Determinants of Capacity Utilization among Agribusinesses Firms in Nigeria

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Abstract - **For agribusinesses in developing economies to realize their potential, enhancing their overall performance in terms of capacity utilisation is essential. The objective of this paper is to provide information on the determinants of capacity utilization among agribusinesses in Nigeria. Providing this information is necessary to deliver good policies and strategic support from governments as well as providing a favourable business environment that will help agribusinesses reach their potential. This study adopted the survey design. Data were collected from 2014 the World Bank Enterprise survey. Purposive sampling technique was used to select all the agribusiness enterprise categories included in the World Bank data. These categories include food, tobacco, textiles, garments, leather, wood, and paper industries. The data were analyzed with instrumental variable estimation technique. Result from the analysis showed that size of enterprise and legal status were statistically significantly different from zero at 1% level of significance while Experience of top manager was found to be significant at 5% per cent level of significance. The result, therefore, revealed the existence of significant effects of firm characteristics on capacity utilization of agribusiness firms. Among other things, effort must be made to harness the potential of women agribusiness leaders, as well as small agribusinesses in the country as they appeared to be the most efficient and performing entity in the country. No previous study in the country has been carried out to uncover these determinants and how they can be improved to deliver a robust agribusiness sector.**
Keywords: **Agribusiness, Capacity Utilization, Performance, Instrumental Variable Estimation**

I. INTRODUCTION

The agribusiness sector plays a critical role in the overall growth and development of any economy, especially among the developing economies (European Union. 2013). According to the World Bank (2012), projects centred on agribusiness have far-reaching impacts on other sectors and in rural development. Studies have shown that the contribution of agribusiness to GDP increases as an economy grows (Iyer & Singhi, 2012). In virtually all economies, the agribusiness sector has a very large and rising share of the GDP (Iyer & Singhi, 2012). Universally experience points to the fact that with rising in per capita income and urbanization driving the commercialization of farming, the portions of both downstream, (for example, processing) and upstream, (for example, supply of inputs)

agribusiness investments are ready for fast development (Gitta, 2012). For agribusinesses to realize their potential, enhancing their overall performance in terms of capacity utilisation is essential (Esterhuizen, 2006). This is because, the capacity utilization rate is a major indicator of production efficiency (Balakrishnan *et al.,* 2004), and a very useful tool for business performance measurement (Fisher *et al.,* 2004).

Overtime, capacity utilization has emerged as a very important operational metric and key economic indicator for assessing business performance. The focus on capacity utilization is based on the fact that it is a more robust measure of business efficiency. This is because, as output rises, the average cost of production tends to fall – with increase in scale in some proportion output should be increase in greater proportion. Therefore, higher capacity utilization will tend to push down the unit costs, making the agribusiness sector more productive (Uremadu *et al.,* 2014). Emerging economies such as Nigeria are obviously blessed with abundant production factors such as land, labour, capital and entrepreneur. However, the extent to which these factors are harnessed remains less than optimal. Given the existing resources, how much the agribusiness sector in the country produces compared with their potential still must be increased. It is argued that an increase in capacity utilization will lead to an increase in production levels, and an increase in production levels will also lead to excess production. However, with a population of over 182 million, effective demand can be increased by adjusting the various elements of marketing mix, increasing promotion and even by subcontracting.

Robust empirical investigations have been done to assess the productivity, efficiency, and performances of farmers and agribusinesses in different parts of Nigeria, but mostly at household and farm levels (Arene, 2002; Okoye *et al.,* 2008; Opata & Nweze, 2009; Arene, & Anyaeji, 2010; Onyekuru, Okorji, & Machebe, 2010; Okon, Enete, & Bassey, 2010). There is no indication of any study that has been done to assess the performance of agribusiness enterprises on a national scale. Scholars posit that alternative strategies that look at agribusiness on a macro scale are needed to ensure more effective and safer control

of agribusiness to produce healthy and profitable growth (Afuah, 2004).

