

Financial Leverage, Liquidity, and Profitability: The Moderating Role of Firm Size in Indonesian Manufacturing Firms

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Abstract

Manufacturing firms require an appropriate balance between debt financing and short-term liquidity to sustain profitability, particularly across the economic disruption and recovery surrounding the COVID-19 pandemic. This study examines the effects of financial leverage and liquidity on profitability and tests firm size as a moderating variable. The study uses a quantitative associative design and secondary financial statement data from manufacturing firms listed on the Indonesia Stock Exchange during 2019–2023. From a population of 276 firms, purposive sampling produced 100 firms and 500 balanced panel observations. Profitability is measured by return on assets, financial leverage by the debt-to-equity ratio, liquidity by the current ratio, and firm size by the natural logarithm of total assets. Panel-data regression and moderated regression analysis were estimated using EViews 13. The fixed-effects model shows that financial leverage has a negative and significant effect on profitability, while liquidity and firm size have positive and significant effects. The interaction between financial leverage and firm size is positive and significant, indicating that larger firm size weakens the adverse effect of leverage on profitability. In contrast, the liquidity–firm size interaction is not significant. These findings show that firm size provides financial resilience against debt-related pressure but does not automatically improve the profitability consequences of liquidity management. The study contributes evidence from Indonesian manufacturing firms across the pandemic and post-pandemic period and highlights the need for optimal debt and working-capital policies.

Keywords: financial leverage; liquidity; firm size; profitability; manufacturing firms

JEL Code: G32; G30; L60

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INTRODUCTION

The increasingly dynamic business environment has intensified competition among manufacturing firms and increased the importance of efficient financial management. Manufacturing companies play a central role in national production, employment, and investment, but they also require substantial fixed assets, working capital, and external financing. Their financial performance therefore attracts attention from investors, creditors, managers, and regulators. Profitability is a primary indicator of that performance because it reflects the ability of management to convert

corporate resources into earnings. In this study, profitability is represented by return on assets (ROA), which indicates how effectively a company uses its asset base to produce net income (Rahmayeni & Rifa, 2022).

Profitability is closely connected with financing decisions. Financial leverage enables a firm to fund operations and expansion through debt. Debt can generate tax benefits and may increase returns when operating performance exceeds financing costs. Nevertheless, high leverage creates fixed interest obligations and increases financial distress risk. Trade-off theory therefore predicts that debt is beneficial only up to an optimal level, after which bankruptcy risk, agency costs, and financing pressure may outweigh the tax shield (Myers, 2001). Empirical studies also report that excessive leverage can reduce profitability because interest expenses absorb operating income and limit managerial flexibility (Dalci, 2018; Singh & Bagga, 2019).

Liquidity constitutes a second key financial condition. A company needs sufficient current assets to pay short-term obligations, purchase raw materials, compensate employees, and maintain uninterrupted production. A healthy current ratio can protect operating continuity and reduce short-term financial pressure. However, liquidity that is excessively high may indicate idle cash, slow-moving inventories, or inefficient current-asset allocation. The expected relationship with profitability is therefore positive when liquidity supports operations, but the benefit may diminish when current assets are not deployed productively (Bintara, 2020; Samo & Murad, 2019).

The sample data illustrate the financial dynamics faced by Indonesian manufacturing firms between 2019 and 2023. Average ROA declined from 0.019 in 2019 to 0.005 in 2020, then rose to 0.031 in 2021, 0.032 in 2022, and 0.054 in 2023. Average debt-to-equity ratio (DER) fell from 1.44 in 2019 to 0.78 in 2020 before increasing to 1.37 in 2023. The average current ratio remained above two and increased from 2.60 to 3.33 over the same period. Firm size, measured by the natural logarithm of total assets, remained relatively stable around 28.5–28.7. These movements indicate that the pandemic and subsequent recovery altered profitability, debt use, and liquidity, while company scale changed more gradually.

