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Impact of Capital Structure on Profitability: Panel Data Evidence of the Telecom Industry in the United States

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Abstract: Debt finance, when considered a source of finance, always leads to financial risk; however, it is also considered a source of increased profitability in the normal business scenario. It has always been challenging to find the correct debt equity combination. In the discussed sample of the telecom industry in the USA, an abnormally high total liability-to-total assets ratio was observed. Thus, it is inclined to investigate the capital structure (CapSt) effect on firms' profitability. By taking annual data of the telecom industry from 2012 to 2020 in the USA, unbalanced cross-sectional data (panel data) comprising 421 firm-year observations for 72 firms were studied using pooled panel regression, univariate analysis, correlation, and descriptive statistics models. We decided to test the impact of CapSt (Total Liabilities to Total Assets (TLsTAs) and Total Equity to Total Assets (TETAs)) on the profitability (Return on Assets (ROA) and Return on Equity (ROE)) of firms in the telecommunication industry in the USA. The results reveal that the ratio of TLsTAs has a significant impact on ROA, and TETAs has a significant impact on ROA. However, TLsTAs and TETAs have no impact on ROE.

Keywords: telecommunication industry; profitability; capital structure; panel data

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1. Introduction

The very essence of the existence of a corporate firm is to earn profit by maximising shareholders' value (Sun et al. 2020). Firms maximise shareholder value by reducing the overall cost of capital and increasing the market price of shares (Hassan et al. 2022; Karim et al. 2021). One way to minimise the cost of capital is to finance the firm's capital through an optimum mix of debt and equity capital (Jreisat et al. 2021; Khan et al. 2022). Firms typically finance their business operations and investment needs through debt or equity. CapSt refers to the composition of a firm's capital in terms of debt and equity and is commonly measured using debt-to-equity or debt-to-total asset ratios. Many factors are involved in deciding whether to use debt or equity to finance operations, and it is a challenge to balance the two and find an optimal equilibrium (Corporate Finance Institute 2022).

The topic of CapSt has drawn much attention among scholars, especially since Modigliani and Miller (1958). They argued that under certain conditions, i.e., unconstrained arbitrage, no bankruptcy, and no corporate taxes, the amount of debt that a firm issues does not affect its market value. On the contrary, they implied that in the presence of positive corporate tax rates and deductible financing costs, unrealistic as it may sound, a firm would be better off with a CapSt consisting entirely of debt. According to them, firms would be able to increase their value by increasing their borrowings, provided they could do this at suitably low interest rates. Of course, the theory holds true only if all the assumptions presented by them are met. However, this is hardly the case in reality, which was acknowledged by the authors themselves. Multiple later studies have demonstrated, by relaxing some of the Modigliani and Miller assumptions, that CapSt is indeed relevant to the firm's market value and that excessive levels of debt could lead to a decrease in such value (Scott 1976).

In addition to the Modigliani and Miller theory, there are a few other prevalent theories on firms' optimal CapSt. One of these is the trade-off theory, which states that CapSt decisions require a careful balancing of tax benefits attained from issuing debt and the prospect of increased financial risk. Another theory is the pecking order theory, according to which when firms lack the internal funds necessary to finance their investment projects, they prefer to borrow rather than issue more stock. A third theory is the free cash flow theory, which states that debt, even at excessively high levels, may increase a company's value if the cash flows from operating activities are far greater than what is needed to fund its profitable investment projects (Myers 2001).

Therefore, even though the theoretical rationale behind Modigliani and Miller's (1958) theory is sound and still commonly accepted, over time, scholars have demonstrated that CapSt composition is vital to firms' profitability and value. Nevertheless, finding the optimal balance between debt and equity is not an easy task and varies with industry.

Our study attempts to examine the CapSt–profitability relationship with empirical evidence from the telecom industry in the USA. While there are quite a few studies on the CapSt of this industry in developing or emerging economies, we noticed that research on the same is scarce in industrialised countries, particularly the USA. In addition to the distinct features of the telecommunication industry, we noticed an abnormally high total liability-to-total assets ratio in this industry in the United States, which led us to investigate the CapSt effect on firms' profitability.

Since the telecom industry is highly intensive in capital expenditures (Van Dorselaer and Breazeale 2011), particularly in long-term real assets, bankruptcy costs are lower relative to other industries with fewer real assets. The implications of this reality are twofold: on the one hand, in the presence of minimal bankruptcy costs, telecom firms would be more inclined to borrow rather than issue new stock (Modigliani and Miller 1963), and on the other hand, lending entities would be willing to provide funding to such firms even when their performance is below par. Thus, while the Modigliani and Miller theory would still apply, the effect of CapSt on the profitability of telecom firms provides an opportunity for further research. Besides the empirical investigation of the overall industry, of special interest would be the examination of profitable and loss-making firms as two separate subsets.

To this end, we employed pooled panel regression, univariate analysis, correlation, and descriptive statistics models considering a sample of 72 listed telecom firms in the United States in the years 2012–2020.

Although there are few studies on the impact of Cap. St. on firms' profitability, such as Wiyasa and Basyith 2020; Fauzi et al. 2022. None of these studies provides a comprehensive empirical analysis of the telecom industry. In this regard, the present study makes several contributions to the existing strand of literature. First, it provides empirical evidence on the effect of the telecom industry capital structure on firm performance. Second, the sample is from the telecom industry in the United States. Third, the results of the study will enrich the academic literature on the impact of capital structure on firm performance, particularly in the telecom sector. Finally, the study will help in a better understanding of the impact of Cap. St. on firm profitability for business managers, academicians, bankers, policymakers, and regulators.

This research article is organised as follows. Section 2 presents the related literature and develops the hypotheses. Section 3 explores the sample and descriptive statistics. Section 4 explains the variables. Section 5 explores the research model. Section 6 of the study reviews the empirical results and analysis, and finally, Section 7 offers a conclusion.

