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TECHNICAL EFFICIENCY OF AFFILIATED DEGREE COLLEGES IN BARAK VALLEY

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ABSTRACT

A production frontier captures all the possible combinations of inputs and output on an output space and helps to estimates the efficiency level of producing units. Efficient management of resources in every sector is a central issue with respect to our scarce resources. Higher education production frontier involves several tangible and intangible inputs as well as outputs, and these outputs contribute to economic development through development of human capital. The study measures the technical efficiency of affiliated colleges in Barak Valley by using a higher education production frontier where weighted results of successful students is taken as input and different institutional specific factors are considered as output. Technical efficiency measures the productive capacity of the institute to produce maximum possible level of outputs for a given level of inputs. The main objectives of the study are to estimate higher education production frontier of affiliated degree colleges of Barak Valley and to compare the technical efficiency scores of NAAC accredited Degree colleges and other Degree colleges. The results of the study reveals that most of the Degree colleges are producing below frontier and number of teaching staffs, number of non teaching staffs and years of establishment have positive impact on determining the outputs of Degree colleges while types of affiliation has negative impact on it.

Key Words: Degree Colleges, Higher Educational Institutions, Production Frontier, Technical Efficiency.

1. INTRODUCTION

Efficient management of resources in every sector is a central issue with respect to our scarce resources from the perspective of management. Recently, different organisations and institutions use various methods to measure their efficiency and then search ways to improve them. This does not only apply to profit-making organizations, but also in non-profit making organizations and the public sectors, including educational institutions. Efficiency of Higher Educational Institutions (Degree colleges) is one of the subjects of growing attention in recent years. The issue of efficiency in higher education in this region or elsewhere has remained vague and problematic due to huge heterogeneity within the system itself. As the resources are scarce so the optimal utilisation of resources are required in every sector. Therefore, it is important to analyse whether the educational institutions are working efficiently or not.

One of the ways to find efficiency is measurement of technical efficiency, which specifies the relationship between inputs and outputs in production processes. Technical efficiency can be defined in two ways; either from input side or output side. From the input side, technical efficiency refers to the production of a given amount of output with a minimum input combination (input orientated), while from the output side it shows the ability of a firm, sector or institution to produce the maximum output with given inputs (output orientated). The measurement of institution specific technical efficiency is based upon deviations of observed output from the best production or efficient production frontier. A unit is considered efficient if the actual production point lies on the frontier, and technically inefficient if it lies below the frontier.

Degree colleges produce skill, efficient and trained workers which increase labour productivity and ultimately lead to economic development. But the labour productivity depends on the quality and level of the education; hence efficient management of Degree colleges is necessary. In Barak Valley, numbers of students in colleges are increasing day by day, but there are inadequate infrastructural facilities and low success rate in most of the colleges. Thus the study focuses on measurement of technical efficiency of

higher educational institutions in Barak Valley by considering the higher educational institutions as analogous to a firm transforming inputs into outputs through a production process where typical inputs in the education production function are the characteristics of the teaching and learning environment, while output(s) are defined as students' performance.

1.1. STRUCTURE OF HIGHER EDUCATION IN BARAK VALLEY

The Barak Valley consists of three districts viz: (1) Cachar, (2) Karimganj and (3) Hailakandi where both public and private institutions operate simultaneously. At present there are 41 degree colleges, 1 Central University (under it these 41 degree colleges are affiliated), 1 Medical College, 1 NIT, 1 Polytechnic Institute, and few study centres of Distance Education which constitutes the set of Higher Educational Institutions in Barak Valley. Here out of these 41 degree colleges 32 provide general education of either single or combination of Arts, Science and Commerce streams, and the rest 9 are professional colleges 7 B.Ed. Colleges and 2 Law colleges). In Barak Valley, there are 15 NAAC accredited Degree colleges out of which one is teacher's training college, another one is central university and the rest 13 are three years general degree colleges. The study is concentrated only on affiliated general degree colleges.

