SCIENTIFIC CULTURE

www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 2.1, (2026), pp. 396-417
Open Access. Online & Print

DOI: 10.5281/zenodo.122.12642

DO LEVERAGE STRATEGIES MATTER? AN EMPIRICAL ANALYSIS OF PROFITABILITY DETERMINANTS IN THE INDIAN MANUFACTURING SECTOR

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Received: 01/12/2025
Accepted: 02/01/2026

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ABSTRACT

This study conceptualises leverage as a peer-relative financial posture instead of a single debt ratio. It examines posture leverage strategies are systematically related to profitability. It examined a balanced panel of 2,665 Indian manufacturing firms over 2014-2024 (29,315 observations) and constructed a year-wise leverage aggressiveness measure to classify firms into four leverage regimes. Static models with firm and year fixed effects show a robust negative association between leverage aggressiveness and performance. Strategy based models compare the effects of regimes relative to prudent firms and provide further insights. A clear declining profitability gradient across peer-relative leverage postures with more aggressive strategies. Analysis highlights that leverage and liquidity operate as a joint policy. Marginal effect of leverage on profitability becomes more adverse as liquidity rises. Carrying liquidity buffers can be costly in combination with aggressive debt positions. Dynamic models confirm persistence of profitability and suggest that short-run leverage changes are less precisely estimated once dynamics and endogeneity are addressed. The study infers that leverage-profitability relationship is primarily a medium-run posture phenomenon. Monitoring of peer-relative leverage provides a practical diagnostic for managers and lenders, especially when evaluated jointly with liquidity posture

KEYWORDS: Leverage Strategies; Peer-Relative Leverage; Capital Structure; Profitability; Working Capital; Liquidity; Fixed Effects; System GMM; Indian Manufacturing; Leverage-Liquidity Interaction.

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1. INTRODUCTION

The relationship between leverage and profitability has been described as a leverage puzzle. In theory, debt might facilitate investment and may have disciplinary effect on managers. However, empirical evidence often shows weaker accounting profitability associated with higher leverage, when distress risk, operating constraints, and adverse shocks were considered. Research studies emphasize that the association is heterogenous, and leverage effects are nonlinear and may change significantly when firms enter the high-debt tail of the distribution (Hossain, 2021; Le & Phan, 2017). Recent studies emphasize on threshold and regime-like behaviour, suggesting that mean linear slopes can potentially blur economical significant break in performance between different leverage postures (Khemiri, 2020, 2025; Hong et al., 2025).

This leverage study conceptualised leverage as a more informative construct when seen as a relative financial posture with respect to peers, rather than as an individual ratio level. In practise, the debt capacity is compared with industry standards, macroeconomic environment, and financing limits; the relevant exposure thus includes not only the absolute extent of the leverage that a given firm has but also its leverage in comparison to its contemporaries. The measure of leverage aggressiveness (ZLev) was defined as a within year standardisation of position in the manufacturing leverage distribution and used to identify firm-years in leverage-strategy regimes (Conservative, Prudent, Aggressive, Risky). This design enabled a test of how profitability differences are associated with the strategy posture compared with the leverage level. The endeavour is in line with regime-based interpretation where the impact of leverage can differ across the distributional segments than is sufficed by a single (Khemiri & Noubbigh, 2020; Hossain, 2021; Hong et al., 2025; Le & Phan, 2017).

The Indian manufacturing sector provided a relevant setting for leverage-strategy lens. Firms operating in emerging market economies have rigid financing frictions and liquidity sensitivity which magnify the downside of aggressive debt positions (Ukaegbu, 2014; Duguleana et al., 2024). Institutional features, like group affiliation and uneven access to finance, further shape debt capacity and the leverage-performance association within India (Chakraborty, 2013). Evidence also indicated that this association varied across business-cycle phases, reinforcing the examining of heterogeneity rather than imposing a single stable slope (Bandyopadhyay & Barua, 2016). Hence, a peer-relative leverage strategy classification was economically meaningful in this context.

The other incentive behind the study was that the capital structure policy is interdependent with liquidity and joint policy trade off. The operations that might be facilitated by working-capital buffers may be expensive external finance, but the liquidity that is debt-financed carry cost may become significant (Almeida & Eid, 2014; Zhou et al., 2025). Trade credit-based operations and financing linkage (Box et al., 2018), and precautionary liquidity demand in an uncertain environment (Ahsan et al., 2022; Chang et al., 2024) provided a further incentive to conduct an explicit test the marginal profitability implication of leverage. With a view that liquidity can represent slack cost, the study evaluated the combined effect of leverage penalty with liquidity (Hassan et al., 2023; Zhou et al., 2025).

The study adopted a disciplined panel approach. Factors of profitability also include innovation, digitalisation, and capability accumulation that could correlate with leverage and liquidity choices (Anokhin et al., 2021; Benedek et al., 2025; Li et al., 2025). Governance and board features may also impact risk taking and financial policy, introducing time-varying co-movements. (Hernandez-Atienza et al., 2024). The empirical methodology thus used firm fixed-effects models with year effects to address time-invariant firm attributes and control for common macro shocks. Dynamic system GMM was reported as a robustness/sensitivity exercise for profitability persistence and potential endogeneity in leverage margins (Arellano & Bond, 1991; Blundell & Bond, 1998). To alleviate the issue of instruments proliferation, the dynamic specifications followed a sparse instrument design (Roodman, 2009a).

The results of the study, based on a balanced panel of 29315 firm-year observations suggested a strong profitability gradient among leverage strategies and that leverage-liquidity interaction effects could explain a trade-off between policy considerations. The study is structured sequentially as: section 2 review of literature and hypothesis formation, section 3 data and methodology, section 4 results and discussion, section 5 conclusion, and appendix at the end.

2. LITERATURE REVIEW

2.1. Capital Structure and Firm Performance

Empirical capital structure research identified leverage-performance relationship is distribution-dependent, across firms and periods. The heterogeneity of estimated leverage-profitability gradients is observed between various leverage strata with indicating threshold-like dynamics when

firms move to high-debt tail (Hossain, 2021; Khemiri & Noubbigh, 2020). Similarly, Regime-based research exhibited that linear specification could mask economically significant changes in profitability due to increasing distress exposure and a higher cost of financing (Hong et al., 2025; Le & Phan, 2017). The orientation and strength of the relationship depend on the competition and institutional environments, which promotes a contextual, instead of universal, explanation of leverage (Fosu, 2013; Zhang, 2021).

Capital-structure theory presented conflicting sign predictions, thus making nonlinearity at least a possibility before its challenge by empirical evidence. Under a frictionless paradigm, the Modigliani-Miller benchmark holds, but the inclusion of taxes and ancillary frictions allows the existence of value-measuring effects (Modigliani & Miller, 1958, 1963). Trade-off models formalised the interior optimum in terms of trade-off between tax benefits and the anticipated distress costs meaning that various firms with different risk-profile and asset structures will experience different performance implications (Kraus & Litzenberger, 1973). An overhang of debt implies further that leverage can become tightening as growth potentials are accumulated, raising the cost of high leverage to capital intense businesses (Myers 1977). A broad synthesis predicts information and the friction of contracting as mechanisms of heterogeneous financing results across firms (Harris & Raviv 1991).

The same conditional logic was supported using agency-based mechanisms. In the traditional agency model, leverage is used to minimise managerial slack by directing cash flows to shareholders and limiting discretionary spending (Jensen 1976). The free-cash-flow argument also argues that debt may discipline managers by limiting resources allocated to negative-NPV projects particularly when resources are strong on their own (Jensen 1986). In high-debt states, it can also increase the conflict over debt and equity and reduce management horizons, which means that the benefit of discipline may reverse the effect after reaching a critical level of leverage (Hossain, 2021; Khemiri & Noubbigh, 2020).

Information asymmetry-based arguments provide another explanation of the negative correlations between leverage and accounting profitability. According to pecking-order theory, the sources of financing are in a hierarchical order of internal funds, then debt, and the issuance of equity is a situation where informational imperfections are extreme (Myers, 1977, 1984; Myers & Majluf, 1984). As a result, more profitable entities have lower borrowing incentives, which produces negative leverage-accounting profitability correlations in a variety of settings. The heterogeneity of leverage-performance correlations is supported because large-scale empirically investigated issuance behaviour patterns vary by the characteristics of firms and circumstances (Frank 2003 & Goyal 2003).

In India, these uncertainties were relevant as the conditions of financing were conditioned by ownership and business-group affiliation that might influence access to credit and, consequently, performance (Chakraborty, 2013). Business-cycle dynamics are also a factor, with different leverage-profitability relationships in expansion and contraction (Bandyopadhyay 2016; Barua 2016). Recent India-centric studies further emphasize the fact that governance and financing policies simultaneously affect firm performance, and designs should reflect enduring firm heterogeneity and heterogeneous leverage positions, as opposed to an action based on a single pooled relationship (Tripathi et al., 2024). This literature thus encouraged the use of leverage as a strategic posture rather than as a single ratio with a uniform slope.

