# The Heterogenous Impact of Capital Structure Determinants: Evidence from an Emerging Economy

**Akhilesh Kumar Kamalakant Yadav[1], Ajaya Kumar Panda[2], Ciorstan Smark[3] and Apoorva Arunachal Hegde[4]**

## Abstract

*Purpose*: This study aims to capture the impact of firm-specific and macroeconomic variables on the capital structure of Indian companies from 2009-2021.
*Design/Methodology/approach: We* employ the Generalized Method of Moments (GMM) as the main estimation technique and establish robustness through a panel Tobit model.
*Findings:* The sectoral level analysis provides evidence for the heterogeneous impact of the determinant variables on the firms' leverage ratios. The results reveal that the firm-specific variables, specifically asset tangibility, effective tax rate, non-debt tax shield, net worth to total asset, firm size, net working capital ratio, liquidity, and macroeconomic variables, including foreign investment, economic growth, government borrowing, and interest rate exhibit a significant influence over capital structure.
*Research limitations/implications:* Our study provides vital implications for manufacturing companies' finance managers to evaluate the factors affecting their capital structure. From the findings, we recommend that managers of different sectors prioritize firm-specific factors while making decisions for capital structure. Additionally, policymakers could utilize our results to determine the behaviour of macroeconomic determinants in policy formulation and amendments.
*Originality/Value*: The sector-level analysis and the utilization of both firm-specific and macroeconomic variables in our model yields unique findings and recommendations to managers and policymakers.

**Keywords:** Capital Structure, Tobit Model, Pecking-order theory, GMM, Trade-off theory.

**JEL codes:** G32, C34, C58

[1] Research Scholar (Finance), Indian Institute of Management Mumbai, Mumbai, India. Email Id: akhilesh.yadav.2018@iimmumbai.ac.in
[2] Associate Professor (Finance), Indian Institute of Management Mumbai, Mumbai, India. Email Id: akpanda@iimmumbai.ac.in

[3] University of Wollongong, Australia.

[4] Research Associate, Institute for Sustainable Finance, Greater Toronto, Canada. Email Id: apoorvahegdebhat@gmail.com

## 1. Introduction

The research on capital structure has garnered significant attention from researchers since Modigliani and Miller (1958) proposed the irrelevance theory**.** Their theory argued that the firm value is irrelevant to a firm's capital structure composition. A firm's value primarily depends on its ability to utilize capital in the best possible way. The firms must decide on an optimum mix of financial sources to invest in profitable assets. If the capital structure is not given heed, it could lead to the liquidation of the firm since the factor of creation could also lead to its destruction. The discourse on the importance of capital structure originated from Modigliani and Miller's (1963) leverage model proposition in the presence of taxes. After that, extensive research in this area led to the inception of several critical theories that essentially explain the debt-equity choice made by the company's financial managers. These theories include 'the agency cost theory' (Jensen & Meckling, 1976), 'signalling theory' (Ross, 1977), 'static trade-off theory' (Bradley et al., 1984), 'pecking-order theory' (Myers & Majluf, 1984), and 'market timing theory' (Baker & Wurgler, 2002). Over the years, these theories have prompted researchers to study the impact of various internal or firm-specific factors and external or industry-specific and macroeconomic factors on the firm's capital structure composition.

Rathinasamy et al. (2000) studied the firm-specific financial data for 49 countries between 1987 and 1991, confirmed the agency theoretic risk shifting theory findings, and reported that firms with monopoly power have higher levels of long term and total debt. De Miguel and Pindado (2001) evidenced that the firm-specific factors impacting the capital structure of US firms have a strikingly different influence on Spanish firms' capital structure. In a similar study by Deesomsak et al. (2004), the capital structure varies among the firms located across the Asia Pacific region of Thailand, Malaysia, Singapore, and Australia, suggesting that the country-specific and firm-specific macroeconomic variables have a significant impact on the firms' managerial decisions. Meric et al. (2003), while researching the capital structure and dividend policy determinants of Japanese firms, found that dividend policy, business risk and profitability are key factors impacting the firms operating in the developed economy of Japan. Pandey and Chotigeat (2006) concluded that Asian firms have lower leverage ratios than firms in developed countries due to less developed markets and higher information asymmetry. They further reported that firm profitability and size positively impact the financial leverage of Asian firms. Jose Arcas and Baschiller (2008) studied capital structure determinants in the EU (European Union) companies and found that firm-specific characteristics, including size and tangibility, have a weaker impact on leverage. Karadeniz et al. (2011) found that neither the pecking order nor the trade-off theory explains the capital structure of Turkish lodging firms.

Furthermore, firm-specific factors such as firm size, net commercial credit, growth opportunity, free cash flow, and non-debt tax shield bear no impact on these companies' capital structure. Vo (2017), using the GMM model, studied the capital structure of firms in the emerging economy of Vietnam and confirmed that there is a difference in the factors affecting the long-term and short-term capital structure of Vietnamese firms. Saif-Alyousfi et al. (2020) explained that Malaysian firms' capital structure is positively associated with collaterals, earnings volatility, and non-debt tax shields. In contrast, it is negatively associated with liquidity, profitability, cash flow, and growth opportunities. They also supported the theory that the firm's age has a significant and inverse U-shaped association with capital structure. Rabbani (2020) studied the firm-specific determinants driving the capital structure of Japanese firms and found that the leverage ratios of private companies are significantly higher than those of public companies. Ahmed and Sabah (2021), in their study on the capital structure of 22 listed Oil and Gas companies of the Gulf Cooperation Council region, concluded that the firm leverage has a

significant positive relationship with tangibility and size, a significant negative relationship with profitability, and statistically insignificant relationship with the price to earnings ratio, growth in sales, and market to book value ratio.

Several studies have evidenced that country-specific variables significantly influence firms' capital structure decisions. Prasad, D. et al. (2007), in their study on the capital structure of European countries, reported the existence of dominant country effect on the firms' capital structure. Jõeveer (2013) explained that the macroeconomic indicators are the key determinants of variation in the unlisted European SMEs' capital structure. Chipeta & Deressa (2016) studied 412 non-financial firms from 12 Sub-Saharan African countries and found that the statistical significance and magnitude of the capital structure's predictor variables are more prominent in underdeveloped equity markets. They base their findings on the notion that these countries have underdeveloped financial markets with limited financing options and high transaction costs. According to the authors, the current economic conditions and economic development status are detrimental in determining the ways of accessing finance and the costs of raising it. Pandey and Chotigeat (2006), Yoo and Wu (2019) and Valer'evna (2021) found that the Capital structure of Malaysian, Korean and Russian firms, respectively, are strongly affected by macroeconomic factors, particularly the financial crises. In contrast, Tulcanaza Prieto et al. (2019) reported that external factors have very little statistical significance on the capital structure of large firms in Korea.