2. Literature Review and Hypotheses Development

2.1. Relevance of Profitability

The effect of CapSt on the profitability of firms has been a topic of discussion and analysis for many researchers. A vast amount of literature has investigated the effects of CapSt choice on a firm's value and performance since the seminal work of Modigliani and Miller (1958). They revealed that firm value is now positively related to financial leverage. This indicates that corporations with a higher percentage of debt CapSt are capable of maximising shareholders' value. The authors (Azhagaiah and Gavoury 2011), who analysed the interrelationship between CapSt and profitability of information technology (IT) companies listed on the Bombay Stock Exchange (BSE) in India, established that there has been a strong one-to-one relationship between variables CapSt and profitability variables, ROA, and return on capital employed (ROCE). CapSt has a significant influence on profitability, and a surge in the use of debt funds in CapSt tends to minimise the net profit of IT firms. The impact of CapSt on corporate profitability was also explored on 30 selected firms from the FTSE-100 index of the London Stock Exchange. The regression analysis results indicated that interest coverage has a positive significant impact on ROA, ROE, and return on invested capital (ROIC), where debt equity has a positive significant impact on ROE but a negative significant impact on ROA and ROIC. The study further recommended that with a view to achieving the targeted level of efficiency in business, an optimal level of CapSt and effective utilisation and allocation of resources should be employed (Nasimi 2016). Following the telecom stock market crash in 2001, an interesting study, which focused on a select European telecom industry (BT Group, Deutsche Telekom, and France Telecom), was initiated. It concluded that an optimal CapSt exists in the telecom industry, so firm value can be maximised with selective issuance of debt (Carapeto and Shah 2005). In another research paper titled 'Analysis of the telecommunication companies' capital and its structure optimisation', the author concluded that there are no unique algorithms to search for the optimal CapSt of a company. Certain objective and subjective factors ensure the most efficient use of capital for each company (Sergeevna 2018). It is interesting to note that Japanese manufacturers' capital and ownership structures are characterised by heavy, low-cost bank debt to fund their asset expansion. This feature has made Japanese manufacturing more highly leveraged than US manufacturing. The study concluded that Japanese manufacturing is not as highly leveraged as it might first appear. Indeed, on a market value basis, there is no significant country difference in leverage between US and Japanese manufacturing, after controlling for characteristics such as growth, profitability, risk, size, and industry classification. While a significant country difference exists when leverage is measured on a book value basis, this outcome is merely concentrated among mature and capital-intensive industries (Kester 1986). However, in another research paper, the authors attempted to analyse the structure of the balance sheet of non-financial firms ranked in Fortune Global 500. They also identified some optimal levels to increase company profitability. DuPont returns, such as ROA and ROE, were used to measure company profitability, while the debt-to-equity ratio was used as a measure of CapSt. A significant correlation (positive or negative) between ROE and debt-to-equity was revealed. The segment analysis revealed a very strong positive relationship (over 0.5) between debt-to-equity and ROE in the technology, health care, and telecommunication sectors. On the other hand, the analysis further indicated the existence of a positive correlation, but not very strong, for the energy, vehicles, and spare parts divisions. When the debt-to-equity ratio and ROE are shown as points of inflection, the results exhibited significant but divergent results. A higher level of ROE will be registered as a result of either a low or a high level of debt-to-equity ratio. Hence, firm profitability will increase as a result of an optimal structure of the debt-to-equity ratio (Herciu and Ogrean 2017).

In a comparison analysis, two researchers studied the CapSt determinants of the USA and the Republic of Korea. As part of their findings, among the five independent variables (profitability, size, non-debt tax shields, growth, and business risk), profitability was the only significant determinant of the leverage ratios across the two countries, with its sign being negative. In addition, the construction industry in the US and the food industry in Korea showed significantly higher leverage than the wholesale trade industry as a control group, while the communication and semiconductor industry had lower debt ratios than the control group for both countries, which may be explained by its higher business risk (Kim and Berger 2008).

Further, a cross-sectional regression analysis for 196 Romanian manufacturing companies listed on the Bucharest Stock Exchange indicated that the firms with a higher percentage of equity components in their capital mix were among the most profitable ones, avoiding borrowed funds and operating based on equity. Nevertheless, the research results revealed that these Romanian manufacturing companies either did not use their assets effectively or did not have sufficient internal funding to adopt into profitable investments (Vătavu 2015). Another study on the life insurance industry in Taiwan (Chen et al. 2009) determined that CapSt exerts a negative and significant effect on operational risk. Operational risk, in turn, exerts a negative and significant impact on profitability. However, there is no reciprocal relationship—just a one-way negative effect between CapSt and operational risk. The empirical tests of another research work on CapSt choice on the performance of non-financial Egyptian-listed firms reveal that, in general terms, it has a weak-to-no impact on the firm's financial performance. Some more academic articles focusing on static or dynamic CapSt policy behaviour among Indonesian public companies determined that the CapSt decision is affected by profitability, non-debt tax shields, company size, and market capitalisation (Utami et al. 2021). On the contrary, a number of research studies on CapSt provide empirical evidence supporting the hypotheses of a negative relationship between debt level and firm's performance (profitability) measured by ROA and ROE (Kester 1986; Friend and Lang 1988; Titman and Wessels 1988; Rajan and Luigi 1995; Fama and French 1998; Wald 1999; Booth et al. 2001). Similarly, Ebaid (2009) found a significantly negative relationship between profitability and debt/asset ratios. He concluded that where CapSt negatively impacts a firm's operations represented by ROA, it has no significant impact on a firm's performance indicated by ROE or measured by gross profit margin. The corporate CapSt stability of listed Chinese Stock Exchange companies from 1990–2013 was also a subject of research analysis. A fixed-effects panel data regression model described that size, profitability, and investment opportunities have a significant influence on CapSt, whereas the tangibility of assets is not initiated to be significant (Kyissima et al. 2019).

