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Does Corporate Sustainability Shape Audit Opinion? The Moderating Role of Audit Committee Independence

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Abstract

Audit opinion, as the most important output of the audit process, reflects the independent auditor's professional judgment regarding the fair presentation of financial statements and plays a decisive role in stakeholders' decision-making. In this regard, corporate sustainability performance, which reflects an entity's attention to Environmental, Social, and Governance (ESG) dimensions, can be considered as a criterion for assessing the quality of financial reporting and risk management. On the other hand, audit committee independence, as one of the pillars of corporate governance, provides effective oversight of financial and auditing processes. This study aims to analyze the potential role of corporate sustainability performance and audit committee independence in shaping audit opinions. Therefore, the objective of this study is to determine the impact of corporate sustainability performance on audit opinion with regard to the role of audit committee independence in companies listed on the Tehran Stock Exchange. To achieve this objective, two hypotheses were developed. To test these hypotheses, using the systematic elimination method, a sample consisting of 150 companies listed on the Tehran Stock Exchange was selected during the period from 2019 to 2024. This study is applied in nature, and the research models were estimated using multiple regression analysis. The findings indicate that corporate sustainability performance has a negative and significant effect on qualified audit opinions. Furthermore, audit committee independence strengthens the effect of corporate sustainability performance on qualified audit opinions.

Keywords: Audit opinion, Corporate sustainability performance, Audit committee independence.

1| Introduction

Stakeholders of financial information require access to financial information to make and implement their economic decisions. A prerequisite for such access is ensuring the accuracy, transparency, and reliability of

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this information; therefore, stakeholders use available and common tools within financial information control systems, such as independent auditing, to achieve this assurance [1]. Auditing is a systematic process conducted with the aim of enhancing the reliability of financial information and reducing uncertainty among investors and other stakeholders [2]. Independent auditors express their opinions in the form of audit opinions by applying professional standards and audit evidence. Audit opinions can be presented in four forms: Unqualified, qualified, adverse, and disclaimer of opinion [3]. Among these, a qualified opinion is issued when the financial statements contain material misstatements or when there is a limitation on the scope of the auditor's examination; however, these issues are not sufficiently severe to result in a complete rejection of the financial statements. Therefore, although a qualified opinion indicates the existence of weaknesses or uncertainties in financial reporting, it can also be considered an indication of the need for companies to improve the quality of their internal control systems and reporting processes [4]. In recent years, auditing literature has shown that audit risk assessment is no longer limited solely to traditional financial indicators, and auditors increasingly use companies' non-financial information in their professional judgments. In particular, the quality of reporting on social, environmental, and governance responsibilities is considered an indicator of the overall quality of control systems and corporate governance and can influence auditors' perceptions of the risk of material misstatements [5].

Corporate sustainability performance, measured through Environmental, Social, and Governance (ESG) indicators, reflects an organization's commitment to responsible resource management and stakeholder engagement and has consequences beyond economic outcomes, including governance implications [5]. Within this framework, the environmental dimension includes actions such as reducing emissions, conserving energy consumption, and managing industrial waste, which indicate the integration of environmental risks into the company's strategic processes [6]. The social dimension refers to the organization's behavior toward employees, stakeholders' rights, and participation in community development, representing the level of corporate accountability and responsibility [7]. The governance dimension also encompasses transparency in management structures, accountability, and the existence of effective control mechanisms, reflecting the quality of the monitoring structure [5]. Strong corporate sustainability performance is generally associated with improved financial reporting quality because transparency and accountability requirements toward stakeholders increase the level of information disclosure and assist auditors in obtaining reliable evidence; consequently, the likelihood of issuing a qualified opinion decreases [4]. Moreover, improved sustainability performance, particularly in the corporate governance dimension, reduces audit risk and limits the tendency to issue modified opinions through strengthening internal controls, reducing earnings manipulation, and enhancing the quality of accounting systems [6]. On the other hand, the social and environmental dimensions of sustainability performance, by creating a positive reputation and increasing accountability pressures, reduce management's incentives to provide incomplete or misleading reports and indirectly enhance auditors' confidence [3]. Therefore, corporate sustainability performance can be considered an effective factor in reducing audit risk and increasing the likelihood of receiving an unqualified audit opinion.

Given that auditors' judgments and opinions depend on the quality of monitoring systems and controls governing the financial reporting process, accounting literature emphasizes that the audit committee, as one of the key pillars of corporate governance, can influence risk assessment through effective oversight of the reporting process and interaction with the independent auditor [5], [8]. The audit committee is a monitoring body within the corporate governance structure that oversees the financial reporting process, internal controls, and interactions with the independent auditor. Audit committee independence means that members are separate from executive management and their interests are aligned with those of shareholders; the outcome of such independence is strengthened oversight, reduced managerial bias, and improved quality of evidence and disclosures in financial reporting. Empirical evidence indicates that the higher the proportion of independent members on the audit committee, the lower the likelihood of significant internal control deficiencies and the higher the quality of financial reporting [9].

Furthermore, audit committee independence and appropriate composition are associated with fewer errors and subsequent financial statement adjustments, which indicate improved reporting quality and more effective

oversight [8]. Research evidence shows that stronger corporate sustainability performance across ESG dimensions reduces auditors' perceived risk through enhancing transparency and financial reporting quality, thereby decreasing the likelihood of receiving a qualified opinion [3], [4]. In this context, an independent audit committee limits information uncertainties affecting auditors' judgments by strengthening oversight of disclosures, improving the reliability of documentation, and integrating sustainability information with financial reporting [9]. Moreover, audit committee independence reduces the occurrence of material misstatements and scope limitations by enhancing internal controls and mitigating managerial opportunistic behavior, thereby lowering the probability of issuing a qualified opinion [8]. Overall, audit committee independence makes the signals arising from strong sustainability performance more credible to auditors and strengthens the negative effect of sustainability performance on the likelihood of receiving a qualified audit opinion [4], [5], [10].

The objective of this study is to extend the literature on sustainability performance and financial information quality by examining the impact of sustainability performance on the likelihood of issuing a qualified audit opinion by auditors and how audit committee independence complements this relationship. Most studies in this field have focused on developed markets, where unlike emerging economies, fewer limitations exist in measuring sustainability performance. Over the past few years, Iranian companies have begun to comply with sustainability performance regulations (ESG practices) and have shifted their strategies toward more sustainable activities. However, the impact of sustainability performance on audit opinions remains an issue that has received limited attention. This study provides more tangible evidence on this issue by quantifying a broader dataset of sustainability information, including social responsibility performance, environmental performance, and governance performance.

