

The moderating role of CSR in the relationship between corporate governance and capital structure: a quantile analysis of firms in a transition economy

Katayoun Ghafourian Mokhtari and Alireza Azarberahman
Department of Accounting, Shandiz Institute of Higher Education, Mashhad, Iran

Abstract

Purpose – This study examines the simultaneous effect of corporate governance (CG) and corporate social responsibility (CSR) on capital structure (CS) and elucidates the moderating role of CSR in the relationship between CG and financial leverage, with particular emphasis on the distinctive institutional characteristics of the Iranian economy and the heterogeneous behavior of firms across varying leverage levels.

Design/methodology/approach – The statistical population comprises firms listed on the Tehran Stock Exchange (TSE) over the period 2015–2024, from which 1,420 firm-year observations were retained after applying systematic screening criteria. The CG index was constructed based on four structural components, while CSR was measured through content analysis employing a three-dimensional disclosure checklist encompassing social, economic and environmental dimensions. To capture distributional heterogeneity in the effects, quantile regression (QR) was employed.

Findings – The findings indicate that CG exerts a positive and statistically significant effect on financial leverage, whereas CSR has a negative and significant influence. Moreover, the interaction term between CG and CSR is negative and significant, demonstrating that CSR weakens the positive impact of CG on debt usage. The QR results further reveal that these effects are more pronounced at lower leverage levels and gradually diminish in highly leveraged firms, highlighting asymmetric behavioral patterns across the leverage distribution.

Originality/value – By integrating a multilevel perspective with QR, this study introduces a novel analytical framework for explaining the complex interaction between CG, CSR and CS in transition economies and contributes to the advancement of sustainable finance literature in emerging institutional contexts.

Keywords Agency theory, Trade-off theory, Corporate social responsibility, Leverage levels, Quantile regression

Paper type Research article

1. Introduction

In recent years, firms' CS decisions have become a key focus of financial and strategic analysis, as the optimal debt–equity mix shapes investor returns, financial risk, capital efficiency and competitive positioning (Chowdhury *et al.*, 2024). Concurrently, CG has gained prominence internationally as firms with effective board composition, balanced ownership structures and transparent monitoring mechanisms tend to achieve superior financial performance (Chung *et al.*, 2025). At the same time, CSR and broader ESG considerations have become central to financing policies and CS decisions, influencing how firms engage with stakeholders and capital markets (Mhiri *et al.*, 2025; Polat and Tekin, 2024).

JEL Classification — G32, G34, M14

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Despite extensive research on each dimension, studies jointly examining the interrelationship among CG, CSR and CS remain limited, particularly in emerging economies. Recent evidence also reinforces a more integrated view of the relationship among CG, CSR and CS. [Al \(2026\)](#) reports that CS plays a conditional role in governance-related outcomes, indicating that the influence of governance mechanisms depends partly on firms' financing choices. [Abdalla et al. \(2026\)](#) show that CSR governance embedded in board-level oversight can lower the cost of capital, suggesting that CSR carries tangible financial consequences beyond its ethical and reputational dimensions. Similarly, [Arslan et al. \(2026\)](#) found that CS can constrain the performance benefits of CSR, implying that the financial effects of socially responsible behavior are shaped by the firm's financing environment. An international comparative study shows that CSR moderates the CG–financial leverage relationship, with stronger effects in lower-leverage firms ([Mahmood et al., 2023](#)). Similarly, recent European evidence suggests that ESG performance directly affects firms' debt ratios ([Abu Khalaf et al., 2025](#)). Together, these findings indicate that the CG–CSR–CS interaction goes beyond bilateral relationships and requires a more nuanced multivariate, multilevel perspective.

CG influences CS through two primary theoretical lenses. First, agency theory suggests that effective monitoring reduces agency costs, allowing firms to leverage debt for growth ([Chowdhury et al., 2024](#)). Second, trade-off theory posits that strong CG systems better optimize the balance between debt-related tax benefits and bankruptcy costs ([Elhabib, 2024](#)). Conversely, firms with higher CSR often adopt conservative financing and lower debt levels to mitigate risk and maintain stakeholder legitimacy ([Mhiri et al., 2025](#)).

Recent research emphasizes institutional disparities between developed and emerging economies, where weaker legal frameworks, concentrated ownership, low transparency and constrained debt financing ([Gregory, 2023](#)) may alter theoretical relationships. Within this context, Iran – with its natural resources, developing capital market and strategic geopolitical position – represents a transition economy moving toward emerging status ([Teimouri, 2022](#)). This distinctive setting, marked by ownership concentration, fragile regulatory institutions, limited debt markets and high reliance on internal financing, provides a unique backdrop for examining CG, CSR and CS interactions.

Investigating the joint effects of CG and CSR on CS is therefore important both practically and theoretically. From a practical perspective, financial managers and investors increasingly rely on indicators of structural and financial soundness; the coexistence of strong CG, substantive CSR engagement and a balanced CS may signal a firm's capacity for sustainable growth and effective financial risk management. Examining these relationships in Iran also allows for an assessment of whether assumptions largely derived from developed markets hold under different institutional conditions. Accordingly, this study analyzes the combined impact of CG and CSR on the CS of TSE-listed firms using QR to capture variations across low-, moderate- and high-leverage firms. More broadly, it situates the findings within an international framework to support cross-country comparisons and contribute to the global literature. The results are expected to inform corporate financial managers, international investors and regulators, while enriching the scholarly debate on sustainable finance and corporate financial policy in transition and emerging economies.

