THE MODERATING EFFECT OF FIRM SIZE ON THE RELATIONSHIP BETWEEN CAPITAL STRUCTURE AND PROFITABILITY: INDONESIAN MANUFACTURING FIRMS (2020–2024)

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Abstract

This study examines the effect of capital structure on profitability and the moderating role of firm size in Indonesian manufacturing companies listed on the Indonesia Stock Exchange during 2020–2024. Employing a quantitative approach with purposive sampling, 102 companies with complete financial data were selected, yielding 510 observations. Profitability, measured by Return on Assets (ROA), Tobin's Q, and Earnings Per Share (EPS), serves as the dependent variable, while capital structure, proxied by Debt to Asset Ratio (DAR) and Debt to Market Capitalization Ratio (DMCR), is the independent variable. Firm size is included as a moderator, and Annual Sales Growth (ASG) and Firm Age (FAGE) are control variables. Secondary data were obtained from company annual reports and Bloomberg, and analysis was conducted using panel data regression and Moderated Regression Analysis (MRA) in EViews. The results show that DAR does not significantly affect profitability, while DMCR negatively and significantly affects ROA. Firm size moderates only the negative effect of DMCR on ROA, indicating that larger firms can better manage debt and reduce operational profitability risks. ASG positively affects ROA, and FAGE positively influences ROA but not Tobin's Q or EPS. These findings provide insights into capital structure management, operational efficiency, and the strategic role of firm size.

Keywords: Annual Sales Growth, Capital Structure, Firm Age, Firm Size, Profitability

INTRODUCTION

Profitability is a key indicator of a company's ability to generate earnings from its available resources, where a high level of profitability reflects effective and efficient management of capital and assets in creating economic value for stakeholders (Abdillah, 2024). For stakeholders, profitability serves as a primary benchmark to assess corporate performance, stock returns, and financial risk, while for management it functions as an evaluation tool for the effectiveness of operational strategies and financing policies (Ambadkar & Solanki, 2025). High profitability signals sound financial conditions and successful business operations, whereas low profitability may indicate weaknesses in operational management or capital structure decisions (Wicaksari & Febriatmoko, 2022). From a macroeconomic perspective, consistent profitability enhances industrial stability and resilience against global economic pressures and market fluctuations (Hamidah, 2016). However, Indonesian manufacturing firms experienced notable profitability fluctuations during 2020–2024, highlighting ongoing challenges in financial efficiency amid cost structure changes, market dynamics, and post–COVID-19 economic adjustments. This condition raises questions regarding internal determinants of profitability, particularly capital structure, which represents the balance between debt and equity financing for operational and long-term investment activities. Capital structure decisions significantly influence the cost of capital, risk level, and long-term profitability (Modigliani & Miller, 1958), and are increasingly strategic in the context of globalization and heightened competition within Indonesia's manufacturing sector, a major contributor to national GDP (Ahmed et al., 2023). Nevertheless, empirical evidence shows that the relationship between capital structure and profitability is not always linear or consistent, especially in developing countries like Indonesia, where variations in capital market conditions, interest rates, and financing patterns lead to mixed results (Mangesti Rahayu et al., 2020).

Theoretically, the relationship between capital structure and profitability is explained by Modigliani and Miller (1963), who argue that under imperfect capital markets—considering taxes, bankruptcy risk, and information asymmetry—the use of debt can enhance firm value and profitability through interest tax shields. This framework was further developed into the Trade-off Theory, which posits that firms seek an optimal capital structure by balancing the tax benefits of debt against the increased risk of bankruptcy arising from higher interest obligations (Kraus & Litzenberger, 1973). Empirically, although the manufacturing sector plays a crucial role in Indonesia's economy with a significant contribution to GDP, its financial performance during 2020–2024 was unstable due to the COVID-19 pandemic and rising raw material prices (Fauzan, 2024). Data on listed manufacturing firms in Indonesia show that while the Debt to Asset Ratio (DAR) remained relatively stable, profitability as measured by Return on Assets (ROA) fluctuated and stagnated toward the end of the observation period, indicating a gap between theoretical predictions and actual outcomes. This suggests that the tax benefits of debt have not been optimally translated into sustained profitability, thereby motivating further investigation into the capital structure–profitability relationship. Prior studies support the strategic importance of capital structure decisions; for instance, Ahmed et al. (2023), examining 156 manufacturing firms listed on the Tehran Stock Exchange from 2011–2019, found that capital

structure negatively affects profitability, with stronger effects in larger firms, reinforcing the Trade-off Theory's emphasis on balancing tax advantages and bankruptcy costs.

Empirical evidence shows mixed results regarding the relationship between leverage, capital structure, and profitability. Studies by Ahmed et al. (2023), Balami & Koirala (2024) in Nepal, Riaz et al. (2023) in Pakistan, and Tripathi et al. (2023) in India report a significant positive effect of leverage on profitability, a finding also supported in Indonesia by Anggraeni & Santoso (2024) and Riani et al. (2019), who argue that proportional debt usage enhances firm profitability. Roy & Bhattacharya (2022) further demonstrate that stock prices influencing profitability significantly affect Total Debt to Market Capitalization, reflecting capital structure decisions. However, Riaz et al. (2023) note that this positive effect is limited, as excessive leverage can reduce profitability beyond a firm's financial capacity, while Widiyanti & Elfina (2015), Anni'Mah et al. (2021), and Angelina et al. (2025) find no significant relationship, suggesting that leverage effects depend on market efficiency and industry characteristics. In the Indonesian context, firm size is considered an important moderating factor, as larger firms have better access to capital markets, stronger financial stability, and greater investor trust due to higher total assets (Anggraeni & Santoso, 2024). Consistent with Modigliani & Miller (1963), larger firms can utilize debt more efficiently to gain tax advantages, thereby strengthening the impact of capital structure on profitability. This moderating role of firm size is supported by Riani et al. (2019) and Ahmed et al. (2023), although contrary evidence is reported by Balami & Koirala (2024) and Kho & Susanti (2023), indicating that the moderating effect of firm size varies across firms depending on scale and financial capacity..

