RELATIVE EFFICIENCY MEASUREMENT OF THE EDUCATIONAL SCHOOLS FROM THE PERSPECTIVE OF DATA ENVELOPMENT ANALYSIS (DEA) -CASE STUDY: EDUCATIONAL SCHOOLS IN SAIDA OF WILAYA-AGERIA

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Abstract

The aim of this search paper is to shed light on the relative efficiency measurement of the educational schools presented in the sample composed by 33 schools from the perspective of data envelopment analysis (DEA) (Model CRS is oriented input) for the period 2010-2013, where the number of efficient institutions 16 , and 17 inefficient institutions.

Key words: data envelopment analysis, Relative Efficiency, Educational schools,

1. Introduction

The concept of educational production function assumes that the school districts maximize the educational outcome of its students given their budget constraint. However, there is no unique measure of educational outcome which is perfect. Conventionally, it is assumed that for the production of education school districts use inputs that are associated with instructional and non-instructional activities within and outside the control of the school management. School inputs that are associated with achievement scores are generally measured as the student-teacher ratio, educational attainment of the teachers, teaching experience, and various instructional and non-instructional expenditures. Non-school inputs include the socioeconomic status of the students and other environmental factors influencing students, productivity such as, family income, number of parents in the home, parental education, percent of student population belongs to minority, and the percent of students qualified for free and subsidized lunch. The environmental factors are often measured by geographic location (e.g., rural vs. urban), the net assessed value per student, and low English proficiency.

1.1 Defining the Educational Production Function

In the production of education, school districts use various school and nonschool inputs to produce multiple outputs, generally measured by achievement test scores. Since, the purpose of education is to develop the student's basic cognitive skills, these skills are often measured by the scores in reading, writing, and mathematics tests. However, there are references in the literature where output is measured either by the number of students graduating per year, student success in gaining admission into the higher education, or a student's future earning potential.

In most studies of the education production function, the measure of output is limited by the Availability of data. School inputs that are associated with student achievement scores are typically measured by the student/teacher ratio, teacher educational qualifications and teaching experience, and various instructional and non instructional expenditures per student. Nonschool inputs include socioeconomic status of the students (SES) and other environmental factors that influence student productivity. While family income, number of parents in the home, parental education, and ethnic background measure the SES of the students, geographic location (i.e., rural/urban) and net assessed value per student capture the environmental factors.

School inputs that are basically associated with the instructional and noninstructional activities are under the control of the school management. Most studies in educational production find an insignificant relationship between most of the school inputs and outputs. For example, see Walberg and Fowler (1987), Hanushek (1971), Deller and Rudnicki (1993), and Cooper and Cohn (1997). These studies and those by Hanushek (1986) and Grosskopf and Weber (1989) find a significant influence of SES and environmental factors on achievement scores.

A school district is technically efficient if it is observed to produce the maximum level of output from a given bundle of resources used or, conversely, uses minimum resources to produce a given level of output. In this study, the single output of our educational production function is measured by the average score on the 11 th grade standardized battery test.

1.2 General description of DEA

Data Envelopment Analysis (in the following: DEA) is a mathematical procedure to measure efficiency of so-called 'decision making units' (DMUs). Since its introduction into the Operations Management literature by Charnes, Cooper, and Rhodes (1978).

A DEA compares input-output relations of decision making units (such as companies or other organizational entities). A basic assumption (the "homogeneity assumption", see Dyson et al., 2001, 247-248) proposes that any DMU uses the same kind of inputs to produce the same kind of outputs. Only the respective quantities vary across DMUs, of course, and build the basis for the comparative efficiency assessment: The observed input-output relations, each referring to a specific DMU's production, combined with a set of "rules" (axioms), are used to construct a set of "feasible" input output relations. This so-called "feasibility set" does not only contain all observed input-output relations (DMUs), but also other (hypothetical) benchmarks. The feasibility set has an outer boundary, a subset that contains Pareto-optimal input-output relations.

