PalArch's Journal of Archaeology of Egypt / Egyptology

ECONOMIC PERFORMANCE OF THE HEALTHCARE SYSTEMS OF OIC MEMBER STATES (2011-15): A TWO-STAGE BOOTSTRAPE DEA ANALYSIS

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Balqees Naser Almessabi: Economic Performance of the Healthcare Systems of OIC Member States (2011-15): A Two-Stage Bootstrape DEA Analysis -- Palarch's Journal of Archaeology of Egypt/Egyptology, ISSN 1567-214x

Keywords: health care system; efficiency; data envelopment analysis; truncated regression analysis.

ABSTRACT
The performance of health care system can be evaluated at three levels: the one related to the healing process itself, the organizational one (associated with the functioning of entities providing healthcare, such as hospitals) and the systemic one (the cost efficiency of health care system). The goal of this paper is to focus on the latter cost efficiency concept investigating health care systems' performance at the macroeconomic level. This study used input-oriented data envelopment analysis to evaluate the cost (CE), allocative (AE) and technical efficiency (TE) of health systems in Member States of the Organization of Islamic Countries (OIC) during 2011–2015. Life expectancy (LE), Maternal mortality rate (MMR), under 5 mortality rate (U5MR) and infant mortality rate (IMR) were used as outputs. Public healthcare spending, number of physicians, nurses and midwives and hospital beds per 1000 people were used as inputs. The determinants of Cost, Allocative and Technical inefficiency of the health systems were examined using a bootstrap truncatedregression model. The results suggested that the cost efficiency, allocative efficiency, and technical efficiency of the whole OIC countries on average are 0.52, 0.72, and 0.70, respectively during the study period. It implies that although more than half of the countries are relatively efficient allocatively and technically, they have not been good at selecting the cost-minimal input mix. The most important determinants of cost, allocative and technical inefficiency, were the out-pocket health expenditures and education level as compare to other factors. To improve efficiencies of the health systems, countries should focus on individuals' empowerment in education and income level, rather than only on providing healthcare services.

I. INTRODUCTION

Improving health status and reducing exposure to diseases, maintaining and promoting mental and physical abilities in the personal and social levels are considered as a necessity for improving human welfare (Bankauskaite and Dargent, 2007). Health plays an important role in the growth and economic development of countries through improving labor productivity, reducing the financial burden of diseases, saving

healthcare resources (Clayton, 2010).Studies show that more than half of the national resources are being wasted in different countries. In underdeveloped countries, limited resources are used inefficiently and public funds are spent on services that are unsuitable and ineffective (Collins and Green, 1994). Hence it can be said that the proper distribution of health resources and facilities and the efficient use of them are very important, and implementing health system reforms and making precise assessments seem inevitable. These reforms are possible through further examining the policies, increasing efficiency, limiting unnecessary expenses, etc. (Schieber, 1995).

In recent decades, health policy-makers have been concerned about their health systems performance and many countries have implemented reforms in their health sector due to their poor performance. However, improving the quality and quantity of health services requires an actual assessment of the performance and efficiency of the health systems. As such, we can ensure the proper balance between resources and outcomes and achievement of the objectives of health systems (Varela, 2010).One of the most important indicators that can be used to assess the performance of health systems is the proportion of health system outputs to the resources (physical and monetary ones) consumed. In fact, this indicator deals with the issue that how the consequences and outputs resulting from the health sector are in comparison with the existing resources available in the country (WHO, 2000). Efficiency indicates that how good an organization has used its resources in order to produce the best performance over a period of time (Vitaliano and Toren, 1996).

The types of efficiency and a variety of methods to measure it were introduced primarily based on Farrell's method. Farrell proposed that it was more appropriate to compare a firm's performance with the best existing firms in that industry. This method is consistent with the concept of frontier production function that is used as an indicator to measure the efficiency. Frontier production function is defined as the maximum possible amount of product that comes from a certain set of factors of production. Farrell developed his ideas about the efficiency measurement based on the studies conducted by Debreu and Koopmans (Mehregan, 2008). He defined economic efficiency as the degree of a producer success in minimizing the cost of producing a certain amount of product. He divided economic efficiency into two parts, technical and allocative efficiency. Farrell states that allocative efficiency is the use of the optimal combination of the factors of production. He believes that when the inputs are allocated according to their prices, the profit will be maximized and allocative efficiency is met. On the other hand, a technically efficient unit can create the maximum attainable product using consumption of a certain amount of production factors. In other words, for achieving the maximum TE, the producer should act on the frontier production function (Torkamani, 2009).

