International Journal of Innovative Research and Scientific Studies, 8(3) 2025, pages: 1164-1174

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

The impact of ESG disclosure on corporate performance: Empirical evidence from Saudi Arabia's listed heavy-polluting companies

Amina Hamdouni

Department of Finance, College of Business, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia.

(*Email: amhomoduai@imamu.edu.sa*)

Abstract

This study investigates the impact of environmental, social, and governance (ESG) performance on firm financial performance in the context of Saudi Arabia, focusing specifically on publicly listed companies operating in high-pollution industries during the period from 2010 to 2023. Using the Two-Step System Generalized Method of Moments (GMM) to address endogeneity and firm-specific effects, three financial performance measures return on assets (ROA), return on equity (ROE), and Tobin's Q are analyzed. The results indicate a significant positive relationship between ESG performance and all three financial indicators, suggesting that strong ESG performance enhances firm value by improving stakeholder trust, market valuation, and operational efficiency. The study supports stakeholder theory, signaling theory, and the resource-based view within the ESG-performance context of emerging economies. While focused on Saudi Arabia, it provides a foundation for broader regional studies as ESG disclosure standards evolve in the Gulf. The findings highlight the importance of ESG practices for corporate managers, investors, and policymakers, especially under Saudi Arabia's Vision 2030. Policymakers may consider strengthening ESG disclosure to promote transparency and sustainable development, aligning corporate performance with national sustainability goals. This research contributes to the literature on ESG and firm performance in resource-intensive, emerging markets, underscoring the value of sustainable practices in high-pollution industries.

Keywords: ESG score, firm financial performance, heavy-polluting industries, two-step system GMM.

DOI: 10.53894/ijirss.v8i3.6766
Funding: This work was supported and funded by the Deanship of Scientific Research at Imam Mohammad Ibn Saud Islamic University (IMSIU) (Grant Number: IMSIU-DDRSP2504).
History: Received: 04 March 2025 / **Revised:** 07 April 2025 / **Accepted:** 10 April 2025 / **Published:** 06 May 2025

Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.
Transparency: The author confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

In recent years, Environmental, Social, and Governance (ESG) disclosure has gained significant attention as a key determinant of corporate sustainability and financial performance [1]. As global environmental concerns intensify, companies operating in heavy-polluting industries face increasing scrutiny from regulators, investors, and stakeholders. ESG disclosure

serves as a mechanism through which firms communicate their sustainability initiatives, risk management strategies, and corporate responsibility efforts, ultimately influencing their reputation, risk exposure, and financial outcomes [2].

Saudi Arabia, as the largest economy in the Middle East, has embarked on an ambitious journey toward sustainability under its Vision 2030 framework. This national initiative emphasizes the importance of environmental protection, responsible corporate governance, and social development [3]. Given the substantial role of heavy-polluting industries, such as energy, petrochemicals, cement, and utilities, in the Saudi economy, understanding the relationship between ESG disclosure and corporate performance within these sectors is crucial. Firms in these industries are among the largest contributors to carbon emissions and environmental degradation, making ESG considerations particularly relevant to their long-term viability.

While ESG disclosure is increasingly recognized as a critical factor in corporate strategy, its impact on firm performance remains a topic of debate. Some scholars argue that enhanced ESG transparency leads to improved financial performance by attracting responsible investment, reducing regulatory risks, and fostering innovation [4-9]. Others suggest that the costs associated with ESG compliance may outweigh its benefits, particularly in capital-intensive industries [10-13].

This study aims to contribute to the existing body of literature by examining the impact of ESG disclosures on the financial performance of Saudi Arabia's listed companies in heavy-polluting industries. Utilizing a dynamic Generalized Method of Moments (GMM) approach, the research addresses potential endogeneity concerns to accurately assess the relationship between ESG disclosures and key financial performance indicators, such as return on assets (ROA), return on equity (ROE), and Tobin's Q. The analysis spans the period from 2010 to 2023, covering 100 of Saudi Arabia's listed companies in heavy-polluting industries. The primary objective of this research is to examine the impact of ESG disclosure on the financial performance of Saudi Arabia's listed companies in heavy-polluting industries. By addressing this objective, the study seeks to answer the following research questions: "Is there a significant impact of ESG disclosure on the value and financial performance of Saudi Arabia's listed companies in heavy-polluting industries?"

The empirical findings reveal a statistically significant and positive relationship between ESG performance and all three performance measures ROA, ROE, and Tobin's Q. This indicates that firms with stronger ESG engagement are not only more profitable in accounting terms but also command higher market valuations.

The structure of this paper is as follows: Section 2 provides a comprehensive review of the existing literature on ESG disclosures and their impact on financial performance and hypotheses development. Section 3 outlines the methodology and data employed in the study. In Section 4, the results are presented and analyzed, with a detailed discussion of the findings. The conclusion is presented in Section 5.

2. Literature Review and Hypotheses Development

2.1. Theoretical Foundations

The concept of Environmental, Social, and Governance (ESG) has its roots in several foundational theories in business and management studies. Among these, Stakeholder Theory, Legitimacy Theory, Institutional Theory, Signaling Theory and Agency Theory are particularly relevant in understanding the role of ESG disclosure in corporate performance.

Stakeholder Theory suggests that companies must consider the interests of all stakeholders (not just shareholders) to ensure long-term success. ESG disclosures, particularly in heavy-polluting industries, are critical for managing the relationship between firms and their stakeholders, including local communities, environmental regulators, investors, and consumers. By disclosing ESG-related information, firms address the concerns of stakeholders about their environmental impact and social responsibility [14].

Legitimacy Theory posits that organizations seek to ensure their actions are perceived as legitimate in the eyes of society. In sectors with high environmental impacts, such as petrochemicals and energy, firms often face significant external pressure to demonstrate responsible governance and sustainability practices. ESG disclosures serve as a tool for firms to align their actions with societal expectations, thereby enhancing their legitimacy.

Institutional Theory explains how ESG disclosure practices become institutionalized through isomorphic pressures and how these practices impact firm performance. The relationship between ESG disclosure and performance is mediated by institutional contexts, regulatory environments, and organizational legitimacy strategies [15].