Efficiency is computed by the following equation:

Efficiency = output(s)/input(s)

1.3 DEA Specification of Technical Efficiency

Data envelopment analysis was developed as a method designed to measure the relative efficiency of decision making units (DMU). Farrell (1957) established modern empirical efficiency measurement with the procedure of calculating a technical efficiency score for every observed DMU. Two decades later, Charnes, Cooper and Rhodes (1981) pioneered DEA as a programming technique designed to compare the DMU efficiency scores. DEA creates a frontier of efficiency comprised of all observed efficiency scores. The DMUs that incur the most efficient scores emerge to create the frontier, thereby enveloping all the other remaining scores.

The nonparametric mathematical programming approach to frontier estimation is known as data envelopment analysis (DEA). This approach constructs the best practice production frontier as a piecewise linear envelopment of the available data on all producers in such a manner that all observed points lie on or below the frontier. In DEA, the performance of a producer is evaluated in terms of his ability to either shrink an input vector or expand an output vector subject to the restrictions imposed by the best observed practice. This measure of performance is relative in the sense, that efficiency in each school district is evaluated against the most efficient district and is measured by the ratio of maximal potential output to actual observed output. A simple input-oriented DEA model is presented in this section, and for a detailed methodological discussion see Seiford and Thrall (1990), Lovell (1993), Fare, Grosskopf, and Lovell (1994), and Chakraborty and Mohapatra (1997).

To overcome the limitation of the Farrell's work, Charnes, Cooper, and Rhode (Charnes et. al., 1978) introduced their CCR DEA model that can handle multiple inputs and multiple outputs to measure TE. In the presence of multiple input and output factors, technical efficiency is defined as follows:

$$\textbf{Technical Efficiency} = \frac{\textbf{weighted sum of outputs}}{\textbf{weighted sum of inputs}}$$

DEA first developed by Charnes, Cooper, and Rhodes (CCR) . Based on the original CCR model, Banker, Charnes, and Cooper (BBC) developed a variable returns to scale (VRS) variation.

- Three basic DEA models are generally distinguished (see Charnes et al., 1994, for a presentation and comparative analysis of these models):

-CCR model – This model was presented in the seminal work of Charnes, Cooper and Rhodes (1978). The CCR model is based on the radial minimization (maximization) of all inputs (outputs) and assumes an environment of Constant Returns to Scale (CRS);
-BCC model – The Banker, Charnes and Cooper (1984) model is the Variable Returns to Scale (VRS) version of the CCR model. The difference between the two types of envelopment surfaces, CRS and VRS, is the presence of a convexity constraint;
-Additive model – The additive model originates in the work of Charnes et al. (1985). This model maximizes the L1 distance (also known as "city-block distance") of the DMU under analysis to the observed efficient frontier and assumes VRS.

2. Literature Review

-Kalyan Chakraborty , " Efficiency in Public Education – The Role of Socioeconomic Variables", Emporia State University AIS, Research in Applied Economics,1(1) (2009):1-18

This study measures the efficiency of public education using a stochastic frontier model that estimates an educational production function and an inefficiency effects function that controls the socio-economic and environmental factors simultaneously. The model developed by Battese and Coelli (1995) is used in this study and applied to a panel dataset. The study finds that although the mean efficiency scores obtained from the model are lower than the efficiency scores from a conventional stochastic frontier model, the estimates are robust and consistent. The empirical application uses three-year panel data from Kansas school districts and finds that Kansas schools are generally efficient and most of the educational inputs under the control of the school administration are either have a low or no influence on students' achievement scores. However, students' socioeconomic factors are found to have significant influence on their achievement scores.

