

The Impact of Enterprise Risk Management Effectiveness on Financial Sustainability of Saudi Listed Industrial Companies: The Mediating Role of Corporate Governance Quality

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Abstract:

This study examines the relationship between Enterprise Risk Management (ERM) effectiveness and financial sustainability of Saudi listed industrial companies, with corporate governance quality as a mediator. Despite growing recognition of ERM's importance, limited empirical evidence exists on how ERM effectiveness influences financial sustainability in emerging markets, particularly Saudi Arabia. Using panel data from 118 industrial firms (708 firm-year observations) over 2019–2024, fixed effects regression and mediation analysis were employed to test three hypotheses. The findings reveal that both ERM effectiveness ($\beta = 0.286$, $p < 0.01$) and corporate governance quality ($\beta = 0.334$, $p < 0.01$) positively influence financial sustainability. Importantly, corporate governance quality partially mediates the ERM-financial sustainability relationship (indirect effect = 0.118, 95% CI [0.048, 0.212]), with 29.37% of the total effect mediated. Results remain robust across alternative specifications and sample exclusions. The study contributes theoretically by integrating agency, resource-based, and stakeholder theories into a comprehensive framework, empirically demonstrating how governance mechanisms transmit the benefits of ERM to sustainability outcomes. Practically, it offers evidence-based guidance for managers, boards, and policymakers in Saudi Arabia to enhance financial sustainability through effective ERM and governance practices in support of Vision 2030 objectives. Methodologically, it develops robust measurement frameworks for ERM effectiveness, governance quality, and financial sustainability using quantitative analysis of secondary data from Saudi listed companies.

Keywords: Enterprise Risk Management; Corporate Governance; Financial Sustainability; Saudi Arabia; Mediation Analysis; Panel Data

1. Introduction

1.1 Background and Context

The contemporary business environment is characterized by increasing volatility, uncertainty, complexity, and ambiguity. Organizations face multifaceted risks ranging from geopolitical tensions and regulatory changes to technological disruptions and environmental challenges (COSO, 2017). In response, Enterprise Risk Management (ERM) has emerged as a comprehensive, integrated approach that moves beyond traditional siloed risk management to provide a holistic framework for identifying, assessing, and managing risks across the entire organization (COSO, 2004). Unlike conventional risk management, ERM aligns risk appetite with strategic objectives, enhances decision-making, and contributes to sustainable value creation (Hoyt & Liebenberg, 2011).

The Kingdom of Saudi Arabia, under its ambitious Vision 2030, has been actively pursuing economic diversification and strengthening its industrial sector. The Saudi industrial sector plays a pivotal role in the national economy, contributing significantly to non-oil GDP and employment. However, these companies operate in an environment characterized by unique challenges, including geopolitical uncertainties, fluctuating oil prices, and increasing global competition (Al-Shammari & Al-Sultan, 2020). The Saudi stock market has experienced multiple crises including the 2006 financial crisis with a 25% value drop and the recent COVID-19 pandemic which significantly disrupted nine sectors (Ahmed et al., 2022). These events have been linked to weak internal control mechanisms and inadequate risk management practices (Al-Hadi et al., 2019), underscoring the critical importance of robust risk management for ensuring financial sustainability.

Furthermore, the Saudi corporate environment has historically suffered from ineffective institutional structures and a weak legal system that can affect sound corporate governance practices (Al-Shammari & Al-Sultan, 2020). Recognizing this, the introduction of the Corporate Governance Code in 2017 and subsequent updates have emphasized transparency, accountability, and protecting shareholder rights (Ministry of Commerce, 2018). These regulatory reforms have positioned Saudi Arabia as a unique context for examining the interplay between risk management, governance, and financial outcomes (Alotaibi, 2020).

1.2 Statement of the Problem

Despite the growing recognition of ERM's importance, there is limited empirical evidence on how ERM effectiveness influences the financial sustainability of Saudi industrial companies. Financial sustainability is defined as an organization's ability to maintain financial health and generate long-term value while managing risks effectively (Schaltegger & Wagner, 2006). It has become a paramount concern for stakeholders including investors, regulators, and management (Younes, 2021).

1.3 Research Objectives

The primary objectives of this research are:

1. To examine the direct effect of ERM effectiveness on the financial sustainability of Saudi listed industrial companies.
2. To examine the direct effect of Corporate Governance quality on the financial sustainability of Saudi listed industrial companies.
3. To investigate the mediating role of Corporate Governance quality in the relationship between ERM effectiveness and financial sustainability.

1.4 Research Questions

This study seeks to address the following research questions:

1. What is the effect of Enterprise Risk Management (ERM) effectiveness on the financial sustainability of Saudi listed industrial companies?
2. What is the effect of Corporate Governance (CG) quality on the financial sustainability of Saudi listed industrial companies?
3. Does Corporate Governance (CG) quality mediate the relationship between ERM effectiveness and financial sustainability?

1.5 Significance of the Study

This study makes three key contributions. Theoretically, it extends ERM literature to the under-researched Saudi emerging market context, tests the mediating role of corporate governance quality, and integrates agency, resource-based, and stakeholder theories into a comprehensive framework. Practically, it offers evidence-based guidance for managers, boards, and policymakers in Saudi Arabia to enhance financial sustainability through effective ERM and governance practices in support of Vision 2030 objectives, while also contributing to risk management knowledge in the MENA region. Methodologically, it develops a robust measurement framework for ERM effectiveness, governance quality, and financial sustainability using quantitative analysis of secondary data from Saudi listed companies.

2. Literature Review and Hypothesis Development

2.1 Enterprise Risk Management Effectiveness

Enterprise Risk Management (ERM) is a comprehensive, integrated approach that provides a holistic framework for identifying, assessing, and managing risks across the entire organization (COSO, 2004, 2017). Unlike conventional risk management, ERM aligns risk appetite with strategic objectives, enhances decision-making, and contributes to sustainable value creation (Hoyt & Liebenberg, 2011). COSO defines ERM as "a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risks to be within its risk appetite" (COSO, 2004).

Prior studies have identified four key dimensions of ERM implementation: internal factors, external factors, structure, and process (Aldriweesh et al., 2022; Shad et al., 2019). Internal factors encompass top management commitment, Chief Risk Officer (CRO) presence, and employee training (Setapa et al., 2020; Saeidi et al., 2021). External factors include regulatory compliance and the role of external auditors (Setapa & Zakwan, 2019; Malik et al., 2020). The structural dimension addresses the organizational framework for distributing ERM duties and responsibilities (Lai & Shad, 2017). The process dimension comprises risk identification, assessment, analysis, treatment, and monitoring (Malik et al., 2020).

