Efficiency of Health Systems in Countries of the North and South Shores of the Mediterranean

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ABSTRACT: This paper aims to study the degree of efficiency of health systems in the countries of the two shores of the Mediterranean. We analyze the classification of these countries to identify particularly efficient and inefficient groups of countries. From the point of view of method, we use the estimation method (DEA). We also use a combination of inputs and outputs. In our model, we use as outputs, life expectancy at birth, survival of children under five years and adult survival rates as inputs, we chose health spending $ current, Adult literacy rates. We rely on the input orientation approach to variable returns to scale. The efficiency scores were calculated using the DEAP software (Coelli, 1996). The average efficiencies of scores (NRP) in 2010 is equal to 0.934.

KEYWORDS: health, efficiency, DEA, life expectancy, health expenditure, input orientation, variable returns to scale.

JEL CLASSIFICATION: C23; I15; O14; O52; O55

1   INTRODUCTION

The notion of efficiency has been analyzed by several authors who have attempted to construct an indicator that empirically measures the performance of public expenditure in the field of providing public education, health, infrastructure and legal regulations.

In this paper we focus on the efficiency of health spending problem. In this framework include multiple jobs. Alexander et al. (2003) and AfonsoAubyn (2005) are based on a parametric and non-parametric approach, considered a measure of efficiency of health systems by constructing an efficient frontier from the amount of input used and of output generated.

The quality of health spending can be measured by the technical efficiency of health services due to these expenses. Hence, the obligation is to construct indicators that measure the efficiency of health spending.

This article is organized as follows: the first part aims to study the efficiency of health systems "literature review". The second is devoted to building health efficiency indicators in the countries of the southern and northern Mediterranean.

Several countries wanted to measure the degree of efficiency of their health systems. They used the parametric and nonparametric methods.

2   ESTIMATION OF THE EFFICIENCY WITH NONPARAMETRIC APPROACH

Work developed by Gupta and Verhoeven (2001) measured the efficiency of public spending (health + education) by using the input orientation in a sample of 38 African countries between 1984 and 1995; Health outputs are used life expectancy at birth, infant mortality and child immunization rates against communicable diseases (measles and DPT). The results confirmed that

1. Health systems in these countries are inefficient especially in the provision of education and health services compared to countries in Asia and Latin America;

2. The productivity of public education and health spending in Africa have evolved but less rapidly in comparison with countries in Asia and Latin America;

3. The performance of health systems differs from one country to another. Some African countries are more successful than others and spending on health and education are associated with higher health outcomes such as Gambia, Guinea, Ethiopia and Lesotho as they are associated with particular outcomes low in Botswana, Cameroon, Ivory Coast and Kenya.

4. The relationship between the efficiency scores and levels of public spending is negative, which justifies the argument that the increase in health spending is not an optimal solution, hence the need for improvement allowances budget in these countries.

Alexander et al. (2003) analyzed the efficiency of health systems in 51 developing countries in 1999. They used the method of (DEA output orientation). They divided the sample into two groups to solve the problem of heterogeneity: a group of countries with a per capita income of less than $ 1,500 and another group with a per capita income between $ 1,500 and $ 4,500[1]. The outputs are used life expectancy at birth disability adjusted for men; life expectancy at birth corrected the inability for women and infant mortality. An input is considered: per capita health expenditures (in international $).

Their results show that efficient countries are either countries that have benefited from relatively high levels of output, given their level of spending (Bhutan, Bangladesh and Jamaica) or countries with relatively low levels of health expenditure (Tanzania , Madagascar, Indonesia, China and Sri Lanka). The most inefficient countries are mainly in Africa.

Afonso and Aubyn (2005) wereinterested in the efficiency of health and education spending for a sample of 24 OECD countries in 2002. They used the method (DEA and FDH input orientation).

The outputs are used infant mortality and life expectancy at birth. Inputs are physical; the number of doctors, the number of nurses and the number of hospital beds (per 1000 inhabitants). The results show that the average efficiency of the health sector in the sample varies between 0.83 and 0.95 depending on the method used. Eleven countries twenty-four are considered efficient with FDH while eight countries are with DEA but the results obtained with both methods are broadly comparable.

