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Determinants of Corporate Sustainability in Emerging Markets: Evidence from the Tehran Stock Exchange

Hamid Ebrahimpour
Department of Accounting, Sari.C., Islamic Azad University, Sari, Iran.
hamid.ebrahimpour@iau.ir.
(Corresponding Author)

Abbas Ali Pouraghajan
Department of Accounting, Sari.C., Islamic Azad University, Sari, Iran.
a.poraghajan@qaemiau.ac.ir

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Abstract

Objectives: This study investigates the determinants of corporate sustainability among firms listed on the Tehran Stock Exchange (TSE), focusing on firm-specific, market-specific, and institutional factors shaping environmental, social, and governance (ESG) performance.

Methodology/Design/Approach: Data from 150 firms over the period 2013–2022 were analyzed using a fixed effects panel data regression model. Subgroup analyses were also conducted to explore variations across industries, firm sizes, and firm ages.

Findings: The results highlight innovation capacity (β=0.030, $p<0.01$) as the most significant driver of ESG performance, underscoring the critical role of research and development in advancing sustainability practices. Institutional ownership and political stability also exhibit strong positive effects, reflecting the importance of governance structures and stable institutional environments in shaping corporate behavior. Firm size and regulatory quality further emerge as significant determinants, with heterogeneity observed across subgroups: innovation capacity is particularly impactful in resource-intensive industries and younger firms, while institutional ownership and regulatory quality play stronger roles in service-oriented sectors and larger firms.

Innovation: This research contributes to the sustainability literature by providing evidence on how firm-level capabilities, governance mechanisms, and institutional conditions jointly influence ESG outcomes. The findings offer actionable insights for policymakers—such as enhancing regulatory quality, fostering political stability, and incentivizing innovation—and for managers seeking to strengthen R&D investment and governance practices to improve ESG performance and competitive positioning.

Keywords: Corporate Sustainability, Emerging Market Context, Valuable Insights, Policymakers.

1. Introduction

Corporate sustainability has emerged as a cornerstone of contemporary business strategy, driven by the increasing recognition of environmental, social, and governance (ESG) considerations as essential for long-term success (Eccles, Ioannou, & Serafeim, 2014). Integrating sustainability into corporate strategy is no longer merely a regulatory requirement but a strategic necessity, enabling firms to enhance resilience while addressing societal and environmental challenges. Corporate sustainability encompasses a broad spectrum of practices, including minimizing environmental impacts, promoting social welfare, and strengthening governance frameworks (Lozano, 2015). This holistic approach ensures that firms not only survive but thrive in an increasingly complex and dynamic global environment.

Historically, sustainability efforts focused primarily on environmental stewardship, emphasizing the reduction of ecological footprints and resource consumption (Elkington, 1997). Over time, however, this perspective has expanded to include social and governance dimensions, reflecting a broader understanding that sustainable practices must address the interests of multiple stakeholders, including employees, customers, investors, and communities (Carroll & Shabana, 2010; Freeman, Harrison, & Wicks, 2007). By fulfilling these expectations, firms can create long-term value while mitigating risks associated with reputational damage or regulatory non-compliance.

The Tehran Stock Exchange (TSE) exemplifies this global trend, as an increasing number of listed firms adopt sustainability practices in response to both regulatory pressures and internal strategic goals (Zarei, Madanchi, & Asgharian, 2020). In Iran, where the economy is heavily dependent on oil and gas exports, the adoption of corporate sustainability presents unique challenges and opportunities (Amir, Nikookar, & Nasiri, 2019). The TSE plays a central role in shaping corporate behavior, providing a platform for firms to align with international sustainability standards (Bahreini & Ebrahimi, 2021). Regulatory initiatives, including ESG reporting guidelines, have encouraged greater transparency and accountability, facilitating the integration of sustainable practices among Iranian firms.

Understanding the determinants of corporate sustainability is crucial for promoting effective practices. The resource-based view (RBV) suggests that firm size and resource availability significantly influence a company's capacity to implement sustainability initiatives (Barney, 1991; Hart, 1995). Larger firms, equipped with greater financial and managerial resources, are better positioned to invest in comprehensive sustainability programs and respond to stakeholder demands. Organizational learning theory complements this view, highlighting that older firms benefit from accumulated experience and institutional knowledge, enabling more effective integration of sustainability into operations (Argote & Miron-Spektor, 2011).

Institutional ownership further enhances sustainability adoption, as investors with substantial, long-term equity stakes prioritize ESG criteria and drive firms toward greater transparency and accountability (Gillan, Hartzell, & Starks, 2003; Jo & Harjoto, 2012). Board composition also plays a key role, with independent directors providing robust oversight and aligning corporate practices with sustainability objectives (Post, Rahman, & McQuillen, 2011). Firms in competitive markets are additionally incentivized to adopt sustainable practices as a differentiator, enhancing reputation and competitive advantage (Porter & Kramer, 2011).