Empirical evidence on ERM effectiveness has yielded mixed results. Studies by Shad et al. (2019) and Saeidi et al. (2021) found positive associations with firm performance, while others found no significant relationship (Tahir & Razali, 2011; González et al., 2020). These inconsistencies stem from measurement difficulties and lack of agreement on ERM dimensions (Lundqvist, 2014). In Saudi Arabia, ERM research remains limited, with most studies focusing on financial institutions (Mosa, 2025; Aldriweesh et al., 2022).

2.2 Corporate Governance Quality

Corporate governance refers to the system by which companies are directed and controlled, encompassing relationships among management, board, shareholders, and stakeholders (OECD, 2004). Quality governance is characterized by transparency, accountability, fairness, and responsibility. The board of directors provides oversight and strategic guidance to ensure management acts in stakeholders' best interests (Fama & Jensen, 1983; Aljamaz et al., 2025).

Key governance attributes include board composition, independence, expertise, and specialized committees. Board diversity enhances decision-making and firm outcomes (Khatib et al., 2021; Aljamaz et al., 2025). Audit committee independence and financial expertise ensure reporting quality and risk oversight (Liu, 2015; Sulimany, 2024). Risk committees enhance risk management and financial performance (Al-Hadi et al., 2019), while sustainability committees improve disclosure and performance (Giannarakis et al., 2020).

In Saudi Arabia, the 2017 Corporate Governance Code emphasized transparency and shareholder rights (Ministry of Commerce, 2018). Regulatory reforms aligned with Vision 2030 have enhanced governance practices (Alregab, 2021; Bazhair, 2023). However, historical institutional weaknesses continue to affect governance quality (Al-Shammari & Al-Sultan, 2020).

2.3 Financial Sustainability

Financial sustainability refers to an organization's ability to maintain financial health and generate long-term value while managing risks effectively (Schaltegger & Wagner, 2006). It encompasses maintaining financial, technical, and operational performance while addressing social and environmental responsibilities (Epstein & Buhovac, 2014; Mosa, 2025). Financial sustainability reflects organizational resilience and adaptability to ensure long-term survival (Alshareef, 2024; Aljamaz et al., 2025).

Various measures have been employed to assess financial sustainability. The Higgins (1977) model measures sustainable growth through profit margin, asset turnover, leverage, and retention rate (Alsulami, 2024). The Altman Z-score predicts financial distress (Abdellatif et al., 2025). Financial performance indicators such as ROA, ROE, and Tobin's Q are also widely used (Shad et al., 2019).

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In Saudi Arabia, financial sustainability is critical given geopolitical uncertainties, oil price fluctuations, and global competition (Al-Shammari & Al-Sultan, 2020). The Saudi stock market has experienced multiple crises linked to weak internal controls and inadequate risk management (Ahmed et al., 2022; Al-Hadi et al., 2019).

2.4 ERM Effectiveness and Financial Sustainability

Theoretical arguments suggest ERM enhances financial sustainability through multiple mechanisms. Agency theory posits that ERM reduces information asymmetry and mitigates agency conflicts (Jensen & Meckling, 1976). The resource-based view suggests ERM constitutes a valuable organizational capability (Barney, 1991). Stakeholder theory emphasizes that ERM addresses diverse stakeholder expectations, enhancing legitimacy and sustainability (Freeman, 1984).

Empirical evidence is mixed. Studies by Hoyt and Liebenberg (2011) and Shad et al. (2019) found positive associations with firm value, while Pagach and Warr (2011) found no significant relationship. In Saudi Arabia, Mosa (2025) found ERM contributes to insurance companies' sustainability, Alsulami (2024) demonstrated operational risk disclosure has threshold effects, and Abdellatif et al. (2025) found sustainability risk management influences financial distress.

Given these arguments, the following hypothesis is proposed:

H1: ERM effectiveness has a significant positive effect on financial sustainability of Saudi listed industrial companies.

2.5 Corporate Governance Quality and Financial Sustainability

Agency theory suggests strong governance reduces agency costs and enhances sustainability (Jensen & Meckling, 1976). Resource dependency theory posits governance facilitates access to external resources (Pfeffer & Salancik, 2003). Signalling theory suggests governance quality signals commitment to transparency, enhancing stakeholder confidence (Ross, 1977).

Empirical evidence supports positive relationships between governance and sustainability outcomes. Board diversity enhances decision-making and long-term performance (Khatib et al., 2021). Audit committee independence improves financial reporting quality (Sulimany, 2024). Risk committees enhance risk management and sustainability (Al-Hadi et al., 2019). Sustainability committees improve disclosure and performance (Giannarakis et al., 2020).

In Saudi Arabia, Aljamaz et al. (2025) found board diversity and audit committee expertise provide firm resilience. Alshareef and Sulimany (2024) demonstrated board financial expertise positively impacts financial sustainability. However, Habbash and Alqahtani (2021) reported insignificant relationships between governance and sustainability outcomes.

Therefore, the following hypothesis is proposed:

H2: Corporate Governance quality has a significant positive effect on financial sustainability of Saudi listed industrial companies.

2.6 The Mediating Role of Corporate Governance Quality

The mediating role of corporate governance quality in the ERM-financial sustainability relationship has received limited attention. Agency theory suggests ERM requires robust governance structures for proper implementation (Jensen & Meckling, 1976). The resource-based view indicates governance complements ERM in building competitive advantage (Barney, 1991). Stakeholder theory emphasizes governance facilitates stakeholder engagement essential for translating risk management into sustainable outcomes (Freeman, 1984).

Prior studies demonstrate governance mechanisms enhance ERM effectiveness. Al-Hadi et al. (2019) found risk committees reduce agency costs and enhance performance. Soliman and Ragab (2019) showed effective governance improves ERM outcomes. Kamarudin et al. (2021) demonstrated risk committees strengthen ERM quality and sustainability. In Saudi Arabia, Mosa (2025) proposed governance moderates the ERM-sustainability relationship.

Thus, the following hypothesis is proposed:

H3: Corporate Governance quality mediates the relationship between ERM effectiveness and financial sustainability of Saudi listed industrial companies.

2.7 Theoretical Foundation

This study integrates three complementary theories:

Agency Theory: Jensen and Meckling (1976) address conflicts from ownership-control separation. Managers may pursue self-interest due to information asymmetry. ERM and governance mechanisms mitigate agency conflicts, reduce information asymmetry, and align managerial behavior with shareholder interests (Aljamaz et al., 2025). Risk disclosure practices build stakeholder trust and enhance sustainability (Alsulami, 2024).