This research gap can be because of two reasons. First, the choice of performance marketing indicator has been a great challenge. Usually, the common practice has always been to use total sales (Okoye *et al.,* 2008; Opata & Nweze, 2009) or net profit (Okon, *et al.,* 2010). This is because, unlike total sales and net profit, it is usually difficult and expensive to collect data and to determine the capacity utilization of agribusiness. By employing the World Bank enterprise survey data, this study was able to overcome this challenge.

Secondly, the method of estimation of the determinants of performance when capacity utilization is used as proxy always has the statistical problem of endogeneity (Piabuo, Baye, and Tieguhong, 2015). If estimated using OLS may suffer from endogeneity problem given the possible bidirectional causality between the determinant variables and the capacity utilization of agribusiness which happens to be the case in this study since variables such as credit constraint can affect agribusiness capacity utilization and capacity utilization, in turn, can exert an effect on credit constraint, it follows that credit constraint is an endogenous regressor. This is common with many other variables usually included in capacity utilization regression equations (Nwosu and Orji, 2016).To address this issue of endogeneity bias due to simultaneity, this study adopted the standard two-stage least squares (2SLS) instrumental variable framework as employed in Thorat and Roy (2008) to obtain consistent estimates of the regression parameters such that a causal effect relationship is achieved.

Agribusinesses daily face several challenges in their business environment, and this has hindered their growth. One of the major obstacles that affect agribusinesses disproportionately is the difficulty in accessing credits (Piabuo, Baye, and Tieguhong, 2015). In the same vein, studies such as Buyinza & Bbaale, 2013; Sabasi & Kompaniyets (2015) have indicated the possibility of an association between agribusiness performance/capacity utilization and lack of access to credit. According to Buyinza & Bbaale (2013, p.3) "credit constraint affects a firm's technology choice by limiting the number of investment alternatives that can be considered in regard to the available resources". However, this argument has still not been empirically ascertained within the Nigeria context. Studies such as Sabasi & Kompaniyets (2015) have conversely argued that credit constraints can improve farm performance and farm acreage, while Oyedele *et al.,* (2009) are of the opinion that credit constraints have a significant negative effect on agriculture in Nigeria. This study intends to contribute to this area of research by analyzing the impact of credit constraint on the capacity utilization of agribusinesses in Nigeria using more robust data collected by the World Bank. Additionally, because financial inclusivity plays a key role in influencing credit constraint, this study will also attempt to consider the indirect effect of financial inclusivity as a possible channel

of impact by employing the use of "Ownership Bank Account" as a proxy for financial inclusivity and the instrumental variable for the study. Financial inclusivity simply means that agribusinesses are not restricted to affordable and useful financial services that are necessary for increased performance (Uremadu *et al.,* 2014). This study, therefore, intends to

1. To examine factors that affect determinants of agribusiness capacity utilisation in Nigeria.
2. To identify the effect of credit constraints and financial inclusivity on agribusiness enterprises capacity utilization in Nigeria.

II. METHODOLOGY

A. Sampling Procedure

The World Bank 2014 enterprise survey data for Nigeria was used for this study. The dataset captures several firm-level characteristics as well as other variables that characterize the business condition of an economy. The dataset covers micro, small, medium, and large enterprises. A comprehensive selection of quantitative and qualitative data was gathered in Nigeria using questionnaires and interviews with firm owners and managers on differing points such as infrastructure, taxing and licensing fraud, and crime, regulations, trade, and their recognitions about deterrents to doing business in the country.

Firm owners and managers in over 2500 enterprises were surveyed between 2014 and 2015 across 19 states in Nigeria, namely, Zamfara, Gombe, Oyo, er Niger, Enugu, Sokoto, Jigawa, Katsina, Kano, Kaduna, Kebbi, Abuja, Lagos, Nassarawa, Cross Riv, Ogun, Anambra, Kwara and Abia. However, after removing observations for non-agribusiness enterprises and controlling for missing data, the study will be based on a sample of 768 agribusiness firms. This selection of agribusiness enterprises was done using World Bank enterprise survey industry groups and components (World Bank Enterprise Survey, 2014).