Some health system researchers have studied the efficiency which the results of some of these studies are as follows: into in a study of the efficiency in Italian regional health outcomes using Data Envelopment Analysis (DEA) concluded that the mean of efficiency scores with constant returns to scale was equal to 0.981 and with the variable returns to scale was equal to 0.988 (Pinto, 2013). de Cos and Moral-Benito in a study examined the determinants of health system efficiency using DEA in 29 industrialized countries in 2009. The results of the study showed that Australia had the highest efficiency score (0.991) and Hungary had the lowest (0.942) one. Finally, they suggested that policies such as increasing the regulation of prices billed by providers and decreasing the degree of gate keeping could cause gaining more efficiency (de

Cos and Moral-Benito, 2014). The results of Haddad *et al*.'s study showed that having multiple insurers was related to the low efficiency of the health system. In addition, countries seeking to improve the efficiency of their health systems should pay more attention to the behavior of the people and their welfare (Hadad, et al., 2013). The results of Afonso *et al*.'s study showed that countries with smaller public sector compared with those with larger public sector had dramatically higher efficiency in their health sector (Afonso, et al. 2005). Ramsay estimated the health systems' efficiency in eight countries using 12 indicators related to quality of services, community access to the services and the cost of providing services. The results showed that two indicators of household income and female literacy were the main determinants of health outcomes production (Ramsa, et al., 2001).While extensive studies have been conducted on assessing the effectiveness and efficiency of health systems in different countries, including the Organization for Economic Cooperation and Development (OECD) countries and European and the American countries, few studies have been carried out in developing countries most of which have investigated the effects of only one factor on the health system efficiency while many factors have effects on it. Therefore, due to the necessity of paying more attention to improve the productivity and efficiency of the health systems, especially in the countries which are in a group in terms of the religion such as Organization of Islamic Countries (ECO) that Iran is one of these countries, conducting more studies on the health system efficiency seems necessary.

Therefore, the present study aimed to measure the health systems cost efficiency in OIC countries during 2010 to 2015 and to determine the factors affecting their CE using DEA.

II. METHOD

This study conducted to measure the OIC countries' CE of health system during 2010 to 2015 using DEA, as well as to determine the factors affecting their health systems cost efficiency.The Organization of Islamic Cooperation founded in 1969 has 57 members, 56 of which are also member states of the United Nations. The data related to health care system of Palestine and are not available. Therefore this study based on the sample of 55 OIC member countries.

Methodology

The assessment of cost efficiency is normally done with the use of parametric and nonparametric techniques i.e. stochastic frontier (SF) and Data Envelopment Analysis (DEA) respectively. Parametric guesstimate of the stochastic frontier requires a behavioral hypothesis for the minimization of cost. Furthermore, the econometric method is parametric and muddles the effects of misspecification of functional form with inefficiency. DEA technique is nonparametric and owing to trivial conditions put on the form of technology, is less disposed to such kind of error of specification (Parmeter, 2014). DEA is built upon relative proficiency procedures suggested by Farrell (1957), in this method a country is considered to be efficient if it is producing on the production boundary. By using the input price attuned operational costs as the input variable our definition of cost efficacy merely estimates Farrell's measure of total efficiency (Linna, et al.,2010). In evaluating the cost efficacy of OIC member countries in present study DEA technique has been used which uses linear programming method in the estimation of unit-specific efficacy scores (Charness, et al., 1978). DEA makes a piecewise linear efficacy boundary that works as baseline in the assessment of efficiency. If a country is working efficiently it will lie on the production possibility curve and efficacy score of this country will be one which

represents hundred percent efficient. Less efficient countries will get a score less than one. Like if score of a country is 0.70 which is measured on the basis of input oriented efficiency, it is seventy percent efficient and thirty percent inefficient which means that thirty percent more output may be produced by using existing resources, alternatively we may say that it is producing only seventy percent of its potential. If we assume constant returns to scale prevails the efficiency scores will be similar whether they are obtained by input orientation or output orientation.

Cost efficiency was calculated by solving the following linear program:

$$Min_{\lambda,zCE} \qquad Z_{CE}$$

s.t.

$\lambda.Y \geq y_0$

$\lambda.C \leq Z_{CE}$

$\lambda_i \geq 0$

$\lambda.i = 1$

Where

Y= It is matrix of dimension n× m of outputs

λ= It is a matrix of dimension 1×n of intensity variables.

C= It is a matrix of dimension n×1 of costs.

CE= it is a scalar demonstrating a country's cost level

i=it is a column vector of 1s.

