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SURVEY ARTICLE

The Efficiency of Hard Wood Industry in Ondo State, Nigeria

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ABSTRACT

Wood furniture industry is an important manufacturing sector in Nigeria for its significant contributions to the growth of national economy and industrialization as well as livelihood of the furniture makers. Therefore, evaluating efficiency of hard wood industry is important to provide useful information about the business to the furniture makers and to assist the policy makers to design appropriate policies in supporting furniture production in Nigeria. The specific objectives of this research were to describe socio-economic characteristics of furniture makers, estimate efficiency of furniture makers, determine the profitability of furniture production, identify factors influencing efficiency of furniture making and examine the problems associated with furniture makings in the study area. The study adopted a multistage sampling procedure. Data were collected from seventy furniture makers through a well-structured questionnaire. Descriptive statistics, budgetary analysis, Cobb Douglas stochastic frontier production function, inefficiency model and relative importance index were used to analyze the data. The findings revealed that 75.7% of the respondents obtained some levels of formal education; 4.3% of the furniture makers were single; 71.4% had no access to credit facility; and 7.1% exported their products beyond the boundary of Nigeria. The estimated gross margin and net profit of #7,041,255.09 (US $16,959.52) and #4,261,542.89 (US $10,264.33) respectively revealed that furniture production is profitable. The efficiency results showed that 27% of furniture makers were most technically efficient; 5.7% of them were most allocative efficient; and 10% of them were most economically efficient. Stochastic frontier production function analysis showed that firm size, labour and fixed assets had a positively significant influence on furniture production. The only identified socio-economic characteristics of furniture makers that had significant influence on efficiency of furniture production were educational level, operating experience and reinforcement training in the study area. The two critical constraints facing furniture making in the ranking scale were fluctuation of wood price and inadequacy of funds.

Keywords: Efficiencies, Stochastic Frontier Production, Furniture Makers

1 Introduction

The Nigerian wood-based industry comprises about ten groups namely the sawmills, particleboard mills, plywood mills, wood preservation, flush doors, toothpicks, medical spoons and confectionary sticks, pulp and paper mill, match industry as well as furniture manufacturing industry. The performance of each segment within the industry varies (Ogunwusi, 2014) .Wood furniture industries in Nigeria have the highest recognition and performance among other wood-based industries. These industries are strategic in the use of planks from the sawmills and protect the continued existence of primary wood industries like sawmills and ply mills (Babatunde et al., 2017). They are, therefore, referred to as secondary processing industries which convert wood into various household materials such as doors, tables, chairs, decoration, cabinets and shelves, cupboards, kitchen nets, beds and bed mate among others.

The capacity utilization of the furniture industry companies represents the major market of wood products in Nigeria (Babatunde, 2018). In the global market, Nigeria is the third biggest furniture producer with the

furniture market size (US$1,148 million) in the Africa (Oy & World Bank Group, 2015) stated that South Africa is the largest market at US$1,548 million, followed by Algeria (US$1,259 million), Nigeria (US$1,148 million) and Egypt (US$701 million). Undoubtedly, this industry contributes to the Nigeria's economy foreign exchange. Arowosoge et al. (2012) cited in their study that wood furniture industry is a major contributor to the national economy, and that only a few other industrial sectors contribute more than the furniture industry in terms of generations of local funds, annual wood consumption, employment generation and socio-economic development. Small and Medium Enterprises (SMEs) are the major players in the wood furniture industry (Alao & Kuje, 2012). Small scale producers comprise both artisanal and cottage scale producers: the artisanal scale producers have 3-6 workers while cottage scale producers have 7-10 workers. The medium scale producers include those with 10-15 workers. While the large-scale producers comprise 16-30 workers Hence, it is no surprise about the ability of SMEs to generate more employment than larger firms if there is productive improvement and technological upgrading in the enterprises.

According to Ngui et al. (2010), furniture has the highest value-added component among the major wood-based products. Furniture is inevitable part of human existence. Wood furniture products contribute to the beautification and aesthetics of an environment like private and public places (Sambe et al., 2022). Furniture is in various forms such as doors, tables, chairs, decoration, cabinets and shelves, cupboard, beds, among others. These furniture products are present in homes, offices and social infrastructure buildings such as schools, hotels and hospitals. Most importantly, furniture adds style and elegance wherever they are because of their primary functions and designs (ADEDOKUN et al., 2017). (O. G. E. Arowosoge & Tee, 2010)opined that Nigerian furniture segment, though operating at abysmal performance level, has been increasing in number due to the returns they provide to the operators.

Therefore, the study aims to widen the information based on hardwood industry in Ondo State. It is set to provide information on profitability; most importantly, to analyze the efficiency of hardwood industry in Ondo State in order to capture the potentiality of furniture makers. This will also serve as data based for the new entrants coming into the business. Finally, the study will enable the policy makers to identify and to make an effective policy decision on the problems faced by the furniture makers and to come up with the interventions on providing comprehensive lasting solutions to them.

