CAPITAL STRUCTURE, PRODUCTION COST EFFICIENCY AND FINANCIAL PERFORMANCE OF LISTED AGRO-ALLIED FIRMS IN NIGERIA

Anthonia T. Odeleye and Aminat O. Olohunlana

Department of Economics, University of Lagos, Lagos, Nigeria

ABSTRACT

The debate on preference among financing options as regards technical efficiency in the corporate world remains inconclusive. Corporate operations are often financed using either debt/equity or both. The association between efficiency and financing options was examined using a 10- year balanced panel of quoted agro-allied firms in Nigeria between 2007 and 2016. The paper employed data envelopment analysis (DEA), stochastic frontier analysis (SFA) and fixed effect regression for its analysis. The impacts of long-term debt, short-term debt and tax liabilities on agro-allied firms' performance measured by input-oriented technical efficiency and returns on assets were related. Firms' technical efficiency was found to be positively related to their share capital, tax liabilities, and long-term debts. However, short-term debts had no effect on production efficiency and return on assets.

JEL classification: D24, D20, C10, C80, O40

1. Introduction

Nigeria's agricultural sector has witnessed a lot of challenges in its growth process. The challenges are attributed to neglect of the sector after commercializing the oil sector, which made the economy overdependent on oil. The global crash in the price of oil made the economy's policymakers and government think-tanks begin to advocate for structural transformation of the

economy. This, therefore, called for the development of the other non-oil sectors of the economy (Bassey, Aniekan, Ikpe & Udo, 2013). Agricultural development is supposed to be a major channel for the development of other sectors. In particular, it generates employment opportunities and provides raw materials for the other sectors (Adetiloye, 2012). For agricultural development to be mutually inclusive, the various chains in agriculture need to be developed as pointed out by Igwe, Ogar & Ogbuu, (2017). The various chains of value in agricultural development include but are not limited to the supply of inputs, production procedures and technology, post-harvest exercise, and processing of raw outputs to inputs (Devaux, Torero, Donovan & Horton, 2017); which is mostly handled by firms in the consumer sector. The financing options available to these various forms of agricultural value chain are still generating empirical issues, particularly in developing economies.

Agricultural financing options are however not free from challenges and this inhibits investors from active participation in the sector. Some of the challenges associated with financing agricultural development include production risks due to natural disasters, inadequate information or statistics on the history of climatic changes and production records as well as huge transaction costs in servicing rural areas due to inadequate infrastructure (Masavi, Kiweu, & Kinyili, 2017). The highlighted challenges have contributory effects on financial performance which could also influence the financing options of the agro-allied firms (Mugera & Nyambane, 2014). The financial performance of firms is often measured by returns on asset and equity. However, it was noted that there are other measures such as the firms' technical efficiency (Awerij & Rahman, 2014). Technical efficiency is a more independent and appropriate measure of the use of debt and equity in the running of firms' activities (Mugera & Nyambane, 2014; Ibrahim, Aminu & Ayinde, 2015).

The technical efficiency of firms has been noted in the literature to have a reductive effect on the cost of operations as well as an increase in the level of productivity, thereby having a ripple effect on the financial performance of the firms (Masavi, Kiweu, & Kinyili, 2017). Hence, evaluating the level of efficiency of the firms vis-a-vis their ownership structure is essential.

In spite of the extant literature (Dimitris and Psillaki, 2010; Mugera and Nyambane, 2014; Suardi and Noor, 2015; Masavi, Kiweu, and Kinyili, 2017) on the nexus between capital structure and financial performance of firms, literature

on the impact of production efficiency on capital structure and financial performance of agro-allied firms in Nigeria is scarce. This study, therefore, contributes to the body of knowledge by gauging the effect of the financial decisions on production efficiency and the financial performance of the agro-allied companies in Nigeria. In achieving the broad objective, the study proffers solutions to the two highlighted research inquiries: (i) Does capital structure influence production efficiency and financial performance? (ii)Does the debt structure have an impact on production efficiency and financial performance? The agro-allied firms in this study depict the firms which employ agricultural outputs as inputs. The remaining part of this study is structured as follows: Section 2 provides an extensive review of the adapted theory of capital structure as well as empirics, while section 3 discusses the methodology. Results and discussion are presented in section 4, and finally, the study concludes with recommendations.

