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Determinants of Firm Performance in the Indian Manufacturing Sector: A Capital Structure Perspective (2019–2023)

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Abstract

This research paper examines the determinants of firm financial performance in the Indian manufacturing sector from 2019 to 2023, with a particular focus on the role of capital structure. Utilizing data from 26 NSE/BSE-listed manufacturing companies across 130 firm-year observations, the study investigates how leverage (Debt-to-Equity ratio), firm size (natural log of total assets), and sales growth influence two widely accepted performance proxies: Return on Assets (ROA) and Return on Equity (ROE). The methodology is quantitative and empirical, employing secondary financial data sourced from Moneycontrol, Screener.in, and published annual reports. Multiple linear regression models were estimated using Microsoft Excel's Data Analysis ToolPak. The study period spans a highly significant economic arc, encompassing pre-pandemic stability (2019), COVID-19 disruption (2020–2021), and recovery (2022–2023). Findings reveal that leverage exerts a statistically significant negative effect on ROA ($\beta = -0.0237$, $p < 0.0001$), indicating that higher debt burdens erode operating profitability. For ROE, levera ge shows a negative but statistically insignificant coefficient, suggesting equity returns are shaped by a broader set of financial and strategic factors. Firm size is negatively associated with both ROA and ROE, albeit not at conventional significance levels, implying diminishing returns to scale. Sales growth significantly enhances ROE ($\beta = 0.1277$, $p = 0.025$) and shows marginal positive effects on ROA, supporting the view that revenue expansion translates into superior value creation for shareholders. The ROA model exhibits superior explanatory power (Adjusted $R^2 \approx 27\%$) compared to the ROE model (Adjusted $R^2 \approx 2.6\%$), indicating that capital structure variables better capture operational efficiency than equity returns. These findings are consistent with Trade-off Theory, Pecking Order Theory, and Agency Cost Theory, and contribute new sector-specific empirical evidence for the post- COVID period in India. The study offers actionable insights for corporate managers, investors, and policymakers regarding the optimal use of financial leverage and growth strategies in capital-intensive manufacturing industries.

Keywords: Capital Structure, Firm Performance, Debt-to-Equity Ratio, Return on Assets (ROA), Return on Equity (ROE), Indian Manufacturing, Leverage, Firm Size, Sales Growth, COVID-19

INTRODUCTION

Background and Context

Capital structure — the mix of debt and equity used to finance a firm's assets — stands as one of the most consequential decisions in corporate finance. The proportion of debt relative to equity affects a firm's cost of capital, risk profile, financial flexibility, and ultimately its profitability. For manufacturing enterprises, which are inherently capital-intensive, the choice of financing mix carries outsized implications. Machinery procurement, production facility setup, working capital management, and research investment all demand substantial funding, making these firms particularly dependent on debt markets.

India's manufacturing sector represents a vital pillar of the economy, contributing approximately 16–17% to GDP, providing employment to millions, and serving as a key driver of export revenue. The government's 'Make in India' initiative and Production-Linked

Incentive (PLI) schemes have further propelled the sector's strategic significance. Against this backdrop, understanding the financial determinants of firm performance is not merely an academic exercise but a matter of national economic consequence.

The study period, 2019 to 2023, offers a uniquely instructive window. It encompasses three distinct phases: pre-pandemic normalcy (2019), acute pandemic-era disruption (2020–2021), and subsequent recovery (2022–2023). The COVID-19 pandemic triggered demand shocks, supply chain dislocations, liquidity crunches, and forced rapid restructuring of financing strategies. Many manufacturers found themselves over-leveraged precisely when revenue streams collapsed, exposing the vulnerability of high-debt capital structures. The recovery phase, aided by government stimulus and demand rebound, then allowed firms to revisit their financing models and growth trajectories.

Statement of the Research Problem

Despite substantial global and Indian empirical literature on capital structure and firm performance, significant ambiguities persist. Some studies assert that debt enhances profitability through tax shields and managerial discipline (Modigliani & Miller, 1963; Jensen, 1986), while others document its detrimental effects via increased financial distress and agency conflicts (Myers & Majluf, 1984; Sheikh & Wang, 2011). For the Indian manufacturing sector specifically, and particularly for the 2019–2023 period that straddles a historic economic crisis, targeted empirical evidence remains scarce.

