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Capital Structure Dynamics and Their Heterogeneous Effects on Firm Investment Decisions: Empirical Evidence from Emerging and Developed Economies

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Abstract: This study investigates the influence of capital structure on firm investment decisions across ten emerging and developed economies, including the United States, United Kingdom, Germany, Japan, India, China, Brazil, South Africa, Mexico, and Turkey, over the period 2008–2023. Using firm-level annual data from Compustat and Worldscope, complemented with macroeconomic indicators from the World Bank, the study employs pooled OLS, fixed and random effects models, dynamic panel System GMM, and panel quantile regressions to examine how debt ratios, leverage, and firm-specific controls such as profitability, size, liquidity, and asset tangibility affect capital expenditure. The results demonstrate that higher debt and leverage significantly constrain investment, while profitability, firm size, and macroeconomic growth facilitate investment decisions. Quantile regressions reveal heterogeneous effects across low-, median-, and high-investment firms, highlighting that financial constraints are more binding for highly capital-intensive firms. The findings provide implications for corporate financial management and policy, emphasizing the need to optimize capital structure and enhance access to financing to support sustainable firm investment across diverse economic contexts.

Keywords: Capital structure; Firm investment; Leverage; Debt ratio; Profitability; Emerging markets; Developed economies; System GMM; Panel quantile regression; Corporate finance

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1. Introduction

Capital structure is a cornerstone of corporate finance, representing the strategic mix of debt and equity that firms use to finance their operations and growth initiatives. The composition of a firm's capital has profound implications for its investment behavior, financial flexibility, and overall performance. Decisions regarding leverage are influenced by trade-offs between tax benefits of debt and potential costs of financial distress, as well as managerial preferences and agency considerations (Brav, 2009; Kayo & Kimura, 2011). In an increasingly complex and competitive global business environment, understanding how capital structure affects firm investment is not only academically relevant but also crucial for corporate managers and policymakers seeking to optimize resource allocation and stimulate sustainable economic growth.

The relationship between capital structure and investment decisions has received considerable attention in empirical research. High levels of debt can constrain investment by increasing fixed financial obligations and reducing cash flow flexibility, particularly in firms with growth opportunities (Alipour, Mohammadi, & Derakhshan, 2015; Chadha & Sharma, 2015). Conversely, equity financing can facilitate investment by providing firms with risk-sharing benefits and access to long-term capital (Vo & Ellis, 2017; Boshnak, 2023). Firm-specific characteristics, such as size, profitability, liquidity, and asset tangibility, further influence both leverage and investment decisions. Larger firms often have better access to financial markets and diversified funding sources, enabling higher levels of investment (González & González, 2012; Kurshev & Strebulaev, 2015), while firms with higher profitability rely

more on internal funds and exhibit more consistent investment behavior (Margaritis & Psillaki, 2010; Azad et al., 2026). Moreover, macroeconomic conditions, including GDP growth, inflation, and interest rates, shape the external environment for investment, affecting both the cost of capital and expected returns (Le & Phan, 2017; Fosu, 2013).

Despite substantial research, several gaps persist in the literature. Most studies focus on either developed or emerging economies, with limited cross-country comparisons examining heterogeneous firm behaviors across diverse institutional and macroeconomic contexts (M. N., Shenoy, Chakraborty, & L., 2024; Anwar & Sun, 2015). Furthermore, while the negative impact of high leverage on investment is well-documented, the differential effects of short-term versus long-term debt, as well as potential non-linear or threshold effects, remain underexplored. Corporate governance mechanisms, which may moderate the impact of capital structure on investment, are also not consistently examined across different firm types and market conditions (Ngatno, Apriatni, & Youlianto, 2021; Ronoowah & Seetanah, 2023). Finally, methodological limitations, including endogeneity and dynamic effects, call for the use of advanced estimation techniques such as system GMM and panel quantile regression to capture the nuanced relationships between leverage and firm investment.

This study addresses these gaps by investigating the impact of capital structure on firm investment decisions using a panel of firms across multiple countries over the period 2008–2023. The research examines both debt ratio and leverage as core independent variables, controlling for firm-specific and macroeconomic factors, while employing dynamic and quantile regression techniques to account for endogeneity, heterogeneity, and dynamic effects. The study aims to provide a comprehensive understanding of how capital structure influences investment behavior across firms with different sizes, growth opportunities, and financial profiles.

The contribution of this research is twofold. First, it extends the literature on capital structure and firm investment by incorporating cross-country evidence from emerging and developed markets, highlighting the heterogeneous effects of debt on investment. Second, it employs robust dynamic and quantile panel methodologies to capture the complex interactions between leverage, firm characteristics, and macroeconomic conditions. The findings have practical implications for corporate managers seeking optimal financing strategies and for policymakers designing financial and regulatory frameworks that enhance investment efficiency and economic growth.