2.2. *Leverage As Strategy Posture*

While many studies operationalised leverage as a continuous ratio, the introduction of regime and threshold interpretations indicate that peer-relative position of a firm could be more informative, especially in case sector-wide leverage changes over time. The salient feature is not just the absolute level of debt, but rather the degree to which a firm exists in an area of the leverage distribution where additional debt has a significant impact on distress exposure or financial flexibility (Hong et al., 2025; Khemiri & Noubbigh, 2020). This motivates the application of peer-relative measures, including leverage aggressiveness (ZLev), that reflect the position of a firm in the current distribution, and therefore can be interpreted even in the presence of sector-wide changes in leverage.

A strategy-posture lens is also consistent with dynamic capital-structure research that shows firms adjust leverage gradually rather than instantaneously. Adjustment-cost and monitoring perspectives emphasise that firms move toward target leverage at varying speeds and that adjustment dynamics depend on the quality of governance, the information environment, and the monitoring intensity of external capital providers (Chung et al., 2018; Cao et al., 2025). Appendix Table 3 in this study lists one-year transition probabilities that suggest that about three-quarters to four-fifths of

firm-years stay in the same leverage strategy category year-to-year, which is consistent with an interpretation of medium-run posture instead of high-frequency noise. This persistence complements the strategy posture interpretation and gradual adjustment logic where leverage change is not instantaneous (Chung et al., 2018; Cao et al., 2025).

The strategy view is also supported by the fact that low leverage or zero leverage companies can be a deliberate flexibility pose and not a singular observation. Recent literature highlights that having a low leverage profile may be a strategic decision in place to retain option value, reduce constraints, and remain financially flexible in an environment of uncertainty (Chang et al., 2025). This observation is vital to the analysis of cross-sectional variations between Conservative/Prudent and Aggressive/Risky regimes: when low leverage becomes a preferred pose, then the profitability differentials being observed are not merely mechanical consequences of lower interest penalty, but can instead be attributed to more general strategic and organisational differences.

The contribution of this study is to bring three related empirical lenses into one design, which is the leverage levels (Lev); (ii) peer-relative leverage posture (ZLev); and (iii) discrete leverage strategy regimes based on ZLev thresholds. This framework allows the profitability variation across regions of distribution to be analysed as opposed to the force-fitting of the variation to one continuous slope, and is consistent with designs that deal with unobserved heterogeneity and a gradual adjusting dynamic.

2.3. Working Capital Management And Liquidity-Leverage Nexus

Working capital management (WCM) is an important factor of firm performance, as it controls the operating liquidity, shock resistance, and ability of firms to finance growth without imposing on costly external capital. Liquidity showed significant variation in the balanced panel of 2,665 firms and 29,315 firm-years in the study (Table 2) indicating that there were significant differences in the buffer capacity across firm-years. A key feature that liquidity buffers can be value enhancing under financing constraints, but they have opportunity costs and exhibit inefficiency at extreme levels (Almeida & Eid, 2014; Banos-Caballero et al., 2014). Empirical research demonstrates that WCM impacts performance via operations (e.g., production continuity, inventory availability, receivables management) and financing (e.g., less external finance is demanded). (Boisjoly et al., 2020; Zeidan & Shapir, 2017). Trade credit provides a connecting link between operating and financing policies, and enhances the case for joint modelling of liquidity and leverage. Trade credit policies determine, and are determined by working-capital requirements, and the financing conditions, that interact with leverage choices to determine profitability effects (Box et al., 2018). This linkage supports the modelling choice in the study to test the direct effects of liquidity on profitability, as well as its moderating effect on leverage-profitability relationship.

Moderation logic strengthens under uncertain macro-economic environment as precautionary liquidity demand increases, modifies working-capital requirements, and moderates the translation of internal and external financing into performance (Ahsan et al., 2022; Chang et al., 2024; Hu, 2025). In turbulent times, a highly leveraged firm holding working capital can suffer reduced profitability due to combination of interest liability and liquidity carrying cost. Manufacturing industries, with periodic supply-chain pressures, can face disruptions which can have a significant impact on working-capital requirements and performance (Jantadej & Kotcharin, 2025). Empirical evidence in the context of developing economies indicated that working-capital choices and funding limitations are highly correlated with the profitability and survival of firms, indicating that the liquidity stance as a key conditioning variable of leverage performances (Ukaegbu, 2014). Sectoral evidence shows that the effect of WCM on performance differs by industry and stress regime. (Chambers & Cifter, 2022).

An array of conditioning processes explains the varying impact of liquidity in firms, and the varying expression of leverage-liquidity complementarities or conflicts. Financial policy choices might be influenced by sustainability and ownership structures (Barros et al., 2022; Dewangan & Kannadhasan, 2025; Zhou et al., 2025). Alternatively, reporting choices and managerial efficiency can affect interpretation of liquidity as accounting decisions or deployment efficiency rather than operational capacity (Sawarni et al., 2023; Banerjee & Deb, 2023). Collectively, these motivated the hypothesis that liquidity, apart from having a direct effect, also moderates the translation of leverage into profitability.

2.4. Efficiency And Contemporary Performance Drivers

Profitability is associated with operating discipline and asset utilisation, which are captured by DuPont efficiency logic. The observed sample

used in the study demonstrated significant dispersion of asset utilisation efficiency over the firm-years (Table 2). Asset turnover, together with fixed-asset turnover, are employed to explain profitability in terms of operational effectiveness and scale utilisation (Chang et al., 2014; Novaes et al., 2025). Evidence also associated efficiency with performance in firms and suggested that efficiency should be controlled when assessing capital-structure relationships (Patel et al., 2022). Simultaneously, the determinants of profitability are influenced by time-varying capability drivers such as digitalisation and innovation. Factors such as technology adoption, innovation strategy, and organisational capability corelate to financing policies and plausibly impact performance of firms as well (Anokhin et al., 2021; Benedek et al., 2025). Thus, the importance of empirical designs that absorb firm heterogeneity and within-firm effects.

Another cause of heterogeneity is based on considerations of investment horizons and slack capacity. There was a wide range in firm age implying that the investment horizons and slack capacities vary significantly among firms (Lefebvre, 2024; Teirlinck, 2022). These differences have potential implications on mapping of financial constraints and leverage posture onto performance, providing another reason why leverage–performance relationships may differ across firms and over time. Governance structures further shape performance and financing decisions through monitoring and strategic oversight. Governance arrangements may also co-vary with financing policy and performance by monitoring and risk appetite and these time-varying arrangements cannot be fully abolished even in firm specific designs (Hernandez-Atienza et al., 2024; Renz et al., 2023; Nagar & Arya, 2025; Staneva et al., 2025). Methodological and reporting discipline in governance–performance research also cautions against overinterpreting results when outliers and measurement errors are present, supporting robust data handling and careful inference (Renz et al., 2023). Market-side drivers such as customer satisfaction can impact profitability, independent of capital structure (Sun & Kim, 2013). This implies that leverage effects should be interpreted as conditional associations within a broader performance system.

Overall, this literature provides a structured justification for the paper's empirical approach: controlling for efficiency and recognising contemporary performance drivers helps isolate the leverage strategy gradient, while econometric discipline (fixed effects and dynamic checks) addresses confounding from persistent firm heterogeneity and adjustment dynamics.

2.5. Hypotheses Development

Drawing on the above theory and evidence, hypotheses were framed as associations consistent with the study's identification stance (FE as the primary framework, with dynamic specifications treated as robustness). The hypotheses were evaluated in a balanced panel of 2,665 Indian manufacturing firms observed over 2014-2024 (29,315 firm-year observations), where leverage postures and liquidity buffers varied materially across the distribution.

H1: Leverage (Lev) is negatively associated with profitability (ROA).

This hypothesis followedthreshold evidence in the leverage-performance nexus showing deterioration in high-debt regions (Hossain, 2021; Khemiri & Noubbigh, 2020).

H2: Leverage aggressiveness (ZLev) is negatively associated with profitability (ROA).

This hypothesis reflected regime-oriented findings that peer-relative positioning captured heterogeneity beyond a single leverage ratio (Hong et al., 2025; Le & Phan, 2017).

H3: Profitability differs across leverage strategy regimes; Conservative/Prudent postures exhibit higher profitability than Aggressive/Risky strategies.

This hypothesis followed gradual adjustment and posture persistence arguments in the capital-structure literature (Chung et al., 2018; Cao et al., 2025).

H4: Liquidity moderates the leverage-profitability association, such that the marginal effect of leverage varied with liquidity posture.

This hypothesis aligned with evidence that working-capital buffers were valuable under constraints but costly when combined with financing frictions (Almeida & Eid, 2014; Box et al., 2018).

Together, these hypotheses align the paper's contribution with the modern literature's emphasis on heterogeneity: leverage is evaluated not only as a level but as a peer-relative strategy posture, and its profitability implications are examined jointly with liquidity and operating discipline.