-Kalyan Chakraborty, Basudeb Biswas, and W. Cris Lewis. "**MEASUREMENT OF TECHNICAL EFFICIENCY IN PUBLIC EDUCATION: A STOCHASTIC AND NONSTOCHASTIC PRODUCTION FUNCTION APPROACH." Economic Research Institute Study Paper 99(12) (1999): 1-30.**

This paper uses both the stochastic and nonstochastic production function approach to measure technical efficiency in public education in Utah. The stochastic specification estimates technical efficiency, assuming half normal and exponential distributions. The nonstochastic specification uses two-stage DEA to separate the effects of fixed inputs on the measure of technical efficiency. The empirical analysis shows substantial variation in efficiency among school districts. While these measures are insensitive to the specific distributional assumptions about the one-sided component of the error term in stochastic specification, they are sensitive to the treatment of fixed socioeconomic inputs in the two-stage DEA.

-Hanushek, Eric A. "The economics of schooling: Production and efficiency in public schools." Journal of economic literature (1986): 1141-1177.

Educational institutions worldwide are increasingly the subject of analyses aimed at defining, measuring and improving efficiency. However, despite the importance of efficiency measurement in education, it is only relatively recently that the more advanced econometric and mathematical programming frontier techniques have been applied to primary and secondary schools, university departments and degree programmes, and universities as a whole. This paper attempts to provide a synoptic survey of the comparatively few empirical analyses in education using frontier efficiency measurement techniques. Both the measurement of inefficiency in education and the determinants of educational efficiency are examined.

-Kirjavainen, Tanja, and Heikki A. Loikkanent. "Efficiency differences of Finnish senior secondary schools: an application of DEA and Tobit analysis."Economics of Education Review 17.4 (1998): 377-394.

We studied efficiency differences among Finnish senior secondary schools by Data Envelopment Analysis (DEA). Four model variants were used. Average efficiencies in the most extensive models were 82–84 per cent. When parents' educational level was treated as an additional input, average efficiency increased to 91 per cent. The efficiency rankings of schools changed to some extent when simplest quantitative inputs and outputs were augmented by measures of teacher quality and national matriculation examination results. As a second stage after DEA analysis, we explained the degree of inefficiency (100-efficiency score) by a statistical Tobit model. Schools with small classes and heterogenous student bodies were inefficient whereas school size did not affect efficiency. Surprisingly, private schools were inefficient relative to public schools. When parents' educational level was only included in the Tobit model, it affected efficiency positively.

-Worthington, Andrew. " An Empirical Survey of Frontier Efficiency Measurement Techniques in Education." Education Economics 9(3) (2001): 245-268.

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the measurement of inefficiency in education and the determinants of educational efficiency
are examined.

-Sergio Perelman, Daniel Santin. "Measuring educational efficiency at student level with parametric stochastic distance functions: An application to Spanish PISA results."

This study explicitly considers that education is a multi-input multi-output production process subject to inefficient behaviors that can be identified at student level. Therefore a distance function allows us to calculate different aspects of educational technology. The paper presents an empirical application of this model using Spanish data from the Programme for International Student Assessment implemented by the OECD. The results provide insights into how student background, peer-group and school characteristics interact with educational outputs. Findings also suggest that, once educational inputs are taken into account; there is no statistically significant difference in efficiency levels across schools regarding public-private ownership.

3. Methodology of the Study

DEA is a technique to measure relative efficiency of a set of decision-making units(DMUs) having similar multiple inputs to produce similar multiple outputs8(p4), and exists as a linear programming-based technique. Using DEA to estimate efficiency allows for data that involves numerous inputs and outputs to be expressed in different units. In addition, the efficiency frontier created by DEA compares decision making units relative to each other and combinations of DMUs. Navigating from the DEA efficiency frontier to other DMUs not creating the frontier provides information indicative of possible efficiency improvement.

