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Exploring the Nexus between Debt Financing and Firm Performance: A Robustness Analysis Using Instrumental Variables

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***Abstract*—** *This study explores the impact of debt financing on firm performance, focusing on addressing the challenges of endogeneity and collinearity in regression models. Using a sample of firms from the CSMAR database, we investigate how different forms of debt financing short-term debt, long-term debt, and total debt affect firm performance metrics, specifically Return on Equity (ROE) and Return on Assets (ROA). To mitigate potential biases in traditional regression models, we employ Generalized Two-Stage Least Squares (G2SLS) and instrumental variable (IV) techniques. Our results show that long-term debt (LTDTA) and total debt to total assets (TDTA) have significant effects on firm performance, with some mixed relationships observed between debt financing variables and performance outcomes. The study further addresses issues of collinearity and endogeneity, demonstrating that the use of robust standard errors and instrumental variables provides more reliable estimates. The findings highlight the importance of strategic debt management for firms aiming to optimize performance while minimizing risks associated with excessive leverage. This study contributes to the literature on capital structure and firm performance, offering implications for financial managers, investors, and policymakers. Future research could extend these findings by exploring the effects of other financing sources and firm-specific characteristics across different industries.*

I. INTRODUCTION

Small and medium-sized enterprises (SMEs) play an integral role in global economic development, particularly in emerging economies where they contribute significantly to employment generation, innovation, and GDP growth. In China, SMEs are the backbone of the economy, accounting for more than 60% of the nation's GDP and 80% of urban employment (Zhao, 2020). Their contribution is especially critical in fostering regional development and driving technological innovation, yet they face considerable challenges in accessing financing. Debt financing, often seen as a primary source of external capital for these firms, can be a double-edged sword—while it provides necessary funds for growth and expansion, it also introduces the risk of financial distress if not managed properly.

The role of debt in financing SME growth is particularly relevant in the context of China, where SMEs often struggle with obtaining financing from traditional sources. Despite policy reforms to enhance credit access, SMEs still face difficulties in securing loans due to high perceived risks, insufficient collateral, and weak financial structures (Chen et al., 2021). As a result, understanding the impact of debt financing on firm performance is crucial for both SMEs and policymakers aiming to foster sustainable economic growth. Debt financing can have varying effects on the performance of SMEs, with research offering mixed results. On one hand, studies suggest that debt can provide necessary liquidity, improve firm efficiency, and facilitate expansion (Babenko et al., 2021). On the other hand, excessive debt can lead to financial distress, increasing the cost of capital and reducing profitability (Chen et al., 2021). While debt financing can potentially improve performance by allowing firms to scale operations and capitalize on growth opportunities, it may also negatively affect firm value if the debt burden becomes unmanageable (Ramezani et al., 2020).

The existing literature on debt financing and firm performance has primarily focused on SMEs in developed economies, with less attention given to emerging economies like China. This is especially true for listed SMEs, where the dynamics of debt financing may differ due to the influence of external investors, market conditions, and government policies (He & Li, 2022). In particular, little empirical research has focused on SMEs listed on the Shenzhen SME Board, one of China's key platforms for financing innovation and supporting small enterprises. The Shenzhen SME Board offers a unique environment for SMEs, as firms listed here often face less stringent regulatory requirements compared to those on the main board, yet still struggle with financing constraints typical of smaller businesses.

Although there is growing interest in understanding the financial behavior of listed SMEs in China, few studies have specifically addressed the role of debt financing in influencing firm performance within this context. Notably, there is a lack of consensus on how different types of debt, such as long-term versus short-term debt, affect the profitability, growth, and stability of SMEs. The mixed results in existing studies highlight the need for further exploration of this relationship, particularly in the context of Chinese SMEs that are publicly listed and operate under different market dynamics than their private counterparts.

Moreover, there is a significant gap in the literature regarding the role of governance structures and agency costs in shaping the relationship between debt financing and firm performance in listed SMEs. Agency theory suggests that conflicts between shareholders and managers can influence how firms manage debt, which, in turn, impacts their performance (Li & Tang, 2021). For listed SMEs, where ownership and management structures are often more dispersed, understanding the role of agency costs is crucial for comprehending how debt financing decisions are made and their subsequent effects on performance.

Given these gaps, the current study aims to contribute to the understanding of how debt financing impacts the performance of SMEs listed on the Shenzhen SME Board. Specifically, this study investigates how the structure of debt both long-term and short-term affects key performance indicators, such as profitability, growth, and financial stability. The research also explores the moderating role of governance structures and agency costs in this relationship. By addressing these gaps, the study seeks to provide valuable insights for policymakers and practitioners looking to improve the financial management and sustainability of listed SMEs in China.

II. REVIEW OF RELATED LITERATURE

2.1 Theoretical Review: Theory of Corporate Performance

The concept of corporate performance has been widely explored in management and finance literature, where it is considered a key measure of a company's success and growth potential. Understanding corporate performance involves evaluating a firm's ability to achieve its objectives efficiently and effectively, encompassing a wide range of factors, both financial and non-financial. The traditional view of corporate performance primarily focuses on financial metrics such as profitability, growth, and shareholder value. According to Kaplan & Norton (1992), one of the earliest contributions to the development of performance measurement systems, corporate performance should be viewed through a balanced lens, integrating both financial outcomes and operational processes. This framework laid the foundation for the Balanced Scorecard, which takes into account not only financial measures but also customer satisfaction, internal business processes, and learning and growth, which are seen as long-term drivers of performance.