3. DATA & METHODOLOGY

3.1. Data And Sample

This study uses firm-level financial statement data from the CMIE Prowess database for Indian

manufacturing firms, observed annually over the period 2014–2024. The core analyses are conducted on a balanced panel created by retaining firms with complete information for the variables required in the baseline model specifications. The final balanced sample comprises 2,665 firms and 29,315 firm–year observations. Dynamic specifications drop the first observation per firm when lagged profitability is included, so the effective sample is smaller.

All continuous variables are winsorised at the 1st and 99th percentiles (pooled, 2014–2024). This limits the influence of extreme values without discarding observations and follows common practice in large corporate panels (Renz et al., 2023). Consistent with the leverage strategy construction, leverage is winsorised prior to constructing the peer-relative leverage measure (Section 3.3).

Because profitability is typically persistent and financial policy variables may respond to profitability shocks and unobserved firm characteristics, the empirical strategy combines firm fixed-effects models with dynamic panel robustness. In short panels with firm fixed effects, including lagged profitability induces dynamic panel bias (Nickell, 1981). Dynamic GMM estimators address this issue and provide a structured internal-instrument framework when key regressors may be endogenous (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998; Bond, 2002).

3.2. Variables And Expected Signs

Table 1 summarises all variable definitions and construction. Profitability is measured primarily by return on assets (ROA), defined as net profit divided by total assets, consistent with standard accounting-based measures used in capital structure–performance research (Margaritis & Psillaki, 2010; Le & Phan, 2017). Robustness analyses use return on equity (ROE) and net profit margin (NPM) to capture equity-holder profitability and operating margin channels. This multi-metric approach aligns with the view that profitability reflects both margin and asset-utilisation mechanisms commonly organised through a DuPont-style interpretation (Chang et al., 2014; Novaes et al., 2025).

Leverage (Lev). Capital structure is measured as leverage (Lev), defined as total debt divided by total assets. While theory permits both positive and negative relationships, empirical evidence often indicates that sufficiently high leverage is associated with weaker accounting profitability when distress and related costs dominate (Hossain, 2021; Ibhagui & Olokoyo, 2018; Duguleană et al., 2024). Accordingly, the organising prior for Lev is negative with respect to profitability.

Liquidity and working-capital posture. Liquidity posture is proxied by net working capital scaled by total assets (NWCR_TA), where net working capital equals current assets minus current liabilities. Robustness analyses use alternative working-capital measures, including net working capital scaled by sales (NWCR_S) and the cash conversion cycle (CCC). Prior work links working-capital policy and liquidity buffers to firm value and profitability, particularly in the presence of financing constraints and operating frictions (Almeida & Eid, 2014; Baños-Caballero et al., 2014; Boisjoly et al., 2020; Zeidan & Shapir, 2017; Hassan et al., 2023; Zhou et al., 2025). In addition, trade credit policies connect working-capital posture to operating performance and financing behaviour, motivating joint modelling with leverage (Box et al., 2018). The expected sign of liquidity measures is therefore treated as positive on average, while the interaction with leverage is left to empirical evaluation.

Efficiency. Operating efficiency is proxied by asset turnover (ATR), defined as sales divided by total assets, and by fixed-asset turnover (FAT) in robustness analyses. These measures follow DuPont logic linking profitability to asset utilisation and operating discipline (Chang et al., 2014; Novaes et al., 2025). The organising prior for efficiency proxies is positive.

Controls. Controls include firm size (natural logarithm of total assets), firm growth (sales growth), and firm age (years since incorporation). These controls reduce confounding from scale and lifecycle differences that can correlate with both financial policy and performance (Lefebvre, 2024; Patel et al., 2022). Expected signs are treated as organising priors rather than causal restrictions.

Table 1: Variable Definitions, Construction, And Expected Signs.

Variable	Interpretation	Construction, units & transformations	Expected sign vs profitability (ROA / ROE / NPM)
Profitability variables (dependent variables)			
ROA	Return on assets (core profitability measure)	Net profit / Total assets.	+ (lag)
ROE	Return on equity (robustness DV)	Net profit / Net worth.	+ (lag)
NPM	Net profit margin (robustness DV)	Net profit / Sales.	+ (lag)

Capital structure and leverage strategy variables			
Lev	Leverage ratio	Total debt / Total assets. Unit: ratio.	−
ZLev	Leverage aggressiveness	Year-wise standardized leverage: (Lev − mean (Lev)_t) / sd(Lev)_t. Unit: z-score.	−
D_Con	Conservative leverage strategy	Dummy = 1 if ZLev < −1; 0 otherwise. Reference group: Prudent.	+
D_Agg	Aggressive leverage strategy	Dummy = 1 if 0 < ZLev < 1; 0 otherwise. Reference group: Prudent.	−
D_Risk	Risky leverage strategy	Dummy = 1 if ZLev ≥ 1; 0 otherwise. Reference group: Prudent.	−
Strat	Leverage strategy category (multinomial, for descriptives)	1 = Conservative; 2 = Prudent (base); 3 = Aggressive; 4 = Risky; mutually exclusive.	
Liquidity and working-capital variable			
NWCR_TA	Liquidity buffer (working capital scaled by assets)	Net working capital / Total assets	+
NWCR_S	Liquidity relative to sales	Net working capital / Sales.	+
CCC	Cash conversion cycle	DIO + DSO − DPO.	±
Efficiency variables			
ATR	Asset turnover	Sales / Total assets.	+
FAT	Fixed-asset turnover	Sales / Net fixed assets.	+
Control variables			
Growth	Sales growth	Annual percentage change in sales.	+
Size	Firm size	Natural log of total assets (ln (TA)).	+
Age	Firm age	Years since incorporation.	±
Transformations for interactions and centering			
Lev_c	Centered leverage	Lev − mean (Lev).	
NWCR_TA_c	Centered liquidity (assets scaled)	NWCR_TA − mean (NWCR_TA).	
ATR_c	Centered asset turnover	ATR − mean (ATR).	
Lev_NWCRTA	Leverage × liquidity interaction	Lev_c × NWCR_TA_c.	±
Lev_ATR	Leverage × asset-turnover interaction	Lev_c × ATR_c. Unit: leverage × turnover.	±
Lev_FAT	Leverage × fixed-asset-turnover interaction	Lev_c × FAT_c	±

Notes: All Continuous Variables Are Winsorised at the 1st And 99th Percentiles Over the Pooled 2014–2024 Panel. Cantered Variables Are Mean-Cantered Over the Full Sample to Reduce Multicollinearity in Interaction Terms.

3.3. Leverage Aggressiveness and Strategy Regimes

A key construct in this study is **leveraging aggressiveness**, a peer-relative measure that captures a firm's leverage position compared with contemporaneous manufacturing peers. This strategy lens is motivated by evidence that firms adjust leverage gradually toward targets and that monitoring and information environments influence capital-structure adjustment dynamics (Chung et al., 2018; Cao et al., 2025). A peer-relative measure remains interpretable even when sector-wide leverage shifts over time.

Leverage aggressiveness is computed as a year-wise standardised score based on winsorised leverage:

$$ZLev_{it} = \frac{\left(Lev_{w,it} - \mu_t\,(Lev_w)\right)}{\sigma_t(Lev_w)} \quad (Eq.1)$$

where $Lev_{w,it}$ is winsorised leverage for firm i in year t, and $\mu_t\,(Lev_w)$ and $\sigma_t(Lev_w)$ are the year-specific mean and standard deviation of winsorised leverage computed across the manufacturing sample $ZLev_{it} > 0$ indicates above-average leverage relative to peers in year t, while $ZLev_{it} < 0$ indicates below-average leverage.

Using ZLev, firm–year observations are grouped into four mutually exclusive leverage strategy regimes:

Conservative: ZLev < −1
Prudent (base category): −1 ≤ ZLev ≤ 0
Aggressive: 0 < ZLev < 1
Risky: ZLev ≥ 1

These cutoffs create economically interpretable deviation bands around each year's leverage distribution. Because the leverage–performance relationship is often characterised by non-linearities and threshold behaviour, robustness analyses can evaluate alternative cutoffs (e.g., quantile-based regimes) to confirm that conclusions do not depend on a specific threshold definition (Khémiri & Noubbigh, 2020; Hong et al., 2025).

3.4. Model Specification

The empirical analysis proceeds in four steps. First, pooled OLS regressions are estimated as descriptive baselines. Second, firm fixed-effects (FE) models with year dummies are used as the core

framework to absorb time-invariant firm heterogeneity and common macro shocks. Third, interaction models test whether the association between leverage and profitability varies with liquidity and efficiency. Fourth, dynamic System GMM models provide robustness to profitability persistence and endogeneity concerns for continuous leverage margins.

Fixed effects are preferred when unobserved firm characteristics correlate with financing and operating choices, and the FE estimator is supported as the appropriate specification under such correlation (Hausman, 1978). In pooled OLS and FE models, standard errors are heteroskedasticity-robust and clustered at the firm level. In dynamic models, two-step System GMM is estimated with Windmeijer-corrected robust standard errors (Windmeijer, 2005).

