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PRODUCTION BEHAVIOR OF SMALL SCALE INDUSTRIES IN ASSAM: A PRODUCTION FUNCTION ANALYSIS

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ABSTRACT

The motivations of human for expanding boundless prosperity for satisfying the never-ending requirements direct them to look for diverse means of wealth accumulation. However, the concept of wealth is dynamic one and ephemeral throughout the human evaluation. In this regard, the small-scale industries have played a very important role in the socio-economic development of India during the past 50 years. However the growth of Small Scale Industries in India is not equal and some regions are lagged behind the others. According to Economic survey of Assam 2007-2008, there is 27,913 small-scale industrial units in Assam and providing employment to 1, 31,099 persons until 2006-2007, which are only 0.50 per cent of total population. However, the Small Scale Industries in Assam is underdeveloped and in this paper an attempt has been made to analyze the production behaviour of Small Scale Industry in Assam.

KEYWORDS: *Small Scale Industries, growth, production function*

INTRODUCTION

The concept of wealth is dynamic one and ephemeral throughout the human evaluation. However, diverse accessibility of factor inputs and the resulting factor abundance outlines a different level of economic structure and national priorities over time; even though, the oldest question in this regard is how wealth could be generated and enlarged following strategic policy over time. In India, small-scale industrial sector is defined as an industrial undertaking, in which the investment in fixed assets in plant and machinery does not exceed Rs. 1 crore. The Government of India has enhanced this investment limit of Rs. 1 crore to Rs. 5 cores as small-scale industry, in respect of certain specified items. The small-scale industries have played a very important role in the socio-economic development of India during the past 50 years. It has significantly contributed to the overall growth in terms of the Gross Domestic Product (GDP), employment generation and exports. However, the growth of small-scale industries in the country is not evenly distributed among the states. The growth of small-scale industries in the North Eastern Region of India is slow in comparison to the other parts of the country. The importance of this sector for a populous state like Assam stems from the fact that this sector is labour intensive and is therefore seen as an important source of generating the employment opportunities both for skilled and unskilled labour force. According to Economic survey of Assam 2007-2008, there is 27,913 small-scale industrial units in Assam and providing employment to 1, 31,099 persons until 2006-2007, which are only 0.50 per cent of total population. So the contribution of SSIs in terms of employment in Assam is negligible and under privilege. In this paper an endeavor is made for analyzing factor behaviour and capacity utilization in Assam. The main objectives of the paper are: to assess the production behaviour of small-scale industries in Assam.

RESEARCH METHODOLOGY

For carrying out the study, the state of Assam is being selected. The study is based on the both primary and secondary data. The primary data is collected by undertaking field study for investing the factor proportion and productivity on small-scale industries of Assam. For present study, the sample survey is conducted following multi stage sampling. In this study in the first stage, five districts are randomly selected out of 25 districts namely: Kamrup, Jorhat, Golaghat, Dibrugarh and Lakhimpur district. In the 2nd stage about log proportionate sample size is collected from the districts, and the registered small-scale industries from each district are selected, which generates about 220 units.

Data Analysis Method:

It is attempted to estimate plausible and meaningful production behaviour of SSIs so that on the basis of that other empirical interpretation can be made. Three production functions: namely, Cobb-Douglas (CD), Constant elasticity of substitution (CES) function and Variable Elasticity of Substitution (VES) function are mainly analyzed. The log-linear Cobb-Douglas production function is can be stated as follows:

$$\text{Log } Q = \log A + \alpha \log L + \beta \log K + U$$

The CES production function is a type of function that displays constant elasticity of substitution. The two factor (Capital, Labor) CES production function is developed by mainly four noted economists namely Solow, Minhas, Arrow, and Chenery (1961). The estimate form of log linear CES function in the stochastic form is

$$\text{Log } \frac{Q}{L} = \beta_0 + \beta_1 \log w + \beta_2 \text{Log } L + U$$

Where

$$\beta_0 = \frac{-v}{v+\rho} \log (v\delta) \quad \beta_1 = \frac{v}{v+\rho} \qquad \beta_2 = \frac{\rho(v-1)}{v+\rho}$$

Kmenta's (1967) approximation of the CES function is

$$\text{Log } \frac{Q}{L} = log\gamma + (v-1)logL + v\delta log\frac{K}{L} - \frac{1}{2}$$

Or

$$\text{Log } Q = \log\gamma + v\delta \log K + v(1-\delta) \log L - \frac{1}{2} + \rho v\delta(1-\delta)\,[logK - logL]^2 + U$$

Hildebrand and Liu have shown the weakness of the CES function in that it empirically does not explain productivity variation in a majority of industries. Simultaneously, Revankar, Sato and Hoffman (Revankar, 1971, Sato and Hoffman 1968) have developed VES production function in which elasticity of substitution is a linear function of the K/L ratio. Lu and Fletcher (1968) have derived a VES function as follows:

$$\text{Log } \frac{Q}{L} = \log A + \beta \log w + \mu \log\frac{K}{L} + U$$

Where A, β and μ can be estimated by the method of OLS. The more general form of VES production function is given by Christenson, Jorgenson and Lau (1973) in estimable form is

$$\text{Log } Q = \beta_0 + \beta_k \log K + \beta_L \log L + \beta_{kk}(logK)^2 + \beta_{LL}(logL)^2 + \beta_{Lk}(logK)(logL) + U$$

The function is used to test whether the elasticity of substitution is constant or not. Restricted Least Square (RLS) technique, F test is applied to describe whether the restriction of constant σ is accepted or not.

