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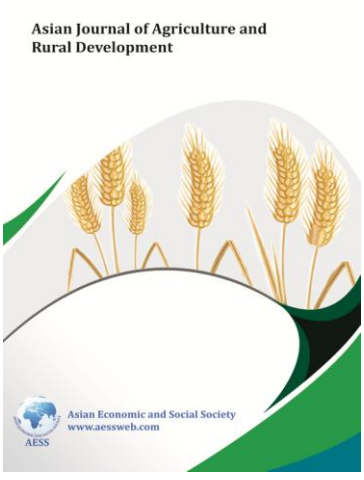

Relative Efficiency of Small and Medium Scale Agribusiness Enterprises in Imo State, Nigeria.

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Abstract

The study examined the Relative Efficiency of Small and Medium Scale Agribusiness Enterprises in Imo state, Nigeria using the stochastic translog profit function approach. A multi-stage and simple random sampling technique were used in selecting four hundred eighty enterprises (240 each from small and medium scale) from two Agricultural Zones of the state namely Orlu and Owerri zones. Economic efficiency was analysed using the stochastic translog profit function and Maximum Likelihood Estimation (MLE) technique was employed to estimate the function. Full economic efficiency was tested using generalized Likelihood Ratio (LR) and t-test statistic was employed to compare the small and medium scale enterprises in the area. The result depicted that both enterprises were not efficient but small scale enterprise was more efficient than medium scale enterprise. There was no significant difference in mean efficiency between the small and medium scale enterprises. The economic efficiencies of the enterprises varied widely between 0.09 and 0.93 and 0.08 and 0.91 respectively for small and medium scale enterprises with a mean of 0.57 and 0.54. Access to credit and business experience was found influencing economic efficiency in both small scale and medium scale enterprises. The study observed that there was an opportunity for increase in enterprises' efficiency and small and medium scale enterprises should focus more on ways of accessing credit facilities.

Keywords: Relative Efficiency, Economic Efficiency, Small and medium Scale Enterprise, Agribusiness, Profit Function, Translog

Introduction

In Nigeria, agriculture has always played a vital role in economic development over the past several decades which accounted for 88% of non-oil foreign exchange earnings and 70% of the active labour force of the population (CBN, 2000). Despite the enormous contribution of the sector to the Nigerian economy over the years, the sector has slipped into a system decline; particularly in the past three decades since the petroleum industry assume greater importance with poor agricultural development in the country (Opara, 2008). Although, overall agricultural enterprise productivity rose by 28% during the 1990's, per capita output rose by only 8.5% during the same period (Library of Congress, 2006). But reports from FAO (2003) revealed that food supply has not kept the pace with demand.

Achieving efficiency in agribusiness production has been the priority goals of many African Governments. But the agribusiness enterprise have not performed efficiently as a result of so many socio – economic, political constraint and other problems militating against performances such as; food security and food self reliance are serious challenges facing some of these economies. World Bank survey (1981) showed that inefficiency of agribusiness enterprises in most nations like Nigeria was as a result of the public policy structure that did not provide the right incentive for growth. According to IFC, (2003) the small and medium enterprise employ four to fifty workers.

Research has received minimal attention on efficiency with respect to agribusiness enterprises. The problem of economic efficiency in the utilization of resources has been the greatest concern of agribusiness entrepreneurs (Awoke and Okorji, 2003). This, study aims at analyzing and compares the economic efficiency of small and medium scale agribusiness enterprises in Imo State.

Methodology

Study Area

The study was conducted in Imo State, specifically, Orlu and Owerri agricultural zones. The area lies between latitude of 5.2^{o}N and 6.08^{0}N and longitude of 6.6^{0}E and 7.5^{0}E. The area has tropical climate characterized by high rainfall and temperature range of 1500mm-2000mm and 34^{0c}-37^{0c} respectively. Agriculture is the major occupation of people and the major arable crops cultivated in this area include cassava, yam, cocoyam, maize, pepper, and other vegetables. The plantation crops such as oil palms, coconuts, rubber, cocoa, plantain and bananas. Livestock reared in Imo State include poultry, goat and sheep. Two out of three agricultural zones were purposively selected for the study. They are Orlu and Owerri zones. A multistage sampling technique was adopted for the study. Four Local Government Areas were purposively selected from two zones and ten small and medium scale agribusiness enterprises were purposively selected per LGA. The enterprises considered in the study in include cassava, feed and palm oil processing enterprises. 240 each of small and medium scale enterprises were selected for the study, making a total 480 enterprises. Data were analyzed using descriptive statistics such as frequencies, percentages, means and t-test.