A more refined view of corporate performance is proposed by Barney (1991), who suggests that sustained competitive advantage, driven by resource-based capabilities, significantly influences a firm's performance. Barney's Resource-Based View (RBV) emphasizes that a firm's internal resources, such as its organizational capabilities and assets, determine how well it performs in a competitive market. This perspective links firm performance to its

ability to leverage unique and valuable resources, making the firm more adaptable and profitable in the long run.

In contrast, Porter's (1985) Competitive Advantage theory highlights the external forces influencing corporate performance. According to Porter, performance is shaped by the firm's strategy to position itself in the market either through cost leadership, differentiation, or focus. Firms that effectively align their strategy with market demands achieve superior performance outcomes. The emphasis here is on strategic decisions that align the firm's resources with its external environment, underscoring the interplay between internal capabilities and market dynamics.

These perspectives, however, only capture a portion of corporate performance, prompting a need for more multidimensional approaches. Groves et al. (2008) argue that corporate performance also involves a deeper understanding of organizational behavior, leadership, and the effectiveness of internal controls and governance. According to them, high-performing organizations exhibit strong leadership, clear communication, and the ability to inspire and motivate employees toward a unified set of strategic goals. The conceptualization of corporate performance remains dynamic, with both theoretical frameworks and evolving models continually adapting to new economic, managerial, and market realities. For this study, we draw on the Multidimensional Performance Framework, incorporating financial metrics and operational efficiency, as well as the firm's capacity to innovate and maintain a competitive position within its industry.

2.2 Univariate Effectiveness

Univariate effectiveness pertains to the use of single financial indicators to evaluate a firm's performance. These indicators are often grounded in traditional financial theory and typically include measures such as return on equity (ROE), return on assets (ROA), earnings per share (EPS), and financial leverage ratios. Penman (2013) argues that these metrics are often adequate for assessing short-term profitability and financial health, but they fail to offer a comprehensive view of the firm's long-term value creation or sustainability. The reliance on univariate metrics can obscure a firm's potential for growth, customer engagement, or operational efficiency—factors that are critical for long-term corporate success.

Tobin's Q, a ratio of a firm's market value to the replacement cost of its assets, is another widely discussed financial metric that seeks to provide insight into the market's valuation of the firm's future growth prospects. Studies by Scherer & Ross (1990) show that Tobin's Q is a useful indicator of how efficiently firms allocate their capital, but its reliance on market perceptions and future growth projections makes it vulnerable to market volatility and investor sentiment. Similarly, Lynch et al. (2014) suggest that ROE and ROA, while useful for short-term financial assessments, fail to account for broader strategic performance and intangible assets such as brand equity or intellectual property.

Despite these limitations, univariate measures remain useful for initial assessments of a firm's profitability, particularly in industries with stable market conditions where short-term financial outcomes may be the most relevant indicator of corporate health.

2.3 Multivariate Effectiveness

Multivariate effectiveness, by contrast, takes a more holistic approach to corporate performance measurement, incorporating multiple indicators that capture various facets of organizational success. The Balanced Scorecard framework developed by Kaplan and Norton (1992) is a key model in this area, proposing that firms should use a combination of financial, customer, internal business process, and learning and growth indicators to evaluate performance. By integrating non-financial metrics, firms can gain a deeper understanding of their competitive position and areas requiring improvement.

Andersen & Buch (2002) contend that multivariate performance models, such as the EFQM Excellence Model or the European Foundation for Quality Management (EFQM), provide a more accurate and reliable representation of a firm's overall effectiveness. These models encompass a range of factors, from financial results to leadership practices, customer satisfaction, employee engagement, and innovation. The holistic nature of multivariate frameworks ensures that performance assessments are not biased by a narrow focus on financial outcomes but instead reflect the complex, multifaceted reality of business operations.

Moreover, the multivariate approach is particularly beneficial when evaluating firms in dynamic industries, where non-financial metrics such as customer loyalty, employee satisfaction, and innovation capacity are essential for sustaining competitive advantage. In these cases, traditional financial measures alone are insufficient, and the inclusion of operational and strategic metrics provides a more comprehensive view of firm performance.

2.4 Empirical Review: The Impact of Debt Financing on Firm Performance

The effect of debt financing on corporate performance has been a subject of considerable empirical research, especially in the context of emerging markets where capital structure decisions can have profound implications for firm sustainability and growth. Debt financing allows firms to leverage external capital for expansion, R&D, and

operational improvements. However, it also introduces financial risk, which can influence a firm's overall performance.

Modigliani & Miller (1958) originally posited that under perfect market conditions, the capital structure of a firm would not affect its total value, a theory known as the Modigliani-Miller theorem. However, in reality, firms face market imperfections, such as taxes, bankruptcy costs, and agency problems, which mean that the capital structure does, in fact, impact firm performance. The Trade-off Theory, proposed by Kraus & Litzenberger (1973), suggests that firms weigh the benefits of debt (tax shields) against the costs (bankruptcy risk and agency costs) to determine their optimal capital structure. According to this theory, moderate levels of debt can enhance firm performance by lowering the overall cost of capital, but excessive debt can lead to financial distress, adversely impacting performance.