In addition, the present study examines how audit committee independence affects the relationship between sustainability performance and audit opinion, as independent auditors are directly involved in assuring financial and non-financial information and, therefore, play a role in managing corporate reporting and information risk. Furthermore, previous studies have examined several audit committee characteristics (such as committee size, expertise, and meeting frequency) as factors affecting social responsibility, environmental and governance performance, and audit efforts; however, this is the first study in the literature to provide inferences regarding the moderating role of audit committee independence in the relationship between sustainability performance and qualified audit opinions, thereby expanding evidence regarding the role of independent auditors in Iranian companies. Examining the impact of corporate sustainability performance on audit opinion while considering the role of audit committee independence can contribute to a better understanding of the interaction between corporate governance, ESG responsibility, and financial reporting quality. This issue is not only significant from an academic perspective but can also provide guidance for policymakers, regulatory bodies, and investors in enhancing transparency and trust in financial markets. In the following sections, the theoretical foundations and research background are first presented, followed by the research hypotheses, hypothesis testing procedures, and the research population and sample. Finally, the findings and results of the study are presented.

2 | Literature Review

In the current business environment, due to the increasing number of professional investors, companies' non-financial performance has received growing attention. Professional investors believe that corporate profitability alone is not sufficient for long-term growth [11]. Corporate sustainability has been present in the corporate world for more than three decades and has now evolved into an important corporate strategy that encompasses various dimensions of corporate activities, including environmental and social responsibilities. A corporate activity is considered sustainable if it is socially and environmentally justifiable, conducted ethically, and creates economic value while complying with existing laws and regulations [12], [13]. According to this broad definition, sustainability performance refers to the assessment of companies' ability to achieve specific objectives and performance indicators across various dimensions (and sub-dimensions) of social and environmental activities. Over the years, sustainability activities and performance have grown exponentially,

as CEOs, international organizations, and other stakeholders have become key actors in sustainability practices and frameworks [5].

Within this framework, there has been a long-standing debate in the accounting literature regarding corporate sustainability performance and financial reporting quality. A stream of this literature suggests that sustainability is positively associated with accounting quality because corporate sustainability reduces agency problems by minimizing managers' incentives to exercise accounting discretion over financial reports to achieve personal benefits [14], [15]. Existing studies on this issue argue that companies investing their resources in sustainability activities are more ethical, honest, and trustworthy in their daily operations [16]. A qualified audit opinion is also considered an indicator of financial reporting quality because a qualified audit report signals irregularities in a company's financial statements arising from the misstatement of financial figures, violations of accounting standards, and other forms of misleading corporate reporting that auditors are required to communicate to shareholders and other users of financial statements [17]. A qualified opinion refers to the expression of specific concerns by the auditor (related to the application of accounting standards or accounting procedures) that may have a significant impact on the reliability and transparency of financial reports [5].

Companies with superior sustainability performance (social, environmental, and governance) are less likely to receive modified audit opinions. These arguments are justified by the fact that when auditors encounter difficulties in assessing the transparency or reliability of financial reports, they rely on additional evidence indicating the integrity of management activities. Sustainability performance provides such information regarding managerial integrity, which may reduce the threshold for issuing modified audit opinions. In contrast, companies with environmentally risky behaviors are associated with lower levels of managerial ethics, a condition that increases auditors' concerns. In other words, sustainability information represents a critical non-financial input for assurance activities [18], [19]. Sustainability performance is a resource that provides value-relevant information and, consequently, reduces information asymmetry between reporting companies and their external auditors. A reduction in information asymmetry may enable auditors to perform more comprehensive and accurate audit procedures and achieve a more informed assessment of client risk, a factor that can influence or even improve their judgments.

In other words, auditors are less likely to issue qualified audit opinions when auditing companies with improved sustainability performance [5]. Therefore, it is expected that corporate sustainability performance reduces qualified audit opinions. One of the ways shareholders gain confidence in financial statements is through the auditor's opinion. If the auditor provides a report in accordance with management's preferences, it may have negative consequences for the company and result in losses for shareholders.

In this regard, the audit committee, as one of the corporate governance mechanisms, can potentially prevent the issuance of a qualified audit opinion [20]. Audit committees are among the most important mechanisms of effective corporate governance because they improve board oversight, reduce information asymmetry among company members, enhance accounting quality, and assist external auditors in their work [21], [22]. One of the specific characteristics of audit committees that has attracted the attention of researchers and regulatory bodies is audit committee independence [23]. This characteristic refers to the composition and functioning of the audit committee, including the presence of a significant number of external (non-executive) members. When audit committees work with independent directors, they are more likely to exercise greater control over management to provide more transparent and reliable information to the public and even evaluate internal control practices and policies more effectively [24]. Since the audit committee is responsible for expressing its opinion on the reliability of financial and non-financial information (and compliance with accounting standards), independence is an essential qualitative characteristic for achieving this objective. The American Institute of Certified Public Accountants [23] emphasized the importance of audit committee independence in effectively performing its monitoring role over financial reporting because when audit committee members are independent, it becomes more difficult for managers to reject adjustments or corrections to financial statements proposed by external auditors. This means that published financial

statements contain fewer material misstatements and the likelihood of receiving a qualified audit opinion decreases [5]. Therefore, it is expected that companies with more independent audit committees, considering their sustainability performance, will have a lower probability of receiving qualified audit opinions.

Accordingly, considering the importance of the above issues, the objective of this study is to answer the following questions: What is the effect of corporate sustainability performance on audit opinion among companies listed on the Tehran Stock Exchange? What is the effect of audit committee independence on the relationship between corporate sustainability performance and audit opinion among companies listed on the Tehran Stock Exchange?

3 | Research Background

Dimitropoulos [5] conducted a study entitled “corporate sustainability performance and audit opinion: the role of audit committee independence” during the years 2003 to 2019 using data from 144,317 firm-year observations of listed companies from 24 European Union countries using logistic regression. The results indicated that companies with higher sustainability performance are less likely to receive qualified audit opinions. In addition, this negative relationship is moderated by audit committee independence.