2. REVIEW OF RELATED LITERATURES

There are several literatures in the field of Economics of Education which have measured the performance of the educational institutions by measuring the technical and allocative efficiency of the institutions. Different authors across the worlds have used Stochastic Frontier Analysis (SFA) or Data Envelopment Analysis (DEA) or both to estimate efficiency of Degree colleges, few of these are as follows:

Liu et al. (2012) analyze the technical efficiency of 40 Teacher's colleges of Thailand by taking a multiple input-output educational production function. They find that high personnel's quality, more intensity funds and more research and development have positive impact in the technical efficiency scores of teacher's colleges, while the years of establishment of the colleges has no impact on it.

Sav (2012) uses SFA to investigate possible differences in cost efficiencies of public relative to private for-profit Higher Educational Institutions in US. The findings suggest that private institutions operated at greater inefficiencies relative to their publicly owned counterparts. While the public minority serving colleges shows inefficiency deterioration over time, the findings point to private institution's efficiency gains.

Daghbashyan (2011) investigates the economic efficiency of higher education institutions in Sweden and found that government financing is significant and negative. The characteristics of the academic staffs found to have significant impact on the HEI cost efficiency.

John Robst (2001) has measured cost efficiency of Public Higher Education Institutions by using OSL and MLE for a stochastic production frontier and examined the factors leading to inefficiency. The study reveals that increase in tution fees lead to more inefficiency and institutions with less state share are more efficient than institutions with more state share.

3. OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

- To measure the technical efficiency of Degree colleges in Barak Valley.
- To analyse the role of institution specific factors in determining output of the Degree colleges.
- To compare the efficiency scores of NAAC accredited Degree colleges with other Degree colleges.

4. HYPOTHESES OF THE STUDY

Based on the above objectives the study, the following hypotheses can be constructed:

- There is no variation in efficiency scores of the Degree colleges.
- The selected institution specific inputs have no impact on determining output level of Degree colleges.
- There is no difference in efficiency scores of NAAC accredited/provincialised Degree colleges and other institutions.

5. METHODOLOGY OF THE STUDY

This section is divided into two sub-sections. In the first sub section data sources and variables are described, and in the second part methodology for data analysis and empirical model are discussed.

5.1. DATASET AND VARIABLES

The study adopts complete enumeration method for data collection. Here, all the general degree colleges of Barak Valley are taken as sample for the study. To avoid heterogeneity in the dataset professional colleges are omitted. Dataset of the study have been collected from the secondary sources, viz; Annual Reports of Assam University Silchar (AUS), Result Booklets of AUS, and from the institutional records of the Degree colleges.

Output of the Degree colleges in this study is taken as weighted results (WR) of the students graduated from the institutions (rather than on numbers of pass out) which represents a better index of performance. Weights are assigned to1st division 2nd and division 3rd division into 3:2:1 ratio. This study is based on the available input variables viz; total number of teaching staffs (NTS), numbers of courses offered by the Degree colleges (CO), type of affiliation (TAO), number of non-teaching staff (NNTS) and years of establishment of the Degree colleges (YOE) are taken as inputs.

The justification of inclusion of number of teaching staffs (NTS) is that performance of HEI is always positively affected by the teachers (*Liu et al. 2012, Daghbashyan 2011).* Courses offered by the Degree colleges (CO) by the Degree colleges is also a crucial variable because it is observed that enrolment in a particular Higher education institution is largely influenced by it, hence it is assumed that it will have a strong impact in determining output of Degree colleges. Again status of a HEI is related with type of its affiliation (TAO) and it is assumed to have strong impact on enrolment and performance. Type of affiliation are divided into three categories viz; permanently affiliated, permitted, temporarily affiliated. Permanent affiliation mainly depends on the institutional performance of the previous years; once an institution gets its permanent affiliation then the infrastructural setup improves which may reflects better performance of that institution. Success rate of the institution is not directly related with number of non-teaching staff (NNTS) but it has strong influence in proper management of the colleges, hence inclusion of this variable is justified. Again there is a common perception that experienced education institute is better than others and it generally attracts good quality students (*Man and Fung 2011, Liu et al. 2012)* which ultimately results in better performance of HEI. Hence in this study years of establishment is considered as crucial variable for determining performance of the Degree colleges.