B. Data Analysis

1. Econometrics Analysis

In this research, the instrument regression of the Two-stage least squares (2SLS) model was adopted. The dependent variable is capacity utilization. The capacity utilization regression that the study is interested in estimating is given as:

$$CapacityU_i = \alpha_0 + \alpha_1 CreditCons_i + \alpha_2 FirmSize_i + \alpha_3 Legal\_S_i + \alpha_4 TopFM_i + \alpha_5 Expereince_i + \alpha_6 Education_i + \mu_{i........} \ (1)$$

Where
i= index representing agribusiness
Capacityu = log of agribusiness capacity utilization
α_0= Intercept term.

Credit constraint = It is represented as a dummy, taking the values 1 if the firm is constrained and 0, if not. As adapted from the Data Source (World Bank Enterprise Survey), in this study, an agribusiness is said to be credit constrained if it did not apply for a credit due to negative credit conditions, or if it applied for more loans than it received.

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ are the partial slope coefficients of specific firm-level characteristics that affect SMEs performance.
μ_{it} = the error term.

According to Gujarati (2009), the stochastic error term is an arbitrary variable that has very much characterized probabilistic properties. The stochastic term speaks to different factors affecting financial development not expressly considered by the above model.

The specification of Equation 1, if estimated using ordinary least square may be biased due to endogeneity given the possible bidirectional causality between the credit constraint variable and the capacity utilization of agribusiness which happens to be the case since credit constraint can affect agribusiness capacity utilization and capacity utilization, in turn, can exert an effect on credit constraint, it follows that credit constraint is an endogenous regressor. To address this issue of endogeneity bias due to simultaneity, this study adopted the technique employed by Thorat and Roy (2008) which is the standard instrumental variable technique with 2-stage least squares (2SLS) method to obtain consistent estimates of the regression parameters such that a causal effect relationship is achieved.

To do this, we choose an instrument which is correlated with the endogenous regressor credit constraint (instrument relevance), but not correlated with the error term in Eqn. 1 (instrument exogeneity) and does not belong in the capacity utilization regression model (instrument excludability). Our study appeals to the role of the bank account in determining the credit constraint status of agribusiness (financial inclusivity). Having a bank account is a prerequisite for any credit transaction in the formal credit market as it is relevant in undertaking credit transactions. Mostagri businesses in Nigeria are highly financially excluded and credit constrained from formal credit because agribusiness is highly unbanked given the ease and flexibility in the assessment of credit from informal sources such as Akawo, family members, friends, among others. On the other hand, being unbanked is uncorrelated with capacity utilization in Nigeria, as most agribusiness in Nigeria operates with the aid of informal financial services (Buckland & Simpson, 2008). Thus, given the limited availability of data, the study adopts bank account as the ideal instrument for the endogenous regressor credit constraint. Based on the foregoing, the reduced form equation of credit constraint consists of all the regressors in the capacity utilization equation stated above with an additional regressor bank account not included in the regression model which is specified in equation 2.

$CreditCons_i = \beta_0 + \beta_1 + \beta_2 FirmSize_i + \beta_3 Legal\_S_i + \beta_4 TopFM_i + \beta_5 Expereince_i + \beta_6 Education_i + \nu_i \dots\dots(2)$
Where
i = index representing firms
$\beta_1 \beta_2 \beta_3 \beta_4 \beta_5$ and β_6 are the parameters of estimation
β_0 is the Intercept.
ν_{it} is the Stochastic error term.

According to Thorat *et al.,* (2008), in estimating the instrument regression, Asmelash (2002) have argued that it is unnecessary to use the logit or probit model to generate 1st-stage estimation as this may lead to bias. They further recounted the stance in Kelejian, (1971) that the consistency of the 2nd-stage estimations of a 2-stage least squares does not depend on getting the 1st-stage functional form. Hence, they inferred that utilizing OLS for the 1st-Stage estimation produces predictable 2nd-stage estimates even when a dummy endogenous variable is used.