3   ESTIMATION OF THE EFFICIENCY WITH THE PARAMETRIC APPROACH

Evans et al. (2000) measured the efficiency of health systems using a fixed-effects panel of 191 countries between 1993 and 1997. The output is measured by life expectancy disability adjusted (DALE) and inputs by health spending (public and private) and the average number of years of education of the adult population. The output oriented efficiency scores are defined as the ratio between current performance and maximum potential. The results show that the most efficient health systems are those of Oman, Malta, Italy, France, San Marino, Spain, Andorra, Jamaica, Japan[2] while the more inefficient are mostly African: Zimbabwe, Zambia, Namibia, Botswana, Malawi. An interesting contribution paper resides in the construction of a confidence interval for the efficiency estimate using a Monte Carlo procedure. Tandon et al. (2000) followed the same approach and the same data that Evans et al. (2000) to estimate the performance of health systems, but by building a composite indicator results (outputs).

Thus, the efficiency of country health systems will be judged on the results achieved over five objectives: the level of health and its distribution[3]. The responsiveness of health systems and distribution and fairness of financial contribution. The

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[1] This is expressed in dollars of purchasing power parity, but the authors do not justify the choice of thresholds.

[2] If the high-income countries are excluded, the most efficient countries are Oman, Jamaica, Morocco, Chile, Costa Rica, Venezuela, Turkey, Cuba, El Salvador or the Dominican Republic.

[3] According to the WHO (WHO 2000), responsiveness is not measured in how the system responds to health needs, which appears in the results in terms of health, but system performance in areas other than health and responsiveness to public expectations as to how it should be treated with preventative care providers, care or non. The reactivity was measured through a key informant survey that involved 1,791 interviews in 35 countries and allowed to rate (0 to 10) to each of the components of responsiveness, and a general note. A second internet survey of 1006 participants (half part of the WHO) generated opinions about the relative importance of the components, for which WHO has used to transform scores into general notes Instead of simply calculating a mean or using global responses of key informants

authors constructed a composite index is a weighted average of the five dimensions[4] (Murray et al., 2000) to use as a measure of the output. The inputs are considered health expenditure per capita (public and private) in purchasing power parity and the average number of years of education among the population over fifteen years. The results show slightly different rankings from those of Evans et al. (2000).

The most efficient countries are France, Italy, San Marino, Andorra, Malta, Singapore, Spain, Oman, Austria and Japan,[5] while the more inefficient are Sierra Leone, Myanmar, Central African Republic, the Democratic Republic of Congo, Nigeria, Liberia, Malawi, Mozambique, Lesotho, or Zambia.

Jayasuriya and Wodon (2003) estimate the efficiency of the provision of education and health services for a sample of 76 developing countries between 1990 and 1998. They used as output, life expectancy at birth and inputs are total expenditure per capita health (in 1995 constant dollars) and the adult literacy rate. The authors also added a time trend to capture technological progress over time and regional dummies to allow the production frontier vary by region. Found the results confirmed that the increase in health spending is not a solution to improve health outcomes. The authors noted that the adult literacy rate has a strong impact on life expectancy; an increase of 10% literacy rate would increase the life expectancy of about 1.2 years. The calculation of average efficiency in the sample amounted to 0.85, which implies that countries could increase average life expectancy by 15% with the same levels of resources.

4 CONSTRUCTION OF HEALTH EFFICIENCY INDICATORS IN THE COUNTRIES OF NORTH SHORE & SOUTH MEDITERRANEAN

Economic efficiency, or productive efficiency has two components: allocative efficiency and technical efficiency.

4.1 ALLOCATIVE EFFICIENCIES OR PRICES

The allocative efficiency (or price) is the ability to combine the inputs and outputs in optimal proportions, given the prices quoted on the market. In this type of model the efficiency measurement is done in two ways:

- ✓ Definition of efficiency in absolute terms (search for the optimum, Pareto[6]).
- ✓ Definition of efficiency in relative terms (benchmarking and comparison to an average or a set of institutions).

4.2 TECHNICAL EFFICIENCY (OR PHYSICAL)

It is the ability to prevent waste. The company declared technically efficient if, for the levels used inputs and outputs products, it is impossible to increase the amount of output without increasing the amount of one or more inputs or to reduce the amount another output.

