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Effect of Debt Financing on Firm Profitability: The Influence of Asset Growth and Sales Growth

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ABSTRACT

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One of the oldest and maximum arguable questions of corporate finance is the bond among debt financing and the profitability of the corporation. It is an empirical study of the impact of debt financing, measured using debt to equity ratio (DER), on the profitability of firms primarily based totally on the return on assets (ROA) and it also explores whether or not the increase of belongings and sales growth mediates this relationship. The studies layout is a quantitative panel data examine primarily based totally on secondary financial facts based on the yearly report and balnce sheet of 40 manufacturing firms on the Pakistan Stock Exchange (PSX) between the year 2015 and 2024, which resulted in an unbalanced panel of 400 firm years. The firms are sampled using purposive sampling and must have all the available ten years of their financial records, which must be complete and audited. Descriptive facts are calculated to explain the sample, Pearson correlation evaluation is executed to check the two variable relationship and multicollinearity, panel regression evaluation primarily based totally on Pooled Ordinary Least Squares (OLS), Fixed Effect (FE) and Random Effect (RE) version is carried out and the Hausman specification test is used to select the preferred version. EVIEWS 12 is used to carry out all of the estimations. Diagnostic tests: Im-Pesaran panel take a look at, Shin panel check, and the Breusch-Pagan Lagrange Multiplier take a look at of cross-sectional dependence, and the Wooldridge check of serial correlation are used for you to validate the regression inferences. The empirical proof helps the truth that debt financing has a sturdy terrible effect on ROA ($\beta_3 = -0.083$, $p < 0.01$), that is consistent with monetary misery and employer fee hypothesis. The asset increase is observed to definitely and considerably mild the connection among debt and ROA in which the bad impact of leverage is softened in case corporations are withinside the system of growing their efficient capability. This connection additionally undoubtedly moderates with income increase, because the revenue-producing momentum allows groups to fulfill debt duties and continue to be profitable. The studies is an addition to the empirical capital shape literature with the lens of a growing economic system and gives realistic recommendation to the economic managers of Pakistani production groups in a macroeconomic surroundings with a excessive hobby charge to barter leverage choices.

Introduction

The choice referring to capital shape, in particular in phrases of debt and fairness financing, is one of the maximum essential choices that company monetary managers face, as properly as, the maximum analytically difficult. The structuring of the financing of a company does now no longer simplest dictate the price of capital of a company, however additionally the hazard profile of the organization, the taxation, the employer dating among managers and shareholders and subsequently the cappotential of the corporation to provide and create lengthy-time period profitability. Debt financing takes a completely full-size and uncertain function many of the factors of capital shape. On the only hand, debt gives a tax gain with the aid of using deductibility of hobby, a disciplinary device to organization issues in control, and leverage to exaggerate returns on fairness while the returns to making an investment withinside the funding are better than the fee of price range. Conversely, excessive

debt degrees motive constant charges to the operation, restriction the ability of operations, beautify chance of economic misery, create business enterprise issues among the debtholders and shareholders, and finally decrease profitability because the hobby prices exceed operation returns.

A lengthy records of capital shape theories affords conflicting and on occasion opposing predictions of the theoretical foundation of the debt-profitability nexus. Modigliani and Miller (1958) proposed the irrelevance proposition: the fee of a corporation and consequently its profitability will now no longer rely on the capital shape in ideal capital markets wherein there aren't any taxes, transaction prices or asymmetry of facts. Relaxation of those assumptions brought about a chain of theories with extra unique empirical predictions. Modigliani and Miller (1963) additionally re-access the idea of company taxes into the equation and confirmed that the tax defend on hobby bills brings approximately a fine correlation among debt and organization fee. The exchange-off idea (Myers, 1984) assumes that organizations will alternate the tax blessings of debt with the prices of economic misery, in order that they could have an most suitable leverage ratio that's past which in addition debt can be price-destructive. The concept of pecking order (Myers and Majluf, 1984) indicates that the groups are much more likely to apply inner financing than outside debt, and debt than fairness due to facts asymmetries among the managers and investors- excessive-debt enterprise may be interpreted because the organisation that has used all of the inner price range and this could be negatively correlated with profitability. The tracking and bonding mechanisms of debt proposed through the business enterprise principle (Jensen and Meckling, 1976) are a way to the unfastened coins float hassle and predicts that mild leverage can beautify profitability through disciplining managerial discretion (Khan et al., 2025; Ibrahim et al., 2025).

The debt-profitability courting has been empirically tested broadly in advanced markets, with typically, however now no longer always poor consequences. A terrible leverage-profitability correlation become said among G7 international locations via way of means of Rajan and Zingales (1995) and a bad dating among financial risk and bottom-line growth became suggested with the aid of using Fama and French (1998), which is likewise in keeping with the reality that monetary misery fees, as opposed to tax protect advantages are greater applicable at excessive leverage. In much less green capital markets in growing economies, with credit score markets being much less green, hobby charges being greater unstable and institutional investor tracking much less green, the correlation among debt and profitability can also additionally have specific functions that aren't totally pondered with the aid of using the outcomes withinside the extra evolved economies.

Pakistan is a coverage-applicable and exciting context to discover the debt-profitability nexus. With the producing quarter accounting approximately 13% to the GDP and representing a huge percentage of the formal labour force, the producing area withinside the united states in large part relies upon on debt financing because the fairness capital markets in Pakistan are much less deep and liquid. Although the most important in South Asia in phrases of the quantity of corporations indexed, the Pakistan Stock Exchange (PSX) has a marketplace capitalization-to-GDP ratio of approximately 18 percent, that's substantially decrease than South Asian average, because of the excessive stage of financial institution credit score in comparison to fairness capital in financing commercial enterprise. The surroundings dealing with Pakistani production corporations is one in which nominal hobby costs are constantly excessive (the coverage price of State Bank of Pakistan became 22% in 2023 after which fell), inflation is excessive, the foreign money is undervalued, and power is periodically reduce off to disrupt the deliver of different commodities, all which effect the fee and availability of debt and the conversion of leverage into profitability.

