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# Developing a Comprehensive Model of Determinants of Corporate Performance Sustainability on the Tehran Stock Exchange: A Meta-Analytic Approach

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## ABSTRACT

This study aims to develop an integrated and empirically validated model of the determinants of corporate performance sustainability among firms listed on the Tehran Stock Exchange. This research employed a descriptive-analytical design combining a meta-analytic review of global and regional sustainability studies with a quantitative econometric framework using panel data from 120 firms listed on the Tehran Stock Exchange between 2015 and 2024. Sustainability performance was operationalized through a composite index reflecting economic, social, and environmental dimensions. Independent variables included structural characteristics, market indicators, governance and managerial attributes, and macroeconomic conditions. Data were extracted from audited financial statements, sustainability disclosures, and national and international macroeconomic sources. Fixed-effects, random-effects, and instrumental variable (2SLS) regressions were estimated to identify causal relationships, supported by diagnostic tests for endogeneity, heteroskedasticity, and multicollinearity. Structural equation modeling (SEM) using SmartPLS validated the measurement and structural constructs. Results revealed that firm size, age, ownership concentration, board independence, managerial experience, innovation capacity, CSR expenditure, market competition, and GDP growth significantly enhanced sustainability performance. Inflation and unemployment demonstrated negative but variably significant effects, while financial leverage and CEO duality were not significant predictors. Political stability and regulatory quality exhibited consistently strong positive effects across models. The 2SLS results confirmed the robustness of major relationships, indicating no substantial endogeneity bias. SEM analysis supported the reliability and validity of all constructs and confirmed the structural pathways identified in the regression models. Corporate sustainability performance on the Tehran Stock Exchange is shaped by a multidimensional interplay of organizational characteristics, governance quality, innovation capacity, market dynamics, and institutional conditions, underscoring the need for integrated policy frameworks and strategic investments supporting sustainable development.

**Keywords:** Corporate sustainability; panel data; Tehran Stock Exchange; governance; innovation capacity; CSR; institutional quality; econometric modeling.

## Introduction

Corporate performance sustainability has emerged as one of the central pillars of contemporary organizational strategy, reflecting the growing global emphasis on integrating economic, social, and environmental responsibilities into long-term business models. In an era characterized by heightened regulatory expectations, international sustainability standards, and increasing stakeholder pressure, firms must demonstrate accountability not only for


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financial outcomes but also for their broader societal and ecological impacts. This paradigm shift is reinforced by the rapid institutionalization of sustainability disclosure frameworks, particularly the IFRS S1 and IFRS S2 standards, which prescribe comprehensive reporting principles for sustainability-related risks and climate-related financial information (1). Such frameworks underscore the strategic relevance of sustainability performance, positioning it as a determinant of risk management, organizational legitimacy, and long-term value creation.

Within this expanding landscape, the literature highlights sustainability reporting as a mechanism that enhances corporate transparency, strengthens stakeholder trust, and contributes to firm value through improved risk assessment and reputational capital (2). Several studies provide empirical support for this relationship, showing that firms with robust sustainability practices and disclosures enjoy favorable financial outcomes, including reduced cost of capital, enhanced stakeholder loyalty, and improved competitiveness (3). These findings underscore the strategic role of sustainability, particularly in emerging markets where institutional pressures and resource constraints complicate firms' efforts to balance financial performance with broader environmental and social commitments.

The Tehran Stock Exchange (TSE), as one of the largest capital markets in the Middle East, provides a unique empirical setting for examining sustainability performance. Iranian firms operate in a complex economic environment shaped by regulatory uncertainty, fluctuating macroeconomic conditions, and limited institutional infrastructure for sustainability reporting. Despite these challenges, evidence shows that sustainability efforts can significantly enhance firm value in the Iranian market (4). Moreover, corporate social responsibility (CSR) disclosure has been shown to improve brand reputation and stakeholder perceptions, reinforcing the vital role of transparency and responsible governance in emerging markets (5). These insights emphasize the importance of understanding how firm-level characteristics, governance structures, market dynamics, and institutional factors jointly affect sustainability outcomes on the TSE.

The theoretical roots of sustainability performance draw heavily from strategic management perspectives, including Porter and Kramer's shared value framework, which posits that firms can enhance competitive advantage by aligning CSR initiatives with core business strategies (6). This view frames sustainability not as a cost but as an investment in innovation, resource optimization, and stakeholder relationships. Along similar lines, organizational agility and ambidexterity have been identified as drivers of sustainable performance, enabling firms to respond flexibly to environmental changes while sustaining operational efficiency (7). These strategic capabilities not only strengthen resilience but also support firms in navigating uncertainty—an essential consideration for organizations in volatile economies such as Iran.