This study addresses the following central research problem: Does capital structure, operationalized through the Debt-to-Equity ratio, significantly determine financial performance — as measured by ROA and ROE — in listed Indian manufacturing firms during 2019–2023? Further, to what extent do firm size and sales growth moderate or independently influence profitability outcome?

Research Objectives

This study pursues the following objectives:

1. To analyze the impact of the Debt-to-Equity ratio on Return on Assets (ROA) and Return on Equity (ROE) of selected Indian manufacturing companies.
2. To examine the relationship between firm size (natural log of total assets) and financial performance.
3. To assess the influence of sales growth on profitability indicators.
4. To derive empirical evidence aligned with established capital structure theories.
5. To provide actionable managerial and policy recommendations based on empirical findings.

Research Hypotheses

Based on the research objectives and existing theoretical and empirical literature, the following null and alternative hypotheses are tested:

$H1_0$: The Debt-to-Equity ratio has no significant effect on firm performance (ROA and ROE). $H1_1$: The Debt-to-Equity ratio has a significant effect on firm performance (ROA and ROE).

$H2_0$: Firm size does not significantly influence ROA and ROE. $H2_1$: Firm size significantly influences ROA and ROE.

$H3_0$: Sales growth does not significantly influence ROA and ROE. $H3_1$: Sales growth significantly influences ROA and ROE.

Significance and Scope

The study is significant on multiple dimensions. Academically, it fills a gap by providing sector- specific, post-pandemic empirical evidence for Indian manufacturing firms. Managerially, the findings guide CFOs and finance teams in calibrating their leverage and growth strategies for sustained profitability. From a policy standpoint, the evidence can inform credit policies, industrial finance frameworks, and PLI scheme design. The scope is limited to 26 NSE/BSE-listed manufacturing companies over five fiscal years (FY2019–FY2023), using secondary quantitative financial data.

REVIEW OF LITERATURE

Theoretical Framework

The intellectual architecture of capital structure theory rests on several seminal contributions, each offering a distinct lens through which to interpret the relationship between financing mix and firm performance.

Modigliani-Miller Theorem

Modigliani and Miller (1958) established the foundational proposition that, under perfect capital market conditions — no taxes, no transaction costs, no bankruptcy risk, and symmetric information — a firm's value is independent of its capital structure. This irrelevance theorem, while theoretically elegant, identified the conditions under which capital structure matters by explicitly assuming they do not exist. Their 1963 revision introduced corporate taxes, demonstrating that the tax deductibility of interest payments creates a 'tax shield,' making debt financing advantageous and implying a positive relationship between leverage and firm value.

Trade-Off Theory

The Trade-Off Theory (Kraus & Litzenberger, 1973) posits that firms optimize their capital structure by balancing the tax benefits of debt against the costs of financial distress and bankruptcy. An optimal leverage ratio exists at the point where the marginal benefit of additional debt equals its marginal cost. For asset-heavy manufacturing firms, this balance is particularly delicate: they have significant tangible assets that can serve as collateral (lowering distress costs), yet their revenue cyclicality during periods like COVID-19 raises bankruptcy risk substantially.

Pecking Order Theory

Myers and Majluf (1984) proposed the Pecking Order Theory, which asserts that firms prioritize financing sources based on information asymmetry considerations. Managers, as insiders, prefer internal funds (retained earnings) first, then debt, and finally equity — which signals potential overvaluation. This theory predicts that profitable firms will use less debt, as they can fund investments internally, creating a negative correlation between profitability and leverage. During the pandemic period (2020–2021), many manufacturing firms exhausted internal reserves, aligning their behavior with this theory's predictions about forced debt reliance.