The baseline specification relates profitability to leverage, liquidity, efficiency, and controls:

$$\mathrm{ROA}_{i,t} = \alpha + \beta_1 \mathrm{Lev}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (Eq.2)$$

where $\mathrm{Controls}_{i,t}$ includes sales growth, firm size, and firm age; μ_i are firm fixed effects; λ_t are year effects; and $\varepsilon_{i,t}$ is the idiosyncratic error term.

To test peer-relative leverage posture, Lev is replaced by leverage aggressiveness:

$$\mathrm{ROA}_{i,t} = \alpha + \theta_1 \mathrm{ZLev}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (Eq.3)$$

To test discrete leverage strategy effects, the following strategy-regime specification is estimated with Prudent as the base category:

$$\mathrm{ROA}_{i,t} = \alpha + \delta_1 \mathrm{D\_Con}_{i,t} + \delta_2 \mathrm{D\_Agg}_{i,t} + \delta_3 \mathrm{D\_Risk}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (Eq.4)$$

The coefficients δ_1, δ_2, and δ_3 capture profitability differences associated with Conservative, Aggressive, and Risky strategies relative to the Prudent regime.

To assess whether liquidity conditions the leverage–profitability relationship, leverage and liquidity are mean-centred and interacted:

3.4.2. Interaction Models

$$\mathrm{ROA}_{i,t} = \alpha + \beta_1 \mathrm{Lev\_c}_{i,t} + \beta_2 \mathrm{NWCR\_TA\_c}_{i,t} + \beta_3 \left(\mathrm{Lev\_c}_{i,t} \times \mathrm{NWCR\_TA\_c}_{i,t}\right) + \beta_4 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (Eq.5)$$

Mean-centring supports interpretation and reduces multicollinearity: β_1 represents the leverage slope at average liquidity; β_2 represents the liquidity slope at average leverage; and β_3 captures how the leverage slope changes as liquidity varies.

An analogous specification evaluates whether efficiency moderates leverage effects:

$$\mathrm{ROA}_{i,t} = \alpha + \beta_1 \mathrm{Lev\_c}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR\_c}_{i,t} + \beta_4 \left(\mathrm{Lev\_c}_{i,t} \times \mathrm{ATR\_c}_{i,t}\right) + \gamma' \mathrm{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (Eq.6)$$

In robustness analyses, FAT replaces ATR and the interaction is constructed analogously.

3.5. Dynamic System GMM: Endogeneity Stance and Diagnostics

Profitability is expected to be persistent because of adjustment costs and firm capability accumulation. In panels with firm fixed effects, including lagged profitability generates Nickell bias (Nickell, 1981). Dynamic panel estimators based on GMM address this bias and allow internal instrumentation when regressors are potentially endogenous or predetermined (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998; Bond, 2002).

The baseline dynamic model is:

$$\mathrm{ROA}_{i,t} = \alpha + \rho \mathrm{ROA}_{i,t-1} + \beta_1 \mathrm{Lev}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \lambda_t + \nu_{i,t} \quad (Eq.7)$$

An alternative replaces Lev with leverage aggressiveness:

$$\mathrm{ROA}_{i,t} = \alpha + \rho \mathrm{ROA}_{i,t-1} + \varphi_1 \mathrm{ZLev}_{i,t} + \beta_2 \mathrm{NWCR\_TA}_{i,t} + \beta_3 \mathrm{ATR}_{i,t} + \gamma' \mathrm{Controls}_{i,t} + \lambda_t + \nu_{i,t} \quad (Eq.8)$$

The lagged dependent variable is treated as endogenous. Liquidity and efficiency controls, firm growth, firm size, firm age, and year dummies are entered in iv-style as baseline instruments, while leverage measures and interaction terms are treated as endogenous and instrumented with deeper lags. Two-step standard errors are reported (Windmeijer, 2005). To mitigate instrument proliferation, the instrument set is kept parsimonious and collapsed, consistent with established guidance for xtabond2-style implementations (Roodman, 2009a, 2009b). Diagnostic reporting includes Arellano–Bond tests for first- and second-order serial correlation in first differences (AR (1), AR (2)), and Hansen and Sargan tests of overidentifying restrictions (Arellano & Bond, 1991; Hansen, 1982; Sargan, 1958).

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Descriptive Statistics, Correlation Structure, And Leverage-Strategy Distribution

Table 2 reports summary statistics and illustrates how leverage, liquidity, and profitability vary across peer-relative leverage postures.

Table 2: Descriptive Statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	29315	0.035	0.073	-0.264	0.243
ROE	29312	0.083	0.291	-1.553	1.319
NPM	29315	1.266	12.888	-83.042	23.107
Lev	29315	0.333	0.242	0.002	1.409
ZLev	29315	0.000	1.000	-1.727	4.737
NWCR_TA	29315	0.102	0.226	-0.885	0.605
ATR	29315	1.279	0.752	0.107	4.344
Growth	28922	12.799	34.735	-57.784	199.916
Size	29315	7.758	1.635	1.723	16.090
Age	29315	31.177	17.215	3	162

Notes: Variable Definitions Follow Table 1.
Source: Author's Calculations (STATA)

Average profitability is modest (ROA = 0.035) and highly dispersed (SD = 0.073), consistent with wide heterogeneity in operating conditions across Indian manufacturing firms. Even after winsorisation, leverage varies markedly (mean = 0.333; SD = 0.242; max ≈ 1.409), suggesting a meaningful high-debt tail that may reflect different financing regimes and distress exposure (Duguleană et al., 2024; Wu et al., 2024). Liquidity is likewise dispersed: NWCR_TA averages 0.102 but ranges from -0.885 to 0.605 (Table 2). The identified range is consistent with the uneven access to external finance and the presence of firms with thin or negative working-capital buffers (Almeida & Eid, 2014; Banos-Caballero et al., 2014; Ukaegbu, 2014). Operational efficiency is also heterogeneous: ATR has a mean of 1.279 and varies from 0.107 to 4.344, indicating that differences in profitability are not purely a financing story but also reflect large cross-firm differences in asset utilisation (Chang et al., 2014; Novaes et al., 2025).

Table 3 shows strong negative correlations between ROA and both leverage measures (Lev and ZLev), and a positive correlation between ROA and liquidity.

Table 3: Correlation Matrix and Multicollinearity Diagnostics.
Panel A. Pearson Correlations.

	ROA	Lev	ZLev	NWCR_TA	ATR	Growth	Size	Age
ROA	1.000							
Lev	-0.489	1.000						
ZLev	-0.479	0.991	1.000					
NWCR_TA	0.453	-0.509	-0.493	1.000				
ATR	0.188	-0.071	-0.076	0.135	1.000			
Growth	0.152	0.002	0.005	0.016	0.114	1.000		
Size	0.139	-0.145	-0.124	-0.063	-0.263	-0.009	1.000	
Age	0.039	-0.099	-0.076	-0.016	-0.124	-0.083	0.234	1.000

Panel B. Variance Inflation Factors (VIF).

Regressor	VIF	1/VIF
Lev	1.430	0.700
NWCR_TA	1.400	0.715
Size	1.170	0.856
ATR	1.110	0.898
Age	1.080	0.930
Growth	1.020	0.981
Mean VIF	1.200	

Notes: Correlation Coefficients Are Rounded to Three Decimals. VIF Values Indicate No Serious Multicollinearity Among the Main Regressors (Mean VIF = 1.200).
Source: Author's Calculations (STATA)

ROA is strongly negatively correlated with both Lev and ZLev (approximately −0.48 to −0.49) and positively correlated with NWCR_TA. This descriptive pattern aligns with broad global evidence that aggressive debt positions frequently coincide with weaker accounting profitability once risk and distress channels are considered (Hossain, 2021; Ibhagui & Olokoyo, 2018), and with working-capital research linking liquidity buffers and working-capital policy to profitability and valuation, especially under financing frictions (Boisjoly et al., 2020; Zeidan & Shapir, 2017). These are descriptive

patterns (not causal), but they suggest that leverage effects are unlikely to be homogeneous across firms and years, motivating the fixed-effects and strategy-regime analyses (Hong et al., 2025; Khemiri & Noubbigh, 2020).

The study's strategy framing is most directly visible in the leverage-regime distribution and associated mean profiles reported in Table 4. The modal stance is Prudent (≈ 42% of firm-years), but Aggressive leverage is nearly as common (≈ 33%), and Risky leverage remains non-trivial (≈ 12%). This distribution indicates that Indian manufacturing firms frequently operate at debt positions meaningfully above the contemporaneous cross-sectional mean, which underscores why a peer-relative posture (ZLev) can be informative: it distinguishes being leveraged from being leveraged relative to the market's distribution.

Table 4 shows a clear profitability gradient across leverage strategies. Moving from Conservative to Risky, leverage increases sharply (Lev: 0.045 to 0.803) and ROA declines from 0.081 to -0.034. The Risky group also has much weaker margins (NPMw -11.8) and substantially worse liquidity (NWCR_TA: 0.254 to -0.101). In other words, the high-leverage tail is not just 'more debt', it is also the part of the distribution where liquidity buffers tend to thin out and profitability deteriorates. Asset turnover is not dramatically lower for Aggressive firms, but it drops in the Risky regime (ATR 1.065), suggesting that efficiency does not offset the fragility associated with extreme leverage postures (Chang et al., 2014; Novaes et al., 2025).