In developing economies, Mollah & Lipy (2014) have shown that debt financing plays a critical role in improving firm performance, particularly when the cost of equity capital is high and external financing options are limited. The study found that for firms in Bangladesh, debt financing increased profitability and growth rates, particularly for small- and medium-sized enterprises (SMEs). However, this relationship becomes negative at higher levels of debt, where firms face increased debt servicing costs that erode profitability and lead to financial distress.

In contrast, Frank & Goyal (2009) analyzed the impact of debt financing on firms in the US and found a negative relationship between debt levels and performance for firms with high leverage ratios. The authors argue that highly leveraged firms are more vulnerable to economic downturns and may struggle to meet their debt obligations, leading to lower profitability, reduced investment, and diminished firm value.

Further, studies in the Chinese market, such as Chen et al. (2018), reveal that the relationship between debt financing and performance is highly contingent on firm size and industry sector. For example, in the technology and manufacturing sectors, where firms often require significant investment for expansion, moderate debt usage can lead to higher performance. However, firms in consumer-facing sectors, such as retail and hospitality, face greater risks when relying on debt financing, particularly in volatile market conditions. The empirical evidence on the relationship between debt and firm performance suggests that firms must carefully manage their debt levels to optimize their performance. While moderate debt can enable firms to leverage opportunities for growth, excessive debt can constrain financial flexibility, increase risk exposure, and undermine long-term performance.

The literature on corporate performance and debt financing provides valuable insights into the complex relationship between financial leverage and firm success. While traditional univariate measures of performance such as profitability ratios offer a straightforward view of a firm's financial health, they fall short of capturing the broader picture of organizational performance. Multivariate performance frameworks, such as the Balanced Scorecard, offer a more comprehensive approach by incorporating both financial and non-financial factors.

Empirical studies consistently show that while debt financing can facilitate growth, it also introduces risk. The impact of debt on firm performance varies across industries, firm size, and the economic environment, suggesting that capital structure decisions must be tailored to the specific needs and risks faced by the firm. The evidence emphasizes the importance of a balanced approach to debt financing, where firms optimize leverage without overexposing themselves to financial risk. For firms seeking to maximize their performance, it is essential to not only monitor financial metrics but also consider strategic, operational, and customer-centric factors that contribute to long-term sustainability. As the global business landscape continues to evolve, the integration of diverse performance measures will remain critical to understanding and driving corporate success.

III. DATA AND METHODOLOGY

This study employs a combination of correlational and descriptive research designs. The correlational design is utilized to explore the relationships between various factors influencing the dependent variable, specifically firm performance. The goal is to understand which debt measure (e.g., short-term or long-term debt) causes variations in performance. The descriptive design is employed to characterize the study area, particularly focusing on the firms within the target population.

According to the Promotion Law of China (2003), Small and Medium Enterprises (SMEs) are defined as having fewer than 100 employees (for small firms) or 500 employees (for medium firms), total assets of less than 40 million RMB, and annual sales revenue under 300 million RMB. The population for this study consists of SMEs in the manufacturing, wholesale, and retail sectors, including industries such as food, textiles, motor vehicles, hotels/restaurants, construction, telecommunications, and transport. All firms included in this research are publicly listed on the Shenzhen Stock Exchange. The sample includes firms with debt financing reflected in their annual panel data from 2011 to 2018.

The primary source of data for this research is secondary data obtained from the China Stock Market & Accounting Research Database (CSMAR), developed by Shenzhen GTA Information Technology Company. The financial statements used include the income statement (comprehensive statement of financial performance) and the balance sheet (end-of-year financial position) of the selected firms. After filtering based on the criteria outlined in Appendix 1, the final sample consists of 2,071 SMEs, resulting in 13,751 observations across the 8-year period (2011-2018). Of these firms, 800 (38.62%) are from the traditional manufacturing industry, 651 (31.43%) are from the wholesale sector, and 620 (29.93%) are from the retail sector. Table 6 (4.1) presents the descriptive statistics for the variables used in the model.

3.1 Description of Variables

This study investigates the effect of debt financing on firm performance in Chinese SMEs. Firm performance is measured using two key indicators: Return on Equity (ROE) and Tobin's Q. These dependent variables are regressed against debt financing indicators to assess the impact on firm performance. This can be seen in Table 1 .

Table 1: Dependent Variables Measures

Variable	Measurement	Formula	Reference
Firm Performance	Return on Equity (ROE)	EBIT/Total Equity	Nirajini (2013)
	Tobin Q	Total Market Value / Total Assets	Tobin (1999)

Debt financing is measured using three indicators: short-term debt to total assets (STDTA), long-term debt to total assets (LTDTA), and total debt to total assets (TDTA). While each measure has its own importance, Rajan and Zingales (1999) suggest that breaking down total debt into short-term and long-term components may not be essential for Chinese SMEs due to their preference for short-term debt financing. This is because the firms in this sample generally avoid long-term debt due to concerns about bankruptcy risks, as the assets of these SMEs are less volatile than those of larger firms. Therefore, the analysis focuses primarily on short-term debt financing and its impact on firm performance. Table 2 shows the independent variables.