2 Materials and Methods

2.1 Study Area, Source of Data, Sample Technique and Size

The study was carried out in Ondo State. The state was carved out of the defunct western state of Nigeria in 1976. It is one of the 36 states of Nigeria located in the southwestern part of Nigeria. It has 18 Local Government Areas (LGA) with many communities. It lies within latitudes 5^0 45' and 8^0 15' North and longitudes 4^0 45' and 6^0 5' East. The land areas are about 14,793,186 square kilometers with varying features like hills, lowland, rivers, creeks and lagoons (Owoeye, 2017). The state has a tropical climate with moderate temperature all the year round. It experiences heavy rainfall between the months of April and October of every year while the presence of dry wind is felt between the months of November and March. Ondo State is characterized with deciduous forests. Within the state, there are three distinct ecological zones: the Mangrove Forest to the south, the Rain Forest in the Middle Belt and the Derived Savanna to the north. The Mangrove and Rain Forest zones have large hectare of forest reserves that are well stocked with various species of economically important trees such as Obeche, Iroko and Mahogany (Oguntade et al., 2012). The logs obtained from these trees are processed into planks and other forms by sawn millings. Furniture makers depend on the processed woods like planks to produce furniture products for the societies. Data for this study were from primary data. Primary data were collected from the selected furniture makers in the study area with the aid of well-structured questionnaire. Data collected include information on the socio-economic characteristics of furniture makers, cost and return of furniture production, efficiency of furniture makers as well as factors influencing efficiency of furniture making in the study area.

A multi-stage sampling technique was adopted for the study. The first stage was a purposive selection of three Local Government Areas namely Akure South, Ondo West and Owo which account for the highest furniture makers in the study area since a membership list of registered furniture makers in the state was used as a guide for the selection. The second stage was also a purposive selection of five communities from each of the Local Government Areas selected through their association lists. The third stage was a stratification of the five communities in each Local Government Area selected into medium scale furniture makers based on their asset strength and/or scale of production. A small-and-medium-scale industry is defined as any enterprise with a maximum asset base of N200 million, excluding land and working capital, with the number of staff employed by the enterprise not less than 10 and not exceeding 300 (Sanusi, 2003).The scale of production used for the selection of furniture makers was production with at least 1000 furniture items per year. In the last stage, a snow balling was used to sample thirty (30) medium scale furniture makers in Akure South, twenty (20) medium scale furniture makers in Ondo West and another twenty (20) medium scale furniture makers in Owo with a view of sampling a total of seventy (70) furniture makers planned for the study. This technique assisted the enumerators employed for the data collection to locate some group of medium scale furniture makers at initial stage of the field survey who then referred them to more other furniture makers in their respective communities. Thus, the total number of furniture makers sampled for the study was seventy (70) furniture makers.

2.2 Data Analysis and Model Specification

2.2.1 Cobb Douglas Stochastic Frontier Production Function

The study used Cobb Douglas stochastic frontier production function together with its cost function to estimate efficiencies of furniture makers while inefficiency model was used to identify factors influencing efficiency of furniture making in the study area.

The dependent variable for this study was value of furniture produced per annual while the explanatory variable was firm size, capital, labour, energy expenditure, raw materials and fixed asset. Details about how these variables were measured have been explained in the models.

$$\mathrm{InY} = \beta_0 + \beta_1 \mathrm{InX}_1 + \beta_2 \mathrm{InX}_2 + \cdots \ldots \ldots \ldots + \beta_n \mathrm{InX}_n + (V_i - U_i) \quad [1]$$

where;

Y = Value of furniture produced (e.g., Monetary value for table, chair, door, etc.) (Naira)

X_1 = Firm size (square per meter)

X_2 = Capital (naira)

X_3 = Labour (man-day)

X_4 = Energy expenditure (naira)

X_5 = Raw materials expenditure (naira)

X_6 = Fixed assets (naira)

$\beta_1 - \beta_n$ = Coefficients of parameters estimated

β_0 = Intercept.

V_i = Random statistical disturbance term which captures the effects of weather and other factors outside the control of the furniture maker.

U_i = Furniture maker and furniture maker's specific characteristics related to production inefficiency.

However, a Cobb-Douglas cost frontier function for furniture maker was specified as

$$InC_i = \beta_0 + \beta_1 InY_1 + \beta_2 InP_1 + \beta_3 InP_2 + \beta_4 InP_3 + \beta_5 InP_4 + \beta_6 InP_5 + (V_i + U_i) \quad [2]$$

where;

C_i= Total cost of production (naira)
P_1 = Capital price (naira)
P_2 = Price of labor used (naira)
P_3= Price of energy consumed (naira)
P_4= Price of raw materials used (naira)
P_5= Price of fixed assets used (naira)
Y_1 = Value of furniture produced (naira)
β_0= Intercept
$\beta_1 - \beta_n$= Coefficients of parameters estimated.

