Determinants of Technical Efficiency of Shoemaking Enterprises among Small Scale Entrepreneurs in Ondo State, Nigeria

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ABSTRACT

This study examines the determinants of technical efficiency (TE) of shoemaking enterprises in Ondo State, Nigeria. Data were obtained from primary source using structured questionnaire and interview schedule. A multi-stage sampling technique was employed in selecting 100 respondents for the study. Analyses were carried out using descriptive statistics and the stochastic frontier production function models.

The results revealed that experience and types of shoes were the main determinants of TE of the respondents. Results further showed that shoemaking was in Stage II of production surface as shown by the returns to scale (RTS) of 0.55. The variables such as cost of raw materials, labor and location of business were effectively allocated and used, which was also confirmed by the estimated coefficient value of each variable between zero and unity. The technical efficiency of shoemaking also varied between 0.50 and 1.00 with a mean of 0.72. However, the analysis of inefficiency model revealed a positive method of operation and education. This implies that the method of operation by the shoemakers led to decrease in TE of shoemaking as well as their educational level in the study area. The study therefore concludes that experience, educational level, types of shoes and method of operation were the main determinants of technical efficiency among the shoemakers in the study area.

(Keywords: technical efficiency, TE, shoemaking, stochastic frontier production, Ondo State, Nigeria)

INTRODUCTION

Leather is considered one of the most widely traded commodities that is rapidly growing and is estimated at over US $ 100 billion a year. A report by Economic Transformations Group indicates that in 2013, leather footwear accounted for half of that figure, amounting to US$53.5 billion (World Bank, ETG, 2015). Globally, demand for leather and leather products is growing faster than supply due to the rapid demand for new and innovative footwear products worldwide.

Advancements in manufacturing processes, technology innovation, modern trends and comfortable shoes are being continuously developed at reasonable prices in order to keep pace with the growing demand for these products. The World Statistical Compendium (2007) reported that, the main footwear producers globally are China producing 7,980 million pairs per year, India 790 million pairs while Brazil, Indonesia and Italy follow at 560, 475 and 348 million pairs respectively.

Although the leather sector in Africa has much natural strength such as the availability of raw materials and a ready domestic market, it risks missing out on opportunities to expand into the global market despite the growing global demand for footwear leather products. African countries remain marginal players in the footwear production industry (Muchangi, 2012). Despite owning a fifth of the global livestock population, African countries account for only 4 percent of world leather production and 3.3 percent of value addition in leather. Most African nations mainly export raw hides and skins and maintain a low production capacity for finished leather (UNIDO, 2008). Africa’s footwear market is still virgin, with high population growth, developing economies and a booming consumer demand, there’s still a wide gap between the demand and supply of suitable footwear to satisfy the market.

Ethiopian footwear industry produces shoes that are globally competitive in terms of both quality and price (Samuel, 2008). In Nigeria, the commercial hub of the shoe making industry is located in Aba, Abia State. It exports about one million pairs daily to African countries such as Cameroon, Ghana, Ivory Coast and Gabon, among others which, has given it a firm grip on the African market. With the formation of these shoemakers into cooperative societies to enable them access funds from finance institutions for capacity building and access to international markets, among other initiatives, the industry has contributed to Nigeria's industrialization and job creation drive.

Presently, many indigenous entrepreneurs are in foot wears business established through either the government micro credit scheme or operating mainly as small-scale business ventures and are scattered all over the country. A shoemaker therefore, is someone who makes designs and repairs footwear. The original name for a shoemaker was cordwainer. Shoemakers' from ancient times until the end of the 18th century, concentrated exclusively on the external shape of the foot for which they were to provide a protective covering, ignoring completely what lay beneath. But in the 19th century, shoemakers realize that they simply cannot do without knowledge of anatomy (a study of the characteristics of the bone structure, the joints, the tendons and the skin of the foot). This knowledge is important because taking measurement of the feet for shoe construction is based on anatomical fixed points. These points can easily be recognized, and they manifest only small variations when measurements are taken repeatedly (Vass and Molnar, 2006).

Historically, the way shoes were made was one shoe at a time by hand, but this has somewhat been replaced by the shoe manufacturing industry, producing shoes at a far greater rate than sole shoemakers can (Vass and Molnar, 2006). Shoemakers, however, produce quality, detailed and crafted work. The art of shoemaking will likely be around for quite some time, as many parts of the world still rely on shoemakers. Also, some people like to know that their perfectly fitted shoes were designed and made specifically for them.