Technical efficiency is divided in turn into scale efficiency and pure technical efficiency.

4.3 THE EFFICIENCY OF SCALE

It helps to bring the measure of technical efficiency of scale yields obtained for the optimal activity levels. It characterizes the gap between actual performance and those that would be obtained in a competitive equilibrium situation where long-term profit is zero, that is to say, compared to a situation where the returns to scale constant. Thus, a company is inefficient scale if its initial situation is one of increasing or decreasing returns to scale.

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[4]*The weights used are: 25% for the standard of health (measured by life expectancy disability adjusted), 25% for the distribution of health status (measured by the health equality in terms of child survival), 12.5% for the degree of reactivity (measured from surveys), 12.5% for the distribution of responsiveness, and 25% for the equity of health financing (measured by inversely proportional index of inequality repartition).*

[5]*If the high-income countries are excluded, the most efficient countries are Oman, Colombia, Morocco, Chile, the Dominican Republic, Costa Rica, Cuba, Croatia, Thailand, and the Czech Republic.*

[6]*The concept of Pareto optimum can divide into two all possible states of society. Can be distinguished: those that are uniformly improvable: it is possible to increase the well-being of individuals without reducing the other and which are not uniformly improvable: increasing the well-being of individuals involves reducing the welfare of at least one other individual.*

4.4   THE PURE TECHNICAL EFFICIENCY (TE)

The pure technical efficiency shows the ability of firms to optimize their production for a fixed level of inputs and or minimize their consumption of resources for a given level of output. It reflects the organization of work within the production unit, the ability to organize, motivate and effectively monitor their employees and supervisors, or the ability to make good decisions and sink errors. These forms of efficiency are often classified under "X-efficiency." Therefore, the measurement of pure technical efficiency does not depend on product prices, inputs and availability. As suggested by the above definitions, the measure of efficiency will be input or output orientation in one is interested in minimizing inputs or maximizing output.

4.5   EFFICIENCY IN INPUT DIRECTION

It has a production function with two factors (X1, X2). We assume that the returns to scale are constant. Either the isoquant SS representing a production function, otherwise it represents a minimum combination of inputs per unit of output. Let U be a decision unit that requires amounts of inputs defined at a point P to produce a unit of output. The technical inefficiency of a company is represented by a QP distance. This distance reflects the proportional reduction of the amount of possible inputs under the constraint that the quantity of output remains fixed. Therefore a technical efficiency ratio input orientation (ET_I) is written as follows: $ET_i = \frac{OQ}{OP}$

Inefficiency and therefore results in resource use surplus. Once the input prices are known, then we can represent the right isorevenue AA' and provide a measure of allocative efficiency: $EA_i = \frac{OR}{OQ^*}$ where RQ is the decreased amount possible production costs tends to the point Q' representing the allocative and technical efficiency threshold. The point Q represents the place of technical efficiency but allocativement inefficient. The allocative inefficiency thus manifests itself in the combination of inputs in optimal proportions as compared to relative prices. The economic inefficiency E Ei is represented by the ratio $EE_i = \frac{OR}{OP^*}$ where the distance RP is interpreted as a cost reduction run. Thus we see that economic efficiency is the product of technical efficiency and allocative efficiency.

$$ET_i \times EA_i = (OQ/OP) \times (OR/OQ) = (OR/OP) = EE_i$$

Technical and allocative efficiency - input orientation: See Figure 3.3
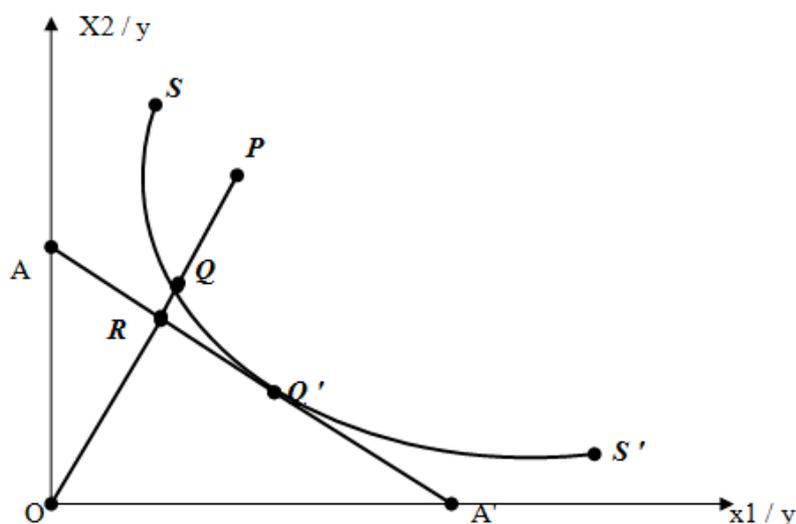
Source: Coelli et al. (1998).