In addition to the general model, this inefficiency model was used to identify the influence of some socio-economic characteristics of furniture makers on technical efficiency of furniture production in the study area as was done by (Haile, 2015). Technical inefficiency effect is as a result of behavioral factors which could be controlled by efficient management. This model has been used to analyze the factors affecting the technical efficiency of a firm. This model was specified as:

$$U_{ij} = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + ------ + \delta_n Z_n + e \quad [3]$$

U_{ij} = technical inefficiency of the i^{th} furniture maker and j^{th} observation of the furniture maker.
Z_1 = Age (years)
Z_2 = Gender (1 = male; 0 = female)
Z_3 = Marital Status (married = 1 and 0, otherwise)
Z_4 = Educational level (years)
Z_5 = Operating experience (years)
Z_6 = Method of skill acquisition (Formal = 1, Informal = 0)
Z_7 = Business Enterprises (Sole proprietorship = 1 and 0, otherwise)
Z_8 = Access to credit (yes = 1, otherwise = 0)
Z_9 = Access to market (yes = 1, otherwise = 0)
Z_{10} = Reinforcement training (yes = 1, otherwise = 0)
δ_0= Constant
$\delta_1 - \delta_n$ = Unknown parameters to be estimated

δ's, β's, γ coefficients are unknown parameters to be estimated along with the various parameters which are expressed in terms of

$$\delta s^2 \text{ (sigma square)} = \delta v^2 + \delta u^2$$

$$\gamma \text{ (gamma)} = \frac{\delta u^2}{\delta s^2}$$

The "γ" parameter has value between zero and one, ($0 \leq \gamma \leq 1$). The parameters of stochastic frontier production function (SFPF) model were obtained by maximum likelihood estimation method using computer programme, frontier version 4.1

2.2.2 Budgetary Analysis

Budgetary analysis was used to determine profitability of furniture production in the study area. Budgetary analysis is a germane exercise in the production process in order to access and determine the financial capacity and performance of an enterprise. This comprises total revenue (TR), total cost of production (TC), gross margin (GM), net profit (NP), return of investment (ROI), and gross ratio (GR). The total cost of production comprises total variable cost and total fixed cost. The total variable cost (TVC) includes cost of labour, cost of raw materials (like woods, adhesive, painting, foams, leathers and workshop garment), cost of energy consumption (like electricity and fuel) and cost of maintaining technologies. The total fixed cost (TFC) includes depreciation costs on vehicles, generators, technologies (like sprayer, plaining machine, industrial machine, jigsaw, filing machine, circular machine and drilling machine) and hand tools (like hammers, tape room, jack plane and hand saw). Gross margin is the difference between total revenue and total variable cost. A gross margin greater than zero implies that the enterprise is profitable while gross margin less than zero means the enterprise is unprofitable. Return on investment is a ratio between net income and total cost of production over a period. A high ROI means that the investment gains compare favorably to its costs. Gross ratio is the total cost of production divided by total revenue obtained. Total revenue is the average prices of items of furniture produced multiply by the quantities produced per annual. The derivatives for the budgetary analysis are presented in the equations below:

$$\text{TR} = P \times Q \quad [4]$$

$$\text{TC} = \text{TVC} + \text{TFC} \quad [5]$$

$$\text{GM} = \text{TR} - \text{TVC} \quad [6]$$

$$\text{NP} = \text{TR} - \text{TC} = \text{GM} - \text{TFC} \quad [7]$$

$$\text{ROI} = TR/TC \quad [8]$$

$$\text{Percentage Profit} = (TR - TC)/TC \times 100 \quad [9]$$

$$\text{GR} = TC/TR \quad [10]$$

2.2.3 Relative Importance Index Analysis

Relative Importance Index (RII), which as well-known as Likert Scale, was used to identify and to rank the constraints associated with furniture makers in the study area. RII was calculated for each of the constraints and ranked accordingly. The RII derived was used in summarizing the importance of each of the constraint. The RII ranges from 1 to 4 and computed as.

$$\text{Relative Important Index (RII)} = \frac{\Sigma W}{A \times N} \quad [11]$$

where:
W is weighting as assigned on Likert Scale by each furniture maker in a range of four to one.
A is the height weight (in the study area)
N is the total number of the furniture makers (in the study area).
Decision rule:
The higher the value of RII, the more important the constraint is to the furniture makers in the study area.

3 Results and Discussion

3.1 Statistical Descriptive and Profitability Results of the Furniture Makers

Table 1 shows that 4.3% of the respondents who are single were involved in furniture production. This could be due to the fact that the enterprise has not yet been discovered by the youths that it is viable and profitable which could serve as a means of livelihood.