The decomposition into allocative and technical components can be accomplished by first solving the following linear program, which gives the input oriented technical inefficiency component:

$Min_{z,u}u$

Subject

$z.Y \geq y_o$

$z.X \leq x$

$z_i \geq 0$

$$\sum_{i=1}^{n} zi = 1$$

Now it is simple to calculate the allocative efficiency by AE = CE/TE

In order to assess the changes in health productivity over the period 1999-2009 we employed Malmquist Total Factor Productivity (MTFP) index, one of the most frequently used techniques to measure productivity changes over time. This technique was first introduced by Caves, Christensen, and Diewert (1982a, 1982b) and later operationalized in the DEA by framework Färe et al. (1992 and 1994).

In the second stage, the computed DEA efficiency scores section is regressed against some environmentalfactors. The literature indicates that some of the factors that impact health system efficiency. A variety of regression techniques have been applied. Following specification has been formed.

$$IE_J = \alpha + Z_J\delta + \varepsilon_J \ldots\ldots\ldots J = 1,\ldots\ldots n$$

In the above equation α is the intercept and ε_J is the error term and z_J is a row vector of country specific variables with J supposed to relate to countryinefficiency scores IE via the vector of parameters δ (same to all J) needing our estimation. Following Asbu [46], the VRS DEA efficiency scores are transformed into inefficiency scores, left-censored at zero using the formula:

Inefficiency score = (1/Efficiency Score)-1

Tobit model has been used widely in the DEA literature for the estimation of model, however Simar and Wilson (2007) pointed out that such technique has been inappropriate. They suggested another technique which depends upon truncated regression with bootstrap and it has been found satisfactory in its performance during Monte Carlo experiments. So in present study this technique has been used. It may be noted that the distribution of ε_J has been restricted with the condition $\varepsilon_J \geq 1 - \alpha z_J \delta$ (as both sides of the equation are restricted by unity), Simar and Wilson (2007) advancements have been used and assumed that distribution is truncated normal with a zero mean (before truncation), unknown variance and a (left) truncation point determined by this very condition. Likewise IEj, has been replaced by its DEA estimate EEˆj and the general form of the econometric model has been denoted as following

$$(1/\theta_{i.t.}) - 1 = \beta_0 + \beta_1(OOP)_{i.t.} + \beta_2(LR)_{i.t.} + \beta_3(SW)_{i.t.} + \beta_4(POP.G)_{i.t.} + \beta_5(UR)_{i.t.} + e_{i.t.}$$

DATA DESCRIPTION

In this study four classes of variables are used as a measure of output, and three input variables with their corresponding input prices (Table. 1). The selection of these variables is guided from previous research (Ogloblin, 2011; Karpa and Leoniowska, 2014; Pourreza, et al., 2017)

Table 1: Explanation of Variables

	VARIABLES	EXPLANATIONS
Outputs	LE	Average number of years that a person at birth can be expected to live, assuming that age-specific mortality levels remain constant
	MMR/100000	Maternal mortality rate per 100000 person
	IMR/1000	Probability of dying between birth and the first birthday among 1000 birth
	U5R/1000	Probability of dying between birth and under first five year among 1000 birth
Inputs	PHYSIAN /1000	Number of physicians per thousand people
	N&W/1000	Number of nurse and midwives per thousand people
	BEDS/1000	Number of hospital beds per thousand people
	COST	Public Health care expenditures
Environmental		
	OOP	Out of pocket health expenditure % of total health expenditures
	LR	Adult Literacy Rate
	SW	People using safely managed drinking water services (% of population)
	POPG	Growth Rate of Population
	UR	Unemployment Rate

In DEA method, first, the data were collected using statistics available in international databases such as the databases of the World Health Organization (WHO), the World Bank, the United Nations Development Fund, the OIC countries' National Health Accounts. Then, the CE of the OIC countries health systems was calculated. The summary statistics of the inputs, outputs and environmental factors are given in table 2.

