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# Determination of Technical Efficiency and Production Function for Small Scale Furniture Industry in Lafia Metropolis, Nasarawa State, Nigeria

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## ABSTRACT

The study assessed the technical efficiency (TE) and production function of small scale furniture industry in Lafia Metropolis of Nasarawa state. Primary data from randomly selected 30 furniture producers were collected using structured questionnaire. Stochastic production frontier model was used in the analysis of the data. The result of TE was 0.52; minimum efficiency was 0.12, while the maximum was approximately 1.00. While the result of the stochastic frontier production indicated that the production function of plywood, timber and labor were significant at 1%, 5% and 10%, respectively. It was observed that the small scale furniture production in the study area level of TE was marginal. © 2010 Friends Science Publishers

**Key Words:** Technical efficiency; Production function; Small scale; Furniture industry; Lafia Metropolis

## INTRODUCTION

Small scale forest based enterprises usually include such productive activities as furniture production from sawn wood, cane, bamboo and rattan, fuel wood marketing, manufacturing of agricultural tools, art and craft such as wood carving, sponge making, mortar and pestle etc. Small scale enterprises play an important role in the processing and marketing of wood products and non-wood products (Kozak, 2007).

According to FAO (2005) small scale enterprises are usually characterized by small size, simple technological operations and technical know-how and low capital input. Arnold (1994) classified small enterprises as organization that employs a minimum of five workers with 50 workers as the ceiling. Traditionally most small scale enterprises have been designed to meet the demand from local market and beyond local market requires up scale in the value or volume of production (Panshin, 1980). Small scale enterprises certainly continue to play an important role in the production of goods and services and in the generation of substantial employment and income in almost all countries, both developing and developed (Moodley, 2003).

Damavan *et al.* (2006) posited that many small scale enterprises lack the necessary skills and resources to operate efficiently and are ill prepared to deal with the problem of production and also severe constraints they face in their management skills. Be that as it may, efficiency is concerned with the relative performance of the processes used in transforming inputs into output (Mijindadi, 1981). Olukosi and Erhabor (1998) defined efficiency as the quantity of output (Y) per unit of input (X) used in the production process that is the average physical productivity (APP). According to Forsund *et al.* (1980), TE is the combination of input that for a given monetary outlay maximizes the level of production. TE measures show how efficiently the firm uses the available inputs to produce a given output. In other words, TE determines whether the firm achieves maximum output using a given bundle of factors of production. Allocative efficiency measures show how far the firm is from the point of maximum profitability given the existing market prices for inputs and products. Thus, allocative efficiency determines whether the factors of production are used in proportions that ensure maximum output at a given market price. The product of the two measures gives the overall efficiency.

According to Sengupta (1995) two types of efficiency measures are usually distinguished at the firm level in production economics. One is technical or production efficiency, which measures the firm's success in producing maximum output from a given set of inputs. The other is the price or allocative efficiency, which measures a firm's success in choosing an optimal set of input with a given set of input prices. TE is concerned with how closely the production unit operates to the frontiers of the production possibility set, while the allocative efficiency refers to how close the point on the production frontier is to the point, where the relative output price plane is tangent to the

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production frontier. Two measures of efficiency can be combined into a single measure of total economic efficiency that is referred to as cost efficiency (CEPA, 2008). Agner and Chu (1968) contended that the measure cannot apply to production functions, which conform to the law of variable proportions.

Furthermore efficiency can be considered in terms of the optimal combination of inputs to achieve a given level of output (an input orientation) or the optimal output that could be produced given a set of inputs (an output orientation). However in order to be economically efficient, a firm must first be technically efficient. When the production unit produces only one output, a technically efficient point always coincides with the allocative efficiency point. Hence in such cases, the productive efficiency i.e., the ratio of actually achieved aggregate output to optimal aggregate output it can achieve with the same level of aggregated input equals the allocative efficiency (Sutummakid, 2003).

The objective of this study is to estimate the TE of small scale furniture production and also determine their input and output relationship.

## MATERIALS AND METHODS

**Description of the study area:** Lafia metropolis is situated in Lafia Local government Area of Nasarawa State, which lies between latitude $7^0$ and $9^0$ north and longitude $7^0$ and $10^0$ east and share boundaries with Benue State to the South, Kogi to the West, Federal Capital Territory (FCT) Abuja to the North-east, Kaduna, Plateau and Taraba states to the South-east. The area has an estimated land area of 2,733$Km^2$ (Focus, 1997) and a population of 330,720 (National Population Census, 2006). Both annual rainfall and temperature are 1288 mm and $32^0$C, respectively.

**Sampling procedure:** A reconnaissance survey was carried out before the purposive random sampling of the furniture firms was done. Due to the constraints of time and money, a total of thirty (30) small scale furniture makers were purposively and randomly selected for the study.

**Data collection:** Primary data for the study were collected using structured questionnaire, which were administered to the furniture producers in the study area. Data collected include production information such as inputs used in furniture production, source of inputs, quantity of inputs, labour types and output in furniture production.

