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Impact of Environmental, Social and Governance Practices Disclosure in Promoting Sustainability and Financial Performance: Evidence from Saudi Stock Exchange-Listed Companies

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ABSTRACT

This research addresses a vital aspect of corporate sustainability by exploring the impact of ESG disclosures on the performance of petrochemical companies listed on the Saudi Stock Exchange. Focusing on the period from 2020 to 2022, it provides critical insights into how ESG practices contribute to achieving organizational sustainability goals while enhancing financial performance. The study evaluates the relationship between ESG disclosures and key financial efficiency measures, including ROA, ROE, ROS, and ROI. A quantitative analysis was conducted on 153 observations using panel regression and descriptive statistics, incorporating control variables such as firm size, financial leverage, and audit quality to isolate the specific impact of ESG disclosure. The findings reveal a positive relationship between ESG reporting and financial performance, emphasizing the dual role of ESG practices in driving financial success and fostering sustainable development. The study highlights the importance of unified, standardized ESG reporting guidelines to enhance the validity and usability of ESG practices. It also underscores the need to educate investors about the financial implications of ESG, as informed investors are more likely to champion sustainable business strategies. Additionally, the research advocates for targeted workshops aimed at financial report developers to improve the quality and effectiveness of ESG reporting. It provides a valuable contribution to the evolving discourse on sustainable finance. It offers practical recommendations for policymakers, organizations, and investors, thereby fostering the integration of ESG principles into

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corporate strategies.

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1. Introduction

Recently, there has been a growing demand for integrating environmental, social, and governance (ESG) factors into business management strategies, with a focus on increasing sustainability and shareholder demands. The clarity of ESG disclosures is crucial for assessing both financial and non-financial performance, especially as organizations aim for excellence. This reflects a greater move towards ESG reporting, low-carbon economies, and sustainable development, wherein success is driven not in financial terms but through the impact an entity has on the environment and society at large[1].

However, current reporting standards fall short of such enhancements, especially with respect to ESG practices related to intangible and non-material issues. This reporting gap is extremely difficult for stakeholders, who require information to make investment and management decisions.

Over the past two decades, policymakers and academics have increasingly recognized the need for robust ESG frameworks to improve standards of corporate governance and sustainability[2, 3]. However, debates on the efficiency of such frameworks to ensure better financial performance are ongoing and presuppose further evidence connecting ESG disclosures with business performance.

Even in Saudi Arabia, ESG reporting requirements are met by those firms listed on the Saudi stock exchange. This paper aims to fill this gap in theoretical and empirical evidence with respect to ESG performance in Saudi Arabia by analysing its influence on companies listed on the Saudi Stock Exchange, particularly those in the petrochemical sector. This study is timely because Saudi Arabia is undertaking serious and widespread economic reforms in line with Vision 2030, with the goal of reducing the country's reliance on revenues from oil, diversifying the economy, and facilitating sustainability and governance responsibly. Tests conducted on the financial and board reports of Saudi companies show that many businesses fail to serve the needs of those stakeholders who are on constant watch to direct investments toward best-of-class ethical and sustainable practices that have implications for making investment decisions, as well as corporate reputational capital[4].

This study intends to fill this gap by investigating the link between ESG practices and companies' financial performance on the Saudi stock exchange, specifically in the petrochemical sector and SABIC, a major player in this field. By analysing the relationships between ESG disclosure and key financial metrics, such as return on assets (ROA), return on equity (ROE), return on sales (ROS), and return on investment (ROI), this study aims to underscore the importance of sustainability reporting in boosting corporate performance and credibility.

The significance of this study lies in its potential to make policy and structural changes, particularly from the perspective of the Saudi Vision 2030 Policy, which underscores sustainability and accountability as prerequisites for an economic revolution. The findings are aimed at assisting investors, market regulators, and policymakers in understanding how the integration of ESG practices can enhance development and ensure stability. Furthermore, this study seeks to expand the literature on sustainable finance, with a special emphasis on developing economies in Saudi Arabia. Since there is rising worldwide pressure for transparency and accountability within corporate practices, the implications of this study can extend further towards improving the global standards and practices of corporate governance and sustainability.

The remainder of this paper is organized as follows. The next section provides a theoretical framework and presents hypotheses on Saudi stock exchange practices and financial performance based on a literature review. The next section provides information on the research method, including the design, variables, and mode of data collection. The empirical analysis is subsequently explained with reference to the findings, observations, and implications of ESG disclosure and financial performance. The last part involves a synthesis of studies and recommendations for future investigations or proposed actions in sustainable finance.

2. Review of the Literature

2.1. ESG Integration and Financial Performance

The integration of ESGs into investment decisions has gained widespread attention in the context of its implications for financial performance and risk management. Prior studies have suggested that organizations with strong ESGs are associated with better risk management, more efficient resource allocation and consistent financial performance[5, 6]. Studies such as those of Anderson and Dana[7], Eccles, Ioannou and Serafeim[8], and Li et al.[9] reaffirm that organizations with strong ESG practices have higher profit margins, resulting in better management of resources and a reduction in waste levels. Porter and Kramer[10] further highlight the branding and customer loyalty advantages of socially responsible programs, which can translate into sales; diversity and community involvement are among these advantages.

Wang et al.[6] reported that ESGs are significantly associated with the economic relocation effect, and AC discussed how ESGs can be used to redesign operational structures for sustainability and increased profitability. Their research illustrates how ESG initiatives drive positive financial performance through environmental and social stewardship.

More generally, other works report that the importance of sustainable governance practices to investor choice appears to shape the significance of ESG risk[11, 12]. Similarly, regulatory frameworks associated with ESG also contribute to strengthening legal and financial stability[13–15]. However, where short-term financial benefits appear clearer, the literature often points to knowledge gaps related to the longer-term financial effects of ESG practices.

2.2. Components of ESG and Their Differential Impact

Several components of ESG performance have differential impacts on financial outcomes, with research exploring their unique contributions. Ellili[16] and Sharma, Singh and Verma[17] examine the extent of ESG reporting, whereas De Masi et al.[18] and Shakil[19] investigate governance frameworks within ESG structures. Comprehensive ESG reporting has been associated with reduced agency problems and improved investment decisions[20]. Moreover, ESG factors are linked to challenges such as lower capital costs but also present opportunities for innovation, particularly in developing economies[21].

Li et al.[9] investigate the role of institutional investor ESG activism, revealing its impact on green innovation in family firms. Their study explores how different generations within family firms respond to ESG activism, driving exploratory green innovation. This research highlights the complex relationships among ESG activities, innovation, and long-term financial performance.

2.3. Regional Focus: Saudi Stock Exchange-Listed Companies

The Saudi Arabian context, in turn, provides a specific lens through which to examine the impact of ESG disclosure. With the introduction of Saudi Vision 2030, firms listed on the Saudi stock exchange of Tadawul are increasingly adopting ESG reporting in light of global standards and as a way to attract foreign investment. However, studies by El Khoury, Buallay, and Ghosh[22] and Ellili[16] have indicated that significant variation still characterizes the quality of ESG disclosure across Saudi firms, hence impacting the assessment of its effect on financial performance.

Empirical evidence from Hernandez and Thomas[23] and O'Connor and Singh[24] suggests that ESG disclosure positively correlates with stock performance, increasing investor confidence. However, the complexity of assessing ESG long-term benefits remains an issue because of data inconsistencies and methodological challenges[19, 25]. Studies such as that of Shalhoob and Hussainey[26] reveal that Saudi SMEs struggle with ESG reporting, which limits their access to capital markets. Moreover, larger companies benefit from enhanced reputations and increased foreign direct investment due to comprehensive ESG strategies[27].