Model Specification

The normalized translog profit function model was used to estimate the economic efficiency in small and medium scale enterprises. This can be specified as follows

$$\Pi^{*} = \Pi/p = F^{*}_{i}\,(k_1; Z) \qquad (1)$$

Where
Π= normalized profit of the ith enterprise
k_1 = vector of variable input prices
Z = vector of fixed input prices

Alternatively, the above equation can be written in transcendental logarithmic form as stated below

$$In\Pi_E = \beta_o + \beta_1 Ink_1 + \beta_2 Ink_2 + \beta_3 Ink_3 + \beta_4 Ink_4 + \beta_5 Ink_5 + 0.5\beta_6 Ink_1^2 + 0.5\beta_7 Ink_2^2 + 0.5\beta_8 Ink_3^2 + 0.5\beta_9 Ink_4^2 + 0.5\beta_{10} Ink_5^2 + 0.5\beta_{11} Ink_1 Ink_2 + 0.5\beta_{12} Ink_1 Ink_3 + 0.5\beta_{13} Ink_1 Ink_4 + 0.5\beta_{14} Ink_1 Ink_5 + 0.5\beta_{15} Ink_2 Ink_3 + 0.5\beta_{16} Ink_2 Ink_4 + 0.5\beta_{17} Ink_2 Ink_5 + 0.5\beta_{18} Ink_3 Ink_4 + 0.5\beta_{19} Ink_3 Ink_5 + 0.5\beta_{20} Ink_4 Ink_5 + V_i - U_i \qquad (2)$$

Where
$\prod_E$ = normalized profit in Naira per enterprise
k_1 = wage rate normalized by the price of output per enterprise
k_2 = price of other inputs normalized by the price of output per enterprise
k_3 = price of petroleum/fuel used normalized by the price of output per enterprise
k_4 = Unit cost of transportation normalized by the price of output per enterprise
k_5 = capita inputs (interest rate) Naira.
$U_{1=}$error term under the control of the enterprise
V_1 =error term not under the control of the enterprises
β_0=intercept
β_1-β_{20}= estimated coefficients

The determinants of economic efficiency, U_i is defined by

$$Exp\ (-U_i)] = b_o + b_1 Z_1 + b_2 Z_2 + b_3 Z_3 + b_4 Z_4 + b_5 Z_5 + b_6 Z_6 + b_7 Z_7 + \varepsilon \qquad (3)$$

Where
Exp ($-U_i$)] =Efficiency of the ith enterprise
Z_i = Age of the enterprise (in years)
Z_2 = Labour (in man-days)
Z_3 = credit status (Access = 1, No access = 0)
Z_4 = Business Experience (in years)
Z_5 = Membership of cooperative society (member = 1, non = 0)
Z_6 = Number of employees
Z_7 = Extension visit (number of times)
ε = Error terms

β and bs are scalar parameters that were estimated. To estimate the model and separate inefficiency (U_i) some assumption i.e. N ($0, \sigma^2_v$) while U_i has a half normal distribution i.e. U_i = ($0, \sigma^2_v$). The estimates for all the parameters of the stochastic frontier function and the inefficiency were simultaneously obtained,

using the computer program frontier version 4.1(Coelli, 1996). Tests of null hypothesis on efficiency was carried out using the generalized likelihood ratio (LR) test statistic which is defined by

$$\lambda = -2 \ln [L(H_o)/2(H_1)]$$

Where $L(H_o)$ is the value of the likelihood function for the frontier model, which the parameter restrictions specified by the null hypothesis, Ho, are imposed; and H_1 is the value of the likelihood function for the general frontier model. The test statistic LR (λ) has a chi-square (X^2) distribution which has a degree of freedom equal to q+1, where q is equal to the number of parameters involved in H_o and H_1 (Spilaimen and Lansink, 2005). If the null hypothesis is true then λ has approximately chi-square (or mixed square) distribution with degrees of freedom equal to the difference between the parameters under Hi and Ho, respectively. The efficiency indices were compared using a t-test as stated below

$$t_{cal} = \frac{X_1 - X_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where