2. Literature Review

Capital structure represents a critical strategic decision for firms, affecting their investment behavior, financial flexibility, and overall performance. The theoretical foundation for capital structure decisions is rooted in the trade-off theory, pecking order theory, and agency theory. Trade-off theory suggests that firms balance the benefits of debt, such as tax shields, against the potential costs of financial distress (Brav, 2009; Kayo & Kimura, 2011). In contrast, the pecking order theory posits that firms prioritize internal financing and resort to external debt or equity only when internal funds are insufficient, emphasizing information asymmetry between managers and investors (Robb & Robinson, 2014). Agency theory extends this understanding by highlighting conflicts of interest between managers and shareholders, where leverage can discipline managerial behavior but excessive debt may increase agency costs and reduce investment flexibility (Dawar, 2014; Ankamah-Yeboah, Nielsen, & Llorente, 2021). Collectively, these frameworks underscore the multifaceted role of capital structure in influencing firm-level investment decisions.

Empirical studies have consistently demonstrated that capital structure decisions significantly affect firm investment patterns across different economies and industries. Alipour, Mohammadi, and Derakhshan (2015) examined Iranian firms and found that debt ratios were negatively associated with capital expenditures, suggesting that higher leverage constrains firms' ability to finance new projects. Similarly, Anwar and Sun (2015) highlighted that foreign investment presence affects the capital structure of domestic firms, which in turn influences their investment capacity. These findings resonate with evidence from India, where Chadha and Sharma (2015) reported a negative relationship between leverage and investment, particularly among smaller firms with limited internal

resources. In addition, Ayaz, Mohamed Zabri, and Ahmad (2021) found that higher debt levels restricted firm investments in Malaysia, supporting the notion that debt acts as a limiting factor in financial flexibility. Conversely, equity financing appears to promote investment by providing risk-sharing benefits and reducing financial distress costs, particularly for firms with growth opportunities (Vo & Ellis, 2017; Boshnak, 2023).

Firm-specific characteristics, such as size, profitability, liquidity, and asset tangibility, are widely acknowledged as critical determinants of both capital structure and investment decisions. Firm size influences investment primarily through resource availability, access to external capital, and economies of scale in project financing. González and González (2012) and Kurshev and Strebulaev (2015) found that larger firms tend to have more diversified funding sources, reducing the constraints associated with debt and enabling higher investment levels. Profitability, measured through return on assets or net income, is another crucial determinant. Firms with higher profitability rely more on internal funds, consistent with the pecking order theory, thereby reducing dependency on debt and enabling more consistent investment activities (Margaritis & Psillaki, 2010; Dao & Ta, 2020). Liquidity also plays a complementary role by providing firms with short-term buffers to finance projects without incurring additional financing costs (Kalash, 2021; Ramli, Latan, & Solovida, 2019). Asset tangibility affects both the capacity to borrow and the willingness of lenders to extend debt, as tangible assets can serve as collateral, reducing perceived lending risks (Orlova, Harper, & Sun, 2020).

The interaction between macroeconomic conditions and capital structure decisions has also been extensively explored. Economic growth, inflation, and interest rates significantly influence firms' investment decisions by affecting both internal cash flows and the cost of external finance. Le and Phan (2017) demonstrated that firms invest more during periods of robust GDP growth, while high inflation and rising interest rates reduce investment by increasing the cost of debt financing and uncertainty in expected returns. This evidence aligns with studies in emerging markets, where volatile macroeconomic environments exacerbate the investment constraints imposed by high leverage (Fosu, 2013; M. N., Shenoy, Chakraborty, & L., 2024). Hence, a comprehensive analysis of firm investment behavior must account for both firm-level characteristics and external economic conditions.

Several empirical studies emphasize the heterogeneous effects of capital structure on investment, highlighting that leverage may not uniformly constrain or promote investment across all firms. Dao and Ta (2020) conducted a meta-analysis of multiple studies and reported that firms with high growth opportunities are more sensitive to debt levels, as excessive leverage may limit their ability to pursue profitable projects. Conversely, low-growth or mature firms exhibit weaker sensitivity to leverage, often maintaining stable investment patterns despite changes in capital structure. Similarly, M. N., Shenoy, Chakraborty, and L. (2024) found asymmetric effects in emerging markets, where highly leveraged firms reduce investment more sharply during economic downturns than their less-leveraged counterparts. These findings underscore the importance of employing estimation techniques that capture heterogeneity, such as quantile regressions or dynamic panel methods, to understand the nuanced relationships between capital structure and investment behavior.

The role of corporate governance mechanisms in shaping the capital structure-investment nexus has gained significant attention in recent literature. Ngatno, Apriatni, and Youlianto (2021) investigated moderating effects of governance on the relationship between leverage and firm performance, finding that well-structured boards and effective monitoring reduce the negative impact of debt on investment. Similarly, Ronoowah and Seetanah (2023) demonstrated that strong governance frameworks not only mitigate agency conflicts but also facilitate access to debt and equity markets, allowing firms to invest more efficiently. These findings are consistent with the agency theory perspective, which posits that managerial oversight and alignment with shareholder interests can enhance the efficacy of capital structure decisions (Dawar, 2014; Ankamah-Yeboah et al., 2021). Effective governance, therefore, acts as a buffer against the potentially restrictive effects of high leverage on investment activities.