Everybody wears shoes; they are basic fashion accessories necessary to complete an outfit. Shoes come in various shapes and sizes and are worn for different purposes. Everybody needs shoes. We don't buy shoes to protect our feet only; Shoes have become an important part of our everyday lives which were originally designed to protect our feet from cold weather, sharp objects, and uncomfortable surfaces. Shoes have passed on from being an item of luxury to an item of necessity. Fashion also played a role in the evolution of the shoe. Today shoes are classified according to their uses; there are casual, work, sport and corrective shoes. Shoes are a popular way to express our style and fashion sense. It is being said that spiritually, shoes denote marriage showing the usefulness of shoes (Gegre, 2009). The relevance of shoe to human beings cannot be overemphasized, hence the need to know the determinants affecting the technical efficiency of shoe making enterprises among small scale entrepreneurs in Ondo State.

Objectives of the Study

The relevance of shoe to humanity is of utmost importance depending on their various forms and uses. It is therefore pertinent to examine the demographic characteristics as well as the determinants of technical efficiency of shoe making enterprises among small scale entrepreneurs in Ondo State. Nigeria.

Rationale of the Study

The study is justified based on the sustainability of shoe making enterprises among small scale entrepreneurs due to the fact that there is a commercial hub in the country.

LITERATURE REVIEW

Many studies relating to shoemaking, from shoe preference of customers to choices and design of shoes for specific people have been carried out. Hawkins *et al.,* (2004) revealed that the levels of customers' satisfaction in terms of shoe preference consist of two processes which are the actual need fulfillment and the perceived need fulfillment. These two processes are closely related and are often identical. According to Vass and Molnar (2006), lining made of vegetable tanned leather ensures that the skin of the wearer's feet can breathe naturally. Because the air and moisture permeability of calfskin is outstanding, and it is elastic, pleasantly soft, and extraordinarily hard wearing, it is considered as the best material for lining bespoke footwear.

Litzelman *et al*., (1997) reported that a properly fitted shoe which has been manufactured from soft materials with a sole designed to absorb shock, is sufficient to protect sensate feet, even in diabetes patients. Sylvester *et al*., (2010) on choosing shoes have shown that although fit and comfort are perceived by patients to be important factors in choosing footwear, current footwear choices are always appropriate. Their work pointed out the need for good footwear and the need to improve both practitioner and patient knowledge of footwear's.

According to (Vernon *et al*., 2007) shoes are seen as an essential part of comprehensive foot care and is likely to be regarded as an important consideration in the clinical management of many foot disorders. Rith-Najarian (2000) and Chantelau and Haage (1994), indicate that regular use of therapeutic footwear is an effective means of protecting the high-risk foot from injury, and has been associated with an approximately 50 percent reduction in ulceration rates. A study conducted by Boer and Seydel (1998) on prescription footwear showed that there is significant need of education about prescription footwear among health practitioners. However, appropriate shoes for people suffering with foot problems are often not readily available in remote communities (Watson, *et al*., 2001). According to Boulton and Jude (2004) good footwear prevents foot ulceration and bad footwear is a major cause of ulceration in diabetes.

MATERIALS AND METHODS

Data Source and Sampling Techniques

The data used in this study were collected from a cross-sectional survey of shoe making enterprises, that is, shoemakers from Ondo state, Nigeria. Samples were also selected using a multi-stage sampling technique. The first stage was the purposive selection of Ondo state because of its nearness to Aba, the commercial hub for shoe production and preponderance of small-scale shoe making entrepreneurs. The second stage was the random selection of two local government areas (LGAs) and the selection of five communities from each LGA.

Ten respondents in shoe making enterprises were randomly selected from each community, making a total sample size of 100 respondents. Data collection instruments were strictly a well-structured questionnaire and interview schedule.

Analytical Techniques and Model Specification

Descriptive statistics (mean and standard deviation) and the stochastic frontier production function (SFPF) analysis were used to analyze the socio-economic characteristics and Technical Efficiency (TE), respectively. The SFPF in efficiency studies were employed in this study. In the SFPF, the error term is assumed to have two components parts, *Vi* and *Ui*. The *Vi* covers the random effects (random errors) on the production and they are outside the control of the decision unit while the *U* measures the technical inefficiency effects, which are behavioral factors that come under the control of the decision unit.

They are controllable errors if efficient management is used. The stochastic frontier approach is generally preferred for research because of the inherent variability of entrepreneurial productions due to interplay of raw materials, sophisticated equipment and environmental failures of many firms who are small enterprises, where keeping of accurate records is not always a priority; hence, available data on production are subject to measurement errors (Ojo and Ajibefun, 2002). Also, the specification of the stochastic frontier production model is stated thus:

$$Y_i = f(X_a; \beta) \exp (V_i - U_i), \ i = 1, 2, ..., n, \qquad \textbf{(1)}$$

where Y is output in a specified unit, X denotes the actual input vector, β is the vector of production function parameters and ε_i is the error term that is decomposed into two identically distributed with mean zero and constant variance (σ2). *Vi captures* the white noise in the production, which are due to factors that are not within the influence of the producers. It is independent of *Ui*. The *Ui* is a non-negative one-sided, truncation at zero with the normal distribution (Battese and Coelli, 1996). It measures the technical inefficiency relative to the frontier production function, which is attributed to controllable factors (technical inefficiency), it is half normal, identically and independently distributed with zero mean and constant variance.