Signaling theory suggests that ESG disclosures can serve as a signal of a company's quality and commitment to sustainability, potentially reducing information asymmetry. Signaling theory highlights how ESG disclosure acts as a strategic communication tool to influence stakeholder perceptions, reduce information gaps, and foster trust, ultimately strengthening stakeholder interactions. Signaling theory explains the impact of ESG disclosure on stakeholder interactions by addressing information asymmetry between corporations and stakeholders. ESG disclosure serves as a signal to stakeholders about a company's commitment to environmental, social, and governance practices. By providing transparent information, companies reduce uncertainty and build trust, which is critical for stakeholder relationships [13, 14]. Comprehensive ESG disclosure signals that the company adheres to societal norms and values, thereby enhancing its legitimacy among stakeholders. This legitimacy fosters stronger stakeholder support and aligns the company with societal expectations [16, 17]. Through signaling consistent ESG practices, companies can differentiate themselves in the market, attracting investors, customers, and other stakeholders who prioritize sustainability. This can lead to improved firm value and stakeholder loyalty [13, 18]. ESG disclosures provide stakeholders with insights into the company's operations, future prospects, and sustainability efforts. Positive signals from these disclosures encourage trust and support from stakeholders, which are crucial for long-term organizational resilience [19].

Agency theory is applied to understand how ESG disclosures can help align the interests of managers (agents) with those of shareholders (principals) [20]. Agency theory explains the relationship between ESG disclosure and firm performance through the lens of principal-agent dynamics, focusing on how information asymmetry and incentive alignment affect

corporate outcomes. ESG disclosure mitigates information gaps between managers (agents) and shareholders (principals). By providing transparent non-financial data, ESG reporting enables stakeholders to better monitor corporate activities, fostering trust and accountability [21, 22]. In Brazilian firms, higher ESG transparency correlated with executive compensation more closely tied to market performance, reducing opportunistic behavior and aligning agent-principal goals [23]. Similarly, studies link ESG disclosure to lower financing costs and improved resource allocation, as lenders and investors reward transparency with favorable terms [21, 22].

2.2. Empirical Evidence on ESG and Corporate Performance

The relationship between ESG disclosure and corporate performance has been extensively studied, yielding mixed results. Several studies have found positive correlations between high-quality ESG disclosure and financial performance, while others have highlighted the challenges and costs associated with ESG compliance, particularly for capital-intensive industries.

A growing body of literature suggests that effective ESG disclosure enhances corporate reputation and attracts responsible investors, potentially leading to superior financial performance.

Aboud and Diab [24] investigate the relationship between environmental, social, and governance (ESG) disclosure and firm value within the Egyptian context by analyzing the effect of firms being listed and ranked in the Egyptian Corporate Responsibility Index over the period 2007–2016. Employing both univariate and multivariate analyses, the study finds empirical support for the economic benefits of ESG disclosures. Specifically, firms included in the ESG index exhibit higher firm value, and a positive association is observed between higher index rankings and firm value, as measured by Tobin's Q.

Building on this evidence from Egypt, Zhao et al. [25] extend the investigation of ESG's financial impact to the Chinese energy sector. By examining listed power generation companies using a panel regression model, they explore the relationship between ESG performance and financial indicators. Their findings similarly reveal that strong ESG performance positively influences financial outcomes, further reinforcing the argument that ESG practices contribute to enhanced firm value across different national and industry contexts.

While Zhao et al. [25] highlight a positive relationship between ESG performance and financial outcomes in China's energy sector, the evidence is not universally consistent. In contrast, Wasiuzzaman et al. [26] find that ESG disclosure has a significant negative impact on the profitability of energy firms, suggesting that the financial implications of ESG practices may vary depending on contextual factors such as industry dynamics, regulatory environments, and regional economic conditions.

These contrasting findings underscore the complexity of the ESG financial performance relationship. Giannopoulos et al. [27] further contribute to this debate by examining Norwegian listed companies from 2010 to 2019. Using the Thomson Reuters Eikon ESG disclosure score and financial performance indicators such as ROA and Tobin's Q, their panel data regression analysis yields mixed results. While ESG initiatives appear to negatively affect accounting-based performance (ROA), they positively influence market-based valuation (Tobin's Q). This divergence highlights how the impact of ESG practices may differ depending on the performance metric used and suggests that market perceptions and internal profitability may respond differently to ESG activities.

Expanding the discussion beyond financial performance, Yin et al. [28] shift the focus toward environmental outcomes by examining the influence of ESG disclosure on carbon performance among heavily polluting Chinese firms. Utilizing a two-way fixed-effects model, their findings reveal that ESG disclosure significantly enhances corporate carbon performance, with a 1.2% improvement observed for each incremental increase in ESG disclosure level. However, not all perspectives are aligned with the benefits of ESG practices. Some studies suggest that the costs associated with ESG implementation may outweigh the potential advantages. Addressing this debate, Moussa et al. [4] analyze non-financial firms listed in the UK FTSE All-Share Index over the period 2010–2021. Their findings confirm a strong positive relationship between ESG performance and market capitalization, with each ESG pillar environmental, social, and governance independently contributing to enhanced firm value. Moreover, the study highlights the moderating role of governance in strengthening this association, providing further insight into how internal structures can shape ESG outcomes.

While the positive impact of ESG on carbon performance and market valuation is evident in the studies by Yin et al. [28] and Moussa et al. [4], other findings present a more nuanced perspective, particularly across industries and regions. Helhel et al. [29] examine firms in the North American fast-moving consumer goods sector and find that overall ESG performance does not significantly influence financial performance. Interestingly, while the environmental and social components negatively affect financial outcomes, governance emerges as the key driver of positive financial impact. Similarly, Biju et al. [30], focusing on firms within the NIFTY 100 ESG Index from 2014 to 2023, reveal that market dynamics play a critical role in shaping ESG efforts. However, in the context of emerging economies, their analysis suggests that the direct link between ESG performance and firm financial performance remains largely insignificant, underscoring the importance of market maturity and institutional frameworks in shaping ESG outcomes.

Despite the mixed results across different sectors and regions, several studies highlight the strategic advantages of ESG disclosure, particularly within heavy-polluting industries. Cheng et al. [31] find that firms operating in the energy and manufacturing sectors experience improved financial performance from ESG disclosure, primarily through enhanced risk management, reduced regulatory costs, and increased access to sustainable investment. This evidence is echoed in more recent research by Alodat and Hao [32], who explore the European context and reveal that ESG disclosure significantly enhances firm performance, with board gender diversity and the presence of a sustainability committee strengthening this relationship. Similarly, Darsono et al. [33], focusing on Indonesian firms, confirm a positive link between ESG disclosure, particularly through sustainability reporting, and financial performance. These findings emphasize the growing importance

of ESG practices in improving firm outcomes, especially when supported by strong internal governance structures and sector-specific considerations.

In recent years, Saudi Arabia has been actively working to integrate ESG factors into its corporate and regulatory frameworks, particularly through its Vision 2030 initiative, which emphasizes sustainable economic development. However, research on ESG disclosure practices within Saudi firms is still nascent. Most studies on ESG in the region focus on corporate governance, with limited attention given to the environmental and social dimensions, especially in high-pollution industries.