The model applied in this study consists of an input- and output-oriented DEA model where efficiency is calculated to determine the most amount of output that may be produced using the least amount of input. In Figure 4 Charnes, Cooper, and Rhodes (1981) introduced the following formulation as a standard form of DEA.

$$(1)\quad Max\left\{\theta_0 = \frac{\sum_i \mu_i y_{i0}}{\sum_j v_j x_{j0}}\right\}$$

Subject to :

$$(2)\quad \frac{\sum_i \mu_i y_{ik}}{\sum_j v_j x_{jk}} \leq 1 \text{ for all DMUs } k=1,2,....,n$$

$$(3)\quad \mu_i \geq 0$$

$$(4)\quad v_j \geq 0$$

Standard DEA formulation:

Where

$\theta 0$ = the efficiency score of the DMU under analysis

n = number of DMUs under analysis

I = number of outputs
J = number of inputs
Yk = {Y1k, Y2k,…, Yik,...,Ylk is the vector of outputs for DMU k with yik being the value of output for DMU k.
Xk = {X1k, X2k,…, Xjk,…,Xlk is the vector of inputs for DMU k with xik being the value of input j for DMU k;
µ and v the vector on multipliers respectively set on Yk and Xk = the respective weights for output i and for input j;

Given a set of J decision making units, the model determines for each DMU0 the optimal set of input weights {v io}i-l and output weights {µ r0}r-1 that maximizes its efficiency score eo.

Despite the popularity of using DEA to measure efficiency, the method does have inherent disadvantages. While DEA provides an efficiency frontier indicating the most efficient DMUs, it does not provide calculations to address absolute efficiency. DEA creates efficiency measurements comparatively and not a finite calculation indicating the distance to maximum, or technical efficiency. DEA's usefulness can be disturbed by statistical noise while regression analysis captures measurement error.2(p57)

3.1 Mathematical formulas for models DEA:

Primal Model :

$$\text{Max } \theta_\pi = \sum_{r=1}^{s} u_r y_{r\pi}$$

s.c;

$$\sum_{i=1}^{m} v_i x_{i\pi} = 1 \qquad i=1, ..., m$$

$$\sum_{r=1}^{s} u_r y_{rj} \leq \sum_{i=1}^{m} v_i x_{ij} \qquad r=1, ..., s$$

$$u_r, v_i \geq 0 \qquad j=1, ..., n$$

dual Model :

$$\text{Min } \theta_\pi$$

s.c.

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{i\pi} \qquad i = 1,2,\dots, m;$$

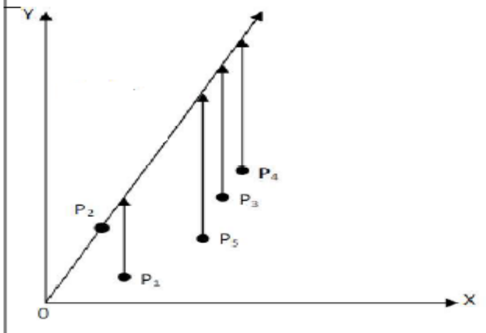
$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{r\pi} \qquad r = 1,2,\dots, s;$$

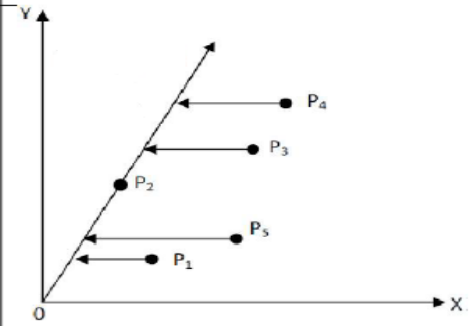
$$\lambda_j \geq 0 \qquad j = 1,2,\dots, n;$$

-CCR DEA MODEL :

The CCR model can be formulated as the following**:**

OUTPUT - ORIENTED	INPUT - ORIENTED
Min $\sum_{i=1}^{m} v_i x_{io}$	Max $\sum_{r=1}^{s} u_r y_{ro}$
Subject to :	Subject to :
$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0$	$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0$
$\sum_{r=1}^{s} u_r y_{ro} = 1$	$\sum_{i=1}^{m} v_i x_{io} = 1$
$u_r, v_i \ge 0$	$u_r, v_i \ge 0$
j = 1,...,n r=1,...,s i=1,...,m	j = 1,...,n r=1,...,s i=1,...,m





Source: W.W.Cooper-L.M.Seiford-Joe Zhu, 2004, P 16.