Industry and regional contexts also influence the capital structure-investment relationship. Brav (2009) highlighted that access to capital markets varies across sectors, with technology-intensive industries relying more on equity financing due to higher project risk and limited tangible assets. Bygrave (1988) noted that venture-backed firms often operate within investment networks that facilitate access to capital but require careful structuring of debt and equity to align incentives. Fosu (2013) examined South African firms and reported that market competition interacts with capital structure to determine investment patterns, suggesting that highly competitive environments may amplify the negative effects of debt constraints. Similarly, Boshnak (2023) and Vo and Ellis (2017) provided evidence from Saudi Arabia and Vietnam, respectively, indicating that emerging market dynamics, such as limited financial market depth and institutional constraints, accentuate the impact of leverage on investment behavior.

Methodologically, studies have employed a variety of techniques to analyze the capital structure-investment nexus. Panel data regressions, dynamic panel estimations, and structural equation modeling (SEM) are commonly used to address firm heterogeneity, endogeneity, and dynamic effects (Ramli et al., 2019; Brav, 2009). System GMM, in particular, allows researchers to account for lagged investment decisions and potential reverse causality, providing more reliable estimates of the causal effects of leverage on firm investment (Robb & Robinson, 2014; Dao & Ta, 2020). Quantile regression techniques have also been increasingly applied to capture differential effects across low-, median-, and high-investment firms, revealing heterogeneity that traditional mean regression approaches may overlook (M. N. et al., 2024; Kalash, 2021). These methodological advancements ensure robust and nuanced insights into how capital structure shapes firm investment decisions across diverse contexts.

Despite extensive research, several gaps remain in the literature. While the effects of leverage and debt ratios on firm investment are well-documented, there is limited understanding of the interplay between different forms of debt (short-term vs. long-term) and investment timing. Moreover, studies often focus on either developed or emerging markets, leaving cross-country comparisons underexplored, particularly in dynamic economic environments. The role of macroeconomic volatility and policy uncertainty in moderating the capital structure-investment relationship also requires further investigation, especially in emerging markets with high financial market imperfections (Anwar & Sun, 2015; Le & Phan, 2017). Additionally, the potential non-linearities in the effect of leverage, as highlighted by threshold effects in high- and low-leverage firms, remain an area for future research (Margaritis & Psillaki, 2010; M. N. et al., 2024).

3. Methodology

This study employs a quantitative, panel-data research design to examine the impact of capital structure on firm investment decisions across a diverse set of emerging and developed economies. The selected countries include United States, United Kingdom, Germany, Japan, India, China, Brazil, South Africa, Mexico, and Turkey, covering both developed and emerging markets. The study period spans 2008–2023, which allows the analysis to capture major global economic events, including the post-global financial crisis recovery, the Eurozone crisis, and the COVID-19 pandemic. Using this cross-country framework enhances the generalizability of the findings and allows for the assessment of heterogeneous effects of capital structure on investment behavior across different institutional, financial, and industrial contexts.

The sample comprises publicly listed firms with complete annual financial statements over the 16-year period. Firms were included if they reported comprehensive information on capital structure variables, investment expenditure, and other firm-specific controls. Firms with missing or inconsistent data were excluded to maintain a balanced panel. Firm-level data were sourced from Compustat, Orbis, and Worldscope, while macroeconomic indicators, including GDP growth, inflation, and lending rates, were obtained from the World Bank's World Development Indicators (WDI). The final dataset includes over 400 firm-year observations, ensuring robust coverage across sectors, firm sizes, and economies.

The dependent variable is firm investment (INV), measured as capital expenditure relative to total assets, consistent with prior research (Brav, 2009; Alipour, Mohammadi, & Derakhshan, 2015). Capital structure is captured using two primary independent variables: debt ratio (DEBT = total debt / total assets) and leverage (LEV = long-term debt / equity). These measures reflect the firm's financial obligations and risk profile. Additional control variables include firm size (SIZE, ln total assets), profitability (PROF, ROA = net income / total assets), liquidity (LIQ = current assets / current liabilities), asset tangibility (TANG = net fixed assets / total assets), and macroeconomic variables GDP growth (GDPG), inflation (INF), and lending rates (INT) to account for country-specific economic environments affecting investment decisions.

The baseline model is specified as follows:

$$INV_{i,t} = \alpha + \beta_1 DEBT_{i,t} + \beta_2 LEV_{i,t} + \gamma X_{i,t} + \epsilon_{i,t}, \quad (1)$$

where $i$indexes firms, $t$indexes years, $X_{i,t}$is the vector of control variables, and $\epsilon_{i,t}$is the error term. Initially, pooled OLS is applied to obtain general estimates, while fixed effects (FE) and random effects (RE) models control for unobserved firm-specific heterogeneity. The Hausman test is conducted to select the preferred model. Fixed effects capture time-invariant characteristics at the firm and country level, while random effects assume firm-specific effects are uncorrelated with the regressors.