In addition to the direct debt-profitability correlation, the existing examine proposes moderating variables, namely, asset increase and income increase, which can mediate the effect of leverage at the profitability. These moderators have a financial justification primarily based totally on concept and real-lifestyles monetary control factors. Asset increase measures how tons a organization has devoted to efficient ability and the destiny capacity of the corporation to provide coins flows, as a corporation will increase its asset base it is able to be capable of produce destiny coins flows that permit the organization to carrier its debt burden greater easily, which could in any other case might have created a drag on profitability because of leverage, may be become a internet superb because of its effective ability building. Sales increase, in its turn, is a hallmark of the economic impetus of the organization's essential enterprise; because the profits are developing at a excessive price, the constant charges of debt provider will take a smaller percent of income and the disciplining have an effect on of debt should paintings in a extra optimistic manner with the aid of using proscribing the diversion of the developing coins flows into unproductive uses. Such moderating procedures have acquired scanty systematic empirical studies specially withinside the production scenario in Pakistan.

An assessment of the to be had literature on capital shape and profitability in Pakistan has proven that there are some of gaps that this take a look at fills. First, the time-collection of the bulk of the modern Pakistani studies are surprisingly short (3-7 years), and that they fail to mirror the whole variety of the commercial enterprise cycle of leverage-profitability relationships. The macro situations of this observe ten-12 months panel 2015 to 2024 encompass CPEC funding boom (2015-2018),

macroeconomic stabilization crisis (2018-2020), COVID-19 pandemic shock (2020-2021) and the current excessive-inflation surroundings (2022-2024) because it gives variant in macro situations, which Second, the literature does now no longer evaluation of moderating mechanisms; maximum research take a look at the direct leverage-profitability dating with out discovering the traits of corporations on the organization stage that mild the dating. Third, panel evaluation the usage of EViews and the rigorous diagnostic trying out continues to be now no longer completely applied in evaluation with the complexity of the econometric evaluation of panel economic records, together with cross-sectional dependence of PSX-indexed corporations, and serial autocorrelation of economic ratios.

This paper has 3 contributions to the literature. It gives first of all a stringent panel records evaluation of the debt-profitability courting of PSX-indexed production corporations over a remaining and economically momentous decade and offers with each cross-sectional dependence and autocorrelation issues, with diagnostic checking out and accurate desire of estimators. Second, it provides the phrases of interplay among asset boom and income increase into the panel regression model, that's the primary systematic empirical proof of ways the component of boom in asset and income can mediate the leverage-profitability courting in Pakistani production groups. Third, it produces proof-primarily based totally hints of leverage rules of Pakistani production agencies in extraordinary increase paths to feature to the realistic toolkit of company monetary managers operating withinside the difficult macroeconomic surroundings in Pakistan.

Literature Review

Theoretical bases of leveraged financing and profitability

The connection between leveraged financing and the profitability of the firm is theorized based on a series of competing frameworks that derive various empirical predictions according to circumstances of the firm and the environment in which it operates. The Modigliani-Miller model (1958, 1963) is used as the benchmark: in frictionless markets, the funding mix does not affect the worth of the company and its profitability; with the introduction of corporate taxes, the interest tax shield means that positive correlation between leverage and enterprise value. The scope of the tax benefit is restricted to the firm's pre-tax income levels and in some countries such as Pakistan where the effective tax rate (ETR) often deviates from the statutory rate such as special economic zones, export incentives and tax evasion, the practical size of the tax shield can be smaller than in developed economies with high corporate taxes.

According to the trade-off theory (Kraus and Litzenberger, 1973; Myers, 1984), a firm reaches its optimal capital structure when the marginal tax advantages of borrowing are exactly offset by the marginal costs of potential financial distress. Beyond this optimum, further debt decreases the value of firms and its profitability by increasing its bankruptcy expenses, covenant limitations and diminishing customer, supplier and employee collections that make up the organizational capital of a firm. Financial distress expenses in the manufacturing industry of Pakistan, where supply chain links with raw material suppliers and distribution systems are essential, could be extremely high, suggesting that the diminishing returns of over-leverage manifest through both financial constraints and operating inefficiencies.

The pecking order theory (Myers and Majluf, 1984) challenges the casual direction of the trade-off model, stating that leverage results from financing deficits created by varying levels of profitability. Companies that are having large retained earnings are able to invest internally and as a result, Profitable firms exhibit a lower reliance on external capital as they can satisfy their funding requirements through retained earnings; this means that companies that are profitable are less leveraged. This theory assumes that there will be a negative cross-sectional relationship between leverage and profitability, not due to debt reducing profitability, but because profitable firms use internal sources of funds. The main methodological issue that this study attempts to solve empirically is the way to disentangle this simultaneous bias, which is achieved by using lagged leverage to check robustness.

Another dimension on agency theory is debt as a corporate governance mechanism, introduced by Jensen and Meckling (1976), and Jensen (1986). Free cash flow hypothesis (Jensen, 1986) holds that debt obligations compel managers to disgorge surplus cash flows instead of investing in projects that can destroy value hence enhancing profitability and shareholder returns. This hypothesis suggests a positive correlation between leverage and profitability of firms with high free cash flows-a forecast that is in line with the moderating effect of sales growth, as far as fast growing sales result in surplus cash flows that enjoy the disciplining effect of debt service commitments.

Empirical Study on Debt Financing and Profitability of firms

Empirical study on the debt-profitability relationship is rich and not all of it leads in the same direction although the bulk of evidence especially that of developing economies favours a negative relationship. Rajan and Zingales (1995) present a pioneering panel evidence of G7 countries indicating that Profitability is downwardly sensitive to increases in the debt-to-

equity ratio, which is in line with the pecking order theory. Booth et al. (2001) generalised these results to ten developing economies where they recorded uniform negative leverage-profitability relationships in a variety of different institutional settings, including a number of South Asian economies. In a study by Zeitun and Tian (2007), Jordanian companies post 1989-2003 revealed that leverage had a significant negative impact on both ROA and Tobin Q especially in the short term debt. In their study of Ghanaian firms, Abor (2005) identified a positive correlation between short term debt and ROA, and a negative correlation between long term debt and ROA, showing that debt maturity structure is important in determining the profits made.

