPRP indicator was identified, as both variables are structurally dependent and derived from the same calculation basis of the VAS. The simultaneous inclusion of these variables would compromise the stability of the estimated coefficients; therefore, the GRRT variable was excluded from the final models.

3.4 Statistical Data Analysis

Data analysis was conducted in three complementary stages. Initially, descriptive statistics were computed for the variables, including mean, median, minimum and maximum values, and standard deviation, with the aim of characterizing the behavior of the data.

In the second stage, the Pearson correlation coefficient was employed to assess the linear association between Value Added Statement (VAS) indicators and ESG scores. In addition, Spearman's rank correlation was applied as a robustness test, considering potential deviations from data normality.

Finally, multiple linear regression models were estimated to analyze the joint relationship between VAS indicators and ESG scores, allowing for greater analytical robustness compared to bivariate techniques. The models were specified as follows:

$$ESG_{it} = \beta 0 + \beta 1 GPRP\_it + \beta 2 PDVAE\_it + \beta 3 PDVAG\_it + \beta 4 PDVAA\_it + \beta 5 PDVAIF\_it + \varepsilon\_it$$

where ESG_it represents the ESG score of firms i in period t, β0 is the intercept, β1 to β5 represent the coefficients of the independent variables, and ε_it is the error term.

The models were estimated separately for the overall ESG score and for each of its pillars (environmental, social, and governance)

3.5 Data Treatment and Outlier Analysis

During the data treatment process, extreme values (outliers) were identified, characterized by observations that deviated substantially from the overall pattern of the variables. The identification and exclusion of these values were carried out based on statistical criteria, considering their potential influence on the model results.

The exclusion of outliers aimed to reduce distortions and increase the robustness of the estimations, which is a common practice in quantitative studies employing econometric techniques.

3.6 Methodological Constraints

Despite the methodological rigor adopted, this study presents some limitations. The sample is restricted to firms operating in a specific sector, which may limit the generalizability of the results. Additionally, the ESG indicators are based on secondary data and are therefore subject to the methodological criteria of the database employed.

Finally, although the regression models allow for greater analytical robustness, it is not possible to establish causal relationships; therefore, the results should be interpreted as statistical associations.

4 Analysis and Discussion of Results

4.1 A Descriptive Data Analysis

To characterize the behavior of the variables analyzed, Table 1 presents the descriptive statistics of the DVA indicators and ESG scores in the period of 2018 to 2022.

Table 1
Descriptive Statistics of VAS Indicators and ESG Scores

Scores	Average	Median	Maximum	Minimum	Range	Standard Deviation
VAS Indicators:						
GPRP (appendix A)	85%	89%	97%	57%	40%	10%
GRRT (appendix A)	15%	12%	43%	3%	40%	10%
PDVAE (appendix A)	12%	10%	34%	2%	32%	9%
PDVAG (appendix A)	42%	46%	85%	7%	78%	23%
PDVAA (appendix A)	26%	14%	85%	2%	83%	24%
PDVAIF (appendix A)	25%	19%	89%	4%	85%	19%
***Scores* ESG:**						
Overall ESG (appendix B)	54%	58%	77%	19%	58%	20%
Environmental ESG (appendix B)	42%	52%	67%	3%	64%	24%
Social ESG (appendix B)	59%	67%	90%	16%	74%	24%
Governance ESG (appendix B)	64%	69%	89%	13%	76%	18%

Note. Values are presented in decimal proportion. VAS indicators are defined in Appendix A and ESG scores are defined in Appendix B.
Source: Research data.

Overall, the Degree of Internally Generated Wealth (GPRP) indicator exhibited the highest mean among the Value Added Statement (VAS) indicators, indicating that most of the value added generated by the firms in the sample originates from their own operational activities. In contrast, the indicator of distribution to employees (PDVAE) showed the lowest mean values, suggesting a relatively smaller share of this stakeholder group in the distribution of generated wealth.

Regarding ESG indicators, the governance pillar presented the highest mean values, whereas the environmental pillar showed the lowest scores, highlighting potential challenges faced by the oil sector in terms of environmental performance. These results are consistent with the nature of the sector analyzed, which is characterized by high environmental intensity and strong regulatory pressure.

4.2 Relationship Between Environmental ESG and VAS Indicators

To analyze the association between environmental performance and VAS indicators, Table 2 presents the Pearson correlation coefficients between the environmental ESG score and the variables analyzed.