Basu (2015) states that an emerging economy, India, consists of a debt market predominantly denominated by banks and a superficial corporate bond market. Since the Indian economy observes significant bank domination, the transaction costs are lower for private debt than for public borrowings. Therefore, firms prefer debt over equity to finance their capital requirements. Kumar and Rao (2016) study the financing pattern of Indian SMEs and conclude that the firms prefer debt over equity due to information asymmetry, low profitability, and easy access to bank finance. Panda & Nanda (2020), in their comprehensive study of Indian manufacturing firms, explain that the magnitude of firm-specific and macroeconomic determinants of capital structure varies across the industry.

The above literature shows that the capital structure varies across firms depending on its determinant factors along with the country's industry and macroeconomic conditions. However, the concurrent impact of the firm-specific and macroeconomic factors on the firm's leverage ratio is scarcely studied. Moreover, most studies on capital structure utilize financial data from developed economies (Kumar & Rao, 2017). The research on the capital structure of the underdeveloped and emerging economy is still in the nascent stages. The current study strives to bridge this gap by identifying the firm-specific and macroeconomic determinants of capital structure among Indian companies.

This study is distinctive in several ways. Firstly, the focus on firms in India, which exhibits an inherent diversification in its institutional set-up, provides a unique perspective on the capital structure behaviour among the emerging economy's firms. Secondly, the study considers eight sectors of the Indian manufacturing industry. The study of capital structure behaviour distinguished among the individual manufacturing sectors gives scope to render sector-specific estimations as opposed to the generalized estimations evidenced in the existing studies (Mukherjee & Mahakud, 2010; Rani et al., 2019). Thirdly, the combination of firm-specific and macroeconomic variables utilized in this study to capture their effects on the firms' leverage ratio draws a broad picture of capital structure-function. Lastly, the study uses parametric and

semi-parametric regression methods to view the capital structure's key determinants comprehensively.

The paper is structured as follows: section 2 covers the theoretical underpinning and hypothesis formulation, and section 3 consists of the description of data, capital structure model, and estimation techniques. Section 4 discusses the findings, and Section 5 encompasses the conclusion.

## 2. Research Methodology

### 2.1 Data and Sampling

The data for firm-specific variables have been extracted from the database of 'The Centre for Monitoring Indian Economy (CMIE).' In contrast, the data for macroeconomic variables was gathered from the RBI database (Handbook of Statistics on Indian Economy). Following the traditional norm in the capital structure literature, we omit all the non-financial firms from the study due to their high regulation and policies for capital structure decisions. Therefore, the study's sample includes companies from eight sectors belonging to the capital-intensive manufacturing industry of the Indian Economy. The firms with missing variables were eliminated to prevent the estimation of biased results. Since 2007-2008, the Indian Government has taken reform measures to strengthen the economy and financial system; therefore, our study focuses on data from 2009 to 2021. The total number of companies initially collected is 15034, which after filtering was reduced to 2575 companies (Table 1). The dependent variables used in the study are short-term borrowing (STB) and long-term borrowing (LTB). Table 2 presents the expected relationship between the dependent and independent variables based on the theoretical underpinnings and empirical evidence. The regressors include a blend of firm-specific and macroeconomic variables (See Table 3 for the description of variables). After descriptive analysis, the majority of the firm-specific measures are found to be non-normally distributed, positively skewed, and leptokurtic across all eight sectors.

**Table 1. Number of Firms**

| SL No. | Sectors | Number of Firms |
|---|---|---|
| 1 | Chemical and Chemical Products | 380 |
| 2 | Construction Material | 186 |
| 3 | Consumer Goods | 320 |
| 4 | Food and Agro | 358 |
| 5 | Machinery | 314 |
| 6 | Metal and Metal Products | 443 |
| 7 | Textiles | 334 |
| 8 | Transport Equipment | 240 |
| **Total** | | **2,575** |

**Table 2. Expected relationship between leverage ratio and independent variables based on Theoretical Expectations and Empirical Evidence**

| Explanatory Variables | Empirical Evidence | Theoretical Expectation | Expected Relationship |
|---|---|---|---|
| ***Firm-Specific Explanatory Variables*** | | | |
| Asset tangibility (AST) | Booth et al. (2001) Zou and Xiao (2006), **(+)** | Agency theory (+)<br>Static Trade off theory (+)<br>Pecking Order Theory (-) | Positive **(+)** |
| Growth Rate (GR) | Chang et al., (2009), Köksal and Orman (2015) **(+),** Wellalage and Locke (2013) (-) | Agency theory (-)<br>Static Trade off theory (-)<br>Pecking Order Theory (+) | Negative **(-)** |
| Effective Tax Rate (ETR) | Huang (2006), Panda and Nanda, (2020) (+) | Static Trade off theory (+/-)<br>Pecking Order Theory (+) | Positive **(+)** |
| Non-debt tax shield (NDTS) | Deesomsak et al. (2004); Huang (2006) (-) | Agency theory (+)<br>Static Trade off theory (-)<br>Pecking Order Theory (-) | Negative **(-)** |
| Change in Free Cash Flow (ΔCF) | Frank and Goyal (2003);<br>Wellalage and Locke (2013);<br>Köksal and Orman (2015) (-) | Static Trade off theory (-)<br>Pecking Order Theory (-) | Negative **(-)** |
| Profitability (ROA) | Khémiri and Noubbigh (2018); Moradi and Paulet (2019); Panda and Nanda (2020) (-) | Agency theory (+)<br>Signaling theory (+)<br>Static Trade off theory (+)<br>Pecking Order Theory (-) | Negative **(-)** |
| Net worth (NWTA) | Moradi and Paulet (2019) **(-)** | Agency theory (+)<br>Static Trade off theory (-)<br>Pecking Order Theory (-) | Negative **(-)** |
| Net working capital (NWCR) | Sattar, (2019); Akbar et al. (2020) (-) | Pecking Order Theory (-) | Negative **(-)** |
| Debt Service coverage ratio (DSCR) | Eriotis et al. (2007); Handoo and Sharma, (2014) **(-)** | Static Trade off theory (-)<br>Pecking Order Theory (-) | Negative **(-)** |
| Firm Size (SIZE) | Handoo and Sharma (2014); Moradi and Paulet (2019); Wellalage and Locke (2013) **(+)** | Agency theory (+)<br>Static Trade off theory (+)<br>Pecking Order Theory (+/-) | Positive **(+)** |
| Liquidity (LIQ) | Deesomsak et al. (2004); Khémiri and Noubbigh (2018) **(-)** | Static Trade off theory (+)<br>Pecking Order Theory (-) | Negative **(-)** |
| ***Macroeconomic Explanatory Variables*** | | | |
| Change in net foreign Investment (ΔFINV) | Anwar and Sun (2014) **(-)**, Panda and Nanda (2020) **(+/-)** | Pecking Order Theory (-)<br>Static Trade off theory (-) | Negative **(-)** |

| | | | |
|---|---|---|---|
| Change in government Borrowings (ΔGB) | Gilchrist and Zakrajšek (2012); Graham et al., 2015) **(-);** Panda and Nanda (2020) **(+/-)** | Static Trade off theory (-) | Negative **(-)** |
| Economic growth (ΔINMI) | Mokhova and Zinecker (2013) **(+);** Köksal and Orman (2015) **(-)** | Static Trade off theory (-) | Positive **(+)** |
| Interest rate (INR) | Krainer (1977) (+)**;** Panda and Nanda (2020) **(+/-)** | Static Trade off theory (+/-) | Negative **(-)** |