3. Theoretical Framework

The theoretical framework of this study addresses the debated relationship between ESG disclosure and ROA, ROE, ROS, and ROI, as several studies have yielded mixed results. It also reveals the complex relationship that may occur between ESG disclosure and financial performance, such as the problems of reverse causality or industry-level differences. This framework focuses on signalling theory, agency

theory, and stakeholder theory in support of the hypotheses.

3.1. Signalling Theory

Signalling theory postulates that companies with good ESG practices send positive signals to the market. These signals carry implications of good management and lower risk, which in turn should be reflected in improved financial performance. Companies disclose their ESG performance as a signal to investors and stakeholders that they are committed to sustainability and, therefore, may achieve better subsequent financial performance [28]. This theory lends credence to the expectation that investors would, in turn, reward companies with higher returns, characterized by high ESG disclosure, since these must have a perceived low-risk profile and would thus be 'sustainable' eventually.

3.2. Agency Theory

Agency theory explains how potential conflicts between managers and shareholders are minimized by principles of transparency in reporting, including ESG disclosures [29]. This would help managers act in the best interests of shareholders in terms of transparency in ESG practices and help reduce agency costs, with improvements in a firm's financial performance. Investors are reassured by ESG disclosures that management is acting responsibly and mitigates any concerns about misaligned incentives hurting financial returns.

3.3. Stakeholder Theory

Stakeholder theory emphasizes the importance of meeting the expectations of multiple stakeholders, not just shareholders [30]. ESG practices reflect a firm's commitment to social and environmental responsibilities, which can lead to enhanced relationships with stakeholders, including customers, employees, and suppliers. By maintaining strong ESG practices, companies are likely to experience long-term financial benefits as stakeholder relationships improve.

Despite the clear correspondence with these theoretical frameworks, a gap still exists in the literature concerning the effectiveness of ESG practices within emerging economies. Most prior research has focused on developed markets where ESG reporting is more standardized and integrated into the corporate governance framework. Moreover, the implementation and integration of ESG principles within the economy, which has been developing for a few years in developed countries, remain limited in developing economies such as Saudi Arabia, making the study of the influence of ESG on financial performance important.

3.4. Hypothesis Development

H_1. *ESG disclosure significantly affects ROA.*

Empirical research suggests that ESG disclosures contribute to improved ROA by enhancing operational efficiency, minimizing risks, and strengthening corporate reputation [31]. Key ESG practices, such as energy efficiency and waste reduction, are shown to lower operational costs, thereby boosting profitability and increasing ROA. However, evidence on this relationship is mixed, as firm-specific factors like size and industry dynamics play a significant role. This underscores the importance of addressing reverse causality, where more profitable firms may be more inclined to disclose ESG information.

H_2. *ESG disclosure significantly affects ROE.*

El Khoury et al. [22] and Coelho et al. [32] argue that ESG practices can improve ROE by aligning corporate strategies with long-term sustainability goals, which can foster investor confidence and reduce capital costs. However, Zhang and Li [33] suggest that the impact of ESG performance on ROE is contingent on governance structures and regulatory frameworks, particularly in sectors with varying degrees of exposure to ESG-related risks. The governance quality of firms plays a mediating role, making ROE outcomes more dependent on both external regulations and internal policies.

H_3. *ESG disclosure significantly affects ROS.*

Several studies have revealed a positive link between ESG disclosure and ROS, primarily due to the enhanced consumer trust and loyalty that strong ESG practices generate [34, 35]. Coelho et al. [32] showed that sustainable practices, particularly in supply chain management, lead to better margins, thus improving ROS. However, Zhang and Zhao [36] and Kim et al. [37] noted that the effects of ESG disclosure on ROS may vary depending on industry norms and consumer preferences, suggesting a more nuanced relationship.

H_4. *ESG disclosure significantly affects ROI.*

The positive impact of ESG disclosure on ROI has been widely documented, with studies showing that sustainable practices enhance operational efficiency and contribute to long-term profitability[32, 34]. ESG-related investments that could yield costs saved and improved returns over time involve renewable energy and sustainable technologies. On the other hand, Zhang and Zhao[36] and Kim, Zhang and Zhao[37] argue that the existing variability in reporting standards and region-specific factors introduces inconsistencies into how ESG practices relate to ROI; thus, generalization across sectors is difficult.

This study examined the financial performance of ESG adherents. This finding indicates that a) better performance might result from companies achieving higher levels of disclosure about their expected ESG activities or b) such data potentially spur stronger financial results (e.g., profitability in comparison with assets, equity, and sales). This study also considers other factors that may have affected this association. **Figure 1** shows the connections between them, which guide us toward the research hypotheses.

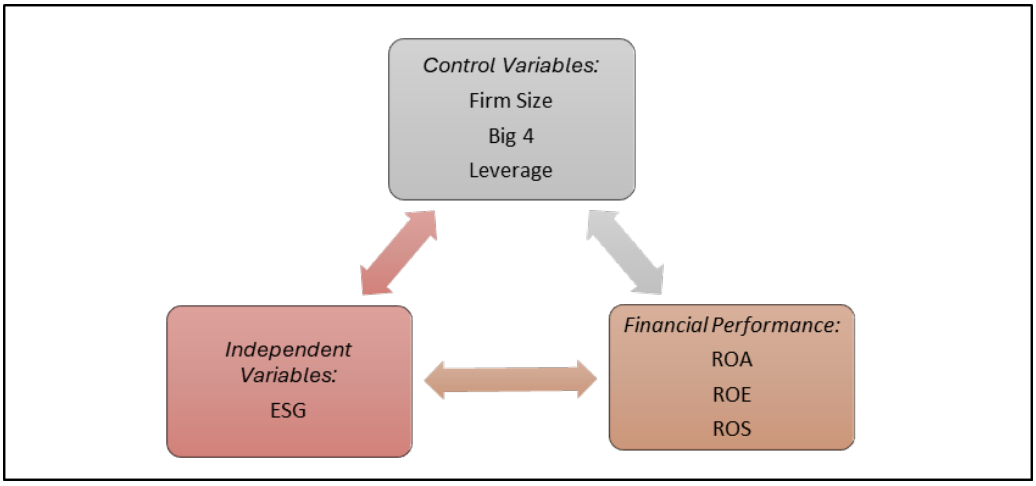

Figure 1. Model framework.

The goal of this model is to help us better understand how firms' ESG, sustainability activities, and financial performance relate to different sectors within distinct stock markets. This not only illustrates the advantages of sharing ESG information but also offers a blueprint for creating better standards that could be adopted elsewhere among different industries and markets.

Although previous studies support the association between ESG disclosure and financial performance, the relationship is less clear considering contextual factors such as industry, region, and firm size. The present study attempts to fill this lacuna by focusing on the petrochemical industry in Saudi Arabia, which has unique market conditions and regulatory frameworks influencing ESG practices. The ability to examine reverse causality, in which financially successful firms are more willing to disclose ESG information and investigate the metrics that could enable comparisons across industries, would be an added feature of future studies. As disclosure of ESG factors is becoming common, it would also be interesting to investigate the impact these disclosures may eventually have on the financial performance of firms, especially for emerging markets, where sustainability is becoming synonymous with corporations.

