Capital Structure, Profitability and Sustainable Financing: Evidence from Pharmaceutical Companies

Pragati Tomar[1] ,Gauri Chauhan[2]

[1]Associate Professor, Shri Vaishnav School of Management, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore, India

[2]Assistant Professor, Shri Vaishnav School of Management, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore, M.P, India

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ABSTRACT

This study examines the impact of capital structure on firm profitability in the Indian pharmaceutical sector using panel data analysis. The sample consists of five leading pharmaceutical companies listed in India over a ten-year period, resulting in 50 firm-year observations. Profitability is measured using Return on Assets (ROA) and Return on Equity (ROE), while capital structure is proxied by Debt–Equity Ratio (DER) and Debt Ratio (DR). Firm size and sales growth are included as control variables. Fixed-effects and random-effects panel regression models are employed, with model selection guided by the Hausman test. The results reveal that leverage has a negative but insignificant effect on ROA, indicating that debt does not significantly influence operational efficiency. However, leverage exerts a significant negative impact on ROE, suggesting that higher debt levels reduce shareholders' returns. Sales growth positively affects profitability, while firm size remains insignificant. The findings highlight the cautious use of debt in capital structure decisions, particularly from a shareholder perspective (Myers, 1984; Boffo & Patalano, 2020). The study contributes to the limited empirical literature on capital structure profitability linkage in the Indian pharmaceutical industry.

Keywords: Capital Structure, Profitability, ROA, ROE, Panel Data, Pharmaceutical Industry, India

INTRODUCTION

In recent years, financial decisions have increasingly been examined from the perspective of sustainability and responsible finance (UNEP, 2016; Schoenmaker, 2017). Green finance emphasizes the efficient allocation of financial resources to achieve economic growth while minimizing adverse environmental and social impacts (OECD, 2017; Boffo & Patalano, 2020). For pharmaceutical companies, sustainable financing is particularly important due to their substantial long-term funding requirements for research and development (R&D), compliance with stringent regulatory standards, and the adoption of environmentally responsible manufacturing practices (Nandy & Lodh, 2012; Malik, 2015). Excessive reliance on debt financing may constrain firms' financial flexibility and limit their capacity to invest in green technologies and sustainability-oriented initiatives due to increased financial risk and debt servicing obligations (Myers, 1984; Jensen, 1986).

Therefore, examining the relationship between capital structure and profitability is essential to understanding how financing decisions influence not only short-term financial performance but also long-term sustainability outcomes. Capital structure decisions play a crucial role in determining firm value and performance, as highlighted by classical and contemporary capital structure theories (Modigliani & Miller, 1963; Myers & Majluf, 1984; Dawar, 2014).

Many researchers have examined whether capital structure affects firm performance, but the findings are mixed (Rajan & Zingales, 1995; Salim & Yadav, 2012; Chadha & Sharma, 2015). Modigliani and Miller (1958) argued that capital structure has no significant impact on firm performance (Vlora Prenaj, 2024). In contrast, other studies report a strong positive relationship between capital structure variables and profitability

(Mukhlis, 2025). Capital structure refers to how firms combine debt, equity, and internal funds to finance their operations. These decisions influence risk, tax benefits, investment capacity, and returns to shareholders. This is especially important for industries that require high initial investment and have long cash-flow cycles. The pharmaceutical industry is vital for public health and economic development and is characterized by high capital requirements and knowledge intensity (KPMG, 2022; Department of Pharmaceuticals, Government of India, 2021). In India, the pharmaceutical sector significantly contributes to exports, healthcare availability, and employment. As a result, financial decisions made by pharmaceutical firms affect not only firm-level profitability but also the overall resilience of the healthcare industry. Financing choices influence firms' ability to sustain R&D activities, comply with strict regulations, and manage long drug development cycles (Malik, 2015). Studying the link between capital structure and profitability in this sector helps to understand whether the benefits of debt, such as tax advantages, outweigh its costs, such as financial distress (Mukhlis, 2025).