**Table 3. Definition of Variables**

| Variables | Notation | Definition | Source of Data |
|---|---|---|---|
| **Dependent Variables** | | | |
| Short-term borrowing | STB | Short-term borrowing to total Assets. | CMIE & Author's Calculation |
| Long-term borrowings | LTB | Long-term borrowings to total Assets. | CMIE & Author's Calculation |
| ***Firm Specific Explanatory Variables*** | | | |
| Asset Tangibility | AST | The net fixed tangible assets divided by total assets. | CMIE & Author's Calculation |
| Growth Rate | GR | The year-on-year percentage of change of sales. | CMIE & Author's Calculation |
| Effective Tax Rate | ETR | The corporate tax expense divided by before tax operating income. | CMIE & Author's Calculation |
| Non-Debt Tax Shield | NDT | The ratio of depreciation to total assets. | CMIE & Author's Calculation |
| Change in Free Cash Flow | ΔCF | The change in Earnings Before Interest and Tax in addition to depreciation. | CMIE & Author's Calculation |
| Profitability | ROA | Return on Assets. | CMIE & Author's Calculation |
| Net Worth | NWTA | Measured by dividing Net worth by total assets. | CMIE & Author's Calculation |
| Net Working Capital | NWCR | Measured by dividing net working capital by total assets. | CMIE & Author's Calculation |
| Debt Service Coverage Ratio | DSCR | The ratio of net operating available to service the debt and debt service. | CMIE & Author's Calculation |
| Firm Size | SIZE | The log of total assets. | CMIE & Author's Calculation |
| Liquidity | LIQ | The ratio of current assets to current liability. | CMIE & Author's Calculation |
| ***Macroeconomic Explanatory Variables*** | | | |
| Change in Net Foreign Investment | ΔFINV | The year-on-year change in the total of net foreign direct investment (FDI) and net portfolio investment (FII). | RBI |
| Change in Government Borrowings | ΔGB | The change in 'net market borrowing of Centre and state Government' which includes dated securities and 364-day treasury bills and excludes Inflation Index National Savings Scheme. | RBI |
| Economic Growth | ΔINMI | The change in 'Index Numbers of Manufacturing Industries.' | RBI |
| Interest Rate | INR | The change in commercial banks' rate of lending. | RBI |

## 2.2 Capital Structure Model Specification

The regression specification used to test the nexus between the capital structures and their key determinants should best capture the affinity between them. The following capital structure model combines firm-specific and macroeconomic variables, which have a direct or indirect association with the dependent variable.

$$\mathrm{CS}_{it} = \alpha + \beta X_{it} + \lambda_t + \eta_i + \varepsilon_{it} \quad (1)$$

$$X_{it} = \beta_1 \mathrm{AST}_{it} + \beta_2 \mathrm{GR}_{it} + \beta_3 \mathrm{ETR}_{it} + \beta_4 \mathrm{NDT}_{it} + \beta_5 \Delta\mathrm{CF}_{it} + \beta_6 \mathrm{ROA}_{it} + \beta_7 \mathrm{NWTA}_{it} + \beta_8 \mathrm{NWCR}_{it} + \beta_9 \mathrm{DSCR}_{it} + \beta_{10} \mathrm{SIZE}_{it} + \beta_{11} \mathrm{LIQ}_{it} + \gamma_1 \Delta\mathrm{FINV}_{it-1} + \gamma_2 \Delta\mathrm{GB}_{it-1} + \gamma_3 \Delta\mathrm{INMI}_{it-1} + \gamma_4 \mathrm{INR}_{it-1} + \varepsilon_{it} \quad (2)$$

In the Equation 1, $\mathrm{CS}_{it}$ is the capital structure of a company' *i'* and time *'t.'* In this study $\mathrm{CS}_{it}$ is calculated from two measures, namely, short-term leverage ($\mathrm{STB}_{it}$) and long-term leverage ($\mathrm{LTB}_{it}$). $\lambda_t$ is the time dummy that captures the non-continuous impact of uncertain macroeconomic conditions such as business cycles, technological development, political instability, sector-specific conditions, and other variables on the firm's capital structure ratio. The model also includes the fixed effects ($\eta_i$) component, which is time invariant and aids in controlling the unobservable firm-specific characteristics. $\varepsilon_{it}$ is the model's error term.

$X_{it}$ (Equation 2) consists of the select capital structure determinants: $\mathrm{AST}_{it}$ represents the asset tangibility; $\mathrm{GR}_{it}$ is the growth opportunity; $\mathrm{ETR}_{it}$ is the effective tax rate; $\mathrm{NDT}_{it}$ represents the non-debt tax shield; $\Delta\mathrm{CF}_{it}$ is the change in the company's free cashflow; $\mathrm{ROA}_{it}$ indicates profitability; $\mathrm{NWTA}_{it}$ represents net worth to total assets ratio; $\mathrm{NWCR}_{it}$ is the net working capital to total assets ratio; $\mathrm{DSCR}_{it}$ is the debt service coverage ratio; $\mathrm{SIZE}_{it}$ represents the firm size; $\mathrm{LIQ}_{it}$ is the liquidity; $\Delta\mathrm{FINV}_{it-1}$ represents the change in net foreign investment; $\Delta\mathrm{GB}_{it-1}$ is the net government borrowing; $\Delta\mathrm{INMI}_{it-1}$ indicates economic growth and $\mathrm{INR}_{it-1}$ is the interest rate. All these variables belong to company' *i'* and time *'t.'*

## 2.3 Estimation Approach

Using panel data in capital structure studies' estimation poses a few challenges in econometric analysis. The complex combination of time-series and cross-sectional data encompasses the problems associated with both data structures. Therefore, an able estimator that tackles the issues of autocorrelation from time-series data and heteroskedasticity from cross-sectional data is required. Additionally, the data for capital structure studies are generally posed with the problems of unbalanced panel data, fractional dependent variable (debt ratio), and lagged dependent variable as a regressor (Elsas & Florysiak, 2011). To obtain unbiased estimations, we choose a two-step GMM model for the data analysis and a Panel Tobit model to establish the findings' robustness.