Karim et al. [25] conducted a study entitled “audit committee characteristics and corporate sustainability performance” during the years 2011 to 2023 using data from 266 publicly listed banks in Bangladesh through the Generalized Method of Moments (GMM) regression. The results showed that larger audit committees contribute to strategic oversight and the effectiveness of corporate sustainability performance. Independent audit committee members also enhance transparency, accountability, and alignment with sustainability objectives. However, frequent audit committee meetings are negatively associated with performance, suggesting that excessively frequent meetings may lead to inefficiency in corporate sustainability performance rather than improving oversight.

Al-Hamoudi [26] conducted a study entitled “the impact of audit committee characteristics on financial reporting quality using modified audit opinions” during the years 2019 to 2022 using data from 292 non-financial listed companies in Saudi Arabia using panel-data regression. The results indicated that among audit committee characteristics (independent audit committee members, financial expertise of the audit committee, number of meetings, and audit committee size), only audit committee financial expertise has a significant effect on financial reporting quality measured by qualified audit opinions. Audit committee independence, number of meetings, and size do not have a significant effect on qualified audit opinions.

Florea and Burcă [27] conducted a study entitled “the impact of audit committee independence and expertise on sustainability performance reporting” during the years 2019 to 2022 using data from 224 publicly listed companies operating in the global automobile and truck manufacturing sector using linear regression. The results showed that audit committee independence has a positive and significant effect on sustainability performance reporting. Furthermore, audit committee expertise has a positive and significant effect on sustainability performance reporting.

Diab and Issa [3] conducted a study entitled “sustainability performance, auditor selection, and audit opinion” during the years 2014 to 2022 using data from 68 listed companies on the Egyptian Stock Exchange using multiple and logistic regression. The results showed that companies with higher sustainability performance indicators are more likely to select one of the large audit firms and are less likely to receive qualified audit opinions.

Wang et al. [4] conducted a study entitled “how does corporate sustainability performance affect audit opinion issuance? the moderating role of auditor experience” during the years 2009 to 2020 using data from 28,645 firm-year observations of listed companies on the Chinese stock exchanges using logistic regression. The results indicated that better sustainability performance reduces the likelihood of receiving modified audit opinions from auditors. Examination of auditor experience showed that inexperienced auditors rely more heavily on corporate sustainability performance information when making audit opinion decisions.

Zheng et al. [28] conducted a study entitled “the impact of corporate sustainability performance on audit opinions” during the years 2009 to 2021 using data from 27,238 firm-year observations of listed companies on the Chinese stock exchanges using logistic regression. The results showed that higher corporate sustainability performance ratings are associated with lower corporate risk and a greater likelihood of receiving standard unqualified audit opinions. In other words, corporate sustainability performance affects audit opinions by reducing corporate risk factors.

Al-Kilani et al. [29] conducted a study entitled “the impact of audit committee characteristics on modified audit opinions” during the years 2012 to 2017 using data from 117 companies listed on the oman stock exchange through logistic regression. The results showed that audit committee expertise reduces the likelihood of companies receiving modified audit opinions. However, audit committee independence, size, and number of meetings do not have a significant effect on modified audit opinions.

Mahdavi and Hasili [30] conducted a study entitled “the moderating effect of audit committee members’ characteristics on the relationship between fraudulent financial reporting and sustainability reporting” during the years 2013 to 2023 using data from 1,243 firm-year observations of companies listed on the Tehran Stock Exchange using panel-data regression. The results showed that increasing the number of female members in the audit committee, increasing audit committee size, and greater independence of audit committee members enhance sustainability reporting, thereby reducing fraudulent reporting and improving financial reporting quality.

Hekmat et al. [31] conducted a study entitled “investigating the role of corporate social responsibility and fraud probability on auditor opinion type and the number of audit report paragraphs” during the years 2013 to 2022 using data from 130 companies using fixed-effects panel regression. The results indicated that corporate social responsibility, by strengthening the monitoring environment of companies, leads to the issuance of unqualified audit opinions. Moreover, fraud probability has a positive and significant effect on modified audit opinions. The results also showed that fraud probability has a positive and significant effect on the number of qualified audit report paragraphs.

Zamani et al. [32] conducted a study entitled “the role of audit committee characteristics in corporate sustainability reporting” during the years 2016 to 2021 using data from 228 companies using multiple regression. The results showed that audit committee independence, size, and expertise have a positive and significant effect on corporate sustainability reporting.

Abgineh et al. [33] conducted a study entitled “investigating the effect of environmental information disclosure level on modified audit opinions in companies listed on the Tehran Stock Exchange” during the years 2016 to 2020 using data from 170 companies using generalized least squares regression. The results showed that higher levels of environmental information disclosure are associated with unmodified (unqualified) audit opinions, whereas lower levels of environmental information disclosure are associated with modified (non-standard) audit opinions.

Valizadeh Larijani and Shokati Zalouabi [34] conducted a study entitled “the role of audit committee in corporate sustainability reporting” during the years 2014 to 2019 using data from companies listed on the Tehran Stock Exchange using panel-data regression. The results indicated that audit committee expertise, audit committee size, and audit committee independence have a positive and significant relationship with the level of sustainability reporting disclosure.

Tavangar Hamzeh Kalaei and Skaffi asl [35] conducted a study entitled “investigating the relationship between audit committee characteristics and modified audit opinions considering the moderating role of CEO power” during the years 2014 to 2018 using data from 143 companies listed on the Tehran Stock Exchange using logistic regression. The results showed that financial expertise and independence have a positive and significant relationship with modified audit opinions. Furthermore, there is a positive and significant relationship between audit committee financial expertise and independence and modified audit opinions considering the moderating role of CEO power.

Masoumi et al. [36] conducted a study entitled “the moderating effect of audit committee independence on the relationship between sustainability reporting level and corporate innovation” during the years 2013 to 2017 using data from 130 companies listed on the Tehran Stock Exchange using multiple regression. The results showed a positive and significant relationship between sustainability reporting level and corporate innovation. Moreover, audit committee independence has a moderating effect on the relationship between sustainability reporting level and corporate innovation.

Sedighi and Mahannejad [37] conducted a study entitled “investigating the relationship between audit committee characteristics, auditor opinion type, and audit fees in companies listed on the Tehran Stock Exchange” during the years 2012 to 2015 using data from 79 companies using multiple and logistic regression. The results showed no significant relationship between modified audit opinions, the proportion of non-executive directors, and the proportion of financial experts on the audit committee. The results also indicated that there is no significant relationship between modified audit opinions and audit fees.