Several theories explain how firms choose their capital structure. The Static Trade-off Theory suggests that firms balance the tax benefits of debt against bankruptcy and financial distress costs, leading to an optimal level of leverage. Evidence from Indian pharmaceutical firms supports this view, especially the positive relationship between leverage and non-debt tax shields (Malik, 2015). Another explanation is the Pecking Order Theory, which states that firms prefer internal funds first, then debt, and issue equity only as a last option due to information asymmetry and high issuance costs (Sudharika, 2018). Studies on Indian pharmaceutical firms show that profitable firms often use retained earnings rather than debt, indicating pecking-order behavior (Malik, 2015).

Agency theory focuses on conflicts between managers, shareholders, and lenders. While debt can control managerial misuse of funds, excessive debt can also lead to risky behavior or under-investment (Kafle, 2020). However, existing studies do not provide sufficient evidence to directly test agency cost theory in the Indian pharmaceutical sector. The Market Timing Theory suggests that firms issue equity when market values are high and rely more on debt when valuations are low, making capital structure dependent on past market conditions rather than an optimal target (Boloupremo, 2024). There is limited empirical evidence on market timing behavior in Indian pharmaceutical firms. Applying these theories to the pharmaceutical industry highlights several challenges. According to the trade-off theory, pharmaceutical firms may benefit from higher debt due to tax advantages, but the uncertainty of R&D outcomes increases financial distress risk (Pandey, 2017). The pecking-order theory suggests that successful firms with stable earnings prefer internal financing. Studies on Indian pharmaceutical firms show support for both theories, indicating that firms may change their financing strategies depending on their life cycle stage or project requirements (Malik, 2015). Overall, empirical evidence is mixed: some studies find that high leverage negatively affects profitability (Nandi), while others report positive short-run and long-run relationships between leverage and profitability under certain conditions (Pandey, 2017).

Pharmaceutical firms are typically R&D intensive and face long product development and approval cycles, which delay revenue generation (Mukhlis, 2025). This increases the need for continuous financing and raises the cost of financial distress if projects fail. Indian studies highlight that R&D intensity and working capital management significantly influence profitability, and careful use of debt can support investment if managed prudently (Pandey, 2017). Firms with strong internal cash flows can finance R&D internally, while others depend on external financing, each with different risks and governance implications. In the Indian context, several studies have examined capital structure and firm performance using panel data and regression models. Results vary across firms, with some studies showing that high leverage reduces profitability and that competition moderates this relationship (Nandi). Other studies identify profitability and tax shields as key determinants of leverage, reflecting both trade-off and pecking-order influences (Malik, 2015). These mixed findings highlight the importance of firm-specific characteristics and industry structure in shaping financing outcomes. Given the capital-intensive and R&D-driven nature of the Indian pharmaceutical industry, further investigation is necessary. Therefore, this study aims to examine the impact of capital structure on the profitability of Indian pharmaceutical firms during the period 2014–2023. The study seeks to determine whether leverage enhances or reduces profitability, while controlling for firm size and sales growth. fixed-effects and random-effects models are employed and compared to identify the most appropriate model for analysis.

REVIEW OF LITERATURE

Recent studies in green finance suggest that financially sustainable capital structures enable firms to undertake long-term investments in environmentally responsible practices. Firms with lower financial risk and balanced leverage are better positioned to invest in green innovation, energy efficiency, and sustainable production processes. Empirical evidence indicates that excessive leverage may hinder firms' sustainability initiatives due to increased financial constraints and risk aversion. In environmentally sensitive industries such as pharmaceuticals, sustainable financing strategies play a critical role in ensuring compliance with environmental regulations and supporting green innovation. However, empirical studies linking capital structure, profitability, and sustainability in the Indian pharmaceutical sector remain limited, thereby justifying the present study.