To obtain more accurate estimates, this study incorporates annual sales growth and firm age as control variables, as sales growth reflects market demand and operational dynamics that directly influence profitability (Prasetyaningrum et al., 2023), while older firms tend to have stronger reputations, greater stability, and more mature managerial capabilities in operations and debt management (Welly & Hermanto, 2025). Prior empirical evidence on the relationship between capital structure and profitability remains mixed, with several studies reporting significant effects (Riani et al., 2019; Roy & Bhattacharya, 2022; Tripathi et al., 2023; Riaz et al., 2023; Ahmed et al., 2023; Kho & Susanti, 2023; Anggraeni & Santoso, 2024; Balami & Koirala, 2024) and others finding no significant relationship (Widiyanti & Elfina, 2015; Anni'Mah et al., 2021; Angelina et al., 2025), indicating a research gap. Addressing this gap, the present study replicates Ahmed et al. (2023) by examining Indonesian manufacturing firms during 2020–2024 using data from the Indonesia Stock Exchange (BEI), rather than Iranian firms during 2011–2019 from the Tehran Stock Exchange, a period that captures the post–COVID-19 era characterized by shifts in financing patterns and declining profitability. By introducing firm size as a moderating variable, this study reassesses the applicability of the Modigliani–Miller theory in a developing country context such as Indonesia, where capital market characteristics, taxation, bankruptcy risk, and access to financing differ markedly from those of developed economies, thereby providing new insights into the financial structure of Indonesia's manufacturing sector.

REVIEW OF LITERATURE

Modigliani & Miller (MM) Theory

The main theoretical framework used in this study is the Modigliani and Miller (MM) theory (1963), which serves as a fundamental foundation in modern capital structure analysis. While the original MM theory (1958) argues that capital structure does not affect firm value or profitability under perfect market conditions, the revised version (MM, 1963) introduces the tax advantage of debt through the interest tax shield, suggesting that increased leverage can enhance profitability as long as tax benefits outweigh financial risks. However, in imperfect markets such as Indonesia, excessive debt may increase bankruptcy risk, agency costs, and financial distress, potentially reducing firm performance—limitations not considered in MM (1958). These weaknesses are addressed by Trade-Off Theory proposed by Kraus and Litzenberger (1973), which posits that firms seek an optimal level of debt by balancing tax benefits against bankruptcy and agency costs. This theory predicts that leverage increases profitability up to a certain optimal point, after which additional debt reduces profitability due to higher interest burdens and financial risk, thereby explaining the inconsistent empirical relationship between capital structure and profitability. Furthermore, Trade-Off Theory provides a logical basis for firm size as a moderating variable, as larger firms generally face lower bankruptcy risk and possess stronger risk management capabilities, enabling them to sustain higher leverage without significantly harming profitability, unlike smaller firms.

Profitability

Profitability is a key factor for companies in attracting investors (Rezhiana, 2019) and reflects a firm's ability to generate profits by efficiently utilizing its resources, including sales, total assets, and equity (Sartono, 2010). It represents income that can be reinvested to generate future returns (Fama & French, 2006) and indicates a firm's capacity to create profits through the use of sales, capital, and assets (Wahyuningsih et al., 2023; Wicaksari et al., 2023). The stability of profitability is also an important consideration in determining capital structure, as consistently stable profits reduce reliance on debt financing due to stronger internal funding capacity (Brigham & Houston, 2011). In this study, profitability is proxied by Return on Assets (ROA), Tobin's Q, and Earnings Per Share (EPS). ROA measures the effectiveness of asset utilization in generating profits, where higher values indicate better performance (Winarno, 2019; Ahmed et al., 2023). Tobin's Q reflects market valuation of a firm's ability to generate returns from its assets and is commonly used to capture growth prospects and financing decisions (Chung & Wright, 1998; Tambunan, 2023; Ahmed et al., 2023). EPS represents the earnings attributable to each outstanding share and serves as an indicator of management's success in generating returns for shareholders (Islam et al., 2014; Fitri et al., 2023; Ahmed et al., 2023).

Capital Structure

Capital structure refers to the proportion between long-term debt and equity used to finance a firm's assets. According to Riyanto (2010), it represents the balance between long-term external funds and owners' equity, while Sartono (2010) emphasizes that capital structure differs from overall financial structure, as it focuses only on permanent financing sources namely long-term debt and equity—whereas financial structure also includes short-term liabilities. In line with this, Kumari (2021) defines capital structure as the ratio between long-term debt and equity, reflecting how firms fund their long-term operations. An optimal

capital structure provides a solid foundation for operational activities and supports the maximization of firm value and shareholder wealth (Filatova et al., 2024). In this study, capital structure is measured using the Debt to Asset Ratio (DAR) and the Debt to Market Capitalization Ratio (DMCR). DAR indicates the proportion of assets financed by debt and is widely used to capture financial risk, particularly in manufacturing firms that require substantial investment in fixed assets and working capital (Ahmed et al., 2023). Meanwhile, DMCR reflects the extent to which debt pressure is embedded in the firm's market value, making it especially relevant during periods of economic fluctuation, such as 2020–2024, when stock price volatility mirrors investor perceptions of leverage-related risk (Apriliyani & Dumilah, 2025). Combining DAR and DMCR allows for a more comprehensive assessment of leverage, capturing both internal asset-based financing conditions and external market-based valuation perspectives (Ahmed et al., 2023).

Firm Size

Firm size describes the scale of a business entity and is commonly assessed through indicators such as total assets, profits, tax expenses, sales levels, and other relevant financial measures (Brigham & Houston, 2011). It reflects the magnitude of a firm's operations, typically measured by total assets or total sales, which represent the company's capacity and economic strength (Dang et al., 2018). Larger firms tend to have greater resources and stronger influence over stakeholders, which can affect overall performance, including social and organizational objectives. In an increasingly integrated global economy, large companies particularly in Asia face greater pressure and exert more significant impact on their business environment (Kuriyama, 2017). Moreover, firms with larger scales are more likely to maintain broader market share, achieve sustainable competitive advantages, and benefit from production efficiencies compared to smaller firms (Dimitratos & Jones, 2010).