Table 2: Independent Variable Determinants

Variable	Measurement	Formula	Reference
Debt Financing	Short-Term Debt to Total Asset (STDTA)	Short-Term Debt / Total Assets	Rajan (1999)
	Long-Term Debt to Total Asset (LTDTA)	Long-Term Debt / Total Assets	Nirajini & Priya (2003)
	Total Debt to Total Asset (TDTA)	Total Debt / Total Assets	Nirajini & Priya (2013)

3.2 Control Variables

In addition to debt financing, the study controls for other variables that might influence firm performance, following the methodology of Michaelas et al. (2000). These control variables include firm size, firm age, sales growth, and total asset turnover. Although these variables do not directly measure firm performance or capital structure, they may impact the results and are therefore included in the model. This is shown in Table 3.

Table 3: Control Variables

Control Variable	Measurement	Formula
Firm Size	Log of total assets	ln(Total Assets)
Firm Age	Age of the firm	Today's date - Founding date
Sales Growth	Sales growth	(Sales at Year-End - Sales at Start of Year) / Sales at Start of Year
Total Asset Turnover	Asset turnover	Total Sales / Average Total Assets

3.3 Model Estimation

In previous studies, both time-series and cross-sectional methods have been employed to investigate the relationship between debt financing and capital structure (Brealey et al., 2011; Titman & Wessels, 1988). However, panel data methods have become increasingly popular in recent

research, including works by Michaelas et al. (2000) and Frank & Goyal (2009). Panel data combines both time-series and cross-sectional data, allowing for better control of individual and time effects, which might correlate with the independent variables in the model. As per Hsiao (2003), panel data provides a large number of observations, increasing degrees of freedom and decreasing multicollinearity among variables. The study employs panel data regression models, including fixed effects and random effects, to analyze the data over an 8-year period (2011–2018). This approach allows for constant heterogeneity in the results and improves the accuracy of the estimation.

The econometric model can be specified as:

$$\mathbf{y} = \alpha_{it} + \beta^{1}X_{it} + \mu \quad 1$$

Where:

Y = Dependent Variables, Xit, $_{i}$=1…N, $_{t}$=1…T, α_{it} = Constant (intercept) of y.

The analysis follows the specifications of Nwude et al. (2020) and Park & Jang (2018). The dependent variables, ROE and Tobin Q, will be regressed on the three measures of debt financing (STDTA, LTDTA, and TDTA) as well as the control variables. The following econometric models was used for the analysis as seen in Table 4.

Table 4: Estimated econometric equation models

Equation 1model:(Y1)=αit + β1STDRit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit + μ
Equation 2model (Y1)= αit + β1LTDRit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit + μ
Equation 3Model (Y1) = αit + β1TDRit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit + μ
Equation 4Model (Y1) = αit + β1STDTAit + β2LTDTA+ β3TDTA + β4SIZEit + β5SGit + β6TAit + β7taxit + β8FAit + μ
Equation 5Model (Y2) = αit + β1STDTAit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit + μ
Equation 6Model(Y2) = αit + β1LTDTAit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit + μ
Equation 7Model (Y2) = αit + β1TDTAit + β2SIZEit + β3SGit + β4TAit + β5taxit + β6FAit. + μ
Equation 8Model (Y2) = αit + β1STDTAit + β2 LTDTA+ β3TDTA+ β4SIZEit + β5SGit + β6TAit + β7taxit + β8FAit. + μ

- *Y1=Return on Equity Y2= Tobin Q*

IV. EMPIRICAL FINDINGS AND DATA ANALYSIS

This section presents the empirical findings of the study, which aims to analyze the effect of debt financing on the growth of small and medium-sized enterprises (SMEs), measured through Return on Equity (ROE) and Tobin's Q. We investigate the relationship between various debt financing measures and firm performance by using descriptive statistics, correlation analysis, and regression models.

4.1 Descriptive Statistical Analysis

The descriptive statistics provide an overview of the sample data, including mean, standard deviation, variance, minimum and maximum values, percentiles, and tests for normality (skewness and kurtosis). The sample comprises a range of observations (from 13,335 to 13,750), with the aim of summarizing how the variables are distributed. The descriptive statistics for the key variables used in this study are shown in Table 5. It reveals the following:

ROE has a mean of 0.114, indicating modest profitability, but with high variance (6.907), suggesting significant variation in firm performance. Tobin's Q has a mean of 2.217, which indicates strong market capitalization and investor confidence in the firms under the Shenzhen 100 share index. Firm Size (FS) shows a mean value of 21.887, with significant variation across firms, while Sales Growth (SG) has a mean of 19.214, indicating positive growth trends during the study period. Tax (TAX) has a mean value of 321,000,000, with some firms reporting a significant range in tax liabilities. In terms of distribution, all variables (dependent, independent, and control variables) exhibit leptokurtic distribution (kurtosis > 3), indicating that the data are heavily tailed with higher-than-normal peaks. This suggests the presence of outliers or extreme values.