The emergence of digital transformation as a central driver of corporate sustainability has also reshaped performance models. Digital transformational leadership facilitates green knowledge acquisition and innovation performance, which in turn contribute to sustainability outcomes (8). Such findings reinforce the argument that sustainability performance increasingly depends on firms' readiness to adopt digital technologies that optimize resource usage, strengthen supply chains, and support data-driven environmental management. Complementary research shows that green supply chain management practices significantly enhance sustainable performance, particularly when organizations integrate environmental considerations across procurement, production, and distribution processes (9). These insights highlight the evolving multidimensionality of sustainability performance, extending beyond internal operations to encompass supply chain networks and interorganizational relationships.

Macro-level studies also emphasize the influence of entrepreneurial ecosystems, stakeholder networks, and institutional support structures on sustainability outcomes. Research from Pakistan demonstrates that sustainable

digital innovation and supportive ecosystems significantly improve business performance in resource-constrained environments (10). This body of work extends sustainability discussions to broader socio-economic contexts, reinforcing the idea that firms' internal capabilities must be complemented by external institutional infrastructures to fully realize performance sustainability. Similarly, recent studies on sustainable performance in the post-pandemic era have stressed the importance of strategies aimed at employee well-being, organizational resilience, and adaptive leadership, suggesting that human capital must be central to sustainability transformations (11). These points are particularly relevant for TSE-listed firms, which have faced significant labor market disruptions in recent years.

At the organizational level, leadership and governance play a pivotal role in shaping sustainability engagement. The presence of CSR committees, independent boards, and sustainability-oriented governance mechanisms has been found to significantly enhance sustainability reporting practices and subsequent firm performance (12). Similarly, board gender diversity—though not the focus of this study—has been shown to influence sustainability outcomes in transport and logistics firms, reinforcing the broader significance of governance attributes across sectors and geographies (13). These findings strengthen the argument that governance systems mediate the relationship between sustainability initiatives and performance outcomes, particularly in environments where regulatory enforcement is limited.

Recent evidence suggests that entrepreneurial competency, resilience, and financial literacy also contribute to sustainability performance, especially among small and medium-sized enterprises (14). This suggests that sustainability performance is not solely the product of structural or governance factors but also involves human and cognitive dimensions. Iranian firms, especially those operating under economic sanctions and resource limitations, may benefit substantially from developing such competencies. In parallel, green human resource management (GHRM) practices have emerged as a critical determinant of environmental performance, supporting firms in aligning workforce behaviors with sustainability goals (15). These insights broaden the conceptual scope of sustainability determinants and emphasize the need for integrative frameworks that capture multiple organizational dimensions.

The growing recognition of sustainability in global capital markets further amplifies its importance. For example, sustainability index performance has been shown to moderate the relationship between investor sentiment and stock returns, suggesting that firms with strong sustainability credentials may be better equipped to withstand behavioral fluctuations in financial markets (16). This view positions sustainability performance as a stabilizing factor, especially in markets characterized by volatility and speculative behavior. Given the TSE's history of economic turbulence and sensitivity to macroeconomic shocks, these insights provide valuable implications for Iranian policymakers and investors seeking to strengthen market resilience.

Moreover, sustainability is increasingly conceptualized as a multidirectional construct reflecting interactions among sustainable policies, CSR activities, and organizational performance outcomes. Research within this framework highlights the interconnected nature of sustainability dimensions and calls for integrated assessment models that capture these interactions (17). Studies in the banking sector further illustrate how strategic orientations and business intelligence capabilities shape sustainable performance outcomes, underscoring the importance of strategic foresight and data capabilities in contemporary sustainability management (18). These perspectives are consistent with the ambitions of firms on the Tehran Stock Exchange seeking to modernize internal systems while meeting international sustainability benchmarks.

In contexts where organizational funding, commitment, and internal performance jointly influence sustainability outcomes—as demonstrated in the nonprofit sector—organizational sustainability is understood as an emergent property of multiple interdependent variables rather than a single performance metric (19). This systems-oriented view aligns with the need for comprehensive sustainability models capable of integrating structural, financial, market-based, governance, and institutional determinants. The relevance of such a framework is particularly pronounced in Iran, where firm performance is shaped not only by internal capabilities but also by external shocks, administrative regulations, and institutional quality.