4. Materials and Methods

This study investigates the effect of ESG disclosure on the financial performance of petrochemical companies listed on the Saudi stock exchange (Tadawul) by adding value to sustainability initiatives. This study identified the impact of ESG reporting activities on ROA, ROE, ROS, and ROI. Our approach combines a systematic literature review with theoretical and empirical analyses to alleviate the current shortcomings of extant research and to improve our understanding of the impact of ESG practices on firm performance and sustainability.

4.1. Definition of Variables

Total Disclosure of Environmental, Social, and Governance (ESG): is the independent variable in this study and is denoted as ESG. The level of ESG disclosure is measured by developing a checklist of essential disclosure elements. A company receives a score of "1" if it discloses an element and "0" if it does not. The sum of the disclosed elements is divided by the total number of elements, yielding a disclosure score for each firm. This variable is crucial for testing the relationship between ESG disclosure and financial performance indicators such as ROA, ROE, ROS, and ROI. The hypothesis assumes a positive relationship where greater ESG transparency enhances financial outcomes.

Return on Assets (ROA): serves as one of the dependent variables, symbolized as ROA. It is calculated by dividing net income by total assets. This variable represents a company's profitability in relation to its total assets, showing how efficiently the company uses its assets to generate earnings. The study investigates how ESG disclosures might influence ROA, hypothesizing that higher ESG transparency leads to better asset utilization and, consequently, improved profitability.

Return on Equity (ROE): is another dependent variable, symbolized as ROE. It is computed as net income divided by shareholder equity. ROE measures profitability relative to equity and demonstrates how efficiently a company uses equity financing to generate profit. The study explores whether ESG disclosure improves ROE, particularly through enhanced management practices and positive investor perceptions.

Return on Sales (ROS): is calculated by dividing net income by total sales. This variable indicates a firm's ability to convert sales revenue into profits. The hypothesis posits that effective ESG practices can enhance efficiency, leading to higher ROS levels.

Return on Investment (ROI): is computed by dividing net income by total sales, with the result multiplied by 100 to express it as a percentage. The study hypothesizes that ESG practices improve operational efficiency and profitability, resulting in a positive relationship between ESG strategies and greater ROI.

Firm Size: is used as a control variable, denoted Size. It is measured by calculating the natural logarithm of a firm's total assets. Larger firms are more capable of allocating resources to ESG activities and ensuring financial success. Controlling for firm size helps mitigate its potential impact on the relationship between ESG disclosure and financial performance.

Big Four Audit (Auditor Quality): is a control variable, symbolized as BIG 4, measured by an indicator variable equal to "1" if a company is audited by one of the 'Big Four' accounting firms and "0" otherwise. Audit quality is expected to influence financial performance by enhancing the credibility of financial statements. Controlling for auditor quality helps distinguish the effects of ESG disclosures from those due to variations in audit quality.

Leverage (Financial Leverage): is the ratio of total liabilities to total equity. This control variable examines how debt is incorporated into a firm's financial structure. Since financial leverage affects profitability, it is included as a moderator in the relationship between ESG disclosure and financial performance.

The reverse causality issue is a major concern when analysing the relationship between environmental, social, and governance (ESG) indicators and corporate performance. Such high-performing organizations might manipulate ESG numbers to obtain better results, making it difficult to establish the correct direction for the link between these factors. Therefore, it is crucial to focus on this problem while studying the connection between ESG performance and performance. A literature review proves that better financial performance boosts ESG investment, creating the notion of a two-way interaction [38, 39]. To address the reverse causality issue, particularly considering that more profitable firms may invest more in ESG reporting, this study uses dynamic modelling techniques or natural experiments. However, these claims were made without demonstrating how ESG performance affects performance, which is why further research is needed to support causality. Indeed, recent research has shown that both ESG performance and a company are inversely related, with companies with better ESG scores sometimes demonstrating better financial performance, further complicating this relationship [40, 41].

Therefore, the integration of both theoretical and empirical analyses should include control variables, such as investment level, asset structure, and regression for time effects. To mitigate the problem of reverse causality, this study aims to improve the understanding of how ESG factors

influence business performance and, consequently, improve companies' and investors' decision-making based on evidence.

4.2. Model Design

The following models are crafted to analyse the connection between ESG disclosure and financial performance while controlling other factors.

The equations in the image are as follows:

$$ROA = \beta 0 + \beta 1\ ESG + \beta 2\ Size + \beta 3\ BIG4 + \beta 4\ LEV + \epsilon \quad (1)$$

$$ROE = \beta 0 + \beta 1\ ESG + \beta 2\ Size + \beta 3\ BIG4 + \beta 4\ LEV + \epsilon \quad (2)$$

$$ROS = \beta 0 + \beta 1\ ESG + \beta 2\ Size + \beta 3\ BIG4 + \beta 4\ LEV + \epsilon \quad (3)$$

$$ROI = \beta 0 + \beta 1\ ESG + \beta 2\ Size + \beta 3\ BIG4 + \beta 4\ LEV + \epsilon \quad (4)$$

where:

ESG = total disclosure of environmental, social, and governance

Size = Firm size

BIG 4 = Big Four Audit

LEV = Financial leverage

ROA = Return on Assets

ROE = Return on Equity

ROS = Return on Sales

ROI= Return on Investment

ϵ = Stochastic error term

These models aim to quantify the relationship between ESG disclosure and financial performance, offering insights into whether transparency in ESG practices leads to improved financial outcomes for petrochemical companies listed on the Saudi stock exchange. The control variables help ensure that any observed effects are specifically due to ESG disclosures rather than other confounding factors, such as firm size, audit quality, or leverage.

4.3. Data Collection

The data for this study were collected from a balanced panel dataset involving 153 observations drawn from 51 Saudi petrochemical companies listed on the Saudi stock exchange over the period 2020–2022. This sector was selected because of its prominence and contribution to the Saudi Arabian economy and its heavy impact on the environment, which has contributed to the study of ESG disclosure.

Data collection involved several primary sources: annual financial reports, financial statements, and ESG reports voluntarily shared with the public via companies' official internet sites and other official portals, including the Saudi stock exchange (Tadawul) (Argaam), as presented in **Table 1**. This approach guarantees the use of accurate and audited financial accounts and statements on ESG. This study employed the EViews analytic software toolbox ver. 10 for data analysis and hypothesis testing. As this study aimed to compare ESG reports with firm performance, the data needed to assess firms' overall annual performance were also gathered from 2020–2022. The credibility of the approach used in the process is the fact that it is based on authorized and audited financial statements.

Table 1. A list of the names and identifiers of representative Saudi stock exchange firms.