Annual Sales Growth

Annual Sales Growth (ASG) reflects a firm's ability to increase sales volume from one period to the next, where positive growth indicates rising market demand and serves as an important indicator of operational performance quality (Prabowo & Ikhsan, 2020). In the manufacturing sector, sales growth is commonly associated with production capacity expansion, efficiency improvements, and the firm's ability to maintain competitiveness in a dynamic economic environment (Hartono, 2017), which in turn increases the potential to generate higher profits as additional revenues can better cover operating costs. ASG therefore needs to be controlled when examining the relationship between capital structure and profitability, as sales growth may independently enhance profits regardless of financing decisions; excluding ASG may bias the estimation results by attributing profit increases to leverage rather than to growing sales (Ahmed et al., 2023). Moreover, prior studies suggest that sales growth reflects a firm's life-cycle stage, with growing firms typically exhibiting higher profitability than those in mature or declining phases (Coad et al., 2017), making ASG an essential control variable to obtain a more accurate and unbiased assessment of the impact of capital structure on profitability.

Firm Age

Firm age reflects the length of time a company has operated since its establishment or initial listing in the capital market. Older firms generally possess greater experience, stronger operational stability, more consistent business processes, and broader networks with creditors, customers, and suppliers, which support more stable financial performance (Coad

et al., 2010). In addition, long-established firms tend to have higher credibility in the eyes of investors and financial institutions, enabling easier access to external financing at lower capital costs (Capasso et al., 2015). In examining the relationship between capital structure and profitability, firm age is an important control variable because it can influence profitability independently of financing decisions; mature firms usually operate more efficiently and generate more consistent profits, while younger firms face greater uncertainty and adjustment challenges. Excluding firm age may bias the estimated effect of leverage on profitability, as differences in profits may stem from firm maturity rather than capital structure itself (Ahmed et al., 2023).

Framework for Thinking

The Effect of Capital Structure on Profitability

Capital structure is a crucial financial decision that determines the proportion of company funding sourced from debt. The use of debt creates fixed interest obligations, but according to Modigliani and Miller (1963), interest expenses provide tax shield benefits that can reduce the cost of capital and potentially increase firm value. This idea is reinforced by Trade-Off Theory, which argues that firms seek an optimal level of leverage where the tax advantages of debt outweigh bankruptcy and agency costs. Therefore, the impact of capital structure on profitability depends on whether debt is maintained within this optimal range, as excessive leverage can become detrimental. Empirical studies support this relationship, with findings from Ahmed et al. (2023) and Alghifari et al. (2022) confirming that leverage significantly affects profitability, although the direction of the effect varies depending on industry characteristics and internal firm conditions.

The Effect of Firm Size in Moderating the Relationship between Capital Structure and Profitability

Firm size reflects the scale of assets, resource capacity, and managerial ability to manage operational and financial risks; larger firms generally have more stable cash flows, easier access to external financing, and stronger bargaining power with creditors, enabling more efficient debt management than smaller firms. Consequently, firm size may influence the strength of the relationship between capital structure and profitability. Prior studies support this moderating role: Riaz et al. (2023) find that the impact of leverage on profitability is more pronounced in large firms due to income stability and greater capacity to bear interest burdens, while Balami & Koirala (2024) show that firm size differentiates how capital structure contributes to profitability in manufacturing firms in Nepal. Based on this theoretical framework, the research model illustrating the effect of capital structure on profitability with firm size as a moderating variable is presented in Figure 1.

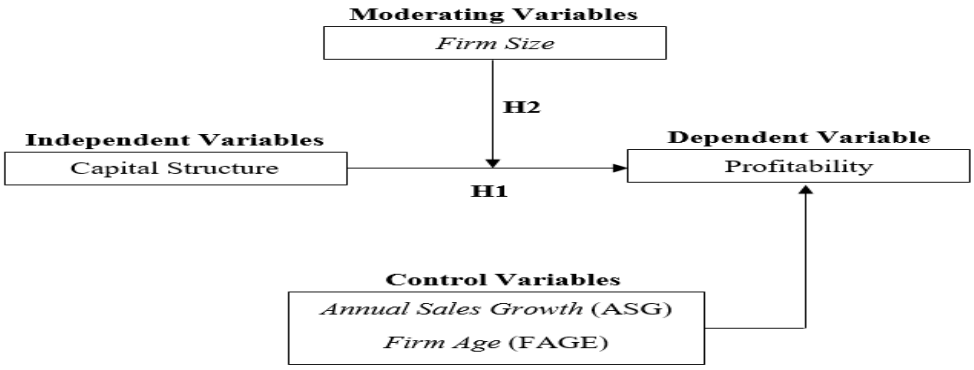

Figure 1.
Thinking Framework
Source: Ahmed et al (2023)

Research Hypothesis

Based on the previous description, the hypotheses formulated in this study include:
H1: Capital structure has a significant effect on profitability
H2: Firm size moderates the relationship between capital structure and profitabilit.

RESEARCH METHOD

This study employs a quantitative approach to examine the effect of capital structure on profitability and the moderating role of firm size among manufacturing companies listed on the Indonesia Stock Exchange during 2020–2024. Using purposive sampling, 102 companies with complete financial data were selected, yielding 510 observations. Profitability, measured by ROA, Tobin's Q, and EPS, serves as the dependent variable, while capital structure, proxied by debt ratios, is the independent variable, firm size as the moderator, and annual sales growth and firm age as control variables. Secondary data were obtained from company annual reports and Bloomberg, and analysis was conducted using panel data regression and Moderated Regression Analysis (MRA) in EViews, with model selection guided by standard panel estimation tests and classical assumption checks. Descriptive statistics profiled the variables, and regression analysis assessed the direct and moderating effects, with model fit evaluated using R^2 and significance tested at a 5% level (Ghozali, 2021).