This is due to their argument that if we are ignorant of the functional form of the binary first stage instrument regression as it is in this case, it is better to estimate the regression linearly with OLS as assuming a nonlinear first-stage functional form could be costly should the functional form be wrong. The costliness of a wrong nonlinear functional form lies in an inconsistent estimate of the second-stage regression. Having stated the above, we estimate the first stage instrument regression linearly using OLS to ensure consistent second stage estimation. The model is set up accounting for various covariate variables. The justification for the inclusion of each covariate variable is stated in Table I.

A poor Instrumental Variable (IV) magnifies the bias in IV estimation (Wooldridge, 2014) thus there is a need to examine for the robustness of the instrumental variable using Eigen F − statistic. If the p − value is < 0.01 we accept that the instrument variable (Bank Account) is a strong instrument as the null hypothesis for a weak instrument will be rejected at 1 percent significance level given the probability and minimum eigen value exceeding the critical value. The rejection of the null hypothesis of a weak instrument will reveal that the instrument variable passed the instrument relevance test which is also consistent with the reduced form result from the first stage regression.

The Hausman test for endogeneity is a test that reveals whether the perceived endogenous variable is truly endogenous. Endogeneity is often a serious problem in the estimation of regression result as it could lead to a spurious outcome should OLS be applied to the regression in the presence of endogenous regressor, in this case, credit constraint. Similarly, if credit constraint were to be exogenous, using IV estimation gives a consistent but inefficient estimator but OLS is BLUE (Best Linear Unbiased Estimator). Hence, the need for a Hausman test for endogeneity to ascertain whether or not the Two-Stage Least Squares/ Instrument variable technique would be adopted against the OLS technique.

TABLE I COVARIATE CONTROL VARIABLES

Variable	Definition of Variables	Nature of the Variables	Expected Sign	Justification For Variable Inclusion
Capacity_U	% Of how agribusiness use its productive capacity such as inputs	Dependent		Oke (2010)
Constraint_1	1 if credit constrained, 0 otherwise	Endogenous regressor	< 0 on capacity utilization	Nwosu *et al.,* (2016)
Size of enterprise	D_{1i} = 1, for medium, and small enterprises becomes the base category	Independent	< 0 on constraint and > 0 on capacity utilization	Piabuo *et al.,* (2015)
Legal status	D_{1i} = 1, for Sole proprietor and limited partnership, becomes the base category.	Independent	< 0 on constraint and > 0 on capacity utilization	Piabuo *et al.,*(2015)
Top Female manager	Dummy for 1= yes, 0 otherwise	Independent	< 0 on both constraint and capacity utilization	Nwosu *et al.,*(2016)
Experience of Top manager	It is the number of years of experience of the top manager	Independent	< 0 on both constraint and > 0 on capacity utilization	Nwosu *et al.,* (2016)
Bank Account	Dummy for 1= yes, 0 otherwise	Instrument	< 0 on constraint	Piabuo *et al.,*(2015)
Age of enterprise	The year the SME officially began operation.	Independent	< 0 on constraint and > 0 on capacity utilization	Piabuo *et al.,* (2015)
Educational Status of Top manager	Converted to a continuous variable by computing number of years spent in school	Independent	< 0 on both constraint and > 0 on capacity utilization< 0 on constraint	Nwosu *et al.,*(2016)

If the p-value of the Hausman test is < 0.01 we do not accept the null hypothesis of no endogenous variable at 1 per cent level of significance. This will show that credit constraint in the performance model is endogenous. Thus, the adoption of the Two-Stage Least Squares/Instrument variable estimation technique in estimating the enterprise performance model becomes appropriate.

III. RESULTS AND DISCUSSION

Table II provides the estimated coefficients of the second-stage regression of the 2-Stage Least Square (2SLS) or instrument variable estimation alongside their standard errors and t-values. All of the estimates of the 2-Stage Least Square (2SLS) estimation conform to apriori predictions from theory. The estimates that conform to apriori expectation include the coefficient estimate on the core variable of interest, Credit constraints among other covariates such as Legal status, Top Female Manager, Experience, Age of Enterprise, Education and Firm size.