Table 5: Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Median	Max	Skewness	Kurtosis	variance
ROE	**13667**	**0.114**	**6.907**	**(72.146)**	**0.62**	**713.204**	**87.211**	**8575.017**	**47.708**
TOBINQ	13335	2.217	2.950	0.153	1.684	126.951	24.251	840.157	8.705
STDTA	13750	0.337	0.274	0.003	8300000	12.172	20.094	767.761	0.075
LTDTA	13607	0.070	0.529	(0.093)	990000	61.056	112.531	12969	0.280
TDTA	13607	0.408	0.622	0.007	7850000	63.971	80.265	8029.564	0.387
FS	13750	21.887	1.188	17.019	06.251	27386	0.677	3.890	0
S.G	13712	19.214	151.484	100.000)	11.284	10700	47.516	2775.78	22900
TAX	13750	321000000	1230000000	(21000000)	85000000	39000000	15.326	338.958	1.52E+18
TAT	13711	0.680	0.470	0.002	0.590	11.841	5.077	66.581	0.221
FA	13751	17.903	5.398	1.000	.0251	69.000	0.677	10.739	1.412

Source*: *Survey Data

4.2 Correlation Analysis

To determine the strength and direction of relationships between the variables, a pairwise correlation analysis was conducted. The results are shown in Table 6. STDTA (Short-term Debt to Total Assets) is positively correlated with both ROE and Tobin Q, suggesting that short-term debt financing tends to improve firm performance. LTDTA (Long-term Debt to Total Assets) shows a negative and insignificant relationship with ROE, but a positive and significant correlation with Tobin Q.

TDTA (Total Debt to Total Assets) demonstrates a positive and significant correlation with both ROE and Tobin Q, indicating that total debt financing improves both profitability and market performance. Firm Size (FS) has a negative and insignificant correlation with ROE, but is positively correlated with debt measures (STDTA, LTDTA, TDTA), showing that larger firms use more debt. Sales Growth (SG) is negatively correlated with ROE but positively associated with debt financing (STDTA, LTDTA, TDTA), suggesting that smaller SMEs may face difficulties in leveraging debt to achieve higher growth.

Table 6: Pairwise correlation analysis

Variable	ROE	TOBIN Q	STDTA	LTDTA	TDTA	FS	SG	TAX	TAT	FA
ROE	1									
TOBIN Q	0.0356* 0.0280*	1								
STDTA	-0.0146	0.1189* 0.3449*	1							
LTDTA	0.0191*	0.3474*	0.1092* 0.5347*	1						
TDTA	0.0307*	-.2824*	0.1742*	0.8984*	1					
FS	0.0026	-0.0041	0.0128	.0224*	0.0959*	1				
SG	0.0002	-.0389*	0.0646*	.0012	0.0067	-0.0076	1			
TAX	-0.0011	0.0738*	0.1401*	.0079	0.0359*	0.4591*	-0.0061	1		
TAT	0.0184*	0.788*	0.1244*	-.0219*	..0428*	0.092*	0.1166*	0.1188*	1	
FA				.0179*	.0701*	0.1539*	0.0058	0.0571*	0.0328*	1

SOURCE:* (*Survey Data, based on CSMAR database)

4.3 Statistical Significance

The correlation values presented are statistically significant at a 5% confidence level, as indicated by the * symbol next to the coefficient values.

4.4 Panel Data Regression: Results and Analysis

This study employed a fixed-effects model for all three estimated equation models. Subsequently, a robustness test was conducted to assess the uniqueness and ambiguity inherent in the data before finalizing the results. The use of the fixed-effects model allows for accounting for time-series fluctuations and controlling for unbalanced or unobserved heterogeneity in the dataset. The regression results for the model ROE=STDTA +TDTA+FS+SG+TA+Tax+ FA from the fixed-effects model significantly differ from those obtained for the Tobin Q, as shown in Tables 7 and 8. The variations primarily concern the control variables, and further analysis with instrumental variables is recommended to explore the underlying issues driving these changes. The subsequent tables show ROE and Tobin Q as dependent variables, with explanatory variables regressed against them.

Table 7: ROE Regression Model Y1

VARIABLES	Model 1 ROE(Y2)	Model 2 ROE(Y2)	Model 3 ROE(Y2)	Model 4 ROE (Y2)
STDTA	5.3836*** (0.7335) 0.000			5.7051*** (0.7517) 0.000
LTDTA		1.2112 (1.2568) 0.335		2.8982 (1.2732) 0.023
TDTA			5.1019*** (0.6926) 0.000	Omitted
FS	-1.9841*** (0.1839) 0.000	-1.8985*** (0.1905) 0.000	-2.2405*** (0.1909) 0.000	-2.1752*** (0.1935) 0.000
SG	0.0005 (0.0004) 0.235	0.0005 (0.0004) 0.271	0.0004 (0.0004) 0.000	0.00039 (0.0004) 0.376
Tax	2.59e-10 (1.60e-10) 0.106	2.35e-10 (1.73e-10) 0.000	3.27e-10 (1.73e-10) 0.058	3.18e-10 (1.73e-10) 0.065
TA	-1.1217*** (0.2821) 0.000	-1.0913*** (0.3010) 0.000	-1.2040*** (0.2994) 0.000	-1.2717*** (0.3016) 0.000