To explain the fact that a decision unit fails to minimize the quantities of inputs used and the costs of these inputs should two reasons advanced beings. First the decisional unit aims to minimize costs but it cannot, this could be explained by

institutional constraints, or by a lack of information that would allow it to identify efficient combinations of inputs or by the objective of the decision unit is not to seek to minimize costs.

4.6   OUTPUT DIRECTION EFFICIENCY

When speaking of output orientation, it is to ask the question: how can we increase the amount of output without changing the amount of inputs used?

We consider the case of a production providing two outputs (X1) and one input (x1). We assume that the returns to scale are constant, the production technology can be represented by the curve of production possibilities in two dimensions ZZ 'of a unit where the point A represents an inefficient firm. The distance AB is the technical inefficiency; it is the amount of potentially increased outputs without additional inputs. Thus a ratio of technical efficiency in output orientation is written in the following way:x_2

$$ET_O = \frac{OA}{OB}$$

If the information on the price of inputs is perfect, then we can represent the right isorevenue DD' and define a measure of allocative efficiency as:EA_0

$$EA_0 = \frac{OB}{OC}$$

The Economic efficiency (EE_0) Corresponds to the product of these two measures:

$$EE_0 = (OA/OC) = (OA/OB) \times (OB/OC) = ET_0 \times EA_0$$

Technical efficiency and output allocative- orientation: see Figure 3.4
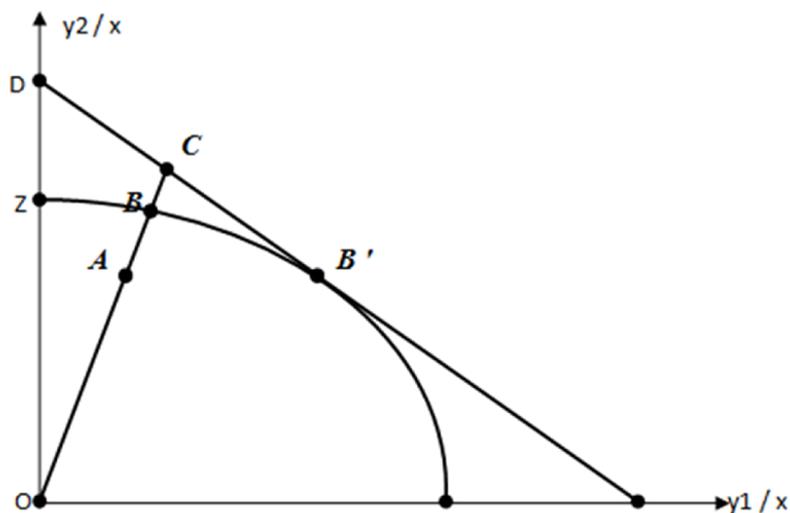
Source: Coelli et al. (1998).

4.7   ESTIMATION METHODS

Quantitative measures of economic efficiency are interesting for at least three reasons (Kalirajan and Shand, 1999). They would allow a comparison of similar productive units and can therefore give us an indication of the relative efficiency of firms. When these measures show changes in the relative efficiency of different production units studied, further analysis can identify the factors that lead to these variations. These analyzes have policy implications for improving efficiency.

Efficiency measures used are rooted in the work of Farrell (1957) and make use of techniques called extreme points. Before the work of Farrell, estimates of production functions were average, implying that some firms produce more or less

than average. This approach has been widely criticized. Instead of measuring the separate indices productivity of each input, Farrell proposes to measure the productive efficiency of the activity in general.