### 2.3.1 Generalized Method of Moments (GMM)

The two-step Generalized Method of Moments has been widely used for parameter estimations since the estimator is asymptotically normal, efficient, and consistent. Arellano and Bond (1991) introduced the GMM estimation technique, which considers the panel data's omitted variable bias, measurement errors, and unobserved panel heterogeneity. The GMM model is a dynamic estimator and controls for the endogeneity of the lagged explanatory variables in the panel data model, making it suitable for capital structure studies. The GMM technique is suitable for the current study since it functions well in the issues encountered in the study's

analysis: Dynamic panel data have large 'N' panels and small 'T'; explanatory variables are not strictly exogenous, indicating the possibility of endogeneity; heteroscedasticity; arbitrarily distributed fixed effects; and autocorrelation within the groups (N). The GMM panel model is given as follows,

$$CS_{it} = \delta\, CS_{i,t-1} + \beta X_{it} + \lambda_t + \eta_i + \varepsilon_{it} \quad (3)$$

Where, $CS_{it}$ is the dependent variable in the form of and $CS_{i,t-1}$ is the lagged form of the dependent capital structure variable. $\lambda_t$ is the dummy variable for time, $\eta_i$ is the unobservable fixed-effects component and $\varepsilon_{it}$ is the error term.
Substituting Equation (2) in (3), we get,

$$\begin{aligned}\mathrm{CS}_{it} = \alpha + \delta_1 CS_{it-1} + \beta_1 \mathrm{AST}_{it} + \beta_2 \mathrm{GR}_{it} + \beta_3 \mathrm{ETR}_{it} + \beta_4 \mathrm{NDT}_{it} + \beta_5 \Delta\mathrm{CF}_{it} + \beta_6 \mathrm{ROA}_{it} + \beta_7 \mathrm{NWTA}_{it} \\ + \beta_7 \mathrm{NWCR}_{it} + \beta_7 \mathrm{DSCR}_{it} + \beta_7 \mathrm{SIZE}_{it} + \beta_7 \mathrm{LIQ}_{it} + \gamma_1 \Delta\mathrm{FINV}_{it-1} + \gamma_2 \Delta\mathrm{GB}_{it-1} + \gamma_3 \Delta\mathrm{INMI}_{it-1} \\ + \gamma_4 \mathrm{INR}_{it-1} + \lambda_t + \eta_i + \varepsilon_{it}\end{aligned} \quad (4)$$

On employing short-term leverage ($\mathrm{STB}_{it}$) as the proxy for capital structure, Equation (4) is modified as follows,

$$\begin{aligned}\mathrm{STB}_{it} = \alpha + \delta_1 (\mathrm{STB})_{it-1} + \beta_1 \mathrm{AST}_{it} + \beta_2 \mathrm{GR}_{it} + \beta_3 \mathrm{ETR}_{it} + \beta_4 \mathrm{NDT}_{it} + \beta_5 \Delta\mathrm{CF}_{it} + \beta_6 \mathrm{ROA}_{it} + \beta_7 \mathrm{NWTA}_{it} + \\ \beta_7 \mathrm{NWCR}_{it} + \beta_7 \mathrm{DSCR}_{it} + \beta_7 \mathrm{SIZE}_{it} + \beta_7 \mathrm{LIQ}_{it} + \gamma_1 \Delta\mathrm{FINV}_{it-1} + \gamma_2 \Delta\mathrm{GB}_{it-1} + \gamma_3 \Delta\mathrm{INMI}_{it-1} + \gamma_4 \mathrm{INR}_{it-1} + \\ \lambda_t + \eta_i + \varepsilon_{it}\end{aligned} \quad (5)$$

On employing long-term leverage ($\mathrm{LTB}_{it}$) as the proxy for capital structure, Equation (4) is modified as follows,

$$\begin{aligned}\mathrm{LTB}_{it} = \alpha + \delta_1 (\mathrm{LTB})_{it-1} + \beta_1 \mathrm{AST}_{it} + \beta_2 \mathrm{GR}_{it} + \beta_3 \mathrm{ETR}_{it} + \beta_4 \mathrm{NDT}_{it} + \beta_5 \Delta\mathrm{CF}_{it} + \beta_6 \mathrm{ROA}_{it} + \beta_7 \mathrm{NWTA}_{it} + \\ \beta_7 \mathrm{NWCR}_{it} + \beta_7 \mathrm{DSCR}_{it} + \beta_7 \mathrm{SIZE}_{it} + \beta_7 \mathrm{LIQ}_{it} + \gamma_1 \Delta\mathrm{FINV}_{it-1} + \gamma_2 \Delta\mathrm{GB}_{it-1} + \gamma_3 \Delta\mathrm{INMI}_{it-1} + \gamma_4 \mathrm{INR}_{it-1} + \\ \lambda_t + \eta_i + \varepsilon_{it}\end{aligned} \quad (6)$$

### 2.3.2 Panel Tobit Model

The panel Tobit model was utilized in this study to establish the robustness of the GMM estimations. The Tobit model can be incorporated in studies with a dependent variable whose range is bound or has a fixed upper or lower limit. The Tobit model, developed by Tobin (1958), has been previously used in the study of determinants of dividend policy (Singhania & Gupta, 2012) and international variation (Aggarwal & Goodell, 2014). Previously, this technique has also been used in capital structure studies (Akthar, 2005; Homapour et al., 2022). The leverage ratio's fractional nature, the incorporation of a lagged dependent variable, and the unbalanced feature of panel data are treated by this technique without yielding an unbiased estimation. A standard Tobit model is given as

$$CS_{it}^{*} = \beta X_{it} + \varepsilon_{it} \quad for\ i = 1,2,3, \ldots \ldots N\ and\ t = 1,2,3, \ldots . . T_i \quad (7)$$

Where, $CS_{it}^{*}$ is the implied capital structure ratio and $\varepsilon_{it} = d_i + u_{it}$, $\left(d_i \sim NID(0, \sigma^2)\right)$; $(u_{it} \sim NID(0, \sigma^2))$. $X_{it}$ denotes the combination of firm-specific and macroeconomic variables that determine the capital structure of company' *i'* and time *'t.'*

The dependent variable in Equation (7) is represented as below,

$$CS_{it} = \begin{cases} CS_{it}^{*} \ if\ CS_{it}^{*} > 0 \\ 0 \ \ if\ CS_{it}^{*} \leq 0 \end{cases} \quad (8)$$

Where, $CS_{it}$ is a non-negative dependent variable and $CS_{it}^{*}$ is the latent variable.

The likelihood function for the standard Tobit model for data having N observation can be given as

$$L\,(\beta,\sigma) = \prod_{j=1}^{N}\left(\frac{1}{\sigma}\varphi\left(\frac{CS_j - X_j\beta}{\sigma}\right)\right)^{y_j}\left(1-\phi\left(\frac{X_j\beta - CS_L}{\sigma}\right)\right)^{1-y_j} \qquad (9)$$

The log likelihood of the standard Tobit model is given as follows,

$$Log\ L(\beta,\sigma) = \prod_{j=1}^{n} CS_j\ log\left(\frac{1}{\sigma}\varphi\left(\frac{CS_j - X_j\beta}{\sigma}\right)\right) + \left(1-\phi\left(\frac{X_j\beta - CS_L}{\sigma}\right)\right)$$

$$= \sum_{CS_j > CS_L} log\left(\frac{1}{\sigma}\varphi\left(\frac{CS_j - X_j\beta}{\sigma}\right)\right) + \sum_{CS_j > CS_L} log\left(\phi\left(\frac{CS_L - X_j\beta}{\sigma}\right)\right) \qquad (10)$$

Here, the probability density function is depicted by $\varphi$, and the standard normal cumulative distribution function is depicted by $\phi$. $CS_j$ is an indicator function, and $CS_L$ is the Tobit function censored from the lower limit. In the Tobit model (Equation 7), if the response variable $CS_{it}$ is affected by its lagged form, then the model is transformed to behave as a dynamic model.