2. Review of Literature

2.1 Theoretical insight: Pecking Order Theory

The optimal choice of capital structure is the absolute responsibility of the board of any firm. The theories underpinning standard corporate finance hold different capital structure concepts depending on the one a company or firm is willing to undertake (Adair and Adaskou, 2015). It is worthy to note that internal financing, debt financing and equity financing are the main sources of funding available to firms. Internal and equity financing are the cheapest forms of funding and less risky while debt financing is a form of funding that necessitates efficient utilization in order to fulfill its payback obligation and also increases the profitability of the firms. Identified capital structure theories are free cash flow, trade-off, and pecking-order.

Myers (1984) criticized the trade-off theory in his presidential address to the American Finance Association meetings in which he proposed what he called "the pecking order theory". The trade-off theory of capital structure refers to the concept that a firm chooses between debt finance and equity finance in its investment decisions (Odeleye, 2014). However, the pecking order theory predicts that firms with more investment holding and profitability tax should accumulate more debt over time. It argues that firms prefer internal financing over external funds. Thus, according to the pecking order theory, with

investments and dividends taxed, more profitable firms should become less levered over time. Based on the above, the pecking order theory is therefore chosen as the most applicable and suitable theory for this study.

2.2 Empirical review

The influence of capital structure on the financial performance of firms has been extensively discussed, especially in developing countries. The imperfection of the market is one of the characteristics of developing economies attributed to the effect debt has on the earning capacities of the firms (Dimitris and Psillaki, 2010). It was however observed that the results of the research are largely controversial. Dimitris and Psillaki (2010, explored the correlation between firm performance, ownership and the capital structure of selected manufacturing firms. Data envelopment analysis (DEA), a non- parametric test, was adopted to construct the best practice frontier for the industry as well as to measure the distance of the selected firm's efficiency from the frontier. The study further compared the firm's technical performance vis-à-vis their capital composition through the use of the quantile regression analysis. The result revealed that higher leverage of the selected firms guaranteed improved efficiency. It was further discovered that firms in research and development faced a higher agency cost compared to their counterparts in the chemical industry. Finally, the study opined that there is no proof that the type of ownership structure has an effect on the choice of leverage.

Ana, Dragan and Monica (2012) enquired into the effect of capital structure on the financial performance of Macedonian agricultural companies. The study revealed that profitability increased in the short run due to the flexibility in prices of agricultural products as a result of different strategies. It was however concluded that information asymmetries increased financial risk exposure hence equity was better preferred to debt in the long run.

In a further inquiry into the determinants of capital structure, Bassey et al. (2013) investigated the factors that determined the capital structure of some unlisted Nigerian agro-based firms. The study employed the multi-stage data sampling technique to gather data for its analysis. The data was analysed using the ordinary least squares method between 2005 and 2010. It revealed that firm size and the level of education of the directors determined the composition of capital. It was further noted that there existed a significant impact of the age of

the firms, export status, gender status of the firms' owners and assets' structures on long-term debt while short-term loans were basically determined by business risk and profitability of the observed firms. Nevertheless, they recommended that policymakers should drift towards policies that would encourage export promotion and gender equity. They further suggested that policies that would absorb the business risk inherent in the agricultural sector should be initiated.

In a similar study, Suardi and Noor (2015) examined the role of capital structure on the financial outcome of the listed agricultural companies in Indonesia. The data for the analysis of the 16 agricultural firms were obtained from the Indonesia stock exchange for the period between 2010 and 2014. Debt asset and debt-equity ratios were used as proxies for capital structure while financial indicators such as gross profit margin, net profit margin, returns on assets, earnings per share and returns on equity were proxies the for financial outcome. The study employed multiple regression analysis as its choice of methodology. It was observed that the debt-equity ratio was significantly and negatively related to the returns on equity (ROA). It concluded that a significant relationship existed between companies' value and the level of solvency of the firms. It was however recommended that the firms should be more efficient in their operations so as to achieve better returns.

Stekla and Grycova (2015) also observed a negative correlation between debt and profitability of sampled firms in the agricultural sector in the Czech Republic. The study sourced data from the Albertina Enterprises database from 2008 to 2013. The level of profitability was measured with the financial ratios such as the interest coverage, gross profit, net profit, and the return on capital employed while debt to equity ratio and the debt to asset ratio were used as proxies for their capital structure choice. Similarly, Nwude, Itiri, Agbadua and Udeh (2016) supported the negative relationship between debt and profitability. It offered an empirical examination of the implication of debt structure on the performance of the listed companies in Nigeria. The study examined the effect by analysing the financials of the firms which were taken from the fact book of the Nigerian Stock Exchange (NSE) for the period between 2001 and 2012. The regression results revealed that there was an inverse relationship between the debt structure and the performance of the listed firms in Nigeria.