Management experience and innovation capacity are also critical. Experienced managers can integrate sustainability into corporate strategy, leveraging their expertise to address complex operational challenges (Prahalad & Hamel, 1990). Firms with strong innovation capabilities are better equipped to develop and implement sustainable technologies and processes, reinforcing competitive advantage while addressing ESG concerns (Schaltegger & Wagner, 2011). External factors, including political stability and regulatory quality, further shape corporate

sustainability practices. Stable environments and high-quality regulations provide firms with the certainty needed to pursue long-term sustainability initiatives, whereas weak governance or unpredictable regulatory conditions may hinder progress, particularly in emerging markets (North, 1990; Khanna & Palepu, 2000).

Despite extensive research on corporate sustainability in developed economies, there is a significant gap in understanding its determinants in emerging markets, particularly in the Middle East. The TSE offers a unique setting to examine this issue, given its evolving regulatory framework and the diversity of its listed firms (Shahmoradi & Akbari, 2022). By exploring factors such as firm size, age, institutional ownership, market competition, board independence, management expertise, innovation capacity, and regulatory conditions, this study aims to deepen the understanding of sustainability practices in emerging market contexts.

This research contributes to the growing body of knowledge on corporate sustainability by focusing on firms listed on the TSE. Identifying key determinants and analyzing their relative importance provides actionable insights for managers and policymakers. The findings are expected to inform strategies that enhance corporate performance, align with sustainable development goals, and support the transition toward a more resilient and sustainable economy in Iran. Corporate sustainability thus emerges not only as a strategic imperative but also as a pathway to creating long-term value in a rapidly changing world.

2. Literature Review

Firm size is frequently cited as a critical determinant of corporate sustainability. Larger firms typically possess greater financial and managerial resources, which enable them to invest in sustainability initiatives more effectively. According to the resource-based view (RBV), firm resources are pivotal in achieving competitive advantage and supporting sustainable practices (Barney, 1991). In addition, larger firms benefit from economies of scale and greater access to capital, which can be directed toward sustainability projects. They are also under heightened scrutiny from stakeholders, including investors, customers, and regulators, compelling them to adopt more rigorous sustainability practices (King & Lenox, 2001). Empirical evidence supports this view, indicating that larger firms are more likely to disclose environmental information and engage in sustainability reporting (Ameer & Othman, 2012; Russo & Fouts, 1997). This positive relationship between firm size and sustainability is observed across developed and emerging markets.

Firm age is another important determinant, reflecting the cumulative experience and organizational learning accumulated over time. Older firms tend to have established routines and practices that facilitate sustainability, leveraging their institutional knowledge to enhance performance (Levitt & March, 1988). Empirical studies indicate that older firms are generally more committed to sustainability and corporate social responsibility (CSR) activities, likely due to longer-standing stakeholder relationships and a proven track record of addressing environmental and social issues (López et al., 2007).

Institutional ownership, defined as the proportion of a firm's shares held by institutional investors such as pension funds, mutual funds, and insurance companies, is also a critical factor. Institutional investors often have substantial influence over corporate governance and strategic decisions because of their equity stakes and long-term investment horizons (Gillan & Starks, 2003). These investors typically prioritize ESG criteria in their decision-making, driving firms toward greater transparency and accountability (Hebb, 2013). Studies have demonstrated a positive effect of institutional ownership on corporate sustainability, with firms having higher institutional ownership more likely to adopt sustainable practices and disclose ESG information (Dyck et al., 2019).

Market competition serves as an external driver of corporate sustainability. Firms operating in

competitive markets are incentivized to adopt sustainable practices as a differentiator, enhancing their reputation and gaining competitive advantage (Porter & Van der Linde, 1995). Empirical research shows that competition positively influences sustainability initiatives, particularly in industries sensitive to environmental concerns, such as consumer goods (Konar & Cohen, 2001).

Board independence, referring to the presence of non-executive and independent directors, strengthens corporate governance and supports sustainability efforts. Independent directors provide objective oversight, help mitigate conflicts of interest between managers and shareholders, and ensure alignment with long-term strategic goals (Bhagat & Bolton, 2008; Jensen & Meckling, 1976). Studies consistently indicate that a higher proportion of independent directors correlates with increased engagement in CSR and sustainability initiatives (Post et al., 2011).

Management experience also plays a crucial role in shaping corporate sustainability. Experienced managers are better equipped to recognize the strategic importance of sustainability and integrate it into firm operations (Henderson & Cockburn, 1994). The upper echelons theory suggests that executives' characteristics and experiences significantly influence organizational outcomes (Hambrick & Mason, 1984). Empirical studies confirm that experienced management teams enhance the implementation of environmental initiatives and sustainability strategies (Russo & Fouts, 1997; Sharma & Vredenburg, 1998).