## 3. Findings

The density distribution of several explanatory variables is found to be non-normal. Moreover, the results of the B&P test and Whites test (Tables 4 and 5) suggest the existence of heteroscedasticity in the data. However, the two-step GMM model handles the issues of heteroscedasticity, endogeneity, and autocorrelation. The Sargan (1958) test was ineffective in rejecting the null hypothesis among the select sectors, thus boosting the GMM model's validity. The results of GMM are presented in Tables 3 and 4. Furthermore, Table 7 provides a comprehensive view of the theoretically established relationships and derived relationships between the capital structure and its determinant variables.

### 3.1 Summary Statistics

The long-term and short-term leverages are the minimum in the textile sector and highest in the construction goods sector. Except for firm size, all the firm-specific variables are found to be highly skewed. Variables, including NWTA, ROA, NWCR, and INMI, have shown high negative skewness, while the remaining variables are positively skewed. Since the mean value is greater than the median, the positive skewness of most variables is confirmed. In all the sectors, among firm-specific variables, only firm size is closer to normal distribution. Among macroeconomic variables, INR, ΔFINV, and ΔGB consist of skewness and kurtosis closer to 0 and 3, respectively, which confirms their status close to normal distribution. According to the descriptive statistics, most of the firm-specific determinants of capital structure are found to be non-normally distributed, positively skewed, leptokurtic across all eight sectors.

**Table 4. GMM Results with STB as dependent Variables.**

| Independent Variables | Chemical & Chemical Products | Construction & materials | Consumer Goods | Food & Agro | Machinery & Products | Metals & Metal Products | Textile | Transport Equipment | All Sector |
|---|---|---|---|---|---|---|---|---|---|
| AST | 0.077*** | 0.193*** | 0.032*** | -0.545*** | -0.213*** | -0.192*** | -0.099*** | -0.062*** | 0.089*** |
| GR | -0.001*** | 0.002*** | -0.001*** | 0.004*** | 0.001*** | 0.013*** | -0.012*** | 0.011*** | -0.011*** |
| ETR | -0.001*** | 0.002*** | 0.421*** | 0.004*** | 0.002*** | 0.004*** | -0.003*** | 0.004*** | 0.742*** |
| NDT | 0.117*** | 0.768*** | 1.483*** | 1.005*** | -0.042*** | -0.177*** | -0.014*** | 0.035*** | 1.312*** |
| CF | 0.011*** | 0.002*** | -0.001*** | 0.003*** | 0.002*** | 0.003*** | 0.002*** | 0.003*** | 0.003*** |
| ROA | 0.002*** | 0.003*** | -0.059*** | -0.032*** | -0.013*** | 0.001*** | -0.012*** | 0.001*** | -0.004*** |
| NWTA | -0.059*** | -0.036*** | 0.063*** | -1.005*** | -0.115*** | -0.316*** | -0.027*** | -0.187*** | 0.671*** |
| NWCR | -0.157*** | -0.348*** | -0.609*** | 1.415*** | -0.271*** | -0.114*** | -0.324*** | -0.145*** | -0.589*** |
| DSCR | -0.0011*** | 0.001*** | 0.002*** | -0.002*** | 0.001*** | -0.002*** | -0.001*** | 0.003*** | 0.012*** |
| SIZE | 0.002*** | -0.308*** | 2.995*** | -0.932*** | -0.273*** | -0.715*** | -0.034*** | -0.084*** | 7.008*** |
| LIQ | 0.012*** | 0.003*** | 0.059*** | 0.031*** | 0.002*** | -0.011*** | 0.003*** | 0.001*** | 0.004*** |
| FINV | 0.003*** | 0.005*** | 0.005*** | 0.001*** | 0.003*** | 0.011*** | 0.011*** | 0.002*** | -0.009*** |
| GB | 0.001*** | 0.001*** | 0.002*** | 0.001*** | -0.003*** | -0.002*** | 0.001*** | 0.003*** | 0.005*** |
| INMI | 0.002*** | 0.006*** | 0.003*** | 0.004*** | -0.013*** | -0.012*** | 0.009*** | 0.002*** | 0.008*** |
| INR | 0.078*** | 0.011*** | -0.001*** | -0.004*** | 0.003*** | -0.004*** | 0.003*** | 0.001*** | 0.111*** |
| Constant | 0.224*** | 0.777*** | -9.501*** | 2.903*** | 1.094*** | 2.008*** | 1.002*** | 0.005*** | -9.107*** |
| ***Post-Estimation Test*** | | | | | | | | | |
| Wald $Chi^2$ | 1110.00*** | 1223.00*** | 2033.00*** | 1233.00*** | 1625.00*** | 1195.04*** | 2259.09*** | 1368.40*** | 3651.00*** |
| Sargan test | 69.71 | 71.16 | 68.47 | 69.26 | 72.15 | 71.63 | 68.32 | 70.29 | 71.36 |
| ***Pre-Estimation Test*** | | | | | | | | | |
| BP test | 289.00*** | 439.26*** | 891.87*** | 613.80*** | 731.19*** | 612.21*** | 221.20*** | 118.89*** | 456.11*** |
| Whites Test | 472.11*** | 338.73*** | 434.00*** | 474.22*** | 417.22*** | 573.00*** | 309.25*** | 236.23*** | 334.04*** |
| IM Test | 494.02*** | 475.69*** | 502.23*** | 523.95*** | 555.82*** | 623.00*** | 257.92*** | 162.09*** | 371.00*** |
| Mean VIF | 2.18 | 3.89 | 4.1 | 5.41 | 2.13 | 2.28 | 1.96 | 2.18 | 3.64 |

***Note:*** *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi2 statistics present an overall significance level of the model that all the coefficients of the model are significantly other than zero. The Sargan test analyses whether the overidentification restrictions are valid. B & P and White's Test are the diagnostic tests for heterogeneity. B & P or Breusch-Pagan / Cook-Weisberg test for heteroskedasticity with $H_0$: Constant variance and White's Test tests the null hypothesis ($H_0$): Homoskedasticity against $H_1$: unrestricted heteroskedasticity, and finally mean VIF reports presence of multicollinearity, where values greater than 10 often regarded as sign of multicollinearity.*