Prior evidence remains inconsistent. Several studies identify a negative effect of leverage on profitability, while others find insignificant or context-dependent effects (Chandra et al., 2019; Dalci, 2018; Herciu & Ogrea, 2017). Research on liquidity also produces mixed conclusions because high liquidity may either support operational stability or create inefficient asset holdings (Bintara, 2020; Zaitoun & Alqudah, 2020). The inconsistency suggests that the direct effects of leverage and liquidity may depend on firm-specific conditions rather than operate uniformly across all companies.

Firm size may explain part of this variation. Larger firms generally possess broader financing access, more diversified operations, stronger bargaining power, and greater capacity to absorb financial shocks. These characteristics may reduce the damage caused by high debt. At the same time, firm size may affect the way current assets are managed, although a larger asset base does not guarantee efficient liquidity. Previous research has frequently examined firm size as a direct determinant of profitability, but simultaneous tests of its moderating role in the leverage–profitability and liquidity–profitability relationships remain limited, especially for Indonesian manufacturing firms across the pandemic and post-pandemic period (Abeyrathna & Priyadarshana, 2019; Akram et al., 2021).

This study addresses that gap by analysing 100 manufacturing firms listed on the Indonesia Stock Exchange from 2019 to 2023. It evaluates the direct effects of financial leverage, liquidity, and firm size on ROA and tests whether firm size changes the effects of leverage and liquidity. The study contributes in three ways. First, it provides panel evidence covering a period of severe disruption and recovery. Second, it tests two moderating paths within one model. Third, it offers practical implications for debt policy, working-capital management, and investment evaluation in the manufacturing sector.

LITERATURE REVIEW

Capital Structure Theory

Trade-off theory states that firms balance the tax benefits of debt against the expected costs of financial distress. Debt may improve performance when its marginal benefit exceeds its marginal cost, but leverage above the optimal point increases interest pressure and bankruptcy exposure. Pecking order theory complements this explanation by proposing that firms prefer internal funds, then debt, and finally external equity because of information asymmetry and financing costs (Adair & Adaskou, 2015). Profitable firms may therefore rely less on debt because retained earnings provide sufficient internal financing.

These theories are especially relevant to manufacturing firms. Production assets and working-capital requirements create a continuing need for financing, but debt must generate operating returns sufficient to cover fixed obligations. The effect of leverage on profitability consequently reflects the balance between financing benefits and financial risk.

Financial Leverage and Profitability

Financial leverage represents the extent to which a firm uses debt relative to shareholders' equity. A high DER increases the amount of fixed financial obligations. When debt supports productive investment, it can expand capacity and earnings. When debt grows faster than operating returns, interest

expenses reduce net income and ROA. Evidence from listed manufacturing and industrial firms frequently shows a negative relationship between leverage and profitability (Dalci, 2018; Chandra et al., 2019; Singh & Bagga, 2019).

H1: Financial leverage has a negative effect on profitability.

Liquidity and Profitability

Liquidity indicates a firm's ability to settle short-term liabilities using current assets. Adequate liquidity supports procurement, production, distribution, and debt servicing. It also reduces disruption caused by short-term cash shortages. Although excessive current assets may create opportunity costs, manufacturing firms with healthy liquidity are generally better positioned to maintain operations and protect earnings. Prior studies report a positive effect of liquidity on profitability when current assets are managed efficiently (Bintara, 2020; Samo & Murad, 2019; Zaitoun & Alqudah, 2020).

H2: Liquidity has a positive effect on profitability.

Firm Size and Profitability

Firm size reflects the scale of corporate resources and is measured in this study by the natural logarithm of total assets. Larger firms may achieve economies of scale, broader market coverage, better access to capital, and stronger risk diversification. These advantages can improve asset utilisation and stabilise earnings. Empirical research has found that size can support profitability, although the magnitude depends on operational efficiency and industry conditions (Abeyrathna & Priyadarshana, 2019; Akram et al., 2021).

H3: Firm size has a positive effect on profitability.