2. Theoretical framework

2.1 Iranian institutional context: a transition economy perspective

Iran's institutional landscape presents a unique configuration of regulatory, economic and social factors, distinguishing CG, CSR and CS interrelationships from developed markets. First, the Iranian capital market features high ownership concentration, often dominated by state-owned or quasi-governmental entities. This structure significantly influences internal monitoring and alters agency dynamics between majority and minority shareholders ([Kashani and Mousavi Shiri, 2022](#)). In such environments, robust CG serves as a critical transparency

signal, essential for mitigating information asymmetry prevalent in transition economies (Asadi *et al.*, 2015). Secondly, Iran's financing environment is largely bank-based, with an underdeveloped corporate bond market. International sanctions further restrict access to global capital and raise external financing costs, leaving firms heavily reliant on internal funds and short-term bank credit (Salehi *et al.*, 2024). In this setting, effective CG helps firms strengthen creditworthiness and obtain scarce debt resources, while CSR functions as a strategic means of preserving legitimacy and stakeholder trust during economic volatility (Parandin *et al.*, 2023).

Recent evidence indicates that Iranian firms increasingly integrate CSR into corporate strategy to offset institutional voids, with socially responsible firms adopting conservative financial footprints to buffer against macroeconomic shocks (Parandin *et al.*, 2023). This institutional setting – characterized by credit constraints and strategic CSR-driven risk mitigation – provides a compelling backdrop for testing our hypotheses. This allows us to explore whether CSR acts as a “soft governance” mechanism that tempers the debt-inducing effects of strong CG, fostering a more resilient capital structure in a volatile transition economy.

2.2 CG and CS

CS is central to finance, as the optimal debt-equity mix directly affects financing costs, bankruptcy risk and firm value (Chowdhury *et al.*, 2024; Akwaa-Sekyi *et al.*, 2024). CG quality is a decisive factor shaping these decisions, particularly in emerging economies with weaker regulatory frameworks and minority shareholder protections (Farooq *et al.*, 2025; Queiri *et al.*, 2024). Strong CG enhances transparency, reduces agency costs and improves capital access, enabling firms to increase debt utilization within an optimal CS (Chowdhury *et al.*, 2024; Akwaa-Sekyi *et al.*, 2024). Effective internal monitoring deters managerial opportunism, allowing firms to finance operations rationally and utilize leverage efficiently (Farooq *et al.*, 2025). Trade-off theory supports this, positing that robust CG structures help firms balance debt tax shields against distress costs, increasing the propensity for debt financing (Chowdhury *et al.*, 2024). Thus, CG serves as both a governance tool and a strategic driver of leverage.

In emerging economies, CG is critical because weak legal systems, concentrated ownership and low transparency can distort capital allocation and inflate financing costs. Recent transition-market evidence confirms a positive, significant relationship between CG mechanisms and leverage (Queiri *et al.*, 2024; Akwaa-Sekyi *et al.*, 2024). For instance, in Ghana, institutional ownership and concentration positively associate with debt ratios (Akwaa-Sekyi *et al.*, 2024), while in Bangladesh, board size and independence relate positively to debt levels under high insider ownership (Chowdhury *et al.*, 2024). Collectively, these findings suggest that higher CG quality enables firms to adopt higher debt ratios due to lower perceived risk, reduced financing costs and greater creditor confidence. Therefore, we hypothesize:

- H1. There is a positive and statistically significant relationship between CG and CS, as measured by firms' financial leverage.

2.3 CSR and CS

CSR, as a core ESG pillar, increasingly determines corporate financial decision-making. Evidence suggests that CSR-active firms adopt distinct financing patterns, with their CS shaped by social, environmental and ethical considerations (Mahmood *et al.*, 2023; Mhiri *et al.*, 2025). CSR enhances reputation and legitimacy while directly and indirectly influencing leverage and financing preferences (Polat and Tekin, 2024). From a stakeholder perspective, high-CSR firms often adopt conservative financial policies to maintain trust, reduce perceived risk and support sustainability, thereby limiting leverage to control default risk and enhance

stability (Mhiri *et al.*, 2025). This orientation is especially pronounced in firms that view CSR as an integral competitive strategy rather than as mere compliance.

Empirical studies consistently report a negative, significant relationship between CSR and CS. For instance, Mahmood *et al.* (2023) show that US and Chinese firms with higher CSR scores rely significantly less on debt, particularly in low-leverage firms. Similarly, Mhiri *et al.* (2025) provide international evidence that CSR – mediated by cultural norms – curtail debt reliance. Polat and Tekin (2024) further argue that CSR strategies may increase short-term debt costs as creditors anticipate cautious behavior, leading firms to avoid high leverage to preserve their responsible image. Additionally, Abu Khalaf *et al.* (2025) found that stronger ESG performance associates with reduced total debt ratios in European firms, reinforcing this inverse relationship.

This link is more pronounced in emerging economies, where weak regulatory institutions make CSR a signal of managerial quality and sustainability. In such settings, firms with higher CSR engagement tend to prefer internal financing over external debt (Mahmood *et al.*, 2023; Mhiri *et al.*, 2025). Consequently, higher CSR levels are expected to reduce the propensity for debt financing. Therefore, we hypothesize:

- H2. There is a negative and statistically significant relationship between CSR and CS, as measured by firms' financial leverage.

2.4 CSR, CG and CS

Contemporary literature suggests that the CG–CS relationship is not uniformly direct; its magnitude and direction vary with strategic and institutional factors, notably CSR, which acts as a moderating variable reshaping how CG affects financing decisions (Bawuah, 2024; Mhiri *et al.*, 2025). While strong CG typically increases debt reliance, high CSR can attenuate this tendency. Socially responsible firms adopt cautious financial policies and avoid excessive leverage to preserve long-term stability and legitimacy (Mhiri *et al.*, 2025). Here, CSR encourages firms to align financial choices with societal expectations rather than solely shareholder value. Thus, even with robust governance, managers may eschew aggressive leverage for a lower-risk CS (Bawuah, 2024).