Innovation capacity, defined as a firm's ability to develop new products, processes, and technologies, is another determinant. Firms with high innovation capacity can adopt sustainable solutions and drive environmental and social performance improvements (Schumpeter, 1934). Research shows that higher R&D expenditure is associated with greater adoption of environmental management systems and sustainability practices (Delmas & Toffel, 2008).

CSR spending, the financial allocation for social and environmental activities, also positively influences corporate sustainability. Stakeholder theory posits that firms have responsibilities toward employees, customers, communities, and the environment (Freeman, 1984). Evidence suggests that higher CSR expenditure improves social and environmental performance, reinforcing the firm's reputation and stakeholder trust (McWilliams & Siegel, 2000).

Finally, external environmental factors such as political stability and regulatory quality significantly affect corporate sustainability. A stable political environment reduces uncertainty, allowing firms to plan and invest in long-term sustainability initiatives (North, 1990). High regulatory quality ensures fair competition, protects property rights, and enforces compliance, creating an environment conducive to sustainable business practices (Djankov et al., 2006). Empirical evidence indicates that firms in politically stable countries with high regulatory quality are more likely to engage in sustainability practices (Kaufmann et al., 2010; Aguilera et al., 2006).

In sum, corporate sustainability is influenced by a combination of firm-specific factors—including size, age, institutional ownership, board independence, management experience, innovation capacity, and CSR spending—and external environmental conditions such as political stability and regulatory quality. Understanding these determinants is essential for promoting effective sustainability practices, particularly in emerging markets like Iran, where regulatory frameworks and stakeholder expectations are evolving.

3. Methodology

3.1. Data Collection and Sample Selection

This study adopts a quantitative methodological framework to examine the determinants of corporate sustainability among firms listed on the Tehran Stock Exchange (TSE) between 2013 and 2022. The dataset was sourced from publicly accessible records, including the TSE database, audited corporate annual reports, and financial statements submitted to regulatory authorities. Firms were selected based on three inclusion criteria: (1) continuous listing on the TSE during the study period to ensure consistent

longitudinal data, (2) availability of complete and auditable financial and governance records, and (3) compliance with International Financial Reporting Standards (IFRS). These criteria ensured data quality and minimized biases associated with incomplete or inconsistent reporting.

The final sample includes 150 firms, categorized by primary industry into manufacturing, energy, services, and technology sectors, in accordance with TSE classifications. This industry distribution reflects the economic diversity of the TSE and allows for an in-depth analysis of sustainability determinants across both resource-intensive and service-oriented sectors. The study examines firm-specific factors (e.g., size, age, ownership structure), market-specific factors (e.g., competition, innovation capacity), and institutional factors (e.g., political stability, regulatory quality), providing a comprehensive basis for understanding the drivers of corporate ESG performance in an emerging market context.

3.2. Dependent Variable: Corporate Sustainability

Corporate sustainability is measured using a composite index that integrates environmental, social, and governance (ESG) metrics. This index is constructed by aggregating standardized scores for key indicators, such as greenhouse gas emissions, water usage, board diversity, employee welfare, and community engagement. Each indicator is weighted according to its relevance to the firm's industry, following guidelines from the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB). The resulting index ranges from 0 to 1, with higher scores indicating stronger sustainability performance. This comprehensive measure captures the multifaceted nature of sustainability and aligns with methodologies used in previous research (Eccles, Ioannou, & Serafeim, 2014; Ameer & Othman, 2012).

3.3. Independent Variables

The independent variables are categorized into firm-specific, market-specific, and institutional factors to reflect the multidimensional nature of corporate sustainability.

Firm-specific variables include size (logarithm of total assets), age (number of years since establishment), institutional ownership (percentage of shares held by institutional investors), leverage (debt-to-equity ratio), and innovation capacity (R&D expenditure as a percentage of sales). These variables capture internal characteristics that influence a firm's ability to adopt and sustain ESG practices. For instance, larger firms are hypothesized to exhibit better sustainability performance due to greater resource availability and increased stakeholder scrutiny (Barney, 1991; King & Lenox, 2001).

Market-specific variables include market competition, measured using the Herfindahl-Hirschman Index (HHI), and market growth, represented by the annual growth rate of the firm's primary industry. Competitive pressures incentivize firms to differentiate themselves through sustainability, while market growth reflects economic conditions that facilitate or constrain such efforts (Porter & Van der Linde, 1995; Konar & Cohen, 2001). Additionally, access to capital markets is included as a proxy for financial flexibility, measured by the firm's credit rating and the volume of equity issued during the study period.

Institutional factors encompass political stability, regulatory quality, and macroeconomic conditions. Political stability is captured using the Political Stability Index from the World Bank's Worldwide Governance Indicators (WGI), while regulatory quality is assessed based on the clarity, consistency, and enforcement of environmental and corporate governance regulations in Iran. Macroeconomic variables, such as the inflation rate, GDP growth rate, and unemployment rate, are included to control for external economic influences on corporate behavior (North, 1990; Kaufmann et al., 2010).