Inputs and Outputs:

INPUTS:

1. The number of battalions pupils
2. The number of students enrolled
3. Number of teachers
4. The number of women professors
5. Number of Masters graduates technological institutes
6. Number of Workers
7. The number of students in need
8. The number of students teaching assistants
9. Operating subsidies

Output:

1. The success rate of students who received a good rating above average in education certificate.
2. The number of students transferring to the first year secondary, they are students who have obtained the average of 10 or above.

4. Research Results and Interpretations

4.1A statistical summary of the study variables:

Table -1- data represent a statistical description of the input and output averages for periods of study, including the outcome of three years in terms of the sum of values and the arithmetic average and the lowest and the highest value and standard deviation.

Table 1: A statistical summary of variables sample of years of schooling

Inp09	Inp08	Inp07	Inp06	Inp05	Inp04	Inp03	Inp02	Inp01	Out02	Out01	VARIABLES	PERIOD
48191094	2627	5484	639	425	470	828	16640	482	2176	454,04%	Total	2011-2010
1460336,20	79,60	166,20	19,40	12,90	14,20	25,10	504,20	14,60	65,90	13,76%	Mean	
1115200	2	0	9	1	1	9	92	4	13	3,03%	Min	
1786639	211	477	35	37	31	45	1056	28	190	33,33%	Max	
156492,27	45,88	106,93	6,20	10,95	7,96	10,77	241,32	6,31	38,40	7,13%	SD	
47971810	3316	5768	666	423	496	867	15143	487	3326	506,33%	Total	2012-2011
1453691,20	100,50	174,80	20,20	12,80	15,00	26,30	458,90	14,80	100,80	15,34%	Mean	
1155000	10	34	10	0	2	9	76	4	24	1,67%	Min	
1798258	297	473	36	38	32	45	1006	28	217	41,44%	Max	
144505,72	57,40	91,15	5,77	10,55	7,83	10,44	212,98	6,16	57,62	9,45%	SD	
56816300	2877	4664	650	340	518	873	14508	489	2183	225,88%	Total	2013-2012
1721706,10	87,20	141,30	19,70	10,30	15,70	26,50	439,60	14,80	66,20	6,84%	Mean	
1434000	23	37	9	1	3	9	67	4	14	0,00%	Min	
2071295	209	305	35	28	33	49	934	29	128	23,86%	Max	
140853,96	47,38	64,85	5,69	8,56	7,63	10,13	197,00	5,88	34,60	6,45%	SD	
50993068,00	2940,00	5305,30	651,70	396,00	494,67	856,00	15430,30	486,00	2561,67	395,42%	Total	OUTCOME
1545244,50	89,10	160,80	19,70	12,00	15,00	25,90	467,60	14,70	77,60	11,98%	Mean	
1268200,00	11,70	33,70	10,00	0,70	2,00	9,00	78,30	4,00	19,70	3,38%	Min	
1884132,70	206,70	392,00	35,30	34,30	30,70	46,30	998,70	28,30	167,30	29,50%	Max	
145745,26	45,23	78,75	5,78	9,83	7,68	10,36	215,31	6,09	41,03	6,26%	SD	

Through Table -1- which reviews the statistical description of the study variables (input and output) note that the largest average number of pupils transferring (out 02) reached 100 students in the 2011-2012 school year, also reached the highest average success rate for pupils good grade and above 15.34% in the same school year, the smallest average this year record in school year 2012-2013, including rate of 6.84%, and the smallest average number of pupils who move amounted to 66 students in semesters seasons 2010-2011 and 2011-2012.