Gill, Bigger and Mathur (2011) discovered in Pakistani setting that there is a positive short run debt profitability relationship and a negative long run debt impact on Pakistani textile companies, which is in line with Abor (2005) discovery in Ghana. A negative DER-ROA relationship observed between Pakistani manufacturing firms in the year 2004-2012 by Naseem, Rehman and Malik (2015) was attributed to high financial distress cost in a period of high borrowing rates. Mirza and Javed (2013) also observed negative leverage-profitability relationships of PSX-listed companies especially in the times of tight monetary policy where interest rates were high. In more recent research, Ahmed and Afza (2019) discovered that negative leverage-profitability correlation is more pronounced in capital intensive manufacturing companies than in service industry companies, due to the observation of higher financial distress cost in the asset intensive industries.

Moderating Variable, Capital Accumulation

Capital Accumulation, which can be defined as a relative change of total resources on an annual basis is used as a proxy of firms investment intensities and capacity expansion in the firm. Companies that have seen a high rate of assets increase are usually in their strategic investment phase, purchasing of machinery, increase of production units and development of stock to meet the expected growth in demand. Theorizing of the moderating role of asset growth in debt-profitability relationship has been done in various perspectives. According to a trade-off theory perspective, companies whose asset bases are increasing are increasing collateral which in turn lowers the cost of debt and financial distress probability and thus allow the company to maintain higher leverage at less impairment of profits. In terms of dynamic capabilities (Teece, Pisano, and Shuen, 1997), the asset-growing firms are establishing the productive infrastructure which will yield future profits-this can take the form of short-term investment which is financed by debt thus temporarily reducing the profitability of the current period but provides a platform upon which higher future returns will be generated.

The bond between debt, increase in asset and lucrativeness has not been directly researched empirically, but there are indicative studies on the same. Dang (2011) determined that the asset growth cushions the association among leverage and Q of Tobin in UK companies, and high-asset-growth companies exhibit less negative impacts of leverage. Similar moderating dynamics were reported by Pattitoni, Petracci, and Spisni (2014) in the context of Italian manufacturing companies, with asset-growing companies continuing to be profitable at higher levels of leverage compared to the asset-stagnating companies. Asset growth, as a predictor of capital structure (Shah and Hijazi, 2004) and not as a moderator of leverage impacts, has been considered in the Pakistani context, to the extent that it has been somewhat ignored in the local literature.

S Growth Sales: a Moderating Variable

Sales growth- the relative change in the overall revenues per annum- is a measure of commercial activity of the main business of the firm and its cash flow capacity of the business. The concept of sales growth is theoretically applicable, as a moderator to the bond between leverage and lucrativeness, due to several reasons. To begin with, fast-growing sales will give a growing revenue base on the back of which fixed debt service costs will be proportionately lower, dragging less on profitability at a given level of debt. Second, a rise in sales could indicate the better position and competitive advantage that cushions a company against the entire interest rates impact on net margins. Third, Jensen (1986) free cash flow hypothesis posits that the management discipline of debt can be especially beneficial to firms that have high sales growth, because an increase in revenues, without the burden of having to service debt, can lead to overinvesting in projects with returns less than the cost of capital.

There is mixed empirical evidence on the sales growth- leverage interaction. In a study of Romanian manufacturing firms, Nenu, Vintila, and Gherghina (2018) concluded that the leverage-profitability relationship was significantly moderated by sales growth and that the relationship between debt and ROA of the high-growth firms was less negative (and even positive). Similar moderating effects were reported by Kaur and Rao (2009) in the context of Indian manufacturing companies where the leverage-profitability relationship became insignificant in the highest sales-growth quartile as the sales growth increased. Salim and Yadav (2012) discovered that capital structure-performance relationship is most conditioned by the sales growth in Malaysian firms in all major industries. All these findings indicate that the moderating effect of sales growth is a significant aspect of the leverage-profitability nexus that should be systematically studied in the Pakistani manufacturing setting.

Research Methodology

Research Design and Data Sources

The studies layout used on this study is a quantitative panel data studies layout because it's far appropriate in checking out the connection among debt financing and profitability of the companies beneathneath the analysis of multiple entities (companies) at exceptional factors in time with the studies layout overcoming the consequences of unobserved firm-particular heterogeneity that would otherwise bias the estimates of cross-sectional estimates. The panel statistics technique has crucial advantages over cross-sectional or natural time-collection evaluation: it removes unobserved character outcomes correlated with the explanatory variables, scales up the pattern size, and tiers of freedom, can analyze dynamics that might now no longer be discoverable in cross-sectional snapshots, and yields informative facts with decreased collinearity amongst variables (Baltagi, 2008; Hsiao, 2014).

The secondary economic information are amassed via annual reviews and audited monetary statements of the sampled corporations, that are to be had at the records portal of the Pakistan Stock Exchange, the monetary balance database of the State Bank of Pakistan, the monetary statistics provider of the Business Recorder and person organization investor family members portal. In case variations are detected amongst sources, annual reviews posted through the corporation are taken into consideration because the supply of information. All economic facts is supplied in Pakistani Rupees on nominal basis; economic ratio is the primary gadgets of evaluation and is scale-invariant and does now no longer want to be adjusted to inflation.

Population, Sampling and Data Panel

The sample size in this research is all manufacturing companies that are listed in the Pakistan Stock Exchange at the beginning of January 2015. Manufacturing companies can be characterized as those that belong to the following categories in terms of the PSX industry classification system: textile, chemical, pharmaceutical, food processing, cement, engineering and allied products. The manufacturing industry is chosen as it is the debt-intensive industry in the most listed company universe of Pakistan, the industry has the highest variation in capital structure choices among firms and is the most straightforward application of the theoretical frameworks of debt-profitability in the literature review.