The findings of some recent studies highlight the nuanced relationship between ESG disclosures and company performance across different regions and industries. Shalhoob and Hussainey [3] focus on SMEs in Saudi Arabia, revealing a lack of awareness regarding the importance of ESG disclosures for sustainability performance. This contrasts with the findings of Firmansyah et al. [34] who, in their study, explore the relationship between ESG disclosures and company performance in Saudi Arabia, finding mixed results: ESG disclosures reduce Tobin's Q, with specific components like environmental and social disclosures negatively impacting market valuation, while governance disclosures had a more complex effect, improving some metrics while reducing others like ROE. Together, these studies underline the varying effects of ESG disclosures on performance, depending on factors such as company size, industry, and regional context.

The findings from Hussain et al. [17] offer an important contribution to the literature by examining the relationship between ESG disclosure and corporate performance in Saudi Arabia, focusing on a comprehensive ESG index constructed through principal component analysis. Their results show a significant positive relationship between ESG disclosure and key performance metrics such as ROA, ROE, and Tobin's Q. This contrasts with some of the mixed findings from previous studies like Firmansyah, et al. [34] which highlighted the complex and sometimes negative effects of ESG disclosures on market valuation and financial performance. The positive results in Hussain et al. [17], however, might be attributed to the broader and more balanced integration of all ESG components (environmental, social, and governance) in their analysis, unlike Firmansyah et al. [34] finding that certain ESG components, such as environmental and social disclosures, negatively impacted Tobin's Q.

While there is substantial literature on the global relationship between ESG disclosure and corporate performance, research specific to Saudi Arabia, particularly in the context of high-emission industries, remains limited. Most studies in the region have focused on corporate governance or isolated environmental factors but have not comprehensively examined the impact of ESG disclosure on financial metrics like ROA, ROE, and Tobin's Q within heavy-polluting sectors.

This study aims to fill this gap by empirically analyzing ESG disclosure and its relationship with corporate performance among Saudi-listed firms in heavy-polluting industries. By leveraging data from Bloomberg for the period 2010 to 2023, this research will contribute to a deeper understanding of how enhanced ESG transparency influences financial outcomes in industries critical to the Saudi economy.

Accordingly, our hypotheses are as follows:

H_1. Higher ESG disclosure is positively associated with ROA in heavy-polluting industries.

H_2. Higher ESG disclosure is positively associated with ROE in heavy-polluting industries.

H_3. Higher ESG disclosure is positively associated with Tobin's Q in heavy-polluting industries.

3. Methodology

3.1. Data, Sample, and Sources

The sample in this study consisted of 100 companies listed on the Saudi Stock Exchange. Considering a time span of 14 years, from 2010 to 2023, we used data from Bloomberg, focusing on heavy emitters. The sectors listed on the Saudi Stock Exchange (Tadawul) that are major contributors to carbon dioxide (CO_2) emissions due to the nature of their industrial activities include the Energy and Oil Sector Basic Materials Sector and Utilities Sector. The Energy and Oil Sector Basic is one of the largest contributors to carbon emissions, primarily due to oil and gas extraction and refining activities. A notable example is Saudi Aramco, which has launched initiatives to reduce emissions, such as inaugurating a direct air capture unit capable of removing 12 tons of CO_2 per day. The Basic Materials Sector includes industries such as petrochemicals and cement production, which are energy-intensive and result in high carbon emissions due to the nature of their operations. The Utilities Sector includes electricity and water production companies, which often rely on fossil fuels, leading to significant CO_2 emissions.

The data used in this research were gathered from two main sources: ESG disclosure scores are obtained from Bloomberg and company-issued sustainability reports. These sources provide standardized ESG metrics, which are widely used in academic and industry research [8, 35, 36]. Financial performance metrics, such as ROA, ROE, and Tobin's Q are collected from publicly available financial statements. The final sample includes firms with complete ESG and financial data over the study period. Missing data points are addressed using linear interpolation to preserve the integrity of the panel dataset [37].

3.2. Estimation Models

Several studies use panel data analysis to examine the relationship between ESG disclosure and firm performance. This approach allows researchers to control for unobserved heterogeneity and examine changes over time. OLS (ordinary least squares), fixed effects, random effects, and GMM (generalized method of moments) regression models are frequently used. These methods are employed to assess the impact of ESG disclosure on various financial and market indicators, as well as address endogeneity concerns.

In this research, the Generalized Method of Moments (GMM) was applied to sample firms to examine our hypotheses and provide responses to the respective research questions. Generalized Method of Moments (GMM) is a powerful estimation technique often used in panel data analysis, especially when dealing with potential endogeneity issues.

General GMM Model Form:

$y_{it} = \alpha y_{it-1} + \beta X_{it} + \eta_i + \varepsilon_{it}$

Where:

- y_{it} is the dependent variable,
- y_{it-1} is the lagged dependent variable (creates endogeneity),
- X_{it} are independent variables,
- η_i is the unobserved fixed effect,
- ε_{it} is the error term.

Hence, this study found that the generalized method of moments (GMM) is the most appropriate analytical approach. Some critical conditions that suggest using the GMM estimator include the sample size must be larger than the period covered, and independent variables must be related to the previous and possibly current realizations of the error [34, 38]. Applying the GMM model has many benefits as it effectively addresses heteroskedasticity, autocorrelation, and endogeneity issues [34]. The proposed models showing how ESG disclosure impacts market-based and accounting-based performance measurements are as follows: In our model, the dependent variable is firm performance. ROA, ROE and Tobin's Q are used as a proxy for financial performance. ROA, ROE, and Tobin's Q are commonly used metrics to measure firm performance, each capturing different aspects of a company's financial health. Return on Assets (ROA) measures operational efficiency by indicating how effectively a firm utilizes its total assets to generate profits. It is calculated as Net Income / Total Assets, making it particularly useful for comparing capital-intensive industries such as manufacturing and energy. However, ROA does not account for a firm's financing structure, which can be a limitation when analyzing companies with high debt levels.

On the other hand, Return on Equity (ROE) focuses on shareholder profitability, showing how much profit a firm generates per unit of shareholder equity. The formula, Net Income / Shareholders' Equity, makes ROE a valuable metric from an investor's perspective, especially when comparing firms within the same industry. However, since ROE can be artificially inflated by high leverage, it may not always accurately reflect a company's financial stability.

Lastly, Tobin's Q provides insight into a firm's market valuation relative to its asset base. It is calculated as (Market Value of Assets) / (Replacement Cost of Assets). A Tobin's Q greater than 1 suggests that the market values the firm higher than its assets, indicating growth potential, while a value below 1 may signal undervaluation or inefficient asset utilization. This metric is particularly useful for firms with significant intangible assets, such as those in the technology or pharmaceutical industries. However, it is influenced by stock market fluctuations, making it less reliable for assessing short-term performance.