5.2. METHODOLOGY FOR DATA ANALYSIS

The study adopted Stochastic Frontier model for analysis of data by framing a higher education production function. An education production function is an application of the economic concept of a production function to the field of education. Although higher education production function involves many tangible and intangible inputs and outputs, but due to non-availability of data the study is restricted to institution specific inputs only.

The stochastic frontier production function was independently proposed by Aigner, Lovell & Schmidt (1977) and Meeusen & Van den Broeck (1977). The original specification involved a production function specified for cross-sectional data which has an error term with two components, one to account for random effects and another to account for technical inefficiency. This model can be expressed in the following form:

$$Y_i = \beta_k X_{ik} + v_i - u_i$$

Where; i=1,2...,n. Y_i is the production (or the logarithm of the production) of the i^{th} firm; X_{ik} is a ***KX1*** vector of input quantities of the i^{th} firm, β_k is the vector of unknown parameters, v_i are random

components which follows N(0,σ_v^2). u_i are non-negative random variables which accounts for technical inefficiency in production. Both the error components are independent of each other. For given values of all the variables technical efficiency measures can be calculated as: $TE(y,\mathbf{x}) = \frac{y}{f(\mathbf{x})} \leq 1$.

In this study, cross-section data linear stochastic frontier model is used for all the affiliated degree colleges of Barak Valley. The empirical model of the study can be written as:

$$WR_i = \alpha + \beta_1 YOE_i + \beta_2 CO_i + \beta_3 NTS_i + \beta_4 NNTS_i + \beta_5 TOA_i + (v_i - u_i) \ldots\ldots\ldots (1)$$

The variables (both output and inputs) are defined in earlier section. Here, the suffix 'i' stands for a particular HEI. ***TOA*** is a dummy variable which takes the value 1 for permanent affiliation and 0 for others.

6. RESULTS AND FINDINGS

The results of the study show interesting findings. Most of the variables of this study are highly significant for the model. Type of affiliation of the Degree colleges, Number of Teaching staffs and number of non teaching staffs are significant at less than one percent, while courses offered by the HEI is insignificant and years of establishment of the Degree colleges is significant at four percent level of significance. The estimated results of the stochastic frontier model are shown in Table 1.

Table 1: Stochastic Frontier Estimates

Variables	Coefficients	Mean	Standard Error	$\lvert t \rvert$	P values
Constant	-11.056	----	7.085	1.561	0.11
YOE	0. 380*	32.645	0.188	2.015	0.04
CO	-0.192	1.5483	3.277	0.058	0.93
NTS	0.6216***	29.612	0.113	5.465	0.00
NNTS	1.3459**	14.258	0.541	2.486	0.01
TOA	-18.001***	0.4838	2.185	8.237	0.00

Source: Estimated Results of SFA from the AUS Annual reports 2011 -12 & AUS Result Booklet 2012.
Note: **, ** and *** denote variables are significant at less than 5%, 1% and less than 0.01% level of significance respectively.*

The model is estimated by using Maximum Likelihood Estimation (MLE) method. The results reveals that years of establishment has positive impact in determining outputs of the Degree colleges. It implies that experienced Degree colleges are performing better than newly established Degree colleges. This is might be due to the reason(s) that it attracts good quality of students and (or) for its efficiency in managing the Degree colleges. The number of teachers is positively related with output. This implies that more number brings good quality of teaching which helps to improve the performance of the Degree colleges. Like number of teaching staffs, number of non-teaching staff is also significant and directly related with output as it helps in management of the Degree colleges in an efficient manner. In this study courses offered by Degree colleges is found insignificant, while type of affiliation is found highly significant and inversely related with level of output of the Degree colleges. Generally, it is expected that infrastructural facilities of Degree colleges and type of affiliation is positively related which positively affect the performance of the Degree colleges. But in this study it is inversely related implying that permanently affiliated Degree colleges are poor in their performance.