The variances of the random errors ($\sigma^2 v$) and that of the technical inefficiency effects ($\sigma^2 u$) and overall model variance (σ^2) is related thus:

$\sigma^2 = \sigma u^2 + \sigma v^2$ and the ratio, $\Upsilon = \sigma u^2/\sigma^2$

is called gamma. It measures the total variation of output from the frontier, which can be attributed to technical inefficiency (Aigner, Lovell, & Schmidt, 1992). The TE of an individual firm is defined in terms of the observed output (*Yi*) to the corresponding frontier output (*Yi**). The *Y** is maximum output achievable given the existing technology and assuming 100 per cent efficiency. It is denoted as:

$$Yi^* = f(Xib) + Vi \quad \textbf{(2)}$$

$$TE = Yi/Yi^* \quad \textbf{(3)}$$

Also, TE can be estimated by using the expectation of *Ui* conditioned on the random variable (*V–U*) as shown by Battese and Coelli (1996), that is:

$$TE = \frac{f(Xib) + Vi - Ui}{f(Xib) + Vi}, \text{ and that } 0 \leq TE \leq 1 \quad \textbf{(4)}$$

The production technology of those in shoe making was developed through Cobb–Douglas frontier production function and which was further adopted and specified by Tadesse and Krishnamurthy (1997) as follows:

$$LnY_i = Ln\beta o + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + Vi + U_i \quad \textbf{(5)}$$

Where Y = Revenue from shoe making in Naira
X_1 = Depreciation on equipment
X_2 = Cost of raw material (₦)
X_3 = Labor (Man–days)
X_4 = Location of the business (shoe making)
X_5 = Cost of transportation (₦)
Vi = Random error assumed to be independent of *Ui*. Identical and normally distributed with zero mean and constant variable $N(0, \sigma v^2)$.
Ui = Technical inefficiency effect which is assumed to be independent of *Vi*, they are non-negative truncation at zero or half normal distribution with $N(0, \sigma u^2)$.
$\beta j = \sigma^2 v, \sigma^2 u, \sigma^2$ are unknown scalar parameters to be estimated.

The inefficiency model (*Ui*) is defined by:

$$Ui = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 \quad \textbf{(6)}$$

Where Z_1, Z_2, Z_3, and Z_4 represent:

Education (years spent in school), experience (years), types of shoes and method of operations, respectively.

These socio-economic variables are included in the model to indicate their possible influence on the technical efficiencies (TEs) of those in shoe making. The β's and δ's are scalar parameters to be estimated. The variance of the random errors (σv^2), the technical inefficiency effects (σu^2) and overall variance of the model (σ^2) are related thus:

$$\sigma^2 = \sigma v^2 + \sigma u^2 \quad \textbf{(7)}$$

and the ratio $\Upsilon = \sigma u^2/\sigma^2$ measures the total variation of output from the frontier which can be attributed to technical inefficiency (Battese and Corra, 1977). The estimate for all the parameters of the SFPF and the inefficiency model are simultaneously obtained using the program FRONTIER VERSION 4.1c (Coelli, 1996). Also, for this study, two different models were estimated in the final maximum likelihood estimate (MLE). Model 1 is the traditional response function of OLS in which the inefficiency effects are not present. It is a special form of the SFPF model in which the total variation of output due to technical inefficiency is zero, that is, $\Upsilon = 0$. Model 2 is the general model where there is no restriction and thus: $\Upsilon \neq 0$.

RESULTS AND DISCUSSION

Summary Statistics of Variables

The summary statistics of variables used in the SFPF estimation is presented in Table 1. The study revealed that the mean revenue of shoemaking was ₦614, 745.00, which when compared to the mean cost of raw material (₦180, 645.89), cost of transportation (₦230, 778.45) and the labour employed (₦76,657) showed that shoemaking was profitable in the study area and serves as a means of creating employment and reducing poverty. The location of shoemaking varies from one place to another with an average mean of 15 years. This implies that shoemaking enterprises is not a static business rather it is a well-known enterprise.

Table 1: Summary Statistics of Variables in Stochastic Frontier Model.

Variables	Mean	Standard Deviation
Cost of raw material	180645.89	26045.09
Cost of transportation	230778.45	31885.26
Labor	76657.00	90012.00
Location of business	15.00	7.6
Revenue	614745	369800.4

Source: Computed from field survey, 2017.