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

Descriptive statistical analysis was used to summarize the characteristics of the study variables, including profitability (ROA, Tobin's Q, and EPS), capital structure (DAR and DMCR), firm size (total sales), the interaction terms between capital structure and firm size (DAR×FS and DMCR×FS), and control variables (annual sales growth and firm age), presenting key measures such as mean, maximum, minimum, and standard deviation. The results of this analysis are shown in Table 1:

Table 1.
Results of Descriptive Statistical Tests

	ROA	TOBIN	EPS	DAR	DMCR	SIZE	ASG	FAGE
Mean	0.0442	2.966	146.547	0.256	0.313	28.883	0.121	3.563
Median	0.038	1.780	28.000	0.251	0.289	28.826	0.047	3.663
Maximum	0.348	110.470	2438.000	1.613	0.925	33.432	14.639	4.779
Minimum	-0.517	-14.860	-960.000	0.000	0.000	24.389	-0.804	1.945
Std. Dev.	0.079	6.719	344.782	0.175	0.233	1.648	0.766	0.489
Skewness	-0.872	10.421	3.077	1.452	0.371	0.099	14.902	-0.451
Kurtosis	11.565	144.934	15.561	10.857	2.103	2.935	267.307	3.356
Jarque-Bera	1623.951	437322.4	4157.988	1491.281	28.846	0.923	150336 6.	20.016
Probability	0.000	0.000	0.000	0.000	0.000	0.630	0.000	0.000
Sum	22.556	1512.830	74739.00	130.6643	159.885	14730.80	61.746	1817.548
Sum Sq. Dev.	3.241	22982.72	60507456	15.698	27.830	1382.426	298.750	121.907
Observations	510	510	510	510	510	510	510	510

Source: Eviews 13 output, data processed by researchers (2026)

Based on the descriptive statistics in Table 1, the profitability of manufacturing companies listed on the Indonesia Stock Exchange from 2020 to 2024 shows considerable variation. ROA ranged from -0.518 to 0.349, with an average of 0.044, indicating that companies generated, on average, 4.42% profit from total assets. Tobin's Q varied between -14.86 and 110.47, with a mean of 2.97, reflecting generally positive market perceptions. EPS ranged from -960 to 2438, averaging 146.55 per share. Capital structure, measured by DAR and DMCR, had means of 0.256 and 0.314, suggesting moderate reliance on debt. Firm size (log of total sales) averaged 28.88, annual sales growth 0.121, and firm age 3.56, indicating a mix of company scales, growth rates, and operational experience across the sample.

Panel Data Regression Model Selection Test

Chow Test

Table 2.
Chow Test Results

	Model 1 (ROA)		Model 2 (TOBIN'S Q)		Model 3 (EPS)	
	Statistic	Prob	Statistic	Prob	Statistic	Prob
Cross-section F	11.112947	0.0000	5.844442	0.0000	9.529997	0.0000

Cross-section Chi-square	678.850994	0.0000	460.063210	0.0000	622.384160	0.0000

Source: Eviews 13 output, data processed by researchers (2026)

Based on the Chow test results, the cross-section F probability for all three models ROA, Tobin's Q, and EPS was 0.0000, below the 0.05 significance level, leading to the rejection of H0 and indicating that the Common Effect Model (CEM) is inappropriate. This suggests significant differences in intercepts across manufacturing companies listed on the Indonesia Stock Exchange during 2020–2024, making the Fixed Effect Model (FEM) more suitable. Given this, a Hausman test is subsequently required to determine whether FEM remains the best model or if the Random Effect Model (REM) is more appropriate.

Hausman test

Table 3.
Hausman Test Results

	Model 1 (ROA)		Model 2 (TOBIN'S Q)		Model 3 (EPS)	
	Chi-Sq. Statistic	Prob	Statistic	Prob	Statistic	Prob
Cross-section random	29.071146	0.0000	89.633729	0.0000	2.267667	0.8110

Source: Eviews 13 output, data processed by researchers (2026)

Based on the Hausman test results, the probability values for model 1 (ROA) and model 2 (Tobin's Q) were 0.0000, below the 0.05 significance level, indicating that the null hypothesis supporting the Random Effect Model (REM) is rejected and the Fixed Effect Model (FEM) is more appropriate. In contrast, model 3 (EPS) had a probability of 0.8110, above 0.05, supporting REM. Since the Chow test initially suggested FEM but the Hausman test showed mixed results, the Lagrange Multiplier test was not performed. Therefore, hypothesis testing was conducted using FEM for ROA and Tobin's Q, and REM for EPS.

Table 4.
Results of Panel Data Estimation Model Selection

Model Selection Test	Results	
Chow Test	Fixed effect Model (FEM)	ROA, TOBIN'S Q and EPS
Hausman Test	Fixed effect Model (FEM)	ROA and TOBIN'S Q
	Random Effect Model (REM)	EPS

Classical Assumption Test

In this study, classical assumption tests focused on multicollinearity, heteroskedasticity, and autocorrelation, while normality testing was not performed as it is not required for obtaining Best Linear Unbiased Estimators (BLUE). Multicollinearity was assessed using correlation matrices, and results showed that correlations among independent variables including debt ratios, firm size, annual sales growth, and firm age were all below 0.80, indicating no strong linear relationships and confirming that the regression model was free from multicollinearity.

Heteroskedasticity was tested using the Glejser method, which revealed that some variables exhibited unequal residual variances across observations, indicating the presence

of heteroskedasticity in the panel data models. To address this issue, regression estimations were recalculated using White cross-section robust standard errors, which corrected the standard errors while keeping the regression coefficients unchanged. This adjustment ensured that the estimators remained consistent and efficient, allowing the regression results to be reliably used for further analysis.

Panel Linear Regression Analysis

Table 5.
ROA Panel Data Regression Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.243753	0.115094	-2.117859	0.1016
DAR	-0.023896	0.020846	-1.146295	0.3156
DMCR	-0.122132	0.027230	-4.485214	0.0109
ASG	0.027525	0.007938	3.467673	0.0256
FAGE	0.092333	0.032488	2.842067	0.0468

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 5, a panel linear regression equation can be made with the Fixed Effect Model (FEM) as follows::

PROF (ROA) = -0,243753 – 0,023896DAR – 0,122132DMCR + 0,027525ASG + 0,092333FAGE + ε

The panel regression results indicate that the constant (α) of -0.2438 represents the ROA when all independent (DAR and DMCR) and control (ASG and FAGE) variables are zero. Debt to Assets Ratio (DAR) and Debt to Market Capitalization Ratio (DMCR) negatively affect ROA, with coefficients of -0.0239 and -0.1221, respectively, implying that higher leverage reduces profitability. In contrast, Annual Sales Growth (ASG) and Firm Age (FAGE) positively influence ROA, with coefficients of 0.0275 and 0.0923, indicating that growth and experience enhance profitability, while the error term captures other factors affecting ROA not included in the model.