**Data analysis:** Regression analysis was used to determine the input and output relationships using Cobb Douglass form of Stochastic Frontier Model to satisfy the objective for this study. The model was specified thus:

$$InYi=\beta_0+\beta_1 InX_{1+}\beta_2 lnX_2+\beta_3 lnX_3+\beta_4 lnX_4+\beta_5 lnX_5+\beta_6 lnX_6+\beta_7 InX_7+V_i-U_i$$

Where:
In = the natural logarithm
$Y_i$= Output
$X_1$= Plywood
$X_2$ = Timber
$X_3$ = Labor
$X_4$ = Nail
$X_5$ = Polish
$X_6$=Adhesive
$X_7$ = Depreciation
$V_i$ = Error term under the control of furniture makers
$U_i$ = Technical inefficiency
$\beta_0$ = Intercept
$\beta_1 - \beta_7$ = parameters to be estimated.

## RESULTS AND DISCUSSION

**TE of small scale furniture production in lafia metropolis.** The frequency distribution of efficiency estimates obtained from the production frontier model is presented in Table I below. The mean TE of the respondents was 0.525411 (53%) with a minimum efficiency of 0.12583639 (13%) and a maximum of 0.96987 (96%). The efficiency indices of approximately 60% were taken for the purpose of determining the technical level of the furniture producers in the sampled area. The result showed that 50% of the furniture producers in the study area are technically inefficient, because they fall below the efficiency level of 60%, while about 50% are technically efficient that is above efficiency level of 60%. The implication of the result is that the average furniture producer need about 48% cost saving to attain the status of efficiency, while the least furniture producer need about 88% cost saving to become an efficient producer. This is in accordance to Damavan *et al*. (2006) who posited that many small scale enterprises lack the necessary skills and resources to operate efficiently. On the other hand, Forsund *et al.* (1980) stated that TE measures show how efficiently the firm uses the available inputs to produce a given output and also Mijindadi (1981) declared that efficiency is concerned with the relative performance of the processes used in transforming inputs into output.

**Input and output relationship:** The input –output relationship of small scale furniture production in Lafia metropolis was estimated using Douglas functional form of stochastic frontier production. The result is presented in Table II. The result indicated that the production function of plywood, timber and labor were significant. The coefficient of plywood is positive and significant at 1%. This is not surprising given the fact that plywood is a major raw material in furniture production. The implication here is that if plywood use increase by 10% output will increase by 6.51%. The increase in furniture output was less proportional compare to increase in plywood. Similarly timber was significant and positive at 5%. The nature of furniture production showed that output was heavily dependent on the quantity of timber to be utilized for production. Also, labor was positive and significant at 10% probability level. This implied that as labor use was increased, efficiency was enhanced and the more the

**Table I: Technical Efficiency Estimates of Small Scale Furniture Production in the Study Area**

| Efficiency Indices | Frequency | Percentage (%) |
|---|---|---|
| 0.12-0.23 | 5 | 16.7 |
| 0.24-0.35 | 4 | 13.3 |
| 0.36-0.47 | 5 | 16.7 |
| 0.48-0.59 | 1 | 3.3 |
| 0.60-0.71 | 8 | 26.7 |
| 0.72-0.83 | 1 | 3.3 |
| 0.84-0.95 | 5 | 16.7 |
| 0.96-1.00 | 1 | 3.3 |
| Total | 30 | 100.0 |

**Table II: Input and Output Relationship of Small Scale Furniture Production in Lafia**

| Production factors | Parameter | Coefficient | Standard error | T-Value |
|---|---|---|---|---|
| Constant term | $\beta_0$ | 0.110 | 0.058 | 1.886* |
| Plywood ($X_1$) | $\beta_1$ | 0.651 | 0.122 | 5.326*** |
| Timber ($X_2$) | $\beta_2$ | 0.459 | 0.174 | 2.632** |
| Labor ($X_3$) | $\beta_3$ | -0.622 | 1.715 | 1.742* |
| Nail ($X_4$) | $\beta_4$ | 2.957 | 0.64 | -0.971 |
| Polish ($X_5$) | $\beta_5$ | -0.433 | -0.273 | 0.574 |
| Adhesive ($X_6$) | $\beta_6$ | -0.066 | 0.165 | 0.401 |
| Depreciation ($X_7$) | $\beta_7$ | -0.042 | -7.245 | 0.573 |
| Diagnostic statistics total variance | $\delta^2$ | 0.933 | 0.230 | 4.057*** |
| Variance ratio | $\Delta$ | 0.798 | 1.386 | 0.576 |
| Log likelihood function 116.883 | | | | |

Source: Field Survey, 2008

Note: ***significant at 1%; ** significant at 5%; * Significant 10%

quantity of output obtained. This is buttressed by Forsund *et al*. (1980) stated that TE is the combination of input that for a given monetary outlay maximizes the level of production. However nail had negative relationship with output in furniture production. Variance ($\delta^2$) was 0.933, while the variance ratio ($\delta$) was 0.798. This implied that 79.8% of the variation in output among the small scale furniture firms in the study area was due to disparity in the input.

## CONCLUSION

The TE showed that an average furniture producer would need 48% cost saving to attain the status of efficiency, while the least furniture producer would need about 88% of cost saving to become an efficient producer. On the whole, the study has shown that furniture production in the study area was marginally efficient. On the other hand, the production function revealed that 79.8% of the variation in output among the small scale furniture firms in the study area was due to disparity in input. From these findings, it is recommended that the TE of these small scale furniture producers could be improved upon through capacity building especially through updating of technical skills and access to credit facilities to improve their production processes.

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