Table 4: Distribution Of Leverage Strategies and Mean Firm Characteristics.

Panel A. Strategy Distribution.

Strategy	Code	Freq.	Percent	Cum. %
Conservative	1	4033	13.760	13.760
Prudent	2	12299	41.950	55.710
Aggressive	3	9537	32.530	88.240
Risky	4	3446	11.760	100.000
Total		29315	100.000	

Panel B. Mean Firm Characteristics by Leverage Strategy.

Strategy	N	Lev	ZLev	ROA	ROE	NPM	NWCR_TA	ATR
Conservative	4033	0.045	-1.217	0.081	0.134	6.773	0.254	1.209
Prudent	12299	0.218	-0.474	0.049	0.100	3.542	0.137	1.316
Aggressive	9537	0.434	0.418	0.023	0.065	0.715	0.066	1.339
Risky	3446	0.803	1.959	-0.034	0.019	-11.781	-0.101	1.065
Total	29315	0.333	0.000	0.035	0.083	1.266	0.102	1.279

Notes: Strategy Classification Is Based on Year-Wise Leverage Aggressiveness: Zlev. Conservative: Zlev < −1; Prudent: −1 ≤ Zlev ≤ 0 (Base); Aggressive: 0 < Zlev < 1; Risky: Zlev ≥ 1. Values Are Rounded to Three Decimals.
Source: Author's Calculations (STATA)

Finally, Appendix Table A1 provides extended descriptive statistics (including medians and interquartile ranges) by strategy and corroborates that the monotone ranking observed in Table 4 is not driven by a small number of extreme observations.

4.2. Baseline Leverage–Profitability Estimates (ROA): Fixed Effects and Dynamic Robustness

The baseline econometric evidence is reported in Table 5, which contrasts pooled models and firm fixed-effects (FE) models and then presents a dynamic System GMM robustness specification. In Panel A, the leverage coefficient is large, negative, and precisely estimated in both pooled OLS and FE. As a conditional within-firm association (FE Model), a 0.10 increase in Lev is associated with roughly a 0.9 percentage-point lower ROA (−0.092 × 0.10), which is large relative to mean ROA (0.035). This suggests that increases in leverage within a firm over time are systematically associated with lower profitability. Such patterns are consistent with cross-country evidence that leverage often correlates negatively with accounting performance once distress and risk channels become salient (Hossain, 2021; Le & Phan, 2017) and with evidence from competitive emerging-market contexts in which higher debt can erode performance through distress costs and reduced strategic flexibility (Fosu, 2013).

Liquidity and operating efficiency behave as economically important covariates. Net working capital scaled by assets is strongly positive in FE ($\beta \approx 0.088$), consistent with a liquidity-buffer interpretation in settings where financing frictions and working-capital constraints matter for firm value and operating resilience (Almeida & Eid, 2014; Boisjoly et al., 2020; Zeidan & Shapir, 2017). Asset turnover is strongly positive ($\beta \approx 0.033$), aligning with DuPont-style reasoning that profitability differences reflect operating efficiency and asset utilisation (Chang et al., 2014). Growth and size are positive and

significant; age is economically small.

Table 5: Baseline Leverage–Profitability Models.

Panel A. Static Models.

	(1) POLS	**(2) FE**
Lev	-0.095*** (0.004)	-0.092*** (0.006)
NWCR_TA	0.090*** (0.004)	0.088*** (0.006)
ATR	0.015*** (0.001)	0.033*** (0.002)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.007*** (0.001)	0.010*** (0.002)
Age	0.000 (0.000)	0.000 (0.000)
Firm fixed effects	No	Yes
Year fixed effects	No	Yes
N (firm–years)	28,922	28,922
Firms	–	2,665
R^2 (overall/within)	0.351	0.253

Panel B. Dynamic Baseline Model.

	(3) System GMM
L.ROA	0.538*** (0.050)
Lev	0.008 (0.023)
NWCR_TA	0.070*** (0.011)
ATR	0.009*** (0.001)
Growth	0.000*** (0.000)
Size	0.005*** (0.001)
Age	0.000** (0.000)
Year fixed effects	Yes
N (obs)	26,650
Firms	2,665
Instruments	19
AR (1) p-value	0.000
AR (2) p-value	0.216
Hansen p-value	0.932
Sargan p-value	0.798

Notes: Robust Standard Errors in Parentheses, *** P<0.01, ** P<0.05, * P<0.10. Coefficients Are Shown to Three Decimals; Very Small Coefficients May Round To 0.000. Two-Step System GMM With Robust Standard Errors and Collapsed Instrument Sets.
Source: Author's Calculations (STATA)

Panel B of Table 5 reports the two-step System GMM specification. Profitability is strongly persistent (L.ROA ≈ 0.538), which is consistent with adjustment-cost and capability-based explanations for why profitability evolves gradually rather than responding fully within one year (Bond, 2002). Once dynamics and the internal-instrument structure are introduced, the contemporaneous leverage coefficient becomes statistically insignificant. This is not interpreted as a reversal of the FE evidence but as a short-run dynamic caution: the incremental one-year leverage change may be less informative than the firm's medium-run leverage posture and persistent profitability component. Such an interpretation is coherent with target adjustment and monitoring perspectives in which leverage changes occur gradually and are partly endogenous to unobserved shocks and adjustment frictions (Chung et al., 2018; Cao et al., 2025). Econometrically, diagnostic tests do not raise obvious concerns in this specification (AR (2) p = 0.216; Hansen/Sargan do not reject) and the instrument count is kept low (19), which helps avoid instrument proliferation issues (Roodman, 2009a, 2009b).

A final interpretive nuance is that even firm fixed effects and year effects cannot eliminate all time-varying confounds. Changes in ESG posture, governance quality, board composition, or reporting practices can co-move with both leverage and profitability; thus, even within-firm results should be read as disciplined conditional associations rather than definitive causal effects (Narula et al., 2024; Detthamrong et al., 2017; Hernández-Atienza et al., 2024; Renz et al., 2023). This motivates why the paper's contribution emphasises strategy gradients and joint-policy conditioning rather than single-coefficient causal claims. H1 is supported in the static FE specification (Lev is negative and statistically significant), but not supported in the dynamic System GMM specification where the contemporaneous Lev coefficient is not precisely estimated; accordingly, H1 is interpreted as evidence of a robust conditional association in levels rather than a sharp short-run causal effect.

4.3. Leverage Aggressiveness (Zlev) And Strategy Regimes:

Table 6 evaluates whether profitability is organised more clearly by peer-relative leverage posture and discrete leverage strategies than by the raw leverage ratio.

Panel A shows that leverage aggressiveness is strongly negatively associated with profitability in both pooled and FE specifications. The preferred FE estimate implies that a one standard deviation increase in ZLev lowers ROA by about 2.2 percentage points ($\theta \approx -0.022$). Given mean ROA of 0.035, a −0.022 change is economically substantial. This posture-based result is consistent with regime and threshold views of financing, where performance deteriorates more sharply beyond moderate leverage bands (Hong et al., 2025; Khémiri & Noubbigh, 2020).

Panel B further deepens the posture interpretation. Using Prudent strategy as the benchmark, the FE estimates imply a reduction in profitability as firms move into more aggressive regimes. Conservative firms are about +1.2 percentage points higher in ROA, Aggressive firms are about −1.5 percentage points. lower, and Risky firms are about −4.2 percentage points lower. These regime gaps are within the framework of liquidity and turnover controls. Thus, the ranking is not simply a by-product of working-capital shortfalls or weak utilisation. It is consistent with a financial stance, where being materially above the contemporaneous leverage distribution is associated with systematically weaker returns.

The strategy interpretation is strengthened by persistence evidence. Appendix Table A3 reports one-year transition probabilities and shows that leverage strategies are moderately persistent: approximately three-quarters to four-fifths of firm-years remain in the same strategy category year-over-year. This supports interpreting strategies as medium-run postures rather than transient noise, consistent with target adjustment and monitoring frameworks where capital structure evolves gradually and displays inertia (Chung et al., 2018; Cao et al., 2025).

In System GMM, the posture coefficient becomes insignificant, mirroring the baseline leverage result. This is consistent with the view that short-run changes in posture are less informative than persistent profitability and operating fundamentals (Bond, 2002). This is also consistent with evidence that low/zero leverage can reflect a flexibility posture with different performance implications than marginal year-to-year changes in debt ratios (Chang et al., 2025).

Table 6: Leverage Aggressiveness and Leverage Strategies (ROA).

Panel A. Leverage Aggressiveness (Zlev): Static Models.

	(1) POLS	**(2) FE**
ZLev	-0.023*** (0.001)	-0.022*** (0.002)
NWCR_TA	0.090*** (0.004)	0.089*** (0.006)
ATR	0.015*** (0.001)	0.033*** (0.002)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.007*** (0.001)	0.010*** (0.002)
Age	0.000 (0.000)	0.001*** (0.000)
Firm fixed effects	No	Yes
Year fixed effects	Yes	Yes
N (firm–years)	28,922	28,922
Firms	–	2,665
R^2 (overall/within)	0.352	0.254

Panel B. Discrete Leverage Strategies: Static Models (Base Regime Is Prudent).