2.2. Concept and Definition of Capital Structure (CapSt.)

The study of CapSt attempts to evaluate the proportions of equity financing vs. debt financing used by corporations. The debt–equity ratio indicates how much of a firm's financing is proportionately offered by financial debts and stockholders' equity. Such an executive decision, in this regard, is considered crucial, which affects the shareholder's returns and risks and, later, the market value of the share. Both debt and equity sources of finance have an effect on earnings per share. The benefits of interest deductions and the tax shields allowed by governments for the debt portion of capital can help a firm increase its earnings per share. The optimal mix of debt–equity ratios that maximise the overall market value is hence a significant managerial decision (Chaklader and Chawla 2016). A firm's CapSt can also be defined as the specific mixture of long-term debt and equity that the firm uses to support its long-term investments (Ross et al. 2006). CapSt consists of the firm's owned capital and long-term debt, which warrants financial stability and expansion (Kakanda et al. 2016). Debt and equity are the two major sources of financing for a business. Debt holders who bear less risk than shareholders (Gitman et al. 2015) exert lower control over their management but earn a fixed percentage as interest on their loan to the firm. They have superior claims over the firm's assets (Kochhar 1997). Dreyer (2010) believed that shareholders generally bear the related risk with the business, as they receive residual claims in the event of liquidation. Over the past few decades, some theories on CapSt have been developed, of which the static trade-off (Kraus and Litzenberger 1973; Scott 1977; Kim 1978) and the pecking order (Myers 1984) are the dominant ones. The static trade-off theory postulates that firms should exert the effort to reach the level of debt that maximises the benefits of debt tax shields for deductible interest and to mitigate the risk of financial distress and bankruptcy. The pecking order theory, which arises from the concept of asymmetric information, implies that firms should follow a specific hierarchy to raise the capital needed to fund their operations (Hoang et al. 2021). It advocates that firms should initially rely on internal financing (retained earnings), followed by external financing (debt), and finally, picking equity financing as a last resort. Hence, companies that make profits and generate high earnings are likely to use less borrowed capital than those that do not generate high earnings (Abor 2005). A comprehensive research study that included a large dataset of Turkish manufacturing, non-manufacturing, small, large, listed, and unlisted firms concluded that the trade-off theory is a better framework than the pecking order theory to understand the CapSt of non-financial firms. In other words, Turkish non-financial firms appear to trade off the tax benefits of debt against the heavy costs of possible bankruptcy to attain optimal CapSt (Köksal and Orman 2015).

The impact of CapSt on the profitability of the telecommunication industry in the United States of America is the subject of this research paper, using a sample of 72 selected publicly quoted firms in the cited sector from the USA. Therefore, the study contributes to the body of knowledge by investigating the CapSt of companies in the telecommunications sector.

2.3. Impact of CapSt on Profitability

The influence of CapSt on profitability in the telecommunications industry has been a topic of research for some scholars. For instance, Wiyasa and Basyith (2020) examined the impact of CapSt on the profitability of five registered telecommunication firms listed on the Indonesian Stock Exchange. The authors concluded that CapSt's variable of debt to asset ratio (DAR) has a negative and significant impact on ROE. Meanwhile, CapSt's variable Long-Term Debt Equity Ratio (LTDtER) has a positive but not a significant impact on ROE. The relationship between CapSt and the profitability of four major Indian telecom firms was also the focus of a research paper in 2019. The empirical results advocated that a significantly positive relationship exists between profitability and the three variables and the ratio of net operating profit (NOP), cost of equity (Ke), and cost of debt (Kd) in the telecom industry (Kumawat and Morani 2019). In a similar research study on the same industry, the effects of leverage in CapSt on the profitability of ten selected Indian telecom firms were examined. The study concluded that CapSt has a significant impact on the profitability of firms, measured in terms of return on total assets (ROTA) and return on investment (ROI) (Pathak and Trivedi 2015). A panel data analysis of 208 Canadian non-financial firms listed on the Toronto Stock Exchange from 1999 to 2016 suggested that age, liquidity, asset tangibility, size, growth opportunities, and profitability are the determinants of CapSt (Amatya 2020). In another research paper, to determine the effect of CapSt on firms' performance in the Indian service sector, the researchers used panel data. The findings revealed that short-term debt to total assets and long-term debt to total assets have a negative and significant association with firms' performance measured by ROA, return on capital employed (ROCE), and earnings per share (EPS) (Farhan et al. 2020).

Sharing a similar motivation with Singh and Bagga (2019) and Ebaid (2009), we decided to test the effects of CapSt (TLsTAs and TETAs) on profitability (ROA and ROE) (Habibniya and Dsouza 2018; Amponsah-Kwatiah and Asiamah 2020). of firms in the telecommunications division in the USA. However, considering CapSt as a relevant measure of profitability, we formulate our hypothesis for the dependent variables ROA or ROE as follows:

H1. *Total Liabilities to Total Assets (TLsTAs) has an impact on the Return on Assets (ROA) of firms in the USA telecommunication division.*

H2. *Total Liabilities to Total Assets (TLsTAs) has an impact on the Return on Equity (ROE) of firms in the USA telecommunication division.*

H3. *Total Equity to Total Assets (TETAs) has an impact on the Return on Assets (ROA) of firms in the USA telecommunication division.*

H4. *Total Equity to Total Assets (TETAs) has an impact on the Return on Equity (ROE) of firms in the USA telecommunication division.*

3. Sample and Descriptive Statistics

Our sample consists of all listed telecom firms in the 2012–2020 period in the USA telecommunication division available on the Thomson Reuters Database. The firm-year data from all listed firms were pooled together. Firm-year data with insufficient or missing financial information for the key variables were excluded from this analysis. After the deletions, unbalanced cross-sectional data (panel data), comprising 421 firm-year observations for the 72 selected firms, was reached. The outliers were not removed; instead, all the variables were winsorised at the 2% (p. 298) level. The data were processed using the STATA software package. Table 1 shows the number of observations, the mean values, the standard deviation, and the highest and lowest observations of each variable for the 2012–2020 period.

Table 1. Descriptive Statistics of the Variables.