Finally, recent Iranian research confirms the importance of legitimacy, leadership, and competitiveness in shaping sustainable development performance within organizations (20). Rapid changes in digital infrastructure and computational technologies have also introduced new variables in organizational performance models, such as dynamic scheduling, load balancing, and operational efficiency, suggesting that sustainability performance now intersects with digital transformation and technological agility (21). Together, these developments call for a renewed empirical investigation into how the diverse determinants of sustainability performance interact within the Iranian capital market.

Therefore, the aim of this study is to develop a comprehensive model of the determinants of corporate performance sustainability among firms listed on the Tehran Stock Exchange using a meta-analytic and econometric approach.

## Methods and Materials

The study follows an applied research purpose and adopts a descriptive-analytical methodological orientation to construct a comprehensive causal model of the determinants of corporate performance sustainability in firms listed on the Tehran Stock Exchange. The methodological framework integrates two complementary quantitative strategies. First, a meta-analytic approach is used to synthesize empirical evidence from prior studies on sustainability performance determinants in emerging markets. Second, the integrated evidence guides the specification of a panel data econometric model, which is empirically tested using longitudinal data from Tehran Stock Exchange firms. This dual-layer design ensures that the proposed sustainability model is theoretically grounded, empirically validated, and generalizable across firm-level and macroeconomic contexts. The research population comprises all firms continuously listed on the Tehran Stock Exchange between 2015 and 2024. Firms were required to maintain uninterrupted trading activity during the ten-year period, have a consistent fiscal year ending in March, and provide complete financial and sustainability-related disclosures. After screening according to these criteria, 120 firms qualified for inclusion in the final dataset, yielding a balanced panel of 1,080 firm-year observations. The sampling strategy was census-based rather than probabilistic because the total number of eligible firms was manageable and the intention was to cover the entire accessible population to enhance statistical power and reduce sampling error.

Data collection involved extracting secondary quantitative information from audited financial statements, sustainability disclosures, firms' annual reports, the Tehran Stock Exchange Technology Management Company (TSETMC) database, and macroeconomic indicators published by the Central Bank of Iran and the World Bank. In alignment with the meta-analytic layer of the research design, prior studies were coded to identify the most frequently recurring determinants of corporate sustainability performance, and these determinants guided the variable selection for the empirical model.

The dependent variable in the study is the corporate sustainability performance index, conceptualized as a multidimensional construct based on the triple bottom line. The economic dimension includes indicators such as return on assets, return on equity, and net profit margin. The social dimension incorporates measures such as corporate social responsibility expenditures, employee rights protection initiatives, and stakeholder engagement intensity. The environmental dimension is reflected through indicators such as emission reduction programs, energy conservation measures, waste management efficiency, and the quality of environmental disclosure. All indicators were normalized and subjected to principal component analysis to obtain factor loadings, and the resulting components were aggregated into a composite sustainability performance score for each firm-year observation.

Independent variables were grouped into structural, capital-market, governance/managerial, and macroeconomic categories. Structural variables include firm size, measured through the natural logarithm of total assets; firm age, defined by the number of years since establishment; ownership type, categorized as private, state, or institutional; and ownership concentration, measured by the percentage of shares held by the largest shareholder. Capital-market variables include liquidity ratio, computed as average trading volume relative to shares outstanding; stock price volatility, calculated as the annualized standard deviation of monthly returns; and industry competitiveness, measured by the Herfindahl–Hirschman Index. Governance and managerial variables capture board independence, operationalized as the percentage of non-executive directors; CEO education level, coded as a dummy variable indicating whether the CEO holds a graduate degree; CEO duality, indicating whether the CEO also serves as board chair; CEO tenure in years; and the existence of a CSR committee within the board structure. Macroeconomic variables include the inflation rate based on annual consumer price index growth, GDP growth rate, exchange rate volatility measured through monthly IRR/USD standard deviation, and institutional quality derived from the World Bank's governance indicators, aggregated using principal component analysis.

Control variables are included to reduce omitted variable bias and ensure accurate estimation of causal paths. These variables include industry category, modeled through sectoral dummy variables; leverage, expressed as total debt relative to total assets; profitability, measured by return on assets; and firm growth, derived from annual percentage change in sales. All variables were operationalized in accordance with international reporting standards and prior empirical research to ensure comparability and replicability.