Resource-Based View: Barney (1991) posits firms achieve competitive advantage through valuable, rare, inimitable, non-substitutable resources. ERM and governance mechanisms constitute strategic capabilities that enhance performance and sustainability (Shad et al., 2019). Their integration creates synergistic effects exceeding what either capability could achieve independently.

Stakeholder Theory: Freeman (1984) emphasizes organizations must consider all stakeholders' interests. Addressing stakeholder expectations enhances legitimacy, reduces risk, and contributes to sustainability (Mahmood et al., 2018). ERM and governance enable firms to respond to stakeholder concerns, building trust and accountability (Alotaibi, 2020; Habbash & Alqahtani, 2021).

2.8 Conceptual Framework

Based on the literature review, this study proposes a conceptual framework examining relationships among ERM effectiveness, corporate governance quality, and financial sustainability. The framework posits that ERM effectiveness directly influences financial sustainability, and corporate governance quality mediates this relationship.

The framework proposes three primary relationships: (1) ERM effectiveness has a direct positive effect on financial sustainability; (2) corporate governance quality has a direct positive effect on financial sustainability; and (3) corporate governance quality mediates the relationship between ERM effectiveness and financial sustainability.

Figure 1: Conceptual Framework

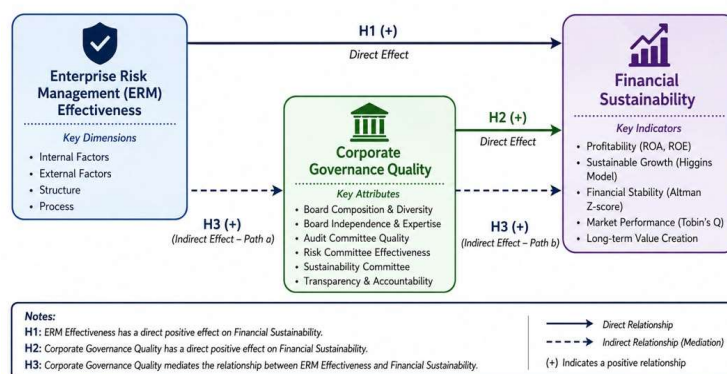


Figure 1: Conceptual Framework

Independent Variable: Enterprise Risk Management (ERM) Effectiveness

Mediating Variable: Corporate Governance Quality

Dependent Variable: Financial Sustainability

The conceptual framework illustrates how ERM effectiveness and governance quality jointly influence the financial sustainability of Saudi listed industrial companies, providing a foundation for empirical investigation.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative explanatory research design to examine the relationship between Enterprise Risk Management (ERM) effectiveness and the financial sustainability of Saudi listed industrial companies, with corporate governance quality acting as a mediating variable. The study employs secondary panel data collected from publicly available corporate reports and financial databases. The use of panel data enables the examination of both cross-sectional differences among firms and variations over time, thereby improving the robustness of the empirical analysis and controlling for unobserved firm-specific heterogeneity (Gujarati & Porter, 2009; Hsiao, 2003). The research follows a deductive approach, wherein hypotheses derived from existing theories (agency theory, resource-based view, and stakeholder theory) are tested using empirical data. The study covers the period from 2019 to 2024.

3.2 Population and Sample

3.2.1 Target Population

The target population comprises all industrial companies listed on the Saudi Exchange (Tadawul). According to the official Tadawul listing as of January 1, 2024, there are 232 listed companies across various sectors. The industrial sector is selected because of its strategic contribution to Saudi Arabia's Vision 2030 and its relatively high exposure to operational, financial, environmental, and strategic risks. The industrial sector includes companies operating in Energy, Materials, Capital Goods, Commercial & Professional Services, Transportation, and other related sub-sectors.

3.2.2 Sample Selection Criteria

The sample consists of industrial firms that satisfy the following criteria: (1) listed on the Saudi Exchange throughout the study period (2019–2024); (2) availability of annual reports and corporate governance reports for the entire study period; (3) availability of complete financial statements with no missing data for the variables under investigation; (4) availability of data required to measure ERM effectiveness and corporate governance quality through content analysis; (5) exclusion of financial institutions (banks, insurance companies, and financial services firms) due to their unique regulatory environment and capital structure (Aljamaz et al., 2025; Alkhyoon et al., 2023); (6) exclusion of Real Estate Investment Trusts (REITs) and holding companies with minimal operational activities; and (7) exclusion of firms with missing observations during the study period to maintain data consistency.

3.2.3 Final Sample

Based on the above criteria, the final sample comprises 118 industrial companies from ten sectors: Energy (7), Materials (47), Capital Goods (14), Commercial & Professional Services (5), Transportation (8), Consumer Durables & Apparel (5), Food & Beverages (15), Health Care Equipment & Services (10), Pharma, Biotech & Life Science (2), and Utilities (5). The sample yields 708 firm-year observations (118 firms × 6 years) for the period 2019–2024. The sample size is adequate for panel data analysis and meets the minimum sample size requirements for regression analysis (Hair et al., 2010; Tabachnick & Fidell, 2007).

3.3 Data Sources

This study relies exclusively on secondary data obtained from publicly available sources. The data were collected from the official website of the Saudi Exchange (Tadawul), which provides comprehensive financial statements, annual reports, corporate governance reports, and other regulatory disclosures for all listed companies. The use of Tadawul ensures the reliability, consistency, and comparability of the data across firms.

3.3.1 Financial Data

Financial data were collected from the Saudi Exchange (Tadawul) database, including total assets, total liabilities, shareholders' equity, net income, operating cash flows, sales revenue, retained earnings, current assets and liabilities, earnings before interest and tax (EBIT), market value of equity, and number of shares outstanding. These data were used to measure financial sustainability and control variables. All financial data were cross-verified with Thomson Reuters DataStream and Refinitiv Eikon databases to ensure accuracy and consistency.

3.3.2 Corporate Governance Data

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Corporate governance data were obtained from the Corporate Governance Reports and Annual Reports available through Tadawul. Information was collected on board size and composition, board independence, board gender and nationality diversity, audit committee characteristics, existence of risk and sustainability committees, CEO duality, board meeting frequency, and ownership structure. These variables were used to construct the Corporate Governance Quality Index (CGQI).

3.3.3 Enterprise Risk Management Data

Data on ERM effectiveness were collected through content analysis of annual reports, corporate governance reports, and risk management disclosures. Following the COSO (2017) framework, an ERM Effectiveness Index was developed based on the extent to which firms disclose key ERM practices. The index includes items related to risk governance (board oversight, risk committee, CRO appointment, risk policy), risk identification (systematic processes, risk categorization), risk assessment (methodologies, impact analysis, prioritization), risk response (mitigation strategies, risk treatment approaches), risk monitoring (continuous processes, reporting, performance indicators), internal control (systems, audit function, control environment), risk communication (disclosure practices, stakeholder communication), and strategic risk integration (strategy alignment, risk appetite, business objectives). Each disclosure item was assigned a score of one if disclosed and zero otherwise, with the overall ERM effectiveness score calculated as the proportion of disclosed items to the total applicable items (maximum 25 items). Content analysis was conducted using a standardized coding protocol (Krippendorff, 2004). Two independent coders performed the analysis for a random sample of 20 companies, achieving a Cohen's Kappa coefficient of 0.85, indicating substantial agreement (Landis & Koch, 1977).