Table 6.
Results of the TOBIN'S Q Panel Data Regression Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.08037	11.70711	2.996501	0.0401
DAR	8.294346	6.738766	1.230841	0.2858
DMCR	-3.072638	3.390649	-0.906209	0.4161
ASG	-1.180797	1.978722	-0.596747	0.5828
FAGE	-9.297013	3.815690	-2.436522	0.0715

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 6, a panel linear regression equation can be made with the Fixed Effect Model (FEM) as follows:

PROF (TOB) = -35,08037 + 8,294346DAR – 3,072638DMCR – 1,180797ASG – 9,297013FAGE+ ε

The panel regression results show that the constant term is -35.08, indicating that when DAR, DMCR, ASG, and FAGE are zero, Tobin's Q would be -35.08. Debt to Assets Ratio (DAR) has a positive effect on Tobin's Q, with a coefficient of 8.29, meaning that an

increase in DAR is associated with higher profitability, holding other variables constant. In contrast, Debt to Market Capitalization Ratio (DMCR) (-3.07), Annual Sales Growth (ASG) (-1.18), and Firm Age (FAGE) (-9.30) negatively affect Tobin's Q, indicating that increases in these variables reduce profitability, assuming other factors remain unchanged. The error term captures the influence of factors outside the model.

Table 7.
Results of EPS Panel Data Regression Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-211.4811	210.1807	-1.006187	0.3148
DAR	-55.05621	109.5075	-0.502762	0.6154
DMCR	-73.25722	96.49673	-0.759168	0.4481
ASG	21.32131	12.88178	1.655152	0.0985
FAGE	110.1308	57.85869	1.903444	0.0576

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 7, a panel linear regression equation can be created with the Random Effect Model (REM) as follows:

PROF (EPS) = -211,4811 – 55,05621DAR – 73,25722DMCR + 21,32131ASG + 110,1308FAGE+ ε

The panel regression results indicate that the constant term is -211.4811, suggesting that EPS would be negative if all independent (DAR, DMCR) and control variables (ASG, FAGE) were zero. Debt to Assets Ratio (DAR) and Debt to Market Capitalization Ratio (DMCR) negatively affect EPS, with coefficients of -55.05621 and -73.25722, respectively, meaning higher leverage reduces profitability. Conversely, Annual Sales Growth (ASG) positively influences EPS (21.32131), while Firm Age (FAGE) also has a positive effect (110.1308). The error term captures other factors outside the model that may affect EPS.

Moderated Regression Analysis

Table 8.
ROA Moderation Regression Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.113032	0.252475	-4.408491	0.0116
DAR	-0.094452	0.482950	-0.195574	0.8545
DMCR	0.112422	0.103965	1.081348	0.3404
SIZE	0.041395	0.015060	2.748626	0.0514
DARXSIZE	0.002039	0.017295	0.117919	0.9118
DMCRXSIZE	-0.008136	0.002761	-2.946690	0.0421
ASG	0.021111	0.008595	2.456262	0.0700
FAGE	0.001787	0.054856	0.032573	0.9756

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 8, a panel linear regression equation can be made with the Fixed Effect Model (FEM) as follows:

PROF (ROA) = -1,113032 – 0,094452DAR + 0,112422DMCR + 0,041395SIZE + 0,002039DARXSIZE – 0,008136DMCRXSIZE + 0,021111ASG + 0,001787FAGE + ε

The regression results indicate that the constant term is -1.113, implying that ROA would be negative if all independent and control variables are zero. Debt to Assets Ratio

(DAR) negatively affects ROA, while Debt to Market Capitalization Ratio (DMCR) and firm size positively influence ROA. The interaction between DAR and firm size slightly increases ROA, whereas the interaction between DMCR and firm size slightly decreases ROA. Additionally, annual sales growth and firm age positively contribute to ROA. The error term captures other factors outside the included variables that may affect profitability.

Table 9.
Results of the TOBIN'S Q Moderation Regression Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-89.72795	111.6399	-0.803726	0.4666
DAR	-113.9839	47.55295	-2.396989	0.0746
DMCR	86.90978	82.45208	1.054064	0.3513
SIZE	6.154719	5.760970	1.068348	0.3456
DARXSIZE	4.362596	1.745492	2.499350	0.0668
DMCRXSIZE	-3.185334	2.837238	-1.122688	0.3244
ASG	-2.214460	2.374495	-0.932602	0.4038
FAGE	-24.22641	15.67388	-1.545656	0.1971

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 9, a panel linear regression equation can be made with the Fixed Effect Model (FEM) as follows:

PROF (TOB) = -89,72795 – 113,9839DAR + 86,90978DMCR + 6,154719SIZE + 4,362596DARXSIZE – 3,185334DMCRXSIZE – 2,214460ASG – 24,22641FAGE + ε

The regression results indicate that the constant (-89.73) represents Tobin's Q when all independent, control, and moderating variables are zero. Debt to Assets Ratio (DAR) negatively affects Tobin's Q (-113.98), while Debt to Market Capitalization Ratio (DMCR) positively influences it (86.91). Firm size (SIZE) has a positive effect (6.15), and the interaction between DAR and SIZE (DAR×SIZE) increases Tobin's Q (4.36), whereas the interaction between DMCR and SIZE (DMCR×SIZE) has a negative effect (-3.19). Control variables Annual Sales Growth (ASG) and firm age (FAGE) negatively impact Tobin's Q (-2.21 and -24.23, respectively), and the error term reflects other factors affecting Tobin's Q not included in the model.