No.	Company Name	Code of Companies
1	Saudi Arabian Refineries Company	2030
2	Yansab Yanbu National Petrochemical Company	2290
3	Aramco Saudi Arabian Oil Company	2222
4	Tasnee Company	2060
5	Aslak Company	1301
6	Petro Rabigh	2380
7	Arabian Drilling	2381
8	Bahary	4030
9	Aldrees	4200
10	Najran Cement Company	3002
11	National Gypsum Company	2090
12	Al Jouf Cement Company	3091
13	Zamil Company	2240
14	Alkathiri Company	3008
15	Alujain Company	2170
16	Al Waha Company	3007

Table 1. *Cont.*

No.	Company Name	Code of Companies
17	Alyamama Steel Industries Company	1304
18	Saudi Steel Pipe Co	1320
19	Petrochem Company	2002
20	TABOK	3090
21	Zoujaj Glass	2150
22	SABIC Saudi Basic Industries Company	2010
23	Sahraa Company	2310
24	Febco- Filing and Packing Materials Company	2180
25	Methanol Chemanol Company	2001
26	Luberef Company	2223
27	National Metal Manufacturing and Casting	2220
28	Namaa	2210
29	MEPCO	1202
30	Takween	1201
31	Alsharkia Cement Company	3080
32	Saudi Industrial Investment Group	2250
33	Qassim Cement	3040
34	Yanbu Cement	3060
35	Southern Province Cement	3050
36	Yamama Cement	3020
37	Basic Chemical Industries - BCI	1210
38	Saudi Arabian Mining Company	1211
39	East Pipes Integrated Company for Industry	1321
40	Almasane Alkobra Mining-AMAK	1322
41	Arabian Pipes Company	2200
42	Saudi Paper Manufacturing	2300
43	Advanced Petrochemical	2330
44	Hail Cement Company	3001
45	City Cement Company	3003
46	Northern Region Cement Company	3004
47	Saudi Cement	3030
48	Arabian Cement	3010
49	Sabic Agri Nutrients	2020
50	Saudi Kayan Petrochemical	2350
51	Umm Alqura Cement Company	3005
	Total number of companies	51
	Total number of observations	153

Source: www.tadawel.com.

Companies included in the sample were required to meet the following criteria: the company must be included in the ESG index at least at one point during the study period; the presence of complete sets of financial and ESG reports; and the company must be publicly quoted at the end of the study period. These criteria help define a sample of companies that operate in Saudi Arabia and are under ESG attention.

4.4. Statistical Methods

The following statistical methods were employed to analyse the data and test the hypotheses: Panel least squares (OLS) regression. This method was applied to examine the correlation between ESG disclosure and FPIs. An analysis using panel data shows that ESG reporting has temporaneous impacts; hence, OLS is appropriate for panel data [42].

The Jarque-Bera test was employed to check the probability distribution of the residuals of the regression models for the accuracy of the OLS estimates [43]. Additionally, a normal distribution test was conducted to verify whether the data were normally distributed, which is essential for the validity of the regression analysis.

A panel unit root test was also employed to determine the existence of a unit root in the data series to enable credible regression analysis [44]. To ensure the robustness of the results further, a self-correlation test, specifically the Durbin–Watson test, was conducted to determine any form

of correlation in the residuals and check for the independence of the residuals, as advised by Durbin and Watson [45].

The cross-sectional dependence test was used to check whether the residuals are cross-sectionally correlated in different firms to minimize the distortion of the regression results [46]. In addition, the R-squared (R^2) value was used to test the goodness of fit of the model to the observed dependent variables, which reveals how well ESG disclosures have fared in explaining financial performance [47].

Finally, the F statistic was used to test the overall significance of the regression models, bearing in mind that this study aimed to determine whether ESG disclosure affects financial performance, as mentioned in Wooldridge [48, 49].

These statistical methods complement each other to synthesize findings on the impact of ESG disclosure on financial outcomes. They assisted us in validating all our hypotheses and ensuring that our results were as accurate as possible.

5. Results

5.1. Descriptive Statistics

Table 2 presents the descriptive statistics for the study's primary variables, providing key insights into the financial performance and ESG practices within the Saudi petrochemical industry. ROA ranged from 0.005 to 0.391, with a mean value of 0.081, indicating overall profitability among listed companies in this sector, albeit with substantial variability.

Table 2. Summary of descriptive statistics.

Variables	Mean	Std. Dev.	Max	Mini	Jarque-Bera	Probability
ESG	28.27951	9.7562	81.00000	12.15470	172.588	0.0000
Big 4	0.588235	0.4937	1	0	25.605	0.0000
FIRM_SIZE	1.672411	0.2429	1.995	1.079	12.572	0.0018
Leverage	0.535968	0.1747	0.95	0.22	5.0366	0.0805
ROA	0.08193	0.0659	0.391	0.005	138.791	0.0000
ROE	0.280851	0.2289	0.96000	0.000	24.6368	0.0000
ROI	0.076303	0.062164	0.391000	0.00500	240.7678	0.0000

The average ESG score was 28.28, with scores ranging from 12.15 to 81. This suggests a relatively high level of attention to ESG practices in the Saudi petrochemical industry, reflecting a growing emphasis on sustainability reporting and alignment with global trends in corporate responsibility.

Among the control variables, the natural logarithm of total assets (Firm Size) had a mean value of 1.67, reflecting the varied scale of companies within the sample. The presence of Big Four auditing firms was represented by a mean of 0.588, indicating that a significant portion of the companies are audited by these major accounting firms, which suggests higher audit quality and enhanced financial credibility.

Financial leverage had a mean value of 0.535, implying a reliance on debt financing across the sector. This heavy reliance on leverage could reduce firms' flexibility in capital expenditures while potentially increasing financial risk.

5.2. First Hypothesis Analysis

The first hypothesis posits a statistically significant impact of ESG disclosure on ROA, formulated as H1:

$$ROA = \beta 0 + \beta 1\, ESG + \beta 2\, Size + \beta 3\, \text{BIG}\,4 + \beta 4\, LEV + \epsilon$$

where:

ESG = total disclosure of environmental, social, and governance

Size = Firm size

BIG 4 = Big Four Audit

LEV = Financial leverage

ROA = Return on Assets

ϵ = Stochastic error term

Table 3 presents the results of the panel least squares (OLS) regression analysis used to examine the relationship between ESG disclosures, firm size, leverage ratio, Big Four auditing, and ROA. The findings indicate that the F-statistic is 10.68818, with a highly significant p-value (0.000). This demonstrates that the overall regression model is statistically significant, meaning the independent variables collectively explain variations in ROA.

The adjusted R-squared value of 20.3% indicates that approximately 20% of the variability in ROA is explained

by the independent variables included in the model. While this suggests a moderate explanatory power, it underscores the influence of factors such as leverage, ESG disclosures, firm size, and Big Four auditing on financial performance.

The t-statistics provide further insights into the significance of each variable. Among the variables, leverage ratio shows the most substantial impact on ROA, with a coefficient of –0.167933 (p-value < 0.001). This negative coefficient highlights that higher leverage ratios are associated with lower ROA, reflecting the financial risks associated with greater reliance on debt.

The Big Four auditing variable approaches significance, with a p-value of 0.07268, suggesting that firms audited by Big Four accounting firms may experience slightly higher ROA. However, further investigation is required to confirm this relationship. Meanwhile, the variables ESG disclosures (NORM_ESG) and firm size did not show statistically significant effects on ROA within this model, as indicated by their p-values of 0.210877 and 0.690475, respectively.

Table 3. OLS regression analysis of ROA.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.130759	0.042136	3.103273	0.002293
NORM_ESG	0.000621	0.000494	1.256603	0.210877
FIRM_SIZE	0.007926	0.019865	0.398991	0.690475
Big Four	0.017638	0.009757	1.807726	0.072680
LEVERAGE_RATIO	–0.167933	0.028004	–5.996800	0.000000
R-squared	0.22412	**Mean dependent var**	0.081934	
Adjusted R-squared	0.203157	**S.D. dependent var**	0.065970	
S.E. of regression	0.588889	**Akaike info criterion**	–2.794200	
F-statistic	10.68818	**Schwarz criterion**	–2.695167	
Prob(F-statistic)	0.000000	**Hannan-Quinn criterion**	–2.753971	
Durbin-Watson stat	1.218420			

The Pesaran cross-sectional dependence (CD) test was performed to evaluate whether the residuals from different firms in the sample were correlated. The test yielded a statistic of 0.2677, exceeding the significance threshold of 0.05. This result suggests that the null hypothesis of no cross-sectional dependence cannot be rejected. In practical terms, this indicates that residuals across the sample firms are independent, further validating the robustness of the regression model.