3.4 Measurement of Variables

3.4.1 Dependent Variable: Financial Sustainability (FS)

Financial sustainability was measured using a Composite Financial Sustainability Index (FSI) developed by standardizing and aggregating multiple accounting-based indicators (Alshareef, 2024; Alsulami, 2024; Shad et al., 2019). The following indicators were used: Return on Assets (ROA = Net Income / Total Assets), Return on Equity (ROE = Net Income / Shareholders' Equity), Operating Cash Flow Ratio (Operating Cash Flow / Total Assets), Altman Z-Score [$1.2(\text{Working Capital}/\text{TA}) + 1.4(\text{Retained Earnings}/\text{TA}) + 3.3(\text{EBIT}/\text{TA}) + 0.6(\text{Market Value of Equity}/\text{Total Liabilities}) + 0.999(\text{Sales}/\text{TA})$] (Altman, 1968; Abdellatif et al., 2025), and Sustainable Growth Rate [$\text{Profit Margin} \times \text{Asset Turnover} \times \text{Financial Leverage} \times \text{Retention Rate}$] (Higgins, 1977; Alsulami, 2024).

To construct the composite index, all indicators were winsorized at the 1st and 99th percentiles to reduce outlier impact. Indicators were then standardized using z-score transformation: $Z = (X - \mu) / \sigma$. For the Altman Z-Score, the value was multiplied by -1 to reflect financial distress (higher score = greater sustainability). The composite index was calculated as: $\text{FSI} = (Z_{\text{ROA}} + Z_{\text{ROE}} + Z_{\text{OCF}} + Z_{\text{Altman}} + Z_{\text{SGR}}) / 5$. A higher FSI indicates better financial sustainability performance.

3.4.2 Independent Variable: Enterprise Risk Management Effectiveness (ERM)

ERM effectiveness was measured using the ERM Disclosure Index (ERMI) developed through content analysis based on the COSO (2017) framework: $\text{ERMI} = (\text{Total Disclosed Items} / \text{Total Applicable Items}) \times 100$. The ERMI ranges from 0 to 1 (0% to 100%), with higher scores indicating greater ERM effectiveness. The index was validated through review by three academic experts in risk management and corporate governance.

3.4.3 Mediating Variable: Corporate Governance Quality (CGQ)

Corporate governance quality was measured using a Composite Corporate Governance Quality Index (CGQI) developed based on the Saudi Corporate Governance Code (2017) and prior governance studies (Aljamaz et al., 2025; Bazhair, 2023; Sulimany, 2024; Habbash & Alqahtani, 2021). The CGQI includes dimensions of board composition (board size, independence, gender diversity, nationality diversity), audit committee (independence, financial expertise, size), risk management (existence of risk committee, independence, meeting frequency), sustainability (existence of sustainability committee, reporting), and governance practices (CEO duality, board meeting frequency, disclosure of governance practices). Each item was scored 1 if the condition was met and 0 otherwise. $\text{CGQI} = (\text{Total Score} / \text{Maximum Possible Score}) \times 100$, ranging from 0 to 1 (0% to 100%), with higher scores indicating better governance quality.

3.4.4 Control Variables

To reduce omitted variable bias, the following firm-level control variables were included: Firm Size (SIZE = natural logarithm of total assets), Firm Age (AGE = number of years since incorporation), Financial Leverage (LEV = Total Debt / Total Assets), Sales Growth (GROWTH = $(\text{Sales}_t - \text{Sales}_{t-1}) / \text{Sales}_{t-1}$), Liquidity (LIQ = Current Assets / Current Liabilities), Profitability (ROA = Net Income / Total Assets), Industry (INDUSTRY = dummy variables for each industry sector), and Year (YEAR = dummy variables for each year).

3.5 Model Specification

This study estimates three panel regression models following Baron and Kenny (1986) and Hayes (2018). Model 1 examines the direct effect of ERM on financial sustainability (H1): $\text{FS}_{it} = \beta_0 + \beta_1 \text{ERM}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{AGE}_{it} + \beta_4 \text{LEV}_{it} + \beta_5 \text{GROWTH}_{it} + \beta_6 \text{LIQ}_{it} + \beta_7 \text{ROA}_{it} + \sum \beta_j \text{INDUSTRY}_j + \sum \beta_k \text{YEAR}_k + \varepsilon_{it}$.

Model 2 examines the relationship between ERM and corporate governance quality: $\text{CGQ}_{it} = \beta_0 + \beta_1 \text{ERM}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{AGE}_{it} + \beta_4 \text{LEV}_{it} + \beta_5 \text{GROWTH}_{it} + \beta_6 \text{LIQ}_{it} + \beta_7 \text{ROA}_{it} + \sum \beta_j \text{INDUSTRY}_j + \sum \beta_k \text{YEAR}_k + \varepsilon_{it}$.

Model 3 tests the mediating role of CGQ (H3): $\text{FS}_{it} = \beta_0 + \beta_1 \text{ERM}_{it} + \beta_2 \text{CGQ}_{it} + \beta_3 \text{SIZE}_{it} + \beta_4 \text{AGE}_{it} + \beta_5 \text{LEV}_{it} + \beta_6 \text{GROWTH}_{it} + \beta_7 \text{LIQ}_{it} + \beta_8 \text{ROA}_{it} + \sum \beta_j \text{INDUSTRY}_j + \sum \beta_k \text{YEAR}_k + \varepsilon_{it}$.

The mediation framework posits that: Total Effect ($\beta_1 c$) = Direct Effect ($\beta_1 c'$) + Indirect Effect ($\beta_1 \times \beta_2$). The path diagram illustrates ERM as the independent variable, CGQ as the mediator, and FS as the dependent variable, with β_1 representing the effect of ERM on CGQ, β_2 the effect of CGQ on FS, and $\beta_1 c'$ the direct effect of ERM on FS after controlling for CGQ.

3.6 Data Analysis Techniques

3.6.1 Preliminary Analysis

Descriptive statistics (means, standard deviations, minimum, maximum) and frequency distributions were computed for all variables. Pearson correlation analysis examined bivariate relationships and identified potential multicollinearity issues. Variance Inflation Factor (VIF) values were calculated for all explanatory variables, with $VIF > 10$ or tolerance < 0.10 indicating serious multicollinearity (Hair et al., 2010).