Four of the parameter estimates were statistically significantly different from zero with two significant at 1 per cent level, one at 1% and the remaining one at 1 per cent level. Others such as top female manager, Education of top manager, and Age of Enterprise are statistically insignificant not different from zero.

The core variable of interest is the Credit Constraint variable which turned up a negative coefficient of about (-1.3122) and statistically significant at 10 per cent level. The coefficient estimate on credit constraint variable of about -1.3122 shows that on the average, the performance of credit-constrained agribusiness enterprises is approximately 1.31units less than those of their unconstrained counterparts all else equal. This reveals that access and use of formal credit (financial inclusion) has a positive effect on agribusiness performance in the country. This resonates with the result of Piabuo *et al.,* (2015); Nwosu *et al.,* (2016); Eton, Mwosi, Mutesigensi, & Ebong, (2017) among others.

TABLE II INSTRUMENT VARIABLE REGRESSION RESULT

Independent Variables	Coefficients	Standard EErrors	z-values
Credit Constraint	-1.3122 *	.7042	-1.86
Size of Enterprise (Medium)	104.9***	22.83	4.59
Top Female Manager	11.48	48.59	0.24
Legal Status of enterprise (Sole Proprietorship)	102.0 ***	18.79	5.43
Experience of Top Manager	3.637**	1.722	2.11
Education of Top Manager	11.74	9.811	1.20
Age of Enterprise	.0240	.0218	1.10
*** p<0.01, ** p<0.05, * p<0.1			

Furthermore, Legal status variable turned up a positive coefficient of about 102.0 in magnitude and statistically significantly at 1% level with p-value = 0.000. A company's legal status characterizes the degree of the risk which shows the degree of duty of the owner over the association's commitments. The sole proprietorship was chosen as the unit of interests. Therefore, from the parameter estimate, a positive coefficient indicates a positive relationship between sole proprietorships and capacity utilization. According to Ben (2019) the sole proprietorship is a very common form of enterprise as it is easy and simple to setup even at a very low cost and capital. This positive relationship might be because a sole proprietor has the governmental support required in business operation and with the least potential amongst the different firm sizes. However, a distinct disadvantage of this to the economy is that they are usually small-scale businesses (Oraka, 2013), employing very few or no staff most times (Okpara & Wynn, 2007), and are usually exempted from tax (Ojo, 2009), hence, returning less to the economy.

Conversely, Age of Enterprise, Education of Top Manager and Top Female Manager all turned up a non–statistically significant positive coefficient of about .0240, 11.74, and 11.48 in magnitudes respectively. These coefficient estimates point to the fact that on the average, additional year of operation and educational level of top manager impacts positively on enterprise performance with enterprises having at least a top female manager performing more than those with no top female manager in terms of capacity utilisation. Though the parameter estimates are statistically insignificant and not different from zero.

Studies on socioeconomic characteristics status of agribusinesses in Nigeria such as Tanko and Mbanasor (2000) and Vivian (2011) indicated that the impact of the business condition on the performance may rely upon firms' understanding and experience gathered over time, as experienced firms and younger firms may vary in their capacity to effectively explore the business condition. Also, findings from Davis (2017) showed that a rise in the number of women in leadership improves firms' performance in many ways. According to the report, the longer it takes to close employment gaps between male and female, the more difficult to ensure a sustainable future workforce of an economy. According to Davis (2017), a study conducted at the University of California uncovered that most California organizations with more ladies at the top performed significantly superior to ones with for the most part male managers and administrators. Other studies in Africa produced similar results (Stella & Hellicy, 2009).

Finally, the coefficient estimates on the variables Experience and Size of Enterprise reveals that on an average, an additional year of experience of the enterprise's top manager exerts a positive effect on the performance of agribusinesses by 3.637 units, and that moderately large enterprises (medium enterprises) tend to outperform

compared to their counterparts (micro, small and large enterprises) with about 104.9 units. Findings from Matemilola *et al.,* (2018) points to the fact that the top manager's experience is a potential determinant of firms' capital structure. The result likewise recommends that experienced top supervisors increase the advantages of debt interest tax-shield as they can expand firm worth.