Table 1: *Socio-Economic Characteristics of Furniture Makers*

Extracted Variables	Frequencies	Percentages
Age Group (Years)		
31 – 40	3	4.3
41 – 50	53	75.7
>50	14	20.0
Total	70	100.0
Mean of age is 47.5 years		
Marital Status		
Married	59	84.2
Single	3	4.3
Windowed	2	2.9
Divorced	6	8.6
Total	70	100.0
Educational Levels		
Tertiary	12	17.1
Secondary	45	48.6
Primary	5	10
Non-Formal	8	24.3
Total	70	100.0
Skill Acquisition		
Formal training	18	25.7
Informal training	52	74.3
Total	70	100.0
Credit Accessibility		
Yes	27	28.6
No	43	71.4
Total	70	100.0
Operating Experience		
<10	8	11.4
11-24	15	21.4
21-30	35	50.0
31- 40	12	17.2
Total	70	100.0
Mean of operating experience is 24.0 years		
Amount of Credit Borrowed (#)		
<300,000	22	31.4
300,001 – 500,000	23	32.9
500,001 – 700,000	5	7.1
700,001 – 900,000	10	14.3
>900,000	10	14.3
Total	70	100.0
Mean of credit borrowed is #542,857.1		
Sources of Market		
Local Market	59	84.3
International	5	7.1
Both	6	8.6
Total	70	100
Scale of Production		
1 – 1000	15	21.4
1001 – 5000	49	70.0
>5000	6	8.6
Total	70	100.0
Mean of scale of operation is 3500		

75.7% of the respondents obtained some levels of formal education whereas about 25.7% of them acquired their skill through formal training. Their mean operating experience of 24 years implies that the categories of people in the study area are not new and that they have been into furniture production for an average of 20 years. This justifies their high level of exposure and experience towards the business which could improve their quality of production and innovative technique. About 71.4% of the furniture makers had no access to credit facility. The average credit used in production was #542,857.1 (US $1,307.52) which implies that only few furniture makers in the study area were financially buoyant to manage the operation with #500,000 (US $1,204.3) and above. About 7.1% exported their products beyond the boundary of Nigeria. The mean value for scale of production was 3500 implying that average furniture makers could be boast of producing at most 3500 furniture items per year. These items of furniture range from school tables and chairs, office tables and chairs, sets of dining chairs and table, set of sitting room chairs and tables, wardrobes and cupboards, beds, doors and door frames, dressing mirrors, shoe rags and many others.
From result in Table 2, the total variable cost formed more than 30% of total cost of furniture production in the study area. This could be as a result of different raw materials used in the production process.

Table 2: *Profitability Analysis of Furniture Production.*

ITEMS	VALUE (#)	PERCENTAGE (%)
Variable Inputs		
Labour	49100	0.7
Raw material (wood, adhesive, paint, foam, nail, leather, garment)		
Wood	3544689.78	48.7
Adhesive	105617.21	1.5
Paint	133306.78	1.8
Foam	223361.42	3.1
Nail	136579.85	1.9
Leather	131022.9	1.8
Workshop garments	7466	0.1
Energy consumption (Electricity and fuel)		
Electricity	117498.9	1.6
Fuel	32458.25	0.4
Maintenance cost	21781.25	0.3
Total Variable Cost	4,502,882.34	61.8
Fixed Cost (Depreciation)		
Transportation Vehicle	84800	1.2
Sprayer	41922.73	0.6
Big diesel generator	720000	9.9
Small Generator	121250	1.7
Plaining Machine (2D)	1044643	14.3
Industrial sewing machine	332357.1	4.6
Jigsaw	85411.76	1.2
Filing machine	31195.12	0.4
Circular machine	41692.31	0.6
Hammer	944.24	0.0
Tape room	389.46	0.0
Jack plane	8224.61	0.1
Hand saw	1652.85	0.0
Band sawn	155224.02	2.1
Drilling machine	110005.00	1.5
Total Fixed Cost	2,779,712.20	38.2
Total Cost	7,282,594.54	100.0
Total Revenue	11,544,137.43	
Gross Margin	7,041,255.09	
Net Profit	4,261,542.89	
Return on Investment	1.59	
Percentage Profit		59.0
Gross Ratio	0.63	