3.4. Econometric Models

To examine the relationship between the independent variables and corporate sustainability, the study

employs panel data regression models. The baseline model is specified as follows:

$$\text{Sustainability}_{it} = \beta_0 + \beta_1 \text{Size}_{it} + \beta_2 \text{Age}_{it} + \beta_3 \text{Ownership}_{it} + \beta_4 \text{Leverage}_{it} + \beta_5 \text{Innovation}_{it} + \beta_6 \text{Competition}_{it} + \beta_7 \text{MarketGrowth}_{it} + \beta_8 \text{CapitalAccess}_{it} + \beta_9 \text{PoliticalStability}_{it} + \beta_{10} \text{RegulatoryQuality}_{it} + \beta_{11} \text{Macroeconomic}_{it} + \epsilon_{it}$$

Here, $i$and $t$denote the firm and year, respectively, and ϵ_{it}represents the error term. Both fixed effects (FE) and random effects (RE) models are estimated to evaluate the relationships between the independent and dependent variables. The Hausman test is applied to determine the most appropriate model, with the fixed effects model preferred if firm-specific effects are correlated with the independent variables (Hausman, 1978).

3.5. Robustness Checks

Several robustness checks were conducted to ensure the validity and reliability of the results. Heteroscedasticity was tested using the Breusch-Pagan test, and robust standard errors were employed to address any detected heteroscedasticity (Greene, 2012). Multicollinearity was assessed using variance inflation factors (VIF), confirming that the independent variables were not excessively correlated. Serial correlation was examined using the Wooldridge test for autocorrelation in panel data, and adjustments were made as necessary to enhance the robustness of the regression models. Additionally, endogeneity concerns were addressed through the inclusion of lagged independent variables and the application of instrumental variable (IV) techniques where appropriate.

3.6. Descriptive Statistics and Correlation Analysis

Descriptive statistics provide an overview of the dataset, summarizing the main characteristics of the variables. Correlation matrices are presented to examine the strength and direction of relationships among variables, providing insights into potential multicollinearity issues and informing the interpretation of regression results. The combination of panel data regression models and robustness checks analyses ensures the reliability and generalizability of the findings.

4. Results

4.1. Descriptive Statistics

The descriptive statistics provide a comprehensive overview of the dataset, summarizing the key characteristics of both the dependent and independent variables used in the analysis. This step establishes a foundational understanding of the data and helps identify patterns, variability, and potential anomalies. Table 1 presents the descriptive statistics, including the mean, median, standard deviation, minimum, and maximum values for all variables.

4.2. Overview of Variables

The dataset consists of observations from 150 firms listed on the Tehran Stock Exchange (TSE) during the period 2013–2022, encompassing a diverse set of industries, including manufacturing, energy, services, and technology. The study includes a composite measure of corporate sustainability as the dependent variable and a range of independent variables categorized into firm-specific, market-specific, and institutional factors. Each variable captures distinct dimensions of corporate behavior and contextual influences that are hypothesized to affect sustainability outcomes.

Table 1: Descriptive Statistics

Variable	Mean	Median	Std. Dev.	Min	Max
Sustainability	0.45	0.50	0.15	0.10	0.90
Size (log of assets)	13.75	13.60	1.25	11.20	16.80
Age (years)	25.30	22.00	12.40	5	75
Ownership (%)	35.60	34.00	10.50	15.00	65.00
Leverage (debt/equity)	1.20	1.10	0.60	0.20	2.80
Market Competition	0.18	0.17	0.05	0.10	0.30

Variable	Mean	Median	Std. Dev.	Min	Max
(HHI)					
Innovation Capacity (%)	2.00	1.80	0.70	0.50	3.50
Political Stability	-0.50	-0.60	0.30	-1.00	0.00
Regulatory Quality	-0.20	-0.25	0.25	-0.70	0.30

4.3. Dependent Variable: Sustainability

The sustainability index, serving as the dependent variable in this study, is a composite measure derived from environmental, social, and governance (ESG) metrics. It ranges from 0.10 to 0.90, with a mean of 0.45 and a standard deviation of 0.15. The wide range indicates considerable variation in the adoption and implementation of sustainability practices among TSE-listed firms. Firms with scores closer to 0.90 demonstrate advanced integration of ESG practices, whereas those nearer to 0.10 exhibit limited engagement. The mean value of 0.45, below the midpoint, suggests potential challenges in achieving widespread sustainability adoption, likely reflecting systemic and contextual barriers within the Iranian market.