3.6.2 Panel Data Analysis

Given the panel structure ($N = 118$ firms, $T = 6$ years), panel data regression techniques were employed. The choice between fixed effects (FE) and random effects (RE) models was determined by the Hausman specification test (Hausman, 1978). The FE model controls for time-invariant unobserved firm-specific heterogeneity, while the RE model assumes firm-specific effects are uncorrelated with explanatory variables. The Hausman test null hypothesis is that the RE model is consistent and efficient; if $p < 0.05$, the FE model is preferred (Gujarati & Porter, 2009).

3.6.3 Diagnostic Tests

To ensure validity and robustness, diagnostic tests were conducted: the Wooldridge test for serial correlation ($p < 0.05$ indicates serial correlation), the Modified Wald test for heteroscedasticity ($p < 0.05$ indicates heteroscedasticity), VIF for multicollinearity ($VIF < 10$ acceptable), the Breusch-Pagan test for cross-sectional independence ($p < 0.05$ indicates dependence), the Jarque-Bera test for normality of residuals ($p < 0.05$ indicates non-normality), and the Ramsey RESET test for model specification ($p < 0.05$ indicates misspecification). To address serial correlation and heteroscedasticity, all models were estimated using robust standard errors clustered at the firm level (Petersen, 2009).

3.6.4 Mediation Analysis

Mediation analysis was conducted using two complementary approaches. First, the Baron and Kenny (1986) four-step approach requires: (1) significant $IV \rightarrow DV$ relationship (Model 1); (2) significant $IV \rightarrow$ Mediator relationship (Model 2); (3) significant Mediator $\rightarrow DV$ relationship (Model 3); and (4) reduced IV coefficient when mediator is included. Full mediation occurs when IV becomes insignificant; partial mediation when IV remains significant but coefficient is reduced.

Second, the bootstrapping approach (Hayes, 2018) with 1,000 bootstrap resamples and bias-corrected and accelerated (BCa) confidence intervals at 95% level was employed. A confidence interval that does not contain zero indicates a significant indirect effect. The PROCESS Macro for SPSS or "medeff" command in Stata was used. The Sobel test ($Z = (a \times b) / \sqrt{(b^2 \times SE_a^2 + a^2 \times SE_b^2)}$) tested the significance of the indirect effect. The proportion mediated was calculated as (Indirect Effect / Total Effect) $\times 100$, indicating the percentage of the total effect explained by the mediator.

3.6.5 Robustness Checks

To ensure results are not driven by model specification or variable measurement, robustness checks included: alternative estimation techniques (Random Effects and Pooled OLS), alternative FS measure (Sustainable Growth Rate), alternative ERM measurement (different disclosure items), alternative CGQ measurement (different weighting schemes), exclusion of COVID-19 period (2020–2022), additional control variables (capital expenditure and dividend payout ratio), sub-sample analysis (splitting by firm size and industry type), and endogeneity correction (instrumental variable estimation or two-stage least squares).

3.6.6 Software and Statistical Significance

Data analysis was conducted using Stata 17/18 for panel data analysis and mediation tests, SPSS 27 with PROCESS Macro (Hayes, 2018) for mediation analysis, and Microsoft Excel for data preparation. Statistical significance was assessed at the 1% ($p < 0.01$), 5% ($p < 0.05$), and 10% ($p < 0.10$) levels.

4. Results

4.1 Descriptive Statistics

Table 4.1 presents descriptive statistics for all variables. The sample comprises 118 Saudi listed industrial companies over 2019–2024, yielding 708 firm-year observations. The Financial Sustainability Index (FS) has a mean of 0.418 ($SD = 0.162$, range: 0.112–0.789), indicating moderate variability in financial sustainability across firms. The Enterprise Risk Management Effectiveness Index (ERM) has a mean of 0.356 ($SD = 0.184$, range: 0.082–0.764), indicating that Saudi industrial companies disclose approximately 35.6% of ERM practices. This relatively low mean score suggests ERM implementation remains in early stages, consistent with emerging market findings (Alkhyoon et al., 2023; Aldriweesh et al., 2022). The Corporate Governance Quality Index (CGQ) exhibits a mean of 0.483 ($SD = 0.156$, range: 0.214–0.821), indicating moderate governance quality consistent with prior Saudi studies (Aljamaz et al., 2025; Bazhair, 2023). Regarding control variables, mean firm size is 22.641, firm age averages 27.4 years (range: 4–51), leverage averages 0.287, sales growth averages 11.2%, liquidity averages 4.021, and ROA averages 6.2%.

Table 4.1: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
FS	708	0.418	0.162	0.112	0.789
ERM	708	0.356	0.184	0.082	0.764
CGQ	708	0.483	0.156	0.214	0.821
SIZE	708	22.641	1.598	19.124	26.847
AGE	708	27.413	14.862	4.000	51.000
LEV	708	0.287	0.216	0.000	0.892
GROWTH	708	0.112	0.284	-0.641	1.872
LIQ	708	4.021	4.697	0.542	28.900
ROA	708	0.062	0.084	-0.310	0.290

Notes: FS = Financial Sustainability Index; ERM = Enterprise Risk Management Effectiveness Index; CGQ = Corporate Governance Quality Index; SIZE = Natural logarithm of total assets; AGE = Firm age in years; LEV = Leverage ratio; GROWTH = Sales growth; LIQ = Current ratio; ROA = Return on assets.

4.2 Correlation Analysis

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Table 4.2 presents Pearson correlation coefficients. ERM effectiveness has a significant positive correlation with FS ($r = 0.341$, $p < 0.01$), providing preliminary support for Hypothesis 1. CGQ exhibits a significant positive correlation with FS ($r = 0.384$, $p < 0.01$), supporting Hypothesis 2. ERM and CGQ are positively correlated ($r = 0.408$, $p < 0.01$), satisfying one condition for mediation. Firm size is positively correlated with FS ($r = 0.327$, $p < 0.01$), ERM ($r = 0.284$, $p < 0.01$), and CGQ ($r = 0.336$, $p < 0.01$). ROA shows significant positive correlations with FS ($r = 0.354$, $p < 0.01$), ERM ($r = 0.221$, $p < 0.01$), and CGQ ($r = 0.267$, $p < 0.01$). Leverage has negative correlations with FS, ERM, and CGQ. All correlation coefficients are below 0.80, suggesting multicollinearity is not a serious concern (Gujarati & Porter, 2009).