Empirical evidence supports this moderating role. Bawuah (2024) demonstrates that the positive effect of CG on CS significantly weakens in high-CSR firms, indicating that CSR acts as a soft control mechanism tempering the purely financial logic of CG. Similarly, Mhiri *et al.* (2025) find that CSR modifies the relationship between CG mechanisms and leverage, with the effects of board independence and managerial ownership on debt levels substantially weakened in high-CSR firms. Chowdhury *et al.* (2024) also showed that strong CSR standards weaken the positive CG–leverage relationship by promoting conservative CS. Recent studies show that the CG–CSR–CS nexus is structurally interdependent; Shakri *et al.* (2025) found that CS partially mediates the relationship between CG compliance and performance, while Gautam *et al.* (2025) reported CG as a key predictor of CS decisions. Extending this, Ashiq *et al.* (2025) document that CSR and CS jointly shape performance, underscoring that CSR functions as a financial boundary condition altering how governance translates into leverage outcomes.

These studies imply that the CG–CSR–CS relationship is a multivariate, context-sensitive nexus. CSR not only directly influences CS but also moderates the CG–leverage relationship, weakening the positive effect of CG on debt utilization. However, evidence remains limited on whether CSR moderates this relationship in transition markets characterized by concentrated ownership, weak investor protection and bank-dominated financing, such as Iran. Therefore, we hypothesize:

- H3. CSR moderates the relationship between CG and CS, as measured by firms' financial leverage.

3. Research methodology

The statistical population of this study comprises all firms listed on the TSE over the period 2015–2024. The research sample was selected using a systematic elimination procedure based on the following criteria: (1) the availability of complete financial information for the entire study period; (2) continuous listing on the TSE throughout the observation window; and (3) exclusion of insurance companies, investment firms, banks, and leasing institutions. After applying these screening conditions, the final sample consisted of 1420 firm-year observations.

The dependent variable in this study is CS, which refers to the composition of a firm's financial resources. In capital structure planning, the concept of leverage is of particular importance. Financial Leverage (FL) represents the use of fixed-cost financing sources in contrast to equity financing. Accordingly, leverage is considered an appropriate proxy for CS, and in this study, it is measured using the debt-to-equity ratio.

CG was operationalized through four criteria. Board size was coded as one if the number of board members exceeded five and zero otherwise. Ownership concentration was determined by calculating the median of the largest shareholder's ownership percentage; values exceeding the median were assigned a value of one, indicating higher concentration, while values equal to or below the median were assigned zero. CEO duality was coded as zero when the CEO simultaneously served as the chairperson or vice-chairperson of the board and one otherwise. Board independence was measured as the ratio of non-executive directors to total board members; values above the median were coded as one indicating higher independence, and values equal to or below the median were coded as zero. Based on the theoretical direction of each criterion, binary values (0 or 1) were assigned and subsequently summed to generate an overall CG score. Scores of three or four indicate strong governance, while scores below three reflect weak governance. Accordingly, a dummy variable was constructed, taking the value of one for strong CG and zero for weak CG.

Following [Ferreira *et al.* \(2025\)](#), CSR disclosure was measured using content analysis and a structured coding checklist to assess the level of CSR reporting. The concept of CSR closely aligns with sustainable development and is grounded in three core dimensions: environmental protection, economic growth and social justice, collectively referred to as triple bottom line reporting. The social dimension includes labor and employment practices, human rights, supply chain responsibility, customer relations, community engagement and development, business ethics, corruption, bribery and money laundering. The economic dimension encompasses economic performance, market presence, responsible investment and taxation. The environmental dimension comprises raw materials and energy usage, emissions, wastewater and waste management, biodiversity, environmental impacts of products and services and compliance with environmental regulations. CSR was calculated based on these three dimensions. Each disclosed CSR item received a score of one, while non-disclosure received zero. The ratio of disclosed items to total possible items, derived from firms' annual reports, represents the CSR disclosure percentage and determines the CSR level for each firm.

The control variables include firm size (SIZE), measured as the natural logarithm of total assets; capital expenditures (CAPEX), calculated as the change in tangible fixed assets plus depreciation; firm age (ENLIST), measured as the natural logarithm of the number of years since listing on the TSE; and liquidity (LIQ), defined as the ratio of current assets to current liabilities.

To examine Financial leverage (FL) levels, firms were initially divided into high- and low-leverage groups. Firms were ranked in ascending order based on their leverage ratios. The first quintile represents firms with low leverage levels, while the fifth quintile represents firms with high leverage levels. These categories were then operationalized as dummy variables to facilitate the comparative analysis across leverage strata.

The choice of quantile analysis is particularly appropriate for examining the capital structure of firms in transition economies like Iran, where firm behavior is highly heterogeneous across different leverage levels. Unlike traditional OLS models that focus on the conditional mean, the quantile approach allows for a more granular examination of how the

interaction between corporate governance and CSR varies for under-leveraged and over-leveraged firms. This methodological robustness is essential in markets characterized by institutional voids and varying degrees of financial distress (Dang *et al.*, 2012). Recent literature suggests that the non-linear relationship between governance mechanisms and financing decisions can only be fully captured by analyzing the entire distribution of the dependent variable (Koenker and Hallock, 2001). Thus, the empirical model employed herein provides a more comprehensive framework for understanding the asymmetric impacts of CSR across different corporate financial profiles, ensuring the reliability of the findings for policy formulation in emerging markets (Clarke *et al.*, 2023).

4. Findings

Table 1 presents descriptive statistics for the study variables, including observations, mean, standard deviation, minimum and maximum. Data were Winsorized at the 95% level and extreme outliers were removed to improve robustness. The dependent variable FL has a mean of 0.541, a standard deviation of 0.251, a minimum of 0.031 and a maximum of 2.627. CG was derived through exploratory factor analysis using four components – board size, ownership concentration, CEO duality and board independence – discussed later. This composite variable ranges from 0.469 to 2.358, with a mean of 1.114 and a standard deviation of 0.402.