Table 10.
Results of EPS Moderation Regression Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2736.278	564.9637	-4.843280	0.0000
DAR	3249.215	1847.907	1.758321	0.0793
DMCR	-2223.968	1615.040	-1.377036	0.1691
SIZE	103.4826	20.61236	5.020417	0.0000
DARXSIZE	-121.5963	66.63368	-1.824847	0.0686
DMCRXSIZE	78.37961	57.26697	1.368670	0.1717
ASG	5.747561	12.89898	0.445583	0.6561
FAGE	-14.33700	53.73928	-0.266788	0.7897

Source: Eviews 13 output, data processed by researchers (2026)

Based on table 10, a panel linear regression equation can be made with the Fixed Effect Model (FEM) as follows:

PROF (EPS) = -2736,278 + 3249,215DAR – 2223,968DMCR + 103,4826SIZE – 121,5963DARXSIZE + 78,37961DMCRXSIZE + 5,747561ASG – 14,33700FAGE + ε

The moderated regression results indicate that the constant (-2736.278) represents EPS when all independent and control variables are zero. Debt to Assets Ratio (DAR) positively affects EPS (3249.215), while Debt to Market Capitalization Ratio (DMCR) negatively affects EPS (-2223.968). Firm size (SIZE) positively influences EPS (103.483). The interaction of DAR and SIZE (DAR×SIZE) negatively impacts EPS (-121.596), whereas the interaction of DMCR and SIZE (DMCR×SIZE) has a positive effect (78.380). Annual sales growth (ASG) positively affects EPS (5.748), and firm age (FAGE) negatively affects EPS (-14.337). The error term captures other factors affecting EPS not included in the model.

Goodness of Fit Model Test

Coefficient of Determination (R^2) Test

Table 11.
Results of the Determination Coefficient Test (Panel Data Model)

	Model 1 ROA (FEM)	Model 2 TOBIN'S Q (FEM)	Model 3 EPS (REM)
R-squared	0.814041	0.583669	0.019288
Adjusted R-squared	0.765710	0.475465	0.011520
S.E. of regression	0.038627	4.866690	189.6213
Sum squared resid	0.602793	9568.608	18157898
Log likelihood	995.1925	-1471.276	
F-statistic	16.84303	5.394122	2.483030
Prob(F-statistic)	0.000000	0.000000	0.042940

Source: Eviews 13 output, data processed by researchers (2026)

Based on the results, the Adjusted R^2 for the ROA model (FEM) is 0.766, indicating a strong explanatory power, with about 76.6% of ROA variation accounted for by capital structure (DAR and DMCR) and control variables (ASG and FAGE), while the remaining 23.4% is influenced by other factors. The Tobin's Q model (FEM) shows a moderate Adjusted R^2 of 0.475, suggesting that nearly 47.5% of its variation is explained by the same variables, with external factors also playing a role. In contrast, the EPS model (REM) has a very low Adjusted R^2 of 0.012, indicating that capital structure and controls explain only 1.2% of EPS variation, as EPS is more affected by internal policies, operational strategies, and share structure.

Table 12.
Results of the Determination Coefficient Test (Moderation Model)

	Model 1 ROA (FEM)	Model 2 TOBIN'S Q (FEM)	Model 3 EPS (REM)
R-squared	0.825942	0.631017	0.097084
Adjusted R-squared	0.779064	0.531640	0.084494
S.E. of regression	0.037510	4.598711	188.2606
Sum squared resid	0.564213	8480.406	17791915
Log likelihood	1012.059	-1440.490	
F-statistic	17.61885	6.349734	7.710918
Prob(F-statistic)	0.000000	0.000000	0.000000

Source: Eviews 13 output, data processed by researchers (2026)

Based on the results, the adjusted R-squared values indicate varying explanatory power of the moderation models. For ROA (FEM), the model achieved an Adj. R^2 of 0.779, showing strong ability to explain 77.9% of profitability variation, with the remaining 22.1% influenced by external factors; the inclusion of firm size as a moderator improved the model compared to the base model (Adj. $R^2 = 0.766$). For Tobin's Q (FEM), the model reached an Adj. R^2 of 0.532, indicating moderate explanatory power, with firm size enhancing the model relative to the base (Adj. $R^2 = 0.475$). In contrast, EPS (REM) showed very low explanatory power (Adj. $R^2 = 0.084$), suggesting that EPS is more affected by internal company policies, cost structure, shares outstanding, and operational strategies, although including firm size slightly improved the model from 0.012. Overall, firm size as a moderator strengthens the models for ROA and Tobin's Q but has limited effect on EPS.

F Test (Simultaneous Significance)

Table 13.
Results of the F-Statistic Test for the Panel Data Regression Model

	Model 1 ROA (FEM)	Model 2 TOBIN'S Q (FEM)	Model 3 EPS (REM)
F-statistic	16.84303	5.394122	2.483030
Prob(F-statistic)	0.000000	0.000000	0.042940

Source: Eviews 13 output, data processed by researchers (2026)

Based on the F-test results, all regression models are simultaneously significant in explaining profitability. For model 1 (ROA, FEM) and model 2 (Tobin's Q, FEM), the F-statistic probability is 0.000, well below the 0.05 significance level, indicating that capital structure (DAR and DMCR) and control variables (ASG and FAGE) jointly have a significant effect on profitability. Similarly, model 3 (EPS, REM) has an F-statistic probability of 0.043, also below 0.05, confirming the simultaneous significance of the independent and control variables in affecting EPS.