Variables	Observations	Mean	Std. Dev.	Min	Max
Return on Assets (ROA)	421	−0.78268	3.145839	−19.0269	0.166839
Return on Equity (ROE)	421	0.061323	1.585788	−6.57151	5.022058
Total Liabilities to Total Assets (TLsTAs)	421	1.63299	3.295596	0.059791	19.52613
Total Equity to Total Assets (TETAs)	421	−0.63299	3.295608	−18.5262	0.940209
Non-Current Assets to Total Assets (TA)	421	0.319254	0.228397	0.002111	0.875065
Size (S)	421	19.51022	4.17779	9.84108	26.39908
Current Assets to Current Liabilities (LI)	421	2.251052	5.204192	0.007236	32.18193
Inflation Rate (IR)	421	0.016209	0.005287	0.007	0.023

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As indicated in Table 1, the mean of ROA has been calculated as −0.78268 and ROE as 0.061323; the standard deviation for ROA was calculated as 3.145 and for ROE as 1.5857. Having a negative ROA indicates that telecommunication firms have a downward trend in profitability. The higher standard deviation of ROA shows diverse behaviour among the telecom firms with respect to ROA, whereas a lower standard deviation of ROE indicates a similar level of performance among the firms with respect to the ROE of all the telecom firms. The TLsTA's mean has been recorded as 1.632 and its standard deviation as 3.295. TLsTAs are a relationship between total liabilities and total assets; a ratio of more than 1 indicates that the liabilities' commitments are more than the assets of the firms. Liabilities commitments are generally high in the telecommunication industry, as there is a consistent commitment to large capital investments due to continuous consumer pressure (Van Dorselaer and Breazeale 2011). A higher standard deviation with TLsTAs also shows diverse behaviour among the firms with respect to TLsTAs. The TETA mean was calculated as −0.63299 and the standard deviation as 3.295. TETAs is a relationship between total equity and total assets; a negative mean here indicates that the equity has a negative value, which could be due to incorrect CapSt decisions or a negative retained earnings balance. A higher standard deviation with TETAs also shows diverse behaviour among the firms with respect to TETAs.

The variables are paired, and the correlation among the respective variables is presented in Table 2. The calculated correlation coefficient between TLsTAs and ROA indicates a negative number (−0.7488), whereas it indicates a positive number (0.1601) between TLsTAs and ROE. This means that TLsTAs and ROA are negatively related, and thus, they move in an inverse direction, whereas TLsTAs and ROE are positively related, and they have a direct relationship. Additionally, the correlation coefficient between TETAs and ROA is positive (0.7488), whereas it is negative (−0.1601) between TETAs and ROE. This means that TETAs and ROA are positively related and thus move in the same direction, whereas TETAs and ROE are negatively related and move inversely. Through correlation analysis, the degree of association among the variables is measured. However, the actual impacts of the illustrative variables on ROA and ROE are obtained through the regression analysis.

Table 2. Correlation among the Variables.

Variables	ROA	ROE	TLsTAs	TETAs	TA	S	LI	IR
ROA	1							
ROE	−0.189 *	1						
TLsTAs	−0.7488 *	0.1601 *	1					
TETAs	0.7488 *	−0.1601 *	−1 *	1				
TA	0.0847	−0.0481	−0.006	0.006	1			
S	0.4945 *	−0.1614 *	−0.5272 *	0.5272 *	0.2053 *	1		
LI	0.0922	−0.082	−0.1546 *	0.1546 *	−0.1471 *	−0.0616	1	
IR	0.0959	0.026	−0.1075	0.1075	−0.0448	0.0707	−0.0203	1

Note: * Statistically significant at 5 percent level.

4. Variables

In this research paper, the firm's profitability, measured as ROA and ROE, is the dependent variable, while TLsTAs and TETAs represent CapSt. The control variables are TA, S, LI, and IR. The data available in series on ROA and ROE (the proxies representing the firm's profitability) were obtained from the published financial statements from the Thomson Reuters (Refinitiv) website for all the listed telecom firms in the period 2012–2020 in the USA telecommunication division, while the series' TLsTAs and TETAs (proxies for CapSt) (mentioned in Table 3), TA, S, LI, and IR (proxies for the control variables) were also obtained from the respective individual telecom firms' financial statements from the Thomson Reuters (Refinitiv) website. The study utilised unbalanced panel data from 2012–2020.

Table 3. Variables and Measurements.

Category	Variables	Measurements
Dependent variables	Return on Assets (ROA)	Earnings before Interest and Tax/Total Assets
	Return on Equity (ROE)	Net Income/Total Equity
Independent variables	Total Liabilities to Total Assets (TLsTAs)	Total Liabilities/Total Assets
	Total Equity to Total Assets (TETAs)	Total Equity/Total Assets
Control variables	Non-Current Assets to Total Assets (TA)	Non-Current Assets/Total Asset
	Size (S)	Natural Logarithm of Total Assets
	Current Assets to Current Liabilities (LI) Inflation Rate (IR)	Current Assets/Current Liabilities Inflation Rate per year in the USA

5. Research Model

To test our hypothesis, the following panel model was adopted. The research paper adopted this model to illustrate the relevance of the existing differences across the selected firms and to identify and study the effects of the selected variables among the firms for the selected period.

$$Profitability = f\ (Capital\ Structure, Control\ Variables)$$
$$PROFITABILITY = \propto it + \beta 1 CAPITAL\ STRUCTURE + \beta 2\ CONTROL\ VARIABLES + Fixed\ Effects + \varepsilon i$$

where, PROFITABILITY refers to ROA or ROE of firm i in year t, CAPITAL STRUCTURE refers to TLsTAs or TETAs, CONTROL VARIABLES refers to TA, S, LI, and IR.Year fixed effects are included in the model. εit denotes the error term.

6. Results and Discussion

6.1. Univariate Analysis

Table 4 shows the distribution of the mean (median) values of firm-level variables over the quartiles of ROA. The column named Q1–Q4 shows the mean difference of the variables between the smallest (Q1) and largest (Q4) quartiles, along with the t-statistic of whether the means are significantly different from zero.

Table 4. Results of TLsTAs, TETAs, TA, S, LI, and IR by the Quartiles of ROA.