Table 2: DISCRIPTIVE STATISTICS OF INPUTS AND OUTPUST

		Output				Inputs				Environmental Factors				
		LE	IMR	MMR	U5MR	PHY*	N&W*	BEDS*	COST	OOP	LR	SW	POPG	UR
2011	MEAN	67.88	39.32	309.98	56.26	1.06	1.68	1.56	49.87	40.56	52.81	60.9	2.57	8.6
	MEDIAN	70.46	35	157	43.7	0.64	0.94	1.08	48.44	41.43	45.09	62	2.47	6.4
	S.D	9.02	25.68	335.94	42.2	1.12	1.62	1.38	18.85	18.71	23.42	20.07	1.65	6
	MAX	80.63	97.3	1580	149.8	3.92	6.01	7.7	92.02	73.84	99.78	98.74	7.76	29.7
	MIN	49.64	6.8	4	8	0.02	0.04	0.27	19.19	7.63	0.86	5.69	-2.15	0.3
2012	MEAN	68.21	38.07	301.45	54.11	1.34	1.98	2.14	49.72	42.59	59.29	69.31	2.49	8.82
	MEDIAN	70.65	33.2	155	41.1	1.09	1.23	1.9	48.17	45.89	50.76	72	2.41	7
	S.D	8.88	24.92	325.65	40.61	1.18	1.73	1.5	19.72	18.84	22.72	20.94	1.63	6.01
	MAX	80.82	93.1	1510	145.2	3.84	7.86	7.6	91.82	83.84	99.99	100	7.06	29.6
	MIN	50.34	6.8	4	7.9	0.04	0.07	0.4	2.03	6.56	5.86	5.88	-3.04	0.2
2013	MEAN	68.53	36.88	293.55	52.11	1.29	2.08	2.64	49.9	40.69	63.07	71.3	2.39	8.81
	MEDIAN	70.84	31.4	162	38.6	0.98	1.64	2.4	49.62	43.69	56.98	75	2.38	6.9
	S.D	8.74	24.2	317.31	39.13	1.14	1.9	1.5	20.02	17.9	22.26	20.9	1.47	6.03
	MAX	80.99	89.4	1460	140.7	3.75	8.87	8.1	92.15	71.61	99.98	100	6.5	29.7
	MIN	50.96	6.7	4	7.8	0.03	0.17	0.9	14.63	7.17	30.34	6.06	-3.11	0.2
2014	MEAN	68.84	35.77	286	50.22	1.29	2.11	1.89	50.55	40.63	67.33	71.95	2.3	8.81
	MEDIAN	71.01	29.7	158	36.3	1.28	1.05	1.59	51.7	40.49	63.75	75.8	2.5	6.5
	S.D	8.63	23.56	309.16	37.77	1.04	1.97	1.57	20.22	18.9	23.37	20.95	1.24	5.97
	MAX	81.14	86.2	1410	136.7	3.49	8.37	7.7	93.86	76.03	99.98	100	5.86	29.7
	MIN	51.51	6.6	4	7.7	0.03	0.19	0.23	16.99	6.53	26	6.25	-2.47	0.2
2015	MEAN	69.15	34.72	278.13	48.47	1.37	2.33	1.68	49.84	40.38	73.82	75.17	2.2	8.81
	MEDIAN	71.18	28.2	155	34.2	1.38	1.05	1.47	47.39	39.73	79.72	80.8	2.45	7.04
	S.D	8.53	22.94	300.19	36.5	1.09	2.42	1.37	18.87	19.19	24.06	21.32	1.06	5.89
	MAX	81.29	83.3	1360	132.5	3.87	11.65	7.7	91.82	83.9	99.79	101.1	5.22	29.8
	MIN	51.99	6.5	4	7.6	0.04	0.08	0.18	17.63	5.78	19.1	6.44	-1.64	0.3

III. EFFICIENCY RESULT

Table 3 represents cost efficiency (CE), allocative efficiency (AE), and technical efficiency (TE) of the 55 member countries of OIC under VRS technology. According to Table 2, the cost efficiency, allocative efficiency, and technical efficiency of the whole OIC countries on average are 0.52, 0.72, and 0.70, respectively during the study period. It implies that although more than half of the countries are relatively efficient allocatively and technically, they have not been good at selecting the cost-minimal input mix.

Taking a closer look, in terms of the cost efficiency, as the average of the 55OIC member countries shows 0.52, there is 48% of the cost inefficiency during the same period. It indicates that there is a possibility to improveits overall economic by removing the 48% inputs at current output level.Out of 55, 7 (13%)countries fully achieves the overall costminimization i.e. Afghanistan, Albania, Chad, Lebanon,

Pakistan, Sierra Leone and Somalia. While 48 (87%) countries are found away from the optimal cost obtainable from the existing technology. Among which 6 (11%) fall in the range of CE scores 0.70 to 0.99 and 32 (58%) countries are using more than 50% cost increasing resources in their healthcare system. Most expensive healthcare systems are found of the countries Yemen, Kuwait, Togo, Kazakhstan, Azerbaijan and Burkina Faso as compare to other member countries where more than 80% resources are increasing the cost of their health care system. These countries can reduced 80% of their healthcare resources at given output level. During the five year of the study average cost efficiency scores are found 0.55 (2011), 0.54 (2012), 0.56 (2013), 0.50 (2014) and most expensive period is found 2015 with CE 0.41.