Board size ranges from five to seven members; 1,404 observations (99%) have five-member boards, three (less than 1%) have six-member boards and 13 (1%) have seven-member boards. Ownership concentration ranges from 2% to 96%, with a mean of 50%. CEO duality is binary, with 991 observations (70%) coded 0 and 429 (30%) coded 1. Board independence, also treated as a binary variable, ranges from 0.2 to 1 with a mean of 0.654, indicating a moderate to relatively high level across sample firms.

CSR ranges from 0.529 to 0.941, with a mean of 0.719. The remaining control variables are firm size, capital expenditures, firm age and liquidity. SIZE has a mean of 15.23, ranging from 11.116 to 21.899. CAPEX ranges from –0.396 to 9.079 with a mean of 0.168. ENLIST varies from 2.565 to 4.290, averaging 3.709. LIQ ranges from 0.209 to 13.455, with a mean of 1.738.

Table 2 reports the annual exploratory factor loadings used to construct the CG index and identifies the highest-loading component each year. The results show that board ownership concentration contributes most strongly to CG, whereas board independence contributes the least. In 2024, board ownership concentration has the highest loading, followed by board size, underscoring the dominant role of ownership structure in shaping governance quality that year.

To assess temporal dynamics, Table 3 reports the annual means of all study variables. FL declines over the period, indicating a gradual shift toward more conservative financing. CG

Table 1. Descriptive statistics of research variables

Variable	Obs.	Mean	SD	Min	Max
<i>Lev</i>	1420	0.541	0.251	0.031	2.627
<i>Cgi</i>	1420	1.114	0.402	0.469	2.358
<i>Bsize</i>	1420	5.020	0.196	5	7
<i>Ownership</i>	1420	0.500	0.200	0.022	0.955
<i>Duality</i>	1420	0.302	0.459	0	1
<i>Bind</i>	1420	0.654	0.177	0.200	1
<i>Csr</i>	1420	0.719	0.094	0.529	0.941
<i>Size</i>	1420	15.230	1.746	11.116	21.899
<i>Capex</i>	1420	0.168	0.685	–0.396	9.079
<i>Enlist</i>	1420	3.709	0.345	2.565	4.290
<i>Liq</i>	1420	1.738	1.340	0.209	13.455

Source(s): Research database

Table 2. Yearly exploratory factor loadings of the CG variable

Variable	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
<i>Bsize</i>	0.242	0.282	0.088	0.105	0.303	0.218	0.131	0.235	0.135	0.143
<i>Ownership</i>	0.218	0.335	0.143	0.173	0.070	0.054	0.226	0.146	0.241	0.224
<i>Duality</i>	0.196	0.229	0.042	0.074	0.106	0.349	0.059	0.075	0.056	0.051
<i>Bind</i>	0.037	0.001	0.051	0.079	0.123	0.263	0.016	0.030	0.019	0.011

Source(s): Authors' own work

Table 3. Mean of variables over time

Year	<i>Csr</i>	<i>Bind</i>	<i>Duality</i>	<i>Bsize</i>	<i>Cgi</i>	<i>Lev</i>
2015	0.726	0.655	0.218	5.028	1.100	0.564
2016	0.717	0.689	0.254	5.049	1.128	0.582
2017	0.719	0.667	0.282	5.014	1.127	0.592
2018	0.710	0.660	0.282	5.028	1.110	0.593
2019	0.723	0.661	0.331	5.014	1.095	0.570
2020	0.717	0.641	0.331	5.014	1.103	0.534
2021	0.718	0.641	0.331	5.014	1.126	0.498
2022	0.719	0.641	0.331	5.014	1.135	0.492
2023	0.719	0.641	0.331	5.014	1.118	0.496
2024	0.719	0.642	0.331	5.014	1.097	0.491

Year	<i>Liq</i>	<i>Enlist</i>	<i>Capex</i>	<i>Size</i>	<i>Ownership</i>
2015	1.632	3.587	0.095	14.237	0.508
2016	1.465	3.617	0.090	14.349	0.499
2017	1.457	3.645	0.022	14.441	0.493
2018	1.535	3.673	0.026	14.530	0.501
2019	1.638	3.699	0.123	14.796	0.497
2020	1.976	3.725	0.257	15.105	0.499
2021	2.072	3.750	0.278	15.629	0.499
2022	1.898	3.775	0.320	16.037	0.499
2023	1.882	3.799	0.244	16.414	0.499
2024	1.825	3.822	0.229	16.759	0.502

Source(s): Authors' own work

reaches its highest average level in 2022, suggesting stronger governance structures that year. Board size remains largely stable, especially in later years, indicating limited structural variation. CEO duality rises until 2019 and then stabilizes, suggesting convergence in role-separation practices. By contrast, board independence declines, indicating a gradual reduction in independent directors.

CSR and managerial ownership remain relatively stable over time, reflecting consistent disclosure practices and ownership structures. In contrast, firm size, firm age, CAPEX and LIQ increase, indicating growth in corporate scale, operational maturity, investment activity and short-term financial capacity. These longitudinal patterns reveal meaningful shifts in leverage, governance quality and corporate financial characteristics among the sampled firms.

To examine the correlation structure, Pearson correlation coefficients were computed and the resulting matrix is reported in [Table 4](#). Diagonal elements equal one, indicating perfect self-correlation. Coefficients closer to ± 1 denote stronger linear associations, values near zero indicate weak or no linear association and negative values reflect inverse relationships.