A poor Instrumental Variable magnifies the bias in Instrument Variable (IV) estimation (Wooldridge, 2014) thus there is a need to test for the power of the instrumental variable. From the table 3, the minimum Eigen F – statistic value of 206.454 with a p-value of 0.0000 indicates that the instrument variable (Bank Account) is a strong instrument as the null hypothesis for a weak instrument is rejected at 10 per cent significance level given the overly small probability and a high minimum eigenvalue exceeding the critical value which is only 16.38 in magnitude. The rejection of the null hypothesis of a weak instrument revealed that the instrument variable (Bank Account) passed the instrument relevance test which is also consistent with the reduced form result from the first stage regression.

Evidence from the reduced form first stage regression further points to instrument relevance of Bank Account as the coefficient estimate on the instrument variable (Bank Account) turned up negative and statistically significantly different from zero with a magnitude of about negative 1.3122 and consistent with theoretical postulates (apriori expectation). This also points to the fact that having a bank account is about the first step to accessing a formal line of credit.

TABLE III F–TEST FOR WEAK INSTRUMENTAL VARIABLE
(INSTRUMENT RELEVANCE)

Null Hypothesis	Ho: Bank Account is a weak Instrument
Minimum Eigenvalue Statistic	206.454
p-value (Probability>F)	0.0000
Degrees of Freedom (DF)	(1, 580)
Level of Significance	10%
Decision	Reject null hypothesis of a weak instrumental variable

The Hausman endogeneity test is a test that reveals whether or not the perceived endogenous variable is truly endogenous. Endogeneity is often a serious problem in the estimation of regression result as it could lead to a spurious outcome should OLS be applied to the regression in the presence of endogenous regressor, in this case, credit constraint. Similarly, if credit constraint were to be exogenous, using instrumental variable estimation gives us consistent but inefficient estimators but OLS is BLUE (Best Linear Unbiased Estimator). Hence, the need for a Hausman test for endogeneity in order to ascertain whether or not the Two-Stage Least Squares/ Instrument variable technique would be adopted as an against the OLS technique.

From table IV, we observed that the p-value for the Hausman test is 0.0087 which is indicative of the rejection of the null hypothesis of no endogenous variable at 1 per cent level of significance with a t–value of about 2.91 approximated from an f – value with single restriction. This shows that credit constraint in the performance model is endogenous. Thus, the adoption of the Two-Stage Least Squares/Instrument variable estimation technique in estimating the enterprise performance model becomes appropriate.

TABLE IV HAUSMAN TEST FOR ENDOGENEITY

Null hypothesis	$H_0: \delta_1 = 0$ (Credit Constraint is exogenous)
Computed t-statistic	2.9077
p-value	0.0887
Decision	Variable Credit Constraint is endogenous at 5% significant level

IV. CONCLUSION

The result obtained from the estimation of the Two-Stage Least Squares Instrument Variable regression of the agribusiness performance model revealed that there exist negative significant effects of Credit Constraint on the capacity utilisation of Agribusinesses in Nigeria. This is as shown in the coefficient estimate on the Credit Constraint variable that turned up negative and statistically significant at 10 per cent level different from zero. Conversely, this invalidates the hypothesis of the study by lending credence to the fact that those agribusinesses that are credit constraint in not being able to access and use financial resources from formal sources are less likely to perform than their counterparts with access and use of formal financial resources. Also, the result obtained from the estimation of 2SLS regression revealed that there exist significant effects of firm characteristics on the capacity utilization of Agribusinesses in Nigeria. This is as shown in the statistically significant variables included in the model. Flowing from this, we reject the null hypothesis that firm characteristics have no impact on the performance of agribusiness firms. We also reject the null hypothesis of no significant negative effect of Credit Constraint on Agribusiness capacity utilisation in Nigeria. and conclude that Credit Constraint exerts a negative significant effect on Agribusiness capacity utilisation in Nigeria. This finding, therefore, shows, among other factors, access to and use of formal financial sources is essential for better performance for agribusinesses in Nigeria.

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