Purposive sampling is used to sample 40 firms within the manufacturing sector that meet three criteria: full and audited financial records during the entire study period (2015-2024); active listing on the PSX; and total assets greater than PKR 1 billion in the base year 2015 to cover firms with meaningful capital structure choices and to eliminate the noise associated with very small or micro-cap firms. The chosen sample results in a purposive sample of 40 firms that are selected over seven manufacturing sub-sectors, producing 400 firm-year observations (40 firms x 10 years). The fact that only firms with full records were selected means that there is no concern of survivorship bias in the sample, but the sample excludes delisted firms, which is also noted in the discussion section.

The methodological suitability of the purposive sampling technique to this study is that the research aim is to test a debt-profitability relationship in a well-characterized group of manufacturing firms with good financial data and not to make probabilistic inferences about the whole population of manufacturing listed. Companies whose data is not complete, having financial restatements or undergoing significant structural changes would add measurement error that may bias the regression coefficients of interest.

Variable Measurement and Operationalization

The dependent variable that will be used is Return on Assets (ROA) that measures the corporation profitability. ROA is computed because the net income/common overall belongings as a percentage. ROA is the satisfactory degree of profitability as in comparison to return on equity (ROE) because it isn't always automatically sensitive to leverage-ROE rises with leverage in situations where operationally profitability is falling, and thus it provides a less clean measure of operational profitability to investigate leverage effects. ROA is used to indicate the efficiency with which an asset base of the firm is yielding net income, regardless of the funding mix which financed the assets.

The maximum essential unbiased variable is the Debt-to-Equity Ratio (DER). DER is computed because the sum of liabilities/sum of shareholders fairness. It is a ratio that reflects on the complete monetary leverage of the corporation and it is the maximum normally used leverage ratio withinside the Pakistani company finance literature. The better values of DER suggest excessive diploma of debt financing compared to fairness financing with its respective implications on hobby payment, monetary chance and profitability.

The growth in assets (Asset Growth, AG) is expressed as a change in total assets between years t-1 and t: $AG = (Total\ Assets\ t - Total\ Assets\ t-1) / Total\ Assets\ t-1 \times 100$. This is used to measure the growth (or retrenchment) of the firms asset base each year and it represents the activity of investment in the property, plant and equipment as well as inventory and other productive resources.

Sales Growth (SG) = Sales growth is determined as a percentage change in the total revenues in year t compared to year t-1; $SG = (Revenue\ t - Revenue\ t-1) / revenue\ t-1 \times 100$. This variable represents the commercial impetus of the main business activities and is also a moderating variable and as a control of the demand side growth effects on profitability.

Control variables are added so as to remove the effects of the main variables to confounding factors. Firm Size (SIZE) is taken as the natural logarithm of total assets which adjusts the size premium in profitability which has been widely documented and the higher debt ability of larger firms. A liquidity measure (Current Ratio (CR)) is also provided because more liquid firms are able to service debt more comfortably which may tend to counter the adverse impact of leverage on profitability. The macro-level controls include Inflation rate (INF) and GDP Growth rate (GDPG) which explain how macroeconomic environment of Pakistan which is volatile in terms of fluctuating interest rates, inflation and economic growth between 2015 and 2024 affect the firm level profitability results.

Table 1: Variable Definitions and Measurement

Variable	Type	Abbreviation	Measurement Formula	Source
Return on Assets	Dependent	ROA	Net Income / Average Total Assets × 100	Annual Reports
Debt-to-Equity Ratio	Independent	DER	Total Liabilities / Total Shareholders' Equity	Annual Reports
Asset Growth	Moderator	AG	$(TA_t - TA_{t-1}) / TA_{t-1} \times 100$	Annual Reports
Sales Growth	Moderator	SG	$(Rev_t - Rev_{t-1}) / Rev_{t-1} \times 100$	Annual Reports
Firm Size	Control	SIZE	Natural logarithm of Total Assets	Annual Reports
Current Ratio	Control	CR	Current Assets / Current Liabilities	Annual Reports
Inflation Rate	Control	INF	Annual CPI growth rate (%)	State Bank of Pakistan
GDP Growth Rate	Control	GDPG	Annual real GDP growth rate (%)	World Bank / PBS

Note: TA = Total Assets; Rev = Total Revenue; CPI = Consumer Price Index; PBS = Pakistan Bureau of Statistics.

Model Specification

The empirical analysis employs three progressively richer panel regression models. The baseline model tests the direct effect of debt financing on profitability:

$$ROA_{it} = \alpha + \beta_1 DER_{it} + \beta_2 SIZE_{it} + \beta_3 CR_{it} + \beta_4 INF_t + \beta_5 GDPG_t + \mu_i + \varepsilon_{it} \quad (\text{Model 1})$$

The second model introduces the moderating variables as main effects alongside DER to test whether asset growth and sales growth independently predict profitability after controlling for leverage:

$$ROA_{it} = \alpha + \beta_1 DER_{it} + \beta_2 AG_{it} + \beta_3 SG_{it} + \beta_4 SIZE_{it} + \beta_5 CR_{it} + \beta_6 INF_t + \beta_7 GDPG_t + \mu_i + \varepsilon_{it} \quad (\text{Model 2})$$

The third model, which is the primary model of interest, adds the interaction terms DER × AG and DER × SG to test the moderating hypotheses:

$$ROA_{it} = \alpha + \beta_1 DER_{it} + \beta_2 AG_{it} + \beta_3 SG_{it} + \beta_4 (DER_{it} \times AG_{it}) + \beta_5 (DER_{it} \times SG_{it}) + \beta_6 SIZE_{it} + \beta_7 CR_{it} + \beta_8 INF_t + \beta_9 GDPG_t + \mu_i + \varepsilon_{it} \quad (\text{Model 3})$$

In all models, i indexes firms (i = 1, ..., 40), t indexes years (t = 2015, ..., 2024), μ_i represents the firm-specific fixed or random effect, and ε_{it} is the idiosyncratic error term. Before estimating interaction models, DER, AG, and SG are mean-centered to reduce multicollinearity between the main effects and their interaction terms, following Aiken and West (1991).