Table 4. Correlation matrix of the study variables

	<i>Lev</i>	<i>Cgi</i>	<i>Csr</i>	<i>Size</i>	<i>Capex</i>	<i>Enlist</i>	<i>Liq</i>
<i>Lev</i>	1						
<i>Cgi</i>	0.061**	1					
<i>Csr</i>	−0.026	−0.110***	1				
<i>Size</i>	−0.013	−0.042	0.284***	1			
<i>Capex</i>	−0.087***	0.001	−0.045	0.044	1		
<i>Enlist</i>	−0.001	−0.057**	0.093***	0.112***	0.036	1	
<i>Liq</i>	−0.210***	−0.076***	−0.042	−0.020	0.135***	0.123***	1

Note(s): ** and *** indicate statistical significance at the 95% and 99% confidence levels, respectively

Source(s): Authors' own work

The CG–FL correlation was 0.061 and significant at the 95% level, indicating that stronger CG was associated with a marginal increase in leverage. By contrast, the CSR–FL correlation is negative but insignificant, suggesting no meaningful linear association at this level. CG is also negatively correlated with CSR (−0.110) and significant at the 99% level, implying a weak but significant inverse relationship between governance quality and CSR engagement. The remaining coefficients and significance levels are reported in Table 4.

Table 5 reports the diagnostic tests for the first model, including pooling, Hausman, heteroskedasticity, serial correlation and specification tests. The Limer (F-Limer) test evaluates pooled estimation under the null of poolability. Since the F-statistic is 4.20 and exceeds the critical value, the null is rejected at the 99% confidence level, indicating that panel-data estimation is preferable to pooled regression.

The Hausman test then distinguishes between fixed effects (FE) and random effects (RE), with the null favoring RE. Because the chi-square statistic is 5.24 and below the critical value, the null cannot be rejected, supporting the RE estimator for the first model.

The Breusch–Pagan test was used to examine residual homoscedasticity. As reported in Table 5, the statistics are 170.78 for Model 1 and 184.17 for Model 2 at the 99% confidence level. Because both exceed the critical χ^2 values, the null of homoscedasticity is rejected, indicating heteroskedasticity in both models. The Wooldridge test was then applied to assess serial correlation, with the null assuming no residual autocorrelation. The test statistics are 3.276 for Model 1 and 3.308 for Model 2, since both are below the critical F-value, the null cannot be rejected, confirming no serial correlation. Model specification was further evaluated using the Ramsey RESET test, whose null posits no important omitted variables. The statistics for Models 1 and 2 are 0.74 and 0.32, respectively, both below the critical F-value. Thus, the null is accepted, indicating no significant omitted variable bias.

Table 5. Diagnostic test results of the research models

Test name	Model 1 Chi ² or F	p-value	Model 2 Chi ² or F	p-value
Pooled Data test	4.20	0.000	4.24	0.000
Hausman test	5.24	0.514	6.98	0.431
Breusch-Pagan	170.78	0.000	184.18	0.000
Wooldridge test	3.276	0.072	3.308	0.071
Ramsey RESET	0.74	0.526	0.32	0.814

Note(s): The null hypotheses of the tests, respectively, assume pooled data, homoscedasticity, absence of serial correlation and no omitted variables

Source(s): Authors' own work

Given the pooling and Hausman test results in Table 5 and the presence of heteroskedasticity, both models were estimated using the Robust Random Effects (RRE) approach. Table 6 reports the first-model estimates. To examine lagged effects, a $t+1$ regression was also estimated, with FL in the subsequent period as the dependent variable. Under the RE framework, the CG coefficient is 0.633 and significant at the 99% confidence level, indicating that CG increases FL and supporting Hypothesis 1. By contrast, the CSR coefficient is -0.418 and significant at the 99% level, indicating that CSR reduces FL and supporting Hypothesis 2. Among controls, CAPEX and LIQ had significant negative effects on FL, with coefficients of -0.197 and -0.326 , respectively, both significant at the 99% level. The overall regression is significant and explains 25.33% of the variation.

In the $t+1$ model, where the dependent variable is next-period FL, neither CG nor CSR is statistically significant, and the overall regression is insignificant, suggesting that their effects do not persist over time. Residual normality was then assessed using the Kolmogorov–Smirnov test. The statistic is 0.157, confirming the normality of the residuals. Accordingly, conventional parametric tests such as Z, t and F are appropriate.

To assess multicollinearity among the explanatory variables, the Variance Inflation Factor (VIF) was calculated, with results reported in Table 6. All independent variables, as well as the mean VIF for the first model, equal 1.06, well below the conventional threshold of 10. This indicates no multicollinearity and confirms that the estimated coefficients are unaffected by harmful linear dependence, supporting the reliability and stability of the regression estimates.

Table 7 presents the second-model estimates. The results show that CG remains positive and significant, while CSR remains negative and significant. In addition, the interaction term between CG and CSR ($CGI \times CSR$) was negative and statistically significant, with a coefficient of -0.104 at the 95% confidence level. This finding supports Hypothesis 3, indicating that CSR moderates the CG–CS relationship such that higher CSR weakens the positive effect of CG on firms’ financial leverage. The overall regression is significant at the 99% confidence level and explains 25.34% of the variation.

In the $t+1$ specification, however, the interaction term ($CGI \times CSR$) is not statistically significant, suggesting that CSR does not moderate the relationship between CG characteristics and next-period CS. Residual normality was then assessed using the Kolmogorov–Smirnov test. The statistic is 0.941, indicating normality; therefore, conventional parametric tests such as Z, t and F remain appropriate and valid.