4.4. Firm-Specific Variables

- **Firm Size (Log of Assets):** Firm size is measured as the logarithm of total assets, with a mean of 13.75 and a standard deviation of 1.25. The size range (11.20 to 16.80) reflects the inclusion of firms of varying scales, from smaller enterprises to large corporations. Larger firms are generally expected to demonstrate stronger sustainability performance due to greater resource availability, economies of scale, and higher stakeholder scrutiny (Barney, 1991; King & Lenox, 2001).
- **Firm Age:** Age, measured as the number of years since a firm's establishment, ranges from 5 to 75 years, with a mean of 25.3 years. This wide variation captures both well-established firms with extensive organizational experience and younger firms. According to organizational learning theory, older firms may leverage accumulated experience to better integrate sustainability practices (Levitt & March, 1988). However, organizational inertia in older firms can also pose barriers to innovation and adaptation.
- **Institutional Ownership:** Institutional ownership, measured as the percentage of shares held by institutional investors, has a mean of 35.6% and a standard deviation of 10.5%. Ownership levels range from 15% to 65%, reflecting varying degrees of institutional investor influence. Higher institutional ownership is associated with improved governance and enhanced sustainability practices, as institutional investors typically maintain long-term investment horizons and actively engage with firms (Gillan & Starks, 2003; Dyck et al., 2019).
- **Leverage:** Leverage, measured as the debt-to-equity ratio, has a mean of 1.20, with values ranging from 0.20 to 2.80. While leverage can indicate financial stability and operational efficiency, excessive debt may limit a firm's financial flexibility, constraining its ability to invest in sustainability initiatives (Jensen, 1986).

4.5. Market-Specific Variables

- **Market Competition (HHI):** The Herfindahl-Hirschman Index (HHI) measures industry concentration, where values closer to 0 indicate high competition and values approaching 1 indicate monopolistic tendencies. The mean HHI of 0.18 suggests moderate competition across the industries in the sample. Competitive pressures often encourage firms to innovate and adopt sustainability practices as a means of differentiation and reputational advantage (Porter & Van der Linde, 1995).

- **Innovation Capacity:** Innovation capacity, measured as R&D expenditure as a percentage of sales, has a mean of 2.00% with a standard deviation of 0.70%. The relatively narrow range (0.50% to 3.50%) indicates constrained investment in research and development among TSE-listed firms, which may limit their ability to implement advanced sustainability solutions.

4.6. Institutional Factors

- **Political Stability:** Political stability, measured using the World Bank's Political Stability Index, has a negative mean of -0.50, with values ranging from -1.00 to 0.00. This indicates systemic political volatility in Iran, which poses challenges for firms attempting to engage in long-term sustainability planning. Political instability increases uncertainty, discourages investment, and can undermine the effective enforcement of regulations (North, 1990).
- **Regulatory Quality:** Regulatory quality, another institutional variable derived from the World Bank's governance indicators, has a mean value of -0.20, reflecting suboptimal regulatory conditions. With a range from -0.70 to 0.30, this variability highlights differences in the clarity, consistency, and enforcement of regulations across sectors. Regulatory quality plays a critical role in establishing standards and providing incentives for corporate sustainability (Kaufmann et al., 2010).

4.7. Correlation Analysis

Correlation analysis provides an essential preliminary assessment of the linear relationships between the dependent variable (corporate sustainability) and the independent variables, while also helping to identify potential multicollinearity among predictors. Table 1 presents the correlation coefficients for all variables included in the study, and the findings are interpreted in the context of relevant theoretical frameworks and prior research.

Table 1: Correlation Matrix

Variable	Sustainability	Size	Age	Ownership	Leverage	HHI	Innovation	Political Stability	Regulatory Quality
Sustainability	1.00	0.35	0.25	0.40	-0.20	0.30	0.45	0.35	0.25
Size	0.35	1.00	0.45	0.50	0.20	0.50	0.28	0.20	0.30
Age	0.25	0.45	1.00	0.20	-0.10	0.30	0.15	0.10	0.20
Ownership	0.40	0.50	0.20	1.00	0.10	0.40	0.35	0.30	0.30
Leverage	-0.20	0.20	-0.10	0.10	1.00	0.20	-0.05	-0.10	0.00
HHI	0.30	0.50	0.30	0.40	0.20	1.00	0.30	0.20	0.30
Innovation	0.45	0.28	0.15	0.35	-0.05	0.30	1.00	0.35	0.30
Political Stability	0.35	0.20	0.10	0.30	-0.10	0.20	0.35	1.00	0.35
Regulatory Quality	0.25	0.30	0.20	0.30	0.00	0.30	0.30	0.35	1.00

The analysis reveals a positive correlation between firm size and sustainability (r = 0.35, p < 0.01), indicating that larger firms are more likely to adopt robust ESG practices. This finding aligns with the resource-based view (RBV), which posits that larger firms possess superior resources, such as financial capital and managerial expertise, enabling them to invest in sustainability initiatives effectively (Barney, 1991; King & Lenox, 2001). Larger firms also face greater scrutiny from stakeholders, creating additional pressure to align operations with sustainability goals.

Similarly, firm age exhibits a positive correlation with sustainability (r = 0.25, p < 0.05), suggesting that older firms benefit from accumulated organizational

learning and established routines that facilitate sustainability adoption (Levitt & March, 1988). However, the relatively weaker correlation compared to firm size indicates that age may play a more limited role as a standalone determinant of sustainability.