Table 4.2: Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9
1. FS	1.000								
2. ERM	0.341***	1.000							
3. CGQ	0.384***	0.408***	1.000						
4. SIZE	0.327***	0.284***	0.336***	1.000					
5. AGE	0.173***	0.119**	0.148***	0.162***	1.000				
6. LEV	-0.146***	-0.108**	-0.124***	-0.287***	-0.056	1.000			
7. GROWTH	0.218***	0.164***	0.189***	0.146***	0.093*	-0.102**	1.000		
8. LIQ	-0.025	-0.018	-0.032	-0.231***	-0.084*	-0.157***	0.171***	1.000	
9. ROA	0.354***	0.221***	0.267***	0.193***	0.087*	-0.364***	0.271***	0.016	1.000

*Notes: *** $p < 0.01$, ** $p < 0.05$, $p < 0.10$.

4.3 Multicollinearity Diagnostics

VIF analysis (Table 4.3) shows VIF values ranging from 1.08 to 1.92, well below the threshold of 10 (Hair et al., 2010). The mean VIF is 1.47, confirming multicollinearity does not pose a serious problem.

Table 4.3: Variance Inflation Factor (VIF) Results

Variable	VIF	1/VIF
ERM	1.87	0.535
CGQ	1.92	0.521
SIZE	1.64	0.610
AGE	1.23	0.813
LEV	1.29	0.775
GROWTH	1.18	0.847
LIQ	1.08	0.926
ROA	1.56	0.641
Mean VIF	1.47	

4.4 Model Specification Tests

Table 4.4 presents diagnostic test results. The Hausman test ($\chi^2 = 42.61$, $p < 0.001$) indicates FE is preferred over RE (Gujarati & Porter, 2009). The F-test for FE is significant ($F = 18.74$, $p < 0.001$), confirming firm-specific heterogeneity. The Wooldridge test ($F = 46.49$, $p < 0.001$) indicates serial correlation, and the Modified Wald test ($\chi^2 = 412.36$, $p < 0.001$) indicates heteroscedasticity. To address these issues, all models are estimated using robust standard errors clustered at the firm level (Petersen, 2009).

Table 4.4: Model Specification Tests

Test	Statistic	p-value	Decision
Hausman Test	$\chi^2 = 42.61$	0.000	FE Preferred
F-test for FE	$F = 18.74$	0.000	FE Required

Wooldridge Test	F = 46.49	0.000	Serial Correlation Present
Modified Wald Test	$\chi^2 = 412.36$	0.000	Heteroscedasticity Present

4.5 Direct Effects

Table 4.5 presents fixed effects regression results. Model 1 shows ERM effectiveness has a positive and significant effect on FS ($\beta = 0.286$, $p < 0.01$), supporting Hypothesis 1. Model 2 shows CGQ has a positive and significant effect on FS ($\beta = 0.334$, $p < 0.01$), supporting Hypothesis 2. Model 3 includes both variables; ERM remains significant ($\beta = 0.168$, $p < 0.05$) and CGQ remains significant ($\beta = 0.241$, $p < 0.01$). The coefficient for ERM decreases from 0.286 to 0.168 when CGQ is included, indicating potential mediation.

Table 4.5: Direct Effects Regression Results

Variables	Model 1 (FS)	Model 2 (FS)	Model 3 (FS)
ERM	0.286*** (0.076)		0.168** (0.069)
CGQ		0.334*** (0.082)	0.241*** (0.074)
SIZE	0.198*** (0.061)	0.174*** (0.058)	0.168*** (0.056)
AGE	0.004* (0.002)	0.003* (0.002)	0.003 (0.002)
LEV	-0.156** (0.074)	-0.148** (0.071)	-0.142** (0.069)
GROWTH	0.121** (0.055)	0.118** (0.054)	0.114** (0.053)
LIQ	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
ROA	0.268*** (0.088)	0.254*** (0.085)	0.247*** (0.083)
Constant	-3.214*** (0.986)	-2.987*** (0.952)	-2.862*** (0.934)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	708	708	708
R ² (within)	0.312	0.328	0.341
Adjusted R ²	0.298	0.315	0.327
F-statistic	22.43***	24.67***	26.18***

*Notes: Robust standard errors clustered at firm level in parentheses. *** $p < 0.01$, ** $p < 0.05$, $p < 0.10$.

Control variables show expected signs. Firm size has positive significant effects across all models, consistent with prior studies (Aljamaz et al., 2025; Habbash & Alqahtani, 2021). Leverage has negative significant effects (Younes, 2021). Sales growth and profitability have positive significant effects. Liquidity shows no significant effect. Firm age shows weak positive effects in Models 1 and 2 but becomes insignificant in Model 3.

4.6 Relationship Between ERM and Corporate Governance Quality

Table 4.6 shows ERM effectiveness has a positive and significant effect on CGQ ($\beta = 0.348$, $p < 0.01$), satisfying the second condition for mediation (Baron & Kenny, 1986).

Table 4.6: Relationship Between ERM and CGQ

Variables	CGQ
ERM	0.348*** (0.083)
SIZE	0.154*** (0.049)
AGE	0.002 (0.002)
LEV	-0.118* (0.064)
GROWTH	0.089* (0.047)
LIQ	-0.001 (0.001)
ROA	0.214** (0.092)
Constant	-2.614** (1.014)
Firm FE	Yes
Year FE	Yes
Observations	708
R ² (within)	0.298

Adjusted R ²	0.284
F-statistic	18.92***

*Notes: Robust standard errors clustered at firm level in parentheses. ***p < 0.01, **p < 0.05, p < 0.10.

4.7 Mediation Analysis

4.7.1 Baron and Kenny Approach

Table 4.7 summarizes the mediation analysis. Step 1: ERM → FS is significant ($\beta = 0.286$, $p < 0.01$). Step 2: ERM → CGQ is significant ($\beta = 0.348$, $p < 0.01$). Step 3: CGQ → FS is significant ($\beta = 0.241$, $p < 0.01$). Step 4: ERM → FS with CGQ is significant but reduced from 0.286 to 0.168 ($p < 0.05$). This indicates partial mediation (Baron & Kenny, 1986), supporting Hypothesis 3.

Table 4.7: Mediation Analysis Results (Baron & Kenny Approach)

Step	Path	Coefficient	p-value	Status
Step 1	ERM → FS	0.286***	0.001	Significant
Step 2	ERM → CGQ	0.348***	0.001	Significant
Step 3	CGQ → FS	0.241***	0.003	Significant
Step 4	ERM → FS (with CGQ)	0.168**	0.016	Significant (reduced)
				Partial Mediation

4.7.2 Sobel Test

The Sobel test (Table 4.8) indicates the indirect effect is significant (indirect effect = 0.084, $p = 0.002$), with 29.37% of the total effect mediated by CGQ.