Table 14.
Results of the F Statistical Test of the Moderated Regression Model

	Model 1 ROA (FEM)	Model 2 TOBIN'S Q (FEM)	Model 3 EPS (REM)
F-statistic	17.61885	6.349734	7.710918
Prob(F-statistic)	0.000000	0.000000	0.000000

Source: Eviews 13 output, data processed by researchers (2026)

Based on the F-test results, all three models show that the regression is simultaneously significant in explaining profitability. For ROA (FEM), Tobin's Q (FEM), and EPS (REM), the F-statistic probability values are all 0.000000, well below the 0.05 significance level, indicating that the independent variables (DAR and DMCR), interaction moderating terms (DAR×SIZE and DMCR×SIZE), and control variables (ASG and FAGE) jointly have a significant effect on profitability.

t-Test (Periodic Significance)

Table 15.
Results of the t-Statistic Test for the ROA Panel Data Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-0.243753	0.115094	-2.117859	0.1016
DAR	-0.023896	0.020846	-1.146295	0.3156
DMCR	-0.122132	0.027230	-4.485214	0.0109
ASG	0.027525	0.007938	3.467673	0.0256
FAGE	0.092333	0.032488	2.842067	0.0468

Source: Eviews 13 output, data processed by researchers (2026)

Based on the panel regression t-test results for ROA, the Debt to Asset Ratio (DAR) has a coefficient of -0.0239 with a p-value of 0.316, indicating no significant effect on profitability and leading to the rejection of H1. In contrast, the Debt to Market Capitalization Ratio (DMCR) shows a significant negative effect on ROA (coefficient = -0.1221, p = 0.011), supporting H1. Additionally, Annual Sales Growth (ASG) (coefficient = 0.0275, p = 0.026) and Firm Age (FAGE) (coefficient = 0.0923, p = 0.047) both positively and significantly influence profitability.

Table 16.
Results of the t-statistic test of the TOBIN'S Q panel data regression model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.08037	11.70711	2.996501	0.0401
DAR	8.294346	6.738766	1.230841	0.2858
DMCR	-3.072638	3.390649	-0.906209	0.4161
ASG	-1.180797	1.978722	-0.596747	0.5828
FAGE	-9.297013	3.815690	-2.436522	0.0715

Source: Eviews 13 output, data processed by researchers (2026)

Based on the panel regression t-test results for Tobin's Q, neither capital structure measured by DAR (coefficient = 8.294, p = 0.286) and DMCR (coefficient = -3.073, p = 0.416) nor the control variables, Annual Sales Growth (coefficient = -1.181, p = 0.583) and Firm Age (coefficient = -9.297, p = 0.072), have a significant effect on profitability, as all p-values exceed the 0.05 significance level. Thus, the hypothesis that capital structure influences profitability is not supported.

Table 17.
Results of the t-Statistic Test of the EPS Panel Data Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-211.4811	210.1807	-1.006187	0.3148
DAR	-55.05621	109.5075	-0.502762	0.6154
DMCR	-73.25722	96.49673	-0.759168	0.4481
ASG	21.32131	12.88178	1.655152	0.0985
FAGE	110.1308	57.85869	1.903444	0.0576

Source: Eviews 13 output, data processed by researchers (2026)

Based on the t-test results for the panel regression model on EPS, neither capital structure measured by DAR (coefficient = -55.06, p = 0.6154) and DMCR (coefficient = -73.26, p = 0.4481) nor control variables, Annual Sales Growth (coefficient = 21.32, p = 0.0985) and Firm Age (coefficient = 110.13, p = 0.0576), had a significant effect on profitability, as all p-values exceeded the 0.05 significance level. Therefore, hypothesis 1, which proposed that capital structure influences profitability, is rejected.

Table 18.
Results of the t-Statistic Test of the ROA Moderation Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.113032	0.252475	-4.408491	0.0116
DAR	-0.094452	0.482950	-0.195574	0.8545
DMCR	0.112422	0.103965	1.081348	0.3404
SIZE	0.041395	0.015060	2.748626	0.0514
DARXSIZE	0.002039	0.017295	0.117919	0.9118
DMCRXSIZE	-0.008136	0.002761	-2.946690	0.0421
ASG	0.021111	0.008595	2.456262	0.0700
FAGE	0.001787	0.054856	0.032573	0.9756

Source: Eviews 13 output, data processed by researchers (2026)

Based on the t-test results of the ROA moderation regression model, capital structure measured by DAR and DMCR did not significantly affect profitability, with coefficients of -0.094 and 0.112 and p-values of 0.8545 and 0.3404, respectively. Firm size (SIZE) also showed no significant effect (coefficient 0.041, p = 0.0514). The interaction between DAR and firm size was not significant (coefficient 0.002, p = 0.9118), indicating that firm size does not moderate the DAR–ROA relationship. However, the interaction between DMCR and firm size was significant (coefficient -0.008, p = 0.0421), suggesting a positive moderating effect. Control variables, annual sales growth and firm age, were also insignificant.

Table 19.
Results of the t-statistic test of the TOBIN'S Q Moderated Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-89.72795	111.6399	-0.803726	0.4666
DAR	-113.9839	47.55295	-2.396989	0.0746
DMCR	86.90978	82.45208	1.054064	0.3513
SIZE	6.154719	5.760970	1.068348	0.3456
DARXSIZE	4.362596	1.745492	2.499350	0.0668
DMCRXSIZE	-3.185334	2.837238	-1.122688	0.3244
ASG	-2.214460	2.374495	-0.932602	0.4038
FAGE	-24.22641	15.67388	-1.545656	0.1971

Source: Eviews 13 output, data processed by researchers (2026)

Based on the t-test results for the moderated regression model using Tobin's Q, all variables were found to have no significant effect on profitability. Specifically, capital structure measured by DAR and DMCR, firm size, their interaction terms (DAR×SIZE and DMCR×SIZE), annual sales growth, and firm age all had p-values greater than 0.05, indicating nonsignificant relationships. Consequently, firm size does not moderate the relationship between capital structure and profitability, and hypothesis 2 (H2) is rejected for both DAR and DMCR interactions. Overall, none of the examined variables significantly influenced Tobin's Q in this model.

Table 20.
Results of the t-Statistic Test of the EPS Moderation Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2736.278	564.9637	-4.843280	0.0000
DAR	3249.215	1847.907	1.758321	0.0793
DMCR	-2223.968	1615.040	-1.377036	0.1691
SIZE	103.4826	20.61236	5.020417	0.0000
DARXSIZE	-121.5963	66.63368	-1.824847	0.0686
DMCRXSIZE	78.37961	57.26697	1.368670	0.1717
ASG	5.747561	12.89898	0.445583	0.6561
FAGE	-14.33700	53.73928	-0.266788	0.7897

Source: Eviews 13 output, data processed by researchers (2026)

The moderated regression results for EPS indicate that capital structure, measured by DAR and DMCR, does not significantly affect profitability, with p-values of 0.0793 and 0.1691, respectively. Firm size (SIZE) has a positive and significant effect on EPS (p = 0.0000). However, the interaction terms between capital structure and firm size (DAR×SIZE and DMCR×SIZE) are not significant (p = 0.0686 and 0.1717), indicating that firm size does not moderate the relationship between capital structure and profitability, leading to the rejection of H2. Additionally, the control variables, annual sales growth (ASG) and firm age (FAGE), show no significant impact on EPS (p = 0.6561 and 0.7897).