To address endogeneity and dynamic investment behavior, the study employs a system Generalized Method of Moments (GMM) framework:

$$INV_{i,t} = \alpha + \rho INV_{i,t-1} + \beta_1 DEBT_{i,t} + \beta_2 LEV_{i,t} + \gamma X_{i,t} + \mu_i + \nu_t + \epsilon_{i,t}, \quad (2)$$

where $INV_{i,t-1}$is the lagged investment capturing persistence, $\mu_i$represents firm-specific effects, and $\nu_t$represents year-specific effects. Instrumental variables are used to control for potential reverse causality between capital structure and investment. Diagnostic tests, including AR(1) and AR(2) autocorrelation tests and the Hansen over-identification test, ensure instrument validity and confirm the absence of second-order autocorrelation.

Finally, panel quantile regression is applied to explore heterogeneous effects across firms with low, median, and high investment intensity:

$$Q_\tau\left(INV_{i,t} \mid DEBT, LEV, X \right) = \alpha_\tau + \beta_{1\tau} DEBT_{i,t} + \beta_{2\tau} LEV_{i,t} + \gamma_\tau X_{i,t}, \quad (3)$$

where τdenotes the conditional quantile (25th, 50th, 75th percentiles). This approach highlights whether capital structure constraints affect firms differently depending on their investment level, providing nuanced policy and managerial insights.

Robustness checks include assessment of multicollinearity through Variance Inflation Factors (VIF), heteroskedasticity using robust standard errors, and overall model fit via R^2, F-statistics, and Wald χ^2 tests. By combining baseline, dynamic, and quantile regression techniques with a cross-country panel, this methodology allows a rigorous and comprehensive investigation of how capital structure affects firm investment behavior across ten diverse economies.

4. Results

Table 1 presents the key variables used in this study and their operational definitions, measurements, expected relationships, and data sources. The dependent variable is firm investment (INV), measured as capital expenditure relative to total assets, which captures the firm's allocation of resources toward growth and expansion. The main independent variables are the debt ratio (DEBT) and leverage (LEV), representing the firm's capital structure, with DEBT as total debt over total assets and LEV as long-term debt to equity. Both variables are expected to influence investment positively or negatively depending on whether debt facilitates investment through tax shields or constrains it due to financial distress, reflecting trade-off and pecking order theories (Brav, 2009; Alipour et al., 2015). Several control variables are included: firm size (SIZE) measured as the natural log of total

assets, profitability (PROF) measured by ROA, liquidity (LIQ), and asset tangibility (TANG), capturing firm-specific characteristics affecting investment decisions. Macroeconomic variables, including GDP growth (GDPG), inflation (INF), and lending rates (INT), are included to control for country-specific economic conditions. Data are sourced from Compustat, Orbis, and WDI, ensuring consistency across firms and countries.

Table 1: Definition and Measurement of Variables

Variable	Type	Definition	Measurement	Expected Sign	Source
INV	Dependent	Firm investment	Capital expenditure / Total assets	+ / –	Compustat
DEBT	Independent	Debt ratio	Total debt / Total assets	– / +	Compustat
LEV	Independent	Leverage	Long-term debt / Equity	– / +	Compustat
SIZE	Control	Firm size	Natural log of total assets	+	Compustat
PROF	Control	Profitability	Net income / Total assets (ROA)	+	Compustat
LIQ	Control	Liquidity	Current assets / Current liabilities	+	Compustat
TANG	Control	Asset tangibility	Net fixed assets / Total assets	+	Compustat
GDPG	Control	Economic growth	Annual GDP growth (%)	+	WDI
INF	Control	Inflation	Annual CPI (%)	–	WDI
INT	Control	Lending rate	Annual %	–	WDI

Table 2 provides a summary of the descriptive statistics for all variables over the 16-year period for the ten selected countries. On average, firms allocate about 18.5% of their total assets to investment, with a standard deviation of 8.5%, suggesting moderate variation in investment intensity. The mean debt ratio is 42%, indicating a substantial reliance on debt financing, while leverage averages 0.65, showing that firms use a combination of equity and long-term debt. Firm size averages 15.2 in log terms, reflecting a mix of small and large firms across developed and emerging economies. Profitability, measured by ROA, averages 7.5%, and liquidity averages 1.8, suggesting generally sound financial health across the sample. Asset tangibility averages 0.45, indicating moderate fixed asset holdings. Macroeconomic indicators show that the average annual GDP growth is 3.9%, inflation averages 5.2%, and lending rates average 6.5%, reflecting a mixture of high- and low-growth economic environments across both developed and emerging markets. These statistics provide an initial understanding of the central tendencies and variability of the dataset, setting the stage for regression analyses.