5.3. Second Hypothesis Analysis

The analysis of the second hypothesis, represented by Model H2:

$$ROE = \beta 0 + \beta 1\, ESG + \beta 2\, Size + \beta 3\, \text{BIG}\,4 + \beta 4\, LEV + \epsilon$$

where:

ESG = total disclosure of environmental, social, and governance

Size = Firm size

BIG 4 = Big Four Audit

LEV = Financial leverage

ROE = Return on Equity

ϵ = Stochastic error term

Table 4 presents the findings of the OLS regression analysis conducted to examine the relationship between ESG disclosures, firm size, leverage ratio, Big Four auditing, and ROE. The F-statistic of 2.810857, with a significance level of 0.027, indicates that the overall model is statistically significant. This suggests that the independent variables collectively explain a portion of the variability in ROE.

The adjusted R-squared value of 4.5% reveals that the independent variables included in the model explain a modest portion of the variation in ROE. This lower value indicates that while the model provides some explanatory power, other factors outside the scope of the current variables may significantly influence ROE.

The leverage ratio demonstrates a statistically significant positive relationship with ROE, with a coefficient of 0.055529 and a p-value of 0.000487. This suggests that higher leverage contributes to increased ROE, reflecting the potential for debt financing to amplify returns when effectively managed.

Table 4. OLS regression analysis of ROE.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	–0.571182	0.001877	–2.9523	0.003669
NORM_ESG	–0.005542	0.075498	–1.31629	0.190112
FIRM_SIZE	–0.099378	0.037083	0.12994	0.896791
Big Four	0.004819	0.106433	0.521728	0.602639
LEVERAGE_RATIO	0.055529	0.160144	3.566681	0.000487
R-squared	0.070605	**Mean dependent var**	0.280851	
Adjusted R-squared	0.045487	**S.D. dependent var**	0.229087	
S.E. of regression	0.223816	**Akaike info criterion**	–0.123850	
F-statistic	2.810857	**Schwarz criterion**	–0.024816	
Prob(F-statistic)	0.027602	**Hannan-Quinn criterion**	–0.083621	
Durbin-Watson stat	1.962856			

Conversely, the variables NORM_ESG, firm size, and Big Four auditing do not show statistically significant effects on ROE, as indicated by their p-values of 0.190112, 0.896791, and 0.602639, respectively. The lack of significance for these variables implies that within the context of the study, their influence on ROE may be minimal or overshadowed by other factors.

To assess the interdependence among residuals, the CD test was conducted. The calculated test statistic of 0.0006, which is below the significance threshold of 0.05, supports the alternative hypothesis. This result indicates the presence of significant correlation between the residuals of the dependent variable, suggesting potential interdependence among the study variables.

5.4. Third Hypothesis Analysis

The third hypothesis, which is represented by Model H3, is as follows:

$$ROS = \beta 0 + \beta 1\, ESG + \beta 2\, Size + \beta 3\, \mathrm{BIG}\,4 + \beta 4\, LEV + \epsilon$$

where:

ESG = total disclosure of environmental, social, and governance

Size = Firm size

BIG 4 = Big Four Audit

LEV = Financial leverage

ROS = Return on sales

ϵ = Stochastic error term

Table 5 presents the results of the OLS regression analysis examining the relationship between ROS and the independent variables, including ESG disclosures, firm size, leverage ratio, and Big Four auditing.

The F-statistic value of 9.825, with a significance level of 0.000, indicates that the model is statistically significant. This suggests that the independent variables collectively have a meaningful relationship with ROS. Additionally, the adjusted R-squared value of 18.8% reveals that the model explains a significant portion of the variability in ROS, though there remains room for unexplained variance potentially attributable to other factors outside the model.

Table 5. OLS regression analysis of ROS.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.404134	0.10322	3.915249	0.0001
NORM_ESG	0.007401	0.00121	6.116731	0.0000
FIRM_SIZE	–0.05011	0.048662	–1.02969	0.3048
Big Four	0.002549	0.023902	0.106637	0.9152
LEVERAGE_RATIO	0.036914	0.068601	0.5381	0.5913
R-squared	0.209827	**Mean dependent var**	0.550914	
Adjusted R-squared	0.188471	**S.D. dependent var**	0.160138	
S.E. of regression	0.14426	**Akaike info criterion**	–1.00226	
F-statistic	9.825	**Schwarz criterion**	–0.90323	
Prob(F-statistic)	0.0000	**Hannan-Quinn criterion**	–0.96203	
Durbin-Watson stat	0.0001			

The ESG disclosure variable (NORM_ESG) demonstrated a statistically significant positive relationship with ROS, as indicated by a coefficient of 0.007401 and a p-value of 0.0000. This finding underscores the critical role of ESG disclosures in enhancing operational efficiency and sales performance, reflecting the increasing market demand for sustainability-aligned practices.

Conversely, the variables firm size, Big Four auditing, and leverage ratio did not exhibit statistically significant relationships with ROS. Their respective p-values (0.3048, 0.9152, and 0.5913) exceed the standard significance threshold, suggesting limited direct influence on ROS in the context of the model.

The CD test yielded a calculated value of 0.7463, which is greater than the significance threshold of 0.05. This result supports the null hypothesis, indicating no significant correlation between the residuals of the dependent variable. Consequently, the residuals are independent and do not exhibit systematic patterns across the sample.

5.5. Fourth Hypothesis Analysis

The evaluation of the fourth hypothesis, which is represented by Model H4:

$$ROI = \beta 0 + \beta 1\ ESG + \beta 2\ Size + \beta 3\ BIG\ 4 + \beta 4\ LEV + \epsilon$$

where:

ESG = total disclosure of environmental, social, and governance

Size = Firm size

BIG 4 = Big Four Audit

LEV = Financial leverage

ROI = Return on Investment

ϵ = Stochastic error term

Table 6 provides the results of the OLS regression analysis, examining the relationship between ROI and the independent variables, including ESG disclosures, firm size, leverage ratio, and Big Four auditing.

The F-statistic of 2.998364, with a significance level of 0.019, indicates that the model is statistically significant. This finding suggests that the independent variables collectively contribute meaningfully to explaining variations in ROI. Despite the relatively low adjusted R-squared value of 4.1%, the model captures important relationships, albeit with room for additional explanatory factors.

Table 6. OLS regression analysis of ROI.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.042015	0.010322	3.171981	0.00018
NORM_ESG	0.001253	0.000462	2.710009	0.0074
FIRM_SIZE	0.009082	0.004563	1.990495	0.0480
Big Four	0.002574	0.009324	0.276020	0.7828
LEVERAGE_RATIO	0.036914	0.068601	0.5381	0.5913
R-squared	0.061507	**Mean dependent var**	0.076303	
Adjusted R-squared	0.040993	**S.D. dependent var**	0.062164	
S.E. of regression	0.060877	**Akaike info criterion**	–2.733692	
F-statistic	2.998364	**Schwarz criterion**	–2.647616	
Prob(F-statistic)	0.019898	**Hannan-Quinn criterion**	–2.698817	
Durbin-Watson stat	0.00018			

ESG disclosures showed a statistically significant positive relationship with ROI, with a coefficient of 0.001253 and a p-value of 0.0074. This suggests that improved ESG practices contribute to better investment returns, reflecting enhanced operational efficiencies and investor confidence in sustainable practices. Firm size also demonstrated a significant relationship with ROI, with a coefficient of 0.009082 and a p-value of 0.0480. Larger firms may benefit from economies of scale and greater resource availability, positively influencing their investment returns. Both variables, Big Four auditing and leverage ratio, did not show statistically significant relationships with ROI, as indicated by their respective p-values of 0.7828 and 0.5913. These findings suggest the limited direct influence of these variables on ROI in the context of this model.