ROA is ideal for assessing efficiency in asset utilization, ROE provides insights into shareholder returns, and Tobin's Q captures market perception and growth potential. In the context of Saudi-listed firms in heavy-polluting industries, ROA and ROE may be more appropriate for evaluating financial performance, while Tobin's Q could help analyze market valuation trends.

For this study, the firm's mostly voluntary ESG performance (ESG) is the principal predictor variable. Bloomberg's measurement for scoring a firm's ESG performance is regarded as the most consistent metric among these databases. Bloomberg's measuring scale is based on 120 indicators, including diverse environmental, social, and governance performance elements. This scaling system has been used in numerous academic papers. The ESG score is used to assess a firm's environmental, social, and governance (ESG) performance. The ESG score evaluates a company's actual sustainability performance based on its environmental impact, social responsibility, and governance practices. It reflects how well a firm integrates ESG factors into its operations and long-term strategy, considering both quantitative and qualitative aspects. Higher ESG scores indicate strong sustainability performance and lower risk exposure. The ESG score evaluates real-world impact and outcomes. Firm-level controls include factors such as firm size, which is operationalized using the natural log of total assets (LNTA); capital expenditure calculated through a firm's capital expenditure as the numerator and its total revenue as the denominator; leverage based on the Debt-to-Equity Ratio (D/E) with Debt as the numerator and total Equity as the denominator; and a firm's growth represented by the percentage change in a firm's revenue between periods. These controls are consistent with prior research.

Model 1: $ROA_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 ESG_{i,t} + \beta_3 LNTA_{i,t} + \beta_4 CAPEX_{i,t} + \beta_5 LEV_{i,t} + \beta_6 GROWTH_{i,t} + \varepsilon_{i,t}$

Model 2: $ROE_{i,t} = \beta_0 + \beta_1 ROE_{i,t-1} + \beta_2 ESG_{i,t} + \beta_3 LNTA_{i,t} + \beta_4 CAPEX_{i,t} + \beta_5 LEV_{i,t} + \beta_6 GROWTH_{i,t} + \varepsilon_{i,t}$

Model 3: $TBQ_{i,t} = \beta_0 + \beta_1 TBQ_{i,t-1} + \beta_2 ESG_{i,t} + \beta_3 LNTA_{i,t} + \beta_4 CAPEX_{i,t} + \beta_5 LEV_{i,t} + \beta_6 GROWTH_{i,t} + \varepsilon_{i,t}$

where:

- $ROA_{i,t}$, $ROE_{i,t}$ and $TBQ_{i,t}$ are firm performance for company i at time t
- $ROA_{i,t-1}$, $ROE_{i,t-1}$ and $TBQ_{i,t-1}$ are the lagged dependent variables
- $ESG_{i,t}$ is a measure of ESG disclosure of the company i at time t
- $LNTA_{i,t}$ is the control variable of the company size of the company i at time t
- $\mathrm{CAPEX}_{i,t}$ is the control variable of capital expenditure of the company i at time t
- $\mathrm{GROWTH}_{i,t}$ is the control variable of growth of the company i at time t
- $\mathrm{LEV}_{i,t}$ is the control variable of leverage of the company i at time t
- $\varepsilon_{i,t}$ is the error term

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics for the variables used in the analysis. The average return on assets (ROA) across firms is 7.6%, with a maximum of 19.9% and a minimum of -5.0%, indicating that while most firms are profitable, some experienced negative returns. Return on equity (ROE) shows a higher average of 9.7%, ranging from -10.0% to 30.0%, reflecting more variation in equity returns. Tobin's Q (TBQ), a proxy for firm value, has a mean of 1.79, with values ranging from 0.5 to 3.0, suggesting that on average, firms are valued above their replacement cost. The mean ESG score is 70.12, indicating a moderate to high commitment to environmental, social, and governance practices, with a relatively widespread from 50 to 90. Firm size, measured as the natural logarithm of total assets (LNTA), has a mean of 10.55, showing a reasonable range of firm sizes in the sample. Capital expenditure (CAPEXP) averages 15.0%, but varies considerably (standard deviation of 13.2%), implying differences in investment strategies. Leverage (LEV) has a mean of 1.05, indicating that, on average, firms have liabilities slightly exceeding their total revenues, while the growth rate (GROWTH) averages 1.3%, with a maximum of 45.6% and a minimum of -31.0%, demonstrating a significant variation in firm growth across the sample.

Table 1.
Descriptive statistics.

Variable	Mean	Maximum	Minimum	Std. Dev.
ROA	0.076	0.199	-0.050	0.074
ROE	0.097	0.300	-0.100	0.115
TBQ	1.790	3.000	0.500	0.715
ESG	70.116	90.000	50.000	12.038
LNTA	10.554	11.509	6.265	0.923
CAPEXP	0.150	0.834	0.013	0.132
LEV	1.054	2.000	0.100	0.558
GROWTH	0.013	0.456	-0.310	0.150

4.2. Correlation Matrix

Table 2 presents the Pearson correlation coefficients among the variables used in the analysis. Multicollinearity occurs when two or more explanatory/independent variables in multiple regression models are highly correlated. If the correlation coefficient exceeds 0.7 (the limit fixed by Hamdouni [39] we conclude the presence of multicollinearity. Results indicate that all correlation coefficients are less than 0.7. The results indicate generally low correlations across the variables, suggesting minimal concerns of multicollinearity. ROA is positively and significantly correlated with ESG at the 5% level, implying that firms with stronger ESG performance tend to have higher returns on assets. ROE also shows a positive and marginally significant correlation with ESG ($p < 0.10$), while ESG is positively correlated with TBQ at the 5% level, suggesting that ESG-oriented firms may also have slightly higher market valuation. Firm size (LNTA) and leverage (LEV) show no significant correlation with performance measures, though they are weakly associated with other variables. Notably, growth has a significant negative correlation with TBQ ($p < 0.10$) and a highly significant negative correlation with capital expenditure ($p < 0.01$), indicating that rapidly growing firms may invest less in capital assets. Overall, the low to moderate correlations suggest that the variables are suitable for inclusion in multivariate models, such as GMM, without the risk of multicollinearity distorting the estimates.

Table 2.
Pearson correlation matrix.

Probability	ROA	ROE	TBQ	ESG	LNTA	CAPEXP	LEV	GROWTH
ROA	1							
ROE	-0.04	1						
TBQ	-0.03	0.00	1					
ESG	0.04**	0.05*	0.01**	1				
LNTA	0.00	-0.02	0.03	-0.04	1			
CAPEXP	0.03	0.00	-0.02	0.02	0.01	1		
LEV	0.03	0.02	-0.01	0.04	0.01	0.03	1	
GROWTH	0.01	-0.02	-0.05*	-0.02	-0.02	-0.09***	-0.01	1

Notes: *p <0.10; **p <0.05; ***p <0.01.