Agency Cost Theory

Jensen and Meckling (1976) introduced agency costs arising from conflicts between managers and shareholders (equity agency costs) and between shareholders and debt holders (debt agency costs). Moderate debt levels can discipline managers by reducing free cash flow available for non -value-maximizing expenditures (Jensen, 1986). However, excessive leverage heightens the risk of asset substitution and underinvestment problems, ultimately reducing firm value and performance.

Signalling and Market Timing Theories

Signalling theory (Ross, 1977) suggests that capital structure choices convey private information about firm quality to the market. High-quality firms may signal confidence in future earnings by taking on more debt. Market Timing Theory (Baker & Wurgler, 2002) argues that firms issue equity when they are relatively overvalued and rely on debt otherwise, implying that historical market valuations shape current capital structures.

Empirical Literature

Global Evidence

A robust body of global empirical research investigates the leverage-performance nexus. Zeitun and Tian (2007), using Jordanian firm data, found that leverage significantly and negatively affected both ROA and ROE, attributing this to the financial distress costs outweighing the tax shield benefits. Sheikh and Wang (2011) corroborated these findings for Pakistani manufacturing firms, noting that higher debt reduces profitability, a pattern particularly pronounced in emerging markets with less developed financial systems and higher borrowing costs.

Gill, Biger, and Mathur (2011) nuanced the discussion for U.S. firms, finding that while short -term debt positively related to performance, long-term debt had detrimental effects. This finding underscores the importance of debt maturity structure in the leverage-performance relationship. Salim and Yadav (2012) extended this evidence to Malaysian listed companies, documenting significant negative relationships between both short-term and long-term leverage and profitability measures. Akbar and Noor (2021) specifically studied pandemic-era impacts, finding that firms with excessive leverage faced steeper performance declines during COVID-19 disruptions, a finding particularly relevant to the present study.

Indian Evidence

The Indian context presents a distinctive regulatory, economic, and structural environment. Bhaduri (2002) examined Indian manufacturing firms and found that profitability reduces debt usage, consistent with Pecking Order Theory, while growth opportunities and business risk drive leverage decisions. Chakrabarti and Chakrabarti (2019, 2021) documented that high financial leverage significantly reduces both ROA and ROE in Indian manufacturing companies, attributing this to elevated borrowing costs and pronounced financial risk in the Indian context.

Kumar and Bansal (2021) found that while leverage negatively impacts profitability, both size and growth positively affect performance in Indian firms. Pandey (2004) obtained mixed results, emphasizing industry and firm-specific heterogeneity in the Indian leverage-performance relationship. Ghosh (2018) found that Indian firms

with higher growth opportunities borrow more extensively, but performance depends critically on the productive deployment of those borrowed funds.

Firm Size and Growth

Regarding firm size, Doğan (2013) found positive size-performance relationships in Turkish firms through economies of scale and bargaining power. However, Majumdar (1997) and Serrasqueiro and Nunes (2010) identified diminishing returns to scale beyond a certain firm size, consistent with bureaucratic inefficiencies in large organizations as theorized by Penrose (1959). On growth, Fama and French (1995) and Titman and Wessels (1988) established that sales growth generally correlates with improved profitability, though growth-intensive firms may take on additional debt, moderating net effects.

Research Gap

Despite the extensive literature, a clear research gap exists: no study has specifically examined the combined impact of leverage, firm size, and growth on both ROA and ROE for listed Indian manufacturing firms over the 2019–2023 period. This span, uniquely characterized by pre-pandemic normalcy, pandemic disruption, and recovery, offers an unreplicated opportunity to assess capital structure determinism under extreme financial stress. This study is designed to fill this gap with rigorous quantitative methodology.

RESEARCH METHODOLOGY

Research Design

This study adopts a quantitative, empirical, and explanatory research design. The quantitative approach ensures objective and statistically verifiable conclusions. The empirical design draws on observable financial data published by listed manufacturing companies, enabling evidence-based rather than theoretically deduced conclusions. The explanatory orientation goes beyond describing trends to testing causal relationships between capital structure variables and firm performance, making it appropriate for hypothesis testing.