The companys long-term and short-term loans, common equity, and preferred equity, along with reserves and surpluses, make up its capital structure (Sudharika, 2018). Zeitun and Tian (2007) identified three primary factors that determine capital structure: a company's profitability; profitable companies are less likely than less profitable ones to rely on debt in their capital structure; a company's growth rate; companies with a high growth rate have a high debt to equity ratio; and the cost of bankruptcy (proxied by firm size).

Most academics have focused their research on capital structure and company performance on theories. The following are major theories related to capital structure of a firm:

Modigliani-Miller Theory (MM Theory) Modigliani-Miller stated that capital structure has an insignificant effect on determining value of a firm (Bolouprem o, 2024). This argument was made under extremely limited presumptions, such as ideal capital markets, uniform investor expectations, a tax-free economy, and zero transaction costs. This idea holds that a companys value is based on its actual assets rather than the variety of securities it issues and, if feasible, in arbitrage circumstances. Nevertheless, these constrictive presumptions do not persist in the actual complicated world, and this idea subsequently came to be known as the 'Theory of Irrelevance' (Sudharika, 2018). However, Modigliani and Miller suggested in a later study from 1963 that businesses that use debt suffer interest costs that can be partially written off when calculating corporate income tax. They discovered a favorable correlation between financial leverage and company value, indicating that businesses might increase their debt levels to maximize their values (Said, 2025).

The Pecking Order Theory: According to Pecking Order Theory (Myers and Majluf, 1984; Myers, 1984), firms only turn to outside funding when internal funding is unavailable. According to Kester (1986), managers will favour using internal resources to finance new initiatives. Managers look for outside sources from debt as a backup plan and equity as a final resort only if this source is insufficient (Sudharika, 2018). The pecking order theory highlights that the order in which businesses obtain finance sources is more significant than other factors, such as tax shields and financial limitations on debt, but it does not negate their significance (Said, 2025).

Agency Theory: Jensen and Meckling (1976) gave the agency costs theory to address the agency costs that result from manager-shareholder dispute and how it affects the relationship between capital structure and profitability. According to this view, conflicts of interest arise between a companys managers and shareholders because of the division of ownership and control. Instead of maximizing the firm's worth, managers typically prioritize their personal utility (Sudharika, 2018). Jensen (1986) outlined how debt reduces agency costs because it reduces the amount of free cash flow that corporate managers must spend whenever they see fit. These consequences of debt control are thought to be a possible factor in determining corporate capital structure (Jensen, 1986). So that it can be assumed that

H1: Capital structure has a significant impact on Return on Assets (ROA).

Trade-off Theory: The Theory of Trade-off states that debt financing is usually utilised when a business has a substantial quantity of tangible assets, whereas equity financing is often employed when a business has a big amount of intangible assets. As a result, a business should keep its debt-to-equity ratio at optimal levels (Bolouprem o, 2024). because of this researcher hypothesizes that

H2: Capital structure has a significant impact on Return on Equity (ROE).

Trade-off theory can be thought of as a summed balance of various debt-related costs and benefits for the ideal capital structure. According to the theory, every source of funding has a unique cost and return that are connected to the companys ability to make money as well as the dangers associated with its operations and insolvency (Shahar, 2015). According to the trade-off argument, more profitable businesses have a larger income tax shield and hence take on more debt in order to benefit from tax advantages, according to Dawar (2014). As a result, a positive correlation between the amount of debt and the performance of the company could be anticipated.

Existing empirical studies on Indian pharmaceutical firms provide useful but fragmented insights into the capital structure profitability relationship. Sectoral determinant studies have documented that leverage correlates positively with non-debt tax shields and negatively with profitability, which simultaneously supports elements of the Static Trade-off and Pecking Order theories (Kafle, 2020). Other research focusing on accounting performance and competitive dynamics finds that higher debt ratios are associated with worse performance and that market competition can exacerbate this negative effect (Nandi). Additionally, time-series and panel approaches have reported both short-run and long-run links between leverage, R&D intensity, and profitability under different model specifications (Pandey, 2017).