The Moderating Role of Firm Size

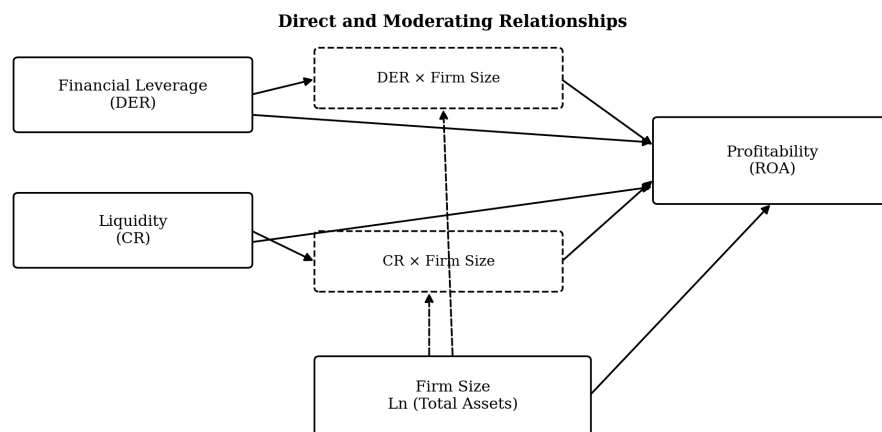
Firm size may change the financial consequences of leverage. A large company typically has a broader asset base, more stable cash flow, stronger creditor relationships, and greater financing alternatives. These characteristics can help the firm absorb interest obligations and refinance debt, thereby reducing the adverse profitability effect of leverage. Accordingly, the negative marginal effect of DER is expected to become weaker as firm size increases.

H4: Firm size weakens the negative effect of financial leverage on profitability.

Firm size may also alter the effect of liquidity. Large firms possess more current assets and stronger access to short-term funding, but scale alone does not ensure that cash, receivables, and inventories are used efficiently. The moderating direction is therefore less certain. The hypothesis tests whether the liquidity–profitability relationship varies with firm size.

H5: Firm size moderates the effect of liquidity on profitability.

Figure 1.
Research Framework



Source: Author's framework based on the thesis model

RESEARCH METHOD

This study applies a quantitative associative design to test causal relationships among financial leverage, liquidity, firm size, and profitability. The data are secondary data obtained from audited annual financial statements, Indonesia Stock Exchange publications, and the official websites of the sampled firms. The observation period covers 2019–2023.

The population consists of 276 manufacturing companies listed on the Indonesia Stock Exchange. Purposive sampling was applied using two criteria: the company had to be listed continuously during 2019–2023 and had to publish complete audited annual financial statements for the entire period. One hundred companies met the criteria, producing a balanced panel of 500 firm-year observations.

Profitability is measured by ROA, calculated as net income after tax divided by total assets. Financial leverage is measured by DER, calculated as total liabilities divided by total equity. Liquidity is measured by the current ratio, calculated as current assets divided by current liabilities. Firm size is measured as the natural logarithm of total assets. Interaction variables are constructed by multiplying DER and CR by firm size.

The analysis begins with descriptive statistics. Panel-model selection uses the Chow test, Hausman test, and Lagrange multiplier test to compare the common-effects, fixed-effects, and random-effects estimators. The selected model is then evaluated through residual normality, multicollinearity, autocorrelation, and heteroskedasticity diagnostics. Hypotheses are tested using panel regression and moderated regression analysis in EViews 13 at a five-percent significance level.

$$\text{Model 1: } ROA_i = \alpha + \beta_1 DER_i + \beta_2 CR_i + \beta_3 SIZE_i + \mu_i + \varepsilon_i$$

$$\text{Model 2: } ROA_i = \alpha + \beta_1 DER_i + \beta_2 CR_i + \beta_3 SIZE_i + \beta_4 (DER \times SIZE)_i + \mu_i + \varepsilon_i$$

FINDINGS AND DISCUSSION

Descriptive Statistics

Table 1 summarises the characteristics of 500 firm-year observations. The average ROA is 0.028, while the negative minimum value indicates that some firms experienced losses. DER and CR display substantial dispersion and extreme maximum values, indicating considerable variation in financing structure and liquidity across the sample. Firm size is considerably more stable than the three financial ratios.