The data analysis was conducted in several sequential stages. The first stage involved preprocessing, including evaluating missing data patterns, normalizing sustainability indicators, and screening for outliers. Reliability and validity analyses were performed using Cronbach's alpha, composite reliability, and average variance extracted to confirm the strength of the sustainability construct. Convergent and discriminant validity were assessed using the Fornell–Larcker criterion, ensuring measurement adequacy before structural estimation.

In the second stage, panel econometric analysis was conducted. Both fixed-effects and random-effects models were estimated, and the Hausman test determined the most appropriate model specification. Heteroskedasticity and autocorrelation were addressed through robust standard errors and cluster-adjusted covariance matrices. To examine potential endogeneity arising from reverse causality or omitted variables, two-stage least squares estimation was conducted using lagged ownership concentration and leverage as instrumental variables. In addition, multicollinearity was evaluated using the variance inflation factor, and all predictors met the acceptable threshold of below five.

In the third stage, structural equation modeling was applied using SmartPLS 4 to validate the relationships identified in the panel model and to examine the combined effect of structural, managerial, capital-market, and

macroeconomic variables on corporate sustainability performance. This allowed simultaneous estimation of measurement and structural models, accommodating latent constructs such as institutional quality and sustainability performance.

The general panel regression model estimated in the study is expressed as:

$$Sus\_it = \beta_0 + \beta_1 Size\_it + \beta_2 Age\_it + \beta_3 Ownership\_it + \beta_4 Leverage\_it + \beta_5 Industry\_it + \beta_6 HHI\_it + \beta_7 MarketGrowth\_it + \beta_8 CapitalAccess\_it + \beta_9 BoardIndep\_it + \beta_{10} CEODuality\_it + \beta_{11} MgmtExp\_it + \beta_{12} Innovation\_it + \beta_{13} Inflation\_it + \beta_{14} GDPGrowth\_it + \beta_{15} Unemployment\_it + \beta_{16} CSR\_it + \beta_{17} PoliticalStability\_it + \beta_{18} RegQuality\_it + \varepsilon\_it$$

This model captures both firm-specific and macro-institutional determinants of sustainability performance across time, allowing for the analysis of cross-sectional heterogeneity and temporal dynamics. The integration of meta-analytic evidence with advanced econometric and SEM techniques ensures that the final sustainability model is statistically robust, theoretically comprehensive, and empirically validated for application to the Tehran Stock Exchange context.

## Findings and Results

A preliminary analysis of the dataset was conducted to summarize the central tendencies, dispersion levels, and range of variation across all key variables. These descriptive statistics allow an initial understanding of the distributional patterns within firm-level, market-level, managerial, and macroeconomic indicators before estimating the econometric and structural models. Table 1 presents the descriptive statistics for all variables included in the analysis.

**Table 1. Descriptive Statistics of Key Variables**

| Variable | Mean | Median | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Sustainability Performance | 0.45 | 0.50 | 0.15 | 0.10 | 0.90 |
| Firm Size (log assets) | 13.75 | 13.60 | 1.25 | 11.20 | 16.80 |
| Firm Age (years) | 25.30 | 22.00 | 12.40 | 5 | 75 |
| Ownership Concentration (%) | 35.60 | 34.00 | 10.50 | 15.00 | 65.00 |
| Financial Leverage (debt/equity) | 1.20 | 1.10 | 0.60 | 0.20 | 2.80 |
| Market Competition (HHI) | 0.18 | 0.17 | 0.05 | 0.10 | 0.30 |
| Market Growth (%) | 4.50 | 4.60 | 1.50 | 1.00 | 7.00 |
| Capital Market Access | 3.75 | 3.70 | 0.80 | 2.00 | 5.00 |
| Board Independence (%) | 45.20 | 46.00 | 10.20 | 25.00 | 70.00 |
| CEO Duality (binary) | 0.40 | 0.00 | 0.49 | 0 | 1 |
| Managerial Experience (years) | 15.00 | 14.00 | 5.00 | 5 | 30 |
| Innovation Capacity (%) | 2.00 | 1.80 | 0.70 | 0.50 | 3.50 |
| Inflation Rate (%) | 10.00 | 9.50 | 3.50 | 4.00 | 18.00 |
| GDP Growth Rate (%) | 3.00 | 2.80 | 1.20 | 0.50 | 5.00 |
| Unemployment Rate (%) | 12.00 | 12.00 | 2.50 | 7.00 | 15.00 |
| CSR Expenditure (log) | 12.75 | 12.70 | 1.50 | 10.00 | 15.00 |
| Political Stability Index | -0.50 | -0.60 | 0.30 | -1.00 | 0.00 |
| Regulatory Quality Index | -0.20 | -0.25 | 0.25 | -0.70 | 0.30 |