Table 21.
Summary of Research Results

	Hypothesis	Results
H1: Capital structure has a significant effect on profitability	H1a: DAR has a significant effect on ROA	Rejected
	H1b: DMCR has a significant effect on ROA	Accepted
	H1c: DAR has a significant effect on Tobin's Q	Rejected
	H1d: DMCR has a significant effect on Tobin's Q	Rejected
	H1e: DAR has a significant effect on EPS	Rejected
	H1f: DMCR has a significant effect on EPS	Rejected
H2: Firm Size moderates the relationship between capital structure and profitability	H2a: Firm size moderates the relationship between DAR and ROA	Rejected
	H2b: Firm size moderates the relationship between DMCR and ROA	Accepted
	H2c: Firm size moderates the relationship between DAR and Tobin's Q	Rejected
	H2d: Firm size moderates the relationship between DMCR and Tobin's Q	Rejected
	H2e: Firm size moderates the relationship between DAR and EPS	Rejected
	H2f: Firm size moderates the relationship between DMCR and EPS	Rejected

Source: Data processed by researchers (2026)

The Effect of Capital Structure on Profitability

The study shows that the effect of capital structure on profitability is inconsistent across different proxies. Debt to Assets Ratio (DAR) has no significant impact on ROA, Tobin's Q, or EPS, aligning with Modigliani & Miller's (MM) theory that capital structure does not affect firm performance in relatively efficient markets and suggesting optimal leverage under Trade-Off Theory, where debt benefits are offset by costs (Angelina et al., 2025; Anni'Mah et al., 2021). Meanwhile, Debt to Market Capitalization Ratio (DMCR) negatively and significantly affects ROA, consistent with Trade-Off Theory and prior findings that market-based leverage reflects operational profitability (Tripathi et al., 2023), but shows no significant effect on Tobin's Q or EPS, supporting MM theory and indicating that changes in leverage do not always translate into market valuation or shareholder returns (Roy & Bhattacharya, 2022; Tripathi et al., 2023).

The Moderating Effect of Firm Size on the Relationship between Capital Structure and Profitability

The results indicate that the moderating effect of firm size on the relationship between capital structure and profitability is inconsistent across proxies. Firm size does not moderate the effect of Debt to Assets Ratio (DAR) on ROA, Tobin's Q, or EPS, nor Debt to Market Capitalization Ratio (DMCR) on Tobin's Q and EPS, consistent with Modigliani & Miller's (MM) theory that capital structure is largely irrelevant to firm performance, though it contradicts some prior studies (Ahmed et al., 2023; Anggraeni & Santoso, 2024). However, firm size weakens the relationship between DMCR and ROA, supporting Trade-Off Theory, as larger firms face lower bankruptcy risk and better financial management. Regarding control variables, Annual Sales Growth (ASG) positively and significantly affects ROA ($p < 0.05$) but shows no significant impact on Tobin's Q or EPS, indicating that while sales growth enhances operational performance, it does not consistently translate into market valuation or earnings per share, partially aligning with Ahmed et al. (2023).

The Effect of Firm Age Control Variable on Profitability

The t-test results in this study indicate that the control variable Firm Age (FAGE) has varying effects on different measures of profitability. In the panel data regression model for ROA, FAGE has a coefficient of 0.092333 with a probability of 0.0468 (<0.05), indicating a positive and significant effect on profitability, meaning that the older the company, the higher the ROA. However, in the moderated regression model for ROA, FAGE is positive but not significant (coefficient 0.001787; probability 0.9756). For Tobin's Q, FAGE has a negative effect in the panel data model (coefficient -9.297013; probability 0.0715) and in the moderated model (coefficient -24.22641; probability 0.1971), both of which are not significant, suggesting that firm age does not significantly influence investor valuation. Regarding EPS, FAGE has a positive but not significant effect in the panel data model (coefficient 110.1308; probability 0.0576) and a negative, non-significant effect in the moderated model (coefficient -14.33700; probability 0.7897), indicating that firm age is not a primary factor in determining earnings per share. Overall, FAGE significantly affects ROA, showing that more mature firms tend to have better experience, stability, operations, and efficiency in generating profits, but it does not significantly affect Tobin's Q and EPS, reflecting that firm age is not a key factor in investor assessment or earnings per share, which aligns with Ahmed et al. (2023) for ROA and Tobin's Q but contradicts their findings for EPS.

CONCLUSION

Based on the findings of this study, it can be concluded that capital structure has a varied impact on profitability, with Debt to Asset Ratio (DAR) showing no significant effect on ROA, Tobin's Q, or EPS, while Debt to Market Capitalization Ratio (DMCR) negatively and significantly affects ROA but not Tobin's Q or EPS, supporting Modigliani and Miller's irrelevance theory and the Trade-Off Theory for excessive debt. Firm size moderates only the negative effect of DMCR on ROA, indicating that larger firms can better manage debt and reduce operational profitability risks, but does not moderate other relationships, highlighting that company size is not a primary determinant for market valuation or shareholder wealth. Among control variables, Annual Sales Growth (ASG) positively and significantly affects ROA but has no significant impact on Tobin's Q or EPS, suggesting that sales growth primarily enhances operational efficiency rather than market valuation or earnings per share. Firm Age (FAGE) positively and significantly influences ROA but not Tobin's Q or EPS, indicating that more mature firms leverage experience and operational stability to improve asset-based profitability. The study recommends future research to explore alternative theories such as Pecking Order or Signaling Theory, use broader proxies for capital structure and profitability, and expand sample size and observation periods for more generalizable insights. Practically, managers should carefully manage market-based debt and focus on operational efficiency and sales growth, while investors should consider operational performance and firm characteristics alongside capital structure when making investment decisions.

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