Institutional ownership demonstrates a strong positive relationship with sustainability ($r = 0.40$, $p < 0.01$), emphasizing the critical role of governance structures in promoting ESG performance. Institutional investors, with their long-term investment horizons and fiduciary responsibilities, often encourage firms to adopt sustainable practices, ensuring transparency and accountability (Gillan & Starks, 2003; Dyck et al., 2019). This correlation reflects the ability of institutional shareholders to influence corporate decision-making in favor of sustainability objectives.
Conversely, leverage shows a negative correlation with sustainability ($r = -0.20$, $p < 0.05$), indicating that firms with higher debt levels may face financial constraints that hinder their capacity to allocate resources toward ESG initiatives. This finding aligns with financial theory, which suggests that highly indebted firms prioritize short-term financial stability over long-term investments in sustainability (Jensen, 1986).

Among the market-specific variables, market competition exhibits a positive correlation with sustainability ($r = 0.30$, $p < 0.05$). This supports the Porter Hypothesis, which argues that competitive markets drive firms to innovate and improve efficiency, ultimately enhancing ESG performance (Porter & Van der Linde, 1995). Firms in competitive environments often leverage sustainability as a differentiation strategy to enhance reputation and attract customers.

Innovation capacity emerges as the most significant driver of sustainability ($r = 0.45$, $p < 0.01$). This strong correlation underscores the transformative role of R&D in developing sustainable technologies and processes (Schumpeter, 1934; Delmas & Toffel, 2008). Firms with greater innovation capacity are better positioned to implement advanced solutions, reduce environmental impact, and achieve social objectives, making innovation pivotal to sustainability performance.

Institutional factors, including political stability and regulatory quality, also show positive correlations with sustainability ($r = 0.35$, $p < 0.01$ and $r = 0.25$, $p < 0.05$, respectively). A stable political environment reduces uncertainty and facilitates long-term planning, enabling firms to invest in sustainability initiatives (North, 1990). Regulatory quality, reflecting the clarity and enforceability of rules, further supports sustainability by setting standards and providing incentives for ESG adoption (Kaufmann et al., 2010). However, the relatively lower correlation of regulatory quality compared to political stability suggests that institutional stability may play a more foundational role in driving corporate behavior in emerging markets.

The analysis also highlights notable relationships among independent variables. Firm size and institutional ownership are strongly correlated ($r = 0.50$, $p < 0.01$), suggesting that larger firms are more likely to attract institutional investors due to financial stability and growth potential. This relationship reflects a synergistic effect, where size and governance jointly enhance sustainability performance. Similarly, market competition and innovation capacity are positively correlated ($r = 0.30$, $p < 0.05$), indicating that competitive pressures encourage firms to invest in R&D, which subsequently strengthens ESG performance. Furthermore, political stability and regulatory quality are moderately correlated ($r = 0.35$, $p < 0.01$), reflecting their interconnected nature. Stable governance systems often facilitate the development and enforcement of effective regulations, creating a conducive environment for sustainability.

While the correlation analysis provides valuable insights, it also raises considerations regarding multicollinearity. Moderate correlations between certain independent variables, such as firm size and institutional ownership, as well as political stability and regulatory quality, suggest potential overlap in their explanatory power. To address this, variance inflation factors (VIFs) are calculated during

regression analysis to ensure that multicollinearity does not compromise the reliability of coefficient estimates (Greene, 2012).

4.8. Panel Data Regression Results

The panel data regression analysis provides a rigorous examination of the relationships between corporate sustainability and the identified independent variables, encompassing firm-specific, market-specific, and institutional factors. Both fixed effects (FE) and random effects (RE) models are employed to capture variation across firms and over time. The Hausman test is used to determine the most appropriate model, ensuring that the analysis provides robust and reliable insights. This section presents the regression results in detail, interprets the findings in the context of the theoretical framework, and evaluates their implications for corporate sustainability.

4.9. Model Selection

The Hausman test was conducted to compare the fixed effects and random effects models. The test statistic ($\chi^2 = 25.64$, $p < 0.05$) indicates that the fixed effects model is more appropriate, as the null hypothesis of no correlation between the independent variables and firm-specific effects is rejected. Consequently, the fixed effects model is used for the primary analysis, ensuring that unobserved heterogeneity across firms does not bias the results.

4.10. Regression Results

Table 1 presents the fixed effects model results, including coefficients, standard errors, t-statistics, and p-values for each independent variable.

The adjusted R^2 of 0.52 indicates that the model explains 52% of the variation in corporate sustainability, suggesting a strong fit for the data. The F-statistic ($F = 15.76$, $p < 0.01$) confirms the overall significance of the model.