ROA	Full Sample Mean (Median)	Q1 Mean (Median)	Q2 Mean (Median)	Q3 Mean (Median)	Q4 Mean (Median)	Mean Diff Q1–Q4	T Stat
TLsTAs	1.633 (0.735)	4.141 (1.486)	0.678 (0.601)	0.706 (0.723)	0.983 (0.728)	3.158	5.499 ***
TETAs	−0.633 (0.265)	−3.141 (−0.486)	0.322 (0.398)	0.294 (0.277)	0.172 (0.272)	−3.158	−5.499 ***
TA	0.319 (0.3245)	0.262 (0.1345)	0.3195 (0.294)	0.354 (0.351)	0.342 (0.368)	−0.081	−2.596 ***
S	19.510 (20.121)	14.578 (14.939)	19.862 (20.350)	22.708 (23.335)	20.939 (20.645)	−6.361	−15.168 ***
LI	2.251 (0.958)	1.279 (0.2461)	4.741 (1.593)	1.384 (0.958)	1.610 (1.102)	−0.3304	−0.7309
IR	0.0162 (0.017)	0.0164 (0.017)	0.0165 (0.017)	0.0163 (0.017)	0.0157 (0.017)	0.0007	1.0305

Note: *, **, *** Statistically significant at 10, 5, 1 percent levels.

Table 5 shows the distribution of the mean (median) values of firm-level variables over the quartiles of ROE. The column named Q1–Q4 shows the mean difference of the variables between the smallest (Q1) and largest (Q4) quartiles, along with the t-statistic of whether the means are significantly different from zero.

Table 5. Results of TLsTAs, TETAs, TA, S, LI, and IR by the Quartiles of ROE.

ROE	Full Sample Mean (Median)	Q1 Mean (Median)	Q2 Mean (Median)	Q3 Mean (Median)	Q4 Mean (Median)	Mean Diff Q1–Q4	T Stat
TlsTAs	1.633 (0.735)	0.857 (0.740)	0.887 (0.599)	1.470 (0.616)	3.324 (1.33)	−2.4670	−5.076 ***
TETAs	−0.633 (0.265)	0.143 (0.260)	0.113 (0.400)	−0.470 (0.384)	−2.324 (−0.333)	2.4670	5.076 ***
TA	0.319 (0.325)	0.315 (0.307)	0.347 (0.354)	0.331 (0.349)	0.284 (0.266)	0.0313	0.9200
S	19.510 (20.120)	19.033 (19.337)	21.260 (21.935)	20.738 (20.480)	17.014 (16.013)	2.019	3.4378 ***
LI	2.251 (0.958)	3.093 (1.109)	3.728 (1.304)	1.522 (1.009)	0.652 (0.391)	2.441	3.9471 ***
IR	0.0162 (0.017)	0.0164 (0.017)	0.017 (0.019)	0.016 (0.017)	0.0155 (0.017)	0.0008	1.2088

Note: *, **, *** Statistically significant at 10, 5, 1 percent levels.

6.2. Regression Results

The findings in Table 6 reflect that the coefficient of TlsTAs is negative and significant at the 1% significance level with respect to ROA. The TLsTAs have the most negative coefficient of −0.651, with no dummy variable, in relation to ROA. This indicates that a single-unit increment in TLsTAs by the selected telecom firms, with all other factors remaining unchanged, will decrease the firms' ROA by 0.651 units (Fauzi et al. 2022). Additionally, the coefficient of TLsTAs is positive and statistically significant at the 10% significance level with respect to ROE. The TLsTAs have the most positive coefficient of 0.46, with year as a dummy variable with relation to ROE. This indicates that a single-unit increment in TLsTAs by the selected telecom firms, with all other factors remaining unchanged, will raise the firms' ROE by 0.46 units (Wiyasa and Basyith 2020).

Table 6. Results of the Effects of TLsTAs on ROA and ROE, as per OLS Regression.

Variables	No Dummy	Year Dummy	No Dummy	Year Dummy
	ROA	ROA	ROE	ROE
TLsTAs	−0.651 ***	−0.65 ***	0.044 *	0.046 *
	(0.092)	(0.093)	(0.026)	(0.025)
TA	0.779 *	0.755 *	−0.236	−0.189
	(0.441)	(0.432)	(0.409)	(0.406)
S	0.092 **	0.093 **	−0.043	−0.046
	(0.04)	(0.041)	(0.03)	(0.031)
LI	0.002	0.001	−0.024 **	−0.024 **
	(0.01)	(0.011)	(0.011)	(0.011)
IR	9.879	−17.285	12.231	−55.937
	(18.161)	(118.351)	(15.291)	(103.981)
_cons	−1.934 *	−1.386	0.761	1.893
	(0.999)	(1.981)	(0.631)	(1.953)
Observations	421	421	421	421
R-squared	0.578	0.58	0.042	0.048
Adj R^2	0.572	0.568	0.031	0.02
Robust standard errors are in parentheses				

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As indicated in Table 7, there is no multicollinearity in the regression models, as the VIF for all explanatory variables is less than the conventional value of ten.

Table 7. VIF (Variance Inflation Factor) Results Obtained after Running TlsTAs on ROA and ROE OLS Model.

Variables	TlsTAs	TA	S	LI	IR	Mean VIF
VIF	1.48	1.08	1.50	1.07	1.02	1.23
1/VIF	0.675959	0.928199	0.667477	0.933765	0.983899	

The findings in Table 8 illustrate the coefficient of TETAs is positive and significant at the 1% significance level with respect to ROA. The TETAs have the most positive coefficient of 0.651, with no dummy variable, in relation to ROA (Vătavu 2015). This indicates that a single-unit increase in TETAs by the selected telecom firms, with all other factors remaining unchanged, will increase the firms' ROA by 0.651 units. Additionally, the coefficient of TETAs is negative and statistically significant at the 10% significance level with respect to ROE. The TETAs have the most negative coefficient of −0.46, with year as a dummy variable with relation to ROE. This indicates that a single-unit increment in TETAs by the selected telecom firms, with all other factors remaining unchanged, will decrease the firms' ROE by 0.46 units (Wiyasa and Basyith 2020).

Table 8. Results of the Effects of TETAs on ROA and ROE, as per OLS Regression.