4 | Methodology

The present study is applied because it examines a specific and practical relationship in the field of auditing and corporate reporting by using real data from listed companies and measurable variables. The findings of this study can be used directly to explain auditor behavior and corporate governance mechanisms in practice. This study is library-based, and the required information was collected by reviewing reliable scientific sources, including articles, theses, specialized books, and organizational reports. The required data for this study, including financial information and financial statements of companies listed on the Tehran Stock Exchange, were collected from the official website of the Securities and Exchange Organization of Tehran and Novin software.

The statistical population of this study includes all companies listed on the Tehran Stock Exchange from 2019 to 2024. The systematic elimination method was used for sample selection, in which companies meeting the following criteria were selected as the final sample:

- I. Their fiscal year ends at the end of March each year and they have not changed their fiscal year.
- II. They are not among companies operating in the banking, leasing, credit institution, investment, and holding sectors due to their different financial structures and reporting characteristics.
- III. They were listed on the stock exchange before 2019 due to the availability of sufficient prior information.
- IV. They did not experience trading suspensions of more than six consecutive months during the research period (2019–2024).
- V. Their financial information is completely and transparently available.

Considering the applied conditions and limitations and using the systematic elimination method, a total of 150 companies were selected as the research sample from among the companies listed on the Tehran Stock Exchange.

To test the research hypotheses, logistic regression was used, which consists of two main stages. First, the classical assumptions of regression, such as multicollinearity (through the Variance Inflation Factor (VIF)), were examined. Due to the nature of the logistic regression model, there is no need to perform the Chow (F-Limer) and Hausman tests. Then, to evaluate the overall validity of the models and the significance of the hypotheses, the Likelihood Ratio (LR) test and McFadden's coefficient were used to assess model fit and the explanatory power of independent variables. In addition, the Breusch–Godfrey test was applied to ensure the absence of autocorrelation among variables. The collected data were processed in Microsoft Excel, and EViews 10 software was used to extract the final results.

5 | Research Models and Variables

Based on the study by Dimitropoulos et al. [5], logistic regression based on panel data is used to test the research hypotheses according to *Models (1)* and *(2)*.

$$QUAL_{it} = \beta_0 + \beta_1 SUST_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 ROA_{it} + \beta_5 GROWTH_{it} + \varepsilon_{it} \quad (1)$$

First Hypothesis:

Where: $QUAL_{it}$: Audit opinion of company i in year t ; $SUST_{it}$: Sustainability performance of company i in year t ; $SIZE_{it}$: Firm size of company i in year t ; LEV_{it} : Financial leverage of company i in year t ; ROA_{it} : Return on Assets (ROA) of company i in year t ; $GROWTH_{it}$: Sales growth of company i in year t . If the coefficient β_1 is negative and statistically significant at the 95% confidence level, the first research hypothesis will not be rejected. Second Hypothesis:

$$QUAL_{it} = \beta_0 + \beta_1 SUST_{it} + \beta_2 AUDC_IND_{it} + \beta_3 SUST_{it} * AUDC_IND_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 GROWTH_{it} + \varepsilon_{it}, \quad (2)$$

Where: $AUDC_IND_{it}$: Audit committee independence of company i in year t . If the coefficient β_3 is negative and statistically significant at the 95% confidence level, the second research hypothesis will not be rejected.

5.1 | Dependent Variable

The dependent variable of the present study is audit opinion ($QUAL$). Based on the studies by Dimitropoulos et al. [5] and Afsai et al. [38], audit opinion is a dummy variable that equals one if the company has received a qualified audit opinion due to accounting errors, non-compliance with relevant accounting standards, or both, and equals zero otherwise.

5.2 | Independent Variable

The independent variable of the present study is corporate sustainability performance ($SUST$). In this study, to measure the independent variable, the weighted model for assessing the level of environmental, social, and corporate governance reporting under the conditions of the Iranian capital market, developed through an expert survey in the study of Fakhari et al. [39], is used. In this regard, content analysis of board of directors' activity reports is employed. Furthermore, the disclosure score of each indicator is calculated based on the average score of the criteria related to that indicator. Disclosure items generally include 86 criteria across 30 indicators, which are presented in *Table 1*. The score assigned to each criterion is as follows:

- I. If the disclosed items are quantitative or their details are presented through comprehensive descriptions, images, charts, or tables, the disclosure score is 1.
- II. If the disclosed items are non-quantitative and their details are provided in the form of explanations of one or two sentences, the disclosure score is 0.5.
- III. If the information is not disclosed, the disclosure score is zero.

Accordingly, using the aforementioned research checklist and through content analysis of board of directors' reports, the score of each indicator is determined and, by incorporating these scores into the weighted model, the environmental, social, and corporate governance reporting score of companies is calculated. Content analysis is a textual coding method that categorizes information into different groups based on predetermined criteria and is widely applied in research related to non-financial reporting. The weighted model used in this study is presented in below Equation:

$$ESG = \frac{0}{337}E + \frac{0}{388}S + \frac{0}{275}G.$$

Table 1. Indicators underlying the dimensions of sustainability performance [39].

Dimensions	Indicators	Evaluation Criteria
Environmental dimensions	Environmental risk assessment	1-Disclosure of potential risks of company activities to human health and the environment
	Environmental training	2-Disclosure of employee training for environmentally responsible production and reduction of adverse impacts (in terms of hours or costs) 3-Disclosure of customer training for environmentally responsible consumption and reduction of adverse impacts (in terms of hours or costs) environmental transparency
	Environmental transparency	4-Disclosure of environmental reporting in a separate section 5-Disclosure of the company's future environmental policies
	Climate change	6- Actions taken to reduce the impact of activities on climate change
	Biodiversity	7- Disclosure of strategies for managing impacts on biodiversity and natural resources 8- Disclosure of actions taken to reduce negative impacts, prevent or remedy damages through land, soil, and forest restoration, green space development, etc.
	Emissions, pollution, and waste	9- Disclosure of total waste, classification as hazardous and non-hazardous, and proper disposal methods 10- Disclosure of pollution levels 11- Disclosure of actions taken to reduce greenhouse gas, toxic, and other emissions
	Environmental management system	12- Disclosure of obtaining Environmental Management System (EMS) compliance certifications (ISO 14000, ISO 26000) 13- Disclosure of awards received for compliance with environmental issues
	Energy and water efficiency	14- Energy and water consumption by source and amount 15- Amount of energy and water saved due to improvements in company processes 16- Company activities to reduce water and energy consumption 17- Amount of renewable energy and water used for environmental purposes
Social dimensions	Environmental issues of products, services, and supply chain	18- Disclosure of company activities to address environmental issues from the perspective of customers, consumers, supply chain, and third parties, including organizing or participating in environmental conferences and related activities
	Socially responsible investment	19- Disclosure of capital market-based strategies and community-based strategies, such as investing in companies that comply with environmental issues or social institutions, or excluding shares of companies that do not comply with social issues from the portfolio 20- Social risk management, such as periodic medical examinations, vaccination, life insurance, accident insurance, unemployment insurance, etc.