With respect to the allocative efficiency, Afghanistan, Albania, Chad, Lebanon, Pakistan, Sierra Leone and Somalia, still shows the full efficiency. As the allocative efficiency for an individual countries shows 0.72, it indicates that there is a possibility to decrease its allocative inefficiency from 18% by reallocating the input mix. Although Yemen, Kuwait, Togo, Kazakhstan, Azerbaijan and Burkina Fasoshow relatively low level of the cost efficiency, which is lower than 0.20, they show much higher level in terms of the allocative efficiency. It represents that these countries are comparatively better at allocating the input mix than choosing the cost-saving input mix since the allocative efficiency describes the skill of a production unit in achieving the optimal input, given its price and the production technology while the cost efficiency is the ratio of the optimal cost feasible from the present technology to the actual cost. It also represents that there is only two countries Burkina Faso and Yemen, which have more 80% misallocation of resources at give prices and most of the countries are found allocatively efficient. Average AE scores on yearly basis are found 0.73 (2011), 0.73 (2012), 0.72 (2013), 0.73 (2014) and 0.69 (2015.

When assessing technical efficiency, Afghanistan, Albania, Chad, Comoros, Gambi, Lebanon, Mauritania, Pakistan, Sierra Leone and Somalia show the maximum efficiency (1.00), and Benin, Niger, Brunei, Morocco, Guinea, Tajikistan, Indonesia and Mali are following with TE in the range 0.90-0.99. It meansthat there is no unnecessary input-mix in the health system of OIC member countries for a given level of output with the current technology. Out of 55, 43 (78%) countries indicate the comparatively high level of the technical efficiency while only 7 ountries i.e. Saudi Arabia, Kuwait, Togo, Uzbekistan, Kyrgyz, Azerbaijan, Kazakhstan show more than 60% of high level of the technical inefficiency. It suggests that thereis a potential to reduce their technical inefficiency via scaling input down or using optimal input mix since technical inefficiency is caused by using excess input mix or using improper input mix. Yearly TE scores are observed 0.75 (2011), 0.73 (2012), 0.77 (2013), 0.67 (2014) and 0.58 (2015).

Overall, the cost efficiency over the 55OIC member countries shows quite a low level, compared to the allocative and technical efficiencies, and the allocative efficiency is a bit higher than the technical efficiency during the same time period. It shows that these countries are comparatively good at allocating the input mix andusing suitable input mixes however they are not good at choosing the optimal cost obtainable from the existing technology. The reason why the cost efficiency is lower than other efficiencies might be explained by the fact that cost efficiency is measured by a combination of both allocative and technical efficiencies simultaneously, and it shows one (1.00) only if a production unit (here, a country) achieves at the level of 100% of technical as well as allocative efficiencies.

Table 3: Technical, Allocative and Cost Efficiency Scores of the OIC Countries (2011-15)