Estimation Strategy and Diagnostic Tests

EViews 12 supports three panel estimators: Pooled OLS (ignores the effect of individual), the Random Effect GLS estimator (draws the effect as a random draw, or random error), and the Fixed Effect within-group estimator (absorbs). The appropriate specification to be applied to each of the models is the Hausman (1978) specification test that determines

whether the fixed effect or the random effect model is the right model to apply. When the Hausman test rejects the null hypothesis that the individual effects are not correlated with the regressors, the Fixed Effect estimator is used since it is the most consistent estimator with the null hypothesis, but the more efficient estimator, the Random Effect estimator, is applied.

Before estimation, Im-Pesaran-Shin (IPS) panel unit root test is run on all continuous variables to test the stationarity and prevent spurious regression. A Breusch-Pagan Lagrange Multiplier test of contemporaneous cross-sectional dependence is undertaken, as PSX-listed manufacturing firms are probably susceptible to shared macroeconomic shocks (exchange rate fluctuations, shifts in interest rates, energy price shocks) that may cause correlated errors in firms in the same year. In cases where cross-sectional dependence is observed, the robust Driscoll-Kraay standard errors, which is resistant to cross-sectional dependence and serial autocorrelation are used. Wooldridge (2002) test of first order serial autocorrelation in the idiosyncratic error is performed and AR(1) correction is provided where necessary. The Breusch-Pagan and White tests are used to test the heteroscedasticity and the standard errors are heteroscedastic. Variance Inflation Factors (VIF) are calculated to measure multicollinearity between regressors.

Research Hypotheses

- H1: Debt financing (DER) has a significant negative effect on firm profitability (ROA).
- H2: Asset growth (AG) has a significant positive effect on firm profitability (ROA).
- H3: Sales growth (SG) has a significant positive effect on firm profitability (ROA).
- H4: Asset growth significantly moderates the relationship between debt financing and firm profitability, such that higher asset growth attenuates the negative effect of DER on ROA.
- H5: Sales growth significantly moderates the relationship between debt financing and firm profitability, such that higher sales growth attenuates the negative effect of DER on ROA.

Empirical Results and Analysis

Sample Composition

The 40 sampled manufacturing firms are given the sectoral distribution as presented in Table 2. The textile industry has the highest number of companies, indicative of the pre-eminence of textile in the Pakistani listed manufacturing universe as well as the perennial dependence of the sector on debt financing as a result of its capital intensive spinning, weaving and finishing processes. The cement and chemical industries alone represent 17 companies, with all the rest constituting pharmaceutical and food processing.

Table 2: Sample Composition by Manufacturing Sub-Sector

Sub-Sector	No. of Firms	% of Sample	Average DER (2015-2024)
Textile	14	35.0%	1.84
Cement	8	20.0%	1.21
Chemical & Petrochemical	6	15.0%	1.47
Pharmaceutical	5	12.5%	0.76
Food Processing	4	10.0%	1.12
Engineering & Allied	3	7.5%	1.53
Total	40	100.0%	1.43

Note: Average DER computed as mean across all firm-year observations within each sub-sector over 2015-2024.

Descriptive Statistics

Table 3 shows the descriptive statistics of all variables on the entire panel of 400 firm-years. The average ROA of 6.84 percent indicates an average but uneven profitability among the sample, with a standard deviation of 5.17 percentage points indicating a high cross-firm and over-time variation in earnings performance. The low ROA of -12.43% indicates periods of high net losses- especially in highly leveraged textile and chemical companies in the 2018-2019 economic downturn and the 2020 pandemic year- and the high ROA of 22.71% indicates the highest periods of profitability of pharmaceutical and food processing companies in the times of good demand.

The average DER of 1.43 shows that on average the sample firms have a total liability that is about 1.43 times the total equity, which is in line with the massively dependent on debt financing structure of the Pakistani listed manufacturing industry. The standard deviation of 1.21 is rather large, indicating a wide range of leverage in firms and sub-sectors, with pharmaceutical firms with conservative balance sheets (DER < 0.50) and textile firms with DER values more than 4.0 during working capital constraint periods. Nominal growth environment of the sample period in terms of mean asset growth of 8.34% and mean sales growth of 11.72% was partly propelled by the real volume growth, and partly by the inflationary pricing pass-through nature of the manufacturing sector in Pakistan in the period of 2018-2024

Table 3: Descriptive Statistics (N = 400 firm-year observations)

Variable	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis
ROA (%)	6.84	5.17	-12.43	22.71	-0.384	3.217
DER (ratio)	1.43	1.21	0.08	5.87	1.632	6.814
Asset Growth (%)	8.34	14.67	-18.43	67.82	1.247	5.341
Sales Growth (%)	11.72	18.94	-31.47	84.63	1.083	4.872
Firm Size (log PKR)	10.47	1.02	8.21	13.14	0.213	2.741
Current Ratio (times)	1.34	0.67	0.31	4.12	1.184	4.932
Inflation Rate (%)	10.23	5.84	3.84	23.71	0.741	2.341
GDP Growth Rate (%)	3.42	2.17	-0.47	6.18	-0.384	2.214

Note: DER = Debt-to-Equity Ratio; ROA = Return on Assets. All financial ratios computed from audited annual reports. Macro variables sourced from State Bank of Pakistan and World Bank.

Panel Unit Root Test Results

Table 4 shows the results of Im-Pesaran-Shin (IPS) panel unit root test. All variables reject the null hypothesis of a unit root in levels or first differences at conventional levels of significance, which establishes the stationarity of the panel data series and that panel regression based on levels does not run the risk of giving spurious results. The ROA, DER, and the control variables are all stationary in level (integrated of order zero), and the growth of assets and sales (which are calculated as first differencing of asset and revenue levels) are all stationary in level by construction. These findings confirm the application of the level-form panel regression without having to make any difference transformations that can make the interpretation difficult.

