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Research Article

Assessing the Efficiency of Public Schools in the Qassim School District

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Abstract

The technical efficiency of seventeen (17) schools in the Qassim district of Saudi Arabia is measured using data envelopment analysis with output oriented variable returns to scale for the year 2011. The analysis was conducted using the number of students who passed the school district's standardized tests as the output, and the number of students per school, the annual expenditure per student, and the number of teachers per school as inputs. Results showed that only six schools were fully efficient, leaving 64.7% of schools categorized as inefficient. The average efficiency was 0.96. The scale efficiency showed that 58.8% of schools were optimal size.

Keywords: Technical efficiency, public schools, data envelopment analysis

INTRODUCTION

Governments have a notable interest in evaluating the efficiency of their education institutions. In all nations, public finance is the single most important source of education funding, so local governments are naturally required to ensure that finance is deployed efficiently. It is, therefore, not surprising to find that methodologies which offer insight into efficiency have attracted the attention of many education policy makers. In particular, efficiency methodologies may be especially useful in making decisions concerning how to address the large gap between the rising cost of education and limited material resources, which has become increasingly important as many school districts continue to experience poor outcomes (Al-Sharm, 2000).

In recent years, the Saudi government has paid considerable attention to improving outcomes in primary and secondary education by raising the qualification standards for a large part of Saudi youth. Accordingly, fiscal spending allocated from the annual public budget for this sector was raised from $1.38 trillion in 2005 to $2.21 trillion in 2010, an increase of 60% (Ministry of Economy and Planning, 2010). Nevertheless, a high spending index does not necessarily indicate the best use of resources (Zidane, 2004).

Given the increasing importance of education services to the economy, educators and policymakers must consider the best techniques to measure different aspects of education service performance. Measuring education performance levels has proven to be a rather difficult task. The aim of this paper is to introduce a new managerial tool for evaluating and managing education service levels. This new approach treats education service as an intermediate variable, not the ultimate managerial goal, and makes use of data envelopment analysis (DEA), a nonparametric technique which allows for the relative comparison of a number of comparable organizational decision making units (DMUs).

The remainder of this paper is presented in four additional sections. Section 2 is a review of the literature concerning education efficiency. Section 3 discusses data envelopment analysis. Section 4 presents the data and results of the present study. The final section concludes the paper by summarizing the study's results.

Education Efficiency

In education, the term efficiency refers to "the ability to produce [an] education service at the lowest cost" (Batson, 1989). The most well-known type of efficiency is called *technical efficiency* (TE).Technical efficiency refers to the

process of transferring physical inputs such as labour and capital into outputs at the best level of performance (Al-Delaimi and Al-Ani, 2006). TE is represented by a minimum combination of inputs necessary to produce a specific level of output (Al-Delaimi and Al-Ani, 2006). In essence, a high degree of TE means that outputs are increased by using a specific quantity of inputs, with no waste. In education institutions, TE is achieved when a certain output is obtained using fewer inputs than were used at a previous point in time, or when more outputs are obtained using the same or fewer inputs.

TE is made clear by the graphical example shown in Figure 1. Suppose we consider one output (education) and two inputs (numbers of staff and numbers of computers). Note that the two axes measure the inputs used per student. By fitting a line through these observations, one creates an envelope, or frontier, from which the inefficiency in other institutions can be evaluated. In Figure 1 this is shown by line B. Any point on the line can be regarded as an equally acceptable combination of input-minimizing bundles. It is clear that any institution not lying on line B, which in economics is referred to as the *isoquant*, must be inefficient. For example, one can see that institution K in Figure 1 uses more computers per student and staff per student than both institutions A and J.