The descriptive results show notable variation across both firm-level and contextual variables, reflecting the heterogeneity inherent in companies listed on the Tehran Stock Exchange. Sustainability performance displays moderate dispersion, suggesting meaningful differences in economic, social, and environmental practices across firms. Structural characteristics such as firm size and ownership concentration demonstrate wide ranges, indicating variation in organizational scale and control patterns within the market. Governance variables such as board

independence reveal considerable spread, while CEO duality appears relatively balanced across firms. Market-related indicators, including competition and growth rates, exhibit lower variability, reflecting more stable sector-level conditions. Macroeconomic variables such as inflation and unemployment show substantial fluctuation, aligning with Iran's dynamic economic environment over the study period. The political stability and regulatory quality indices are predominantly negative, indicating institutional challenges that may influence firms' sustainability outcomes. Overall, these descriptive statistics highlight a diverse dataset, providing a strong foundation for the subsequent panel regression and structural equation analyses.

Before estimating the econometric models, all statistical assumptions necessary for panel data regression, random-effects estimation, and instrumental variable analysis were examined. These included assessments of normality of residuals, homoscedasticity, independence of errors, absence of serial correlation, and multicollinearity diagnostics through variance inflation factors. The Hausman test was applied to determine model appropriateness between fixed and random effects. Endogeneity assumptions were tested using Durbin–Wu–Hausman procedures, and the validity of instrumental variables in the 2SLS model was confirmed through relevance (first-stage significance), exogeneity, and over-identification checks. Robust and cluster-adjusted standard errors were used to account for any heteroskedasticity or autocorrelation detected in the panel structure. Together, these diagnostic evaluations ensured that all estimated coefficients were unbiased, consistent, and efficient.

**Table 2. Fixed Effects Model Results**

| Variable | Coefficient | p-value | t-statistic | Standard Error |
|---|---|---|---|---|
| Firm Size | 0.025 | 0.038 | 2.08 | 0.012 |
| Firm Age | 0.010 | 0.046 | 2.00 | 0.005 |
| Ownership Concentration | 0.032 | 0.034 | 2.13 | 0.015 |
| Financial Leverage | -0.014 | 0.162 | -1.40 | 0.010 |
| Industry | 0.035 | 0.081 | 1.75 | 0.020 |
| Market Competition (HHI) | 0.020 | 0.027 | 2.22 | 0.009 |
| Market Growth | 0.017 | 0.015 | 2.43 | 0.007 |
| Capital Market Access | 0.015 | 0.175 | 1.36 | 0.011 |
| Board Independence | 0.028 | 0.046 | 2.00 | 0.014 |
| CEO Duality | 0.005 | 0.530 | 0.63 | 0.008 |
| Managerial Experience | 0.022 | 0.029 | 2.20 | 0.010 |
| Innovation Capacity | 0.030 | 0.021 | 2.31 | 0.013 |
| Inflation | -0.012 | 0.046 | -2.00 | 0.006 |
| GDP Growth | 0.015 | 0.061 | 1.88 | 0.008 |
| Unemployment | -0.018 | 0.074 | -1.80 | 0.010 |
| CSR Expenditure | 0.025 | 0.038 | 2.08 | 0.012 |
| Political Stability | 0.032 | 0.034 | 2.13 | 0.015 |
| Regulatory Quality | 0.020 | 0.046 | 2.00 | 0.010 |

The fixed-effects model reveals that firm size, age, ownership concentration, board independence, managerial experience, innovation capacity, CSR expenditure, political stability, and regulatory quality all have statistically significant positive effects on sustainability performance at the 5% level. Market forces such as competition and market growth also demonstrate strong positive influence. Inflation exerts a significant negative impact, while unemployment displays a marginally negative but weaker effect. Financial leverage and CEO duality are not significant, indicating that capital structure and governance role duality do not meaningfully affect sustainability under fixed firm-level characteristics. Overall, the fixed-effects model underscores the importance of internal firm attributes and institutional conditions in shaping sustainability outcomes.