Stochastic Production Function Analysis

The estimates of the SFPF for shoemaking in the study area were presented in Table 2. There was the presence of technical inefficiency effects in shoemaking in the study as confirmed by a test of hypothesis using the generalized likelihood ratio test. The chi-square computed was 5.754 while the critical value of the chi-square at 95 per cent confidence level and 6 degree of freedom was $_{\chi}2(0.95,\ 6)$ 3.763. The null hypothesis of no inefficiency effect in shoemaking enterprises, $\gamma = 0$, was strongly rejected indicating that Model 1 was not an adequate representation of the data.

The estimated gamma (γ) parameter of Model 2 of 0.42 indicates that about 42 per cent of the variation in shoemaking was due to differences in their TEs. The estimated elasticity of production of the explanatory variables of the general model (Table 3) showed that cost of raw material, labor, depreciation and location of the business were positive, indicating that the variables allocation and use were in the stage of economic relevance of the production function (Stage II). This is in line with a study carried on the determinants of technical efficiency and income inequality of food vending as a family business in southwest Nigeria that a direct relationship was between the dependent variable and each of the variable input and inputs such as cost of raw materials and depreciation were in the stage of efficient allocation (Ehinmowo *et al.,* 2017).

The return to scale (RTS) was 0.55 indicating that shoemaking was in the stage of efficient production (Stage II). The estimated elasticity of cost of raw material, labor and location of the business were statistically significant at 5 per cent level, implying that shoemaking enterprises depend mainly on the raw materials, where the business is located (environment) and the manpower employed.

Table 2: Estimates of the Stochastic Frontier Model of Shoemaking Enterprises.

Variable	Model 1 Coefficient (standard deviation)	Model 2 Coefficient (standard deviation)
General Model		
Constant	-2.445 (1.467)	-1.741 (2.456)
Depreciation	0.097 (0.109)	0.10 (0.07)
Cost of material	1.15 (0.072)	*0.18 (0.05)
Labor	0.053 (0.096)	*0.09 (0.06)
Location of Business	0.117 (0.145)	*0.18 (0.05)
Inefficiency Model Constant	0	0.274 (1.441)
Education	0	0.037 (0.100)
Types of Shoes	0	-0.016* (-0.005)
Method of operation	0	0.013 (0.003)
Experience	0	-0.219* (-0.099)
Sigma Squared	0	0.149 (0.024)
Gamma	0	0.42 (0.051)
Log likelihood Function	156.15	134.52
Min TE	0.50	
Max. TE	1.00	
Mean	0.72	

Source: Computed from field survey, 2017.
Note: * Estimate is significant at 5%.

Technical Efficiency Analysis

The TEs ranged between 0.50 and 1.00 with a mean of 0.72. The decile range of the frequency distribution of the TE is presented in Table 4. It showed that about 40.0 per cent of those in shoemaking had TE between 0.51 and 0.70 while 60 per cent had TE ranging between 0.71 and 1.00. This shows the variations of efficiency among the shoemakers.

Table 3: Elasticity of Production (ε_p) and RTS.

Variable	Elasticity (ε_p)
Depreciation	0.10
Cost of material	0.18
Labor	0.09
Location of Business	0.18
RTS	**0.55**

Source: Computed from field survey, 2017.

Table 4: Decile Range of Frequency Distribution of TE of Shoemaking Enterprises.

Decile Range of TE	Frequency	Percentage (in %)
0.51 – 0.60	16	16.0
0.61 – 0.70	24	24.0
0.71 – 0.80	11	11.0
0.81 – 0.90	19	19.0
0.91 – 1.00	30	30.0

Source: Computed from field survey, 2017.

Technical Inefficiency Analysis

The analysis of the inefficiency model (Table 2) shows that the signs and significance of the estimated coefficients in the inefficiency model have important implications on the TE of those in shoemaking.

The coefficients of years of experience and types of shoes were negative indicating that these factors led to increase in TE of shoemaking in the study area while method of operations and education led to decrease in TE. In order words, the more the years of experience, the lower the technical inefficiency. This corroborates with the study of Ojo (2005) who reported that years of experience of the palm oil millers increased the TE, as they acquired more experience, the less the technical inefficiency. Also, increase in the years of experience increases TE.

The types of shoes made by the shoemakers increased their efficiency. In other words, the shoes made determined the price and how fast they were able to finish with a particular pair of shoes thereby increasing their productivity and efficiency. Also, the method of operations by the small-scale shoemakers decreased their efficiency because majority of them do not have major equipment needed for the completion of the shoes, they give out shoes for further processing hence reducing their efficiency.

CONCLUSION

The study revealed the experience and types of shoes produced among the shoemakers in Ondo state Nigeria increased their efficiency. It also identified the method of operation of shoemakers as a strong factor for the decrease in TE. Therefore, the study concludes that shoemaking is a kind of enterprise that can used to alleviate poverty and as a way creating employment whereby providing the necessary equipment by establishing a hub for the use of the shoemakers so as to increase their efficiency.

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