Igwe et al. (2017) examined the influence of capital structure on the profitability of ten listed companies in Nigeria. The study made use of secondary

data which was sourced from the Nigerian Stock Exchange and employed regression analysis. It was discovered that the profitability of the agro-allied firms was largely determined by their choice of capital. A reductive effect of a high leverage ratio on profitability was established. This suggests that the drivers of the firms should ensure an optimal mix of their capital funding options through advisory services from financial experts for the sustainability of the firms.

In line with the above, Masavi et al. (2017) adopted a longitudinal research design to analyse the impact of the capital structure of financial performance of six quoted agricultural companies. Pearson's correlation coefficient and the multivariate regression were employed to analyse the financial ratios derived from their annual published financial statements for the period 2010-2014. It was found that a positive relationship existed between debt ratio and the firm's financial performance. In addition, it was discovered that the debt to equity ratio had a significant reductive effect on the profits after tax of the firms. The study, therefore, recommended a balance in the choice of capital of firms for increased financial and progressive outcomes.

In the study by Mailumo, Dawang and Agulu (2014), the technical efficiency in the production of ginger in the northern part of Nigeria was evaluated through the stochastic frontier analysis. Data employed were generated using the multi-stage sampling method in which a sample of 100 farmers was examined. It was revealed that farm output was significantly determined by the number of labour employed and the volume of fertilizer inputted. Additionally, it was noted that inefficiencies were caused by factors not captured in the analysis. The study recommended that there should be a motivation in the form of market expansion from government and farm cooperative societies so as to increase production and improve living standards.

Anyanwu, Kalio, Olatunji and Akonye (2014), in a similar vein, adopted the multistage sampling technique to obtain data from 94 small-scale cassava farmers in Rivers State, Nigeria. The data was processed using the stochastic frontier production function. The result revealed that there existed an elastic, significant and positive relationship between the factor inputs and output. The factor inputs included the volume of labour employed, the size of the farms and the cassava stems. The farms were producing at increasing returns to scale as depicted in the estimates of the production elasticity. It was also observed that

household size, farming experience, and the age of the farmers are significant factors that influence technical inefficiencies amongst the farmers. The results indicate that the sampled farmers possessed the potential for growth as their mean technical efficiency was a little above average. It was recommended that subsidy should be tilted more to farmers with more experience in their operations.

Ibrahim, Aminu, & Ayinde (2015) harvested primary data through the use of multistage sampling methodology to evaluate the technical efficiency in the production of maize in Ogun State. Combinations of methodologies such as the stochastic production frontier, the descriptive and gross margin analysis were employed in analysing the sample size of 100 farmers. The result shows that the technical inefficiencies were largely influenced by the size of households and the level of educational attainment. It was also noted that the factor inputs such as seeds, herbicide, farm size and labour significantly contributed to the level of the farmers' efficiency. Stakeholders in the agricultural sector were encouraged to make factor inputs more accessible to the farmers. Furthermore, the active participation of youths in agriculture was recommended.

In addition, the work of Mugera and Nyambane (2014) is one of the very few studies in extant literature that examined the impact of debt structure on the technical and financial performance of farms. They evaluated the influence of debt structure on the technical and financial performance of Western Australian Broad-arced farms. Long and short-term debts, as well as tax liability were used as proxies for debt structure while return on assets accounted for financial performance. The technical efficiency was evaluated with an analysis of the variable returns to scale under the input orientation method of estimation. The study observed the determinant of technical efficiency with simple linear regression and the stochastic frontier analysis. The results revealed that the technical efficiencies of the farms had a negative relationship with the off-farm income and positive relationship with short-term debt, tax liability and capital investment. It also revealed that long term-debt had no effect on the production efficiency and the returns of assets of the selected farms.

A review of past studies shows that few studies undertook analysis of the simultaneous effects of capital structure and cost efficiency on the performance of firms. This motivates our study so that it can expand knowledge in this regard.