The concept of productive efficiency is different from the concept of social or collective efficiency. The social or collective efficacy is relative to the overall economy including producers and consumers. She suffers when it is impossible to increase the utility (or satisfaction) of a consumer without diminishing that of another. Optimum is called Pareto or first-best. In his 1957 article (applied to inter-State of the US agricultural data) he argues that the measure of efficiency allows giving a theoretical and empirical importance so that a satisfactory measure of efficiency used to evaluate the Industrial productivity (see Ali and Seinford 1993).

To estimate the efficiency score, two approaches have been developed: one is developed by parametric (Aigner and Chu, 1968 Aigner et al 1977 and Meeusen et al 1977..) Is the second non-parametric (Charnes, Cooper and Rhodes, 1978 Banker et al. 1984), which give rise to particular interpretations of the deviation from the border of a firm?

The parametric approach the border based on a specification of the technology we need to estimate the parameters. Technical efficiency is measured from the error term of the production function. We distinguish the boundaries of deterministic output, probabilistic, and stochastic.

The nonparametric approach is unusual not to impose any functional form for production frontiers. These are constructed by solving problems and primal dual linear programming. Once defined, the inputs and outputs of the production units, a production unit (UP) is considered efficient in a sample if no other UP no longer outputs produced with the same amount of inputs. One of the most used methods is the Data Envelopment Analysis (DEA in French and Data Envelopment Analysis, DEA English).

4.8   GENERAL PARAMETRIC APPROACH

4.8.1   PRODUCTION FRONTIER - GENERAL

According to neoclassical theory, firms within their production frontier producing the maximum output level with the chosen level of inputs. This is the "function of primal production." Thus, all firms are technically efficient by definition, the only source of economic inefficiency lies in allocative inefficiency. We can write the production function of firm i (which produce a single output and uses several inputs) as follows:

$$y_i^* = f(x_{i1}, x_{i2}, \ldots, x_{1m})/T \text{(1)}$$

Where, y_i^* x and T represent output, inputs and technology firm i.

In practice, the firm produces below the production possibility frontier (PPF) being technically inefficient because it can have an incomplete knowledge of the best methods to use the inputs, or be influenced by factors that prevent it from being on the border. To model the influence of various factors that make office is located below the PPF, we can rewrite the production function of firm i as follows:

$$y_i = f(f(x_{i2}, \ldots, x_{1m})exp(u_i)/T \text{ (2)}$$

Where u_i indicates the combination of factors that prevent the firm to be on the production and achieve border y_i^*.

On the other hand, $exp(u_i)$ represents the firm's ability to be at the observed level of production y_i, which represents the level of technical efficiency achieved. The values taken by u_i depend on the situation in which firm i located. When nothing affects the ability of the firm to achieve y_i^*, u_i takes the value zero. Otherwise, the value of depends on the constraints of the firm. u_i

Thus, measurement of technical efficiency of the firm can be defined as the ratio of the observed product and the maximum possible product:

$$exp(u_i) = \frac{y_i}{y_i^*} \text{(3)}$$

Equation (3) is the base model for measuring technical efficiency.

The estimate of FPP by the parametric approach involves a number of choices including: The type of FPP, the choice of the functional form of the FPP, the choice of estimation technique and FPP the choice of method for modeling inefficiency.

4.8.2   CHOICE OF PRODUCTION TYPE OF BORDER

In the literature there are three parametric approaches to estimate the production possibility frontier and therefore technical efficiency: deterministic, probabilistic and stochastic. The literature on the border of the deterministic production possibilities provided the basis for studies and probabilistic stochastic production frontiers, and the disruption of the type of distribution that reflects inefficiency. Probabilistic and stochastic approaches include (by definition) to reduce the sensitivity of the frontier (PPF) Estimated error (truly) random.

The deterministic approach was developed by Afriat (1972) and Richmond (1974) and is using all the observations supposed be on or under the PPF and assumes that the entire error term results from technical efficiency. This technique most closely matches the theoretical concept of "border" considered the highest limit of output. But empirically this technique is very sensitive to measurement errors. Deterministic frontier models have several limitations which include the following:

(1) They do not differentiate the effects due to statistical noise, external shocks or outside the control of the company, the effects due to technical inefficiency;

(2) Construction, the border is sensitive to measurement error in the dependent variable.