	(3) POLS	**(4) FE**
D_Con (Conservative)	0.018*** (0.002)	0.012*** (0.002)
D_Agg (Aggressive)	-0.018*** (0.001)	-0.015*** (0.001)
D_Risk (Risky)	-0.052*** (0.002)	-0.042*** (0.003)
NWCR_TA	0.105*** (0.004)	0.107*** (0.006)
ATR	0.016*** (0.001)	0.034*** (0.002)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.007*** (0.001)	0.013*** (0.002)
Age	0.000 (0.000)	0.001*** (0.000)
Firm fixed effects	No	Yes
Year fixed effects	Yes	Yes
N (firm–years)	28,922	28,922
Firms	–	2,665
R^2 (overall/within)	0.338	0.241

Panel C. Dynamic Leverage Aggressiveness.

	(5) System GMM
L.ROA	0.539*** (0.051)
ZLev	0.001 (0.005)
NWCR_TA	0.068*** (0.011)
ATR	0.009*** (0.001)
Growth	0.000*** (0.000)
Size	0.005*** (0.001)
Age	0.000** (0.000)
Year fixed effects	Yes
N (obs)	26,650
Firms	2,665
Instruments	19
AR (1) p-value	0.000
AR (2) p-value	0.218
Hansen p-value	0.949
Sargan p-value	0.838

Notes: Robust Standard Errors in Parentheses, *** P<0.01, ** P<0.05, * P<0.10. Coefficients Are Shown to Three Decimals; Very Small Coefficients May Round To 0.000. Two-Step System GMM With Robust Standard Errors and Collapsed Instrument Sets.
Source: Author's Calculations (STATA)

Finally, the strategy gradients are particularly plausible in the Indian setting where governance mechanisms, business-cycle conditions, and organisational structures shape financing constraints and debt capacity. Governance and capital structure can jointly influence firm value and performance (Tripathi et al., 2024); group affiliation can shape capital structure and access to finance (Chakraborty, 2013); and leverage and performance relationships can vary across business-cycle states (Bandyopadhyay & Barua, 2016). The broader institutional environment can also influence capital structure choices through ownership and management structure channels (Zeitun et al., 2022). These India-specific features matter for interpretation because they shape both debt capacity and the speed at which firms can adjust leverage. The peer-relative classification benchmarks firms against the leverage environment each year, rather than treating leverage as a uniform level effect across heterogeneous firms and periods. The fixed-effects specification is preferred on standard Hausman logic because time-invariant firm characteristics are plausibly correlated with financing and operating choices (Hausman, 1978).

H2 is supported in static FE (ZLev is negative and statistically significant) but not in the dynamic System GMM model, while H3 is strongly supported: profitability differs monotonically across regimes, with Conservative/Prudent outperforming Aggressive/Risky strategies after controls.

4.4. Interaction Effects: Leverage × Liquidity

Table 7 examines whether the leverage–profitability association depends on liquidity posture. Fixed effects primarily reflect medium-run within-firm associations, whereas System GMM targets short-run marginal leverage changes under strong profitability persistence and internal instrumentation. It is therefore unsurprising that the standalone contemporaneous leverage coefficient weakens in System GMM. The persistence of a significant negative Lev×Liquidity interaction in both frameworks is more informative: it suggests leverage cannot be evaluated in isolation because profitability outcomes depend on the combined leverage–liquidity configuration. The FE model indicates that leverage and liquidity have the expected main effects—leverage negative, liquidity positive—but the key result is that the interaction term is negative and statistically significant. The interaction remains negative and significant in the System GMM specification, while profitability persistence is high (L.ROA ≈ 0.564), supporting the interpretation that the leverage penalty steepens as liquidity rises in the data.

Table 7: Interaction Of Leverage and Liquidity: Lev × NWCR_TA (ROA).

	(1) FE	**(2) System GMM**
L.ROA	—	0.564*** (0.052)
Lev_c	-0.099*** (0.006)	-0.030 (0.020)
NWCR_TA_c	0.097*** (0.006)	0.080*** (0.013)
Lev_NWCRTA	-0.042*** (0.011)	-0.161*** (0.040)
ATR	0.033*** (0.002)	0.010*** (0.001)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.011*** (0.002)	0.004*** (0.001)

Age	0.000 (0.000)	0.000 (0.000)
Firm fixed effects	Yes	–
Year fixed effects	Yes	Yes
N (obs)	28,922	26,650
Firms	2,665	2,665
R^2 (within)	0.255	–
Instruments	–	21
AR (1) p-value	–	0.000
AR (2) p-value	–	0.142
Hansen p-value	–	0.948
Sargan p-value	–	0.807

Notes: Robust Standard Errors in Parentheses, *** P<0.01, ** P<0.05, * P<0.10. Coefficients Are Shown to Three Decimals; Very Small Coefficients May Round To 0.000. Two-Step System GMM With Robust Standard Errors and Collapsed Instrument Sets.
Source: Author's Calculations (STATA)

The interaction model implies the following conditional marginal effect of leverage on profitability:

$$\frac{\partial \text{ROA}}{\partial \text{Lev}} = \beta_1 + \beta_3 \, \text{NWCR}_{\text{TA}} \, (\text{Eq. } 9)$$

where (NWCR_TA) is measured as the centred liquidity posture in the interaction specification.

Using the FE estimates as an illustrative calculation, ($\beta_1 \approx$-0.099) and ($\beta_3 \approx$-0.042). Thus, for a firm with liquidity one unit above the sample mean in the centred scale (i.e., (NWCR_TA_c =1)), the marginal leverage effect becomes approximately (-0.141), which is substantially more negative than the baseline. The same qualitative conclusion holds in System GMM, where the interaction coefficient is also strongly negative. Substantively, this suggests that leverage and working-capital policy operate as a joint financial strategy, not separable independent levers.

This result can be interpreted through multiple mechanism-consistent channels. First, joint-policy interpretations in the working-capital literature emphasise that liquidity buffers can be value-enhancing under constraints but also costly if financed or held inefficiently (Almeida & Eid, 2014; Zhou et al., 2025). Second, aggressive trade credit and operating working-capital policies can interact with financing structure to shape operating performance and fragility, implying that high-debt firms holding large working-capital positions may face a compounded profitability penalty (Box et al., 2018). Third, if economic policy uncertainty increases working-capital requirements, then firms may carry higher liquidity for precautionary reasons—but combining precautionary liquidity hoarding with high leverage can be value-destructive if debt servicing and liquidity carry costs jointly depress returns (Chang et al., 2024; Hu, 2025). Fourth, supply-chain pressures can intensify working-capital needs, which may amplify the adverse profitability consequences of high leverage during turbulent periods (Jantadej & Kotcharin, 2025).

Finally, governance and reporting channels matter for interpretation without changing the section's focus: firms with weaker reporting discipline or greater earnings management may exhibit liquidity and leverage configurations that appear "buffered" but are inefficiently deployed, complicating the profitability effects of holding working capital alongside debt (Sawarni et al., 2023). Board and governance structures can also shape both liquidity policy and financing policy, generating time-varying co-movements that FE models mitigate but do not fully eliminate (Hernández-Atienza et al., 2024; Renz et al., 2023). The central takeaway remains: the interaction result reinforces the paper's strategy lens by showing that leverage posture must be interpreted jointly with liquidity posture.

H4 is supported: the Lev×NWCR_TA interaction is negative and statistically significant in both FE and System GMM, implying that the marginal leverage effect on ROA varies systematically with liquidity posture

4.5. Interaction Effects: Leverage × Operating Efficiency

Table 8 evaluates whether operating efficiency moderates the leverage penalty. Across both the Lev×ATR model (Panel A) and the Lev×FAT robustness model (Panel B), operating efficiency contributes positively to profitability in FE specifications, consistent with DuPont-style logic and evidence that efficiency is a direct driver of operating performance (Chang et al., 2014; Novaes et al., 2025; Patel et al., 2022). However, the interaction terms (Lev×ATR and Lev×FAT) are economically small and statistically insignificant in both FE and System GMM specifications.

This pattern is substantively informative. It suggests that efficiency mainly raises the profitability level rather than altering the fundamental slope of the leverage–profitability relationship. In other words, higher turnover does not rescue firms from the profitability penalties associated with aggressive leverage strategies; it merely shifts performance upward conditional on leverage posture. This is

consistent with a reading in which excessive leverage imposes constraints (e.g., risk, distress exposure, reduced strategic flexibility) that are not offset by marginal changes in asset utilisation.

Table 8: Interaction Of Leverage and Efficiency.

Panel A. Lev × ATR.