Despite these contributions, the corpus reveals several gaps that justify further targeted research. First, findings are mixed across studies and methods: some analyses report no significant relationship between capital structure and performance in samples of pharma firms (Dash, 2018). Second, there is limited consensus about time-varying behavior how firms may move between debt and internal financing across growth or product cycles and whether such transitions are more pronounced in Indian pharma given policy shifts, market expansion, and export orientation (Nandi).

Third, while several studies examine determinants of leverage or the impact of capital structure on performance, few synthesize these aspects across a contemporary and policy-relevant period. The 2014–2023 decade encompasses important developments for Indian pharma rising global demand, regulatory changes, and evolving financing conditions yet comprehensive, methodologically rigorous analyses that cover this specific interval and explicitly link capital structure choices to profitability in the post-2014 environment are scarce in the supplied literature (Malik, 2015). These lacunae motivate a study that (a) uses a recent and sufficiently long-time window to capture both cyclical and structural changes, (b) employs panel data analysis technique to address endogeneity and long-run versus short-run relationships, and (c) explicitly compares the fixed-effects and random-effects model to identify the appropriate specifications. Doing so will clarify whether mixed empirical findings reflect genuine heterogeneity in the sector or methodological differences across prior studies.

Sales Growth and Firm Profitability

Sales growth is widely recognized as a key indicator of a firm's market performance and competitive strength. From a financial perspective, increasing sales enable firms to exploit economies of scale, improve asset utilization, and spread fixed costs over a larger revenue base, thereby enhancing profitability. Sales growth also signals market acceptance and demand stability, which strengthens operating cash flows and supports reinvestment activities.

Recent empirical evidence largely supports a positive relationship between sales growth and profitability. For instance, Vătavu (2020) finds that firms with higher sales growth exhibit superior profitability due to improved operational efficiency and revenue expansion. Similarly, Dang, Vu, Ngo, and Hoang (2020) report that sales growth contributes positively to firm performance by enhancing resource utilization and competitive positioning. Studies focusing on emerging and developed markets further demonstrate that sustained sales growth improves return on assets and return on equity, particularly when firms effectively manage growth-related costs (Yazdanfar & Öhman, 2020; Dalci, Tanova, Ozyapici, & Bein, 2021).

However, the literature also cautions that rapid or uncontrolled sales growth may exert pressure on operational resources, potentially weakening profitability if not accompanied by sound cost management and financial discipline (Coad, 2021). Despite this caveat, the dominant empirical evidence suggests that moderate and sustainable sales growth positively influences firm profitability, especially in competitive business environments. Based on the above discussion, the following hypothesis is proposed:

H3: Sales growth positively influences firm profitability.

Firm Size and Profitability

Firm size is another important determinant of profitability extensively examined in finance and management literature. Larger firms often benefit from economies of scale, diversified operations, superior access to financial markets, and stronger bargaining power with suppliers and customers. These advantages enable cost efficiencies and enhance profitability. From the resource-based view, firm size reflects the accumulation of strategic resources that can generate sustained competitive advantage.

Recent studies confirm that firm size has a significant effect on profitability, although the direction of the relationship may vary across contexts. Dang et al. (2020) document that larger firms tend to achieve higher profitability due to scale efficiencies and better access to capital. Similarly, Banchuenvijit (2021) finds a statistically significant relationship between firm size and financial performance in listed firms. Evidence from panel data studies also indicates that size positively influences profitability in capital-intensive and manufacturing industries (Pervan, Pervan, & Ćurak, 2019; Pratheepan, 2020).

Conversely, some studies suggest that excessive firm size may lead to bureaucratic inefficiencies, agency problems, and higher coordination costs, which could adversely affect profitability (Coad, 2021). As a result, the relationship between firm size and profitability is not always linear. Nonetheless, recent empirical literature consistently supports the existence of a significant relationship between firm size and profitability, justifying its inclusion as a key explanatory variable. Accordingly, the following hypothesis is formulated:

H4: Firm size has a significant effect on profitability.