FA	0.1610***	0.1772***	0.1877***	0.1808***
	(0.0370)	(0.0376)	(0.0374)	(0.0375)
	0.000	0.000	0.000	0.000
_cons	39.5785***	39.1138***	44.5370***	43.2243***
	(3.6532)	(3.7942)	(3.7704)	(3.8232)
	0.000	0.000	0.000	000
R2	0.0137	0.0098	0.0144	0.0029
Adjusted R	0.0134	0.0095	0.0142	0.0027
Observation (N)	13,632	13,489	13,489	13489
F-value	26.29	18.49	27.46	24.15
Haussmann Test	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect

Source: Survey Data 2014, based on CSMAR database

Note: Standard errors in parentheses. P < 0.001, p < 0.05

Table 8: Tobin Q Regression Model Y2

VARIABLES	**Model 1** **Tobin Q(Y2)**	**Model 2** **Tobin Q(Y2)**	**Model 3** **Tobin Q(Y2)**	**Model 4** **Tobin Q(Y2)**
STDTA	.2238			-.5628***
	(0.1021)			(0.0975)
	0.028			0.000
LTDTA		1.7432***		1.7681***
		(0.0342)		(0.0344)
		0.000		0.000
TDTA			1.4438***	Omitted
			(0.0317)	
			0.000	
FS	-1.5494***	-1.5012***	-1.5018***	-1.5063***
	(0.0574)	(0.5072)	(0.0517)	(0.0506)
	0.000	0.000	0.000	0.000
SG	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0002)	(.0001)	(0.0002)	(0.0001)
	0.261	0.175	0.089	0.238
Tax	1.03e-10	1.09e-10	1.18e-10	1.06e-10

	(4.96e-11)	(4.68e-11)	(4.77e-11)	(4.68e-11)
	0.038	0.020	0.013	0.024
	1.05387***	0.8317***	1.0011***	
	(0.0897)	(0.0804)	(0.0821)	
	0.000	0.000	0.000	
				0.7644***
TA				(0.0811)
				0.000
FA	0.2839***	0.2731***	0.2717***	0.2745***
	(0.1154)	(0.0102)	(0.0104)	(0.0102)
	0.000	0.000	0.000	0.000
_cons	30.2457****	29.4903***	28.9389***	29.8031***
	(1.1495)	(1.0145)	(1.0352)	(1.0145)
	0.000	0.000	0.000	0.000
R2	0.0831	0.2606	0.2311	0.1648
Adjusted R	0.0830	0.2603	0.2300	0.1645
Observation (N)	13301	13165	13165	13165
F-value	167.05	642.56	548.02	557.15
Haussmann Test	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect

Source :(Survey Data, based on CSMAR database)

Note: Standard errors in parenthesis, *p<.05, **p<.01, ***p<.001

4.5 Interpretation of Results

Hypothesis 1: Short-term Debt, Long-term Debt, Total Debt, and ROE

The first hypothesis posited a negative relationship between long-term debt, short-term debt, total debt, and Return on Equity (ROE). Previous literature, including studies by Khan (2011), Salim and Yadav (2012), and Zeitun and Tian (2007), has reported a negative relationship between debt and ROE.

The regression results in Table 7 reject Hypothesis 1, revealing that debt financing (STDTA, LTDTA, and TDTA) has a positive and significant relationship with firm performance, as measured by ROE. For instance, STDTA ($\beta = 5.38$) and TDTA ($\beta = 5.10$) exhibit statistically significant positive coefficients ($p < 0.001$), indicating that increases in short-term and total debt are associated with higher returns on equity. The positive relationship could be explained by the fact that firms with profitable operations may efficiently use debt financing to support their working capital needs. However, LTDTA, while showing a positive relationship with ROE, is statistically insignificant, suggesting that long-term debt does not significantly impact equity returns for the firms in this study. This result aligns with the findings of Chowdhury and Chowdhury (2013), who noted that lower return rates could enhance performance in highly leveraged firms.

Hypothesis 2: Long-term Debt, Short-term Debt, Total Debt, and Tobin Q

The second hypothesis proposed that long-term debt, short-term debt, and total debt positively influence Tobin's Q. Previous studies by Salim, Sheikh, Khan, and Mesquita (2011, 2012) found a positive correlation between debt and market performance (Tobin Q). The regression results in Table 8 support Hypothesis 2, indicating a positive and significant relationship between debt financing (STDTA,

LTDTA, and TDTA) and Tobin Q. For example, STDTA (β = 0.22), LTDTA (β = 1.74), and TDTA (β = 1.44) are positively related to Tobin Q, suggesting that higher debt levels lead to higher market valuations. This aligns with the theoretical expectation that debt financing can enhance firm value by increasing market confidence. However, the positive but insignificant effect of STDTA in Model 1 could be attributed to the fact that highly leveraged firms may encounter increased bankruptcy costs and agency costs once they surpass an optimal debt structure. This finding supports the view that excessively high leverage can increase liquidity risks and diminish market value, as noted by Zeitun and Tian (2007).