The probabilistic approach aims to reduce this sensitivity. Given the fact that the border is sensitive to extreme observations that may bias the estimate for a given sample of companies, Timmer (1971) reduces this sensitivity by allowing a predetermined percentage of the most effective observations to be below of the border. Many frontier models have been developed (see the literature review of these studies in Kaliragan and Shan, 1999). Afriat (1972) and Richmond (1974) were the first to specify such models using Beta and Gamma distributions, respectively.

The stochastic approach simultaneously proposed by Aigner, Lovell and Schmidt (1977), by Battese and Corra (197) and Meeusen and van den Broeck (1977) with the aim to specify in the error term of two components:

(1) one captures the effects of inefficiency with respect to the border

(2) the other allows a random variation of the border through all the sample companies and captures the effects of measurement errors and other statistical noise outside the control of producers. Thus, we can rewrite equation

$$y_i = f(x_i)\exp(\varepsilon_i) \quad \textbf{(4)}$$

In equation (4) the error term is decomposed as follows:

$$\varepsilon_i = v_i - u_i \quad \textbf{(5)}$$

The estimate of the border (4) requires the following hypotheses:

- First, v_i and u_i follow independent distributions.

- Second, the term v_i is a vector of random errors assumed to follow a normal density.

- Third, The term u_i is a non-negative random variable for which a particular distribution is chosen: it is supposed to represent the technical inefficiency score of the ith firm.

4.9   NONPARAMETRIC APPROACH - GENERAL

Methods of data envelopment (DEA)[7] are considered an important tool to assess and improve the performance of manufacturing operations and service. They have been extensively applied in assessing the performance of schools, hospitals, bank branches, factories, etc.

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[7] *DEA (data envelopment analysis) is a method of analyzing efficiency.*

4.9.1 ANALYTICAL FRAMEWORK

Suppose there are k inputs and outputs m to n (DMUs). For a (DMU)i there is a column vector of outputs and xi is a column vector of inputs. X (k × n) is the matrix of the inputs Y and (m × n) is the matrix of the outputs

The purpose of the DEA is to create a non-parametric boundary so that all observations are below or exactly on the shape of this curve. Hence, the need is to integrate the ratios outputs / inputs in the specification. That is to say that for every (DMU), we seem to find a measure of all inputs to outputs by reports as U'Yi / V'xi where u is a (m × 1) vector of weights of output and V is a (K × 1) vector of the weights of the inputs.

In order to achieve optimal weights, we solve the following mathematical program:

Maximize u, v () $\frac{u'y_i}{v'x_i}$

S / c $\frac{u'y_i}{v'x_i}$ ≤**1, J = 1, ..., N (1)**

And u, v ≥ 0

Where u and v are coefficients associated with each (DMU) such that efficiency is maximized when it does not exceed a unit value. However, the resolution of this program can provide a multiplicity of solutions (eg, if (u *, v *) is a solution, then (α u *, v * α) is too). So, we need an additional constraint is necessary to avoid this problem.

The program can be rewritten as follows:

Maximize u, v () $u'y_i$

   S / C = 1$v'x_i$

   0, j = 1, ..., N, (2)$u'y_i - v'x_i \leq$

And u, v ≥ 0.

Duality[8] linear programming leads us to derive an "envelopment" form of this problem in the context of variable returns to scale:

Minimize $\theta, \lambda \theta,$

S / c (3)$-y_i + Y\lambda \geq 0$

   $0\theta x_i - x\lambda \geq$

n1'λ= 1

$\lambda \geq 0$

Where θ is a scalar and λ is a (n × 1) vector of constants.

n1 'λ = 1 implies the convexity of the efficiency curve.

This programming configuration implies fewer constraints than the previous form

(K + m <n + 1) is generally preferred in solving this problem.

The calculated value of θ is the efficiency score for a (DMU) i. It must satisfy the condition θ ≤1. If θ = 1, then we are on the efficiency frontier and DMU is technically efficient.

(1- θ) represents the amount of input that must be reduced without changing the output for efficient production.