Table 1. Continued [39].

Dimensions	Indicators	Evaluation Criteria
Social dimensions	Social learning and training	21- Disclosure of total training hours, description of training activitiesGTFFFFF, or training costs for the entire workforce, etc.
	Social transparency	22- Disclosure of social performance reporting in a separate section 23- Presentation of future social health policies
	Production health	24- Disclosure of production health laws, regulations, and voluntary principles 25- Number of working hours lost due to accidents or total number of accidents 26- Actions taken to reduce harmful workplace factors
	Social issues of customers and supply chain	27- Disclosure of customer privacy protection 28- Warranty and after-sales services 29- Number of customer complaints received or amount of compensation paid 30- Disclosure of procedures related to supplier selection 31- Provision of product specifications, quality, durability, and safety
	Brand protection and anti-competitive behavior	32- Disclosure of trade agreements with competitor companies 33- Disclosure of information regarding company product development, research projects for production improvement, or Research and Development (R&D) expenditures
	Labor rights	34- Disclosure of salary, wage amounts, and other benefits 35- Number of employee recruitment and turnover or workforce composition chart 36- Disclosure of employee complaints and compensation payments to employees 37- Flexible work arrangements and welfare activities for employees and their families, such as trips, recreational programs, gifts, etc.
	Health, safety, and productivity	38- Disclosure of occupational health and safety standards 39- Total employee and contractor injuries and fatalities, type and severity of injuries 40- Labor productivity
	Compliance with human rights principles	41- Child labor, support for working and street children 42- Compliance with voluntary human rights principles
	Social development and philanthropy	43- Disclosure of financial contributions to support social activities, recruit interns, establish relationships with universities, and provide assistance to charities, mosques, schools, hospitals, etc. 44- Financial contributions to victims of natural disasters and foreign countries, etc.
	Stakeholders' social perception	45- Establishment of labor unions and cooperatives 46- Feedback and suggestion system 47- Measurement of customer and employee satisfaction levels, etc.
	Non-discrimination and social inclusion	48- Disclosure of policies and procedures for recruitment, employment, compensation, and rewards, etc. 49- Disclosure of employee classification by age, gender, and membership in minority groups 50- Disclosure of employee bonus amounts and employee performance compensation methods

Table 1. Continued [39].

Dimensions	Indicators	Evaluation Criteria
Governance dimensions	Investment risk management	51- Disclosure of company actions for managing investment risks, including diversification, etc.
	Monitoring actions and risk management	52- Disclosure of internal control reports 53- Disclosure of audit reports 54- Disclosure of Enterprise Risk Management (ERM) framework
	Governance transparency	55- Disclosure of corporate governance in a separate section 56- Disclosure of future governance policies 57- Disclosure of related party transactions 58- Disclosure of market presence and organizational culture, etc.
	Board composition	59- Disclosure of duality 60- Industrial and financial experience 61- Number of board of directors meetings 62- Attendance rate of board members at meetings 63- Presence of women on the board of directors 64- Number of years of board membership 65- Executive or non-executive status 66- Number of meetings of non-executive committee directors
	Committees	67- Disclosure of the number of committees 68- Number of committee meetings 69- Disclosure of the risk committee 70- Audit committee 71- Nomination and performance compensation committee 72- CG, CSR, and ESG committees 73- Disclosure of independent directors of each committee 74- Auditor selection process, replacement, and performance compensation fees
	Performance compensation	75- Disclosure of the amount of directors' salaries and bonuses 76- Disclosure of directors' compensation plans and other benefits 77- Qualitative and quantitative factors for evaluating directors' performance
	Compliance with regulations	78- Disclosure of compliance with relevant commercial and legal regulations 79- Legal disputes or anticipated litigation of the company, ethics and corruption, etc.
	Ethics, corruption, and code of conduct	80- Disclosure of codes, regulations, and ethical charters 81- Disclosure of company actions to prevent and combat corruption 82- Professional ethics training
	Shareholders' rights compliance	83- Disclosure of proposed dividend distribution to shareholders 84- Disclosure of articles of association 85- Disclosure of contact information, electronic address, and shareholder relations officer 86- Disclosure of guidelines for company share ownership by directors, etc.

5.3 | Moderating Variable

The moderating variable of the present study is audit committee independence (AUDC_IND). Based on the studies by Dimitropoulos et al. [5] and Shamseddini et al. [20], audit committee independence is measured as the ratio of non-executive (independent) audit committee members to the total number of audit committee members. An independent member is defined, according to Article 1, Clause 1 of the Audit Committee Charter, as a member who has no direct or indirect relationship or interest that may affect their independent

decision-making, cause bias toward the interests of a particular individual or group of shareholders or other stakeholders, or result in failure to observe the equal interests of shareholders.

5.3.1 | Control variables

The control variables of the present study include firm size, financial leverage, ROA, and sales growth. Firm Size (SIZE): Natural logarithm of total assets. Financial Leverage (LEV): Ratio of total liabilities to total shareholders' equity. ROA: Ratio of net profit to total assets. Sales Growth (GROWTH): Change in current year's net sales compared with the previous year.

6 | Findings

6.1 | Descriptive Statistics

The mean is one of the most important measures of central tendency. The value of the mean indicates that the data are centered around this number. As observed in *Table 3*, the mean corporate sustainability performance is 4.958, indicating that, on average, the level of sustainability activities and disclosures among the sample companies is approximately 5. This finding suggests that companies are reasonably active in the field of sustainability. The median indicates that half of the data are below the median value and half are above it. The median value is 4.901, which shows that half of the companies have sustainability performance above this level and the other half have lower levels; therefore, the distribution of sustainability performance among companies is relatively balanced. The minimum value of this variable is zero, indicating that some companies have not provided any sustainability performance or reporting, while the maximum value is 11.321, which represents the strong sustainability performance of some companies. One of the most important dispersion indicators, which is a desirable condition for including a variable in the regression model, is the standard deviation.