The study employs a longitudinal framework covering five fiscal years (FY2019 –FY2023), enabling the capture of temporal variations in performance across the pre-pandemic, pandemic, and recovery phases. A pooled cross-sectional time-series (balanced panel) structure is used, combining 26 firms across 5 years to generate 130 firm-year observations — a sample size deemed adequate for multiple regression analysis at the MBA research level.

Data Sources and Collection

The study relies exclusively on secondary financial data obtained from the following authoritative and publicly accessible sources:

- Moneycontrol.com – for financial statements, ratios, and annual performance trends of listed companies.
- Screener.in – for detailed balance sheet data, profit and loss statements, and key financial ratios.
- Company Annual Reports – for audited disclosures, notes to accounts, and segment-level financial information.

Secondary data was preferred for its standardization (adherence to Ind-AS/GAAP accounting norms), auditability, and broad coverage across firms and

years. The raw data extracted included total assets, total debt, shareholders' equity, net profit after tax, and net sales revenue. From these, five key variables were computed.

Sample Selection

The study population comprises all NSE/BSE-listed Indian manufacturing companies. Given the size of this universe, purposive sampling was employed — a non-probability technique widely used in empirical finance research — to select firms based on predefined criteria. Specifically, firms were included if they: (a) were classified in the manufacturing sector; (b) maintained continuous listing throughout FY2019–FY2023; (c) had complete, uninterrupted financial data for all five years; and (d) were not involved in major mergers, acquisitions, delisting, or bankruptcy proceedings during the study period. Applying these filters yielded a final sample of 26 manufacturing companies, generating 130 firm-year observations.

Variable Operationalization

Table 3.1 provides a comprehensive summary of all study variables, their definitions, measurement formulas, and expected relationships with performance.

Analytical Methods

Three sequential analytical techniques were employed, each building on the preceding one:

Descriptive Statistics

Descriptive statistics (mean, standard deviation, minimum, maximum) were computed for all five variables across 130 observations. This step characterized the central tendency and d ispersion of the data, and flagged potential anomalies or extreme values attributable to the pandemic years.

Pearson Correlation Analysis

Pearson's bivariate correlation coefficients were computed for all variable pairs. This analysis served two purposes: first, to examine the direction and strength of linear associations between independent and dependent variables; and second, to test for multicollinearity among independent variables. Correlations exceeding 0.80 between independent variables would indicate potential multicollinearity, which could destabilize regression estimates.

Multiple Linear Regression Analysis

Two separate multiple linear regression models were specified and estimated — one for each performance proxy:

$$\textbf{Model 1: ROA} = \beta_0 + \beta_1 (D/E) + \beta_2 (SIZE) + \beta_3 (GROWTH) + \varepsilon$$

$$\textbf{Model 2: ROE} = \beta_0 + \beta_1 (D/E) + \beta_2 (SIZE) + \beta_3 (GROWTH) + \varepsilon$$

Where β_0 is the intercept, β_1 , β_2 , β_3 are partial regression coefficients representing the marginal impact of each predictor on the performance variable while holding others constant, and ε is the stochastic error term. Regression assumptions — linearity, independence of errors, homoscedasticity, normality of residuals, and absence of severe multicollinearity — were assessed through visual inspection of residual plots and correlation matrices.

All computations were performed in Microsoft Excel using the Data Analysis ToolPak, which generated regression coefficients, standard errors, t-statistics, p-

values, R^2, Adjusted R^2, F-statistics, and 95% confidence intervals.

DATA ANALYSIS AND INTERPRETATION

Descriptive Statistics

Table 4.1 presents the descriptive statistics for all five study variables across 130 firm-year observations (26 firms × 5 years: FY2019–FY2023).

The mean ROA of 8.0% and mean ROE of 16.0% indicate moderate overall profitability, with ROE being roughly twice ROA, reflecting the leverage-magnification of equity returns. The negative minimum values for both ROA (–4.6%) and ROE (–9.0%) confirm that certain firms experienced losses, particularly during the pandemic years of 2020–2021. The mean Debt-to-Equity ratio of 1.55 signals moderate to moderately high leverage in line with the capital-intensive nature of manufacturing. The wide range of D/E (0.15 to 5.39) indicates substantial heterogeneity in financing strategies across the sample — a necessary condition for meaningful regression analysis. Firm size spans from 5.88 to 12.73 on the log scale, representing a broad cross-section of mid-to-large manufacturers. Sales growth averaging 9.2% with a range from –52.6% (pandemic contraction) to +83.3% (recovery surge) vividly captures the economic turbulence of the study period.