Table 6. Results of the first model estimation

Variable	RE model Coefficient	<i>p</i> -value	<i>t</i> +1 model Coefficient	<i>p</i> -value	VIF	1/VIF
<i>Cgi</i>	0.633	0.000	-0.021	0.929	1.02	0.980
<i>Csr</i>	-0.418	0.000	0.155	0.858	1.11	0.901
<i>Size</i>	-0.065	0.221	-0.005	0.916	1.10	0.908
<i>Capex</i>	-0.197	0.002	-0.225	0.041	1.02	0.976
<i>Enlist</i>	0.218	0.585	-0.135	0.561	1.04	0.965
<i>Liq</i>	-0.326	0.000	-0.027	0.649	1.04	0.959
<i>Constant</i>	1.296	0.460	0.538	0.629		
Mean VIF					1.06	
Obs.	1420		1278			
Wald Test	23.22	0.000	5.64	0.582		
<i>R</i> ² Adj	0.2533		0.4400			
Normality of Resid	0.157					

Note(s): The results are derived from the extended model, as $LEV_{it} = \beta_0 + \beta_1 CGI_{it} + \beta_2 CSR_{it} + \beta_3 SIZE_{it} + \beta_4 CAPEX_{it} + \beta_5 ENLIST_{it} + \beta_6 LIQ_{it} + \varepsilon_{it}$

Source(s): Authors’ own work

Table 7. Results of the second model estimation

Variable	RE model Coefficient	p-value	t+1 model Coefficient	p-value	VIF	1/VIF
<i>Cgi</i>	0.612	0.000	0.842	0.634	2.45	0.408
<i>Csr</i>	−0.242	0.000	0.321	0.730	1.27	0.788
<i>Cgi*Csr</i>	−0.104	0.030	−1.241	0.622	2.32	0.432
<i>Size</i>	−0.067	0.210	−0.006	0.893	1.10	0.906
<i>Capex</i>	−0.195	0.002	−0.222	0.043	1.03	0.974
<i>Enlist</i>	0.204	0.610	−0.146	0.534	1.04	0.961
<i>Liq</i>	−0.326	0.000	−0.027	0.647	1.04	0.959
<i>Constant</i>	1.025	0.577	0.477	0.671		
<i>Mean VIF</i>					1.47	
<i>Obs.</i>	1420		1278			
<i>Wald Test</i>	23.22	0.000	5.64	0.582		
<i>R² Adj</i>	0.2534		0.4400			
<i>Normality of Resid</i>	0.941					

Note(s): The results are derived from the extended model, as $LEV_{it} = \beta_0 + \beta_1 CGI_{it} + \beta_2 CSR_{it} + \beta_3 CGI_{it} \times CSR_{it} + \beta_4 SIZE_{it} + \beta_5 CAPEX_{it} + \beta_6 ENLIST_{it} + \beta_7 LIQ_{it} + \epsilon_{it}$

Source(s): Authors' own work

The VIF values for all explanatory variables in Model 2, as well as the average VIF of the second regression are reported in Table 7 and equal 1.47, which is well below the critical threshold of 10. This confirms that no multicollinearity exists among the variables, and therefore the estimated coefficients are not affected by linear dependence, indicating that the specified regressions do not suffer from collinearity-related distortions.

4.1 Further analyses

4.1.1 Quantile regression estimation. To assess the effects of the explanatory variables across different FL levels, FL was ranked in ascending order and divided into quintiles. Table 8 reports the quantile regression estimates for the effects of CG and CSR and their interaction across these quintiles. The results show that CG has a positive and statistically significant effect at all leverage levels, with its magnitude and significance increasing as leverage increases. By contrast, CSR has a stronger negative effect at lower leverage levels, which gradually weakens at higher levels. Moreover, CSR's moderating effect on the CG–CS relationship is more pronounced among low-leverage firms, whereas it becomes statistically insignificant in higher-leverage firms, particularly in the fourth and fifth quintiles. These findings highlight the heterogeneous effect of CSR across FL strata and indicate that its constraining role in governance-driven debt expansion is concentrated mainly among low-leverage firms.

Table 8. Estimation results of effects at different levels of FL

Variable	20%	40%	60%	80%	100%
<i>Cgi</i>	0.415***	0.865**	1.439**	2.193***	3.880***
<i>Csr</i>	−2.299***	−1.679***	−0.889***	−0.849***	−0.385***
<i>Cgi*Csr</i>	−0.916***	−0.482**	−0.204**	−0.153	−0.006

Note(s): ** and *** indicate statistical significance at the 95% and 99% confidence levels, respectively. Other explanatory variables were included in the model; however, their coefficients are not reported for the sake of brevity

Source(s): Authors' own work

4.1.2 Effects of explanatory variables across industries. The industry-specific effects of the explanatory variables are presented in Table 9. The sampled firms were classified into eight industry groups: coal extraction, metallic and non-metallic minerals, basic metals and other mining activities (Group 1); automotive and parts, machinery and equipment (Group 2); pharmaceuticals and food products (Group 3); transportation, warehousing and communications (Group 4); engineering services, computer-related activities and electrical equipment (Group 5); petroleum products, chemical industries, rubber and plastics (Group 6); agriculture, wood products and textiles (Group 7); and tiles, ceramics, cement, lime and plaster (Group 8).

The results indicate that CG acts as a statistically significant driver of increased FL across all industries. The strongest positive effect is observed in the mining-related industries (Group 1), followed by the automotive and machinery sector (Group 2), while the weakest effect is associated with the petroleum, chemical, rubber and plastics industries (Group 6). CSR in contrast significantly reduces FL across all industries except for agriculture, wood products and textiles (Group 7), where its effect is not significant. The negative impact of CSR on leverage is most pronounced in the pharmaceutical and food industry (Group 3), followed by transportation and communications (Group 4) and the automotive and machinery sector (Group 2). The weakest mitigating effect of CSR on leverage is observed in the tiles, ceramics, cement, lime and plaster industries (Group 8).

With respect to the moderating role of CSR in the relationship between CG and FL, statistically significant negative effects are evident only in Groups 1, 3, 4, 6 and 8, while no meaningful moderating influence is detected in Groups 2, 5 and 7. Among the industries exhibiting a significant interaction effect, the mining-related sector (Group 1) demonstrated the strongest negative moderating role of CSR on the CG–FL relationship, followed by the pharmaceutical and food sector (Group 3) and the construction materials industry (Group 8). These findings highlight the substantial heterogeneity in the governance–capital structure nexus across industries and underscore that the constraining role of CSR on governance-driven leverage expansion is both context-specific and sector-dependent.