Table 2
Pearson Correlation Coefficients Between the Environmental ESG Score and VAS Indicators

Environmental ESG	n	Correlation (ρ)	α =*(0,05) α =**(0,01)
GPRP	28	0,5761	0,0013**
GRRT	28	-0,5761	0,0013**
PDVAE	29	0,2624	0,1690
PDVAG	30	0,5874	0,0006**
PDVAA	26	-0,5087	0,0080**
PDVAIF	25	-0,2496	0,2288

Note. Dependent variable: Environmental ESG score. Pearson correlation coefficients (ρ). *p < 0.10; **p < 0.05; ***p < 0.01.
Source: Research data.

The results indicate the existence of statistically significant correlations for some variables. A positive correlation is observed between the GPRP indicator and the environmental ESG score, suggesting that firms with a greater capacity for internally generating value tend to exhibit better environmental performance. This finding may be interpreted considering Stakeholder Theory, as such firms have greater autonomy to invest in sustainable practices.

Conversely, the GRRT indicator showed a negative correlation, indicating that firms more dependent on resources obtained from third parties may present lower environmental performance. A positive correlation is also observed between the indicator of value distribution to government (PDVAG) and environmental ESG, possibly reflecting higher levels of regulatory compliance. In contrast, distribution to shareholders (PDVAA) exhibited a negative correlation, suggesting potential trade-offs between capital remuneration and investments in socio-environmental initiatives.

4.3 Relationship Between Social ESG and VAS Indicators

For the social pillar, Table 3 presents the Pearson correlation coefficients between the social ESG score and the VAS indicators.

Table 3
Pearson Correlation Coefficients Between the Social ESG Score and VAS Indicators

Social ESG	n	Correlation (ρ)	α =*(0,05) α =**(0,01)
GPRP	28	0,2881	0,1371
GRRT	28	-0,2881	0,1371
PDVAE	29	0,0929	0,6317
PDVAG	30	0,6219	0,0002**
PDVAA	26	-0,7149	0,0000**
PDVAIF	25	-0,3651	0,0727

Note. Dependent variable: Social ESG score. Pearson correlation coefficients (ρ). *p < 0.10; **p < 0.05; ***p < 0.01.
Source: Research data.

The results indicate that the main statistically significant relationships are concentrated in the PDVAG and PDVAA variables. The positive correlation between PDVAG and social ESG may reflect firms' role in fulfilling fiscal and social obligations, thereby contributing to economic and social development. Conversely, the negative correlation between PDVAA and social performance suggests that higher distributions to shareholders may reduce the resources allocated to social initiatives.

The lack of statistical significance for the remaining indicators may be associated with the multidimensional nature of the social pillar, which encompasses institutional and qualitative aspects that are not always captured by accounting-based indicators.

4.4 Relationship Between Governance ESG and VAS Indicators

Regard to the governance pillar, Table 4 presents the Pearson correlation coefficients between the governance ESG score and the VAS indicators.

Table 4

Pearson Correlation Coefficients Between the Governance ESG Score and VAS Indicators

Governance ESG	n	Correlation (ρ)	α =*(0,05) α =**(0,01)
GPRP	28	0,3037	0,1161
GRRT	28	-0,3037	0,1161
PDVAE	29	0,2040	0,2885
PDVAG	30	0,2194	0,2440
PDVAA	26	-0,2694	0,1833
PDVAIF	25	-0,0078	0,9705

Note. Dependent variable: Governance ESG score. Pearson correlation coefficients (ρ). $*p < 0.10$; $**p < 0.05$; $***p < 0.01$.

Source: Research data.

The results indicate the absence of statistically significant correlations, suggesting that corporate governance practices may be more closely related to institutional and structural factors than directly to the distribution of economic value. This finding is consistent with previous empirical evidence, reinforcing the notion that governance follows a distinct dynamic compared to the other ESG pillars.

4.5 Multiple Linear Regression Analysis

Table 5 presents the results of the multiple linear regression analysis, estimated with the purpose of examining the joint relationship between the VAS indicators and the ESG performance of the firms analyzed. Considering that $n > 30$, the regression estimators are expected to exhibit appropriate asymptotic properties, in accordance with the Central Limit Theorem, thereby contributing to the validity of the statistical inferences.

Table 5

Multiple Linear Regression Results for Overall ESG

Variable	Coefficient (β)	Standard Error	t	p-value
Constant	81,299	6,944	11,71	0,000***
GPRP	-8,558	6,062	-1,41	0,172
PDVAE	-14,507	10,676	-1,36	0,186

Variable	Coefficient (β)	Standard Error	t	p-value
PDVAG	-5,364	7,327	-0,73	0,472
PDVAA	-42,480	21,427	-1,98	0,055*
PDVAIF	-32,732	18,787	-1,74	0,093*

R^2 = 0,54; R^2 adjusted = 0,44; F = 5,62 (p = 0,001); N = 31
Note. Dependent Variable: Overall ESG. *p < 0,10; *pp < 0,05; ***p < 0,01.
Source: Research data.