4.2 Showing the relative efficiency indicators:

I've been relying on the program **DEAP** in order to obtain the relative efficiency of 33 medium-indicators for the years of study by search form CRS orientation entrances which assume that all the averages operate at the level of the ideal size, and the following table illustrates these indicators:

Table 2: The relative efficiency of 33 medium indicators by CRS I

ORDER INSTITUTION	OUTCOME	2013-2012	2012-2011	2011-2010	INSTITUTIONS
32	%80,90	%64,80	%75,00	%72,70	CEM01
29	%81,90	%62,90	%68,50	%100,00	CEM02
2	%100,00	%100,00	%100,00	%100,00	CEM03
15	%95,60	%100,00	%95,10	%80,90	CEM04
19	%91,40	%97,90	%88,00	%68,40	CEM05
26	%78,40	%93,70	%81,60	%64,60	CEM06
4	%100,00	%100,00	%100,00	%100,00	CEM07
22	%88,80	%69,40	%100,00	%68,80	CEM08
11	%100,00	%100,00	%100,00	%82,40	CEM09
10	%100,00	%100,00	%100,00	%84,20	CEM10
5	%100,00	%100,00	%100,00	%100,00	CEM11
3	%100,00	%100,00	%100,00	%100,00	CEM12
33	%81,10	%61,00	%44,30	%100,00	CEM13
1	%100,00	%100,00	%100,00	%100,00	CEM14
7	%100,00	%100,00	%98,30	%100,00	CEM15
25	%77,90	%70,40	%81,30	%92,20	CEM16
28	%83,60	%86,90	%44,30	%100,00	CEM17
18	%100,00	%68,10	%100,00	%96,20	CEM18
16	%96,80	%72,00	%100,00	%100,00	CEM19
24	%84,00	%54,10	%85,40	%100,00	CEM20
31	%80,20	%69,00	%74,60	%78,40	CEM21
13	%100,00	%100,00	%100,00	%75,70	CEM22
17	%100,00	%100,00	%64,90	%100,00	CEM23
9	%100,00	%100,00	%100,00	%85,10	CEM24
14	%100,00	%100,00	%100,00	%75,30	CEM25
12	%100,00	%100,00	%100,00	%81,40	CEM26
21	%81,80	%66,50	%100,00	%90,10	CEM27
23	%85,10	%59,20	%98,80	%83,10	CEM28
27	%82,90	%69,60	%65,60	%97,90	CEM29
30	%84,30	%65,00	%84,10	%72,10	CEM30
20	%93,40	%82,60	%100,00	%69,50	CEM31
6	%100,00	%100,00	%99,40	%99,40	CEM32
8	%100,00	%100,00	%90,30	%100,00	CEM33
%88,78	%92,37	%85,25	%89,08	%88,44	Mean
%100,00	%100,00	%100,00	%100,00	%100,00	Max
%60,23	%77,90	%54,10	%44,30	%64,60	Min
%13,49	%8,59	%16,85	%16,17	%12,36	SD

Through the table note that during the 2010-2011 school year the number of averages that have achieved full efficiency of 13 out of 33 medium, while the rest of the seasons, the outcome of years of study with the number of averages that have achieved full efficiency 16 out of 33 medium-medium reached, also note that the average the relative efficiency of years of schooling, including the outcome of years amounted to 88.78% with a standard deviation value of 13.49%.

4.3Showing reference institutions and optimization transactions:

What distinguishes style data Envelopment Analysis DEA is determined benchmarking units and optimization transactions per unit incompetent, and this is shown in Table -3- which explains the reference averages with improvements transactions averages that did not check for the full relative efficiency of the outcome of three years (2010-2013).