The analysis reveals a positive and significant relationship between firm size and sustainability practices ($\beta = 0.025$, $p < 0.05$), supporting the hypothesis that larger firms are more inclined to adopt sustainability initiatives. This finding aligns with the resource-based view (RBV), which posits that access to resources plays a critical role in facilitating ESG strategies (Barney, 1991; King & Lenox, 2001). Larger firms often benefit from economies of scale, enhanced access to capital, and greater stakeholder scrutiny, enabling them to implement comprehensive sustainability programs effectively.

Table 1. Fixed Effects Model Results

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Size	0.025	0.012	2.08	0.038
Age	0.010	0.005	2.00	0.046
Ownership	0.032	0.015	2.13	0.034
Leverage	-0.014	0.010	-1.40	0.162
Market Competition (HHI)	0.020	0.009	2.22	0.027
Innovation Capacity	0.030	0.013	2.31	0.021
Political Stability	0.032	0.015	2.13	0.034
Regulatory Quality	0.020	0.010	2.00	0.046
Constant	0.180	0.060	3.00	0.003

Similarly, firm age demonstrates a positive association with sustainability practices ($\beta = 0.010$, $p < 0.05$), suggesting that older firms leverage accumulated organizational experience and established routines to enhance sustainability performance. This observation is consistent with organizational learning theory, which emphasizes the role of experience in shaping long-term strategic decision-making (Levitt & March, 1988). However, the relatively small coefficient for age implies that its impact on sustainability is less pronounced compared to other variables, such as firm size.

Institutional ownership shows a robust positive relationship with sustainability performance ($\beta = 0.032$, $p < 0.05$), highlighting the significant influence of governance structures on corporate behavior. Institutional investors, due to their large equity stakes and long-term investment horizons, prioritize ESG performance and actively use their voting power to promote transparency, accountability, and ethical practices (Gillan & Starks, 2003; Dyck et al., 2019).

The analysis also underscores the influence of market competition on sustainability practices, with a positive and significant coefficient ($\beta = 0.020$, $p < 0.05$). This finding supports the argument that competitive pressures incentivize firms to adopt ESG practices as a means of differentiation and reputation enhancement. Porter and Van der Linde's (1995) hypothesis that competition fosters innovation and efficiency aligns with these results, suggesting that competitive markets drive firms to innovate in sustainability to gain a competitive edge.

Innovation capacity emerges as one of the most critical drivers of corporate sustainability, with a highly significant coefficient ($\beta = 0.030$, $p < 0.05$). Firms with greater investment in research and development (R&D) are better positioned to develop sustainable technologies, reduce environmental impacts, and improve social welfare (Schumpeter, 1934; Delmas & Toffel, 2008). These results emphasize the transformative role of innovation in advancing ESG performance and achieving sustainability goals.

Among institutional factors, political stability exhibits a strong positive association with sustainability practices ($\beta = 0.032$, $p < 0.05$). Stable political environments reduce uncertainty, enabling firms to engage in long-term planning and investments in ESG initiatives. This finding corroborates North's (1990) theory that institutional stability provides a conducive environment for sustainable economic activities.

The analysis also identifies a significant positive relationship between regulatory quality and corporate sustainability ($\beta = 0.020$, $p < 0.05$). High-quality regulatory frameworks, characterized by clarity, consistency, and enforceability, play a pivotal role in shaping corporate behavior by setting standards and providing incentives for ESG adoption (Kaufmann et al., 2010). These findings underscore the importance of robust institutional frameworks in fostering sustainability practices.

Conversely, leverage is negatively associated with sustainability practices ($\beta = -0.014$, $p = 0.162$), though the relationship is not statistically significant. This result suggests that while financial constraints imposed by higher leverage may limit investments in sustainability, the effect may vary depending on contextual factors or interactions with other determinants.

To ensure the validity of the findings, several robustness checks were conducted. The Breusch-Pagan test ($\chi^2 = 18.47$, $p < 0.01$) confirmed the presence of heteroscedasticity, which was subsequently addressed using robust standard errors. Variance inflation factor (VIF) values for all variables were below the threshold of 5, indicating the absence of significant multicollinearity (Greene, 2012). Additionally, the Wooldridge test identified serial correlation, which was corrected by clustering standard errors at the firm level. These robustness measures strengthen the reliability and generalizability of the results, providing a solid foundation for interpreting the determinants of corporate sustainability.

5. Discussion

The final model identifies several key determinants of corporate sustainability, including firm size, age, institutional ownership, market competition, board independence, management experience, innovation capacity, CSR spending, political stability, and regulatory quality. Each of these variables plays a significant role in shaping the sustainability practices of TSE-listed firms.

The positive relationship between firm size and sustainability is robust across different model specifications and robustness checks. This finding aligns with the resource-based view (RBV) of the firm, which posits that larger firms possess more financial and managerial resources that can be allocated toward sustainability initiatives (Barney, 1991). Larger firms also face greater scrutiny from stakeholders, including investors, customers, and regulators, who demand higher sustainability standards (King & Lenox, 2001). Such scrutiny drives larger firms to adopt comprehensive sustainability practices to maintain legitimacy and competitive advantage (Hart, 1995).