RESULT AND DISCUSSION

The main objective of the paper is estimate likely and evocative production function for the production structure of SSIs so that based on that other pragmatic interpretation can be made. Before deciding the production behaviour of the SSIs, it is required to estimate first the elasticity of substitution (σ) as it determines the process of labour absorption in the production process. For the most popular production function i.e. CD production function, the elasticity of substitution between labour and capital in CD production function is equal to unity. On the other hand, in the CES production function σ is constant while assuming CD and Leontief production function as a special case. Thus, σ is the parameter that determines the nature of the production function that fits the production process.

Estimation of the VES Production Function

First the Lu and Fletcher VES function is being estimated. The fitted VES function is:

$$\text{Log}\,\frac{Q}{L} = 1.686^{**} + .097\ \text{logw} + .698^{**}\ \log\frac{K}{L}$$

SE (0.222) (0.088) (0.190)

t (7.592) (1.194) (3.670)

** indicates significant at 1 per cent level of significance.

* indicates significant at 5 per cent level of significance.

$R^2 = 0.857$ $\bar{R}^2 = 0.855$ $F = 6.819^{**}$

Another form of VES production function given by Christenson, Jorgenson and Lau has been estimated as is:

$$\text{LogQ} = 25.86 - 1.93\ \text{logK} + 0.30\ \text{logL}$$

SE (369.42) (1.044) (0.147)

t (0.07) (-1.848) (2.030)

$$+0.070^{**}(\text{logK})^2 - 0.03(\text{logL})^2 + 0.04(\text{logK})(\text{logL})$$

(0.017) (0 .152) (0.04)

(4.100) (-0.197) (.864)

** indicates significant at 1 per cent level of significance.

* indicates significant at 5 per cent level of significance.

$R^2 = 0.947$ $\bar{R}^2 = 0.901$ $F = 12.607^{**}$

In this case, the value of R^2 and $\bar{R}^2$ is found to be higher than the earlier regression but it is observed that the coefficient of capital components turns out to be statistically insignificant and negative sign which contrary to the earlier expectation which is due to serious multicolinearity problem leading to higher standard errors of different coefficients. So even though the model best fitted but it cannot be considered as reliable one for SSIs in Assam. Now it required to test whether production function follows VES or CES by estimating the σ.

Estimation of CES Production Function:

The estimated CES production function is:

$$\text{Log}\,\frac{Q}{L} = -2.236^{**} + 2.641^{**}\log w + 1.568^{**}\text{LogL}$$

SE (0.405) (1.203) (0.427)

t (-5.51) (2.194) (3.67)

** indicates significant at 1 per cent level of significance.

* indicates significant at 5 per cent level of significance.

$R^2 = 0.827$ $\bar{R}^2 = 0.815$ $F = 11.819^{**}$

Here it is seen that all the co-efficient turn out to be statistically significant. Also high R^2 and $\bar{R}^2$ indicates that the model fit well to the data. The significant value of $\hat{\beta}$ indicates $\rho \neq 0$ ($\sigma \neq 0$). Again following the restricted least square method with the restriction of $\beta_2 = 0$, the estimated regression is:

$$\text{Log}\,\frac{Q}{L} = 2.016^{**} + 0.187^{**}\text{logw}$$

SE (0.502) (0.091)

t (4.01) (2.054)

$R^2 = 0.86$ $\bar{R}^2 = 0.81$ $F = 16.411^{**}$

The estimated F value is 5.158** which is highly significant. Thus, the hypothesis of unitary elasticity of substitution may be rejected. Again the estimated Kmenta's form of CES production function is

$$\text{Log Q} = -1.254^{**} + 0.423^{**}\ K + 0.658^{**}\ \text{logL} - 0.2587^{**}\left[\log\frac{K}{L}\right]^2$$

SE (0.242) (0.212) (0.268) (0.1047)

t (-5.17) (1.990) (2.457) (-2.470)

$R^2 = 0.89$ $\bar{R}^2 = 0.87$ $F = 4.104^{**}$

From the estimated model it is seen that the model fit the data well and the all the co-efficient are significant at the desire level of significance. The estimated value of ρ is positive which implies that the calculated value of the elasticity of substitution is bellow unity and is equal to 0.587. The estimated model satisfies the necessary properties regarding the parameters of the CES function.