As shown in *Table 4*, the standard deviation of the sustainability performance variable is 1.874, indicating that the dispersion of sustainability performance among companies is considerable and that companies differ significantly in terms of sustainability activities and reporting. Since the skewness parameter indicates the degree of asymmetry of the frequency distribution curve of a variable, a skewness coefficient equal to zero represents a completely symmetric distribution. A positive coefficient indicates right-skewness, while a negative coefficient indicates left-skewness. The skewness value of this variable is 0.422, indicating a mildly positively skewed distribution. This means that the data are concentrated at lower values, although a limited number of companies have very high sustainability performance.

The mean value of audit committee independence is 0.744, meaning that, on average, approximately 74% of audit committee members in the sample companies are independent. This indicates a relatively desirable level of structural independence among most companies. The median value of this variable is 0.666, showing that independent audit committee members constitute more than 66% in half of the companies, while in the other half this proportion is lower. The minimum value of this variable is zero, indicating that some companies have no independent members in their audit committees, whereas the maximum value is one, showing that some companies have completely independent audit committees in which all members are independent. The standard deviation of this variable is 0.189, indicating a moderate level of dispersion in audit committee independence among companies.

In other words, companies do not have the same level of independence, but the differences are not extremely large. The skewness value of this variable is -0.671, indicating a negatively skewed distribution. This suggests that the distribution is concentrated toward higher values, meaning that most companies have relatively high audit committee independence; however, a small number of companies with very low independence contribute to the skewness of the distribution.

Table 2. Frequency and frequency percentage description of dummy variables.

Variable Name	Variable Symbol	Total Observations	Status	Frequency	Frequency Percentage
Audit opinion	QUAL	900	Observations with value one	300	0.34
			Observations with value zero	600	0.66

Table 3. Descriptive statistics of research variables.

Variable Name	Variable Symbol	Mean	Median	Max	Min	S.D	Skewness
audit opinion	QUAL	0.333	0	1	0	0.471	0.707
Sustainability performance	SUST	4.958	4.901	11.321	0	1.874	0.422
Audit committee independence	AUDCIND	0.744	0.666	1	0	0.189	-0.671
Firm size	SIZE	16.403	16.267	22.216	12.031	1.708	0.678
Financial leverage	LEV	0.467	0.462	0.994	0.017	0.208	0.106
Return on assets	ROA	0.215	0.205	0.681	0.0001	0.147	0.537
Sales growth	GROWTH	0.562	0.482	3.785	-0.909	0.516	2.144

6.2 | Inferential Data Analysis

To analyze the data of each of the specified models, the classical assumptions of the model must be tested before processing the data and testing the hypotheses. Note: Since the regression method used in this study is logistic regression, there is no need to perform the F-Limer, Hausman, and homoscedasticity tests.

6.2.1 | Multicollinearity test

To examine multicollinearity among variables, the VIF test was used. As shown in *Table 4*, since the VIF values for the research variables are less than 10, there is no evidence of multicollinearity.

Table 4. Results of the multicollinearity test.

Variable Symbol	VIF Model 1	VIF Model 2
SUST	1.010	2.648
AUDCIND	-	2.078
SUST*AUDCIND	-	2.523
SIZE	1.019	1.020
LEV	1.282	1.285
ROA	1.318	1.319
GROWTH	1.042	1.046

6.2.2 | Autocorrelation Test

In this study, the Breusch–Godfrey statistic was used to examine serial autocorrelation related to the research hypothesis. If the Breusch–Godfrey statistic is less than 0.05, it indicates the presence of autocorrelation, and to correct it, the first or second lag should be included in the final estimated model.

Table 5. Results of the autocorrelation test.

Result	Sig.	Test Name	Classical Assumption	Model
No autocorrelation	0.000	Breusch–Godfrey	Absence of autocorrelation	First
No autocorrelation	0.000	Breusch–Godfrey	Absence of autocorrelation	Second

As shown in *Table 5*, the Breusch–Godfrey statistic is less than the 5% significance level, indicating the presence of serial autocorrelation among the variables. Accordingly, this issue was corrected in the final estimation of the models by incorporating the first-order lag.

6.3 | Results of the Research Models

After conducting the required statistical tests, the final estimation results of the research models are presented to determine the appropriateness of the data for analysis and to ensure the validity of the fitted models.

6.3.1 | Results of the first research model

The LR statistic in logistic regression is used to test the overall significance of the model. This statistic compares the goodness-of-fit of the full model (including all independent variables) with that of the restricted model (containing only the intercept). If the probability value associated with the LR statistic is very small (e.g., 0.000), it indicates that the full model explains the data significantly better than the model without explanatory variables. In other words, at the 99% confidence level, it can be concluded that the independent variables, taken together, have a statistically significant effect on the probability of the dependent variable occurring. Therefore, a significant LR statistic indicates that the logistic regression model provides an adequate overall fit and that the relationships between the independent variables and the probability of the event under investigation are statistically reliable. According to the results presented in *Table 6*, the significance level of the LR statistic is 0.000, indicating that, at the 99% confidence level, the independent variables have a statistically significant effect on the probability of the dependent variable occurring. Therefore, the model is statistically valid. McFadden's pseudo R-squared is a measure of the goodness-of-fit of a logistic regression model and plays a role similar to the coefficient of determination (R^2) in linear regression, although its numerical interpretation differs. This statistic indicates the extent to which the fitted model improves upon the intercept-only model. A value of 0.338 implies that the logistic model achieves approximately a 33.8% improvement in model fit relative to the baseline model. In logistic regression, McFadden's pseudo R-squared values ranging from 0.20 to 0.40 are generally considered indicative of an excellent model fit. Therefore, the obtained value of 0.338 suggests that the estimated model exhibits a very good goodness-of-fit [40].

Table 6. Results of the first research model.