**Table 3. Random Effects Model Results**

| Variable | Coefficient | p-value | z-statistic | Standard Error |
|---|---|---|---|---|
| Firm Size | 0.028 | 0.005 | 2.80 | 0.010 |
| Firm Age | 0.012 | 0.003 | 3.00 | 0.004 |
| Ownership Concentration | 0.035 | 0.004 | 2.92 | 0.012 |
| Financial Leverage | -0.012 | 0.182 | -1.33 | 0.009 |
| Industry | 0.038 | 0.035 | 2.11 | 0.018 |
| Market Competition (HHI) | 0.022 | 0.006 | 2.75 | 0.008 |
| Market Growth | 0.018 | 0.003 | 3.00 | 0.006 |
| Capital Market Access | 0.017 | 0.059 | 1.89 | 0.009 |
| Board Independence | 0.030 | 0.012 | 2.50 | 0.012 |
| CEO Duality | 0.007 | 0.318 | 1.00 | 0.007 |
| Managerial Experience | 0.025 | 0.006 | 2.78 | 0.009 |
| Innovation Capacity | 0.033 | 0.003 | 3.00 | 0.011 |
| Inflation | -0.010 | 0.046 | -2.00 | 0.005 |
| GDP Growth | 0.018 | 0.010 | 2.57 | 0.007 |
| Unemployment | -0.015 | 0.095 | -1.67 | 0.009 |
| CSR Expenditure | 0.028 | 0.005 | 2.80 | 0.010 |
| Political Stability | 0.035 | 0.004 | 2.92 | 0.012 |
| Regulatory Quality | 0.022 | 0.015 | 2.44 | 0.009 |

The random-effects model demonstrates consistently strong significance for firm structure variables, market determinants, innovation, CSR expenditure, and institutional indicators. Compared to the fixed-effects model, the random-effects estimations show slightly higher coefficient magnitudes for key predictors, indicating that between-firm variation contributes meaningfully to sustainability outcomes. CEO duality and financial leverage remain non-significant. The Hausman test (reported elsewhere) ultimately determines which model is preferable, but the random-effects results highlight broader generalizability across firms, reaffirming that ownership structure, innovation, institutional strength, and market dynamics robustly enhance sustainable performance.

**Table 4. Instrumental Variable (2SLS) Regression Results**

| Variable | Coefficient | Standard Error | z-statistic | p-value |
|---|---|---|---|---|
| Firm Size | 0.026 | 0.012 | 2.17 | 0.030 |
| Firm Age | 0.011 | 0.004 | 2.75 | 0.007 |
| Ownership (IV) | 0.032 | 0.014 | 2.29 | 0.022 |
| Financial Leverage (IV) | -0.011 | 0.009 | -1.22 | 0.222 |
| Industry | 0.036 | 0.018 | 2.00 | 0.046 |
| Market Competition (HHI) | 0.020 | 0.008 | 2.50 | 0.013 |
| Market Growth | 0.017 | 0.007 | 2.43 | 0.015 |
| Capital Market Access | 0.015 | 0.009 | 1.67 | 0.095 |
| Board Independence | 0.027 | 0.011 | 2.45 | 0.015 |
| CEO Duality | 0.006 | 0.007 | 0.86 | 0.391 |
| Managerial Experience | 0.023 | 0.009 | 2.56 | 0.010 |
| Innovation Capacity | 0.030 | 0.011 | 2.73 | 0.007 |
| Inflation | -0.009 | 0.004 | -2.25 | 0.025 |
| GDP Growth | 0.017 | 0.007 | 2.43 | 0.015 |
| Unemployment | -0.014 | 0.009 | -1.56 | 0.121 |
| CSR Expenditure | 0.027 | 0.010 | 2.70 | 0.007 |
| Political Stability | 0.033 | 0.012 | 2.75 | 0.007 |
| Regulatory Quality | 0.021 | 0.009 | 2.33 | 0.021 |

The 2SLS results confirm that endogeneity does not bias the major relationships in the sustainability model. Instrumented ownership and leverage variables show expected signs, though leverage remains non-significant, indicating its limited predictive value. Firm size, age, industry structure, market forces, innovation, CSR investment, regulatory quality, and political stability remain strongly significant even after correcting for endogeneity. The persistence of these effects across all three models reinforces the robustness of the findings and supports the

conclusion that sustainability performance on the Tehran Stock Exchange is shaped primarily by structural characteristics, market competitiveness, innovation capacity, and institutional context rather than by short-term financial structure or governance role duality.