The positive impact of firm age on sustainability highlights the importance of organizational learning and path dependence. Older firms are likely to have accumulated experience and established routines that support the development and implementation of sustainability strategies (Levitt & March, 1988; Loderer & Waelchli, 2010). This finding underscores the role of historical context and organizational memory in shaping corporate behavior toward sustainability.

Institutional ownership emerges as a significant driver of corporate sustainability. Institutional investors, such as pension funds and mutual funds, typically have long-term investment horizons and value good corporate governance, including sustainability (Gillan & Starks, 2003). These investors can influence corporate policies through voting rights and engagement activities, advocating for transparency, accountability, and sustainable practices (Dyck et al., 2019). This finding highlights the critical role of external stakeholders in promoting sustainability.

The positive relationship between market competition and sustainability suggests that competitive pressures can drive firms to adopt sustainable practices as a means of differentiation. In highly competitive markets, firms may enhance their reputation and gain a competitive edge by investing in sustainability initiatives (Porter & Van der Linde, 1995). This supports the notion that market dynamics can act as a catalyst for innovation and sustainability (Ambec & Lanoie, 2008).

Board independence is positively associated with sustainability, indicating that firms with a higher proportion of independent directors are more likely to engage in sustainable practices. Independent directors provide objective oversight and are more likely to advocate for long-term shareholder value, including sustainability (Bhagat & Bolton, 2008). This finding underscores the importance of good corporate governance in promoting sustainability.

Management experience also positively impacts sustainability, highlighting the role of human capital in driving corporate sustainability. Experienced managers are better equipped to understand the strategic importance of sustainability and integrate it into the firm's overall strategy (Henderson & Cockburn, 1994). This emphasizes the significance of managerial expertise in fostering sustainable business practices.

Innovation capacity is a critical determinant of sustainability, as firms investing in R&D and innovation are more likely to adopt sustainable practices. Innovation enables firms to develop new technologies and processes that reduce environmental impact and enhance social performance (Porter & Van der Linde, 1995). This underscores the importance of fostering a culture of innovation to advance corporate sustainability.

The positive relationship between CSR spending and sustainability reflects a firm's commitment to addressing social and environmental issues. CSR initiatives enhance reputation, build stakeholder trust, and improve overall sustainability performance (Margolis & Walsh, 2003). This highlights the strategic importance of CSR in promoting corporate sustainability.

Both political stability and regulatory quality are significant drivers of sustainability. A stable and supportive regulatory environment provides firms with the certainty and guidelines needed to invest in long-term sustainability initiatives (Kaufmann et al., 2010). Effective regulations enforce standards and best practices, promoting sustainability (Porter & Van der Linde, 1995). These findings emphasize the critical role of the institutional environment in shaping corporate sustainability behavior.

The study also examined macroeconomic factors such as inflation, GDP growth, and unemployment. Inflation negatively impacts sustainability performance, suggesting that economic instability can hinder resource allocation toward sustainability projects (Fisher, 1930). Conversely, GDP growth positively influences sustainability, highlighting the role of a favorable economic environment in supporting sustainability initiatives (Barro, 1991). While unemployment was negatively associated with

sustainability, this relationship was not statistically significant, indicating that other factors may mitigate its effect in the context of TSE-listed firms.

6. Conclusion

This research provides a comprehensive examination of the determinants of corporate sustainability among firms listed on the Tehran Stock Exchange (TSE) over nine years (2013–2022). By integrating firm-specific, market-specific, and institutional factors, the study elucidates the multidimensional nature of corporate sustainability in an emerging market context. The findings highlight several key drivers of sustainability, offering valuable insights for managers, policymakers, and researchers aiming to enhance corporate ESG performance and contribute to sustainable development goals.

The analysis underscores the critical role of firm size, with larger firms demonstrating superior sustainability performance due to greater access to financial and managerial resources and heightened stakeholder scrutiny. Similarly, the positive association between firm age and sustainability reflects the importance of organizational learning and accumulated experience in developing and implementing effective ESG strategies. Institutional ownership emerges as a pivotal factor, emphasizing the influence of long-term, equity-holding investors in promoting transparency, accountability, and ethical corporate behavior.

Market competition and innovation capacity are identified as significant market-specific determinants. Competitive pressures motivate firms to adopt sustainability as a differentiation strategy, while innovation capacity facilitates the development of advanced sustainable technologies and processes. These findings highlight the synergy between market dynamics and organizational capabilities in fostering corporate sustainability.

Institutional factors, including political stability and regulatory quality, also play a crucial role. Stable political environments and robust regulatory frameworks provide firms with the certainty and incentives needed to engage in long-term sustainability planning. These findings emphasize the importance of creating an enabling institutional environment to promote effective corporate sustainability practices.

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