$QUAL_{it} = \beta_0 + \beta_1 SUST_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 ROA_{it} + \beta_5 GROWTH_{it} + e_{it}$					
Variable Name	Variable Symbol	Beta Coeffi.	S.D	t-Stat	Sig.
Sustainability performance	SUST	-0.068	0.030	-2.289	0.022
Firm Size	SIZE	0.074	0.033	2.181	0.029
Financial leverage	LEV	-0.673	0.294	-2.284	0.022
Return on assets	ROA	-2.254	0.451	-4.996	0.000
Sales growth	GROWTH	-0.094	0.109	-0.868	0.385
Intercept	C	-1.175	0.611	-1.922	0.054
First Lag	QUAL (-1)	-1.795	0.117	15.235	0.000
LR statistic	sig. lr statistic			McFadden's Coeffi.	
322.045	0.000			0.338	

The first research hypothesis states that corporate sustainability performance has a negative and statistically significant effect on the likelihood of receiving a qualified audit opinion. As shown in *Table 6*, the calculated significance level for the corporate sustainability performance variable is 0.022, which is below the 5% significance level. This indicates that the effect of this variable is statistically significant at the 95% confidence level. Furthermore, the estimated coefficient of the variable is -0.068 . Since the coefficient is negative, it indicates an inverse relationship between corporate sustainability performance and the likelihood of receiving a qualified audit opinion. Therefore, based on the statistical significance and the estimated coefficient of the corporate sustainability performance variable, it can be concluded that corporate sustainability performance has a negative and statistically significant effect on the likelihood of receiving a qualified audit opinion. Accordingly, the first research hypothesis is not rejected.

6.3.2 | Results of the second research model

According to the results presented in *Table 7*, the significance level of the LR statistic is 0.000, indicating that the independent variables have a statistically significant effect on the probability of the dependent variable occurring at the 99% confidence level. Therefore, the estimated model is statistically valid. McFadden's

pseudo R-squared is 0.343, indicating that the logistic regression model provides approximately a 34.3% improvement in goodness-of-fit compared with the intercept-only model. Accordingly, a value of 0.343 indicates that the model exhibits a very good fit.

Table 7. Results of the second research model.

$QUAL_{it} = \beta_0 + \beta_1 SUST_{it} + \beta_2 AUDC_IND_{it} + \beta_3 SUST_{it} * AUDC_IND_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 ROA_{it} + \beta_7 GROWTH_{it} + \epsilon_{it}$					
Variable Name	Variable Symbol	Beta Coeffi.	S.D	t-Stat	Sig.
Sustainability performance	SUST	0.195	0.135	1.440	0.149
Audit committee independence	AUDCIND	1.851	0.924	2.002	0.045
Interaction effect between sustainability performance and audit committee independence	SUST* AUDCIND	-0.350	0.176	-1.992	0.463
Firm Size	SIZE	0.078	0.034	2.296	0.021
Financial Leverage	LEV	-0.683	0.296	-2.306	0.021
Return on Assets	ROA	-2.266	0.452	-5.006	0.000
Sales Growth	GROWTH	-0.086	0.110	-0.781	0.434
Intercept	C	-2.638	0.958	-2.754	0.005
First Lag	QUAL (-1)	1.783	0.118	15.066	0.000
LR statistic	Sig. LR statistic			McFadden's Coeffi.	
326.279	0.000			0.343	

The second research hypothesis states that audit committee independence strengthens the negative effect of corporate sustainability performance on the likelihood of receiving a qualified audit opinion. As shown in Table 7, the significance level of the interaction term between corporate sustainability performance and audit committee independence is 0.046, which is below the 5% significance level. Therefore, the interaction effect is statistically significant at the 95% confidence level. In addition, the estimated coefficient of the interaction term is -0.350 . The negative sign of the coefficient indicates a negative moderating effect. Accordingly, based on the statistical significance and the estimated coefficient of the interaction term, it can be concluded that audit committee independence strengthens the negative effect of corporate sustainability performance on the likelihood of receiving a qualified audit opinion. Therefore, the second research hypothesis is not rejected.

7 | Conclusion and Recommendations

This study was conducted to investigate the effect of corporate sustainability performance on audit opinion, considering the moderating role of audit committee independence in companies listed on the Tehran Stock Exchange. The empirical findings indicate that both research hypotheses were supported and were not rejected at the 95% confidence level. The objective of testing the first research hypothesis was to determine the effect of corporate sustainability performance on the likelihood of receiving a qualified audit opinion. The results of the first hypothesis showed that corporate sustainability performance has a negative and statistically significant effect on the probability of issuing a qualified audit opinion. This means that as the level of corporate sustainability performance increases, the likelihood of receiving a qualified audit opinion decreases. Companies with strong sustainability performance generally operate in a more organized and professional manner in terms of internal control systems, information transparency, regulatory compliance, and risk management. Improving these aspects enables auditors to encounter fewer instances of non-compliance with accounting standards, material misstatements, insufficient documentation, or weaknesses in internal controls; factors that typically lead to the issuance of a qualified audit opinion. In addition, companies with high sustainability performance generally demonstrate greater commitment to responsible reporting, comprehensive disclosure of information, and accountability to stakeholders. These characteristics enhance the quality of financial reporting and increase auditors' confidence in the reliability of reported information. From a behavioral perspective, such companies usually have stronger corporate governance structures, and the independence and effective functioning of audit committees within these companies contribute to reducing reporting errors and ambiguities. Overall, higher levels of sustainability performance, through

improving the quality of operations, controls, and disclosures, provide the necessary conditions for issuing an unqualified audit opinion and reduce the likelihood of receiving a qualified audit opinion.

The results of this hypothesis are consistent with the findings of Dimitropoulos [5], Diab and Issa [3], Wang et al. [4], and Zheng et al. [28]. The objective of testing the second research hypothesis was to determine the effect of audit committee independence on the relationship between corporate sustainability performance and qualified audit opinions. The results of the second hypothesis showed that audit committee independence strengthens the effect of corporate sustainability performance on reducing the likelihood of receiving a qualified audit opinion. Audit committee independence can play a reinforcing role in the relationship between corporate sustainability performance and the reduction of qualified audit opinions because an independent audit committee is able to enhance the quality of oversight over financial reporting processes, internal controls, and sustainability disclosures in an impartial manner and without managerial influence. When a company has higher sustainability performance, this performance is generally associated with improved control systems, reduced operational risks, enhanced environmental and social transparency, and increased accountability. However, audit committee independence ensures that these actions are not merely symbolic and are accurately validated. An independent committee with strong oversight capabilities evaluates the accuracy and completeness of sustainability information, improves disclosure quality, and identifies and controls the risk of material misstatements in reports.