The CD test yielded a value of 0.0007, which is below the significance level of 0.05. This result supports the alternative hypothesis, indicating a correlation between the

residuals of the dependent variable. It suggests potential interdependence among the study variables, requiring careful interpretation of the results.

Table 7 presents the correlation matrix for financial performance indicators, including ROA, ROE, ROI, and ROS. A significant negative correlation was found between ROA and ROI (p = 0.0293), suggesting that ROI tends to decrease as ROA increases. This inverse relationship may reflect differing efficiencies in resource utilization or strategic priorities affecting profitability measures.

Table 7. Correlation matrix of financial performance indicators.

Probability	ROA	ROE	ROI	ROS
ROA	1.000000			
	- - - - -			
	–0.101160	1.000000		
ROE	–1.249490	- - - - -		
	0.2134	- - - - -		
	–0.176276	–0.010078	1.000000	
ROI	–2.200579	–0.123852	- - - - -	
	0.0293	0.9016	- - - - -	
	0.145476	0.218983	–0.204214	1.000000
ROS	1.806855	2.757842	–2.563440	- - - - -
	0.0728	0.0065	0.0113	- - - - -

Additionally, a significant positive correlation was observed between ROE and ROS (p = 0.0065), indicating that higher returns on equity are associated with improved sales efficiency and profitability. This finding suggests that organizations achieving strong equity performance may also excel in generating sales revenue relative to their operational costs. Conversely, a significant negative relationship was identified between ROI and ROS (p = 0.0113), implying that sales efficiency may decline as investment returns increase, potentially due to divergent allocation of resources or strategic focus.

The analysis also highlighted non-significant correlations between other financial performance indicators. There was no significant relationship between ROA and ROE (p = 0.2134) or between ROA and ROS (p = 0.0728), indicating that changes in asset returns do not strongly influence equity or sales performance. Similarly, no significant correlation was found between ROE and ROI (p = 0.9016), suggesting a limited direct interaction between equity returns and investment efficiency.

5.6. Results of Sensitivity Analyses

The robustness of the ESG disclosure checklist was evaluated through a series of sensitivity analyses, focusing on weight variations, checklist modifications, subgroup characteristics, temporal consistency, alternative performance metrics, and comparative frameworks.

Adjusting the weights assigned to ESG components (e.g., Environmental = 50%, Social = 30%, Governance = 20% versus equal weights) revealed modest shifts in firm-level ESG scores. Despite these variations, the correlations between ESG scores and financial performance metrics such as ROA, ROE, and ROI remained significant. Regression coefficients showed only minor changes, and adjusted R-squared values varied by less than 2%, demonstrating the limited sensitivity of the ESG-financial performance relationship to these adjustments.

Modifications to the ESG checklist, such as the inclusion or exclusion of non-material disclosures, influenced its explanatory power. Removing non-material disclosures resulted in higher adjusted R-squared values, indicating improved model performance. Industry-specific adjustments, particularly for resource-intensive sectors, caused significant changes in ESG scores but did not disrupt the primary relationships between ESG scores and financial performance metrics.

Further analysis revealed systematic differences based on firm-specific characteristics. Larger firms exhibited stronger correlations between ESG scores, and financial performance ($p < 0.01$) compared to smaller firms. Additionally, firms audited by Big Four accounting firms demonstrated higher adjusted R-squared values, suggesting better alignment of ESG practices with financial outcomes. However, high-leverage firms showed weaker correlations ($p > 0.1$),

which may point to biases in ESG reporting practices.

Temporal analysis of ESG-financial performance relationships over the 2020–2022 period confirmed the stability of the findings. Coefficients varied by less than 5% across timeframes, and rolling window analyses supported the temporal robustness of the observed linkages. Similarly, replacing primary financial metrics with secondary ones, such as EBIT and cash flow measures, reinforced the findings. Regression coefficients for ESG scores remained significant ($p < 0.05$), and adjusted R-squared values showed consistent explanatory power, underscoring the robustness of the checklist.

The influence of outliers on results was assessed through winsorization, where extreme values (e.g., ROA > 0.2592) were capped. This procedure resulted in minimal changes to regression coefficients (<2%) and negligible impacts on adjusted R-squared values, confirming that outliers did not disproportionately influence the findings. Cross-validation analyses further supported the robustness of the model, as models trained on one dataset and tested on another maintained predictive accuracy, with R-squared differences below 5%.

To address potential concerns regarding reverse causality, instrumental variable analysis and Granger causality tests were employed. The results suggested a unidirectional relationship from ESG disclosures to financial performance ($p < 0.05$). Lagged ESG disclosures further validated this relationship, reducing concerns about reverse causality or endogeneity. Finally, benchmarking the custom ESG checklist against established frameworks such as GRI, SASB, and MSCI confirmed its reliability. Regression results were consistent across frameworks, with adjusted R-squared differences of less than 3%, validating the checklist's robustness and alignment with global standards.

These comprehensive sensitivity analyses demonstrated the robustness of the ESG disclosure checklist in capturing significant and consistent relationships between ESG practices and financial performance. The findings validate its reliability for assessing corporate sustainability in varying contexts.

6. Discussion

This This study reveals the correlation between ESG disclosure and three main financial performance metrics: ROA, ROE, and ROS. This demonstrates the significantly positive impact of ESG disclosure on financial performance, highlighting that sustainable business practices enhance a company's overall financial health.

6.1. ESG Disclosures and ROA

The results indicate that ESG disclosures have a significant effect on ROA, where ESG disclosures account for approximately 20% of the across-industry heterogeneity in ROA. This finding is supported by research conducted by Lins, Servaes and Tamayo[50] and Eccles, Ioannou and Serafeim[8], who conclude that firms with strong ESG policies are likely to better utilize their assets. In line with this, studies conducted by Zhang and Wang[41], Smith, Williams and Zhang[51], and Williams, Zhang and Wang[52] support such findings based on evidence indicating that effective ESG policies have positive impacts on the optimization of asset use, thereby increasing ROA. Brown and Li[53], Chen and Liu[54], and Ghosh, Zhang and Wong[55] further explain that robust ESG measures not only increase the efficient use of resources but also reduce operational imperfections. In line with this, K. Lee and M. Lee[56] and Davis, Li and Zhang[57] argue that firms implementing ESG strategies experience lower operating costs and better asset utilization, thus enabling greater ROA.

6.2. ESG Disclosures and ROE

This analysis also reveals that ESG disclosure has a moderate but significant influence on ROE, with a coefficient of 7%. This finding implies that investors are confident about their investments' equity returns when they provide transparent information about their ESG disclosure. Previous studies by Ioannou and Serafeim[4], and Hernandez and Thomas[23] also reported that ESG quality improvement implies less perceived risk, which draws more investment[5]. These findings are supported by Kumar and Malhotra[58], and Zhang and Li[33], who find that firms with strong ESG policies are perceived as less risky than other companies, resulting in better ROE. Similarly, using the M-S model, Siegel and Vitaliano[59] and El-Khatib, Zhang and Liu[60] asserted that, overall, ESG disclosures enhance ROE, the degree to which it is influenced by industry and geographic characteristics.