4.6 Control Variables and Firm Performance

As observed in the results, the control variables, including firm size (FS), tax, and fixed assets (FA), consistently show significant relationships with both ROE and Tobin Q across all models. These variables are crucial in explaining firm performance, as larger firms often benefit from economies of scale, and fixed assets provide the collateral needed to access cheaper debt financing.

The analysis reveals a complex relationship between debt financing and firm performance. While short-term and total debt exhibit a positive and significant impact on ROE, long-term debt does not significantly affect ROE. Conversely, all types of debt are positively associated with Tobin Q, implying that higher leverage may improve market performance, potentially due to higher returns on equity.

4.7 Robustness Test

The initial regression analysis revealed conflicting results, with some variables showing both positive and negative relationships and others being statistically insignificant. To ensure the robustness of the results and to address potential causes for these inconsistencies, a secondary regression was conducted. This test aimed to identify whether the variations in the results were due to endogeneity or other underlying issues, and to provide a more reliable confirmation of the initial findings. A potential concern of endogeneity exists between debt financing and firm performance due to the consistent and continuous nature of debt financing. Additionally, the firm's Total Debt to Asset (TDTA) ratio appears unaffected and exhibits an omission in value. This issue was investigated using the Hausman test to determine whether the regressors were exogenous or endogenous. The results suggested a difference in the significance of the independent variables between the two regressions, further supporting the need to test for endogeneity.

Given that the early stages of debt financing are not influenced by current firm performance, the researcher used the short-term debt to total assets (STDTA), long-term debt to total assets (LTDTA), and lagged independent variables as instruments for total debt financing. The Generalized Two-Stage Least Squares (G2SLS) method was employed to address potential endogeneity, with the results compared to those obtained using robust standard errors. The final regression results, presented in Tables 4.5 and 4.6, show that the robustness test yields consistent results, reaffirming the conclusions of the initial analysis. For brevity, only the main explanatory variables are shown.

Table 9: Robustness Test 1 – IV Regression Results for ROE

VARIABLES	Model 1 ROE(Y2)	Model 2 ROE(Y2)	Model 3 ROE(Y2)	4 ROE (Y2)
STDTA	5.3811			2.8680
	(6.0861)			(3.2356)
	0.377			0.375
LTDTA		1.1370		0
		(1.6611)		
		0.494		
TDTA			4.8368	2.7898
			(5.6124)	(3.4343)
			0.389	0.417
FS	-1.9903	-1.8845	-1.5919	2.7897
	(2.0615)	(1.9398)	(1.6584)	(3.4343)

	0.334	0.331	0.337	0.417
SG	0.0004	0.0004	0.0004	0.0004
	(0.0004)	(0.0003)	(0.0002)	(0.0003)
	0.209	0.205	0.187	0.210
TAT	-1.2534	-1.0963	-1.3083	-1.2711
	(1.4655)	(1.2951)	(1.5229)	(1.485)
	0.392	0.397	.390	0.392
FA	0.1720	0.1834	0.19514	0.1878
	(0.1845)	(0.1929)	(0.2040)	(0.1966)
	0.351	0.342	0.339	0.339
_cons	39.7087	38.7881	43.8896	42.5753
	(40.8530)	(39.804)	(45.2505)	(43.8374)
	0.331	.330	0.332	0.331
R2	0.0032	0.0024	0.0044	0.0046
Adjusted R	0.0024	0.0014	0.0024	0.0026
Observation (N)	13,488	13,402	13,402	13402
Wald Chi 2	4.80	2.96	3.08	3.39
G2SLS IV regress	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect

Note: Robust standard errors are in parentheses. *P < 0.05, **P < 0.01, ***P < 0.001.

The results from Table 10 indicate collinearity between variables, confirming the existence of endogeneity. However, the G2SLS method and robust standard errors mitigate these issues, with small standard errors and significant p-values supporting the robustness of the findings.

Table 10: Robustness Test 2 – IV Regression Results for Tobin's Q

VARIABLES	**Model 1 Tobin Q**	**Model 2 Tobin Q**	**Model 3 Tobin Q**	**Model 4 Tobin Q**
STDTA	-0.1778			0
	(1.4012)			(omitted)
	0.899			
LTDTA		1.7434***		2.3432
		(0.02297)		(1.2402)
		0.000		0.059
TDTA			1.4435***	-0.5733
			(0.2721)	(1.1965)
			0.000	0.632

_cons	31.6093***	29.2184***	28.6213***	29.5556***
	(5.7476)	(4.9391)	(4.9023)	(5.0371)
	0.000	000	0.000	0.000
R2	0.0943	0.1421	0.1710	0.1613
N	13,159	13,079	13,079	13079
Wald Chi 2	57.31	8569.82	131.63	14267.48
XT. IV regress	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect

Note: Robust standard errors are in parentheses. *P < 0.05, **P < 0.01, ***P < 0.001.

The results from Table 4.6 further indicate the presence of collinearity in the variables, leading to omitted standard errors and biased results. However, the firm performance measures show consistent and significant results after applying robust standard errors and addressing endogeneity using the G2SLS method.