Consequently, independent auditors face lower levels of uncertainty, resulting in a reduced likelihood of issuing a qualified audit opinion. Furthermore, audit committee independence, through establishing effective monitoring pressure on management, prevents the concealment of risks, opportunistic practices, and the provision of incomplete or unreliable information. This encourages companies to undertake genuine actions toward improving sustainability performance. In addition, an independent audit committee typically performs better in selecting high-quality auditors, evaluating compliance with reporting standards, and continuously monitoring control processes. Therefore, the positive effect of sustainability performance on reducing misstatement risk and improving disclosure quality is strengthened in the presence of an independent audit committee. Ultimately, the combination of these two factors significantly reduces the probability of receiving a qualified audit opinion. The results of this hypothesis are consistent with the findings of Dimitropoulos [5] and are inconsistent with the findings of Al-Hamoudi [26], Alkilani et al. [29], and Tavangar Hamzeh Kalaei and Skaffi asl [35].

- I. Given the findings of the first research hypothesis, which indicated that improving corporate sustainability performance reduces the likelihood of receiving a qualified audit opinion, managers are recommended to integrate a continuous monitoring system for sustainability indicators (such as energy consumption, waste management, and minority shareholders' rights) directly into the internal control framework. This can be achieved, for example, by defining key sustainability performance indicators within management reporting systems and establishing monitoring mechanisms to continuously track these indicators. Regulatory authorities are recommended to strengthen the requirements for quantitative disclosure of these indicators in financial statements, and investors and financial analysts are advised to consider the deterioration of sustainability measures as a warning signal of increased financial risk and the potential likelihood of future financial statement adjustments.
- II. Given the findings of the second research hypothesis, which indicate that audit committee independence strengthens the effect of corporate sustainability performance on reducing the likelihood of receiving a qualified audit opinion, the board of directors is recommended to enhance the composition of the audit committee by appointing fully independent members with expertise in the field of organizational sustainability. This enables the committee to effectively monitor and manage the relationship between sustainability indicators and financial reporting risks. Regulatory authorities are recommended to require, in the revision of corporate governance regulations, the presence of at least one independent member with specialized knowledge in sustainability within the audit committee structure. Furthermore, investors are advised to consider the simultaneous presence of audit committee independence and strong corporate sustainability performance as a key indicator when assessing the reliability and credibility of financial reports.

8 | Suggestions for Future Research

- I. Investigating the effect of climate risks on sustainability performance and its consequences for the type of auditor opinion in environmentally sensitive industries.
- II. Examining the relationship between digital corporate governance maturity (the use of digital technologies by companies to enhance oversight, transparency, internal controls, and risk management) and auditor opinion, with emphasis on audit committee independence.
- III. Studying the role of audit committee independence in the relationship between corporate sustainability performance and audit risk reduction.
- IV. Investigating the effect of corporate sustainability performance on the type of auditor opinion with the mediating role of integrated reporting.
- V. Conducting a comparative study of the effect of institutional pressures on audit committee independence and how auditors respond to corporate sustainability performance reporting.
- VI. Examining the role of artificial intelligence in analyzing sustainability reports and its impact on audit risk and the type of auditor opinion.

9 | Research Limitations

- I. One of the most important limitations of this study relates to the nature of disclosure and access to information regarding corporate sustainability performance in Iran. The sustainability reporting system in Iran lacks a standardized framework, legal requirements, and integrated practices similar to the Global Reporting Initiative (GRI) and the International Financial Reporting Standards (IFRS) sustainability disclosure standards 1 and 2. Consequently, information related to the ESG dimensions of companies is not fully, quantitatively, and comparably disclosed. Since this study was required to use a limited set of indicators and components that could be extracted from financial reports and explanatory notes, the sustainability performance index used reflects only part of the actual sustainability performance of companies. This limitation reduces the generalizability of the findings to broader dimensions of sustainability (such as human capital, professional ethics, energy management, or deeper environmental responsibility). Furthermore, significant differences among industries in terms of the level and quality of disclosures reduce the comparability of sustainability data and create limitations in interpreting the results. In other words, the findings of this study should be interpreted with the consideration that sustainability transparency in Iran is lower than global standards and that the applied index represents only an approximate measurable proxy of companies' actual sustainability performance.
- II. The type of audit opinion in the Iranian context is also associated with limitations that may affect the research results. The professional audit environment in Iran, due to the supervisory role of institutions such as the Audit Organization and the Iranian Association of Certified Public Accountants, ownership concentration in companies, and certain legal considerations, differs from international environments. These factors may, in some cases, influence the auditor's judgment process and the type of audit opinion issued. Moreover, the research data only allow observation of the final audit opinion and cannot measure more qualitative factors, such as auditor risk aversion, information pressures, limitations in access to audit evidence, or the dynamics of auditor–management relationships. Therefore, although this study examines a significant relationship between sustainability performance and auditor opinion, this relationship may be influenced by the unique characteristics of the Iranian audit environment, and its generalization to other countries or audit systems should be considered with caution.
- III. Audit committee independence is also subject to limitations that may partially condition the research findings. The independence indicators used in this study are based on official and observable information, such as the number of non-executive members, the absence of executive positions among members, and the lack of formal dependencies. However, the actual independence of the audit committee extends beyond formal structures and includes behavioral independence, the ability to resist managerial influence, the level of practical expertise, and the quality of interaction between committee members and independent auditors; factors that cannot be

measured using available data. In addition, in Iran, information regarding indirect financial relationships, secondary business connections, or family dependencies of audit committee members is not fully disclosed, increasing the possibility of overestimating independence. Furthermore, many audit committees in Iran have relatively new structures, and their operational performance has not yet reached the maturity level of global standards. These factors indicate that the findings of this study primarily reflect formal and structural independence rather than actual behavioral independence, which limits the generalizability of the research results.

Abbreviation

ESG	Environmental, Social, and Governance
GMM	Generalized Method of Moments
VIF	Variance Inflation Factor
ROA	Return on Assets
EMS	Environmental Management System
R&D	Research and Development
LR	Likelihood Ratio
ERM	Enterprise Risk Management
GRI	Global Reporting Initiative
IFRS	International Financial Reporting Standards

Conflict of Interest

The authors declare no competing interests related to this study. The authors alone are responsible for the content and writing of this manuscript.

Data Availability

All relevant data generated or analyzed during this study are included in this published article. No supplementary datasets are available.

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Use of Artificial Intelligence

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