The breakdown of total variable cost in descending order indicates that cost of wood accounted for 48.7%, cost of foam was 3.1%, cost of nail accounted for 1.9%, cost of paint accounted for 1.8%, cost of leather accounted for 1.8%, cost of electricity was 1.6%, cost of adhesive accounted for 1.5%, cost of labour accounted for 0.7%, cost of fuel accounted for 0.4%, maintenance cost accounted for 0.3% and cost of workshop garments accounted for 0.1% of the total cost of furniture production. Among all the raw materials used in the production process, the cost of woods takes the largest share of total variable cost of furniture production. This implies that furniture makers who want to be cost efficient must learn how to buy raw materials in large quantities, most especially woods rather than buying them in smaller quantities in order for them to enjoy greater economies of scale. Whereas the total fixed cost formed one third (38.2%) of the total cost of furniture production in the study area. This could be as a result of durable working tools and machines that the enterprise contains which are kept in the workshop and used over time by the operators. The breakdown of total fixed cost in descending order indicates that plaining machine (2D) accounted for 14.3%, big diesel generator accounted for 9.9%, industrial sewing machine accounted for 4.6%, band saw accounted for 2.1%, small generator accounted for 1.7%, drilling machine accounted for 1.5%, Jigsaw accounted for 1.2%, transport vehicle accounted for 1.2%, circular machine accounted for 0.6%, sprayer accounted for 0.6%, filing machine accounted for 0.4%, jackplane accounted for 0.1%, hammer accounted for 0.0%, tape room accounted for 0.0% and hand saw accounted for 0.0% of the total cost of furniture production.

Based on the estimated gross margin and net profit of #7,041,255.09 (US $16,959.52) and #4,261,542.89 (US $10,264.33) respectively, the result implies that furniture production is profitable in the study area. Similarly, the estimated gross ratio of 0.63 reveals that total revenue accrued from furniture production is greater than total cost expended in the course of the business by 37%. Again, the return on investment (ROI) of 1.59 means that for every one naira a furniture maker invested on furniture production in the study area, it would yield #1.59 as revenue or gain of 59k on each naira expended. This value was statistically lower than the value of 4.2% obtained for ROI in the recent research conducted by (Sambe et al., 2022). The percentage profit of over 59% further confirms that furniture production is a highly profitable venture in the study area. Thus, in a situation that furniture makers collect loan for furniture production, it is expected that they should be able to pay back the loan even at commercial bank interest rate of at least 27% per annum. All these profitability measures confirmed and reiterated the financial viability and profitability of furniture production in the study area.

3.2 Efficiency Analysis Results of the Furniture Makers

The analysis of efficiency is generally associated with the possibility of firms producing a certain optimal level of output from a given bundle of resources or a certain level of output at 'least cost.' In other words, efficiency means the maximum degree of utilization of resources under the condition of certain technical levels or investments (Theophilus Miebi, 2019; Zhaoqun et al., 2018). There are three types of efficiency: technical, allocative and economic efficiencies.

3.2.1 Technical Efficiency Analysis Results of the Furniture Makers

Technical efficiency is the ability of firms to derive maximum output from the inputs available to them. The result of technical efficiency is presented in Table 3. The technical efficiency of the furniture makers ranges between 0.195 and 0.999. About 25.8% of furniture makers were technically inefficient because they were operating below 60% technical efficiency level. Majority (27.0%) of furniture makers attained 90% to 99% technical efficiency while about 12.9% of them achieved 70% to 79% technical efficiency. The mean technical efficiency of the furniture makers in the study area was 66.4% which implies that on the average, furniture makers were able to obtain just over 66.4% of optimal output from a given set of inputs while the minimum and maximum efficiencies were 19.5% and 99.9% respectively. The implication of this result is that average furniture makers need about 33.5% cost saving to attain the efficiency status while the least furniture makers need about 80.5% cost savings to become an efficient firm. The findings of this study

almost tally with the findings of Alao & Kuje (2012) and (O. G. E. Arowosoge & Tee, 2010) with the mean of 53% and 59.5% respectively.

Table 3: *Distribution of Technical Efficiency among Furniture Makers*

Range	Frequency	Percentage (%)
<0.20	2	2.9
0.20-0.29	10	14.3
0.30-0.39	2	2.9
0.40-0.49	3	4.3
0.50-0.59	1	1.4
0.60-0.69	24	34.3
0.70-0.79	9	12.9
0.80-0.89	0	0.0
0.90-0.99	19	27.0
Total	70	100.0

Mean = 0.664. Minimum = 0.195. Maximum = 0.999. Standard Deviation = 0.253.

3.2.2 Allocative Efficiency Analysis Results of the Furniture Makers

The estimation of allocative efficiency gives an overview on how well the furniture makers were able to use their available resources optimally given the market constraints to produce their products. The result is presented in Table 4. Allocative efficiency of the furniture makers ranges between 0.052 and 4.436. The result revealed that furniture makers were at least 5% efficient in selecting and combining their inputs to achieve their productivity. To expatiate the result further, about 5.7% of the furniture makers operated on the frontier line with their allocative efficiency of 1.00 while about 5.7% of them also attained allocative efficiency between 0.90 and 0.99 which is very close to 1.00. The mean allocative efficiency was 1.159. The least efficient was 0.052 and the most efficient was 1.00 and those beyond the frontier line were 41.6%. The implication of this result is that for the least furniture makers in the study area to attain allocative efficiency of their most efficient counterparts, they need about 94.8% cost savings.