Pearson Correlation Analysis

Table 4.2 presents the Pearson correlation matrix for all study variables.

The most salient finding is the moderately strong negative correlation between D/E and ROA ($r = –0.51$), the strongest predictor correlation in the matrix. This bivariate relationship suggests that leverage is inversely related to asset efficiency — firms with higher debt ratios tend to generate less profit per unit of assets. The much weaker correlation between D/E and ROE ($r = –0.08$) foreshadows the regression finding that equity returns are less directly explained by leverage alone. The strong positive ROA-ROE correlation ($r = 0.83$) is expected, as both capture profitability from different perspectives. Crucially, no correlation among independent variables exceeds 0.80, confirming the absence of severe multicollinearity.

Regression Analysis — Model 1: Determinants of ROA

Table 4.3 presents the complete regression output for Model 1, with ROA as the dependent variable.

Model 1 achieves an Adjusted R^2 of 27.4%, indicating that approximately 27% of the variation in ROA is explained by the three predictors. The overall model is highly statistically significant ($F = 17.23$, $p < 0.001$). The most important and significant predictor is the Debt-to-Equity ratio ($\beta = –0.0237$, $t = –5.52$, $p < 0.0001$). Each unit increase in D/E is associated with a 2.37 percentage point reduction in ROA, holding size and growth constant. This result aligns with Trade-Off Theory and Pecking Order Theory: excessive debt elevates interest obligations, compresses net profit, and reduces the return generated per unit of assets. It also corroborates Indian empirical evidence from Chakrabarti and Chakrabarti (2021) and Kumar (2019).

Firm Size shows a negative but statistically insignificant coefficient ($\beta = –0.0051$, $p = 0.151$), suggesting that larger firms tend to earn lower ROA, but this effect is not reliably distinguished from zero in the sample. This may reflect the

bureaucratic inefficiencies and slower asset turnover characteristic of large capital-intensive manufacturers (Penrose, 1959). Sales Growth shows a marginally positive and borderline-significant coefficient (β = 0.0496, p = 0.056), indicating that revenue expansion modestly improves asset profitability, likely through better absorption of fixed costs and improved operational leverage.

Regression Analysis — Model 2: Determinants of ROE

Table 4.4 presents the regression output for Model 2, with ROE as the dependent variable.

Model 2 exhibits considerably lower explanatory power (Adjusted R^2 = 2.6%, F = 2.13, p = 0.10). The three predictors explain only a small fraction of ROE variation, confirming that shareholder returns are shaped by a broader and more complex set of determinants beyond capital structure and firm size. The key significant predictor is Sales Growth (β = 0.1277, t = 2.26, p = 0.025): each percentage point increase in sales growth is associated with a 12.77 percentage point increase in ROE, controlling for size and leverage. This substantial coefficient reflects how revenue growth magnifies profitability and, through the leverage effect embedded in ROE, amplifies equity returns.

The Debt-to-Equity ratio's coefficient is negative but statistically insignificant for ROE (β = –0.0052, p = 0.582). While higher leverage mechanically reduces net profit available to equity holders, it also increases the denominator effect in different ways, and the competing forces may cancel out partially. ROE is also sensitive to factors such as dividend policy, retained earnings, share buybacks, and market conditions that are outside this model's scope. Firm size remains negative and insignificant (β = –0.0058, p = 0.456), suggesting similar diminishing returns dynamics as in Model 1, though even more attenuated.

Hypotheses Testing Summary

Table 4.5 consolidates the hypothesis testing outcomes from both regression models.