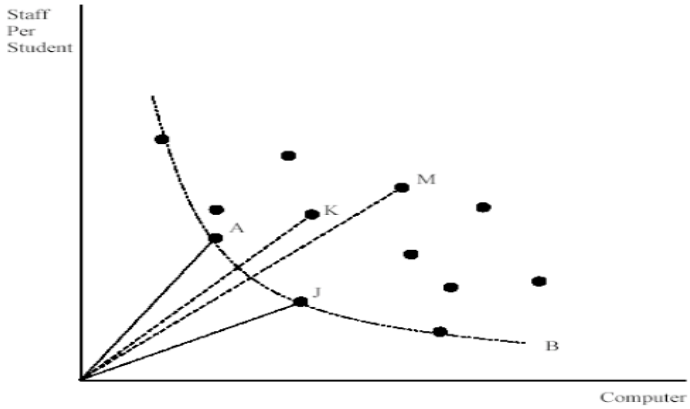

Figure 1. Technical efficiency. Source: Salerno, C.S. (2003).p. 9.

Data Envelopment Analysis

Data envelopment analysis (DEA) is a technique for measuring the relative efficiency of decision making units (DMUs) with multiple inputs and multiple outputs (Banker et al., 1984; Charnes et al., 1978, 1994). The method has become popular in school performance measurement (Borage and Naper, 2005; Diaz, 2003; Ruggireo and Vitaliano, 1999; Stupnytskyy, 2002; Waldo, 1990).There are various kinds of DEA methods, such as the constant return to scale (CRS) method, andthe variable return to scale (VRS) method(Cooke and Zhu, 2005).The DEA efficiency score for an individual producer is a weighted output/input (input/output) ratio of the relevant maximization (minimization) problem solved by particular linear programs. It finds the set of most favorable non-negative weights which optimizes the performance measure of each producer relative to all other producers in the sample. In other words, DEA measures the efficiency of the DMUs by comparing the DMUs to the best producer in the sample to obtain compared efficiency (Al-Delaimi and Al-Ani, 2006). DMUs operating at a TE of 1 denote maximum efficiency. In this paper, we adopted Banker et al. (1984) output oriented model with variable return to scale to estimate efficiency score:

$$\theta^* = \max_{\theta,\lambda} \theta$$
$$s.t. \quad \theta x_{io} \leq \sum_{j=1}^{n} \lambda_j x_{ij} \quad i = 1, \ldots, m$$
$$y_{ro} \geq \sum_{j=1}^{n} \lambda_j y_{rj} \quad r = 1, \ldots, s$$
$$\sum_{j=1}^{n} \lambda_j = 1$$
$$\lambda_j \geq 0 \quad \forall j$$

Where:
χ_{ij} and γ_{rj} denote the levels of the i^{th} input and r^{th} output of the j^{th} university, j = 1, 2, . . , N. The first two constraints require that the performance of a given university O in terms of its inputs χ_{io} and outputs γ_{ro} is located within a production possibility set defined by the envelopment of all data points. The last two constraints, where λ is an N×1 vector, allow for variable returns to scale by imposing a convexity restriction which generates a frontier in the form of a convex hull of intersecting planes.

DATA AND RESULTS

Data variables

The model of this study includes one output and three inputs in the Qassim school district for the year 2011. The output and inputs are expressed as follows:
Output:
a: number of students who passed the school district's standardized tests
Inputs:
a: the number of students per school
b: annual expenditure per student
c: the number of teachers per school

Results

In this paper, we adopted the output variable returns to scale (VRS). The data were analyzed using data envelopment analysis program ver 2.1, as shown in Table 1. From results, we see that the mean efficiency is 0.957 and 0.963 respectively for TE CRS and TE VRS. Also, we see that ten (10) schools reached optimal economic size in the Qassim district, which means that only about 58% of our sample study receives the economic scale. Conversely, we see that diseconomies scales are 42%. This result indicates that the secondary schools in the Qassim school district could be expanded to accept a higher number of students.