3. Empirical Modelling

3.1 Data envelopment analysis (DEA)

The influence of the firm's capital structure on the production efficiency of agro-allied firms in Nigeria is evaluated with the parametric and the non-parametric approaches. The parametric approach, data envelopment analysis (DEA), uses a two-stage technique to determine the factors that influence firm financial performance while the non-parametric approach evaluates the level of firms' inefficiency through the stochastic frontier analysis (SFA). The two approaches were adapted from the work of Mugera and Nyambane (2014), where it evaluated the financial performance measures of Western Australian farms vis-à-vis their production efficiency and debt structure. It is therefore assumed that the agro-allied firms employ the same level of technology to transform their inputs to output. The functional form of the model is specified as:

$$\varphi = \left\{(\alpha,\beta) \in \mathbb{Q}^{a+b} \middle| \alpha \in \mathbb{Q}_{+}^{a} \text{ can yield } \beta \in \mathbb{Q}^{b}\right\} \quad (1)$$

where:

φ is the production sect which depends on a set of inputs and outputs given a return to scale which is dependent on the firms' production efficiency ($\mathbb{Q}^{a+b}$).

The model can be further expanded to accommodate the various degrees to scale i.e', the constant returns to scale, the variable returns to scale, or the increasing returns to scale. The input-oriented technical efficiency under the variable returns to scale approach is adopted for our analysis, to reflect the conditions above as indicated below:

$$\emptyset_{DEA}(\alpha_0, \beta_0) = (\emptyset | \beta_0 \leq \sum_{i=1}^{n} \delta_i \mathbf{A}_i ; \emptyset \alpha_0 \geq \sum_{i=1}^{n} \delta_i \mathbf{B}_i \emptyset > 0; \sum_{i=1}^{n} \delta_i = 1; \delta_i \geq 0, i = 1, \ldots n)$$

The radial distance between the input and output is measured by $\emptyset_{DEA}(\alpha_0, \beta_0)$ and the level at which the inputs attain their optimum efficiency level. The efficiency level assumes scores between zero and one. The optimum efficient firms score one while the not fully efficient firms fall between zero and unitary

level. The level of efficiency of the firms was further evaluated through the adoption of the fixed effect regression. The second level efficiency check emphasizes the factors that influence the technical efficiency of the firms. The second efficiency level is structurally modelled by considering the technical efficiency scores of the firms as the dependent variable while other factors attributable to their level of efficiency are the regressors. The model below explains the relationship thus:

$$TE_{it} = \rho + \sigma_1 eqty_{it} + \sigma_2 std_{it} + \sigma_3 ltd_{it} + \sigma_4 tax_{it} + \mu_{it} \quad (3)$$

where:

ρ is the autonomous factor affecting the technical efficiency of firms,

TE_{it} signifies the technical efficiency of the firms at different periods,

$eqty_{it}$ indicates the share capital of firms,

std_{it} is the short-term debt of the firms,

ltd_{it} is the long-term debt of the firms, while

tax_{it} denotes the tax liability of the firms for the period

$\sigma_1 - \sigma_4$ represent their coefficients respectively.

In addition to the measure of the technical efficiency of the firms, the financial performance was also evaluated. Return on assets (ROA) was employed to ascertain the financial soundness of the firms and specified as follows:

$$ROA_{it} = \rho + \sigma_1 eqty_{it} + \sigma_2 std_{it} + \sigma_3 ltd_{it} + \sigma_4 tax_{it} + \mu_{it} \quad (4)$$

ROA_{it} represents the returns on the assets employed by the firms at a different time period. The other variables remained as they have been defined above.

3.2 Stochastic frontier analysis

The second model measures the level of inefficiency of the firms as specified below:

$$\alpha_{it} = \beta_{it}\delta + \gamma_{it} - \omega_{it} \quad (5)$$

where α_{it} is the level of output while β_{it} is the vector of the factors of production, γ_{it} is the stochastic error term otherwise known as the white noise and ω_{it} denotes the one-sided error term which accounts for the shortfall in the level of the output. The model explains that the level of output produced by the various firms at different intervals (time) is largely dependent on stochastic error as well as the one-sided error which is attributed to the output. A more expanded model which defines the effect of technical inefficiency can be summarized as:

$$\omega_{it} = \rho + \sigma_1 eqty_{it} + \sigma_2 std_{it} + \sigma_3 ltd_{it} + \sigma_4 tax_{it} + \mu_{it} \quad (6)$$

The one-sided error which is attributed to the output is further regressed with the capital finance options. The negative signs from the results indicate that the regressors have a positive influence on the technical efficiency, while positive results signify that the regressors contributed to the level of inefficiency of the firms.