Table 1.
Descriptive Statistics of Research Variables

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
ROA	0.028128	0.030226	-1.011196	0.943569	0.162207
DER	1.106772	0.670764	-19.05558	49.02432	3.275627
CR	2.752792	1.746312	0.057489	83.43234	4.480555
Firm size	28.59322	28.41217	25.55282	32.85992	1.483144

Source: EViews 13 output processed from the thesis dataset.

Model Selection and Diagnostic Tests

The Chow tests reject the common-effects model for both specifications, and the Hausman tests reject the random-effects model. The fixed-effects model is therefore used for the direct and moderating regressions. Centered VIF values range from 1.008 to 1.024, showing no multicollinearity. The Durbin–Watson statistic for Model 1 is 2.087, which falls within the no-autocorrelation interval used in the thesis. The Glejser probabilities for DER, CR, and firm size exceed 0.05, indicating homoskedastic residual variance. The Jarque–Bera test rejects residual normality. Because the dataset contains 500 observations, the thesis proceeds with the estimator, but the non-normal residual distribution and extreme financial ratios should be considered when interpreting the results.

Panel Regression and Moderated Regression Results

Table 2 reports the fixed-effects estimates. Model 1 tests the direct effects, whereas Model 2 includes the interaction terms. Both models are

jointly significant. The explanatory power increases from 56.9 percent in Model 1 to 58.2 percent after the interaction variables are included.

Table 2.
Fixed-Effects Regression and Moderated Regression Results

Variable	Model 1		Model 2	
	Coefficient	p-value	Coefficient	p-value
DER	-0.005692***	0.0072	-0.385714***	0.0012
CR	0.017185***	0.0000	0.075542**	0.0409
Firm size	0.061871**	0.0313	0.060410**	0.0368
DER × Firm size	—	—	0.013627***	0.0014
CR × Firm size	—	—	-0.002220	0.1104
Constant	-1.781969**	0.0301	-1.738720**	0.0353
R-squared	0.568940		0.582353	
Adjusted R-squared	0.458189		0.472390	
F-statistic	5.137111	0.0000	5.295913	0.0000

*Notes: Dependent variable = ROA. *** $p < 0.01$; ** $p < 0.05$. Source: EViews 13 output processed from the thesis dataset.*

Financial Leverage and Profitability

DER has a negative and significant coefficient in Model 1. The result supports H1 and indicates that greater debt relative to equity reduces the return generated from corporate assets. Manufacturing firms bear fixed interest and repayment obligations, so debt that is not matched by sufficiently productive investment lowers net income. The finding is consistent with trade-off theory because the observed financing costs appear to exceed the incremental tax benefit at higher leverage levels.

The result also corresponds with evidence that leverage can suppress profitability in manufacturing and industrial firms (Chandra et al., 2019; Dalci, 2018; Singh & Bagga, 2019). Debt may still be useful for expansion, but its contribution depends on operating returns, debt maturity, and financing cost. Managers should therefore evaluate debt on the basis of cash-flow capacity rather than treating leverage as an automatic mechanism for raising shareholder returns.

Liquidity and Profitability

CR has a positive and significant coefficient, supporting H2. Firms with stronger current-asset coverage are better able to maintain production, settle short-term liabilities, and avoid interruptions that would reduce earnings. Liquidity also lowers the need for emergency financing, which may carry high costs. The positive coefficient indicates that the sampled firms generally benefited from stronger short-term financial capacity during the observation period.

This result is consistent with studies showing that liquidity supports profitability when firms convert current assets into operational continuity and sales (Bintara, 2020; Samo & Murad, 2019; Zaitoun & Alqudah, 2020). Nevertheless, the extreme CR values in the sample show that liquidity must

still be managed carefully. A high ratio improves solvency only when cash, receivables, and inventories remain productive.