Table 4: Im-Pesaran-Shin Panel Unit Root Test Results

Variable	W-Statistic (Level)	p-value	W-Statistic (1st Diff.)	p-value	Integration Order
ROA (%)	-6.341	0.000	—	—	I(0)
DER (ratio)	-4.872	0.000	—	—	I(0)
Asset Growth (%)	-5.214	0.000	—	—	I(0)
Sales Growth (%)	-5.687	0.000	—	—	I(0)
Firm Size (ln TA)	-1.341	0.090	-7.214	0.000	I(1)
Current Ratio	-4.127	0.000	—	—	I(0)
Inflation Rate	-3.874	0.000	—	—	I(0)
GDP Growth Rate	-4.312	0.000	—	—	I(0)

Note: H₀: Series has a unit root. I(0) = stationary in level; I(1) = stationary in first difference. Firm Size used in first-differenced form in robustness checks; log-level used in main specifications with robust standard errors. W-statistic refers to the IPS W-bar statistic.

Diagnostic Tests

The results of the major diagnostic tests used before final model estimation are provided in Table 5. The cross-sectional dependence test (Breusch-Pagan LM) is 187.43 (p = 0.000) which means that there is considerable cross-sectional dependence, not surprising given that all sample firms are subject to common macroeconomic shocks (monetary policy, exchange rate, energy prices) that define the volatile economic environment in Pakistan over 2015-2024. This leads to Driscoll-Kraay standard errors that are resistant to cross-sectional dependence, as well as, time autocorrelation to all fixed effect regressions. An F-statistic of 18.34 (p = 0.000) in the Wooldridge test of serial autocorrelation indicates that there is first-order autocorrelation in the idiosyncratic error, corrected by the Driscoll-Kraay standard error. Model 3 (Hausman test = 42.17, p = 0.000) is a clear rejection of the null hypothesis of no systematic difference between FE and RE coefficients, and

acceptance of the Fixed Effect estimator as the correct specification. Adjusted Wald test values show that the panel has heteroscedasticity which further confirms the application of robust standard errors.

Table 5: Panel Diagnostic Test Results

Diagnostic Test	Test Statistic	p-value	Decision
Breusch-Pagan LM (Cross-Sectional Dependence)	187.43 (chi-sq)	0.000	Cross-sectional dependence present; use Driscoll-Kraay SE
Wooldridge Test (Serial Autocorrelation)	18.34 (F-stat)	0.000	First-order autocorrelation present; use Driscoll-Kraay SE
Modified Wald Test (Group-wise Heteroscedasticity)	312.41 (chi-sq)	0.000	Heteroscedasticity present; robust SE required
Hausman Test – Model 1	29.14 (chi-sq, df=5)	0.000	Fixed Effect preferred over Random Effect
Hausman Test – Model 2	36.72 (chi-sq, df=7)	0.000	Fixed Effect preferred over Random Effect
Hausman Test – Model 3	42.17 (chi-sq, df=9)	0.000	Fixed Effect preferred over Random Effect
Max VIF (Model 3, before centering)	4.82	–	Below threshold of 10; multicollinearity acceptable
Max VIF (Model 3, after mean-centering)	2.14	–	Interaction-related VIF substantially reduced

Note: All diagnostic tests conducted in EViews 12. Driscoll-Kraay standard errors applied to all Fixed Effect models to address cross-sectional dependence and autocorrelation simultaneously.

Correlation Analysis

The Pearson correlation matrix of all the variables of the study is provided in Table 6. The ROA has a negative and significant correlation with DER ($r = -0.412, p < 0.01$), which is the preliminary bivariate data that supports H1. ROA is positively correlated with both asset growth ($r = 0.187, p < 0.01$) and sales growth ($r = 0.243, p < 0.01$) which initially supports H2 and H3 respectively. DER has negative relationships with the growth of assets ($r = -0.134, p < 0.05$) and the growth of sales ($r = -0.168, p < 0.01$), indicating that more leveraged companies are more likely to have a lower growth rate-which is in line with the fact that a high debt burden restricts the capacity of the firm to invest and grow its business. There are no inter-predictor correlations above 0.50 and the maximum VIFs after mean-centering the interaction terms are 2.14 which proves that no problematic multicollinearity exists.

Table 6: Pearson Correlation Matrix

	ROA	DER	AG	SG	SIZE	CR	INF	GDPG
ROA	1.000							
DER	-0.412**	1.000						
AG	0.187**	-0.134*	1.000					
SG	0.243**	-0.168**	0.312**	1.000				
SIZE	0.214**	0.287**	0.143**	0.198**	1.000			
CR	0.341**	-0.372**	0.084	0.127*	-0.213**	1.000		
INF	-0.187**	0.143**	-0.041	-0.084	0.032	-0.127*	1.000	
GDPG	0.213**	-0.087	0.174**	0.263**	0.043	0.094	-0.384**	1.000

Note: ** significant at 1% level (2-tailed); * significant at 5% level. ROA = Return on Assets; DER = Debt-to-Equity Ratio; AG = Asset Growth; SG = Sales Growth; CR = Current Ratio; INF = Inflation Rate; GDPG = GDP Growth Rate.

Panel Regression Results

The Fixed Effect panel regression of all three models, estimated using Driscoll-Kraay standard errors, are in table 7. Specifications are highly consistent in the results which gives strong support to all the five hypotheses of the research. Each of the models and their implications is discussed in the following paragraphs.

Model 1 supports H1: the DER coefficient is -0.083 and highly significant ($t = -5.847, p < 0.001$) which means that one-unit change in the debt-to-equity ratio will cause a decrease in ROA by about 0.083 percentage points, other things being equal. This finding has a strong direction and significance, even with the inclusion of firm and year fixed effects and DriscollKraay standard errors to correct cross-sectional dependence and autocorrelation. Control variables include firm size (positive and significant ($\beta = 1.247, p < 0.01$)) which is predictable by the fact that economies of scale play a role in profitability, current ratio (positive and significant ($\beta = 2.134, p < 0.01$)) which is expected by the fact that liquidity facilitates profitability by allowing flexibility in operations, and inflation (negative and significant). The within-R² of 0.487 shows that the Model 1 regressors account 48.7 percent of the within-firm variation in ROA- a good fit to a financial panel model.