FINDINGS, IMPLICATIONS, AND CONCLUSION

Key Research Findings

The empirical analysis yields several substantive and nuanced findings that collectively advance understanding of capital structure determinism in Indian manufacturing:

Finding 1 — Leverage Significantly Erodes Asset Profitability: The Debt-to-Equity ratio is the single most powerful predictor of ROA, with a highly significant negative coefficient (β = –0.0237, p < 0.0001). This finding is robust and theoretically coherent: higher debt commitments increase fixed financial charges (interest payments), reducing net income per unit of assets. For manufacturing companies, which often carry substantial long-term debt for capital expenditures, this finding underscores the real cost of over-leverage on operational performance metrics.

Finding 2 — Leverage Does Not Significantly Explain Equity Returns: The absence of a significant leverage-ROE relationship (p = 0.582) suggests that shareholder returns are shaped by factors beyond the debt ratio — including retained earnings policy, equity buybacks, market pricing, dividend decisions, and non-financial strategic factors. This

differential impact of leverage on ROA versus ROE highlights that the two performance metrics capture fundamentally different aspects of financial performance that require distinct analytical treatment.

Finding 3 — Firm Size Exhibits Diminishing Returns: Negative, albeit insignificant, size coefficients in both models align with theories of managerial diseconomies at scale (Penrose, 1959). As manufacturing companies grow larger, additional assets do not necessarily generate proportional improvements in profitability, potentially due to organizational complexity, bureaucratic inertia, and the challenge of maintaining operational efficiency across large asset bases.

Finding 4 — Sales Growth Drives Shareholder Value Creation: Sales growth is the dominant predictor of ROE (β = 0.1277, p = 0.025) and shows marginal positive influence on ROA. Reve nue expansion enables firms to spread fixed costs across a larger sales base, improve gross margins, and ultimately generate stronger equity returns. The pandemic's impact on growth volatility (range:–52.6% to +83.3%) reinforces why growth is a critical performance driver in the Indian manufacturing context.

Finding 5 — ROA is More Tractable by Capital Structure Variables: The substantially higher Adjusted R^2 of the ROA model (27.4%) compared to the ROE model (2.6%) demonstrates that capital structure and firm-specific characteristics are stronger determinants of operating efficiency (as measured by ROA) than equity returns (ROE). This distinction has important implications for how analysts and researchers choose performance proxies when evaluating capital structure impacts.

Theoretical Implications

The findings offer nuanced support for classical capital structure theories while revealing important contextual qualifications. The significant negative leverage-ROA relationship is consistent with Trade-Off Theory: after a certain leverage threshold, financial distress costs and interest burdens outweigh tax shield benefits, reducing operating performance. The tendency for manufacturing firms to turn to debt when internal funds are insufficient (especially during COVID-19) aligns with Pecking Order Theory, and the resulting performance deterioration validates the theory's warning about the inefficiency risks of external financing.

The positive sales growth-ROE relationship extends Fama and French's (1995) growth-value framework to the specific context of Indian manufacturing, confirming that growth-oriented strategies are shareholders' strongest allies. The limited explanatory power for ROE relative to ROA suggests that future theoretical frameworks for equity return determinism must incorporate market-level, governance, and strategic variables beyond the financial statement variables examined here.

Managerial Implications

The empirical evidence translates into concrete guidance for corporate managers and CFOs in the Indian manufacturing sector:

- Debt Discipline is Imperative: Firms must exercise rigorous discipline in leverage decisions.
- The significant negative impact of D/E on ROA confirms that incremental debt beyond the optimal range measurably reduces

asset efficiency. Managers should evaluate the full cost of debt — not just interest rates, but the dilution of operating profit ratios — before taking on additional leverage, particularly during economically uncertain periods.

- Pursue Organic Revenue Growth Strategically: Given that sales growth is the primary driver of ROE, firms should prioritize strategies that generate sustainable revenue growth — market expansion, product diversification, value-chain integration, and export development. Revenue growth that leverages existing asset bases can dramatically improve equity returns.
- Optimize Asset Utilization in Large Firms: The negative size-performance relationship implies that firm size per se does not guarantee superior profitability. Large manufacturers must focus on operational efficiency, asset rationalization, and lean production strategies to counter the natural tendency toward diminishing returns at scale.
- Maintain Financial Buffers for Crisis Resilience: The pandemic years demonstrated the performance consequences of being over-leveraged when revenues collapse. Maintaining adequate liquidity buffers and financial flexibility through conservative leverage during stable periods creates crisis resilience.