X_1 = the mean economic efficiency indices of small scale enterprises

X_2 = the mean economic efficiency indices of medium scale enterprises

S_1^2 = the variance economic efficiency indices of small scale enterprises

S_2^2 = the variance of economic efficiency indices of medium scale enterprises

n_1 = the number of sampled small scale enterprises

n_2 = the number of sampled medium scale enterprises

Results and Discussion

Estimation Economic Efficiency

Table 1 depicts the maximum likelihood estimates of the profit frontier function of small scale agribusiness enterprises in Imo State. The sigma square (δ^2) indicate the goodness of fit and correctness of the specified assumption of the composite error terms distribution (Idiong, 2005 and Okoye, 2006). The variance ratio (γ = 0.98) indicating that 98% of variation in the total profit is due to inefficiency that 98% of variation in the total profit is due to inefficiency. The result shows that all the variables are significant except capital inputs (interest) rate that is not significant even at 10% level of probability. Coefficient of wage rate is positively signed and significant at 1% probability level. This implies that wage is increasing with profit; this explains the positive impact of wage on the profit structure of small scale enterprises which agrees with Ajibefun and Daramola, (2003). Price of other inputs, petrol and unit cost of transportation showed negative relationship with profit of the enterprise. This indicates that every 1% increase in price of other inputs, petrol and unit cost of transportation would lead to 1.459, 3.401 and 11.498percent reduction in profitability of the enterprise.

The result of medium scale enterprise in table 2 revealed that coefficients of wage rate, price of other inputs, petrol and cost of transportation are statistically significant but wage rate is positively signed while price of other inputs, petrol and transportation cost are negatively signed which agreed with the a priori expectations. This implies that price of other inputs, petrol and transportation costs are decreasing with profit while wage rate is increasing with profit with the tune of 15.521%. The diagnostic statistics have coefficients that are highly significant at 1% level of probability. The coefficient for total variance (δ^2) is 0.107 indicating good fit while variance ratio of 0.963. This would mean that 96.3% of the variation in profit among the medium scale enterprise is due to economic inefficiency.

Comparing the two enterprises, small scale profit function result, revealed that the coefficient of wage rate (positive) price of other inputs, and petrol were statistically significant at 1% while transportation cost is significant at 5% level of probability. The variance parameter had a value of 0.45 and log-likelihood function of -233.090 whereas the medium scale enterprise showed that wage rate was positive and significant at 5% probability level, price of other inputs, transportation cost and petrol were negative, and significant at 1% level except transportation cost that is significant at 10% level. The variance ratio was 0.107 while the

log-likelihood stood at -333.083. Based on a high value of the log-likelihood ratio and the variance parameter, the small scale enterprise was more efficient than medium scale enterprises in Imo state. This result is consistent with findings of Sanusi, (2003), Amaechi, (2007) and Owualah, (1999) which admitted that small scale enterprises are more efficient, and enjoy a competitive advantage over medium and large scale enterprises.

Economic Efficiency Analysis

Although economic efficiency estimates presented in table 3 indicated a range of 0.98 to 0.09 for small scale enterprises and 0.91 and 0.08 for medium scale respectively; the mean economic efficiency was 0.57 and 0.54 for small and medium scale enterprises respectively. The estimates show that for the average small and medium scale agribusiness enterprise to attain the level of the most economical efficient farmer in the sample, the enterprise would maximize a profit if 38.71% (1-0.57/0.93) for small scale and 40.66% (1-0.54/0.91) for medium scale enterprises. The least economically efficient enterprise will have an efficiency gain of 90.32% (1-0.09/0.93) for small scale and 91.21% (1-0.08/0.91) for medium scale enterprise respectively, if the enterprise is to attain the efficiency level of most economically efficient agro-processing enterprise in the study area. This result further suggests that there are still opportunities to increase profitability through increased efficiency in resource utilization by both levels of enterprises in Imo State.