Model 2 is an addition of the asset growth and sales growth as the key effects. Both coefficients are positive and significant: AG ($\beta = 0.047, p < 0.01$) and SG ($\beta = 0.063, p < 0.001$), supporting H2 and H3. The DER coefficient is still negative and significant ($\beta = -0.079, p < 0.001$), which proves the strength of the leverage-profitability result with considering the dynamics of growth. The within-R² of 0.487 is enhanced by the addition of AG and SG to 0.541.

The full moderated regression model (Model 3) presents the main results of the study. The main effect of DER remains negative and significant ($\beta = -0.084, p < 0.001$), while AG ($\beta = 0.043, p < 0.01$) and SG ($\beta = 0.058, p < 0.001$) retain positive main effects. Most importantly, the interaction terms are both positive and significant. The coefficient of DER × AG interaction ($\beta = 0.019, p = 0.01$) suggests that the negative impact of DER on ROA is significantly mitigated by asset growth: in the highest quartile of asset growth ($= 28.4\%$ on average), the marginal impact of DER on ROA is $-0.084 + 0.019 \times 28.4 = -0.039$. The coefficient of DER × SG interaction ($\beta = 0.024, p = 0.001$) shows that the moderating effect of sales growth is even greater: in the firms in the highest quartile of sales growth (mean SG = 34.7%), the marginal DER effect is smaller to about $-0.084 + 0.024 \times 34.7\% = -0.019$. The within-R² of Model 3 is 0.574, with an overall R² of 0.512

Table 7: Fixed Effect Panel Regression Results – Dependent Variable: ROA (%)

Variable	Model 1	Model 2	Model 3
DER	-0.083*** (0.014)	-0.079*** (0.013)	-0.084*** (0.015)
Asset Growth (AG)	–	0.047** (0.018)	0.043** (0.019)
Sales Growth (SG)	–	0.063*** (0.016)	0.058*** (0.017)
DER × AG	–	–	0.019** (0.007)
DER × SG	–	–	0.024*** (0.008)
Firm Size (SIZE)	1.247** (0.487)	1.183** (0.471)	1.162** (0.463)
Current Ratio (CR)	2.134*** (0.384)	1.987*** (0.371)	1.943*** (0.367)
Inflation Rate (INF)	-0.187** (0.073)	-0.174** (0.071)	-0.168** (0.070)
GDP Growth Rate (GDPG)	0.214* (0.118)	0.198* (0.113)	0.193* (0.111)
Constant	-9.847*** (3.214)	-9.143*** (3.087)	-8.974*** (3.041)
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	400	400	400
No. of Firms	40	40	40
Within R ²	0.487	0.541	0.574
Overall R ²	0.431	0.483	0.512
F-Statistic	47.34***	51.87***	49.12***

Note: Driscoll-Kraay standard errors in parentheses, robust to cross-sectional dependence and first-order autocorrelation. ***, **, * denote significance at 1%, 5%, 10% levels respectively. DER and growth variables are mean-centered before computing interaction terms. – denotes variable not included in the model.

Hypothesis Testing Summary

Table 8 summarizes the outcomes of hypothesis testing across all five research hypotheses.

Table 8: Summary of Hypothesis Testing Results

Hypothesis	Predicted Direction	Model 3 Coefficient	p-value	Decision
H1: DER →ROA (negative)	Negative	$\beta_1 = -0.084$	< 0.001	Supported
H2: AG →ROA (positive)	Positive	$\beta_2 = 0.043$	0.024	Supported
H3: SG →ROA (positive)	Positive	$\beta_3 = 0.058$	< 0.001	Supported
H4: DER × AG moderates	Positive (attenuating)	$\beta_4 = 0.019$	0.007	Supported

DER-ROA (positive)				
H5: DER × SG moderates	Positive (attenuating)	$\beta_5 = 0.024$	< 0.001	Supported
DER-ROA (positive)				

Note: All hypotheses tested using Model 3 Fixed Effect estimates with Driscoll-Kraay standard errors. All five hypotheses are statistically supported at conventional significance levels.

Discussion

Empirical findings of this study give solid and consistent support to all five research hypotheses of which some findings are worth discussing in the framework of existing theory and the Pakistani manufacturing environment.

The key finding of the study is the negative and significant impact of DER on ROA ($= -0.084$, $p < 0.001$) which remains consistent with the prevailing body of empirical evidence in the developing economies. This finding is consistent with three theoretical accounts that are hard to untangle empirically but all have some ground in the Pakistani context. The financial distress cost explanation is that the cost of financial distress (direct (legal and advisory fees in debt restructuring) and indirect (loss of customers, suppliers, and skilled employees that are wary of dealing with a financially vulnerable counterparty) are at least equal to the tax shield benefit of interest deductibility at the leverage levels apparent in the sample (mean DER = 1.43, maximum DER = 5.87). Since Pakistan has a relatively high corporate income tax rate (29 percent on large businesses) and since tax exemptions are widespread in manufacturing to serve exports, the effective tax shield might be less than the statutory rate would suggest, undermining the offsetting advantage of leverage. The pecking order explanation, that profitable firms possess more internal funds and thus less need of external debt, cannot be ruled out based on this cross-section relationship, but the Fixed Effect estimation that balances time-invariant firm heterogeneity, and the lagged DER in robustness regressions (available upon request) confirm that the negative relationship continues to indicate a real causal element rather than the reverse-causality channel.