On the basis of above-mentioned reviews and gaps following research objectives were framed

1. To examine the impact of capital structure on firm profitability measured by ROA.

2. To analyze the effect of leverage on shareholders' profitability measured by ROE.

3. To assess the role of firm size and sales growth as control variables.

4. To compare fixed-effects and random-effects models and identify the appropriate specification.

Although previous studies have examined the relationship between capital structure and profitability, most evidence from the Indian pharmaceutical sector is based on relatively small samples and limited sets of financial variables. Existing studies primarily focus on leverage indicators while paying less attention to other factors that may influence profitability, such as liquidity position, research and development (R&D) expenditure, market share, and macroeconomic conditions. Furthermore, limited research has compared the pharmaceutical industry with other sectors to determine whether the effects of capital structure are industry-specific or generalizable across industries.

RESEARCH METHODOLOGY

The present study adopts a **quantitative, explanatory research design** to examine the impact of capital

structure on firm profitability. Panel data methodology is employed as it allows controlling for unobserved firm-specific heterogeneity and captures both cross-sectional and time-series variations. The study focuses on the **Indian pharmaceutical industry**, which is capital-intensive and strategically important due to high R&D

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expenditure and regulatory requirements. A **purposive sampling technique** is used to select leading pharmaceutical companies based on market presence, data availability, and continuous listing during the study period. The final sample consists of the following **five Indian pharmaceutical companies**: **Sun Pharmaceutical Industries Ltd., Dr. Reddy's Laboratories Ltd., Cipla Ltd., Divi's Laboratories Ltd. And Torrent Pharma Ltd.** All selected companies are **listed on Indian stock exchanges (NSE/BSE)** and have complete financial data for the study period. The study covers a period of **ten years**, from **2014–15 to 2023–24**, resulting in a **balanced panel dataset of 50 firm-year observations**. This length provides enough data points for panel regression and accounts for macro events like GST implementation, demonetization, COVID effects, and global pharmacy changes. The study relies exclusively on **secondary data**, collected from Published **annual reports** of the selected companies, Official company websites and Financial databases such as **NSE/BSE filings and Moneycontrol (for cross-verification**). All financial figures are converted into crores of Indian Rupees to ensure consistency. Dependent Variables of the study was:

ROA: Net Profit / Total Assets = ROA measures operational efficiency and reflects how effectively a firm utilizes its assets to generate profits.

ROE: Net Profit / Shareholders' Equity = ROE represents profitability from shareholders' perspective and captures the effect of financial leverage.

Independent Variables (Capital Structure Measures):

DER: Total Debt / Shareholders' Equity = DER reflects the firm's reliance on debt financing relative to equity.

DR: Total Debt / Total Assets = DR indicates the proportion of assets financed through debt.

Control Variables:

Firm Size (Size)= Measured as the natural logarithm of total assets, firm size controls for scale effects.

Sales Growth (Sales Growth): Sales Growth= Sales t − Sales t−1/ Sales t−1= Sales growth captures firm expansion and market performance.

Model Specification

To examine the differential impact of capital structure on profitability, two separate panel regression models are estimated.

Model 1: ROA Model

$$ROA_{it} = \alpha + \beta_1 DER_{it} + \beta_2 Dr_{it} + \beta_3 Size_{it} + \beta_4 SalesGrowth_{it} + \varepsilon_{it}$$

This model assesses how leverage affects operational efficiency.

Model 2: ROE Model

$$ROE_{it} = \alpha + \beta_1 DER_{it} + \beta_2 Size_{it} + \beta_3 SalesGrowth_{it} + \varepsilon_{it}$$

In the ROE model, only DER is included as the leverage proxy. This specification is theoretically justified, as ROE is directly influenced by the debt–equity structure. Moreover, the high correlation between DER and DR necessitates their separate inclusion to avoid multicollinearity.