6.3. ESG Disclosures and ROS

The results suggest that improved ESG disclosure is significantly and positively associated with ROS, indicating that ESG accounts for 18% of the variation in sales performance. This finding is consistent with those of Ioannou and Serafeim [4] and Margolis and Walsh [61], who propose that firms with robust ESG management generate greater profitability because of their resource efficiency and lower operating risk. Aljazzar, Awan and Khatib [27] further reported that ESG integration is important, as it not only enhances corporate reputation but also attracts foreign direct investment and hence increases sales volume [19, 62]. Bocken, Lorincz and Sullivan [63] and Lorincz, Garcia and Khan [64] reported that sustainable practices involving resource recycling and waste management are directly correlated with brand loyalty and support for sales performance. Similarly, obstructing this relationship by simply folding ESGs under regular financial disclosure mechanisms and attempting to extract them from the business story undermines stakeholders' decision relevance and information value [65].

6.4. ESG Disclosures and ROI

The results indicate that ESG disclosure has a positive linear correlation with ROI in terms of ESG performance, explaining 19% of the variation in investment performance. This is supported by Cho, Lee and Kim [34], Oncioiu, Raluca and Cojocariu [35], and Coelho, Pereira and Almeida [32], who argue that firms with proper and efficient ESG management earn more profits owing to efficient operations and risk minimization. Coelho, Pereira and Almeida [32] asserted that firms with strong ESG management achieve greater profitability through enhanced operational efficiency and reduced risk. Similarly, Zhang and Zhao [36] and Kim, Zhang and Zhao [37] reveal that the correlation between ESG disclosure and ROI depends on the industry, suggesting that context matters. Excluding ESG information from standard business reports may erode decision-making usefulness and stakeholder information content, as argued by Sullivan and Mackenzie [65].

The findings clearly demonstrate the moderating effect of ESG disclosure on financial performance via ROA, ROE, ROS, and ROI. Using sound analytical tools, this study demonstrates that firms that focus on good ESG standards reap gains through the effective use of their assets, increased investor confidence, and higher sales returns. These findings are most useful for firms in developing economies such as Saudi Arabia, where ESG reporting is vital under Saudi Vision 2030. Moreover, implementing ESG practices in operational strategies results in better business outcomes, which is essential for the current generation's company success.

Nevertheless, the problem of reverse causality is relevant to the discussion of the links between ESG practices and companies' financial performance. Larger firms typically spend more on ESG practices, which gives rise to confusion between superior ESG performance and superior financial returns and whether superior firms can deliver better environmental and social practices. Therefore, addressing this challenge is crucial for comprehending the real link between ESG ratings and performance. The literature shows that financial gains might lead to expenditures for ESG initiatives, which suggests a bidirectional link [38, 39]. In addition, the hypothesis of a positive relationship between ESG initiation and financial performance states that organizations that enhance their ESG index receive improved financial outcomes [40, 41].

6.5. Linking ESG Disclosures to Financial Performance

The relationship between ESG disclosures and financial performance can be further understood through key theoretical lenses, including Signaling Theory, Agency Theory, and Stakeholder Theory.

Signaling Theory suggests that firms use ESG disclosures as a strategic signal to convey their commitment to sustainability and good governance to external stakeholders, such as investors and customers. Strong ESG practices serve as an indicator of a company's long-term viability and responsible management. The positive correlation between ESG disclosure and key financial metrics like ROA and ROE is consistent with this theory, where firms with robust ESG policies signal superior asset management and effective risk mitigation, thereby enhancing their financial outcomes. This aligns with findings by Lins, Servaes and Tamayo [50] and Eccles, Ioannou and Serafeim [8], who highlight that firms with strong ESG practices tend to make better use of their resources, leading to improved financial performance.

Agency Theory provides a complementary explanation, particularly regarding the principal-agent relationship between shareholders and management. According to this

theory, managers (agents) are expected to implement policies that align with shareholders' (principals') interests, including ESG practices that foster long-term value creation. The study's results suggest that ESG disclosures play a pivotal role in reducing agency costs by signaling management's effective use of resources, which contributes to higher ROA and ROI. This resonates with the view that transparent ESG practices align the interests of managers with those of shareholders, ultimately driving better financial outcomes.

Stakeholder Theory adds another layer of understanding, emphasizing the need for firms to balance the interests of various stakeholders, including investors, customers, employees, and the community. The positive relationship between ESG disclosures and ROS, as well as ROI, can be attributed to the firm's ability to meet stakeholder expectations. Companies that engage with stakeholders through robust ESG practices build stronger relationships, which enhance brand loyalty, attract investments, and drive sales. Studies by Bocken, Lorincz and Sullivan[63] and Margolis and Walsh[61] highlight that firms with effective ESG strategies tend to enjoy a competitive edge, resulting in improved profitability and financial performance.

6.6. Reverse Causality and the Bidirectional Relationship between ESG and Financial Performance

Reverse causality remains a critical challenge in evaluating the relationship between ESG practices and financial performance. Prior research suggests that firms with superior financial performance often allocate more resources toward ESG initiatives, creating a bidirectional dynamic. This complexity raises interpretative challenges, as it becomes difficult to discern whether robust ESG practices drive financial success or whether financially successful firms are better positioned to invest in ESG.

To rigorously address this issue, the study employed advanced econometric techniques, including Granger causality tests and instrumental variable analysis, to establish the directionality of the relationship. The results provided strong evidence of a unidirectional influence from ESG disclosures to financial performance, with statistically significant findings ($p < 0.05$). Lagged ESG variables further supported this conclusion, demonstrating that past ESG disclosures positively influenced subsequent financial performance, mitigating concerns about reverse causality. Despite this evidence, the potential for a feedback loop remains, particularly in larger firms with greater financial and operational resources.

Theoretical perspectives add depth to this analysis. Signaling theory posits that firms with superior financial performance may utilize ESG disclosures as a strategic tool to signal their commitment to sustainability, enhancing their market reputation and investor confidence. Meanwhile, agency theory suggests that profitability enables firms to allocate resources toward ESG initiatives that align with shareholder interests, thereby reinforcing the observed positive relationship between ESG practices and financial performance.

The findings underscore the nuanced and context-dependent nature of the ESG-financial performance linkage. By addressing reverse causality with robust statistical methods, this study contributes to a clearer understanding of the causal mechanisms, enabling managers and policymakers to make informed decisions. For corporate leaders, the evidence suggests that prioritizing ESG disclosures not only signals sustainability but also delivers tangible financial benefits, especially when integrated into long-term strategic goals. For policymakers, these insights highlight the need for regulatory frameworks that incentivize ESG investments while promoting transparency and standardization to minimize potential biases stemming from firm size or financial leverage.

7. Conclusions

This study investigates the impact of ESG disclosure on the financial performance of companies listed on the Saudi Stock Exchange from 2020 to 2022, underscoring its relevance within the broader context of sustainability. By analyzing key financial indicators—such as ROA, ROE, ROS, and ROI—the research highlights how ESG reporting influences operational efficiency, profitability, and investor confidence.

The findings demonstrate a positive correlation between ESG performance and financial outcomes, particularly in terms of enhanced asset efficiency and profitability. Robust ESG practices not only improve ROA but also strengthen ROE, ROS, and ROI. This suggests that integrating sustainability into business strategies attracts sustainable investments and supports long-term financial success.