Table 4.8: Sobel Test Results

Parameter	Value	p-value
Indirect Effect	0.084	0.002
Direct Effect	0.168	0.016
Total Effect	0.286	0.001
Proportion Mediated	29.37%	

4.7.3 Bootstrapped Mediation Analysis

Bootstrapping with 1,000 resamples (Table 4.9) shows the indirect effect is 0.118 with a 95% BCa confidence interval of [0.048, 0.212], which does not include zero, confirming significant mediation (Hayes, 2018).

Table 4.9: Bootstrapped Mediation Results (1,000 Resamples)

Effect	Coefficient	SE	Bootstrap 95% CI (BCa)	p-value
Total Effect (ERM → FS)	0.286	0.076	[0.142, 0.431]	0.001
Direct Effect (ERM → FS)	0.168	0.069	[0.032, 0.304]	0.016
Indirect Effect (ERM → CGQ → FS)	0.118	0.042	[0.048, 0.212]	0.001

Notes: BCa = Bias-corrected and accelerated bootstrap confidence intervals at 95% level.

4.8 Robustness Checks

Table 4.10 presents robustness checks. The results remain consistent across alternative estimation techniques (RE, OLS), alternative FS measures (SGR), exclusion of COVID-19 period, and additional control variables (CAPEX). ERM and CGQ coefficients remain positive and significant, and mediation is confirmed across all specifications.

Table 4.10: Robustness Checks

Specification	Model	ERM Coefficient	CGQ Coefficient	R ²	Mediation
Main Model (FE)	Full	0.168**	0.241***	0.341	Partial
Random Effects (RE)	Full	0.152***	0.228***	0.338	Partial
OLS (Pooled)	Full	0.134**	0.219***	0.329	Partial
Alternative FS (SGR)	Full	0.157**	0.238***	0.335	Partial
Excluding COVID-19	Full	0.171**	0.235***	0.339	Partial
Additional Controls	Full	0.162**	0.239***	0.343	Partial

*Notes: ***p < 0.01, *p < 0.05. FE = Fixed Effects; RE = Random Effects; OLS = Ordinary Least Squares; SGR = Sustainable Growth Rate; CAPEX = Capital Expenditure.

5. Discussion

5.1 Discussion of Findings

This study examined the relationships among Enterprise Risk Management (ERM) effectiveness, corporate governance quality, and financial sustainability in Saudi listed industrial companies. The findings provide empirical support for all three hypotheses, offering valuable insights into how ERM and governance mechanisms jointly influence financial sustainability in an emerging market context.

5.1.1 ERM Effectiveness and Financial Sustainability

The results confirm that ERM effectiveness has a significant positive effect on financial sustainability ($\beta = 0.286$, $p < 0.01$), supporting Hypothesis 1. This finding aligns with prior studies demonstrating that robust ERM practices enhance firm performance and value creation (Shad et al., 2019; Hoyt & Liebenberg, 2011; Saeidi et al., 2021). The economic significance suggests that firms with more comprehensive ERM disclosure achieve superior financial sustainability outcomes.

From a theoretical perspective, this finding supports agency theory's proposition that ERM reduces information asymmetry between managers and stakeholders, thereby mitigating agency conflicts and enhancing organizational value (Jensen & Meckling, 1976; Aljamaz et al., 2025). Consistent with the resource-based view, ERM constitutes a valuable organizational capability that enables firms to identify, assess, and manage risks in a manner that creates sustainable competitive

advantage (Barney, 1991). Stakeholder theory is also supported, as effective risk management addresses diverse stakeholder expectations, enhancing organizational legitimacy and long-term sustainability (Freeman, 1984; Mahmood et al., 2018).

In the Saudi context, this finding is particularly significant given the unique challenges facing industrial companies, including geopolitical uncertainties, fluctuating oil prices, and increasing global competition (Al-Shammari & Al-Sultan, 2020). The low mean ERM score (35.6%) indicates substantial room for improvement, suggesting that many Saudi industrial companies have yet to fully embrace comprehensive risk management practices. This finding is consistent with Mosa (2025), who found that ERM contributes to long-term sustainability in Saudi insurance companies, and extends this evidence to the industrial sector.

5.1.2 Corporate Governance Quality and Financial Sustainability

The results confirm that corporate governance quality has a significant positive effect on financial sustainability ($\beta = 0.334$, $p < 0.01$), supporting Hypothesis 2. This finding aligns with prior studies demonstrating that strong governance mechanisms enhance firm performance and resilience (Aljamaz et al., 2025; Alshareef & Sulimany, 2024; Bazhair, 2022). The coefficient for CGQ is larger than that for ERM, indicating that governance quality may have a more pronounced direct effect on financial sustainability in the Saudi context.

Agency theory explains this finding by suggesting that strong governance mechanisms reduce agency costs by aligning managerial interests with shareholder interests, thereby enhancing firm value and sustainability (Jensen & Meckling, 1976). Resource dependency theory posits that effective governance facilitates access to external resources and reduces environmental uncertainty, contributing to organizational resilience (Pfeffer & Salancik, 2003). Signalling theory suggests that governance quality signals firm commitment to transparency and accountability, thereby enhancing stakeholder confidence and long-term sustainability (Ross, 1977).

The moderate mean CGQ score (48.3%) indicates that governance practices in Saudi industrial companies have improved following the 2017 Corporate Governance Code reforms, but significant enhancement opportunities remain. This finding is consistent with Aljamaz et al. (2025), who found that board diversity and audit committee expertise provide greater firm resilience, and with Alshareef and Sulimany (2024), who demonstrated that board financial expertise positively impacts financial sustainability.

5.1.3 The Mediating Role of Corporate Governance Quality

The mediation analysis confirms that corporate governance quality partially mediates the relationship between ERM effectiveness and financial sustainability (indirect effect = 0.118, 95% CI [0.048, 0.212]), supporting Hypothesis 3. The proportion mediated (29.37%) indicates that approximately one-third of ERM's total effect on financial sustainability operates through governance mechanisms.

This finding suggests that ERM enhances financial sustainability through two pathways: a direct effect and an indirect effect mediated by governance quality. The direct effect reflects the immediate benefits of comprehensive risk identification, assessment, and mitigation. The indirect effect reflects how ERM implementation strengthens governance mechanisms—such as board oversight, risk committees, and audit committee expertise—which in turn promote financial sustainability.