A comparative analysis was equally carried out to ascertain the difference in economic efficiency between small and medium scale agribusiness enterprises. The result showed that there was no significant difference in the mean of economic efficiency between the two enterprises in the state. The t-calculated for economic efficiency was 0.838 respectively and where less than the t-critical value of 10% ($t_{\alpha 0.1}$ = 1.282). This implies that the SMEs share similar features and use almost the same kind production. The only difference might be the amount of capital employed.

Determinant of Economic Efficiency

The **c**oefficient (table 4) of labour, credit status, business experience and number of employees are statistically significant which agreed with the a priori expectation. However, labour and number of employee are significant at 1%negatively signed. The result implies that the addition of labour and number of employees, lower the profit of the enterprise. The coefficient of business experience and credit status are positively signed, implying that the more experienced and access to credit an enterprise has, the high the level of economic efficiency and profit. This is consistent with Bravo and Pinheiro (2005) who identified positive impact of experience on efficiency.

From the result, the seven efficiency factors are contained in table 5, credit status and business experience were significant and are evidenced to be related to economic efficiency. Labour and number of employee are negatively signed and significant at 1% probability level. The implication is that labour and number of employee are decreasing with efficiency.

Conclusion

The study observed that economic efficiency of small and medium scale enterprises varied due to the presence of economic inefficiency effects in production with small scale enterprise been more efficient than medium scale enterprise in the area. This shows that there is a great opportunity for the enterprises to increase their level of efficiency in agribusiness production. There was no significant difference in mean efficiency between the small and medium scale agribusiness enterprises in the area. Access to credit and business experience was found influencing economic efficiency in both small scale and medium scale enterprises. The entrepreneurs are encouraged to adopt cost reducing strategy called vertical integration and government and private sectors should encourage the processors with more credit facilities.

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Tables

Table 1: Maximum Likelihood Estimates of the Stochastic Profit Function Model (Translog) for Small Scale Agribusiness Enterprises in Imo State

Production factors	Parameters	Coefficient	Standard error	t-value
Constant term	β_0	31.750	6.160	5.154***
Wage rate	β_1	4.904	0.493	9.954***
Price of other inputs	β_2	-1.459	0.322	-4.528***
Price of petrol	β_3	-3.401	0.298	-11.415***
Unit of transportation	β_4	-11.498	4.835	-2.378***
Interest rate	β_5	-0.270	0.442	-0.612

Wage rate^2	β_6	0.271	0.139	1.955**
Price of other inputs^2	β_7	0.067	0.221	0.301
Price of petrol^2	β_8	0.391	0.359	1.089
Unit cost of transportation^2	B_9	-0.043	0.236	-1.81
Interest rate^2	B_{10}	0.062	0.015	4.692***
Wage rate x price of other inputs	B_{11}	-1.292	0.916	-1.410
Wage rate x price of petrol	B_{12}	-0.792	0.363	-2.179**
Wage cost x unit cost of transport	B_{13}	0.560	0.425	1.318
Wage rate x interest rate	B_{14}	0.107	0.034	3.123***
Price of other inputs x price of petrol	B_{15}	-2.867	0.504	-0.569
Price of other inputs x unit				
cost of transport	B_{16}	1.664	0.700	2.378**
Price of other inputs x interest rate	B_{17}	-0.074	0.062	-1.194
Price of petrol x unit cost of trans	B_{18}	0.071	0.134	0.528
Price of petrol x interest rate	B_{19}	.0.009	0.013	-0.709
Unit cost of transport x interest rate	B_{20}	-0.053	0.017	-3.128***
Diagnostic statistics				
Log-likelihood function		-233.090		
Total variance	δ^2	0.451	0.044	10.359***
Variance ratio	γ	0.983	0.016	60.945***
LR test		49.998		

***,**,* are significant levels at 1.0%, 5% and 10% respectively.

Table 2: Maximum Likelihood Estimates of the Stochastic Profit Function Model (Translog) for Medium Scale Agribusiness Enterprises in Imo State