Table 4: *Distribution of Furniture Makers based on Allocative Efficiency*.

Range	Frequency	Percentage (%)
<0.20	3	4.3
0.20-0.29	1	1.4
0.30-0.39	1	1.4
0.40-0.49	5	7.1
0.50-0.59	1	1.4
0.60-0.69	4	5.7
0.70-0.79	11	15.7
0.80-0.89	7	10.0
0.90-0.99	4	5.7
1.00	4	5.7
>1.00	29	41.6
Total	70	100.0

Mean = 1.159. Minimum = 0.052. Maximum = 4.436. Standard Deviation = 0.842.

3.2.3 Economic Efficiency Analysis Results of the Furniture Makers

Economic efficiency of the furniture makers is obtained by the inverse of cost efficiency. The result of economic efficiency of furniture makers is presented in Table 5. It was revealed that variation in the economic efficiency level among the furniture makers was large with the efficiency range between 0.028 and 0.945. The gamma value of 0.999 was statistically significant at 1% level of probability which implies that about 99% variation in the total cost of furniture production was due to the cost inefficiency because of the differences in their cost efficiency. About 30% of furniture makers operated below 50% economic efficiency while the majority (24.3%) of them were within 0.80 to 0.89 economic efficiency. Also, 10% of the furniture makers achieved 0.90 to 0.99 economic efficiency. The mean economic efficiency was 0.631. The implication of the result is that the average furniture makers need about 33% cost savings to attain the status of the most economically efficient furniture makers while the least operators need about 97% cost savings to attain the status of the most economically efficient counterparts in the production.

Table 5: *Distribution of Furniture Makers by Economic Efficiency*

Range	Frequency	Percentage (%)
0.00-0.09	3	4.3
0.10-0.19	2	2.9
0.20-0.29	1	1.4
0.30-0.39	4	5.7
0.40-0.49	11	15.7
0.50-0.59	9	12.9
0.60-0.69	4	5.7
0.70-0.79	12	17.1
0.80-0.89	17	24.3
0.90-0.99	7	10.0
Total	70	100.0

Mean = 0.631. Minimum = 0.028. Maximum = 0.945. Standard Deviation = 0.234

3.3 Estimate Results of Stochastic Production Function

The result of maximum likelihood estimate of stochastic production function is presented in Table 6. The high and significant value of sigma square (δs^2) indicates a goodness of fit and correctness of distributional form assumed for the composite error term in the model. Also, the gamma (γ) value of 0.999 was statistically significant showing that about 99% residual variation in furniture production, which is unexplained by the function, was due to disparity in inputs and technology. This explains why the ordinary least square (OLS) estimate was not adequate in explaining inefficiency differentials among the furniture makers in the study area.

Table 6: *Maximum Likelihood Estimate of Stochastic Production Function*

Variables	Parameters	Coefficients	Standard Errors	T- values
Constant	β_0	10.081	3.249	**3.103*** **
Firm Size	β_1	0.119	0.017	**7.054*** **
Capital	β_2	0.343	0.264	1.299
Labour	β_3	0.190	0.061	**3.127*** **
Energy Expenditure	β_4	-0.170	0.043	**-3.932*** **
Raw materials	β_5	-0.167	0.005	**-30.906*** **
Fixed Assets	β_6	0.569	0.046	**12.499*** **
Stigma square	$\delta s2$	1.862	0.407	**4.579*** **
Gamma	γ	0.999	0.033	**30.417*** **
Number of Observation		70		
Log-likelihood Function		-23.525		
Return to Scale (RTS)		0.884		

***Significant at 1%

The empirical analysis shows that the coefficients of firm size, labour, fixed assets and capital had positive direct relationships with the value of furniture produced suggesting that an increase in each of these variables would cause the furniture production to increase in the study area. The elasticity coefficient of firm size is positive and statistically significant at 1% implying that output of furniture production is positively related to changes in the size of firms used in the study area. This is in tandem with the a priori expectation. The estimated coefficient of number of labours used is positive and statistically significant at 1% showing that output of furniture production is positively related to changes in the amount of labour used in the study area. Thus, a 1% increase in the man-day of total number of labours used would induce an increase of 0.31% in output of furniture production. This is in conformity with the findings of Alao & Kuje (2012) that as labour increases efficiency will be enhanced and the more the quantity of output obtained. Similarly, the estimated coefficient of fixed assets is positive and statistically significant at 1% indicating that output of furniture production is positively related to changes in the amount of fixed assets used in the study area. Thus a 1% increase in the amount of fixed assets used would bring about a 0.12% increase in output of furniture production. This satisfies a priori expectation because the more technologies used in furniture production the faster the rate of production and the more output would be realized. Although the elasticity of production with respect to the amount of capital used is positive as expected, it is not statistically significant. This stems from the fact that capital is a major augmenting input that improves the productivity of existing furniture production in the study area. Thus, an increase in the amount of capital used in furniture production by 1% would further increase the value of furniture produced by 0.13%.