***Table 5. GMM Results with LTB as dependent Variable.***

| Independent Variables | Chemical & Chemical Products | Construction & materials | Consumer Goods | Food & Agro | Machinery & Products | Metals & Metal Products | Textiles | Transport Equipment | All Sectors |
|---|---|---|---|---|---|---|---|---|---|
| AST | 0.118*** | 0.206*** | -0.333*** | 0.004*** | 0.145*** | 0.203*** | 0.103*** | 0.216*** | -0.017*** |
| GR | 0.002*** | -0.002*** | 0.004*** | 0.002*** | 0.001*** | 0.002*** | 0.005*** | -0.011*** | -0.002*** |
| ETR | -0.001*** | -0.002*** | -0.109*** | -0.011*** | 0.007*** | -0.006*** | -0.001*** | -0.005*** | 0.004*** |
| NDT | 0.042*** | 0.111*** | 0.118*** | 0.034*** | -0.021*** | -0.056*** | -0.077*** | -0.062*** | 1.066*** |
| CF | 0.001*** | 0.002*** | 0.002*** | 0.001*** | 0.001*** | 0.002*** | -0.002*** | 0.001*** | 0.002*** |
| ROA | -0.011*** | -0.001*** | -0.031*** | 0.012*** | -0.012*** | 0.001*** | 0.003*** | -0.003*** | 0.006*** |
| NWTA | -0.679*** | -0.247*** | 0.609*** | -0.982*** | -0.794*** | -0.481*** | -0.862*** | -0.113*** | 0.001*** |
| NWCR | 0.097*** | -0.015*** | -0.550*** | 0.167*** | 0.111*** | -0.110*** | 0.058*** | 0.119*** | -0.062*** |
| DSCR | -0.002*** | 0.002*** | -0.002*** | -0.001*** | 0.002*** | -0.001*** | -0.001*** | 0.001*** | 0.001*** |
| SIZE | -0.007*** | -0.304*** | 4.712*** | -1.907*** | -0.116*** | -0.230*** | -0.077*** | -0.072*** | 4.01*** |
| LIQ | 0.002*** | -0.001*** | 0.033*** | 0.091*** | 0.011*** | -0.011*** | 0.009*** | 0.003*** | 0.079*** |
| FINV | 0.001*** | -0.001*** | -0.004*** | -0.002*** | -0.001*** | 0.001*** | -0.001*** | 0.001*** | -0.001*** |
| GB | 0.002*** | 0.001*** | 0.002*** | 0.002*** | -0.002*** | -0.001*** | 0.002*** | -0.003*** | 0.002*** |
| INMI | 0.002*** | 0.001*** | 0.007*** | -0.001*** | -0.002*** | -0.002*** | 0.001*** | -0.003*** | 0.001*** |
| INR | 0.001*** | 0.001*** | -0.011*** | -0.003*** | -0.003*** | 0.002*** | 0.002*** | 0.002*** | 0.056*** |
| Constant | 0.28*** | 0.63*** | -9.23*** | 3.701*** | 2.002*** | 2.071*** | 1.11*** | 0.95*** | -3.98*** |
| ***Post-Estimation Test*** | | | | | | | | | |
| Wald $Chi^2$ | 2007.00*** | 1901.00*** | 1038.20*** | 1560.00*** | 1450.00*** | 1113.00*** | 1470.32*** | 1571.0*** | 1043.00*** |
| Sargan test | 84.74 | 91.27 | 54.03 | 43.14 | 89.11 | 57.04 | 72.88 | 66.97 | 729.47 |
| ***Pre-Estimation Test*** | | | | | | | | | |
| BP test | 288.00*** | 344.13*** | 823.05*** | 149.00*** | 208.60*** | 705.00*** | 199.44*** | 563.39*** | 175.00*** |
| Whites Test | 493.10*** | 244.00*** | 415.65*** | 466.00*** | 395.03*** | 573.00*** | 411.68*** | 308.15*** | 334.80*** |
| IM Test | 495.32*** | 259.61*** | 492.03*** | 481.76*** | 501.80*** | 622.12*** | 337.18*** | 201.07*** | 376.70*** |
| Mean VIF | 2.18 | 3.89 | 4.1 | 5.41 | 2.13 | 2.28 | 1.96 | 2.18 | 3.64 |

***Note:*** *The Superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi2 statistics present an overall significance level of the model that all the coefficients of the model are significantly other than zero. The Sargan test analyses whether the overidentification restrictions are valid. B & P and White's Test are the diagnostic tests for heterogeneity. B & P or Breusch-Pagan / Cook-Weisberg test for heteroskedasticity with $H_0$: Constant variance and White's Test tests the null hypothesis ($H_0$): Homoskedasticity against $H_1$: unrestricted heteroskedasticity, and finally mean VIF reports presence of multicollinearity, where values greater than 10 often regarded as sign of multicollinearity.*

***Table 6. TOBIT Results with STB as dependent Variable***

| Independent Variables | Chemical & Chemical Products | Construction & materials | Consumer Goods | Food & Agro | Machinery & Products | Metals & Metal Products | Textiles | Transport Equipment | All Sectors |
|---|---|---|---|---|---|---|---|---|---|
| AST | 0.066*** | 0.178*** | 0.029*** | -0.696*** | -0.075*** | 1.014*** | -0.187*** | 1.014*** | -0.177*** |
| GR | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.002*** | 0.004*** | -0.001*** | -0.001*** | -0.003*** |
| ETR | -0.001*** | 0.004*** | 0.388*** | 0.163*** | -0.001*** | -0.110*** | 0.001*** | -0.110*** | 0.548*** |
| NDT | 0.118*** | 1.034*** | 1.387*** | 1.371*** | -0.075*** | -1.320*** | -0.006*** | -1.320*** | 1.457*** |
| CF | 0.004*** | -0.003*** | -0.001*** | -0.001*** | 0.001*** | 0.003*** | 0.001*** | -0.001*** | 0.001*** |
| ROA | -0.001*** | -0.005*** | -0.034*** | 0.030*** | -0.002*** | 0.002*** | -0.002*** | 0.002*** | -0.152*** |
| NWTA | -0.291*** | 0.100*** | 0.118*** | -0.513*** | -0.054*** | -0.452*** | 0.001*** | -0.452*** | 0.563*** |
| NWCR | -0.064*** | -0.517*** | 0.022*** | -0.445*** | -0.785*** | -0.129*** | -0.393*** | -0.129*** | -0.363*** |
| DSCR | 0.001*** | 0.002*** | 0.001*** | -0.005*** | 0.001*** | -0.002*** | 0.007*** | -0.002*** | -0.002*** |
| SIZE | -0.024*** | -0.211*** | 1.117*** | 0.160*** | -0.102*** | -0.256*** | -0.115*** | -0.256*** | 1.045*** |
| LIQ | 0.004*** | 0.009*** | 0.014*** | 0.026*** | 0.202*** | 0.087*** | 0.001*** | 0.087*** | 0.011*** |
| FINV | -0.001*** | 0.003*** | 0.001*** | -0.005*** | 0.002*** | -0.002*** | -0.001*** | -0.002*** | 0.002*** |
| GB | 0.007*** | 0.002*** | 0.003*** | 0.006*** | 0.003*** | 0.009*** | 0.005*** | 0.001*** | -0.002*** |
| INMI | 0.003*** | 0.010*** | 0.020*** | 0.008*** | 0.003*** | -0.008*** | 0.001*** | -0.008*** | 0.075*** |
| INR | 0.005*** | -0.001*** | 0.069*** | -0.022*** | 0.015*** | 0.008*** | 0.008*** | 0.008*** | -0.108*** |
| Constant | 0.262*** | 0.455*** | -4.206*** | -0.181*** | 0.192*** | 1.053*** | 0.607*** | 1.053*** | -2.508*** |
| Wald $Chi^2$ | 116.00*** | 164.00*** | 117.00*** | 473.00*** | 435.00*** | 122.00*** | 348.00*** | 122.00*** | 284.00*** |