Policy Implications

For policymakers and regulators, the findings suggest several actionable directions. First, credit policies targeting Indian manufacturing should incorporate leverage guardrails — incentivizing firms that maintain balanced capital structures with access to subsidized credit or PLI scheme benefits, while flagging highly leveraged entities for enhanced monitoring. Second, given that growth is the dominant driver of shareholder returns, policies that accelerate revenue generation — through export promotion, domestic demand stimulation, and technology adoption subsidies — have direct implications for sectoral profitability. Third, regulators may consider requiring larger manufacturing firms to disclose leverage-to-performance benchmarks alongside standard financial statements, improving market discipline.

LIMITATIONS OF THE STUDY

The study is subject to several limitations that contextually bound its findings and conclusions:

The sample is restricted to 26 manufacturing firms and 130 firm-year observations, which, while adequate for the analytical methods employed, limits generalizability to the broader manufacturing sector population.

Only three independent variables — leverage, size, and growth — are included. Critical omitted variables such as liquidity ratios, asset tangibility, firm age, interest coverage ratio, macroeconomic conditions, and governance quality may influence both capital structure decisions and firm performance.

The study uses pooled OLS regression rather than panel data

econometrics (fixed-effects or random-effects models), which would control for unobserved firm-level heterogeneity and time-invariant characteristics.

The 2019–2023 study period encompasses the highly atypical COVID-19 pandemic years, which may introduce structural breaks or regime changes in the leverage-performance relationship that a single pooled model cannot adequately capture.

Data sourced from Moneycontrol and Screener.in, while reliable, may contain minor reporting lags or classification discrepancies relative to primary audited financial statements.

Directions for Future Research

Building on this study's findings and limitations, several productive avenues for future research are identified:

Panel Data Econometrics: Future studies should apply fixed-effects and random-effects panel models to control for firm-level unobserved heterogeneity, yielding more precise and unbiased coefficient estimates.

Extended Variable Sets: Incorporating variables such as liquidity (current ratio), asset tangibility, capital expenditure intensity, cash flow adequacy, board composition, and CEO tenure would provide a richer and more complete picture of performance determinants.

Sub-Sector Analysis: Decomposing the manufacturing sector into sub-industries (automotive, pharmaceuticals, textiles, steel, FMCG) would reveal whether capital structure effects are uniform or heterogeneous across industry verticals.

Dynamic Capital Structure Models: Employing GMM (Generalized Method of Moments) or dynamic panel approaches would allow examination of how firms adjust leverage toward target ratios over time and how these dynamic adjustments affect performance.

Machine Learning Approaches: Random forests, gradient boosting, or neural network models could be applied to identify non-linear interactions among capital structure and performance variables that OLS cannot capture.

Post-2023 Extension: Extending the analysis to FY2024 and FY2025 would enable examination of whether the leverage-performance patterns observed during the pandemic normalization persist as the sector reaches a new equilibrium.

CONCLUSION

This research paper set out to empirically investigate how capital structure and firm-specific characteristics determine financial performance in India's listed manufacturing sector during the economically turbulent period of 2019–2023. Drawing on 130 firm-year observations from 26 companies, and employing descriptive statistics, Pearson correlation analysis, and multiple linear regression, the study arrives at clear and theoretically coherent conclusions.

Leverage, measured by the Debt-to-Equity ratio, is the most powerful determinant of Return on Assets, exerting a highly significant negative influence that confirms the primacy of financial structure in shaping operational profitability. The finding that D/E does not significantly predict ROE illuminates the more complex and multi-dimensional nature of equity return determination. Firm size shows consistently negative but non-significant associations with both performance proxies, pointing to diminishing efficiency at scale in Indian manufacturing. Sales growth emerges as the dominant driver of

ROE and a marginally positive contributor to ROA, highlighting the central role of revenue expansion in value creation for shareholders.