## Discussion and Conclusion

The findings of this study provide substantial empirical evidence demonstrating that corporate performance sustainability among firms listed on the Tehran Stock Exchange is significantly shaped by a combination of structural attributes, market dynamics, governance factors, managerial capabilities, and macro-institutional conditions. One of the most notable results concerns the positive and significant influence of firm size and firm age on sustainability performance. Larger firms exhibited greater capacity to invest in sustainability initiatives, adopt reporting frameworks, and integrate environmental and social considerations into long-term strategies. This pattern aligns closely with prior work showing that firms with extensive resources and operational experience are better positioned to meet sustainability expectations and optimize their value creation processes (2). Older firms also possess historical legitimacy and accumulated capabilities that support sustainability disclosures and CSR-related activities, as highlighted in research focusing on CSR disclosure and brand reputation within Iranian firms (5). These findings reinforce the broader literature that conceptualizes sustainability performance as path-dependent, shaped by accumulated routines, organizational learning, and institutionalized governance mechanisms.

Ownership concentration emerged as another strong predictor of sustainability, confirming the idea that large shareholders may exert substantial influence over strategic decisions, particularly in environments where institutional governance structures remain underdeveloped. The positive impact of concentrated ownership suggests that block shareholders perceive sustainability as a strategic asset capable of enhancing firm value, consistent with evidence demonstrating a positive relationship between sustainability performance and firm valuation in the Iranian context (4). Likewise, international studies reveal that strong ownership structures support ESG disclosure and reduce the cost of capital, affirming that monitoring by influential shareholders strengthens organizational accountability and incentivizes responsible governance (3). These findings jointly indicate that shareholder governance—particularly in emerging markets with evolving regulatory frameworks—plays a critical role in shaping sustainability behaviors.

Board independence and managerial experience were also positively associated with sustainability performance. These results are in line with governance research showing that independent boards promote transparency, strengthen oversight, and facilitate the adoption of comprehensive sustainability strategies (12). Independent directors typically carry broader professional experience, external networks, and stronger incentives to protect organizational legitimacy, making them more likely to advocate for CSR initiatives and responsible stakeholder engagement. The significance of managerial experience further supports the view that sustainability practices are shaped by leadership competence and organizational knowledge, echoing literature emphasizing the strategic importance of leadership and managerial expertise in promoting sustainable organizational outcomes (11). Experienced managers possess enhanced judgment, familiarity with regulatory expectations, and the ability to integrate sustainability into operational decision-making processes, thereby reinforcing the long-term stability of corporate performance.

Innovation capacity was identified as one of the strongest drivers of sustainability outcomes, confirming the well-established link between innovation and sustainability performance. Firms that invest in technological capabilities,

green innovations, and process optimization tend to exhibit enhanced environmental and social outcomes, as well as strengthened competitive positioning. The results corroborate studies showing that organizational agility and ambidexterity facilitate sustainable performance by enabling firms to respond to environmental shifts and capitalize on innovation opportunities (7). Furthermore, digital transformation represents a crucial mechanism through which innovation translates into sustainability improvements, a finding strongly supported by research demonstrating the mediating roles of green knowledge acquisition and innovation performance (8). These observations highlight that sustainable performance is not solely a product of compliance-oriented activities but rather the outcome of dynamic capabilities, technological adaptability, and organizational learning.

Market-related factors also contributed meaningfully to sustainability outcomes. Market competition (HHI) exhibited a positive effect, indicating that firms operating in more competitive industries may adopt sustainability strategies to differentiate themselves and strengthen their reputation among investors and customers. This finding resonates with strategic perspectives that frame sustainability as a competitive instrument capable of establishing shared value and enhancing long-term profitability (6). Similarly, market growth was positively associated with sustainability outcomes, suggesting that firms in expanding markets have greater incentives and financial flexibility to adopt sustainability practices. Evidence from entrepreneurial ecosystems supports this interpretation, showing that environments rich in opportunities and supportive networks amplify firms' capacity for sustainable digital innovation (10). Together, these findings highlight the importance of market conditions in shaping corporate incentives to pursue sustainability as a strategic priority.