The result further shows that the coefficients of energy expenditure and raw materials were significant at 1% level but negatively affected the value of furniture produced suggesting that an increase in each of these variables would cause the furniture production to be decreased in the study area. This is not consistent with the a priori expectations. The negative signs of these variables symbolize a great loss of efficiency in utilization of resources in the study area. There could be many factors responsible for it. One of the likely reasons might be that these resources were over utilized by the operators or there could be wastage associated with the use of these resources in the study area. Another probable factor might be as a result of the poor technical know-how of some operators in the application of these resources in the study area. Thus, the rule of thumb demands that if these resources were efficiently used their resultant output would be positive.

Based on the return to scale of 0.884, furniture makers in the study area were in stage II of production region and they also experienced a positive decreasing return to scale. For instance, each additional unit in inputs at 1% would bring about 0.009% increase in the output of furniture production in the study area. This implies that the increase in output is less than the increase in total inputs used in furniture production in the study area. This could be attributed to a loss of efficiency in the production process, that is to say furniture makers were not efficient enough in managing their resources during the production process. Therefore, their resources allocation and use of resources were not economically relevant to the production function. Hence, the major inputs that had a positively significant influence on furniture production in the study area were firm size, labour and fixed assets.

3.4 Estimate Results of Factors Influencing Efficiency of Furniture Production

From Table 7, the value of R – square was 0.701 which implies that 70.1% of total variation in the efficiency of furniture production in the study area was accounted for by all explanatory variables in the model while the remaining 29.9% was explained by the random error. The significance of F-value of 2.117 implies that all the explanatory variables jointly exerted significant influence on the efficiency of furniture production in the study area.

The regression analysis revealed that educational level, operating experience and reinforcement training made positive and significant contributions to the efficiency of furniture production in the study area. This implies that as these variables increase the efficiency of furniture production would be improved in the study area. This result corresponds to the findings of (O. G. E. Arowosoge & Tee, 2010) To expatriate the

result further, the direct relationship between efficiency and educational level means that educated furniture makers would efficiently use resources better than their non-educated counterparts. Also, furniture makers with more operating experience would know the systems of operation better than those with less operating experience. Likewise, the more reinforcement training of the furniture makers the more their exposure to new techniques, innovations and improvements which could have positive influence on the efficiency of furniture production in the study area.

Table 7: Determinant of Factors Influencing Efficiency of Furniture Production

Variables	Parameters	Coefficients	Standard Errors	T- values
Constant	δ_0	0.229	1.361	0.169
Age	δ_1	-0.016	0.010	-1.600
Marital Status	δ_2	-0.204	0.145	-1.403
Educational level	δ_3	0.034	0.008	**4.301*** **
Operating experience	δ_4	0.338	0.089	**3.806*** **
Skill Acquisition	δ_5	0.115	0.344	0.334
Business Enterprise	δ_6	-0.145	0.117	-1.237
Access to Credit	δ_7	-0.098	0.061	-1.598
Access to Market	δ_8	-0.008	0.119	-0.067
Reinforcement training	δ_9	0.344	0.078	**4.406*** **
R - Squares		0.701		
F-value Statistics		**2.117****		

***Significant at 1% level. **Significant at 5% level

The only identified socio-economic characteristics that had significant influence on efficiency of furniture production in the study area were educational status, operating experience and reinforcement training. Hence, the null hypothesis that socio-economic characteristics of furniture makers do not significantly affect their technical efficiency could not be accepted. At this stage, it can be concluded that some identified socio-economic variables in the model significantly contributed to technical efficiency of furniture production in the study area.

3.5 Estimate Results of Constraints Facing Furniture Production

Table 8 reveals the ranks of relative importance index (RII) of the constraints faced by furniture makers in the study area. It shows that fluctuation of wood prices was ranked first as the most crucial constraint facing furniture production in the study area with 78.6% of operators strongly affirmed to it. In the course of field survey, most furniture makers visited lamented the effect of dwindling prices of sawn wood on their production. This result is in agreement with the views of Arowosoge et al. (2012) that Nigeria furniture industry is currently constrained with the escalating prices of wood used in furniture making. Sambe et al. (2022) found that limited wood supply was the first challenge facing furniture production in his study.