These findings are theoretically grounded in Trade-Off, Pecking Order, and Agency Cost frameworks, and empirically consistent with prior Indian and global evidence. They provide actionable guidance for corporate financial managers seeking to optimize leverage ratios, investors benchmarking firm performance against capital structure profiles, and policymakers designing industrial finance frameworks. The study also charts a clear path for future research through extended variable sets, panel econometric methods, and sub-sector analyses-all of which promise to deepen understanding of what drives manufacturing firm performance in India's dynamic and rapidly evolving economic landscape.

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Variable	Type	Operationalization	Expected Relationship
Return on Assets (ROA)	Dependent	Net Profit / Total Assets	N/A
Return on Equity (ROE)	Dependent	Net Profit / Shareholders' Equity	N/A
Debt-to-Equity Ratio (D/E)	Independent	Total Debt / Total Shareholders' Equity	Negative (–)
Firm Size (SIZE)	Independent	Natural log of Total Assets ln(Total Assets)	Mixed / Negative
Sales Growth (GROWTH)	Independent	(Salest – Salest-1) / Salest-1	Positive (+)

Table 3.1: Variable Operationalization Summary

Variable	Mean	Std. Dev.	Minimum	Maximum	N
ROA	0.08016	0.06714	–0.04587	0.33524	130
ROE	0.16020	0.12733	–0.09025	0.82099	130
Debt/Equity	1.55141	1.30487	0.15297	5.39581	130
Size (ln Assets)	10.47140	1.57737	5.87774	12.72731	130
Growth (%)	0.09220	0.19646	–0.52640	0.83333	130

Table 4.1: Descriptive Statistics of Study Variables (FY2019–FY2023)

Variable	ROA	ROE	D/E	Size	Growth
ROA	**1.0000**	0.8275	–0.5099	–0.3114	0.1306
ROE	0.8275	**1.0000**	–0.0817	–0.0833	0.1918
D/E	–0.5099	–0.0817	**1.0000**	0.4347	0.0155
Size	–0.3114	–0.0833	0.4347	**1.0000**	0.0619
Growth	0.1306	0.1918	0.0155	0.0619	**1.0000**

Table 4.2: Pearson Correlation Matrix

Variable	Coefficient (β)	Std. Error	t-Stat	p-Value	Significance
Intercept	0.16602	0.03512	4.727	0.0001	*** Sig.
Debt/Equity (D/E)	–0.02365	0.00429	–5.518	<0.0001	*** Sig.
Firm Size	–0.00513	0.00355	–1.445	0.1511	Not Sig.
Sales Growth (%)	0.04962	0.02569	1.932	0.0557	† Marginal

Table 4.3: Regression Output — Model 1 (ROA) | $R^2 = 0.291$ | Adj. $R^2 = 0.274$ | $F = 17.23$ ($p < 0.001$)

Variable	Coefficient (β)	Std. Error	t-Stat	p-Value	Significance
Intercept	0.21765	0.07717	2.821	0.0056	** Sig.
Debt/Equity (D/E)	–0.00520	0.00942	–0.552	0.5821	Not Sig.
Firm Size	–0.00584	0.00781	–0.748	0.4557	Not Sig.
Sales Growth (%)	0.12773	0.05645	2.263	0.0254	* Sig.

Table 4.4: Regression Output — Model 2 (ROE) | $R^2 = 0.048$ | Adj. $R^2 = 0.026$ | $F = 2.13$ ($p = 0.100$)

H	Hypothesis Statement	ROA Result	ROE Result	Decision
H1	D/E ratio significantly affects firm performance	Supported ***	Not Supported	Partially Supported
H2	Firm size significantly influences ROA and ROE	Not Supported	Not Supported	Rejected
H3	Sales growth significantly influences ROA and ROE	Marginal †	Supported *	Partially Supported

*Table 4.5: Hypotheses Testing Summary | *** p<0.001, * p<0.05, † p<0.10*