Estimation Technique and Tools Used

The analysis is conducted using Gretl econometric software, which is well suited for panel data estimation. The following econometric techniques are employed:

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- Descriptive statistics to summarize data characteristics
- Correlation analysis to examine inter-variable relationships
- Fixed Effects (FE) model to control for firm-specific effects
- Random Effects (RE) model to account for random firm heterogeneity
- Hausman test to determine the appropriate model between FE and RE
- Breusch–Pagan test to test for the presence of random effects

All tests are conducted at 1%, 5%, and 10% significance levels. The selected firms represent major participants in the Indian pharmaceutical industry; however, future studies should include firms from different market segments to improve representativeness and generalizability.

Results and Analysis

Descriptive Statistics

Summary Statistics

Variable	Mean	Median	S.D.	Min	Max
ROA	0.102	0.0954	0.0473	0.0309	0.224
ROE	0.157	0.147	0.0725	0.0492	0.496
DER	0.241	0.144	0.295	0.000	1.24
DR	0.117	0.0908	0.111	0.000	0.403
Size	2.10e+005	2.46e+004	2.81e+005	4.97e+003	9.21e+005
Sales Growth	0.0810	0.0597	0.165	-0.439	0.846

Above table presents the descriptive statistics of the variables used in the study. The mean ROA is 10.2%**,** while mean ROE is 15.7%**,** indicating moderate profitability among the sampled firms. The average Debt–Equity Ratio (DER) of 0.241 suggests relatively conservative capital structures, though the wide standard deviation indicates heterogeneity in leverage decisions across firms. Sales growth shows considerable variability, reflecting differences in firm expansion and market conditions.

Correlation matrix

ROA	**ROE**	**DER**	**DR**	**Size**	
1.0000	0.7372	-0.4326	-0.5264	-0.2323	ROA
	1.0000	0.1278	0.0491	-0.2863	ROE
		1.0000	0.9619	-0.2587	DER
			1.0000	-0.1985	DR
				1.0000	Size
				Sales Growth	
				0.2823	ROA
				0.1351	ROE
				-0.0404	DER
				-0.1016	DR
				-0.0576	Size
				1.0000	SalesGrowth

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The correlation matrix reveals that ROA and ROE are strongly positively correlated (r = 0.737), confirming consistency across profitability measures. Leverage variables (DER and DR) show negative correlations with ROA and ROE, indicating that higher debt levels are generally associated with lower firm performance. Importantly, no correlation coefficient exceeds the conventional multicollinearity threshold (except DER–DR, which are not jointly emphasized in interpretation), suggesting that multicollinearity is not a serious concern.

Panel regression results using ROA as Dependent Variable

Fixed effect

Model 1: Fixed-effects

Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	0.121644	0.0217474	5.594	<0.0001	***
DER	−0.100010	0.0735112	−1.360	0.1811	
DR	−0.0922863	0.182740	−0.5050	0.6163	
Size	5.18536e-08	7.66056e-08	0.6769	0.5023	
SalesGrowth	0.0549388	0.0283520	1.938	0.0596	*
Mean dependent var	0.102072		S.D. dependent var		0.047266
Sum squared resid	0.039562		S.E. of regression		0.031063
LSDV R-squared	0.638594		Within R-squared		0.379250
LSDV F(8, 41)	9.055715		P-value(F)		4.64e-07
Log-likelihood	107.6005		Akaike criterion		−197.2010
Schwarz criterion	−179.9928		Hannan-Quinn		−190.6480
rho	0.110209		Durbin-Watson		1.369767

Joint test on named regressors - Test statistic: F(4, 41) = 6.26228 with p-value = P(F(4, 41) > 6.26228) = 0.000498913

Test for differing group intercepts - Null hypothesis: The groups have a common intercept Test statistic: F(4, 41) = 5.0826 with p-value = P(F(4, 41) > 5.0826) = 0.00202564

Model 2: Random-effects

Dependent variable: ROA

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.133211	0.0293721	4.535	<0.0001	***
DER	−0.0763818	0.0703493	−1.086	0.2776	
DR	−0.148761	0.174113	−0.8544	0.3929	
Size	4.78998e-010	5.73959e-08	0.008346	0.9933	
SalesGrowth	0.0560933	0.0276623	2.028	0.0426	**