Table 1. Efficiency Summary

	CRS TE	VRS TE	Scale efficiency	
school 1	1	1	1	-
school 2	0.939	0.943	0.995	irs
school 3	0.983	0.986	0.997	irs
school 4	0.915	1	0.915	irs
school 5	0.899	0.908	0.99	irs
school 6	0.891	0.894	0.996	irs
school 7	0.953	0.953	1	-
school 8	1	1	1	-
school 9	0.931	0.936	0.995	irs
school 10	0.929	0.93	0.999	irs
school 11	1	1	1	-
school 12	0.881	0.881	1	-
school 13	1	1	1	-
school 14	0.985	0.985	1	-
school 15	1	1	1	-
school 16	0.981	0.981	1	-
school 17	0.976	0.976	1	-
mean	0.957	0.963	0.993	

Source: The output of DEAP software ver. 2.1

CONCLUSION

The aim of this paper was to estimate the technical efficiency of seventeen (17) schools in the Qassim district of Saudi Arabia using data envelopment analysis with output oriented variable returns to scale for the year 2011. The number of students who passed the district's standardized tests was used as the output, and the number of students per school, the annual expenditure per student, and the number of teachers per school were used as inputs.

The results showed only five faculties were fully efficient in terms of CRS TE, six in terms of VRS TE, which means that 64.7% of schools wereinefficient. The average efficiency was 0.96.The scale efficiency showed that58.8% of schools reached the optimal size. So, we can conclude that most Qassim secondary schools reach an adequate economy size. Nevertheless, we see that the diseconomies scale is 42%. This result gives us an indication that the secondary schools in the Qassim district could be expanded to accept more students. Accordingly, while we can see that outcomes in Saudi secondary education are nearing efficiency, overall, there are still improvements to be made.

References

Al- Delaimi KSK, Al-Ani AHB(2006). Using data envelopment analysis to measure cost efficiency with an application on Islamic banks. Sci. J. Admin. Dev. 4: 134-156.

Al-Sharm S(2000). The quantitative internal efficiency for the baccalaureatedegree in Saudi Kingdom University, Master thesis. College of Education.

Banker RD, Charnes A, Cooper WW(1984). Some models for the estimation of technical and scale inefficiencies in data envelopment analysis. Manage. Sci. 30: 1078-1092.

Batson RG(1989). Financial planning using goal programming. Long Range Planning. 22(5): 112-120.

Borage LE, Naper LR(2005). Efficiency potential and efficiency variation in Norwegian lower secondary schools. Cesifo Working Papers No. 1624. Retrieved from www.CESifo-group.de.

Charnes A, Cooper WW, Rhodes E(1978). Measuring the efficiency of decision making units. Euro. J. Operational Res. 2: 429-444.

Cooke W, Zhu J(2005). Modeling performance measurement: Applications and implementation issues in DEA. New York: Springer.

Diaz AS(2003). Technical efficiency on performance in the secondary education centres of A Coruña in Spain. J. Econ. Analysis Working Papers. 2: 1-32.

Farrell MJ(1957). The measurement of productive efficiency. *J. Royal Statistical Society. 120*(3): 250-290.

Ministry of Economy and Planning(2010). Annuals book statistics, no 64. Riyadh.

Ruggireo J, Vitaliano D(1999). Assessing the efficiency of public schools using data envelopment analysis and frontier regression. Contemporary Economic Policy. 17(3): 321-331.

Salerno CS(2002). On the technical and allocative efficiency of research-intensive higher education institutions. (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3136573)

Stupnytskyy O(2002). Secondary schools efficiency in the Czech Republic. Center for Economic Research and Graduate Education, Prague, Czech Republic. Retrieved from https://iweb.cerge-ei.cz/pdf/gdn/RRCIII_33_paper_01.pdf.

Waldo S(2007). Efficiency in Swedish public education: Competition and voter monitoring. Edu. Econ. 15(2): 231-251.

Zidane M(2004). New methods to provide education convenience for poor family, The fifth scientific conference for Arabic education and futures challenges, Egypt. Pp. 56-93.