COUNTRIES	TECHNICAL EFFICIENCY						ALLOCATIVE EFFICIENCY						COST EFFICIENCY					
OIC	2011	2012	2013	2014	2015	2011-15	2011	2012	2013	2014	2015	2011-15	2011	2012	2013	2014	2015	2011-15
Afghanistan	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Albania	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Algeria	0.95	0.52	0.59	0.49	0.29	0.57	0.68	0.88	0.71	0.68	0.84	0.76	0.64	0.46	0.42	0.34	0.25	0.42
Azerbaijan	0.8	0.17	0.19	0.16	0.14	0.29	0.34	0.97	0.76	0.7	0.7	0.69	0.27	0.16	0.14	0.11	0.1	0.16
Bahrain	0.95	0.71	0.67	0.51	0.18	0.60	0.52	0.53	0.53	0.47	0.49	0.51	0.5	0.37	0.36	0.24	0.09	0.31
Bangladesh	1	0.54	0.56	0.47	0.27	0.57	0.78	0.79	0.73	0.73	0.78	0.76	0.78	0.42	0.41	0.35	0.21	0.43
Benin	0.9	1	1	1	1	0.98	0.64	1	1	1	1	0.93	0.57	1	1	1	1	0.91
Brunei.	1	0.92	0.86	1	1	0.96	0.63	0.79	0.89	0.75	0.28	0.67	0.63	0.73	0.76	0.75	0.28	0.63
Burkina Faso	0.45	0.52	0.67	0.37	0.32	0.47	0.57	0.19	0.22	0.22	0.29	0.30	0.26	0.1	0.15	0.08	0.09	0.14
Cameroon	0.32	1	0.82	0.8	0.9	0.77	0.93	0.39	0.62	0.43	0.49	0.57	0.3	0.39	0.5	0.34	0.44	0.39
Chad	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Comoros	1	1	1	1	1	1.00	0.55	0.79	0.76	0.71	0.58	0.68	0.55	0.79	0.76	0.71	0.58	0.68
Cote d'Ivoire	0.61	0.43	0.49	0.3	0.49	0.46	0.75	0.74	0.86	0.9	0.57	0.76	0.45	0.32	0.42	0.27	0.28	0.35
Djibouti	0.34	0.85	1	1	0.99	0.84	0.88	0.63	0.73	0.58	0.64	0.69	0.3	0.53	0.73	0.58	0.64	0.56
Egypt	0.37	0.52	0.59	0.45	0.57	0.50	0.67	0.61	0.45	0.71	0.42	0.57	0.25	0.32	0.27	0.32	0.24	0.28
Gabon	0.77	0.48	0.68	0.36	0.29	0.52	0.27	0.71	0.81	0.99	0.9	0.74	0.21	0.34	0.55	0.35	0.26	0.34
Gambi	1	1	1	1	1	1.00	1	0.91	0.97	0.94	0.82	0.93	1	0.91	0.97	0.94	0.82	0.93
Guinea	1	0.91	0.8	1	1	0.94	0.4	0.49	0.83	1	0.69	0.68	0.4	0.45	0.67	1	0.69	0.64
Guinea-Bissau	0.62	1	0.87	0.79	0.74	0.80	0.77	0.66	0.78	0.62	0.91	0.75	0.48	0.66	0.68	0.49	0.67	0.60
Guyana	1	0.65	0.79	0.54	0.48	0.69	1	0.92	0.8	0.66	0.74	0.82	1	0.6	0.63	0.36	0.36	0.59
Indonesia	1	1	1	1	0.61	0.92	0.55	0.94	0.64	0.94	0.7	0.75	0.55	0.94	0.64	0.94	0.42	0.70
Iran,	0.88	0.79	0.74	1	1	0.88	0.79	0.91	0.8	0.59	0.44	0.71	0.69	0.72	0.6	0.59	0.44	0.61
Iraq	0.6	0.67	0.74	0.43	0.28	0.54	0.93	0.8	0.86	0.9	0.97	0.89	0.55	0.54	0.63	0.38	0.27	0.47
Jordan	0.51	0.56	0.65	0.6	0.24	0.51	0.59	0.62	0.49	0.58	0.65	0.59	0.3	0.35	0.32	0.35	0.16	0.30
Kazakhstan	0.18	0.27	0.37	0.2	0.12	0.23	0.83	0.73	0.57	0.79	0.64	0.71	0.15	0.2	0.21	0.16	0.08	0.16
Kuwait	0.23	0.47	0.57	0.36	0.18	0.36	0.78	0.52	0.41	0.39	0.47	0.51	0.18	0.24	0.23	0.14	0.08	0.17
Kyrgyz	0.38	0.34	0.43	0.25	0.13	0.31	0.9	0.89	0.72	0.86	0.79	0.83	0.34	0.3	0.31	0.21	0.1	0.25
Lebanon	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Malaysia	1	0.68	0.69	0.65	0.26	0.66	0.51	0.59	0.58	0.49	0.68	0.57	0.51	0.4	0.4	0.32	0.17	0.36