Now this estimated model is considered as unrestricted model and imposing the restriction $\rho = 0$ ($\sigma = 0$) in Kmenta's CES function, the restricted function is:

Log Q = -10.244 - 0.201K+ 0.658** logL

SE	(56.91)	(1.367)	(0.109)
t	(-0.18)	(0.147)	(6.014)

$R^2 = 0.75$ $\bar{R}^2 = 0.74$ F = 14.147**

This is estimated CD function. The estimated F-value is found to be 14.17 which is insignificant. So the hypothesis of $\rho = 0$ ($\sigma = 0$) may be rejected which satisfied that the σ is not unity.

Now summarizing the estimated production function, the following results are derived.

Table: 1
Fitted Models

Model	Dependent variable	R^2	$\bar{R}^2$	t values of the independent variables			
				Logw	LogL	LogK	LogK/L
VES (Lu & Flettcher)	LogQ/L	0.857	0.855	2.194	--	--	35.67**
VES (Christenson et al)	LogQ	0.947	0.901	--	2.03	-3.848	--
CES (SMAC)	LogQ/L	0.827	0.815	5.194**	15.67**		--
CES (Kmenta)	LogQ	0.89	0.87		1.457**	1.089**	--
CD	LogQ	0.75	0.74		0.014	0.147	--

Source: Calculated from data of field survey

From the analysis (table: 1), it is clear that in both CES and VES (Christenson et al) model show higher amount of goodness of fit. Though VES model shows higher R^2 and $\bar{R}^2$ but some co-efficient of the important repressors are not plausible and fails to pass the level of significance. On the other hand, the CES production function is seemed to be consistent and fit the data well along with significant repressors. So the elasticity of substitution of the SSIs in Assam is not variable or unity rather it is constant and less than one. The different parameters entering in the CES model and elasticity of substitution are:

$\Upsilon = 1.587$ $\sigma = 0.587$ $\rho = 0.568$ $\delta = .4879$ $\nu = .147$

Returns to Scale under CES Function:

Under the hypothesis of constant returns to scale (i.e. υ=1) Kmenta's CES function takes the form of

$$\text{Log}\,\frac{Q}{L} = \log\gamma + (1\text{-}\delta)\log\frac{K}{L} + -\frac{1}{2}\rho\delta(1\text{-}\delta)\,[logK - logL]^2 + U$$

Now estimated restricted repressor is

$$\text{Log}\,\frac{Q}{L} = -2.271^{**} + 1.457^{**}\log\frac{K}{L} - 1.257^{**}\left[log\frac{K}{L}\right]^2 + U$$

SE	(1.145)	(2.478)	(4.1254)
t	(-0.57)	(0.241)	(-0.145)

$R^2 = 0.71$ $\bar{R}^2 = 0.77$ F = 11.107**

The estimated F value using is significant at the desire level of significance. So there is seemed to be no evidence of constant returns to scale. So the SSIs of Assam there is no constant returns to scale.

CONCLUSION

The analysis of Small Scale Industries in Assam indicates that the sustainability of the factor ratios are not up to mark and productivity of the inputs, especially the labour is low as compared to capital. The TFP growth in Assam is a long but growing over the decades, especially after the 2000-01. On the other hand, the elasticity of substitution of the inputs are not variable i.e. constant and bellow one. So the mobility of the inputs is small and choice among the modern technology is hard as the management and quality of the labour inputs are not good. Most of them have little formal training facility, and the infrastructure facilities of the units are far below the standard. However, when there is the limited capability of choice among alternative's methods of production, the choice is required in terms of type of industry that has flexibility of technology, production and future marketing opportunities. With the increase in the capital intensity labour productivity is declined for most of the SSIs, which can be restored by managerial and labour efficiency. In developing countries generally there exists no unique relationship between the macro policy regime and micro industrial structure. A policy regime correcting the structural imbalance present in Assam can provide a better environment for development of the small scale industries in Assam.

REFERENCES

1. *Arrow, K. J.; Chenery, H. B., Minhas, B. S.; Solow, R. M. (1961) 'Capital-labor substitution and economic efficiency', Review of Economics and Statistics, MIT Press, Canada, pp 43:*
2. *Christenson, Jorgenson and Lau (1973), Transcendental logarithmic production frontiers. Rev. Econ. Statist. 55: pp28-45*
3. *Christensen, Laurits R. (1973). "The Translog Function and the Substitution of Equipment, Structures, and Labor in U.S. manufacturing 1929–68". Journal of Econometrics.* ***1*** *(1): pp 81–113.*
4. *Kmenta J. (1967) 'On Estimation of the CES Production Function', International Economic Review, Vol. 8, No. 2 , Blackwell Publishing, Economics Department of the University of Pennsylvania and Institute of Social and Economic Research, Osaka University, pp 56*
5. *Lawrence R. Klein and Robert Summers (1966), The Wharton Index of Capacity Utilization , University of Pennsylvania, Wharton School of Finance and Commerce, Economics Research Unit, pp 45*
6. *Lu, Y. and L.B. Fletcher (1968), A Generalization of the CES Production Function, Review of Economics and Statistics 50, pp 449-452.*
7. *Revankar, N.S. (1971) 'A Class of Variable Elasticity of Substitution Production Functions', Econometrica, Society, USA , pp 39*