Mean dependent var	0.102072		S.D. dependent var	0.047266
Sum squared resid	0.092004		S.E. of regression	0.044722
Log-likelihood	86.50181		Akaike criterion	−163.0036
Schwarz criterion	−153.4435		Hannan-Quinn	−159.3631
rho	0.110209		Durbin-Watson	1.369767

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'Between' variance = 0.00238405

'Within' variance = 0.00079125

theta used for quasi-demeaning = 0.820771

Joint test on named regressors -

Asymptotic test statistic: Chi-square(4) = 25.2682

with p-value = 4.44339e-05

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 2.03454

with p-value = 0.15376

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(4) = 2.77211

with p-value = 0.596656

The fixed-effects and random-effects models were estimated to analyze the impact of capital structure on operational performance (ROA). The Hausman test favors the random-effects model, indicating consistency of GLS estimates. Results show that Debt–Equity Ratio (DER) has a negative but statistically insignificant effect on ROA. Debt Ratio (DR) is also negative and insignificant. Firm Size does not significantly influence ROA. Sales Growth has a positive and statistically significant effect on ROA ($p < 0.05$). These findings suggest that leverage does not significantly enhance firms' operational efficiency. Instead, internal growth dynamics, represented by sales growth, play a more important role in improving asset utilization. This supports the view that profitability at the operational level is driven more by business expansion than by financing structure.

Panel Regression Results: ROE as Dependent Variable (Robustness Model)

Model 1: Fixed-effects

Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	0.198695	0.0355806	5.584	<0.0001	***
DER	−0.190713	0.0590764	−3.228	0.0024	***
Size	−5.02143e-09	1.36124e-07	−0.03689	0.9707	
SalesGrowth	0.0663878	0.0517444	1.283	0.2065	

Mean dependent var	0.157025		S.D. dependent var	0.072482
Sum squared resid	0.138199		S.E. of regression	0.057363
LSDV R-squared	0.463157		Within R-squared	0.223975
LSDV F(7, 42)	5.176455		P-value(F)	0.000263
Log-likelihood	76.33010		Akaike criterion	−136.6602
Schwarz criterion	−121.3640		Hannan-Quinn	−130.8353

rho	0.016349		Durbin-Watson	1.387370

Joint test on named regressors -

Test statistic: F(3, 42) = 4.04066

with p-value = P(F(3, 42) > 4.04066) = 0.0130198

Test for differing group intercepts -

Null hypothesis: The groups have a common intercept

Test statistic: F(4, 42) = 7.10324

with p-value = P(F(4, 42) > 7.10324) = 0.000183678

Model 2: Random-effects

Dependent variable: ROE

	Coefficient	Std. Error	z	p-value	
const	0.201005	0.0518804	3.874	0.0001	***
DER	−0.167573	0.0551026	−3.041	0.0024	***
Size	−4.23158e-08	1.04100e-07	−0.4065	0.6844	
SalesGrowth	0.0654657	0.0506306	1.293	0.1960	
Mean dependent var		0.157025		S.D. dependent var	0.072482
Sum squared resid		0.387690		S.E. of regression	0.090823
Log-likelihood		50.54237		Akaike criterion	−93.08474
Schwarz criterion		−85.43665		Hannan-Quinn	−90.17230
rho		0.016349		Durbin-Watson	1.387370

'Between' variance = 0.00795063

'Within' variance = 0.00276399

theta used for quasi-demeaning = 0.816707

Joint test on named regressors -

Asymptotic test statistic: Chi-square(3) = 10.3421

with p-value = 0.0158713

Breusch-Pagan test -

Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 2.68468

with p-value = 0.101318

Hausman test -

Null hypothesis: GLS estimates are consistent

Asymptotic test statistic: Chi-square(3) = 3.39119

with p-value = 0.335151

To ensure robustness, ROE was used as an alternative measure of firm performance. The Hausman test indicates that the random-effects model is appropriate. DER has a negative and statistically significant effect on ROE ($p < 0.01$). Firm Size remains insignificant. Sales Growth is positive but statistically insignificant. The negative impact of leverage on ROE indicates that higher debt levels reduce shareholder returns, possibly due to increased interest burden and financial risk. Unlike ROA, ROE is directly influenced by capital structure, explaining why leverage appears significant only in the ROE model.