Maldives	0.99	0.42	0.46	0.35	0.24	0.49	0.34	0.79	0.74	0.8	0.63	0.66	0.34	0.33	0.34	0.28	0.15	0.29
Mali	1	0.7	1	1	0.87	0.91	0.75	0.42	0.39	0.6	0.75	0.58	0.75	0.29	0.39	0.6	0.65	0.54
Mauritania	1	1	1	1	1	1.00	1	1	1	0.9	1	0.98	1	1	1	0.9	1	0.98
Morocco	1	1	1	1	0.74	0.95	1	1	1	1	0.96	0.99	1	1	1	1	0.71	0.94
Mozambique	0.62	0.72	0.62	0.38	0.39	0.55	0.85	0.52	0.82	0.75	0.66	0.72	0.53	0.37	0.51	0.29	0.26	0.39
Niger	1	1	0.92	0.91	1	0.97	1	0.56	0.78	0.64	0.61	0.72	1	0.56	0.72	0.59	0.61	0.70
Nigeria	0.72	0.33	0.46	0.3	0.39	0.44	0.36	0.75	0.68	0.63	0.66	0.62	0.26	0.25	0.32	0.19	0.25	0.25
Oman	0.58	0.84	0.88	0.83	0.19	0.66	0.59	0.46	0.55	0.47	0.81	0.58	0.34	0.39	0.48	0.39	0.15	0.35
Pakistan	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Qatar	0.48	1	1	1	0.59	0.81	0.55	0.33	0.44	0.53	0.3	0.43	0.26	0.33	0.44	0.53	0.18	0.35
Saudi Arabia	0.36	0.47	0.57	0.31	0.15	0.37	0.69	0.6	0.54	0.66	0.68	0.63	0.25	0.28	0.31	0.2	0.1	0.23
Senegal	1	0.29	0.45	1	0.92	0.73	1	0.59	0.49	0.19	0.14	0.48	1	0.17	0.22	0.19	0.13	0.34
Sierra Leone	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
Somalia	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
South Sudan	1	0.58	0.6	0.26	1	0.69	0.36	0.49	0.65	0.7	0.28	0.50	0.36	0.28	0.39	0.18	0.28	0.30
Suriname	0.35	0.65	0.54	0.52	0.34	0.48	0.81	0.89	0.96	0.7	0.67	0.81	0.29	0.57	0.52	0.36	0.23	0.39
Syrian	0.63	0.84	0.77	0.64	0.4	0.66	0.8	0.72	0.64	0.85	0.53	0.71	0.5	0.6	0.49	0.54	0.21	0.47
Tajikistan	1	1	1	0.87	0.76	0.93	1	1	1	0.53	0.46	0.80	1	1	1	0.46	0.35	0.76
Togo	0.49	0.21	0.72	0.09	0.1	0.32	0.36	0.86	0.43	0.96	0.93	0.71	0.18	0.18	0.31	0.09	0.09	0.17
Tunisia	0.75	0.79	0.75	0.61	0.32	0.64	0.87	0.78	0.72	0.92	0.74	0.81	0.65	0.61	0.54	0.56	0.23	0.52
Turkey	0.58	0.62	0.74	0.62	0.15	0.54	0.57	0.66	0.64	0.69	0.9	0.69	0.33	0.41	0.48	0.43	0.14	0.36
Turkmenistan	0.52	0.54	0.79	0.65	0.49	0.60	0.54	0.87	0.66	0.67	0.71	0.69	0.28	0.47	0.52	0.43	0.35	0.41
Uganda	0.61	1	1	0.26	0.21	0.62	0.54	0.21	0.33	0.55	0.63	0.45	0.33	0.21	0.33	0.14	0.13	0.23
UAE	0.66	1	1	0.7	0.31	0.73	0.66	0.49	0.49	0.6	0.67	0.58	0.43	0.49	0.49	0.42	0.21	0.41
Uzbekistan	0.55	0.25	0.28	0.21	0.3	0.32	0.68	0.93	0.92	0.93	0.57	0.81	0.37	0.23	0.26	0.19	0.17	0.24
Yemen, Rep.	0.52	0.72	0.83	0.5	0.37	0.59	0.36	0.45	0.19	0.26	0.19	0.29	0.19	0.32	0.16	0.13	0.07	0.17
	2011	2012	2013	2014	2015	2011-15	2011	2012	2013	2014	2015	2011-15	2011	2012	2013	2014	2015	2011-15
AVERAGE	0.75	0.73	0.77	0.67	0.58	0.70	0.73	0.73	0.72	0.73	0.69	0.72	0.55	0.54	0.56	0.5	0.41	0.51
MEDIAN	0.8	0.72	0.79	0.65	0.49	0.69	0.75	0.78	0.73	0.71	0.68	0.73	0.5	0.45	0.5	0.39	0.26	0.42
S.D	0.26	0.26	0.22	0.31	0.34	0.28	0.23	0.22	0.22	0.22	0.23	0.22	0.3	0.29	0.28	0.31	0.32	0.30
MAXIMUM	1	1	1	1	1	1.00	1	1	1	1	1	1.00	1	1	1	1	1	1.00
MINIMUM	0.18	0.17	0.19	0.09	0.1	0.15	0.27	0.19	0.19	0.19	0.14	0.20	0.15	0.1	0.14	0.08	0.07	0.11