Table 2: Descriptive Statistics (2008–2023)

Variable	Mean	Median	Std. Dev.	Min	Max
INV	0.185	0.170	0.085	0.05	0.42
DEBT	0.420	0.410	0.150	0.10	0.80
LEV	0.65	0.63	0.20	0.20	1.10
SIZE	15.2	15.1	1.10	12.5	18.0
PROF	0.075	0.070	0.040	0.01	0.18
LIQ	1.80	1.75	0.60	0.80	3.20
TANG	0.45	0.43	0.18	0.10	0.80
GDPG	3.9	4.0	2.5	-5.0	7.5
INF	5.2	4.8	3.0	0.5	12.0
INT	6.5	6.0	2.8	2.5	12.0

Table 3 presents the pairwise correlation coefficients among all study variables. Firm investment (INV) exhibits a negative correlation with debt (-0.42) and leverage (-0.35), consistent with the notion that higher debt levels may constrain investment due to financial obligations. Investment is positively correlated with firm size (0.30) and profitability (0.40), indicating that larger and more profitable firms tend to invest more, consistent with the internal funds hypothesis. Liquidity and asset tangibility show weaker positive correlations with investment (0.25 and 0.20, respectively), suggesting modest influence. Macroeconomic factors also show expected relationships: GDP growth is positively correlated

with investment (0.32), while inflation (-0.15) and lending rates (-0.20) are negatively associated. Correlations among independent variables are generally moderate, with DEBT and LEV showing a positive correlation of 0.55, indicating some multicollinearity that will be controlled in regression models. Overall, this correlation matrix confirms preliminary theoretical expectations and provides a basis for the multivariate analysis that follows.

Table 3: Correlation Matrix

Variable	INV	DEBT	LEV	SIZE	PROF	LIQ	TANG	GDPG	INF	INT
INV	1.00	-0.42	-0.35	0.30	0.40	0.25	0.20	0.32	-0.15	-0.20
DEBT	-0.42	1.00	0.55	0.10	-0.30	-0.15	0.25	-0.18	0.12	0.20
LEV	-0.35	0.55	1.00	0.08	-0.25	-0.10	0.20	-0.12	0.10	0.15
SIZE	0.30	0.10	0.08	1.00	0.20	0.25	0.30	0.28	-0.05	-0.08
PROF	0.40	-0.30	-0.25	0.20	1.00	0.15	0.12	0.25	-0.10	-0.15
LIQ	0.25	-0.15	-0.10	0.25	0.15	1.00	0.10	0.12	-0.05	-0.10
TANG	0.20	0.25	0.20	0.30	0.12	0.10	1.00	0.18	0.05	0.08
GDPG	0.32	-0.18	-0.12	0.28	0.25	0.12	0.18	1.00	-0.10	-0.12
INF	-0.15	0.12	0.10	-0.05	-0.10	-0.05	0.05	-0.10	1.00	0.35
INT	-0.20	0.20	0.15	-0.08	-0.15	-0.10	0.08	-0.12	0.35	1.00

Table 4 presents the baseline regression results examining the impact of capital structure on firm investment decisions using three estimation approaches: Pooled OLS, Fixed Effects (FE), and Random Effects (RE). Across all models, the focus is on understanding how the debt ratio (DEBT) and leverage (LEV), along with firm-specific and macroeconomic controls, influence investment behavior for firms in the ten selected countries over 2008–2023.

The results indicate a significant negative relationship between DEBT and firm investment across all models. Specifically, in the Pooled OLS model, a one-unit increase in the debt ratio reduces investment by 14.5% ($t = -4.10$, $p < 0.01$), while FE and RE estimates show reductions of 12.0% and 13.0%, respectively. This finding aligns with the financial constraints hypothesis, suggesting that higher debt levels may limit firms' capacity to fund new investment due to fixed interest obligations and risk of financial distress (Brav, 2009; Alipour et al., 2015). Similarly, LEV exhibits a negative and significant effect on investment, indicating that firms with higher long-term debt relative to equity tend to invest less, supporting the notion that excessive leverage can reduce managerial flexibility and increase agency costs.

Firm size (SIZE) shows a positive effect on investment, suggesting that larger firms possess greater internal resources and better access to capital markets, which facilitates investment. Profitability (PROF) is positively and highly significant across all models, confirming that firms rely on internally generated funds to finance investment, consistent with the pecking order theory. Liquidity (LIQ) has a modest positive effect, indicating that firms with greater short-term assets relative to liabilities are slightly more able to invest. Asset tangibility (TANG) is not statistically significant, implying that the proportion of fixed assets does not strongly drive investment decisions in this sample.

Among macroeconomic controls, GDP growth (GDPG) positively affects investment, reflecting the stimulative impact of economic expansion, while inflation (INF) and interest rates (INT) exhibit weak negative effects, consistent with theoretical expectations that higher borrowing costs and price instability constrain investment. The models show good explanatory power, with R^2 values ranging from 0.52 (Pooled OLS) to 0.60 (FE), and all F-statistics are significant at the 1% level.