The estimated values of σ_u^2 and σ_v^2 indicate that errors variances of controlled and uncontrolled factors respectively. The result shows that variation in output among the Degree colleges is due to inefficiency term. The Adjusted R^2 and R^2 values for are 0.82 and 0.85, which indicates the measurement of goodness of fit is very high for the model.

6.1. TECHNICAL EFFICIENCY OF NAAC ACCREDITED/PROVINCIALISED AND NON-PROVINCIALISED DEGREE COLLEGES

The study reveals a significant variation in terms of technical efficiency scores of provincialised and non-provincialised Degree colleges within and between the groups. The technical efficiency score ranges from 0 to 1, closer the score to 1 indicates greater degree of efficiency and vice-versa. Here out of 31 Degree colleges, most of the Degree colleges are producing below the production frontier. The technical efficiency scores of 24 Degree colleges are below 0.9 and only 7 Degree colleges are producing near the frontier. Provincialised Degree colleges in comparison to others are producing more with average technical efficiency score 0.608; whereas the average technical efficiency score of Non- Provincialised Degree colleges is 0.451. Out of 31 Degree colleges, 18 Degree colleges have efficiency score below the ungrouped average 0.517, and out of these 18 inefficient Degree colleges 8 are provincialised and 10 are non-provincialised Degree colleges. The technical efficiency score of Degree colleges for five different ranges are shown in the following Table 2.

Table 2: Technical Efficiency Score of Degree colleges

Technical Efficiency Scores	Number of Provincialised (NAAC Accredited) Degree colleges	Number of Non-Provincialised Degree colleges	Both types of Degree colleges
0.0-0.2	0	6	6
0.2-0.4	4	2	6
0.4-0.6	4	5	9
0.6-0.8	1	1	2
0.8–1.0	4	4	8
Average TE scores	0.608	0.451	0.517

Source: Estimated result of Stochastic Frontier Analysis from AUS Annual Report 2011-12 & Result Book 2012

In this study almost 60 percent Degree colleges are technically inefficient in terms of producing successful good quality student. The probable reason may be deficiency in resources management or lack of complementary resource. It is observed that only the non-provincialised are operating at the minimum efficiency range 0.0 to 0.2 and huge variation is observed in this group in terms of their technical efficiency scores. 33 percent non-provincialised Degree colleges fall under lowest range, whereas 22 percent belong to highest range. No single provincialised HEI fall in lowest range and 31percent fall in highest range. So it is observed that provincial Degree colleges are performing better than non-provincial Degree colleges in Barak Valley.

7. CONCLUSIONS AND SUGGESTIONS

Degree colleges offers more skills and knowledge which helps in development of a region through development of human resource. Affiliated degree colleges of Barak Valley provide higher education to a large number of students who wants pursue higher education and helps to develop local community, but majority of these Degree colleges are either over utilising or under utilising their resources. The study reveals that the provincialised Degree colleges are more technically efficient compared to non-provincialised Degree colleges although both contribute into the sector of higher education. Among the determinants of technical efficiency number of academic staffs, non-teaching staffs, type of affiliation and years of establishment have found to be highly significant, while courses offered by the Degree colleges are found insignificant. Except type of affiliation all other significant variables are positively related with the level of Degree colleges' output. In this study only two Degree colleges are fully efficient and six are highly efficient. Again 11 Degree colleges are moderately technically efficient and 12 have low

technically efficient scores. Hence in this study majority of colleges are technically inefficient. But the technical efficiency score depends on a set of input variables; inclusion or exclusion of some inputs variables may bring separate picture in technical efficiency score.

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