*Note: The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi2 statistics present an overall significance level of the model that all the coefficients of the model are significantly other than zero.*

***Table 7. TOBIT Results with LTB as dependent Variable***

| Independent Variables | Chemical & Chemical Products | Construction & materials | Consumer Goods | Food & Agro | Machinery & Products | Metals & Metal Products | Textiles | Transport Equipment | All Sectors |
|---|---|---|---|---|---|---|---|---|---|
| AST | 0.161*** | 0.554*** | -0.247*** | -2.407*** | 0.257*** | 2.276*** | 0.196*** | 2.276*** | -0.339*** |
| GR | 0.003*** | 0.004*** | 0.001*** | 0.009*** | 0.004*** | -0.002*** | 0.002*** | 0.002*** | 0.005*** |
| ETR | -0.004*** | 0.012*** | -0.068*** | 0.906*** | -0.005*** | -0.980*** | 0.001*** | -0.980*** | 0.752*** |
| NDT | 0.073*** | 0.405*** | 2.091*** | 4.896*** | -0.030*** | -7.427*** | 0.017*** | -7.427*** | 2.115*** |
| CF | 0.002*** | 0.009*** | 0.001*** | -0.002*** | 0.003*** | -0.006*** | 0.002*** | -0.006*** | -0.001*** |
| ROA | -0.001*** | -0.018*** | -0.056*** | 0.655*** | -0.002*** | -0.003*** | 0.002*** | -0.003*** | -0.101*** |
| NWTA | -0.707*** | 0.184*** | 1.823*** | -5.972*** | -0.800*** | -0.867*** | -0.940*** | -0.867*** | 2.009*** |
| NWCR | -0.015*** | -0.148*** | -2.289*** | -6.033*** | 0.022*** | -0.523*** | 0.309*** | -0.523*** | -2.512*** |
| DSCR | -0.001*** | 0.001*** | 0.008*** | -0.007*** | 0.003*** | -0.002*** | 0.001*** | -0.002*** | -0.001*** |
| SIZE | 0.002*** | -0.278*** | 0.269*** | 3.494*** | -0.106*** | -0.528*** | 0.059*** | -0.528*** | 0.868*** |
| LIQ | 0.006*** | -0.011*** | 0.028*** | 0.152*** | 0.075*** | 0.592*** | 0.004*** | 0.592*** | 0.077*** |
| FINV | -0.001*** | -0.005*** | -0.001*** | -0.016*** | 0.003*** | -0.002*** | 0.002*** | -0.002*** | -0.001*** |
| GB | 0.003*** | 0.003*** | 0.005*** | -0.028*** | -0.005*** | -0.004*** | 0.002*** | -0.004*** | 0.004*** |
| INMI | 0.001*** | 0.010*** | 0.043*** | -0.159*** | -0.003*** | -0.049*** | 0.002*** | -0.049*** | 0.049*** |
| INR | -0.003*** | 0.024*** | -0.019*** | -0.543*** | 0.001*** | -0.023*** | 0.005*** | -0.023*** | -0.090*** |
| Constant | 0.508*** | 0.677*** | -1.026*** | -5.615*** | 0.748*** | 3.106*** | 0.385*** | 3.106*** | -2.702*** |
| Wald $Chi^2$ | 140.00*** | 948.00*** | 669.00*** | 231.30*** | 145.00*** | 105.00*** | 365.59*** | 105.00*** | 375.00*** |

***Note:*** *The superscript ***, ** and * indicate the level of significance at 1%. 5% and 10% level respectively. Wald Chi2 statistics present an overall significance level of the model that all the coefficients of the model are significantly other than zero.*

## 3.2 Empirical Findings

The GMM and Tobit model results suggest that the determinant variables of short-term and long-term leverage vary in size and magnitude across all sectors. Asset tangibility is documented as a critical determinant for all eight sectors of manufacturing industries; however, the results are assorted in terms of sign and magnitude. Consistent with the findings of Viviani (2008) and Rathinasamy et al. (2013), the short-term leverage of chemical, construction, and consumer goods sectors and the long-term leverage of all sectors except consumer and food & agro sectors are positively influenced by AST. The increase in asset tangibility reduces both STB of the food & agro, machinery, metals & metal products, textiles and transportation sectors and LTB of consumer and food & agro sectors (Mukherjee & Mahakhud, 2010). Along the lines of Eriotis et al. (2007) and Wellalage and Locke (2013), the growth rate of firms from the chemical and textile sectors negatively influences their short-term leverage. However, it has a weak positive impact on LTB in the chemical, consumer, food & agro, machinery, metal, and textile sectors.

Supporting the findings of Huang (2006), the effective tax rate is found to have a significant positive influence on the STB of firms from the construction, consumer, and food & agro sectors. However, chemical, consumer goods, construction, metals and metal products, machinery, textiles, and transport manufacturing firms demonstrate a negative relationship between the effective tax rate and the long-term leverage ratio. The results maintain the agency cost theory's predictions, where the short-term leverage ratio of the Indian firms has a strong and positive association with NDT. However, the machinery and metal sector has shown a significant negative relationship between short-term leverage and NDT, confirming the findings of Beneish (1999) and Korajczyk and Levy (2003). Concerning LTB, supporting empirical findings of Deesomsak et al. (2004) and Huang (2006), firms belonging to machinery, metals & metal products, textiles, and transport sectors bear a negative influence from NDTS.

Contrary to the assumptions of the null hypothesis, the estimation shows that the change in free cash flow has a feeble but positive impact on the LTB of the firms from chemical & chemical products, construction material, consumer goods, metals, machinery, and transportation sectors. Nevertheless, manufacturing firms in the food & agro sector do not reject null hypotheses and exhibit a negative influence of cashflow on LTB. Profitability, measured by the return on assets, has shown a weak positive relationship with STB of chemical, construction, metal, and transport equipment sector firms and with LTB of food & agro and textile sector firms. In line with the evidence of Jõeveer (2013) and Prieto and Lee (2019), an increase in profitability has reduced the short-term leverage ratio of firms from consumer goods, food & agro, machinery, and textile sectors, thus supporting the prediction of the pecking-order theory.