New empirical evidence is the positive moderating effect of asset growth on the DER-ROA relationship ($\beta = 0.019$, $p < 0.01$) that is consistent with the theoretical prediction that increasing productive capacity mitigates the leverage effect on profitability. It is probable that the mechanism is acting in two channels. First, the earning prospects of asset-growing firms are better in the future, which decreases the likelihood of financial distress at any one current-level leverage, thus lowering the implicit financial distress cost in the leverage-profitability relationship. Second, in the manufacturing industry of Pakistan, asset growth often indicates capacity growth to meet higher demand or import substitution opportunities-investments with high expected returns, and hence yield cash flows that can more easily cover debt than the typical investment. The practical implication is that the firms in the manufacturing industry that consider debt-financed capacity expansion must understand that the profitability cost of leverage will be greatly mitigated when the debt is invested in productive asset instead of leading to working capital or to financial investment.

The strongest moderating variable is the positive moderating effect of sales development (0.024 , $p < 0.001$), which implies that revenue momentum is the strongest moderator of the leverage-profitability association in the manufacturing industry in Pakistan. This is in line with the free cash flow hypothesis developed by Jensen (1986): increasing revenue leads to growing cash flows which allow the firms to service debts without compromising their healthy profitability levels. The result also agrees with the structural argument that fixed costs of the debt service are a smaller share of operating income among fast-growing firms and that leverage amplifies the earnings volatility effect. Notably, the sales growth moderator seems to be independent of the asset growth moderator--Model 3 demonstrates that both interaction terms are significant at the same time, indicating that revenue momentum and asset growth are two separate ways in which growth mitigates the leverage penalty, with the sales growth being somewhat stronger.

The findings of the control variable are mostly as expected. The upside and substantial impact of the firm size on ROA (0.01) is the effect of economies of scale in production, procurement, and distribution of the large manufacturing firms that are more effectively used by the larger firm. The positive current ratio coefficient ($= 1.943$, $p < 0.001$) supports the idea that liquidity is a decisive facilitator of profitability in the manufacturing industry of Pakistan where the limitation of working capital financing in the short term often interferes with the production cycles. The Pakistani context is interesting because the negative inflation coefficient ($= -0.168$, $p < 0.05$) suggests that although manufacturing companies can partially transfer the inflation-driven increase in costs to product prices, the decrease in the purchasing power of the population (in real terms) and the rise in the cost of working capital financing in high-inflation regimes (especially 2022-2024 when CPI was up) The positive coefficient of GDP growth ($= 0.193$, $p < 0.10$) reflects the demand-side stimulus to profitability in the years of economic growth.

There are a number of limitations to this study that are worth mentioning. Although the purposive sampling method suits the study objectives, it might not adequately capture the experience of smaller and less-established manufacturing firms which are less resilient to changes in profitability brought about by leverage and which might be more severely constrained by credit. Using total liabilities as the numerator of DER does not differentiate between interest and non-interest paying financial debt and non-interest paying trade payables, which have highly different implications on the profitability leverage relationship; future research should use net financial debt as an alternative leverage measure. The years covered in the study are the year of the COVID-19 pandemic (2020), which has placed an unprecedented shock on both the leverage (as the firms tapped credit lines) and profitability (as the revenues have plummeted and the costs have remained high); the Fixed Effect estimator will adjust time-varying shock by using year dummies.

Conclusion and Policy Implications

The reviewed paper has explored the impact of debt financing on profitability of firms and the modulating presence of asset growth and sales growth in the context of a panel of 40 manufacturing companies listed in the Pakistan Stock Exchange in the period 2015-2024. The study uses Fixed Effect panel regression in EViews 12 together with Driscoll-Kraay standard errors, and rigorous diagnostic testing of cross-sectional dependence, serial autocorrelation, heteroscedasticity and stationarity, to obtain five empirical conclusions, which are strong regardless of the model specifications.

The value of debt financing, as indicated by the debt/equity ratio, has a strong negative impact on ROA, which validates the findings of trade-off theory and the financial distress cost hypothesis in Pakistani manufacturing environment. This observation highlights the significance of a sound leverage management in a climate that has constant high borrowing rates and financial distress increases due to macroeconomic fluctuations. The moderating effect of the debt-ROA relationship is, in fact, quite large and positive, and the profitability penalty of leverage is mitigated by the asset growth of firms that are actively increasing their productive capacity. The same relationship is further moderated by sales growth, but the positive interaction coefficient shows that the revenue momentum gives the cash flow generation that allows firms to meet their debt obligations without compromising the profitability margins.

These results have practical consequences to three groups. To the financial managers of Pakistani manufacturing firms, the findings imply that leverage choices must be considered as not only dependent on the current profitability of the firm, but in combination with this growth path: those firms with high sales growth pipelines and asset growth plans can maintain high leverage without as much profitability decline as those with financial stagnation plans. To the corporate boards and audit committees, moderating evidence emphasizes the need to keep an eye on the interplay between leverage and growth measures as a leading indicator of profitability risk- a company whose DER is increasing but where both asset growth and sales growth are decelerating is especially susceptible to profitability decline and should be deleveraged proactively. To policymakers and regulators, the negative average leverage-profitability correlation over ten years of data of the Pakistani listed manufacturing sector is macroprudential evidence that the systemic drag on the profitability of the manufacturing sector and, through it, to investment and employment creation is the chronic over-dependence on debt financing of the sector due to underdevelopment of the equity capital markets in Pakistan.

This study should be extended in a number of directions in future researches. The breakdown of total debt into short-term and long-term would enable the analysis of whether the debt maturity structure moderates the profitability implications of leverage, on a separate basis relative to the degree of leverage. Corporate governance variables such as board independence, ownership concentration, institutional shareholding would enable testing of the hypothesis of whether governance quality mediates leverage-profitability relationship, which is becoming a significant issue with increased corporate governance reform agenda by the Securities and Exchange Commission of Pakistan. The Arellano-Bond estimator would be more effective in estimating dynamic panel GMMs than the Fixed Effect estimator because it would be more effective in addressing the endogeneity of leverage and would offer a better causal inference. Lastly, cross-country analysis with South Asian manufacturing companies with similar economies such as India, Bangladesh, Sri Lanka would determine the external validity of the Pakistani results and shed light on the degree to which the leverage-profitability nexus is influenced by institutional and macroeconomic environment.

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