Variables	No Dummy	Year Dummy	No Dummy	Year Dummy
	ROA	ROA	ROE	ROE
TETAs	0.651 ***	0.65 ***	−0.044 *	−0.046 *
	(0.092)	(0.093)	(0.026)	(0.025)
TA	0.779 *	0.755 *	−0.236	−0.189
	(0.441)	(0.432)	(0.409)	(0.406)
S	0.092 **	0.093 **	−0.043	−0.046
	(0.04)	(0.041)	(0.03)	(0.031)
LI	0.002	0.001	−0.024 **	−0.024 **
	(0.01)	(0.011)	(0.011)	(0.011)
IR	9.879	−17.285	12.231	−55.937
	(18.161)	(118.351)	(15.291)	(103.981)
_cons	−2.585 ***	−2.036	0.805	1.939
	(0.962)	(1.948)	(0.612)	(1.941)
Observations	421	421	421	421
R-squared	0.578	0.58	0.042	0.048
Adj R^2	0.572	0.568	0.031	0.02
Robust standard errors are in parentheses				

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As indicated in Table 9, there is no multicollinearity in the regression models, as the VIF for all explanatory variables is less than the conventional value of ten.

Table 9. VIF (Variance Inflation Factor) Results Obtained after Running TETAs on ROA and ROE OLS Model.

Variables	TETAs	TA	S	LI	IR	Mean VIF
VIF	1.48	1.08	1.50	1.07	1.02	1.23
1/VIF	0.675960	0.928199	0.667478	0.933765	0.983899	

Table 10 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.0199), the fixed-effects results are accepted for interpretation. Hence, the results in Table 10 reveal that the coefficient of TLsTAs is negative and statistically significant at the 1% significance level. The TLsTAs have a negative coefficient of −0.593, with no dummy variable, in relation to ROA. This indicates that an additional single unit in TLsTAs by the telecom firms, with all other factors remaining unchanged, will decrease the firms' ROA by 0.593 units. TLsTAs have a significant impact on ROA (Vătavu 2015; Wiyasa and Basyith 2020; Utami et al. 2021).

Table 10. Results of the Fixed Effects of TLsTAs on ROA, as per Panel Data Regression.

Variables	No Dummy	Year Dummy
	ROA	ROA
TLsTAs	−0.593 ***	−0.584 ***
	(0.124)	(0.126)
TA	1.212	1.196
	(1.202)	(1.219)
S	0.536 **	0.591 **
	(0.247)	(0.28)
LI	−0.074 *	−0.081 *
	(0.042)	(0.046)
IR	−1.145	87.478
	(10.812)	(127.075)
_cons	−10.468 **	−12.915 *
	(5.085)	(6.738)
Observations	421	421
R-squared	0.671	0.674
Adj R^2	0.667	0.664
Hausman test (Prob > chi2)	0.0199 **	0.0199 **
Robust standard errors are in parentheses		

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 11 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.0085), the fixed-effects results are accepted for interpretation. Thus, the results in Table 11 show that the coefficient of TLsTAs is positive and statistically insignificant. TLsTAs have an insignificant impact on ROE (Singh and Bagga 2019; Kumawat and Morani 2019).

Table 11. Results of the Fixed Effects of TLsTAs on ROE, as per Panel Data Regression.

Variables	**No Dummy**	**Year Dummy**
	ROE	**ROE**
TLsTAs	0.027	0.026
	(0.058)	(0.058)
TA	−0.032	0.052
	(0.504)	(0.524)
S	0.151	0.128
	(0.153)	(0.166)
LI	−0.052	−0.051
	(0.047)	(0.045)
IR	16.121	−42.392
	(17.987)	(72.017)
_cons	−3.056	−1.701
	(2.986)	(4.126)
Observations	421	421
R-squared	0.018	0.031
Adj R^2	0.007	0.003
Hausman test (Prob > chi2)	0.0085 ***	0.0085 ***
Robust standard errors are in parentheses		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 12 presents the results of the fixed-effects model, whichh achieved the objectives of the study in relation to the impact of TETAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.0199), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 12 reveal that the coefficient of TETAs is positive and statistically significant at the 1% significance level. The TETAs have a positive coefficient of 0.593, with no dummy variable, in relation to ROA. This indicates that an additional unit in TETAs by the telecom firms, with all other factors remaining unchanged, will increase the firms' ROA by 0.593 units. TETAs have a significant impact on ROA (Kumawat and Morani 2019).

Table 12. Results of the Fixed Effects of TETAs on ROA, as per Panel Data Regression.

Variables	**No Dummy**	**Year Dummy**
	ROA	**ROA**
TETAs	0.593 ***	0.584 ***
	(0.124)	(0.126)
TA	1.212	1.196
	(1.202)	(1.219)
S	0.536 **	0.591 **
	(0.247)	(0.28)
LI	−0.074 *	−0.081 *
	(0.042)	(0.046)
IR	−1.145	87.478
	(10.812)	(127.075)
_cons	−11.062 **	−13.499 **
	(5.025)	(6.654)
Observations	421	421
R-squared	0.671	0.674
Adj R^2	0.667	0.664
Hausman test (Prob > chi2)	0.0199 **	0.0199 **
Robust standard errors are in parentheses		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 13 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TETAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.0085), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 13 reveal that the coefficient of TETAs is negative and statistically insignificant. TETAs have an insignificant impact on ROE (Amatya 2020; Hoang et al. 2021).

Table 13. Results of the Fixed Effects of TETAs on ROE, as per Panel Data Regression.

Variables	No Dummy	Year Dummy
	ROE	ROE
TETAs	−0.027	−0.026
	(0.058)	(0.058)
TA	−0.032	0.052
	(0.504)	(0.524)
S	0.151	0.128
	(0.153)	(0.166)
LI	−0.052	−0.051
	(0.047)	(0.045)
IR	16.121	−42.393
	(17.987)	(72.017)
_cons	−3.029	−1.675
	(2.935)	(4.079)
Observations	421	421
R-squared	0.018	0.031
Adj R^2	0.007	0.003
Hausman test (Prob > chi2)	0.0085 ***	0.0085 ***
	Robust standard errors are in parentheses	

*** p < 0.01, ** p < 0.05, * p < 0.1.

Additional Analysis: Profit-Making vs. Loss-Making Firms

The sample is further analysed by segregating the firm-year data into profitmaking firm-year (248 firm years) data (ROA and ROE greater than or equal to zero) and loss-making firm-year (173 firm years) data (ROA and ROE less than zero).