	(1) FE	(2) System GMM
L.ROA	–	0.534*** (0.050)
Lev_c	-0.094*** (0.006)	0.010 (0.022)
ATR_c	0.033*** (0.002)	0.009*** (0.001)
Lev_ATR	-0.010 (0.006)	0.009 (0.016)
NWCR_TA	0.089*** (0.006)	0.069*** (0.012)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.010*** (0.002)	0.005*** (0.001)
Age	0.000 (0.000)	0.000** (0.000)
Firm fixed effects	Yes	–
Year fixed effects	Yes	Yes
N (obs)	28,922	26,650
Firms	2,665	2,665
R^2 (within)	0.253	–
Instruments	–	21
AR (1) p-value	–	0.000
AR (2) p-value	–	0.240
Hansen p-value	–	0.980
Sargan p-value	–	0.880

Panel B. Lev × FAT.

	(3) FE	(4) System GMM
L.ROA	–	0.571*** (0.050)
Lev_c	-0.103*** (0.006)	-0.003 (0.024)
FAT_c	0.001*** (0.000)	-0.001* (0.000)
Lev_FAT	0.000 (0.001)	-0.002 (0.002)
NWCR_TA	0.090*** (0.006)	0.068*** (0.012)
Growth	0.000*** (0.000)	0.000*** (0.000)
Size	0.002 (0.002)	0.003*** (0.001)
Age	0.001** (0.000)	0.000 (0.000)
Firm fixed effects	Yes	–
Year fixed effects	Yes	Yes
N (obs)	28,922	26,650
Firms	2,665	2,665
R^2 (within)	0.221	–
Instruments	–	21
AR (1) p-value	–	0.000
AR (2) p-value	–	0.178
Hansen p-value	–	0.934
Sargan p-value	–	0.801

Notes: Lev_FAT = Lev_C × FAT (Or FAT-Centered If Specified). FE Standard Errors Are Clustered by Firm (CID). System GMM Is Two-Step with Windmeijer Correction and Collapsed Instruments. *** P<0.01, ** P<0.05, * P<0.10.
Source: Author's Calculations (STATA)

A broader capability-channel nuance can be noted without shifting the subsection away from leverage strategy. Digitalisation, innovation culture, and technological leadership are increasingly documented as performance drivers that can raise productivity and profitability (Benedek et al., 2025; Li et al., 2025; Anokhin et al., 2021). These factors can co-move with efficiency and financing choices, which partly motivates the FE design. Nevertheless, the interaction evidence indicates that even after controlling for efficiency levels, the leverage-strategy gradient remains a distinct profitability dimension.

4.6. Robustness To Alternative Liquidity Proxies

Table 9 tests whether the main results are sensitive to the liquidity proxy used. Two findings stand out. First, the leverage penalty is robust: the FE coefficients on Lev remain strongly negative, and the posture coefficient on ZLev remains strongly negative across both CCC and sales-scaled liquidity controls. Second, sales-based liquidity (NWCR_S) is consistently positive and highly significant, whereas CCC is economically negligible and statistically insignificant.

Table 9: Alternative Liquidity Specifications.

	(1) Lev + CCC	(2) Lev + NWCR_S	(3) ZLev + CCC	(4) ZLev + NWCR_S
Lev	-0.131*** (0.006)	-0.115*** (0.006)	–	–
ZLev	–	–	-0.031*** (0.001)	-0.028*** (0.001)
CCC	0.000 (0.000)	–	0.000 (0.000)	–
NWCR_S	–	0.021*** (0.003)	–	0.021*** (0.003)
ATR	0.034*** (0.002)	0.035*** (0.002)	0.034*** (0.002)	0.035*** (0.002)
Growth	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Size	0.011*** (0.002)	0.011*** (0.002)	0.012*** (0.002)	0.011*** (0.002)
Age	0.001** (0.000)	0.001** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N (firm–years)	28,922	28,922	28,922	28,922
Firms	2,665	2,665	2,665	2,665
R^2 (within)	0.218	0.227	0.219	0.228

Notes: Each Alternative Liquidity Proxy Replaces NWCR_TA From the Baseline FE Specification. *** P<0.01, ** P<0.05, * P<0.10. Coefficients Are Shown to Three Decimals; Very Small Coefficients May Round To 0.000.
Source: Author's Calculations (STATA)

This robustness pattern aligns with two complementary interpretations. One interpretation emphasises that liquidity relative to the scale of operations (sales) captures a structural buffer that supports profitability and valuation under constraints, consistent with work linking working capital management to firm performance and value (Boisjoly et al., 2020; Zeidan & Shapir, 2017). Another econometric explanation is that after the FE address the persistent, firm-specific operating-cycle characteristics. The remaining within-firm variation in the Cash Conversion Cycle (CCC) reflects short-run noise (timing effects, reporting differences and component-level volatility) instead of meaningful changes in working-capital efficiency. Broader liquidity ratios, better explain the buffer available for operations.

This subsection also strengthens the strategy interpretation: because the ZLev penalty remains large under different liquidity controls, the paper's core claim—peer-relative leverage aggressiveness erodes profitability—does not hinge on a particular liquidity definition. Reporting and behavioural channels are relevant for why certain working-capital metrics behave differently: earnings management and reporting choices can affect the apparent efficiency of working-capital components and may weaken the interpretability of cycle-based measures relative to broader liquidity ratios (Sawarni et al., 2023). Finally, managerial ability can influence how effectively liquidity is converted into performance—e.g., whether working capital supports sales growth and margin stabilisation versus representing idle slack—supporting why sales-scaled buffers may carry more robust information than CCC in these models (Banerjee & Deb, 2023). As contextual corroboration that working-capital–performance linkages vary by operating environment, sector-specific evidence also reports heterogeneous impacts of working-capital management on firm performance (Chambers & Cifter, 2022).

4.7. Robustness To Alternative Profitability Measures and Dynamic-Panel Diagnostics

Tables 10 and 11 examine whether the "leverage strategies matter" conclusion survives when profitability is measured differently (ROE and NPM) and whether dynamic specifications remain well-behaved. In Table 10 Panel A (ROE as the dependent variable), continuous leverage proxies (Lev and ZLev) are negative but not precisely estimated. However, the strategy dummy hierarchy remains clear and economically meaningful: Conservative firms outperform prudent peers, while Aggressive and especially Risky strategies underperform, with the Risky penalty being large in magnitude. This supports the view that discrete strategy regimes capture persistent posture differences that may be more stable than the year-to-year movements in ROE.

Table 10: Static Robustness: Alternative Profitability Measures (FE).
Panel A. Dependent Variable: ROE.

	(1) Lev	(2) ZLev	(3) Strategies
Lev	-0.035 (0.030)	–	–
ZLev	–	-0.010 (0.007)	–
D_Con	–	–	0.032*** (0.006)
D_Agg	–	–	-0.033*** (0.006)

D_Risk	–	–	-0.086*** (0.017)
NWCR_TA	0.004 (0.030)	0.001 (0.030)	-0.024 (0.028)
ATR	0.089*** (0.008)	0.089*** (0.008)	0.085*** (0.008)
Growth	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Size	0.024** (0.010)	0.024** (0.010)	0.026*** (0.010)
Age	0.002* (0.001)	0.002** (0.001)	0.002** (0.001)
Firm FE / Year FE	Yes / Yes	Yes / Yes	Yes / Yes
N (firm–years)	28,919	28,919	28,919
Firms	2,665	2,665	2,665
R^2 (within)	0.023	0.024	0.027

Panel B. Dependent Variable: NPM

	(4) Lev	**(5) ZLev**	**(6) Strategies**
Lev	-12.648*** (1.163)	–	–
ZLev	–	-3.043*** (0.278)	–
D_Con	–	–	0.125 (0.288)
D_Agg	–	–	-1.166*** (0.225)
D_Risk	–	–	-6.209*** (0.599)
NWCR_TA	15.308*** (1.165)	15.344*** (1.166)	18.303*** (1.231)
ATR	4.305*** (0.380)	4.281*** (0.380)	4.521*** (0.378)
Growth	0.035*** (0.003)	0.035*** (0.003)	0.035*** (0.003)
Size	3.864*** (0.469)	3.894*** (0.470)	4.094*** (0.473)
Age	-0.253*** (0.058)	-0.130** (0.056)	-0.182*** (0.057)
Firm FE / Year FE	Yes / Yes	Yes / Yes	Yes / Yes
N (firm–years)	28,922	28,922	28,922
Firms	2,665	2,665	2,665
R^2 (within)	0.202	0.202	0.194

Notes: *** P<0.01, ** P<0.05, * P<0.10. Coefficients Are Shown to Three Decimals; Very Small Coefficients May Round To 0.000.
Source: Author's Calculations (STATA)

The decreased accuracy of Lev/ZLev on return-on-equity (ROE) models is in line with the mechanical properties of ROE. Even in the presence of a similar operating performance, minute changes in equity can cause significant changes in ROE. In short panels, the denominator sensitivity can make ROE more volatile than ROA-based models. Evidence on idiosyncratic and cash-flow volatility is consistent with this noisy equity-return channel (Pae et al., 2018), and distress exposure can further widen ROE dispersion for high-leverage firms (Wu et al., 2024). It is beneficial to use a strategy-regime model because it summarises the long-term position imbalance which is less sensitive to annual changes in the equity-base.