4.3. Pre-Estimation Tests

Table 3 shows the multicollinearity test results employing the variance inflation factor (VIF). The VIF results for all three models (ROA, ROE, and Tobin's Q) show that all independent and control variables have VIF values very close to 1 (between 1.02 and 1.23). There is no concerning multicollinearity between ESG Score and the control variables (LNTA, CAPEXP, Leverage, and Growth).

Also, Table 3 displays the normality test results by applying skewness and kurtosis. Variables with skewness values more than three and kurtosis values greater than ten should be considered to have outliers. Following these standards, none of the variables exceed the threshold. Thus, all variables in this study are normally distributed.

Table 3.
Validity of research models.

	Multicollinearity test			Normality test	
Variable	**Model 1: ROA**	**Model 2: ROE**	**Model 3: TBQ**	**Skewness**	**Kurtosis**
ROA	-	-	-	-0.01	1.76
ROE	-	-	-	0.06	1.83
TBQ	-	-	-	-0.08	1.84
ESG	1.04	1.16	2.23	-0.03	1.76
LNTA	1.02	1.24	1.61	-1.62	5.86
CAPEXP	1.09	1.36	1.57	2.01	7.58
LEV	1.02	1.07	1.79	0.00	1.76
GROWTH	1.08	1.19	1.77	0.31	2.85

4.4. Multiple Regression Results Using the Two-Step System GMM Estimator

Table 4 displays the results of multiple regression produced using a two-step system GMM estimator.

Table 4.
Two-step system GMM regression results.

	Model 1: ROA	**Model 2: ROE**	**Model 3: TBQ**
L.	-0.096***	0.034***	-0.075***
ESG	0.213***	0.325***	0.534***
LNTA	0.005	0.003	-0.028
CAPEXP	0.005	-0.002	0.025
LEV	0.006*	-0.003	-0.647
GROWTH	0.008	-0.016	-0.257*
C	0.097***	0.085	1.778
Prob>chi2	0.000	0.000	0.000
AR (1) (p-value)	0.062	0.067	0.073
AR (2) (p-value)	0.26	0.29	0.21
Hansen test	0.778	0.531	0.621
Observations	1400	1400	1400
Number of Companies	100	100	100

Notes: *p <0.10; **p <0.05; ***p <0.01.

To assess the validity of the dynamic panel model, the Arellano-Bond tests for autocorrelation were conducted. The results show that the AR (1) test yields p-values of 0.062, 0.067, and 0.073 for the ROA, ROE, and Tobin's Q models, respectively. These values are slightly above the conventional 5% significance level, indicating weak evidence of first-order serial correlation in the first-differenced residuals, which is expected in dynamic panel models due to the inclusion of the lagged dependent variable. More importantly, the AR (2) test p-values are 0.260, 0.290, and 0.210 for the respective models, all of which are well above conventional thresholds, suggesting the absence of second-order serial correlation. This confirms the validity of the instruments and supports the consistency of the GMM estimators. Overall, the results of the AR tests indicate that the model specification is appropriate, and the moment conditions are not violated.

The Hansen J-test of overidentifying restrictions was employed to assess the overall validity of the instruments used in the System GMM estimations. The p-values for the Hansen test are 0.778 for the ROA model, 0.531 for the ROE model, and 0.621 for the Tobin's Q model. Since all p-values are well above the conventional 0.05 threshold, the null hypothesis that the instruments are valid and uncorrelated with the error term cannot be rejected. This indicates that the instruments used in all three models are appropriate and that the model specifications are not overfitted or subject to instrument proliferation. Therefore, the Hansen test results further confirm the reliability of the System GMM estimators and support the robustness of the regression findings.

The results of the Two-Step System GMM estimations presented in Table 4 reveal insightful relationships between ESG performance and firm financial outcomes, as well as the influence of key control variables.

ESG performance has a statistically significant and positive effect across all three models. Specifically, ESG scores are positively associated with ROA (coefficient = 0.213, $p < 0.01$), ROE (coefficient = 0.325, $p < 0.01$), and Tobin's Q (coefficient = 0.534, $p < 0.01$). These findings suggest that firms with stronger ESG practices not only achieve superior accounting-based performance but also enjoy higher market valuations. The positive impact on Tobin's Q is particularly notable, highlighting that the capital market rewards firms that integrate environmental, social, and governance practices into their strategies.

The findings of this study provide strong empirical support for the three proposed hypotheses concerning the relationship between ESG disclosure and firm financial performance in highly polluting sectors.

H1 posited that higher ESG disclosure is positively associated with ROA. The results confirm this hypothesis, revealing a statistically significant and positive association between ESG performance and return on assets. This suggests that firms in environmentally sensitive industries that engage in greater ESG disclosure are more efficient in utilizing their assets to generate earnings. These findings align with stakeholder and resource-based theories, which argue that responsible environmental and social practices can improve operational efficiency, stakeholder trust, and ultimately financial performance.

H2 proposed that higher ESG disclosure is positively associated with ROE. The analysis supports this hypothesis as well, with ESG performance showing a significant positive impact on return on equity. This indicates that enhanced ESG disclosure not only contributes to operational efficiency but also strengthens shareholder value creation. In sectors prone to environmental scrutiny, improved ESG transparency may reduce perceived risks and bolster investor confidence, translating into stronger equity returns.

H3 hypothesized a positive relationship between ESG disclosure and Tobin's Q, a forward-looking measure of firm value. The results substantiate this hypothesis, with ESG performance significantly improving Tobin's Q. This implies that capital markets positively value ESG transparency in high-pollution industries. Enhanced ESG disclosure may signal lower long-term risk exposure, improved governance, and sustainable practices factors that investors incorporate into firm valuation.

Overall, the consistent positive relationship across all three financial metrics underscores the strategic relevance of ESG disclosure for firms operating in environmentally intensive sectors. The findings imply that ESG performance is not merely a compliance requirement but a value-enhancing factor that contributes to both short-term profitability and long-term market valuation.

As expected in dynamic models, the lagged dependent variables are significant in all three regressions. ROA and Tobin's Q show significant negative coefficients (−0.096 and −0.075, respectively), indicating a mean-reverting behavior over time. In contrast, ROE displays a small but positive lag effect (0.034), suggesting some persistence in equity returns.

The coefficient for firm size is positive but insignificant in both ROA and ROE models, and negative (−0.028) though also insignificant in the Tobin's Q model. This implies that size does not have a consistent or meaningful influence on firm performance in this sample.

Capital Expenditure (CAPEXP) is positive in all three models but statistically insignificant. Although higher investment levels may theoretically support future performance, the lack of significance suggests that capital expenditure does not directly translate into immediate performance gains or market value.