The results indicate overall statistical significance of the model ($p < 0.01$), with a coefficient of determination (R^2) of 0.54 and an adjusted R^2 of 0.44, evidencing moderate explanatory power. These findings suggest that, taken together, the VAS indicators contribute to explaining ESG performance.

With respect to the individual variables, the percentage of value distributed to shareholders (PDVAA) exhibited a negative coefficient and statistical significance at the 10% level, indicating that firms allocating a larger share of their results to shareholders tend to exhibit lower ESG performance. Similarly, the variable related to distribution to financial institutions (PDVAIF) also showed a negative coefficient and significance at the 10% level.

In contrast, the variables related to internally generated wealth (GPRP), distribution to employees (PDVAE), and distribution to government (PDVAG) did not present statistical significance, suggesting that these dimensions do not exert a direct influence on ESG performance within the estimated model.

These results suggest that the way value is distributed may exert a more relevant influence on ESG performance than wealth generation itself, highlighting the importance of analyzing resource allocation among stakeholders.

The comparison between the correlation and regression analyses indicates that some bivariate relationships do not persist when examined jointly, pointing to the presence of interdependence among variables. This finding reinforces the importance of employing multivariate models for a more robust analysis.

From a theoretical perspective, the results may be interpreted considering Stakeholder Theory, by evidencing potential conflicts in value allocation among different stakeholder groups, as well as Legitimacy Theory, by suggesting that firms adjust their practices in response to institutional and social pressures.

Finally, it should be noted that the results should be interpreted as statistical associations, as it is not possible to establish causal relationships.

5 Final considerations

This study aimed to analyze the relationship between value distribution indicators disclosed in the Value Added Statement (VAS) and the ESG scores of Brazilian oil companies listed on B3 over the period from 2018 to 2022.

The results indicated the existence of relevant associations between VAS indicators and ESG scores, particularly with respect to the environmental and social pillars. Positive correlations were observed between the percentage of value added distributed to government (PDVAG) and ESG scores, as well as negative correlations between the distribution to shareholders (PDVAA) and these same indicators. Additionally, the degree of internally generated wealth (GPRP) showed a positive association with ESG performance, whereas the degree of wealth received through transfers (GRRT) exhibited a negative relationship.

These findings suggest that firms with a greater capacity for internal value generation tend to exhibit better socio-environmental performance, possibly due to greater autonomy to invest in sustainable and innovative practices. Conversely, firms that allocate a larger share of their results to shareholders or rely more heavily on external resources may face reduced capacity to direct resources toward ESG initiatives, highlighting potential trade-offs in value allocation.

These results reinforce the notion that it is not merely the capacity to generate wealth that influences ESG performance, but rather how this wealth is distributed among different stakeholders. Accordingly, resource allocation emerges as a central element in understanding the relationship between economic performance and socio-environmental practices, indicating that decisions related to value distribution may reflect firms' strategic priorities in response to sustainability demands.

Regarding the governance pillar, no statistically significant relationships were identified with VAS indicators, which may suggest that corporate governance practices are more strongly associated with institutional and structural factors than directly with the distribution of economic value.

From a theoretical perspective, this study contributes by integrating Stakeholder Theory, Legitimacy Theory, and Voluntary Disclosure Theory to explain the relationship between accounting-based value distribution metrics and ESG indicators. From an empirical standpoint, the research advances the literature by examining this relationship within a specific sector of high environmental relevance, thereby exploring an approach that remains under investigation.

In practical terms, the findings suggest that managers and investors should consider not only value creation, but also how such value is distributed, as this distribution may be associated with firms' ESG performance. Moreover, the study underscores the importance of transparency and the integration of financial and socio-environmental information in decision-making processes.

Despite its contributions, this study presents limitations. The analysis is restricted to a specific group of firms and a single economic sector, which may limit the generalizability of the results. Furthermore, the use of secondary ESG data may be subject to methodological variations inherent to the database employed.

For future research, expanding the sample to other economic sectors is recommended, as well as the use of more robust econometric models and additional analytical techniques. Further investigations could also incorporate qualitative sustainability-related variables and analyze alternative ESG data sources, with the aim of deepening the understanding of the relationship between financial performance and socio-environmental practices.