Firm Size and Profitability

Firm size has a positive and significant effect in both specifications, supporting H3. Larger firms can spread fixed costs across greater output, access more diverse financing sources, negotiate with suppliers and creditors, and diversify product and market exposure. These advantages strengthen asset utilisation and make earnings more stable.

The result is in line with evidence that total asset scale can improve profitability through economies of scale and financial access (Abeyrathna & Priyadarshana, 2019; Akram et al., 2021). Size alone, however, is not sufficient. The positive relationship depends on whether management uses the larger resource base efficiently.

Firm Size as a Moderator of the Leverage Effect

The $DER \times$ firm size interaction is positive and significant. Since the direct DER coefficient is negative, the positive interaction means that the adverse marginal effect of leverage becomes weaker as firm size rises. H4 is supported. Larger manufacturing firms appear better able to absorb debt pressure because they hold broader assets, more stable cash flows, more diversified operations, and stronger access to refinancing.

The finding does not imply that debt becomes harmless in large firms. Rather, scale reduces the severity of the negative effect. Financial managers in large companies still need an optimal capital structure, while smaller firms require greater caution because limited financing alternatives and weaker shock-absorption capacity can magnify the profitability cost of leverage.

Firm Size as a Moderator of the Liquidity Effect

The $CR \times$ firm size interaction is negative but not statistically significant. H5 is not supported. Firm size therefore does not meaningfully change the relationship between liquidity and profitability in the sample. The result indicates that current-asset management depends more on efficiency than on scale. A large firm may hold more cash, receivables, and inventory, but those assets do not automatically generate higher returns.

This finding clarifies that firm size is a contextual moderator rather than a universal one. It protects profitability from debt-related pressure but does not substitute for effective working-capital management. Companies of all sizes must control collection periods, inventory turnover, short-term liabilities, and idle cash directly.

CONCLUSIONS

The study concludes that financial leverage reduces profitability, while liquidity and firm size improve profitability among Indonesian manufacturing firms. The negative leverage effect confirms that excessive debt and fixed

financing obligations can outweigh the benefits of external funding. The positive liquidity effect shows that adequate short-term financial capacity supports operating continuity and asset productivity. The positive firm-size effect indicates that scale provides operational and financing advantages.

Firm size weakens the negative effect of financial leverage on profitability. Large companies are therefore more resilient to debt pressure, although they still require disciplined capital-structure decisions. Firm size does not moderate the effect of liquidity, showing that the profitability consequences of current assets are driven primarily by management quality rather than corporate scale. Investors should evaluate leverage, liquidity, and size jointly. Managers should maintain debt within cash-flow capacity and improve the productivity of current assets.

LIMITATIONS & FURTHER RESEARCH

The study is limited to 100 manufacturing firms and a five-year observation period. It uses ROA, DER, CR, and the natural logarithm of total assets as single proxies for the principal constructs. The data contain extreme financial-ratio values, and the residual normality test is rejected. These conditions may affect coefficient sensitivity even though the panel contains 500 observations. The model also excludes macroeconomic conditions, corporate governance, industry subsectors, debt maturity, and managerial characteristics.

Future studies should extend the observation period, compare industrial sectors, and test alternative measures such as debt-to-assets ratio, quick ratio, and return on equity. Robustness analysis may use winsorisation, robust standard errors, quantile regression, threshold regression, or nonlinear panel models. Additional moderators or mediators, including governance quality, operating efficiency, managerial overconfidence, and risk tolerance, may explain why financing policies generate different profitability outcomes across firms.

AUTHOR CONTRIBUTION

Andriansyah Rizki Saputra: conceptualisation, research design, data collection, methodology, formal analysis, visualisation, writing the original draft, and revising the manuscript. The author approved the final version of the paper.

Declaration of Interest

The author declares no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Acknowledgements

The author thanks R.A. Sista Paramita for academic guidance during the preparation of the undergraduate research on which this article is based.

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