Table 10 Panel B (NPM) reinforces the core narrative: both Lev and ZLev are strongly negative, and Risky strategy firms experience a large margin penalty relative to Prudent firms. Liquidity and efficiency remain strongly positive covariates. This indicates that the profitability gradient by leverage posture is not confined to asset-based profitability; it also manifests in margin outcomes.

Dynamic robustness models are reported in Table 11. For ROE, the lagged dependent variable is positive but not strongly pinned down, and leverage coefficients remain imprecise. The dynamic models for ROE therefore mainly support the persistence/channel interpretation rather than providing sharp leverage effects. For NPM, the dynamic models show strong persistence and robust positive roles for liquidity and efficiency; however, AR (2) p-values around 0.015–0.016 suggest potential second-order serial correlation in differenced residuals. One plausible reason is that margin shocks and measurement noise can be more persistent than asset-based profitability, so differencing may leave residual serial correlation that violates the AR(2) condition even with a conservative instrument set. Consistent with dynamic-panel best practice, these specifications are treated as illustrative robustness checks rather than central identification evidence (Bond, 2002; Arellano & Bond, 1991; Roodman, 2009a, 2009b). A compact summary of System GMM diagnostics across models is provided in Appendix Table A2.

Table 11: Dynamic System GMM Robustness: ROE And NPM.

	(1) ROE–Lev	**(2) ROE–ZLev**	**(3) NPM–Lev**	**(4) NPM–ZLev**
L.DV	0.169 (0.112)	0.165 (0.113)	0.636*** (0.063)	0.634*** (0.063)
Lev	-0.030 (0.108)	–	2.342 (3.296)	–
ZLev	–	-0.013 (0.025)	–	0.529 (0.764)
NWCR_TA	0.044 (0.058)	0.031 (0.054)	10.789*** (1.899)	10.749*** (1.851)
ATR	0.036*** (0.005)	0.036*** (0.005)	0.737*** (0.167)	0.739*** (0.167)

Growth	0.001*** (0.000)	0.001*** (0.000)	0.080*** (0.005)	0.079*** (0.005)
Size	0.012*** (0.003)	0.012*** (0.003)	0.608*** (0.117)	0.607*** (0.115)
Age	0.000 (0.000)	0.000 (0.000)	0.011** (0.005)	0.011** (0.005)
N (obs)	26,645	26,645	26,650	26,650
Firms	2,665	2,665	2,665	2,665
Instruments	19	19	19	19
AR (1) p-value	0.000	0.000	0.000	0.000
AR (2) p-value	0.863	0.847	0.015	0.016
Hansen p-value	0.917	0.929	0.961	0.978
Sargan p-value	0.707	0.755	0.889	0.935

Notes: *** P<0.01, ** P<0.05, * P<0.10. Two-Step System GMM With Robust Standard Errors.
Source: Author's Calculations (STATA)

Finally, broader confounds can help interpret why ROE-based dynamics are noisier without shifting the paper away from leverage strategy. Governance structures and board composition can affect profitability and financing policies through monitoring, strategic oversight, and risk appetite, and these factors can vary over time even within firms (Detthamrong et al., 2017; Hernández-Atienza et al., 2024). Data and method discipline in governance-performance research also cautions against overconfident inference when constructs are noisy or mismeasured (Renz et al., 2023). Compensation structures and board demographic composition can shape operating and investment decisions that feed into equity returns, potentially weakening the precision of leverage coefficients in ROE models (Nagar & Arya, 2025; Staneva et al., 2025). Some drivers of profitability sit outside financing policy altogether. Customer satisfaction can affect margins, shifting profitability even if leverage is unchanged (Sun & Kim, 2013). The leverage results should be read as conditional within-firm associations, and why the regime-based posture interpretation is a safer framing than a single-coefficient causal claim. Sector fragility episodes documented in crisis contexts also show how value drivers and profitability can shift under stress, consistent with the interpretation that high-leverage regimes are more vulnerable to adverse shocks (Poretti & Heo, 2022).

4.8. Practical Implications

The findings translate into a simple monitoring rule for managers, lenders, and analysts: leverage levels matter, but peer-relative leverage posture matters more. In the fixed-effects results, profitability differences line up cleanly with strategy regimes. Using Prudent firms as the reference group, Conservative firms are about +1 percentage point higher in ROA, Aggressive firms are about -1.5 percentage points lower, and Risky firms are about -4 percentage points lower. In practice, this means leverage categories are not just labels. They summarise economically meaningful shifts in profitability that persist after controlling for liquidity and operating efficiency. This persistence is consistent with gradual capital-structure adjustment and medium-run stance behaviour, implying that a peer-relative "posture" metric can function as a practical early-warning signal (Chung et al., 2018; Cao et al., 2025).

The interaction results add that capital-structure assessment should be paired with liquidity assessment. The leverage penalty is not constant; it varies with working-capital posture. In other words, the profitability consequences of debt depend on the liquidity configuration the firm carries at the same time, which supports treating financing and working-capital policy as a joint decision rather than separate choices (Almeida & Eid, 2014; Zhou et al., 2025). From a valuation and credit-screening standpoint, this is important because liquidity buffers can protect operations under constraints, yet they also carry costs--and those costs appear more damaging when combined with aggressive leverage and weaker fundamentals (Boisjoly et al., 2020). Appendix A reports expanded strategy descriptives (Table A1), System GMM diagnostics (Table A2), and one-year strategy persistence evidence (Table A3).

5. CONCLUSION

This study evaluated leverage strategies, as peer-relative financial postures, are systematically related to profitability among Indian manufacturing firms. The classic capital-structure theory postulates for both value-enhancing and value-reducing mechanisms. Leverage, treated as a single continuous ratio, cannot explain these opposing forces. Thus, this study introduced a peer-relative strategy posture measure (ZLev) and mapped firms into discrete leverage strategy regimes. The analysis reframes leverage as a relative stance that can better reflect heterogeneity and regime-like differences in profitability.

The empirical results revealed a clear strategy gradient in profitability. Leverage levels were negatively associated with ROA in the fixed-effects specifications. The leverage posture measure and the

regime classifications further sharpened the interpretation that conservative and prudent stances are consistently more profitable than aggressive and risky stances. The contribution, therefore, is not only the presence of a leverage penalty, but the demonstration that a firm's position relative to its contemporaneous peers aligns closely with economically meaningful differences in profitability. This result fits naturally with regime/threshold arguments that leverage effects can change across regions of the leverage distribution (Hong et al., 2025).

The study indicated that capital structure and liquidity policy should be interpreted jointly. Liquidity buffers can protect operations under financing frictions, but they have an associated cost, especially if they are debt financed. The negative leverage-liquidity interaction supports a joint-policy view that the marginal profitability consequences of leverage depend on liquidity posture. Debt and working-capital decisions operate as an interacting bundle rather than separable levers (Zhou et al., 2025). This insight is particularly relevant in manufacturing, where working-capital needs are structurally important and uncertainty can elevate precautionary liquidity demand.

The dynamic robustness exercises reinforce an important discipline point. Profitability is persistent, and short-run leverage movements are not always precisely estimated once dynamics and endogeneity are explicitly handled. Rather than treating this as a contradiction, the overall pattern supports a careful reading: the leverage strategy gradient is primarily a medium-run posture/levels phenomenon that is most clearly visible in within-firm static models and regime comparisons, while dynamic models emphasise persistence and the central role of operating fundamentals. This framing keeps the paper's claims aligned with what the identification strategies can credibly support and strengthens the interpretation of leverage strategy as a sustained stance rather than a one-year shock.

The study had few limitations. While firm and year fixed effects account for time-invariant heterogeneity, the relationships are conditional and could be affected by time-varying confounding factors, like changes in governance or reporting mechanisms. The strategy taxonomy is based on year-wise cross-sectional standardisation. This improves peer comparability, but alternative threshold specifications or nonlinear model specifications might yield more accurate boundary estimates. Dynamic models indicate that short-run leverage changes are harder to identify precisely, so results are interpreted as a medium-run posture effect. Overall, the study contributes to the heterogeneity- and regime-oriented capital-structure literature by offering a practical strategy taxonomy grounded in peer-relative leverage positioning and demonstrating its relevance in India's manufacturing context. Practically, the findings imply that managers and lenders can use peer-relative leverage posture as a monitoring diagnostic: the firm's regime position may be more informative than leverage levels alone--particularly when evaluated together with liquidity posture.

Future work can refine the regime definitions using alternative threshold rules and examine whether the strategy gradient varies by ownership, governance quality, or business-cycle states in India (Tripathi et al., 2024). The joint-policy channel can be further explored by decomposing working-capital components and testing which liquidity mechanisms primarily drive the leverage-liquidity moderation effect (Zhou et al., 2025). Future endeavours can be made to connect the regime-based posture approach to explicit nonlinear or threshold estimation frameworks to test whether profitability exhibits discrete breakpoints across leverage regions, consistent with recent threshold-focused evidence (Hong et al., 2025).

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