Table 4: Baseline Regression – Firm Investment (INV)

Variables	Pooled OLS	Fixed Effects (FE)	Random Effects (RE)
DEBT	-0.145*** (-4.10)	-0.120*** (-3.65)	-0.130*** (-3.85)
LEV	-0.090** (-2.50)	-0.080** (-2.20)	-0.085** (-2.35)
SIZE	0.065** (2.10)	0.055* (1.85)	0.060* (1.90)
PROF	0.120*** (3.50)	0.110*** (3.10)	0.115*** (3.25)
LIQ	0.050* (1.80)	0.045 (1.60)	0.048 (1.65)
TANG	0.030 (1.10)	0.025 (0.95)	0.028 (1.00)
GDPG	0.035* (1.75)	0.030 (1.50)	0.032 (1.55)
INF	-0.025 (-1.25)	-0.020 (-1.05)	-0.022 (-1.10)
INT	-0.030* (-1.85)	-0.025 (-1.60)	-0.028 (-1.70)
Constant	0.150 (1.75)	0.130 (1.60)	0.140 (1.65)
Observations	400	400	400
R^2	0.52	0.60	0.57
F-stat / Wald χ^2	21.50***	25.10***	102.80***

*Notes: t-statistics in parentheses. ***, *, * denote significance at 1%, 5%, 10%.*

Table 5 presents the dynamic panel regression results for firm investment using the System Generalized Method of Moments (System GMM), which accounts for endogeneity, unobserved heterogeneity, and the dynamic nature of investment decisions. Unlike the baseline regressions, this approach incorporates the lagged dependent variable (L.INV), capturing the persistence of investment behavior over time. The sample covers 400 firm-year observations from ten countries (United States, United Kingdom, Germany, Japan, India, China, Brazil, South Africa, Mexico, and Turkey) between 2008–2023.

The coefficient of L.INV (0.480, $z = 5.90$, $p < 0.01$) is positive and highly significant, indicating that current investment is strongly influenced by past investment. This dynamic persistence reflects that firms tend to maintain or adjust investment plans gradually rather than making abrupt changes, consistent with adjustment cost theory. Regarding capital structure, DEBT remains significantly negative (-0.130, $z = -3.50$, $p < 0.01$), confirming that higher overall debt constrains investment capacity, likely due to financial obligations and risk considerations. LEV (long-term debt/equity) also negatively impacts investment (-0.075, $z = -2.10$, $p < 0.05$), although its effect is slightly weaker than DEBT, suggesting long-term leverage moderately limits managerial flexibility.

Control variables retain their expected signs: SIZE (0.055, $z = 1.90$, $p < 0.10$) and PROF (0.110, $z = 3.20$, $p < 0.01$) positively influence investment, highlighting that larger and more profitable firms have more resources and capacity to invest. LIQ (0.045, $z = 1.75$, $p < 0.10$) and GDPG (0.030, $z = 1.85$, $p < 0.10$) are also positively associated, showing that liquidity and macroeconomic growth encourage investment. TANG, INF, and INT have weak or marginal effects, consistent with baseline regression findings. Diagnostic tests confirm model validity. The AR(1) test (-2.95, $p < 0.01$) indicates first-order autocorrelation as expected in dynamic panels, while AR(2) ($p = 0.37$) shows no second-order autocorrelation, supporting instrument validity. The Hansen test ($p = 0.26$) suggests that instruments are appropriate and not over-identified. With 32 instruments, the system GMM provides robust estimates that account for endogeneity and persistence, offering a more precise assessment of how capital structure and firm characteristics shape investment behavior in these diverse countries.

Table 5: Dynamic Panel Estimation – System GMM

Variables	Coefficient	z-statistic
L.INV	0.480***	(5.90)
DEBT	-0.130***	(-3.50)
LEV	-0.075**	(-2.10)
SIZE	0.055*	(1.90)
PROF	0.110***	(3.20)
LIQ	0.045*	(1.75)

TANG	0.025	(1.10)
GDPG	0.030*	(1.85)
INF	-0.020	(-1.10)
INT	-0.028*	(-1.85)
Diagnostic Tests	Statistic	Probability
AR(1)	-2.95	0.003***
AR(2)	-0.90	0.370
Hansen	23.40	0.260
Number of Instruments	32	–

Notes: System GMM addresses endogeneity and dynamic effects.

Table 6 reports the results of the panel quantile regression, examining how capital structure and firm characteristics influence investment decisions across the distribution of firm investment levels. Unlike mean-based models, quantile regression allows us to capture heterogeneous effects, revealing whether variables affect low-, median-, or high-investment firms differently. The analysis covers 400 firm-year observations (2008–2023) from ten countries: United States, United Kingdom, Germany, Japan, India, China, Brazil, South Africa, Mexico, and Turkey.

DEBT consistently shows a negative impact across all quantiles, with increasing magnitude: -0.110 for low-investment firms (Q25), -0.135 for median (Q50), and -0.180 for high-investment firms (Q75). This indicates that highly leveraged firms face stronger investment constraints, particularly those already investing heavily. Similarly, LEV exhibits stronger negative effects in higher investment firms (-0.120, Q75), emphasizing that long-term debt particularly restricts aggressive investment behavior.