Table 3: Benchmarking units and improvement of the average transaction

λ	peers	λ	peers	λ	Peers	Λ	peers	Λ	peers	INSTITUTIONS
0.121	CEM25	0.078	CEM32	0.377	CEM09	0.092	CEM03	0.050	CEM07	CEM01
				0.439	CEM07	0.247	CEM14	0.144	CEM03	CEM02
								1.000	CEM03	CEM03
		0.262	CEM14	0.170	CEM03	0.401	CEM09	0.105	CEM11	CEM04
		0.188	CEM26	0.017	CEM14	0.412	CEM03	0.342	CEM07	CEM05
		0.368	CEM11	0.138	CEM03	0.210	CEM14	0.046	CEM07	CEM06
								1.000	CEM07	CEM07
		0.081	CEM11	0.294	CEM07	0.263	CEM03	0.405	CEM14	CEM08
								1.000	CEM09	CEM09
								1.000	CEM10	CEM10
								1.000	CEM11	CEM11
								1.000	CEM12	CEM12
				0.469	CEM32	0.159	CEM14	0.417	CEM25	CEM13
								1.000	CEM14	CEM14
								1.000	CEM15	CEM15
				0.338	CEM14	0.106	CEM26	0.091	CEM32	CEM16
		0.135	CEM03	0.289	CEM26	0.003	CEM32	0.117	CEM12	CEM17
								1.000	CEM18	CEM18
				0.481	CEM32	0.155	CEM14	0.039	CEM03	CEM19
				0.110	CEM33	0.205	CEM26	0.424	CEM14	CEM20
		0.046	CEM26	0.426	CEM14	0.100	CEM03	0.124	CEM22	CEM21
								1.000	CEM22	CEM22
								1.000	CEM23	CEM23
								1.000	CEM24	CEM24
								1.000	CEM25	CEM25
								1.000	CEM26	CEM26
						0.729	CEM14	0.046	CEM11	CEM27
				0.018	CEM14	0.118	CEM33	0.672	CEM26	CEM28
0.090	CEM25	0.124	CEM14	0.370	CEM09	0.348	CEM07	0.003	CEM32	CEM29
				0.159	CEM15	0.391	CEM32	0.403	CEM14	CEM30
				0.834	CEM26	0.057	CEM32	0.172	CEM14	CEM31
								1.000	CEM32	CEM32
								1.000	CEM33	CEM33

average transaction :λ Benchmarking units :Peers

Note through Table -3- that there averages benchmarking more than once, for example, (CEM14) were considered medium of reference for 14 medium, also note that the biggest factor to improve the value of 0.834 for to medium benchmarking (CEM 26) For medium incompetent (CEM 31).

4.4 Width ratios improve variables:

Table4: Improvements on the outputs rates by CRS I

Out02	Out01	Instutution
0,00%	30,78%	CEM01
0,00%	22,21%	CEM02
0,00%	0,00%	CEM03
0,00%	0,00%	CEM04
0,00%	5,28%	CEM05
0,00%	0,00%	CEM06
0,00%	0,00%	CEM07
0,00%	0,00%	CEM08
0,00%	0,00%	CEM09
0,00%	0,00%	CEM10
0,00%	0,00%	CEM11
0,00%	0,00%	CEM12
0,00%	185,22%	CEM13
0,00%	0,00%	CEM14
0,00%	0,00%	CEM15
0,00%	15,47%	CEM16
0,00%	0,00%	CEM17
0,00%	0,00%	CEM18
0,00%	0,00%	CEM19
0,00%	34,21%	CEM20
0,00%	0,00%	CEM21
0,00%	0,00%	CEM22
0,00%	0,00%	CEM23
0,00%	0,00%	CEM24
0,00%	0,00%	CEM25
0,00%	0,00%	CEM26
0,00%	0,00%	CEM27
0,00%	0,00%	CEM28
0,00%	0,00%	CEM29
0,00%	0,00%	CEM30
0,00%	251,27%	CEM31
0,00%	0,00%	CEM32
0,00%	0,00%	CEM33
0,00%	17,01%	Mean
0,00%	0,00%	Min
0,00%	251,27%	Max
0,00%	53,43%	SD

Through Table -4- which reviews the improvements ratios on the outputs note that the highest percentage improvement proposed increase in output 01 were registered with the medium (CEMP31) by 251.27% while did not score any improvement proposed in the number of students transferring.