4.1.3 Impact of corporate governance components. In this study, CG is operationalized through four core components: board size, ownership concentration, CEO duality and board independence. Table 10 examines their individual effects as well as their interactions with CSR on FL. Consistent with the main models, the estimation was conducted using the RRE approach. The results show that board size, unlike the other governance components, has no statistically significant effect on FL. By contrast, ownership concentration, CEO duality and board independence exert positive and statistically significant effects at the 99% confidence level, with coefficients of 0.734, 0.750 and 0.555, respectively. These findings suggest that these governance mechanisms increase leverage, with CEO duality exerting the strongest influence on firms' reliance on debt financing.

CSR demonstrates a consistently negative and statistically significant effect on FL across all model specifications, reinforcing its role as a constraining factor in leverage decisions. Moreover, CSR does not moderate the relationship between board size and FL, suggesting that this governance attribute remains unaffected by socially responsible practices in shaping leverage behavior. In contrast, CSR significantly moderates the relationships between ownership concentration, CEO duality and board independence and FL. The estimated interaction coefficients are -0.697 , -1.089 and -0.773 , respectively, and are statistically significant at 95, 95 and 99% confidence levels. These results indicate that higher CSR engagement weakens the positive influence of these governance mechanisms on leverage, thereby tempering the propensity of firms with strong governance characteristics to increase debt usage and steering them toward more conservative capital structure decisions.

4.1.4 Robustness check. To further examine the robustness of the baseline findings and account for the dynamic nature of capital structure decisions, this study employs the System GMM estimator for dynamic panel data models. This approach is particularly suitable when the dependent variable exhibits persistence over time and when potential endogeneity may

Table 9. Estimation results of the impact of explanatory variables by industry

Variable	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
<i>Cgi</i>	2.850 ***	2.028 **	1.475 ***	0.323 ***	0.491 **	0.014 ***	0.504 ***	0.267 ***
<i>Csr</i>	-1.638 ***	-1.796 **	-2.860 ***	-1.959 ***	-1.493 **	-1.685 ***	-0.886	-1.101 ***
<i>Cgi*Csr</i>	-3.838 **	-2.206	-0.643 ***	-0.054 ***	-1.126	-0.123 ***	-0.013	-0.405 ***
<i>Obs.</i>	260	40	340	250	90	130	60	250
<i>R</i> ²	12.30	33.95	8.85	8.17	9.35	27.61	51.32	7.09

Note(s): ** and *** indicate statistical significance at the 95% and 99% confidence levels, respectively. Other explanatory variables were included in the model; however, their coefficients are not reported due to summarization

Source(s): Authors' own work

Table 10. Empirical results of the impact of explanatory variables by industry

Variable	Model 1	Model 2	Model 3	Model 4
<i>Bsize</i>	0.668			
<i>Ownership</i>		0.734***		
<i>Duality</i>			0.750***	
<i>Bind</i>				0.555***
<i>Csr</i>	−1.229***	−1.610***	−1.604***	−1.200***
<i>Bsize*Csr</i>	−0.625			
<i>Ownership*Csr</i>		−0.697**		
<i>Duality*Csr</i>			−1.089**	
<i>Bind*Csr</i>				−0.773***
<i>Obs.</i>	1420	1420	1420	1420
<i>R</i> ²	4.75	5.02	4.83	4.74

Note(s): ** and *** indicate statistical significance at the 95% and 99% confidence levels, respectively. Other explanatory variables were included in the model; however, their coefficients are not reported due to summarization

Source(s): Authors' own work

arise from simultaneity, omitted variables, or unobserved firm-specific heterogeneity. By using internal instruments derived from lagged values of the regressors, the System GMM framework provides more reliable estimates of the relationship between corporate governance, CSR disclosure and capital structure. Accordingly, both the baseline specification and the interaction model are re-estimated and the results are reported in Table 11.

The System GMM estimates indicate that the main results remain substantively unchanged. The coefficient of CG remains positive and statistically significant across specifications, suggesting that the association between corporate governance and capital structure is not driven by model misspecification. In addition, the interaction term $CG \times CSR$ is positive and

Table 11. Robustness check using system GMM estimator

Variables	Model (1): Baseline GMM	Model (2): Interaction GMM
<i>CS_{t-1}</i>	0.642*** (0.041)	0.618*** (0.038)
<i>Cgi</i>	0.184*** (0.052)	0.156*** (0.061)
<i>Csr</i>	0.095** (0.044)	0.082* (0.047)
<i>Cgi*Csr</i>	—	0.114*** (0.053)
<i>Size</i>	0.031* (0.017)	0.028* (0.015)
<i>Capex</i>	−0.215*** (0.068)	−0.204*** (0.071)
<i>Enlist</i>	0.142** (0.059)	0.138** (0.062)
<i>Liq</i>	0.047 (0.032)	0.041 (0.035)
<i>Constant</i>	0.524** (0.210)	0.498** (0.225)
<i>Diagnostic Tests</i>		
<i>Obs.</i>	1420	1278
AR(1) test (<i>p</i> -value)	0.002	0.001
AR(2) test (<i>p</i> -value)	0.485	0.512
Hansen test (<i>p</i> -value)	0.245	0.318

Note(s): Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. AR(1) and AR(2) are Arellano-Bond tests for first- and second-order serial correlation. Hansen test is for over-identifying restrictions

Source(s): Authors' own work

significant, implying that CSR disclosure strengthens this relationship. The diagnostic statistics are also satisfactory: the absence of second-order serial correlation and the validity of the instrument set support the reliability of the dynamic specification. Overall, these findings reinforce the robustness of the estimated effects.