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[8] *The advantage of this transformation is that it involves a lower number of constraints (Coelli et al. 2005).*

4.9.2   SELECTION OF INPUTS

The inputs correspond to the factors used in the production process. From the perspective of the health system and as part of the production of health inputs are numerous; they can be approached in physical terms (personnel, medical equipment, etc.) or cash (expenses) and the results are sensitive to this choice (Afonso and Aubyn 2005). Economists have selected the variable total health expenditure per capita in purchasing power as a better input used because it allows to some extent to approach all controllable inputs by health systems. But the choice of inputs in the context of a health production function raises unresolved discussion in the literature.

Some authors have claimed that the inclusion of health spending is not sufficient to measure the efficiency of health systems. According to Tandon et al. (2003), next to the inputs "direct" (approximated by health spending), other inputs broken "indirect" participate in health production as per capita income, level of education of the population, power quality, housing conditions or access to infrastructure (water, sanitation).

A population health can also be strongly influenced by other factors such as the presence of some disease vectors, the severity of the HIV / AIDS etc. But due to the unavailability of data, we adopt in our calculations the following inputs: we introduce a controllable input (health expenditure) and a non-controllable input (by the health system), an environment variable; the level of education of the population, as measured by the adult literacy rate. Even if this variable is not directly controllable by health systems, it is a crucial variable closely correlated to income, and thus serves to explain the health outcomes of a country (Caldwell 1985).

4.9.3   CHOICE OF OUTPUTS

The output of a health system should match the level of health services to the population.

Depending on the relevance of the indicators for the health services offered, we use three indicators of outputs to estimate the efficiency of health systems. Threecharacterizelevels of mortality:

- Survival of children under five.
- The survival rate of adults.
- Life expectancy at birth.

4.9.4   CHOICE OF METHOD OF STUDY OF THE EFFICIENCY

The calculation of efficiency scores, reasoning with an assumption of constant returns to scale, is based on the model of Charnes et al. (1978). The assumption of constant returns to scale is appropriate when all units of decision realize an optimal scale.

However, imperfect competition, government regulations or financial constraints can lead to a decision unit does not achieve its desired effect at an optimum level. Many authors have suggested then adjust the DEA model with constant returns to scale in order to take into account situations characterized by variable returns to scale. Banker et al. (1984) have extended the measure of the efficiency with variable returns to scale by introducing an additional convexity constraint in the program:

$$= 1 \sum_{i=1}^{i} \lambda_i$$

The advantage of the specification to variable returns to scale calculates the net technical efficiency of efficiency of scale. The measures of scale efficiency can be obtained for each decision unit by performing both a DEA analysis with constant returns to scale and variable returns to scale. The technical efficiency scores obtained with constant returns to scale are then broken down into two components: one from the scale inefficiency and the other from a technical inefficiency "pure" (that is, ie technical efficiency with variable returns to scale). If the scores at constant returns to scale are different from those with variable returns to scale for a particular decision unit, then it means that it is characterized by scale inefficiency (Coelli et al. 2005).

Our analysis focuses on the model with the assumption of variable returns to scale and input orientation. We chose minimizing inputs that seems to admit because: first, it is considered that, as in the case of public services, the services provided by the state to citizens are assumed to be fixed; Second, the use of resources by the countries studied is usually done in a difficult budgetary situation; and third, that choice to follow the type of data that we have. The values of the inputs are more dispersed than those of outputs; they thus provide a better discriminate the efficiency scores. In the choice of returns to scale, we chose the assumption of variable returns to scale. This may be justified on the one hand, that this is a

very general approach and, secondly, for the consideration of multi-output character in the health sector. Similarly, another argument reinforces this choice. It's the same kind of data used: using aggregate data makes it difficult to identify inefficiencies of scale.

4.10   RESULTS

4.10.1   EFFICIENCY SCORES ANALYSIS

We use a combination of inputs and outputs. In our model, we use as outputs, life expectancy at birth, the survival of children under five years and the adult survival rate; and as inputs, we chose health spending and the adult literacy rate.

Efficiency scores are presented in Appendix A. We used the DEAP software (Coelli, 1996). The complementary to 1 of each coefficient and efficiency score measures the proportional decrease of inputs without reducing the levels of output.