Table 5: Improvements For Impot Rates By CRS

Inp09	Inp08	Inp07	Inp06	Inp05	Inp04	Inp03	Inp02	Inp01	Institution
-29,28%	-46,17%	-45,61%	-19,09%	-19,09%	-19,09%	-19,09%	-20,64%	-19,09%	CEM01
-24,80%	-18,13%	-51,89%	-18,13%	-30,21%	-37,96%	-25,47%	-18,13%	-19,77%	CEM02
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM03
-4,42%	-4,42%	-38,34%	-21,44%	-29,20%	-19,61%	-4,66%	-6,58%	-4,42%	CEM04
-8,56%	-8,56%	-37,80%	-22,50%	-8,56%	-22,24%	-16,31%	-8,56%	-16,84%	CEM05
-21,61%	-21,61%	-44,97%	-23,26%	-31,48%	-28,08%	-22,39%	-21,61%	-22,29%	CEM06
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM07
-11,20%	-11,20%	-25,01%	-52,02%	-30,38%	-30,43%	-16,09%	-11,20%	-17,46%	CEM08
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM09
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM10
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM11
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM12
-18,87%	-37,97%	-32,95%	-44,64%	-18,87%	-18,87%	-21,98%	-24,95%	-24,08%	CEM13
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM14
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM15
-46,26%	-38,47%	-49,85%	-22,07%	-22,10%	-22,08%	-42,28%	-39,93%	-42,07%	CEM16
-46,14%	-49,81%	-16,37%	-32,22%	-16,37%	-21,03%	-29,38%	-23,60%	-16,37%	CEM17
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM18
-37,57%	-24,54%	-41,08%	-38,78%	-3,19%	-13,66%	-3,18%	-5,59%	-4,54%	CEM19
-25,12%	-45,99%	-19,00%	-22,81%	-16,05%	-16,04%	-16,03%	-17,00%	-20,63%	CEM20
-32,37%	-33,04%	-19,76%	-54,09%	-19,76%	-36,77%	-19,76%	-22,64%	-22,48%	CEM21
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM22
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM23
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM24
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM25
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM26
-30,76%	-56,29%	-33,05%	-32,91%	-40,34%	-44,97%	-18,21%	-35,99%	-25,85%	CEM27
-19,52%	-17,09%	-40,62%	-37,47%	-14,89%	-24,98%	-16,84%	-25,22%	-14,91%	CEM28
-17,13%	-25,22%	-43,77%	-47,31%	-17,13%	-17,13%	-25,56%	-17,13%	-28,07%	CEM29
-15,66%	-17,60%	-24,94%	-18,58%	-15,66%	-29,66%	-22,34%	-35,09%	-28,91%	CEM30
-6,62%	-33,34%	-32,66%	-39,32%	-6,63%	-6,62%	-16,15%	-31,46%	-17,98%	CEM31
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM32
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	CEM33
-12,37%	-15,30%	-18,68%	-17,08%	-10,62%	-12,79%	-10,49%	-11,42%	-10,80%	Mean
-46,26%	-56,29%	-51,89%	-54,09%	-40,34%	-44,97%	-42,28%	-39,93%	-42,07%	Min
0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	Max
14,82%	18,21%	19,46%	18,49%	12,27%	14,00%	11,81%	13,08%	12,05%	SD

Through Table -5- which reviews the improvements related to input ratios note that the highest percentage improvement proposed reduction in the input recorded at the entrance 7 average 18.68% followed by the entrance 6 with an average 17.08% followed by the entrance 8 average 15.30%.

6. CONCLUSIONS

The results of this study is that the average relative efficiency of the sample averages of 90% exceeded the index of high efficiency. Therefore, we can say that these institutions can provide 10% of the resources used (inputs) while maintaining the same level of output current (output). Note that the efficiency indicators are not fixed but are differentiated between institutions where there are institutions reached 100% yield and institutions index recorded a low yield and reached 44.30%, which requires examination of the inputs and outputs of the latter were taken by the authorities of the decision on the level of guardianship in order to achieve the best use of resources.

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