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ANNEX 1

DESCRIPTION
1 – REVENUES
1.1) Sales of goods, products and services
1.2) Other revenues
1.3) Revenues related to the construction of own assets
1.4) Allowance for doubtful accounts – Reversal / (Provision)
2 – INPUTS ACQUIRED FROM THIRD PARTIES (includes tax amounts – ICMS, IPI, PIS and COFINS)
2.1) Cost of goods and services sold
2.2) Materials, energy, third-party services and others
2.3) Loss / Recovery of asset values
2.4) Others (specify)
3 – GROSS VALUE ADDED (1–2)
4 – DEPRECIATION, AMORTIZATION AND DEPLETION
5 – NET VALUE ADDED GENERATED BY THE ENTITY (3–4)
6 – VALUE ADDED RECEIVED IN TRANSFER
6.1) Equity in earnings of associates and joint ventures
6.2) Financial income
6.3) Others
7 – TOTAL VALUE ADDED TO BE DISTRIBUTED (5+6)
8 – DISTRIBUTION OF VALUE ADDED (*)
8.1) Personnel
8.1.1) Direct compensation
8.1.2) Benefits
8.1.3) F.G.T.S. (Severance Indemnity Fund)
8.2) Taxes, fees and contributions
8.2.1) Federal
8.2.2) State
8.2.3) Municipal
8.3) Remuneration of third-party capital
8.3.1) Interest
8.3.2) Rentals
8.3.3) Others
8.4) Remuneration of equity capital
8.4.1) Interest on equity
8.4.2) Dividends
8.4.3) Retained earnings / Loss for the year
8.4.4) Non-controlling interests' share in retained earnings (for consolidation purposes only)

Source: *CPC-09 (2014).*

APPENDIX A *Calculation of VAS Indicators*

Companies	Year	GPRP	GRRT	PDVAE	PDVAG	PDVAA	PDVAIF
COSAN	2022	69%	31%	11%	20%	13%	55%
	2021	57%	43%	12%	11%	2%	29%
	2020	89%	11%	8%	59%	4%	20%
	2019	78%	22%	8%	48%	8%	14%
	2018	72%	28%	8%	46%	11%	19%
PETROBRAS	2022	97%	3%	6%	47%	39%	8%
	2021	95%	5%	8%	46%	27%	19%
	2020	91%	9%	12%	47%	3%	38%
	2019	97%	3%	12%	54%	15%	19%
	2018	86%	14%	11%	47%	8%	24%
PETRORIO	2022	79%	21%	2%	10%	59%	29%
	2021	-	-	6%	20%	74%	-
	2020	91%	9%	6%	16%	78%	-
	2019	72%	28%	5%	7%	85%	-
	2018	-	-	18%	16%	-	-
ULTRAPAR	2022	80%	20%	19%	26%	20%	28%
	2021	67%	33%	19%	32%	11%	12%
	2020	91%	9%	30%	46%	14%	10%
	2019	90%	10%	34%	45%	7%	14%
	2018	88%	12%	33%	35%	17%	15%
VIBRA	2022	95%	5%	3%	82%	5%	10%
	2021	93%	7%	2%	85%	8%	5%
	2020	94%	6%	-	83%	17%	5%
	2019	88%	12%	8%	79%	9%	4%
	2018	88%	12%	6%	79%	12%	4%
BRASKEM	2022	83%	17%	13%	46%	-	46%
	2021	94%	6%	7%	24%	40%	30%
	2020	89%	11%	22%	32%	-	-
	2019	83%	17%	24%	28%	-	89%
	2018	89%	11%	10%	30%	18%	42%

Source: *data from the companies' Financial Statements*

APPENDIX B *Overall ESG Score, Social, Environmental, and Governance*

Companies	Year	Overall ESG	Environmental ESG	Social ESG	Governance ESG
COSAN	2022	50%	10%	71%	75%
	2021	51%	12%	69%	78%
	2020	30%	12%	39%	42%
	2019	25%	15%	34%	25%
	2018	33%	18%	59%	13%
PETROBRAS	2022	76%	63%	90%	70%
	2021	77%	65%	85%	82%
	2020	75%	61%	84%	77%
	2019	74%	65%	84%	69%
	2018	74%	62%	87%	69%
PETRORIO	2022	26%	12%	24%	52%
	2021	19%	5%	16%	43%
	2020	20%	3%	17%	51%
	2019	20%	3%	17%	50%
	2018	23%	5%	18%	59%
ULTRAPAR	2022	66%	59%	67%	77%
	2021	66%	59%	71%	67%
	2020	66%	59%	71%	70%
	2019	65%	61%	66%	71%
	2018	58%	47%	59%	71%
VIBRA	2022	76%	59%	82%	89%
	2021	71%	55%	75%	85%
	2020	72%	52%	80%	88%
	2019	75%	65%	82%	80%
	2018	64%	67%	78%	36%
BRASKEM	2022	53%	49%	49%	66%
	2021	54%	51%	50%	67%
	2020	55%	50%	51%	69%
	2019	52%	50%	49%	61%
	2018	57%	53%	51%	73%

Source: *Extracted from Site Refinitiv Eikon (LSEG, 2024).*