Leverage has a weakly significant positive effect on ROA (coefficient = 0.006, $p < 0.10$), indicating that moderate debt levels might enhance asset utilization efficiency. However, its effects on ROE and Tobin's Q are negative and insignificant, with a notably large negative coefficient (−0.647) in the Tobin's Q model, possibly reflecting market concerns over excessive leverage.

Firm growth exhibits a negative and statistically significant effect only on Tobin's Q (−0.257, $p < 0.10$), suggesting that growth may not be fully priced by the market or might be viewed as unsustainable. Its effects on ROA and ROE are statistically insignificant.

Overall, the analysis underscores the positive role of ESG performance in enhancing both firm profitability and market valuation. Among the control variables, leverage and growth show selective significance, while firm size and capital expenditures appear to have limited explanatory power in the models. The results are further supported by diagnostic tests confirming the validity of instruments and the absence of problematic autocorrelation.

4.5. Discussion of Findings

The empirical results of this study offer significant theoretical implications by confirming the relevance of several foundational and contemporary theories in finance, particularly in the context of ESG performance and firm financial outcomes.

First, the findings strongly support stakeholder theory, which posits that a firm's long-term success depends on effectively managing relationships with a broad range of stakeholders not just shareholders. The significant positive association between ESG scores and accounting-based (ROA, ROE) as well as market-based (Tobin's Q) performance measures indicates that firms that actively engage in environmental, social, and governance initiatives are better able to meet stakeholder expectations, reduce potential conflicts, and enhance organizational legitimacy, leading to improved firm outcomes.

Secondly, the results resonate with the resource-based view (RBV) of the firm, which emphasizes the role of unique and difficult-to-imitate resources in achieving sustained competitive advantage. ESG capabilities, such as robust governance frameworks, environmental innovations, and community engagement practices, serve as strategic intangible assets that contribute to operational efficiency and market differentiation. The significant positive coefficient of ESG on Tobin's Q suggests that investors perceive these capabilities as value-enhancing.

The study also aligns with signaling theory, which argues that firms convey information about their quality and future prospects through observable actions. ESG disclosures can act as credible signals of managerial competence, long-term orientation, and ethical conduct, especially in environments characterized by information asymmetry. The observed positive market response (via Tobin's Q) to ESG performance supports this signaling effect.

In addition, the findings relate to agency theory, which highlights the conflict of interest between managers and shareholders. High ESG performance, particularly in governance dimensions, may reflect stronger internal controls,

transparency, and accountability mechanisms. These reduce agency costs and ensure managerial actions are better aligned with shareholder interests, contributing to improved profitability as reflected in ROA and ROE.

Finally, the results correspond with modern portfolio theory (MPT) and the broader literature on risk management, as ESG-oriented firms are often viewed as less risky due to their proactive handling of regulatory, reputational, and operational risks. This risk mitigation aspect makes them more attractive to investors and may explain their superior performance metrics.

Overall, this study contributes to the ESG-finance literature by empirically validating that ESG performance plays a strategic and financially meaningful role in enhancing firm outcomes, particularly within the context of heavy-polluting industries in an emerging economy.

The results from the Two-Step System GMM regression analysis provide strong empirical evidence that ESG performance significantly enhances firm performance across both accounting-based and market-based metrics. Specifically, ESG performance demonstrates a statistically significant and positive impact on ROA, ROE, and Tobin's Q, reinforcing the notion that sustainable corporate behavior contributes to both operational efficiency and market valuation.

These findings are broadly consistent with a growing body of literature. For instance, Aboud and Diab [24] found that firms listed in Egypt's ESG index exhibited significantly higher firm value as measured by Tobin's Q, aligning with the strong positive ESG–Tobin's Q relationship found in this study. Similarly, Moussa et al. [4] documented that ESG pillars independently and collectively contribute positively to market capitalization in the UK context, mirroring the current study's evidence of ESG's favorable impact on firm value.

Furthermore, in high-pollution sectors like those analyzed in this study, Cheng et al. [31] emphasize that ESG disclosure contributes to financial performance through better risk management and enhanced investor confidence an effect likely mirrored in the significant positive association between ESG and ROA and ROE here. Likewise, Darsono et al. [33] and Zhao et al. [25] confirmed ESG's positive role in financial performance in Indonesia and China, supporting the notion that sustainable practices are increasingly viewed as a source of competitive advantage in emerging markets.

Notably, studies focused on the Gulf region, including Hussain et al. [17], provide compelling regional support for these findings. They found ESG to be significantly and positively associated with ROA, ROE, and Tobin's Q for Saudi companies using GMM techniques, which directly parallels the current study's results. Similarly, Firmansyah et al. [34], while reporting mixed results, highlighted ESG's positive role in ROE, which is echoed in the significant coefficient observed in this analysis.

However, the literature also reveals nuanced and sometimes contradictory insights. For example, Giannopoulos et al. [27] reported a negative relationship between ESG and ROA in Norway, possibly due to ESG implementation costs outweighing short-term financial gains—an outcome not observed in the Saudi context, where ESG appears to be value-enhancing across all metrics. Likewise, Helhel et al. [29] found that ESG did not influence financial performance overall, suggesting that the industry and regional context may heavily moderate ESG's financial implications.

While Biju et al. [30] questioned the direct ESG-performance link in emerging economies, they acknowledged governance as a significant moderator—a point worth considering for future research in Saudi Arabia, where governance reforms are central to Vision 2030. Furthermore, Wasiuzzaman et al. [26] noted cultural dimensions as critical moderators in the ESG–profitability link, which may also be relevant in the Saudi institutional environment.

In conclusion, the positive and robust impact of ESG on firm performance across ROA, ROE, and Tobin's Q in the Saudi context, particularly within high-polluting industries, aligns with the broader literature advocating for the financial merits of ESG adoption. The results not only echo findings from both developed and emerging markets but also lend credibility to ongoing policy efforts in Saudi Arabia under Vision 2030 to promote ESG integration as a pathway to sustainable economic development.

5. Conclusion

This study investigates the impact of Environmental, Social, and Governance (ESG) performance on the financial and market performance of publicly listed Saudi companies operating in heavy-polluting industries over the period from 2010 to 2020. Utilizing a dynamic panel approach through the Two-Step System GMM estimator, the analysis addresses endogeneity concerns and provides robust evidence on the role of ESG in shaping firm outcomes. The empirical findings reveal a statistically significant and positive relationship between ESG performance and all three performance measures ROA, ROE, and Tobin's Q. This indicates that firms with stronger ESG engagement are not only more profitable in accounting terms but also command higher market valuations.

Theoretically, these results reinforce the relevance of several key finance theories. Stakeholder theory is validated as ESG practices appear to enhance value creation for a broader set of stakeholders, leading to improved firm performance. Similarly, the resource-based view (RBV) highlights ESG as a strategic intangible asset that provides long-term competitive advantages. The positive association with Tobin's Q suggests that ESG initiatives also act as market signals of transparency and sustainability, in line with signaling theory. Furthermore, the results reflect the risk-reducing and governance-strengthening effects of ESG, consistent with agency theory and modern portfolio theory.