Combined evidence from ROA and ROE models highlighted that leverage does not improve operational efficiency (ROA) but significantly reduces shareholder profitability (ROE). This indicates that while firms may manage assets efficiently irrespective of debt levels, excessive reliance on debt adversely affects equity holders' returns. The results align with agency cost and trade-off theories, suggesting that beyond a certain point, the costs of debt outweigh its benefits. "The findings suggest that capital structure decisions primarily affect shareholder returns rather than operational efficiency, emphasizing the importance of cautious leverage management from an equity holder's perspective.

The results suggest that capital structure affects firm profitability differently depending on the performance measure used. While leverage does not significantly influence operational efficiency (ROA), it negatively impacts shareholders' profitability (ROE). This finding indicates that debt may impose financial costs that outweigh its benefits from an equity perspective. The positive influence of sales growth highlights the importance of revenue expansion strategies in enhancing profitability. The insignificance of firm size suggests that scale alone does not guarantee superior performance in the pharmaceutical sector.

CONCLUSION

This study provides empirical evidence on the relationship between capital structure and profitability in the Indian pharmaceutical industry from a sustainable finance perspective. The findings indicate that while leverage does not adversely affect operational efficiency, it significantly reduces shareholder profitability. These results imply that excessive reliance on debt may undermine financial sustainability and constrain firms' ability to invest in green and environmentally responsible initiatives. Therefore, pharmaceutical companies should adopt prudent and sustainable financing strategies that support long-term profitability while facilitating investments in green technologies and sustainable operations. The study contributes to the emerging literature on green finance by highlighting the role of capital structure in achieving financially and environmentally sustainable corporate performance.

This study investigates the impact of capital structure on profitability in the Indian pharmaceutical industry using panel data analysis. The findings reveal that leverage adversely affects ROE, while its effect on ROA remains insignificant. These results imply that while debt does not impair operational efficiency, it reduces returns to shareholders. The study emphasizes the need for cautious debt management in pharmaceutical firms, particularly in balancing growth financing with shareholder value creation.

From a green finance standpoint, the results suggest that policymakers and financial institutions should encourage pharmaceutical firms to adopt sustainable financing mechanisms such as green bonds, sustainability-linked loans, and equity-based funding for environmentally responsible projects. Corporate managers should prioritize capital structures that enhance long-term financial resilience, enabling investments in green innovation and regulatory compliance. Promoting sustainable capital structures can support the pharmaceutical industry's transition toward environmentally responsible growth while safeguarding shareholder value. Pharmaceutical firms should avoid excessive reliance on debt financing. Managers should prioritize internal financing and operational efficiency. Policymakers may encourage equity-based financing for R&D-intensive sectors.

Future research may incorporate explicit environmental, social, and governance (ESG) indicators to examine the interaction between capital structure, profitability, and sustainability performance. Additionally, comparative studies across green and non-green firms may offer deeper insights into the role of sustainable finance in emerging economies. The study is limited to five firms and a ten-year period. Future research may expand the sample size, incorporate macroeconomic variables, or explore nonlinear capital structure effects.

The study has certain limitations that should be acknowledged. First, the analysis is based on a sample of five leading pharmaceutical companies and therefore may not fully capture the heterogeneity of the entire Indian pharmaceutical sector. Second, the study focuses primarily on capital structure variables along with firm size and sales growth. Other potentially important determinants of profitability, such as liquidity, R&D expenditure, market share, ownership structure, and corporate governance characteristics, were not incorporated because of data availability constraints. Third, macroeconomic variables such as inflation, interest rates, exchange-rate fluctuations, and GDP growth were not included, although they may influence both financing decisions and profitability.

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