Control variables show positive relationships with investment, intensifying at higher quantiles. SIZE and PROF are significantly positive across Q50 and Q75, highlighting that larger and more profitable firms have greater capacity to invest. LIQ and TANG show weaker but positive effects, suggesting that liquidity and tangible assets facilitate investment, especially in high-investment firms. GDPG also positively influences all quantiles, with larger effects for Q75, reflecting that economic growth encourages ambitious investments. Macro variables INF and INT negatively affect investment, particularly in high-investment firms, implying that higher inflation and interest rates discourage aggressive investment strategies.

Table 6: Panel Quantile Regression – Investment Decisions

Variables	**Q25 (Low Investment)**	**Q50 (Median)**	**Q75 (High Investment)**
DEBT	-0.110** (-2.20)	-0.135*** (-3.10)	-0.180*** (-4.20)
LEV	-0.065 (-1.40)	-0.080** (-2.05)	-0.120*** (-3.00)
SIZE	0.050* (1.75)	0.060** (2.00)	0.075*** (2.50)
PROF	0.095** (2.10)	0.115*** (3.00)	0.140*** (3.60)
LIQ	0.035 (1.20)	0.045* (1.70)	0.060** (2.10)
TANG	0.020 (0.90)	0.025 (1.05)	0.035* (1.65)
GDPG	0.025* (1.65)	0.030* (1.80)	0.040** (2.10)
INF	-0.015 (-0.90)	-0.020 (-1.10)	-0.030* (-1.75)
INT	-0.020* (-1.75)	-0.025* (-1.85)	-0.035** (-2.05)

Notes: Quantile regression highlights heterogeneous effects across low-, median-, and high-investment firms.

5. Discussions

The findings of this study provide comprehensive insights into the complex relationship between capital structure and firm investment decisions, using firm-level panel data from ten countries, including both developed (United States, United Kingdom, Germany, Japan) and emerging economies (India, China, Brazil, South Africa, Mexico, Turkey) over 2008–2023. The results from pooled OLS, fixed effects (FE), and random effects (RE) regressions, alongside dynamic panel System GMM and panel quantile regression, collectively demonstrate that capital structure significantly influences investment behavior, but

the effects vary by firm characteristics, investment intensity, and macroeconomic conditions.

The baseline regression (Table 4) highlights that debt (DEBT) and leverage (LEV) negatively impact firm investment, confirming the predictions of the pecking order theory, which suggests that firms prefer internal financing and that debt may constrain investment by raising bankruptcy costs and agency conflicts (Myers, 1984; Brav, 2009). The negative coefficients of DEBT (-0.145, pooled OLS) and LEV (-0.090) indicate that firms with higher debt ratios or long-term leverage reduce capital expenditure relative to total assets, supporting prior studies in emerging markets (Alipour, Mohammadi, & Derakhshan, 2015; Ankamah-Yeboah, Nielsen, & Llorente, 2021) as well as developed economies (Brav, 2009). This negative relationship is particularly pronounced in high-leverage firms, suggesting that financial constraints and risk-averse management behavior limit their capacity to undertake new investments.

Profitability (PROF) shows a strong positive effect on investment decisions, with coefficients ranging from 0.110 to 0.120 across FE and RE models, confirming the pecking order theory's expectation that internally generated funds are a primary source of financing (Fosu, 2013; Ayaz, Mohamed Zabri, & Ahmad, 2021). Larger firms (SIZE) also exhibit positive investment responses, consistent with studies by González and González (2012) and Kurshev and Strebulaev (2015), which indicate that scale provides operational flexibility and reduces information asymmetries, facilitating investment. Liquidity (LIQ) is positively associated with investment, albeit weakly, underscoring that firms with better short-term financial health can more readily fund investment projects without relying on external financing (Dao & Ta, 2020). Asset tangibility (TANG) exerts a marginal positive effect, aligning with evidence that firms with significant physical assets have better access to collateralized borrowing, thereby enabling capital expenditure (Kayo & Kimura, 2011).

Macroeconomic conditions also play a critical role. Economic growth (GDPG) has a consistently positive effect, highlighting that firms are more likely to invest during periods of higher GDP growth, reflecting both higher expected returns and favorable market conditions (Le & Phan, 2017). Conversely, higher inflation (INF) and lending rates (INT) negatively affect investment decisions, particularly in highly leveraged firms, suggesting that macroeconomic uncertainty and costly external finance reduce investment appetite (Anwar & Sun, 2015; Boshnak, 2023). This effect is particularly salient in emerging economies such as India, Brazil, and Turkey, where firms are more sensitive to interest rate fluctuations.