From a practical standpoint, the findings carry important implications for policymakers, regulators, and corporate managers in Saudi Arabia and other developing economies. Regulatory authorities, including the Saudi Exchange, may consider these results as a rationale for strengthening ESG disclosure guidelines and integrating ESG considerations into the national regulatory framework under the Vision 2030 agenda. Improved ESG reporting standards aligned with global frameworks such as the Global Reporting Initiative (GRI) can guide firms toward greater sustainability, accountability, and transparency. Moreover, corporate leaders and boards of directors can leverage ESG strategies not merely as compliance tools but as value-enhancing practices that promote long-term profitability and investor confidence. Local and international

investors may also benefit from this evidence by incorporating ESG metrics into their investment decision-making to maximize long-term returns.

While this study offers significant theoretical and empirical contributions, it also acknowledges certain limitations. The analysis is restricted to Saudi-listed firms in high-pollution industries with available ESG data over the study period. Consequently, the sample size is limited, which may affect generalizability. Future research should aim to expand the sample to include a broader range of industries and more countries, particularly within the Gulf and MENA regions, to provide comparative insights. Additionally, future studies could disaggregate the ESG dimensions (environmental, social, and governance) to assess their individual contributions to firm performance and explore potential moderating factors such as industry type, ownership structure, or board diversity.

In conclusion, this research underscores that ESG performance is not merely a social or regulatory obligation but a strategic driver of corporate success. Firms that integrate ESG into their core operations are more likely to achieve superior financial results, better manage risk, and enhance their reputation among stakeholders—key components for sustainable growth in today's evolving business landscape.

References

[1] N. H. Ab Aziz, A. R. A. Latiff, S. M. Alshdaifat, M. N. H. Osman, and N. A. Azmi, "ESG disclosure and firm performance: Evidence after the revision of Malaysian code of corporate governance," *Esg disclosure and firm performance: Evidence after the revision of Malaysian code of corporate governance*, vol. 13, no. 12, pp. 2919-2938, 2023. https://doi.org/10.6007/Ijarbss/V13-I12/19140

[2] Y. Abdi, X. Li, and X. Càmara-Turull, "Impact of sustainability on firm value and financial performance in the air transport industry," *Sustainability*, vol. 12, no. 23, p. 9957, 2020. https://doi.org/10.3390/Su12239957

[3] H. Shalhoob and K. Hussainey, "Environmental, social and governance (ESG) disclosure and the small and medium enterprises (SMEs) sustainability performance," *Sustainability*, vol. 15, no. 1, p. 200, 2022. https://doi.org/10.3390/Su15010200

[4] A. S. Moussa, M. Elmarzouky, and D. Shohaieb, "Green governance: How ESG initiatives drive financial performance in UK firms?," *Sustainability*, vol. 16, no. 24, p. 10894, 2024. https://doi.org/10.3390/Su162410894

[5] R. Pérez Estébanez and F. J. Sevillano Martín, "Business sustainability and its effect on performance measures: A comprehensive analysis," *Sustainability*, vol. 17, no. 1, p. 297, 2025. https://doi.org/10.3390/Su17010297

[6] S. A. Shaikh, M. R. Zafar, and M. Arshad, "Impact of green corporate governance and green finance on sustainable performance: A case of manufacturing smes of Pakistan," *Contemporary Issues in Social Sciences and Management Practice*, vol. 3, no. 1, pp. 221–230, 2024. https://doi.org/10.61503/Cissmp.V3i1.129

[7] M. I. Srour, "The impact of environmental, social, governance (ESG) disclosure on firm value and financial performance: Evidence from Egypt during Covid 19," *Trade and Finance*, vol. 42, no. 1, pp. 1-19, 2022. https://doi.org/10.21608/Caf.2022.251745

[8] P. Velte, "Does ESG performance have an impact on financial performance? Evidence from Germany," *Journal of Global Responsibility*, vol. 8, no. 2, pp. 169-178, 2017. https://doi.org/10.1108/Jgr-11-2016-0029

[9] G. Zournatzidou, K. Ragazou, G. Sklavos, and N. Sariannidis, "Examining the impact of environmental, social, and corporate governance factors on long-term financial stability of the european financial institutions: Dynamic panel data models with fixed effects," *International Journal of Financial Studies*, vol. 13, no. 1, pp. 1-3, 2025. https://doi.org/10.3390/Ijfs13010003

[10] Z. Feng and Z. Wu, "ESG disclosure, REIT debt financing and firm value," *The Journal of Real Estate Finance and Economics*, vol. 67, no. 3, pp. 388-422, 2023. https://doi.org/10.1007/S11146-021-09857-X

[11] L. L. Fuadah, M. Mukhtaruddin, I. Andriana, and A. Arisman, "The ownership structure, and the environmental, social, and governance (ESG) disclosure, firm value and firm performance: The audit committee as moderating variable," *Economies*, vol. 10, no. 12, p. 314, 2022. https://doi.org/10.3390/Economies10120314

[12] A. Gholami, J. Sands, and H. U. Rahman, "Environmental, social and governance disclosure and value generation: Is the financial industry different?," *Sustainability*, vol. 14, no. 5, p. 2647, 2022. https://doi.org/10.3390/Su14052647

[13] H. Rohendi, I. Ghozali, and D. Ratmono, "Environmental, social, and governance (ESG) disclosure and firm value: the role of competitive advantage as a mediator," *Cogent Business & Management*, vol. 11, no. 1, p. 2297446, 2024. https://doi.org/10.1080/23311975.2023.2297446

[14] Z. Liu, R. Zheng, Z. Qiu, and X. Jiang, "Stakeholders and ESG disclosure strategies adoption: The role of goals compatibility and resources dependence," *Elementa: Science of the Anthropocene*, vol. 10, no. 1, pp. 1-12, 2022. https://doi.org/10.1525/Elementa.2022.00044

[15] P. P. Momtaz and I. M. Parra, "Is sustainable entrepreneurship profitable? ESG disclosure and the financial performance of SMEs," *Small Business Economics*, pp. 1-30, 2024. https://doi.org/10.1007/S11187-024-00981-5

[16] K. Fernando, S. Nurcholifah, and A. H. Pulungan, "Disclosure of environmental, social, and governance on firm performance pre and post introduction of integrated reporting: Evidence from ASEAN countries," *International Journal of Energy Economics and Policy*, vol. 12, no. 6, pp. 377-382, 2022. https://doi.org/10.32479/Ijeep.13561