While backing the evidence of Moradi and Paulet (2019), NWTA (net worth to total assets) of all the sectors of the Indian manufacturing industry except that of the consumer goods sector has shown a negative impact on both the short-term and long-term leverage ratio. However, the GMM regression results of the overall manufacturing industry exhibit a positive association of NWTA with both leverage ratios. This may be attributed to the higher number of firms having a direct and positive relationship between NWTA and LTB compared to the ones with an inverse relation. According to Sattar (2019), Akbar et al. (2020), and the predictions of the pecking order theory, there is a negative effect of a firm's net working capital to total asset ratio (NWTA) on the leverage of the firm. From the results of the select estimators, it is evident that

the capital structure of the firms belonging to the food & agro, construction material, consumer goods, metals, and transport equipment sectors demonstrate a negative influence of NWTA on LTB.

Only the firms' STB of the food & agro sector and LTB of chemical & chemical products, machinery, and textile sectors have shown a positive relationship between the working capital and debt. An increase in working capital suggests higher production activity, which compels the firms to borrow more to fulfil their funding requirements while supporting the industrial expansion**.** The increased variable DSCR leads to enhanced borrowing capacity, which supports the positive relationship between DSCR and debt (Eriotis et al., 2007; Handoo & Sharma, 2014). However, our results indicate that debt service coverage has a negative impact on LTB among the firms of consumer goods and food & agro sectors. Additionally, the debt service coverage ratio has been found to have an insignificant impact on the short-term leverage of most of the sectors of the Indian manufacturing industry. Therefore, we conclude DSCR is not a prominent determinant of capital structure among Indian manufacturing firms.

Six out of the eight manufacturing industry sectors record a significant negative impact of firm size on their LTB, supporting the pecking order theory. Therefore, with the increase in size, the firms in these sectors handle the information asymmetry problem efficiently while increasing the companies' chances of handling higher obligations associated with debt issuance (Frank & Goyal, 2009). Supporting the existence of static trade-off theory, liquidity is found to strongly determine the firms' STB of all the sectors except the metal sector. Contrary to the findings of Sharma and Paul (2015), in 5 sectors (Chemical & Chemical Products, Consumer Goods, Food & Agro, Machinery, and Transportation sectors), the long-term leverage ratio bears a positive impact from liquidity. This evidence suggests that an increase in liquidity enhances the ability of these firms to borrow more and meet their contractual obligations.
The estimations of macroeconomic variables reveal intriguing insights into the capital structure behaviour of Indian manufacturing firms. Consistent with the findings of Anwar and Sun (2014), the construction materials, consumer goods, food & agro and textile sectors exhibit an inverse relationship between change in net foreign investment and long-term borrowings. Furthermore, the GMM estimations reveal the insignificant relationship between LTB and the net foreign investment among the machinery and transport equipment sector firms. Change in government borrowing has shown a negative impact on both the leverage ratios among the machinery and metal sector firms, confirming the hypothesis that an increase in government borrowing leads to a decrease in credit availability and an increase in the cost of borrowing (Xia et al., 2021). However, GB also influences the ratios in a significantly positive manner among the firms of chemical, consumer goods, construction, and food & agro sectors.

Contrary to the hypothesis and consistent with the findings of Yadav et al. (2019), the increase in economic growth is observed to reduce the long-term leverage of firms belonging to construction materials, food & agro, machinery, metals, and transport equipment sectors, and short-term leverage of firms belonging to machinery and metal sectors. This suggests that economic growth motivates these sectors' companies to reduce their reliance on external finance to fund their investment opportunities and opt for internal earnings. The relationship between interest rate and leverage ratios is consistent with the findings of Barry et al. (2008) and the predictions of the static trade-off theory. The interest rate variable has a significant negative influence over the LTB of firms from consumer goods, machinery, and food & agro sectors and over the STB of firms from consumer goods, food & agro, and metals sectors. Nevertheless, the LTB of the firms belonging to the chemical, construction, metals, textile, and transportation sectors; and STB of the firms belonging to chemical, construction, machinery,

textile, and transportation sectors bear a positive influence from INR. This result suggests that the increased interest rates in the scenarios of higher inflation motivate these firms to opt for debt financing to avoid the uncertain equity markets (Panda et al., 2020).

### 3.3 Robustness Checks

Since the dependent variables (STB and LTB) are range bound (min = 0 and max = 1), dynamic Tobit regression has been used for robustness check and further comprehensive analysis of the dynamic panel data. The results from the Tobit regression are demonstrated in Tables 5 and 6. The estimations from the Tobit regression technique reveal a similarity to that of the GMM estimator. From Tobit estimations, the firm-specific determinants, including change in free cash flow, net worth to total asset ratio, debt service coverage ratio, and firm size, and macroeconomic determinants, including government borrowing and economic growth, are documented to have significant effects on both the leverage measures, similar to the estimations of GMM.

## 4. Conclusion

Since there is a lack of concord among the researchers concerning the influence of firm-specific and macroeconomic variables over the firms' capital structure behaviour, this study intends to investigate the dynamic relationship between the capital structure of Indian manufacturing firms and its determinant variables at the sectoral level. The study is based on extensive panel data of 2575 firms belonging to the eight sectors of the Indian manufacturing industry. We employ the two-step GMM as the principal estimator and the Panel Tobit regression as the robustness technique. Furthermore, we use a blend of firm-specific and macroeconomic variables, which are literature-evidenced as capital structure determinants. We find that the influence of select determinant variables on the capital structure ratios varies across the eight manufacturing industry sectors, consistent with the findings of Vo X. V (2017) and Panda and Nanda (2020). Additionally, firm-specific variables are found to explain the capital structure behaviour of these firms significantly. Among firm-specific determinants, asset tangibility, non-debt tax shield, effective tax rate, net worth to total asset, firm size, net working capital ratio, and liquidity are strong determinants of long-term and short-term capital structure. Growth rate, free cash flow, and profitability are weak determinants of long-term capital structure. Among macroeconomic factors, changes in foreign investment, government borrowings, economic growth, and interest rates impact the capital structure of all the firms significantly. Furthermore, growth rate, cash flow, and debt service coverage ratio are noted to have a negligible impact on the short-term leverage of these firms. Among the macroeconomic variables, economic growth and interest rates significantly impact the short-term capital structure. This study utilizes two new variables to test their role in significantly determining capital structure. Both these variables, net worth to total assets ratio (NWTA) and net working capital ratio (NWCR), are prominent determining variables of capital structure among all the sectors.

Our study provides vital implications for the manufacturing companies' finance managers to evaluate the factors affecting their capital structure. From the findings, we recommend that managers of different sectors prioritize firm-specific factors while making decisions for capital structure. Additionally, policymakers could utilize our results to determine the behaviour of macroeconomic determinants in policy formulation and amendments.

## 5. Limitations and Future research scopes of study:

As the study is based on data related to Indian manufacturing firms, the findings may not be directly comparable to studies conducted on firms from other emerging countries. The scope for future research lies in extending this research, analysing the data from other key emerging economies, and conducting cross-country analysis. Further, this study lacks industry-specific or sector-specific variables, presenting an opportunity to incorporate these variables alongside the critical determinants considered in this research for a more comprehensive study on capital structure determinants.

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