Table 8: *Distribution by Rank of Constraints Faced by Furniture Makers*

Constraints	Strongly Agree (4)		Agree (3)		Strongly Disagree (2)		Disagree (1)		RII	Rank
	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Fluctuating wood prices	55	78.6	15	21.4	0	0	0	0	3.8	1st
Inadequate funds	49	70	21	30	0	0	0	0	3.7	2nd
High taxation	43	61.4	25	35.7	0	0	2	2.9	3.6	3rd
Inadequate technologies	43	61.4	18	25.7	8	11.4	1	1.4	3.4	4th
Much Spending on fuel	23	32.9	64.3	23	0	0	2	2.9	3.3	5th
Expensive tools and equipment	19	27.1	45	64.3	0	0	6	8.6	3.2	6th
Low valuation of products	19	27.1	49	70	0	0	2	2.9	3.2	6th
Other challenges	20	28.6	36	51.4	6	8.6	8	11.4	3	7th
Risk in using new method	18	25.7	12	71.1	10	14.3	30	42.9	2.5	8th
Difficulty in using new technologies	12	17.1	11	15.7	25	35.7	22	31.4	2.1	9th

Inadequacy of funds known as capital also posed a major threat to investment in furniture production in the study area with 70% of operators strongly attested to it. This was ranked second with an RII value of 3.7. This could be due to the complaints of the majority of furniture makers about inability of the government at all levels and financial institutions to assist furniture production by providing them credit facilities with low interest rates. Sambe et al. (2022) also discovered that finance was the highest challenge to the furniture makers in his study and it was ranked third. Moreover, high taxation is another threat to furniture making in the study area as the majority of furniture makers visited gave their concerns on exorbitant tax levy that government placed on them every year. This problem was ranked third given an RII value of 3.6 with about 61.4% of the furniture makers strongly agreed to the fact.

The fourth rank in the table is inadequate technologies and equipment meaning that about 61.4% of the furniture makers strongly affirmed that they did not have enough technologies even though they were able to manage their operations with that equipment they have in their workshops. They believed that having additional technologies could boost their production better. This is supported by Joseph et al. (2014) that furniture operation is mostly confronted by technological problems.

The fifth challenge is the high spending on fuel during the production process. About 32.9% of furniture makers mostly affirmed to the issue of fuel given the RII of 3.3. In the course of field survey, majority of the furniture makers visited gave their concerns on the rate at which fuels were sold to them at unstable prices due to irregular supply of electricity in the area which could have lessen the burden effect of fuels on their production.

The sixth rank is the expensive tools and equipment followed by low valuation of products in Table 8. About 27.1% of them with RII of 3.2 strongly agreed that most tools and equipment used in their production were more expensive to buy and this has left them to borrow those ones they did not have from their counterparts to keep their operation growing. Similarly, 27.1% of furniture makers with RII of 3.2 strongly gave their concerns for low valuation of the products at same time.

The eighth and ninth constraints of furniture making in the ranking are the risk in trying new methods and the difficulty in using new technologies respectively. About 25.7% of respondents with RII of 2.5 strongly agreed that they faced the difficulty of trying new method they have not mastered while about 17.1% of them strongly attested to difficulty in using new technologies and equipment unless they learn them from their senior counterparts or someone who have the skills.

Other issues facing furniture making in the study area were raised by some furniture makers such as impact of COVID -19 on the sale of raw materials, lack of centralized market, occupational hazards which have left some of them to loss their fingers mistakenly when operating machines and un-availability of apprentices to learn work nowadays which could have served as source of labour for their production. These issues were ranked seventh with RII of 3 indicating that majority of the respondents that stated those issues were 51.4%.

4 Conclusion

Furniture makers in the study area were able to increase their production significantly over the year, they still experienced a positive decreasing return to scale as a result of poor management of resources during the production process. This, therefore, has resulted in an inefficient utilization of resources and so does the potential to increase firm output from the existing level of inputs. In order to tackle some of the problems facing the efficiency of hardwood industries in the study area, furniture makers should focus on how to optimize the major resources that improve their efficiency. Also, Credits should be provided for furniture makers at an affordable and low interest rate by governmental agencies and private organizations. Thirdly, responsible agencies should develop a centralized market for furniture making and also create a website that will allow registered furniture makers in Ondo State to advertise only good qualities furniture products that meet up with international standards. Furthermore, dynamic good policies like creating conducive workshop environments, providing incentives and health insurance and subsidizing the cost of working tools and machines for the young people coming into the enterprise should be strategized in order to make the enterprise to be more attractive for them. Specifically, sensitization programmes should be

used to encourage more youths to try the enterprise. More so, skill acquisition and development centers should be established by the concerned agencies where these furniture makers could go for reinforcement courses from time to time in order to improve their technical capacity. Lastly, government at all levels should encourage the planting of fast timber species that will sustain supply of raw materials for the growing hardwood industries. There should be also capacity building for furniture makers on improved wood technology and innovation by the wood technologists and scientists from the university around the study area.

5 Declarations

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5.2 Competing Interests

The authors declare no competing interests.

5.3 Publisher's Note

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