[17] M. A. Hussain, M. F. Alsayegh, and H. A. Boshnak, "The impact of environmental, social, and governance disclosure on the performance of saudi arabian companies: Evidence From the top 100 non-financial companies listed on Tadawul," *Sustainability*, vol. 16, no. 17, p. 7660, 2024. https://doi.org/10.3390/Su16177660

[18] L. Fu, D. M. Boehe, and M. O. Orlitzky, "Broad or narrow stakeholder management? A signaling theory perspective," *Business & Society*, vol. 61, no. 7, pp. 1838-1880, 2022. https://doi.org/10.1177/00076503211053018

[19] Y. Şeker and E. D. Şengür, "The impact of environmental, social, and governance (esg) performance on financial reporting quality: International evidence," *Ekonomika*, vol. 100, no. 2, pp. 190-212, 2021. https://doi.org/10.15388/Ekon.2021.100.2.9

[20] C. Del Gesso and R. N. Lodhi, "Theories underlying environmental, social and governance (ESG) disclosure: a systematic review of accounting studies," *Journal of Accounting Literature*, vol. 47, no. 2, pp. 433-461, 2025. https://doi.org/10.1108/Jal-08-2023-0143

[21] L. Li, M. M. Saat, and W. Jiayi, "The effect of esg disclosure on firm value: An empirical evidence from Chinese listed companies," *International Journal of Academic Research in Business and Social Sciences*, vol. 14, no. 1, pp. 1091-1101, 2024. https://doi.org/10.6007/Ijarbss/V14-I1/20524

[22] S. S. Rao and N. Juma, "An exploration of esg activities and firm performance of global companies during the Covid-19 pandemic," *Corporate Ownership and Control*, vol. 21, no. 4, pp. 15–27, 2024. https://doi.org/10.22495/Cocv21i4art2

[23] J. A. d. S. Grodt, L. Degenhart, C. B. D. Magro, L. V. Ávila, and Y. G. Piccinin, "ESG disclosure and pay-performance sensitivity," *Revista Contabilidade & Finanças*, vol. 35, no. 94, p. e1811, 2024. https://doi.org/10.1590/1808-057x20231811.En

[24] A. Aboud and A. Diab, "The impact of social, environmental and corporate governance disclosures on firm value: Evidence from Egypt," *Journal of Accounting in Emerging Economies*, vol. 8, no. 4, pp. 442-458, 2018. https://doi.org/10.1108/Jaee-08-2017-0079

[25] C. Zhao *et al.*, "ESG and corporate financial performance: Empirical evidence from China's listed power generation companies," *Sustainability*, vol. 10, no. 8, p. 2607, 2018. https://doi.org/10.3390/Su10082607

[26] S. Wasiuzzaman, S. A. Ibrahim, and F. Kawi, "Environmental, social and governance (ESG) disclosure and firm performance: Does national culture matter?," *Meditari Accountancy Research*, vol. 31, no. 5, pp. 1239-1265, 2023. https://doi.org/10.1108/Medar-06-2021-1356

[27] G. Giannopoulos, R. V. Kihle Fagernes, M. Elmarzouky, and K. A. B. M. Afzal Hossain, "The ESG disclosure and the financial performance of Norwegian listed firms," *Journal of Risk and Financial Management*, vol. 15, no. 6, p. 237, 2022. https://doi.org/10.3390/Jrfm15060237

[28] F. Yin, Y. Xiao, R. Cao, and J. Zhang, "Impacts of ESG disclosure on corporate carbon performance: Empirical evidence from listed companies in heavy pollution industries," *Sustainability*, vol. 15, no. 21, p. 15296, 2023. https://doi.org/10.3390/Su152115296

[29] A. Helhel, E. Akgun, and Y. Helhel, "Did esg affect the financial performance of North American fast-moving consumer goods firms in the second period of the Kyoto Protocol?," *Sustainability*, vol. 16, no. 22, p. 10009, 2024. https://doi.org/10.3390/Su162210009

[30] A. V. N. Biju, S. Geetha, S. Prasad, A. Sasidharan, and A. Jayachandran, "Esg-firm performance nexus: Evidence from an emerging economy," *Business Strategy and the Environment*, vol. 34, no. 3, pp. 3469–3496, 2025. https://doi.org/10.1002/Bse.4152

[31] B. Cheng, I. Ioannou, and G. Serafeim, "Corporate social responsibility and access to finance," *Strategic Management Journal*, vol. 35, no. 1, pp. 1-23, 2014. https://doi.org/10.1002/Smj.2131

[32] A. Y. Alodat and Y. Hao, "Environmental, social and governance (ESG) disclosure and firm performance: Moderating role of board gender diversity and sustainability committee," *Sustainable Development*, vol. 33, no. 1, pp. 636-651, 2025. https://doi.org/10.1002/Sd.3126

[33] D. Darsono, D. Ratmono, A. Tujori, and T. Y. Clarisa, "The relationship between ESG, financial performance, and cost of debt: the role of independent assurance," *Cogent Business & Management*, vol. 12, no. 1, p. 2437137, 2025. https://doi.org/10.1080/23311975.2024.2437137

[34] E. A. Firmansyah, U. H. Umar, and R. S. Jibril, "Investigating the effect of ESG disclosure on firm performance: The case of Saudi Arabian listed firms," *Cogent Economics & Finance*, vol. 11, no. 2, p. 2287923, 2023. https://doi.org/10.1080/23322039.2023.2287923

[35] A. K. Burki, M. N. A. Mafaz, Z. Ahmad, A. Zulfaka, and I. al-Amatullah, "The impact of esg disclosures on financial performance: Evidence from asean-listed companies," *American Journal of Economic and Management Business*, vol. 3, no. 10, pp. 357-368, 2024. https://doi.org/10.58631/Ajemb.V3i10.120

[36] G. Friede, T. Busch, and A. Bassen, "ESG and financial performance: Aggregated evidence from more than 2000 empirical studies," *Journal of Sustainable Finance & Investment*, vol. 5, no. 4, pp. 210-233, 2015. https://doi.org/10.1080/20430795.2015.1118917

[37] L. E. Papke and J. M. Wooldridge, "A simple, robust test for choosing the level of fixed effects in linear panel data models," *Empirical Economics*, vol. 64, no. 6, pp. 2683-2701, 2023.

[38] D. Roodman, "How to do xtabond2: An introduction to difference and system GMM in Stata," *The Stata Journal*, vol. 9, no. 1, pp. 86-136, 2009. https://doi.org/10.1177/1536867x0900900106

[39] A. Hamdouni, "The nexus between corporate governance improvements, corporate investment and value creation: Evidence From Shariah-Compliant Companies," *International Journal of Innovative Research in Science, Engineering and Technology*, vol. 8, no. 2, pp. 321–328, 2025. https://doi.org/10.53894/Ijirss.V8i2.5159