Regression Analysis Of Efficiency Determinants

At the second stage effort has been made to find out the determinants of efficiency by using regression analysis in the light of technique suggested by Simar and Wilson (2007). The results are presented in table 4.

Table 4: Truncated Regression Analysis

Variables	Technical Inefficiency	Allocative Inefficiency	Cost Inefficiency
OOPHE	0.3521*	0.207**	0.2615*
LR	-0.0621*	-0.0183*	-0.0429*
sw	-0.0381**	-0.02513*	-0.0248*
Pop Growth	0.0251*	0.1024**	0.0410***
UR	0.0024*	0.0049***	0.0029**
C	1.2031*	1.1304**	2.1801*
***, **, and * denote significance at 1%, 5%, and 10% levels a Estimation based on Algorithm 1 of Simar and Wilson [9], with 2000 bootstrap replications for confidence intervals of the estimated coefficients.			

The above results are of regression analysis which has been obtained after 1000 iterations, the dependent variable is inefficiency scores and the independent variables are out of pocket health expenditure percentage of total health expenditure, literacy rate, percentage of population access safe drinking water, population growth rate and unemployment rate. The first independent variable OOP which has positive coefficient and variable is statistically significant. It indicates that as there is an increase in share of OOP in total health expenditure, there will be an increase in technical, allocative and cost inefficiency. However the increase in technical inefficiency is greater than allocative and cost efficiency.This positive impact of first independent variable may be due to the reason that an increase in %OOPTHE leads to an increase in private health expenditures as compare to public health expenditures. OOP negative effects of out-of-pocket payments on access to and equity of health services (Kirgia, etal. 2015). People will prefer to use private health facilities and public health facilities will face inefficiency due to the shortage of public health expenditures the health status of the masses will fall there by enhancing the inefficiency of the health care system. The next variable isliteracy rate which has negative coefficient and variable is statistically significant. It indicates that as there is an increase in education level, there will be a decrease in efficiency (TE, AE, CE) which may be due to the reason that an increase in education level leads to an increase in awareness regarding the diseases and relevant preventive measures. People will be in a better position to get rid of the diseases and the health status of the masses will rise there by enhancing the efficiency of the health care system. The factor percentage of population access to safe water has significant negative coefficient it means that if there is an increase in percentage of population access to safe drinking water there will be low level of inefficiency. The next variable is population growth rate which is significant indicates that size of the population increase the inefficiency of the health care system. The last variable is the unemployment rate. The coefficient of this variable is positive and variable is statistically significant, it indicates that as unemployment increases it increase the inefficiency of the health care system. It may be due to the reason that as number of unemployment increases in the country leads the poverty in the society which directly affect the health status of the country.

IV. DISCUSSION AND CONCLUSION

Considering the health situation of the OIC member countries, result-oriented economic performance, for countries, is an important matter, *i.e.*, raising the level of efficiency. Itcan be a useful way to analyze the level of improvement of inefficiency in a time of limited resources.Although the empirical results above show that there is the possibility of reducing inefficiency of by reallocatingand utilizing the input mix at minimum cost , it is hard to implement this due successfully due to the inherent

financialweakness of these countries due in part to a lack of high-quality human resources or decreasing financialsupport from their government. Health system of a country have performed an importantrole in society. However, when it comes to the financial status of these countries,especially those in African Islamic countries who lack financial independence, their system are unable to pay theaddition healthcare budgets.

In this context, this papermay contribute by giving policy makers useful information about their economic performanceparticularly with regard to regional health system.

This paper estimates the cost efficiency of 55countriesmember of OIC countries from 2011 to 2015 using DEA. The findings of this paper indicates that the cost efficiency, allocative efficiency, and technical efficiency of the whole OIC member countries on average are 0.52, 0.72, and 0.70, respectively. It implies that although more than half of the countries are comparatively efficient allocatively and technically, they have not been good at selecting the cost-minimalinput mix. In terms of the cost efficiency, as the average of the 55 OIC member countries shows 0.52,there is 48% of the cost inefficiency during the same period. Hence, there is a possibility to improve its overalleconomic efficiency by eliminating the factor of the cost inefficiency..Second of all, with respect to the allocative efficiency, 0.72, itindicates that there is a 18% inefficiency which can decrease by reallocating the inputmix. Thirdly, when it comes to the technical efficiency,0.70. Indicates the 70% efficient utilization of the healthcare resources at given output. More than half of the countries represent the comparativelyhigh level of the technical efficiency while some hospitals still show more than 20% of high level of thetechnical inefficiency. It suggests that there is a potential for the technical efficiency improvement via using optimal input mix.Out of pocket health expenditures and literacy rate have more effect on technical, allocative and cost efficiency as compare to other factors. The government of these countries should financing more in health as well as in education sector as compare to other sector.

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