3.3 Data sources and variables justification

The productive activities of any firm follow the normal Cobb-Douglas production function which assumes that a firm's output is subject to the employment of capital and labour. This paper expanded the production function by incorporating land and other expenses. In view of the above, the productive efficiency of the agro-allied firms was measured with the assumption of one output and five inputs. The output was proxied by the firms' revenue while the capital, land, labour and the other expenses were proxied by current assets; fixed assets, staff cost and number of employees respectively. Operational expenses were however adopted as the other expenses.

In addition, the relationship between the firms' capital choice and financial performance of the firms was analysed. The return on capital was used as a measure of the firms' performance while the firms' borrowings and share capital were described as the measures of long-term debt, short-term debt and equity respectively. The soundness of these variables has been tested in extant studies

and this informed the choice of data employed (see, Suardi and Noor, 2015; Mugera and Nyambane, 2014; Dimitris and Psillaki, 2010). The data employed was collated from the annual accounts and reports of 10 agricultural firms extracted from the various issues of the Nigerian Stock Exchange Factbook for the period between 2007 and 2016. This was due to the fact that the number of agro-allied companies quoted on the Nigerian Stock Exchange is limited. This informed the basis for the expansion of definition of agro-allied firms to include few consumer firms whose raw materials include agricultural inputs.

4. Results and Discussion

4.1 Descriptive indicators of the input and output analysis on selected agro-allied firms

Table 1 reflects the synopses of the variables employed in the estimation of the technical efficiency level and the other factors that may influence the production efficiency and financial performance of the firms. It also contains the output and inputs employed in the evaluation of the technical efficiencies of the selected firms between 2007 and 2017. The variables were transformed into logarithm form due to the hugeness of their values so that the variables could conform to normality. The amount of income realized from the operations of the firms (the output level of the firms) has an average mean value of 7.77 while the inputs employed recorded a mean value of 7.35, 6.58, 6.93 and 7.46 for the level of current assets, staff cost, operating expenses and fixed assets respectively.

Table 1. Descriptive Statistics

Variable description	Obs	Max	Min	Mean	Std. Dev.
Revenue (log)	99	8.57	5.39	7.77	7.96
Current assets (log)	99	8.35	5.61	7.35	7.56
Staff Cost (log)	99	7.62	4.02	6.58	6.85
Operating Expenses (log)	99	7.95	4.86	6.93	7.21
Fixed Assets (log)	99	8.29	5.31	7.46	7.65
Staff Strength (log)	99	3.67	1.61	2.98	3.03
Equity (log)	99	6.6	4.95	6.18	6.12
Long term debt (log)	99	7.48	4.18	6.68	6.76
Short term debt (log)	99	8.05	4.67	6.83	7.17

Variable description	Obs	Max	Min	Mean	Std. Dev.
Tax (log)	99	7.28	4.85	6.38	6.66
Return on Assets %	99	2.07	0.01	0.64	0.42

Source: Authors computation, 2018.

Moreover, there was also a wide variation in the level of the firms' share capital. This implies that many of the firms relied on debts more than equity funding (see the maximum figures for the short and long-term loans). The dependence on external financing for the firms' operations can equally be attributed to their inefficiency levels.

4.2 Technical efficiency scores

The summary of the technical efficiency scores under the DEA and the SFA is presented in table 2.

Table 2. Technical Efficiency Scores

The DEA and SFA Technical Efficiency Scores for the period 2007-2017				
Year	TECRS	TEVRS	SCE	SFA
2007	0.9733	0.9022	0.9836	0.9993
2008	0.9814	0.9932	0.9881	0.9996
2009	0.9418	0.9861	0.955	0.9005
2010	0.9593	0.9926	0.9666	0.9257
2011	0.9874	0.9961	0.9913	0.9986
2012	0.9929	1.0000	0.9929	0.9991
2013	0.9749	0.9991	0.9756	0.9993
2014	0.9641	0.9968	0.9682	0.9976
2015	0.968	0.9886	0.9781	0.962
2016	0.9909	0.996	0.9948	0.9976
2017	0.9991	0.9995	0.9997	0.9969
Mean score for the years	0.9757	0.9864	0.9813	0.9797

Source: Authors' compilation extracted from the results of DEAP 2.1 and SFA 4.1c.

Technical efficiency under constant returns to scale indicates that the firms are at the highest level of efficiency (99.9% in the year 2017) while their lowest level of technical efficiency was in 2009 at 94.18%. On the contrary, the firms' optimum level of efficiency under the variable returns to scale was attained in 2012 while the barest minimum remained in 2009.