Table 3.2. Average scores efficiencies in the Mediterranean countries

Years	Average efficiency scores in the (NRP)	Average efficiency scores in the (PRSM)
1992	0.9371	0953
2010	0934	0960

in_vrsdea oriented input variable returns to scale

4.10.2   ANALYSIS OF EFFICIENCY SCORES

The score of efficiency (NRP) in 2010 is equal to 0.934. So these countries can reduce their inputs 0.066% without reducing levels of output. Also,it is observed an average of the scores in the efficiencies (PRSM) which equals 0.96. Thus, these countries can also cut spending by 0.04% and retain the same results of their outputs.

4.10.3   EVALUATION OF HEALTH OUTCOMES IN THE MEDITERRANEAN COUNTRIES OVER TIME

A population health in both shores of the Mediterranean has increased dramatically in recent decades. Life expectancy, for example, has increased by about one year every four years since the early 90's premature and infant mortality also declined rapidly and it is the same for the mortality rate after diagnosis individuals such as cancer or acute myocardial infarction.

However, there remain significant differences in health status between countries, and those who spend the most are not necessarily the ones who get the best results (see table below).

Table 3.3- Relation between health spending and effectiveness score:

Country	$ Current health expenditure (2010)	Efficiency Score (2010)
PRT	2578	0.91
FRA	3851	0.97
ITA	2836	1
ESP	2941	1
RCMP	3010	0.97
Belg	4096	0.91
SLO	3622	0.95
DEN	4118	0.79
Horn	3922	0.82
SW	3622	1
March	231	1
AL	437	1
TUN	501	1
LYB	502	0.91
EGY	261	0.88

Source: Author's calculations

For example, Italy has health spending per capita lower than those of the majority of NRP but the Italians have a very high level of health. This suggests that there is a potential for improving the cost-effectiveness of spending. There are usually no contradiction between improving health equity and raise the average level of population health. In fact, countries that show less inequality generally enjoy a high average health status such as we see in Sweden and Italy.

5   CONCLUSION

In all countries of the world, the rise in health spending increases, in principle, the population's health. Sometimes the positive effects of these expenses are dimmed. On one hand, the expenditure improves the supply of medical care. Other factors are influencing the health status of the population. We cite as an example the training, lifestyle, health and income distribution. On the other hand, the increase in these expenses must be controlled and allocated in a beneficial way to have positive effects on labor productivity, the supply of labor and training. This could contribute positively to economic growth. However, these expenses can cause serious problems due to their development that exceeds GDP growth. Several factors are due to the increase in health spending (demand factors, factors for tenders, institutional factors).

Improve efficiency in the health sector is a key objective. So we reviewed the efficiency of the health system. It is obvious that the performance is associated with efficiency. Theoretical work estimates the efficiency of the health system using the non-parametric and parametric methods. Economists Gupta and Verhoeven (2001), Alexander et al. (2003) and Afonso Aubyn (2005), Evans et al. (2000) measured the efficiency of public spending (health + education) by using the input orientation, output orientation, variable and constant returns to scale. Health outputs are used life expectancy at birth, infant mortality and child immunization rates against communicable diseases (measles and DPT). Health inputs used are the current health expenditures in $ and literacy rates. The results found mention that the increase in health spending is not an effective solution. So we need to improve budgetary allocations in these countries.

We then move to an analytical application to build health efficiency indicators. Certainly, the measure of efficiency is a complex task and poses a number of conceptual and methodological challenges that leave plenty of room for measurement errors. We estimate the degree of efficiency of health systems in the countries of the two shores of the Mediterranean and analyze the classification of these countries to identify particularly efficient and inefficient groups of countries. From the point of view of method, we use the estimation method (DEA). We also use a combination of inputs and outputs. In our model, we use as outputs, life expectancy at birth, survival of children under five years and adult survival rates as inputs, we chose health spending $ current, Adult literacy rates. We rely on the input orientation approach to variable returns to scale. The efficiency scores were calculated using the DEAP software (Coelli, 1996). The average efficiencies of scores (NRP) in 2010 is equal to 0.934. So, these countries can reduce their inputs 0.066% without reducing levels of output. Also, it is observed an average of the scores in the efficiencies (PRSM) of about 0.96. Thus, these countries can also cut spending by 0.04% and retain the same results of their outputs. Our results confirm the theoretical approach that suggests that countries that spend the most are not necessarily the ones who get the best results.

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