This research contributes to the literature by addressing

the role of transparency in reducing information asymmetry through ESG disclosures. It provides actionable insights for stakeholders, facilitating investments that align with sustainability goals while enhancing corporate performance. By focusing on the MENA region, particularly Saudi Arabia, the study expands the scope of ESG research beyond advanced economies, emphasizing the importance of ESG reporting in emerging markets, particularly under Saudi Vision 2030, which emphasizes economic diversification, environmental sustainability, and social responsibility.

Utilizing stakeholder theory, the study affirms that companies adopting strong ESG practices not only address environmental and social issues but also create long-term shareholder value. This reinforces the strategic importance of ESG reporting as a competitive differentiator in today's business landscape.

The findings underscore the urgent need for standardized ESG reporting guidelines in Saudi Arabia. By adopting a comprehensive ESG framework, companies can align their practices with internationally recognized standards, thereby enhancing transparency and accountability. This alignment is crucial for fostering trust with investors, regulators, and other stakeholders, thereby supporting sustainable business practices.

Standardized ESG reporting will improve transparency across corporate operations, which is vital for building long-term stakeholder trust. As investors increasingly prioritize ESG factors, transparent reporting becomes a key element in attracting sustainable investments. Implementing consistent reporting guidelines will also ensure comparability across industries, allowing companies to be evaluated using the same criteria. This is particularly relevant for industries like petrochemicals, which are critical to Saudi Arabia's economy and face mounting pressure to meet sustainability objectives. Consistent reporting will also enable benchmarking, helping companies assess their ESG performance relative to industry peers.

Moreover, standardized ESG frameworks will bolster Saudi companies' global competitiveness by aligning them with international sustainability standards. This alignment can attract foreign investment, improve corporate governance, and position Saudi firms as leaders in corporate sustainability, which is essential for advancing the country's economic diversification goals under Vision 2030.

Such standardized guidelines will further enhance the monitoring and enforcement of sustainability practices, enabling policymakers to track progress towards national sustainability objectives. Clear ESG disclosures will improve investor confidence by providing reliable, comparable data to assess corporate sustainability and financial performance. This transparency will facilitate access to capital and foster long-term relationships with investors who prioritize ethical business practices.

In light of these findings, it is imperative for Saudi regulatory bodies to prioritize the development and implementation of standardized ESG reporting requirements. Such measures will contribute to the achievement of Vision 2030 goals and position Saudi Arabia as a global leader in sustainability and ethical business practices.

The study provides actionable insights for corporate managers, policymakers, and regulators. It highlights that companies with strong ESG practices demonstrate greater efficiency in asset management, attract sustainable investments, and achieve higher equity returns. This reinforces the need for stringent ESG reporting requirements to align with national goals under Vision 2030, elevate corporate governance standards, enhance global competitiveness, and attract foreign investment.

The petrochemical industry, a cornerstone of Saudi Arabia's economy, is identified as a critical sector for ESG adoption. Facing pressures to balance profitability with sustainability, this sector must embrace ESG reporting to enhance transparency and attract international investment.

The study advocates for comprehensive ESG frameworks that align with global best practices. Saudi companies should adopt environmental regulations, support social initiatives, and adhere to governance standards to improve financial performance and sustainability. Additionally, educating employees and investors on the importance of ESG is vital for informed decision-making and fostering long-term trust in corporate strategies.

The practical implications of adopting ESG practices are particularly significant in key industries in Saudi Arabia, in the context of Vision 2030, which prioritizes sustainability and economic diversification. By implementing ESG practices, companies can contribute to national objectives, enhance their competitive advantage, and improve their resilience in the global market.

In the petrochemical industry, major companies such as SABIC and Saudi Aramco can take a leading role in sustainability by adopting carbon capture and utilization (CCU) technologies and shifting towards renewable energy sources. These initiatives align with Saudi Vision 2030, positioning these companies as global leaders in sustainability. Moreover, improving governance through transparent ESG reporting that adheres to international standards will enhance investor confidence and attract foreign capital. By integrating sustainability into their operations, these companies not only support national development goals but also strengthen their competitive edge in the global market.

The financial sector plays a critical role in advancing social responsibility by introducing green financial products. For example, offering loans for renewable energy projects or funding sustainable real estate developments can drive growth while contributing to environmental goals. The issuance of Islamic green bonds (sukuk) represents a unique opportunity to align ESG principles with Sharia compliance, thus broadening the appeal to a diverse range of investors. Additionally, incorporating ESG risks into risk management frameworks will enhance the sector's resilience, enabling financial institutions to better navigate environmental and social challenges while ensuring long-term profitability.

In the real estate and construction sectors, adopting green building certifications such as LEED or GSAS can support the development of energy-efficient buildings, minimizing environmental impacts. These certifications help reduce energy consumption, creating a more sustainable built environment. Moreover, focusing on affordable housing projects that incorporate sustainable designs can promote community well-being and contribute to broader societal benefits. These actions align with both environmental and social sustainability objectives, supporting the goals of Vision 2030.

Retailers in Saudi Arabia can enhance their ESG practices by sourcing products from sustainable suppliers, reducing their carbon footprint, and supporting local economies. Implementing waste reduction initiatives—such as recycling unsold food products into compost or bioenergy—can also help minimize waste and meet national sustainability goals. These practices not only help preserve the environment but also improve the companies' sustainability performance, strengthening their appeal to an increasingly eco-conscious consumer base.

Companies in the renewable energy sector, such as ACWA Power, are well-positioned to drive innovation through solar and wind energy projects. By leveraging artificial intelligence (AI) to optimize energy efficiency, these companies can improve the scalability and affordability of renewable energy solutions. This not only helps address energy access gaps, particularly in underserved communities, but also contributes to Saudi Arabia's broader social responsibility goals. These efforts are vital in advancing the country's sustainability objectives and will play a crucial role in its transition to a low-carbon economy.

To overcome challenges such as regulatory inconsistencies and resource constraints, Saudi companies must align their ESG practices with both local and international regulations. Adhering to the Saudi Capital Market Authority's ESG disclosure requirements will enhance transparency and credibility in the market. Additionally, capacity-building initiatives through employee training will equip companies to manage ESG initiatives effectively. By adopting these practices, companies in Saudi Arabia can contribute to the nation's sustainable development goals and enhance their global competitiveness.

To address current limitations, future studies should adopt longitudinal or comparative approaches across regions, expanding sample sizes to include companies from diverse countries. This would provide deeper insights into ESG performance and its financial implications. Research could explore how ESG performance mitigates information asymmetry, the influence of accounting disclosure on earnings management, and the effects of digitalization on ESG reporting. These studies will broaden the understanding of ESG's role in both Saudi and global contexts, offering strategies to improve corporate sustainability and financial outcomes.

While this study addresses reverse causality using advanced techniques, further research is needed to refine our understanding of this relationship. Longitudinal studies could capture the evolving dynamics between ESG practices and financial performance over time. Cross-industry comparisons would reveal how sector-specific factors, particularly in resource-intensive industries, influence ESG performance. Additionally, exploring external factors like regulatory changes or investor activism will provide a broader perspective on the mechanisms driving ESG investments and

their financial implications.

This study highlights the critical importance of ESG disclosure in achieving Vision 2030, enabling companies to align with global sustainability trends while simultaneously improving financial and operational performance. Future research will deepen our understanding of how ESG can drive both national and corporate growth, contributing to long-term sustainability.

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