Table 14 presents the results of the random-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.5613), the random effects results are accepted for interpretation. Hence, the findings in Table 14 reveal that the coefficient of TLsTAs is negative and statistically significant. TLsTAs have a significant impact on ROA.

Table 14. Results of the Random Effects of TLsTAs on ROA, as per Panel Data Regression (Loss-Making Subsample).

Variables	No Dummy	Year Dummy
	ROA	ROA
TLsTAs	−0.413 ***	−0.413 ***
	(0.064)	(0.064)
TA	7.663 ***	7.519 ***
	(2.87)	(2.917)
S	0.512 **	0.472 *
	(0.25)	(0.278)
LI	0.028	0.035
	(0.028)	(0.027)
IR	36.05	−521.648
	(73.52)	(814.18)
_cons	−13.445 **	−4.195
	(6.094)	(14.584)
Observations	248	248
Pseudo R^2	.z	.z
Adj R^2	.z	.z
Hausman test (Prob > chi2)	0.5613	0.5613
	Robust standard errors are in parentheses	

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 15 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.0133), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 15 reveal that the coefficient of TLsTAs is negative and statistically insignificant. TLsTAs have an insignificant impact on ROE.

Table 15. Results of the Fixed Effects of TLsTAs on ROE, as per Panel Data Regression (Loss-Making Subsample).

Variables	No Dummy	Year Dummy
	ROE	ROE
TLsTAs	−0.003	−0.006
	(0.012)	(0.011)
TA	0.09	0.378
	(0.691)	(0.594)
S	0.089	−0.023
	(0.184)	(0.174)
LI	−0.025	−0.021
	(0.036)	(0.034)
IR	47.469	−190.842
	(31.599)	(142.59)
_cons	−2.436	3.458
	(3.189)	(4.637)
Observations	248	248
R-squared	0.025	0.065
Adj R^2	0.005	0.018
Hausman test (Prob > chi2)	0.0133 **	0.0133 **
Robust standard errors are in parentheses		

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 16 presents the results of the random-effects model, which achieved the objectives of the study in relation to the impact of TETAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.5613), the random effects results are accepted for interpretation. Hence, the findings in Table 16 reveal that the coefficient of TETAs is positive and statistically significant. TETAs have a significant impact on ROA.

Table 16. Results of the Random Effects of TETAs on ROA, as per Panel Data Regression (Loss-making subsample).

Variables	No Dummy	Year Dummy
	ROA	ROA
TETAs	0.413 ***	0.413 ***
	(0.064)	(0.064)
TA	7.663 ***	7.519 ***
	(2.87)	(2.917)
S	0.512 **	0.472 *
	(0.25)	(0.278)
LI	0.028	0.035
	(0.028)	(0.027)
IR	36.05	−521.649
	(73.52)	(814.18)
_cons	−13.858 **	−4.608
	(6.094)	(14.587)
Observations	248	248
Pseudo R^2	.z	.z
Adj R^2	.z	.z
Hausman test (Prob > chi2)	0.5613	0.5613
Robust standard errors are in parentheses		

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 17 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TETAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.0133), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 17 reveal that the coefficient of TETAs is positive and statistically insignificant. TETAs have an insignificant impact on ROE.

Table 17. Results of the Fixed Effects of TETAs on ROE, as per Panel Data Regression (Loss-Making Sample).

Variables	No Dummy	Year Dummy
	ROE	ROE
TETAs	0.003	0.006
	(0.012)	(0.011)
TA	0.09	0.378
	(0.691)	(0.594)
S	0.089	−0.023
	(0.184)	(0.174)
LI	−0.025	−0.021
	(0.036)	(0.034)
IR	47.469	−190.842
	(31.599)	(142.59)
_cons	−2.439	3.452
	(3.178)	(4.632)
Observations	248	248
R-squared	0.025	0.065
Adj R^2	0.005	0.018
Hausman test (Prob > chi2)	0.0133 ***	0.0133 ***
Robust standard errors are in parentheses		

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 18 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.0025), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 18 reveal that the coefficient of TLsTAs is negative and statistically significant. TLsTAs have a significant impact on ROA at 10%.

Table 18. Results of the Fixed Effects of TLsTAs on ROA, as per Panel Data Regression (Profit-Making Subsample).

Variables	No Dummy	Year Dummy
	ROA	ROA
TLsTAs	−0.036	−0.045 *
	(0.022)	(0.024)
TA	0.057	0.056
	(0.039)	(0.034)
S	−0.029 ***	−0.035 ***
	(0.009)	(0.009)
LI	0.003	0.003
	(0.004)	(0.004)
IR	−0.097	−5.157
	(0.335)	(3.71)
_cons	0.703 ***	0.929 ***
	(0.201)	(0.226)
Observations	173	173
R-squared	0.181	0.23
Adj R^2	0.157	0.172
Hausman test (Prob > chi2)	0.0025 ***	0.0025 ***
Robust standard errors are in parentheses		

*** p < 0.01, ** p < 0.05, * p < 0.1.

Table 19 presents the results of the random-effects model, which achieved the objectives of the study in relation to the impact of TLsTAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.1635), the random effects results are accepted for interpretation. Hence, the findings in Table 19 reveal that the coefficient of TLsTAs is positive and statistically significant. TLsTAs have a significant impact on ROE.

Table 19. Results of the Random Effects of TLsTAs on ROE, as per Panel Data Regression (Profit-Making Subsample).