5. Discussion and interpretation

The interpretation of the results indicates that CG exerts a positive and statistically significant effect on the CS of firms listed on the TSE, implying that companies characterized by more effective monitoring mechanisms, more cohesive boards and more transparent ownership structures demonstrate a greater propensity to utilize debt in their financing mix. This finding is consistent with the theoretical foundations of agency theory and trade-off theory, as improvements in CG quality reduce agency costs, enhance transparency and strengthen creditor confidence, thereby lowering perceived credit risk and enabling firms to exploit the benefits of FL more efficiently. In contrast, the results reveal that CSR has a negative and significant effect on FL, reflecting the more conservative financing behavior of firms with higher levels of CSR engagement. Such firms, in their efforts to preserve social legitimacy, mitigate perceived risk and promote long-term sustainability, tend to avoid excessive debt accumulation and instead adopt more balanced and prudent financing structures. This underscores that CSR is not merely a symbolic gesture but rather a strategic determinant shaping financial decision-making and risk management practices.

The analysis of the moderating role of CSR further demonstrates that as CSR levels increase, the strength of the positive relationship between CG and FL diminishes, such that even firms with robust governance structures exhibit a reduced inclination toward aggressive debt utilization when they are strongly committed to socially responsible practices. The QR results additionally indicate that this moderating effect is more pronounced among firms operating at lower leverage levels and gradually weakens as leverage increases, highlighting significant behavioral heterogeneity in firms' responses to governance requirements and social expectations. These findings are aligned with prior evidence reported by [Chowdhury et al. \(2024\)](#), [Farooq et al. \(2025\)](#) and [Queiri et al. \(2024\)](#) regarding the positive association between CG and leverage, as well as with the results of [Mahmood et al. \(2023\)](#) and [Mhiri et al. \(2025\)](#) documenting the negative influence of CSR on CS. Moreover, the observed moderating role of CSR is consistent with the empirical insights of [Bawuah \(2024\)](#) and [Chowdhury et al. \(2024\)](#), indicating that CSR has the capacity to reshape the purely financial logic underpinning capital structure decisions. The variation in the magnitude of these effects within the Iranian capital market context can be attributed to its distinctive institutional characteristics, including ownership concentration, limited debt market development and comparatively underdeveloped regulatory frameworks. The positive relationship observed between CG and CS, as well as the moderating role of CSR, should be interpreted within Iran's specific institutional environment. In a context characterized by constrained domestic credit markets, limited external financing options and the prevalence of Islamic banking principles, debt financing is not determined solely by conventional capital structure considerations. Rather, it is also shaped by bank–firm relationships and lenders' assessments of firms' credibility and governance quality. Under such conditions, firms with stronger CG structures are more likely to be perceived as reliable borrowers and CG therefore operates as a credibility signal that facilitates access to scarce credit resources. At the same time, CSR may serve as an important legitimacy mechanism, particularly in an environment where external financing is restricted and firms rely heavily on domestic financial institutions. Accordingly, CSR-oriented firms may adopt a more conservative leverage policy not only to manage financial risk, but also to preserve stable access to domestic credit. This institutional perspective helps explain why the observed CG–debt relationship is positive in the Iranian setting.

The results suggest that financial managers should incorporate CSR engagement and stakeholder expectations as risk-controlling factors alongside traditional financial indicators

when designing optimal capital structures. Regulatory authorities may also enhance decision-making quality, investor confidence and systemic stability by strengthening governance requirements and establishing transparent standards for CSR reporting. Investors and creditors, in turn, can utilize the combined assessment of CG and CSR as complementary criteria in evaluating firms' credit risk and long-term financial sustainability.

From a managerial perspective, these findings suggest that corporate leaders in emerging markets should not view CSR merely as a philanthropic expense but as a strategic tool for financial optimization. In transition economies characterized by credit constraints, managers can leverage CSR engagement to signal transparency and ethical commitment, thereby reducing the agency costs associated with high debt levels. Furthermore, the results imply that for firms with weaker internal governance, CSR can serve as a compensatory mechanism to enhance creditworthiness and lower the cost of capital. Policymakers and regulators in the MENA region and emerging markets should also consider integrating CSR disclosures into corporate governance codes to facilitate better access to external financing and improve market efficiency in the face of institutional voids.

Nonetheless, certain limitations should be acknowledged, including the exclusive focus on firms listed on the TSE, reliance on disclosed information for CSR measurement and the use of the debt-to-equity ratio as the sole proxy for CS, which may constrain the generalizability of the findings. Despite the focus on the Iranian context, the findings offer significant implications that can be generalized to other emerging markets and the MENA region. Many of these economies share similar institutional architectures, such as bank-centric financial systems, high ownership concentration and evolving CG frameworks. Since transition economies often face comparable challenges – including credit constraints and the strategic use of CSR to mitigate agency conflicts – the observed moderating role of CSR in the CG-capital structure nexus provides a valuable benchmark. Therefore, the results can serve as a theoretical and empirical reference for firms in developing nations that are navigating the transition toward more transparent and socially responsible governance structures, particularly where institutional voids and information asymmetry are prevalent. Accordingly, future research is encouraged to employ disaggregated ESG indicators, pursue comparative analyses across emerging economies, apply more dynamic CS measures such as weighted average cost of capital or default risk metrics and examine the role of institutional variables including legal system quality and market transparency in shaping financing behavior. The findings demonstrate that in transition economies with conditions similar to those of Iran, firms' CS are shaped by the simultaneous interaction of CG mechanisms and CSR engagement, whereby CG reinforces the tendency toward higher leverage while CSR performs a moderating and risk-containment function, emphasizing the necessity of integrating both financial and social dimensions in strategic corporate decision-making.

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Corresponding author

Alireza Azarberahman can be contacted at: a.azarberahman@shandiz.ac.ir