CSR expenditure also significantly enhanced sustainability performance. This result is consistent with empirical research conducted on the TSE, which reveals that CSR disclosure positively influences brand reputation and stakeholder trust (5). International studies similarly emphasize the role of CSR committees, sustainability reporting, and responsible leadership in strengthening organizational legitimacy and improving sustainability outcomes (12, 20). Additionally, CSR investments align with research showing that sustainability indices moderate investor sentiment and support stock market stability (16). Overall, the findings illustrate that CSR engagement is a critical strategic component for firms seeking to enhance resilience and ensure long-term performance sustainability.

Macroeconomic variables also played a significant role in the sustainability model. Inflation exhibited a negative relationship with sustainability performance, suggesting that macroeconomic instability diverts resources away from long-term sustainability investments and pressures firms to prioritize short-term survival. This finding is intuitively consistent with sustainability models emphasizing the need for stability and resource availability to support sustainable development initiatives. Conversely, GDP growth positively influenced sustainability outcomes, reinforcing the notion that favorable economic conditions stimulate corporate investment in green practices, innovation, and social responsibilities. Such relationships have been documented in cross-national sustainability studies analyzing the interplay between economic development and corporate sustainability engagement (17). Political stability and regulatory quality were also significant predictors, confirming that institutional environments shape organizational behavior by providing incentives, governance oversight, and policy clarity. Research examining sustainable banking performance and organizational sustainability similarly identifies institutional support and strategic alignment as critical enabling conditions for sustainability outcomes (18, 19).

The overall findings reinforce the multidimensional nature of sustainability performance, highlighting that firm-level characteristics, governance attributes, digital and innovation capabilities, market environments, and institutional conditions interact to shape sustainability outcomes. This aligns with broader sustainability literature

that conceptualizes sustainability as an outcome of interconnected organizational systems rather than isolated variables (9, 13). The results also reflect global trends in sustainability reporting and climate-related disclosures, affirming that firms increasingly must align internal strategies with international frameworks such as IFRS S1 and S2 to maintain competitiveness and legitimacy (1). Altogether, the evidence presented in this study contributes to a deeper understanding of sustainability determinants within emerging markets and provides a comprehensive empirical foundation for developing integrated sustainability performance models tailored to economically volatile contexts such as Iran.

Despite its strengths, this study is subject to several limitations. First, the analysis relies on secondary data extracted from financial reports, sustainability disclosures, and macroeconomic datasets, which may vary in accuracy, completeness, and reporting quality across firms. Second, while panel data analysis allows for temporal insights, the study does not directly capture unobservable managerial, cultural, or behavioral factors that may influence sustainability performance but are not quantifiable. Third, although instrumental variable techniques were employed to address endogeneity, the validity of IVs remains inherently constrained by data availability. Fourth, the findings are specific to Tehran Stock Exchange firms and therefore may not fully generalize to non-listed Iranian firms or firms in other emerging markets with different institutional characteristics. Finally, the conceptualization of sustainability—while comprehensive—may not encompass evolving dimensions such as biodiversity impacts, circular economy practices, or social equity indicators.

Future studies should consider incorporating qualitative approaches, such as interviews or case studies, to capture the deeper organizational, cultural, and behavioral mechanisms underlying sustainability performance. Research could also investigate sector-specific sustainability determinants, recognizing that manufacturing, services, and energy industries may exhibit unique sustainability challenges and capabilities. Additionally, longitudinal designs that extend beyond financial and institutional indicators could incorporate dynamic environmental variables, technological transformations, and geopolitical shifts. Future work may also expand comparative studies across multiple emerging markets, enabling cross-cultural insights into sustainability drivers. Finally, researchers could develop predictive models using machine learning or simulation-based approaches to forecast sustainability trajectories under different regulatory or macroeconomic scenarios.

Managers should prioritize the development of innovation capacity and digital transformation capabilities as central components of sustainability strategies. Strengthening governance structures—particularly through enhancing board independence and establishing dedicated sustainability or CSR committees—can significantly improve sustainability outcomes. Firms should invest in building long-term leadership competence and managerial experience to enhance sustainability integration across organizational processes. Policymakers should promote institutional stability and regulatory clarity, enabling firms to operate with greater confidence and allocate resources toward sustainability. Investors and stakeholders should encourage transparent sustainability reporting and incentivize firms to adopt internationally recognized sustainability frameworks to improve accountability and performance.

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## Authors' Contributions

All authors equally contributed to this study.

## Declaration of Interest

The authors of this article declared no conflict of interest.

## Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

## Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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