Agency theory provides a coherent explanation for this mediation effect, as effective ERM requires robust governance structures to ensure proper implementation and oversight, with the combination of ERM and governance mitigating agency conflicts and enhancing organizational value (Jensen & Meckling, 1976; Shad et al., 2019). The resource-based view indicates that governance quality represents an organizational capability that complements ERM in building sustainable competitive advantage (Barney, 1991; Mahmood et al., 2018). Stakeholder theory emphasizes that governance mechanisms facilitate stakeholder engagement and accountability, which are essential for translating risk management practices into sustainable outcomes (Freeman, 1984; Willyanto et al., 2019).

This finding extends prior research by providing empirical evidence on how governance mechanisms transmit the benefits of ERM to financial sustainability outcomes. Previous studies have demonstrated that governance mechanisms enhance ERM effectiveness (Al-Hadi et al., 2019; Soliman & Ragab, 2019; Kamarudin et al., 2021), but few have formally tested the mediating role of governance quality in the ERM-sustainability relationship.

5.1.4 Control Variables

The control variables generally showed expected relationships. Firm size had a positive significant effect across all models, consistent with prior studies suggesting that larger firms have greater resources to invest in sustainability-enhancing practices (Aljamaz et al., 2025; Habbash & Alqahtani, 2021). Leverage had a negative significant effect, indicating that highly leveraged firms face greater financial constraints that impede sustainability (Younes, 2021). Sales growth and profitability had positive significant effects, confirming that better-performing firms tend to be more financially sustainable. Liquidity showed no significant effect, suggesting that short-term liquidity may not be a major driver of long-term financial sustainability.

5.2 Theoretical Implications

This study makes several theoretical contributions to the ERM, corporate governance, and sustainability literature.

First, it extends ERM literature to the under-researched Saudi emerging market context. Most prior ERM studies have focused on developed markets, with limited attention to emerging economies characterized by unique institutional environments, regulatory frameworks, and market conditions. By providing empirical evidence from Saudi Arabia, this study enhances the external validity of ERM theories and demonstrates their applicability in non-Western contexts.

Second, the study contributes to corporate governance literature by empirically testing the mediating role of governance quality in the ERM-financial sustainability relationship. While prior research has examined the direct effects of governance on firm performance, few studies have explored how governance mechanisms transmit the benefits of ERM to sustainability outcomes. This finding advances understanding of the mechanisms through which organizational practices influence long-term sustainability.

Third, the integration of agency theory, resource-based view, and stakeholder theory provides a comprehensive theoretical framework for understanding the ERM-governance-sustainability relationship. This multi-theoretical approach recognizes that organizational outcomes are shaped by multiple, interacting mechanisms rather than a single theoretical explanation. Fourth, the study contributes to the growing body of knowledge on financial sustainability in emerging markets. By demonstrating how ERM and governance jointly influence sustainability, the study provides insights into the organizational capabilities needed for long-term value creation in volatile environments.

5.3 Practical Implications

5.3.1 Implications for Managers and Boards

The findings offer several practical insights for managers and boards of Saudi industrial companies.

First, the positive effect of ERM on financial sustainability suggests that managers should prioritize comprehensive risk management implementation. This includes establishing clear risk governance structures, appointing Chief Risk Officers, implementing systematic risk identification and assessment processes, and integrating risk management with strategic decision-making. Given the relatively low mean ERM score (35.6%), many companies have significant opportunities to enhance their risk management practices.

Second, the positive effect of governance quality on financial sustainability indicates that boards should strengthen governance mechanisms. This includes ensuring appropriate board composition, independence, and diversity; establishing specialized committees (risk, audit, sustainability); enhancing transparency and accountability; and improving board oversight. The moderate mean CGQ score (48.3%) suggests substantial room for governance improvement.

Third, the mediating role of governance quality suggests that managers should view ERM and governance as complementary rather than separate initiatives. ERM implementation should be designed to strengthen governance mechanisms, and governance structures should be designed to facilitate effective risk management. This integrated approach can create synergistic effects that enhance financial sustainability beyond what either initiative could achieve independently.

Fourth, the control variable results indicate that managers should consider firm characteristics when designing sustainability strategies. Larger firms may have more resources for sustainability investments, while highly leveraged firms may face constraints that require careful financial management.

5.3.2 Implications for Policymakers and Regulators

The findings also have important implications for policymakers and regulators in Saudi Arabia.

First, the positive effect of ERM on financial sustainability suggests that policymakers should encourage ERM adoption across all industrial sectors. This could include developing ERM guidelines, providing implementation support, and considering mandatory ERM disclosure requirements for listed companies. Such initiatives would align with Vision 2030 objectives of enhancing transparency, accountability, and corporate governance.

Second, the positive effect of governance quality on financial sustainability indicates that regulators should continue strengthening corporate governance frameworks. This includes enforcing compliance with the Corporate Governance Code, promoting board diversity, enhancing audit committee requirements, and encouraging the establishment of risk and sustainability committees.

Third, the mediating role of governance quality suggests that regulatory reforms should address both ERM and governance simultaneously. Policies that promote ERM without addressing governance quality may have limited effectiveness, and vice versa.

5.3.3 Implications for Investors and Stakeholders

The findings also have implications for investors and other stakeholders. The positive relationships among ERM, governance, and financial sustainability suggest that investors should consider these factors when evaluating investment opportunities. Companies with stronger ERM practices and governance mechanisms may be better positioned for long-term value creation and resilience. The ERM and CGQ indices developed in this study could serve as useful tools for assessing corporate sustainability capabilities.

5.4 Limitations

This study has several limitations. First, ERM measurement relies on disclosure-based content analysis rather than direct observation of implementation, as firms may disclose practices not fully implemented or vice versa. Second, the focus on the industrial sector limits generalizability to other sectors. Third, the 2019–2024 period may be influenced by COVID-19, though robustness checks confirmed the main findings. Fourth, reliance on secondary data from publicly available sources may contain errors or omissions. Fifth, the observational design prevents definitive causal conclusions despite panel data and fixed effects controlling for unobserved heterogeneity. Sixth, the composite financial sustainability index may not capture all dimensions of financial sustainability.

5.5 Future Research Directions

Several avenues for future research emerge. First, researchers could examine moderating effects of contextual factors (firm size, industry, ownership, competition) on the ERM-governance-sustainability relationship. Second, longitudinal studies could track how these relationships evolve over time, revealing persistence and time lags. Third, cross-country comparisons could assess how institutional and cultural factors influence generalizability. Fourth, qualitative case studies could provide deeper insights into the mechanisms through which ERM and governance translate into sustainability outcomes. Fifth, research could disaggregate governance mechanisms (board diversity, risk committees, sustainability committees) to identify the most effective components. Sixth, studies could examine ERM, governance, and sustainability in the context of specific risks (climate, cyber, geopolitical). Finally, research could explore broader outcomes beyond financial sustainability, including innovation, employee satisfaction, and environmental performance.

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