Production factors	Parameters	Coefficient	Standard error	t-value
Constant term	β_0	91.066	13.562	6.715***
Wage rate	β_1	15.521	6.548	2.370***
Price of other inputs	β_2	-8.592	0.617	13.927***
Price of petrol	β_3	-2.958	0.750	-3.942***
Unit cost of transportation	β_4	-1.295	0.666	-1.953*
Interest rate	β_5	-0.221	0.735	-0.301
Wage rate^2	β_6	3.298	0.197	1.670*
Price of other inputs^2	β_7	2.357	0.390	2.534**
Price of petrol^2	β_8	-1.082	0.475	2.280**
Unit cost of transportation^2	β_9	-0.229	0.213	-1.072
Interest rate^2	β_{10}	0.074	0.019	3.783***
Wage rate x price of other inputs	β_{11}	-2.015	2.106	-0.951
Wage rate x price of petrol	β_{12}	-1.332	0.992	-1.343
Wage cost x unit cost of transport	β_{13}	1.462	0.726	2.013**
Wage rate x interest rate	β_{14}	-0.097	0.065	-1.505
Price of other inputs x price of petrol	β_{15}	3.998	1.206	3.314***

Price of other inputs x unit				
cost of transport	β_{16}	-1.785	1.435	-1.244
Price of other inputs x interest rate	β_{17}	0.059	0.107	0.555
Price of petrol x unit cost of trans	β_{18}	-0.091	0.442	-0.204
Price of petrol x interest rate	β_{19}	0.061	0.038	1.619
Unit cost of transport interest rate	β_{20}	-0.030	0.024	-1.235
Diagnostic statistics				
Log-likelihood function		-333.083		
Total variance	δ^2	0.107	0.015	9.343***
Variance ratio	γ	0.963	0.041	2.328***
LR test			21.59	

Table 3: Maximum Likelihood Estimates of the Determinants of Economic Efficiency of Small Scale Agribusiness Enterprise

Variable	Parameter	Coefficient	Standard error	t-value
Constant	Z_0	-2.021	3.996	-0.506
Age of enterprise	Z_1	0.081	0.101	0.745
Labour	Z_2	-0.000	0.000	-7.537***
Credit status	Z_3	0.315	0.120	2.619***
Business experience	Z_4	0.072	0.079	8.867***
Membership to cooperative organization	Z_5	-2.062	2.116	-0.975
Number of employees	Z_6	-0.124	0.016	-7.676***
Extension visit	Z_7	-0.004	0.023	-0.185

***,**,* are significant levels at 1.0%, 5% and 10% respectively.

Table 4: Maximum Likelihood Estimates of the Determinants of Economic Efficiency of Medium Scale Agribusiness Enterprise

Variable	Parameter	Coefficient	Standard error	t-value
Constant	Z_0	-6.066	9.084	-0.668
Age of enterprise	Z_1	-0.004	0.023	-0.019
Labour	Z_2	-0.000	0.000	-3.706***
Credit status	Z_3	0.660	0.197	3.358***
Business experience	Z_4	0.048	0.006	7.578***
Membership to cooperative organization	Z_5	1.509	1.951	0.773
Number of employees	Z_6	-0.143	0.002	-6.568***
Extension visit	Z_7	-0.014	-0.033	-0.428

***,**,* are significant levels at 1.0%, 5% and 10% respectively.

Table 5: Frequency Distribution of Economic Efficiency Indices of Small and Medium Scale Agribusiness Enterprises in Imo State

Small			Medium	
Economic efficiency index	**Freq**	**%**	**Freq**	**%**
0.00-0.50	72	30.00	77	32.08
0.51-0.60	36	15.00	45	18.75
0.61-0.70	53	22.00	57	23.75
0.71-0.80	51	21.25	51	21.75

0.81-0.90	23	9.58	7	2.92
0.91-0.99	5	2.08	3	1.25
Total	240	100	240	100
Maximum economic efficiency	0.93		0.91	
Minimum economic efficiency	0.09		0.08	
Mean economic efficiency	0.57		0.54	

Source: computed from output of computer programme frontier 4.1.