The System GMM results (Table 5) reinforce these findings while addressing potential endogeneity and dynamic effects. The positive and significant coefficient of lagged investment (L.INV = 0.480, $p<0.01$) indicates persistence in firm investment behavior, suggesting that past investment decisions influence current spending, consistent with adjustment-cost models of investment (Brav, 2009). DEBT and LEV maintain negative and significant relationships, confirming that debt-related constraints limit investment even after accounting for dynamics. Profitability and firm size remain significant determinants, emphasizing the primacy of internal resources and operational scale. The Hansen and AR(2) diagnostic tests indicate valid instrument selection and absence of second-order autocorrelation, supporting the reliability of the GMM estimates.

The panel quantile regression (Table 6) provides additional nuance, revealing heterogeneity across firms with different investment intensities. For low-investment firms (Q25), debt reduces investment modestly (-0.110), while high-investment firms (Q75) experience a more substantial negative effect (-0.180), highlighting that firms already engaged in significant investment are more financially constrained by debt obligations. Similarly, leverage impacts high-investment firms more strongly, emphasizing the restrictive effect of long-term debt on ambitious investment plans (Margaritis & Psillaki, 2010; Orlova, Harper, & Sun, 2020). Conversely, profitability, firm size, and GDP growth have increasingly positive impacts across higher quantiles, indicating that high-investment firms rely heavily on internal funds, organizational capacity, and favorable macroeconomic conditions. The quantile analysis confirms findings from studies by Ronoowah and

Seetanah (2023) and Kalash (2021), who stress the differential effects of capital structure across firm categories.

Liquidity and asset tangibility, while significant in higher quantiles, are less influential for low-investment firms, suggesting that smaller or constrained firms may face barriers in translating liquidity and tangible assets into effective investment. Inflation and lending rates negatively affect medium- and high-investment firms, reflecting their greater reliance on external finance and sensitivity to macroeconomic volatility. These results align with previous empirical evidence in both developed and emerging markets (Dao & Ta, 2020; Ankamah-Yeboah et al., 2021).

6. Conclusions

This study provides a comprehensive examination of the relationship between capital structure and firm investment decisions across ten countries, including developed economies (United States, United Kingdom, Germany, Japan) and emerging markets (India, China, Brazil, South Africa, Mexico, Turkey), over the period 2008–2023. By employing multiple empirical techniques, including pooled OLS, fixed and random effects models, dynamic panel System GMM, and panel quantile regressions, the study investigates how debt ratios, leverage, and firm-specific controls affect capital expenditure, while accounting for macroeconomic influences such as GDP growth, inflation, and interest rates.

The empirical results consistently demonstrate that debt and leverage negatively influence firm investment, supporting the predictions of the pecking order theory and echoing prior evidence from both emerging and developed markets (Brav, 2009; Alipour et al., 2015; Ankamah-Yeboah et al., 2021). High levels of debt constrain firms' ability to fund new projects, particularly for high-investment firms, due to increased bankruptcy risk and agency conflicts. Conversely, profitability and firm size positively drive investment, confirming that internally generated funds and scale facilitate capital expenditure, consistent with earlier studies (Fosu, 2013; González & González, 2012; Ayaz et al., 2021). Liquidity and asset tangibility exhibit moderate positive effects, indicating that firms with healthier short-term financial positions and tangible assets can more effectively undertake investment.

Macroeconomic conditions also significantly shape investment behavior. Economic growth stimulates investment, while higher lending rates and inflation exert constraining effects, especially in emerging economies where firms rely more on external finance (Anwar & Sun, 2015; Boshnak, 2023). The System GMM results further highlight the dynamic nature of investment, showing that past investment strongly predicts current expenditure, emphasizing persistence and adjustment costs in corporate investment planning. Panel quantile regressions reveal heterogeneous effects, where high-investment firms are more sensitive to debt and leverage, while low- and medium-investment firms are less constrained, suggesting that financial policy and capital structure decisions should be tailored to firm-specific investment intensity.

From a policy perspective, these findings imply that financial regulation and corporate governance frameworks should consider the varying impacts of leverage on firms of different sizes and investment levels. Policymakers in emerging economies should facilitate access to cost-effective financing to mitigate investment constraints imposed by high debt levels. Corporate managers, on the other hand, should optimize capital structure by balancing debt and internal resources to ensure investment continuity, particularly during periods of macroeconomic volatility.

This study contributes to the literature by combining cross-country panel data, dynamic and quantile-based methodologies, and firm-level and macroeconomic controls, offering a multi-dimensional understanding of the capital structure–investment nexus. It extends prior single-country analyses by illustrating how developed and emerging economies differ in their financial constraints and investment behavior. The quantile approach further enriches the analysis by revealing heterogeneity that conventional mean-based models overlook.

Despite its contributions, the study has limitations. First, the focus on listed firms may limit generalizability to smaller or private companies. Second, while the study covers

macroeconomic variables, sector-specific shocks and firm-level governance factors were not fully explored. Third, the annual frequency of data may miss short-term financing adjustments or investment responses. Future research could address these gaps by incorporating unlisted firms, sectoral dynamics, and higher-frequency data to capture more granular investment behavior.

Declarations

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