The scale efficiency scores, which were attained by dividing the constant return to scale efficiency scores by the variable efficiency scores, recorded a prime score of 99.99% in 2017 and its scale efficiency level in year 2009. The mean score of scale efficiency of 98% signifies that a certain degree of pure technical inefficiency affects the optimal production level of the agro-allied firms. It was however observed that the lowest technical efficiency in the three scales in DEA was obtained in 2009; this could be attributed to the fact that most of the firms increased their share capital and debts. Alternatively, the technical efficiency of 99.99% under the stochastic frontier analysis (the topmost efficiency score) was attained in the 2008 while its least value was in the 2009.

4.3 Analysis of the determinants of efficiency and financial performance

The paper investigated the importance of production efficiency on the choice of capital employed by the firms and their financial performance. From the foregoing, three regression analyses were run. The technical and the scale efficiency scores as well as the return on assets were used as the explanatory variables while long-term debt and short-term debt measured the impact of financing decisions on production efficiency and financial performance. The current tax liability serves as the control variable; the level of investments and other income of the firms were initially controlled for but were later expunged from the model because it was observed that data on them was insufficient. Table 3 presents the summary of the coefficients as revealed in the findings.

Table 3. Summary Results of the Determinants of Efficiency and Financial Performance

Variable	TEVRS	SCE	ROA
Time	-0.035	-0.0052	0.0041
Equity	0.04	0.02**	0.037
Long-term loan	0.12**	0.07	0.015**
Short-term loan	1.17	0.15**	-0.06

Variable	TEVRS	SCE	ROA
Liability	-0.045**	0.038**	-0.302**
C	1.026**	0.89**	1.85**
No of Observation	99	99	99
R^2			0.94
Adjusted R^2			0.86
Y	0.135	0.087	
w	0.254	0.093	

Source: Authors'compilation from regression results.

The results reveal that the share capital of the firms has a significant and positive relationship with technical efficiency. This implies that increasing the share capital of firms would increase their technical efficiency. Also, despite the fact that a positive relationship was established between technical efficiency and long and short-term debts of the selected firms, only short-term debt was significant. This may be the outcome of the increased liquidity level of the firms in the short run. The tax liability had an inverse relationship with the level of technical efficiency of the firms. This could be justified by the fact that tax expenses increased their cost of operations. As such, level of technical efficiency was reduced.

The choice of financing decision of firms has a positive but not significant relationship with scale efficiencies except for long-term debt which is statistically significant. This implies that in the long run, equity and debts are necessary for the survival of the firms. Tax liability was also positive and significant. This is contrary to the a priori expectation. However, the result can be attributed to the fact that most of the firms accrued tax expenses and plowed them back into business operations. The deferred taxation of most of the firms was high, consequently, the firms' scale efficiencies increased.

Interestingly, share capital, long-term loans, and tax liability exhibited a positive and significant relationship with returns on capital, while short-term loans showcase a negative and significant relationship with returns on assets. Short-term loans reduced the net flows of income, which was as a result of interest expenses. Meanwhile, tax liability increased as the level of income increased and as such it had a positive relationship with returns on assets.

5. Conclusion

The research investigated the impact of firms' financing options on the production efficiency and financial performance of 10 agro-allied firms in Nigeria between 2007 and 2017. It was observed that the quoted agro-allied firms in Nigeria are few. Therefore, for the robustness of our analysis, the paper expanded its scope of agro-allied firms to accommodate consumer firms that use agricultural outputs as their inputs and also firms whose end products are consumable. Data envelopment analysis (DEA), stochastic frontier analysis (SFA) and fixed effect regression were employed to appraise the impact of equity and debt on the production efficiency and financial performance of the firms.

The result of the empirical analysis carried out indicates that the operations of the firms conform to the pecking order theory. The efficiency scores of the firms attest to the assertion that firms should internally source for funds before considering the debt option. The technical efficiency scores increased as short-term debt increased. However, scale efficiency scores had a negative relationship with debt. Return on assets (ROA) exhibited a negative relationship with short-term debt while its relationship with equity and long-term debt were positive, tax liability also increased as income increased. The result of the analysis depicts that, though tax liability increased technical efficiency, it reduced the scale efficiency of the selected firms.

It is suggested that further studies be carried out on the relationship between deferred tax liability, financing options, and firms' profitability for the frontier of knowledge.

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