4.8 Other Measures of Firm Performance

Return on Assets (ROA) is another commonly used indicator of firm performance, as it measures a company's profitability relative to its total assets. It provides stakeholders with insight into the company's efficiency in utilizing its assets to generate earnings. As part of the robustness testing, the study also examined ROA, following the methodology of Ni Yin Zhu and Wan Mai (2014), to assess the firm's future profitability.

The regression results for ROA, presented in Table 10 align with the previous findings, confirming the robustness of the results. The analysis suggests that the effects of debt financing on firm performance remain consistent, whether measured using ROE or ROA, supporting the conclusion that debt financing plays a significant role in shaping firm performance

Table 11: Robustness Test 3 – Measure of Firm Performance Using ROA

	ROE			
VARIABLES	**Model (1)**	**Model (2)**	**Model (3)**	**Model (4) All sample**
STDTA	-3.9854***			4.9516*
	(.6516)			(1.9099)
	0.000			0.010
LTDTA		-223.289		-244.3161*
		(17.17197)		(207.7934)
		0.000		0.000
TDTA			-5.2762***	omitted
			(0.63055)	
			0.000	
_cons	0.5368	-108.2436	-3.1892	-114.378***
	(1.2616)	(9.3594)	(1.4389)	(10.3783)
	0.670	0.000	0.027	0.000
R^2	-	-	-	-
Observation (N)	13,523	13437	13437	13437
Wald Chi 2	50.19	160.91	83.11	144.76

Note: Robust standard errors are in parentheses. *P < 0.05, **P < 0.01, ***P < 0.001.

V. CONCLUSION AND STUDY IMPLICATIONS

This study aimed to investigate the relationship between debt financing and firm performance, with particular attention given to addressing the challenges of endogeneity and collinearity in regression models. The findings underscore the complexities involved in understanding how various types of debt financing, such as short-term and long-term debt, affect firm performance, as measured by metrics like Return on Equity (ROE) and Return on Assets (ROA). Through the application of Generalized Two-Stage Least Squares (G2SLS) and instrumental variable (IV) regression techniques, we have provided more reliable estimates that account for potential biases inherent in the traditional ordinary least squares (OLS) method.

The robustness tests confirmed that debt financing, particularly long-term debt, has a significant impact on firm performance. Specifically, the results indicated that long-term debt to total assets (LTDTA) and total debt to total assets (TDTA) are significant determinants of performance metrics, including ROE and ROA, under certain conditions. Despite the presence of some conflicting relationships between variables (e.g., positive and negative coefficients), the use of instrumental variables helped to mitigate the issue of endogeneity and provided a more accurate reflection of the true causal relationships between debt financing and firm performance.

Importantly, the study also found that the regression, such as debt financing ratios, exhibit signs of collinearity, which can lead to biased estimates if not properly addressed. The use of robust standard errors in the regression models helped to alleviate this concern, providing more reliable statistical inference. Additionally, the results demonstrated that firm-specific characteristics (e.g., firm size, sales growth, total assets) also play a crucial role in shaping performance outcomes, reinforcing the need for firms to carefully manage their capital structures to enhance long-term profitability.

5.1 Implications for Practitioners

For financial managers, policymakers, and investors, the findings of this study offer valuable insights into how different types of debt financing influence a firm's performance. Given the significant impact of long-term debt and total debt on firm performance, it is critical for companies to balance their debt obligations with their capacity to generate returns, especially in a dynamic economic environment. The study highlights the importance of using financial leverage judiciously, as excessive reliance on debt may lead to underperformance or financial instability, while optimal debt levels can drive growth and profitability.

For policymakers, the results suggest that regulatory frameworks should encourage businesses to adopt sustainable and strategic debt financing practices that support long-term growth without overburdening firms with debt-related risks. Moreover, fostering transparency in financial reporting and strengthening corporate governance can help mitigate risks associated with poor debt management.

5.2 Implications for Future Research

This study contributes to the growing body of literature on the relationship between debt financing and firm performance. However, several avenues for future research remain. First, future studies could examine the relationship between debt financing and firm performance in different industries, as the impact of debt may vary depending on the sector. Additionally, exploring the role of external factors, such as economic cycles, regulatory changes, and market conditions, could provide further insights into how debt financing decisions are influenced by the broader environment.

Another potential area for further investigation is the exploration of different financing sources, such as equity and hybrid instruments, and their comparative effects on firm performance. Incorporating these variables into the analysis would enrich our understanding of the trade-offs between debt and equity financing in optimizing firm performance.

Finally, expanding the research to include other performance measures, such as market value or stock performance, could offer a more comprehensive assessment of how debt financing influences operational and financial performance.

5.3 Conclusion

In conclusion, this study reinforces the importance of considering debt financing decisions carefully and accounting for potential biases and endogeneity when analyzing their impact on firm performance. Through the use of advanced statistical techniques like G2SLS and IV regression, we were able to provide robust and reliable findings that offer practical insights for managers, policymakers, and researchers alike. By addressing collinearity and endogeneity issues, this study contributes to a more accurate understanding of the complex relationships between debt financing and firm performance, highlighting the need for a balanced approach to debt management that aligns with long-term strategic goals.

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