Variables	No Dummy	Year Dummy
	ROE	ROE
TLsTAs	1.14 ***	0.998 ***
	(0.377)	(0.342)
TA	0.15	−0.067
	(0.228)	(0.203)
S	−0.089 **	−0.065 **
	(0.039)	(0.033)
LI	−0.033	−0.04
	(0.032)	(0.027)
IR	−12.616 **	2.511
	(5.751)	(31.174)
_cons	1.631 **	0.992
	(0.776)	(1.032)
Observations	173	173
Pseudo R^2	.z	.z
Adj R^2	.z	.z
Hausman test (Prob > chi2)	0.1635	0.1635
Robust standard errors are in parentheses		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 20 presents the results of the fixed-effects model, which achieved the objectives of the study in relation to the impact of TETAs on the ROA of the firms. Considering the results of the Hausman test statistic (0.0025), the fixed-effects results are accepted for interpretation. Hence, the findings in Table 20 reveal that the coefficient of TETAs is positive and statistically significant. TETAs have a significant impact on ROA at 10%.

Table 20. Results of the Fixed Effects of TETAs on ROA, as per Panel Data Regression (Profit-Making Subsample).

Variables	No Dummy	Year Dummy
	ROA	ROA
TETAs	0.036	0.045 *
	(0.022)	(0.024)
TA	0.057	0.056
	(0.039)	(0.034)
S	−0.029 ***	−0.035 ***
	(0.009)	(0.009)
LI	0.003	0.003
	(0.004)	(0.004)
IR	−0.097	−5.157
	(0.335)	(3.71)
_cons	0.667 ***	0.884 ***
	(0.206)	(0.223)
Observations	173	173
R-squared	0.181	0.23
Adj R^2	0.157	0.172
Hausman test (Prob > chi2)	0.0025 ***	0.0025 ***
Robust standard errors are in parentheses		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 21 presents the results of the random-effects model, which achieved the objectives of the study in relation to the impact of TETAs on the ROE of the firms. Considering the results of the Hausman test statistic (0.1635), the random effects results are accepted for interpretation. Hence, the findings in Table 21 reveal that the coefficient of TETAs is negative and statistically significant. TETAs have a significant impact on ROE.

Table 21. Results of the Random Effects of TETAs on ROE, as per Panel Data Regression (Profit-Making Subsample).

Variables	No Dummy	Year Dummy
	ROE	**ROE**
TETAs	−1.14 ***	−0.998 ***
	(0.377)	(0.342)
TA	0.15	−0.067
	(0.228)	(0.203)
S	−0.089 **	−0.065 **
	(0.039)	(0.033)
LI	−0.033	−0.04
	(0.032)	(0.027)
IR	−12.616 **	2.511
	(5.751)	(31.174)
_cons	2.771 ***	1.99 *
	(1.058)	(1.129)
Observations	173	173
Pseudo R^2	.z	.z
Adj R^2	.z	.z
Hausman test (Prob > chi2)	0.1635	0.1635
Robust standard errors are in parentheses		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

7. Conclusions

The results of the regression analysis concluded that the ratio of the TLsTAs has a significant and negative impact on ROA, whereas the TETAs has a significant and positive impact on ROA. Similar results are reported by Vătavu (2015) and Azhagaiah and Gavoury (2011). The selected sample of telecom firms has a negative mean for ROA, which indicates that a majority of the firms have a negative EBIT; thus, the sample includes loss-making firms that are under financial distress. Considering the poor performance of the firms, the impact of the TLsTAs is found to be significant and negative on ROA. Due to high liability obligations, firms are not able to provide adequate funds to increase operating performance. This, in turn, has a negative impact on EBIT and ROA. On the other hand, as EBIT is a portion of total equity, and considering the loss-making firms in the sample, this indicates that if the firms rely more on equity as a source of finance, it has a positive impact on EBIT. Additionally, EBIT affects equity as it is a part of the composition.

Due to high capital investment requirements, telecom firms operate in quasi-monopolistic environment. Because of this, there is a natural predisposition towards inefficiency among telecom firms. Agency cost theory posits that when relying on internally generated funds, managers have a tendency to accept poor-quality investment projects, and debt financing could be used as a tool to encourage managers to be more efficient. However, this does not seem to be the case in the U.S. telecom industry. When considered as a whole, it appears that higher leverage levels do not lead to improved efficiency, which is demonstrated by a deterioration in ROA. This implies that their inclination towards inefficient use of capital persists regardless of how it is funded. Fuelled probably by a false sense of security in terms of bankruptcy costs and competition, it seems that these companies are willing to accept any investment projects, regardless of their return ratios, so long as they have the potential to improve the return on equity even by the smallest margin, and they can at least cover the borrowing costs. This explains the high debt-to-equity ratios that characterise the sector in general. As for the impact of TLsTAs and TETAs on ROE, it turns out that they both have a statistically insignificant relationship with ROE. Additionally, TLsTAs and TETAs correlation with ROE is negligible at +/− 0.1601 respectively. Thus, the results of these relationships are not interpreted.

When analysed separately, the results of the loss-making subsample are very similar to the results of the whole sample; that is, the impact of TlsTAs (TETAs) on ROA is significant and negative (positive), and the impact of TLsTAs and TETAs on ROE is statistically insignificant for both. Consequently, the above analysis of the whole sample also holds true for the loss-making subsample.

In the case of the profit-making subsample, the impact of TlsTAs (TETAs) on ROA is negative (positive), consistent with the whole sample, even though at a lower significance level, at 10%. A difference worth noting with this subsample is the significant positive (negative) impact of TlsTAs (TETAs) on ROE. It appears that the firms in this subsample avail of better financing terms and manage to maximise shareholders' profits through the leverage and tax-shield effect of debt, consistent with the DuPont model and the Modigliani and Miller (1963) corrected theory.

The key results of this research are valuable for investors, lenders, and corporations. It will also help firms decide on the optimal combination of the CapSt to reduce costs and maximise the value of the firm. Further studies can be encouraged in the telecom industry considering a different location and comparing the results with the telecom industry in the USA.

The results of the study are limited to data obtained from the telecom industry in the United States only. Taking samples from the global industry might provide better implications for the study. Further research can be carried out based on exploring the different methodologies, industries, and country comparisons at a lower significance level of 10% to obtain a more comprehensive outlook.

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