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The Relationship between Efficiency of Healthcare Costs and Economic Growth: Empirical Validation from Mediterranean Countries

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ABSTRACT:
The increase of healthcare costs improved as a rule the health of the population. Sometimes the positive effects of this expense are shaded off. On one hand, this expense improves the offer of the medical care. Other influential factors on the health of population, we quote as example the training, the lifestyle, the hygiene and the distribution of income. On the other hand the increase of these expenses must be controlled and assigned in a profitable way to have positive effects on the productivity of the work, on the offer of the hand of work and the training. This could contribute positively on the economic growth. The purpose of this paper is to study the relation between efficiency of healthcare costs and economic growth, for 15 countries of the north and south Mediterranean bank by using econometric techniques given in panel, test of Unit-root and test of cointegration, during period 1992-2010. We notice that, the variable efficiency of healthcare costs contributed positively to the economic growth. We also assure of a better mode of financing without wasting and an important efficiency of the expense in the sector health.

Keywords: *Healthcare costs, Gross domestic product, Human resources, Efficiency economic growth, Test of cointegration, Test of unit-root, Panel data*

INTRODUCTION

The relation between the public spending in human resources and the economic growth was analyzed in several empirical works. The very important majority of these works showed that the public finances in human resources, taken in their totality (health + education), are not still carrier of long-term growth. This can be explained on one hand by the existence of effects of eviction of the investment deprived by the public investment and on the other hand by the bad mobilization and the ineffective allocation of tax revenue.

In this context, the quality of public services plays then a very important role in the process of economic growth where from the necessity of taking into accounts the efficiency of public services in the analysis of their effects on the growth.

The majority of the works analyzed the relation between the part of the spending in health and education with regard to the GDP (Gross Domestic Product) and the economic growth. These indicators were considered as indicator of the size of the public sector. Nevertheless, these indicators do not allow giving enough information as well onto the quality of the production generated by the public spending in human resources as on the

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performances of the Government as producer of public services.

To be able to explain the economic growth from the public spending in human resources, it is necessary to see in a sharper and more precise way the volume and the composition of the public spending necessary for the production of public services in efficient healthy living, susceptible to stimulate the economic growth. The methods of envelope of data (DEA) are considered as a mattering tool to estimate and improve the execution of the operations of manufacturing and service. It was extensively applied in the evaluation of the performances of schools, hospitals, branches of bank, factories, etc. Having calculated the scores of efficiencies of health of all the countries, we verify the quality of healthcare costs affects the economic growth.

Literature Review

Estimation of the Efficiency with the Parametric Approach

Evans et al. (2000) measured the efficiency of health systems by using a panel with fixed effects of 191 countries between 1993 and 1997. The output is measured by the life expectancy corrected by the incapacity and the inputs by healthcare costs (public and private) and the average number of educational years of the adult population. The scores of efficiency orientation output are defined as the ratio between the current performance and the potential maximum.

The results show that the most efficient health systems are the ones of Oman, Malta, Italy, France, San Marino, Spain, Andorra, Jamaica, Japan while most inefficient are especially African: Zimbabwe, Zambia, Namibia, Botswana, Malawi. Evans et al. (2000) estimated the performance of health systems but by building a composite indicator of results (outputs). So, the efficiency of the health systems of countries is judged according to the results affected with regard to five objectives: the level of health and its distribution, the reactivity of health systems and his distribution, and the equity of the financial contribution.

The authors built a composite indication which corresponds to a weighted average of five dimensions (Murray et al., 2000) which they use as measure of the output. The considered inputs are healthcare costs per capita (public and private) in purchasing power ratio and the average number of educational years among the population of more than fifteen years. The results highlight classifications a little bit different from those of Evans et al. (2000).

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

Jayasuriya and Wodon (2003) estimate the efficiency of the educational range of services and the health for a sample of 76 developing countries between 1990 and 1998. They used as output, the life expectancy in the birth and the inputs are the total spending of health a head (dollar on constant 1995) and the literacy rate of the adults. The authors have addition also a temporal trend to capture the technological progress in time and regional dumb variables to allow the border of production to vary by region.

The results, found confirmed that the increase of healthcare costs is not a solution to improve the sanitary results. The authors mentioned that the literacy rate of the adults has a strong impact on the life expectancy; an increase of the 10 % literacy rate would allow to increase the life expectancy about 1, 2 year. The calculation of average efficiency in the sample amounts to 0.85, what implies that countries could improve on average the 15 % life expectancy with the same levels of resources.

Estimation of the Efficiency with the Non Parametric Approach

Works elaborated by Gupta and Verhoeven (2001) measured the efficiency of the public spending (health + education) by using the orientation input in a sample of 38 African countries between 1984 and 1995; the used outputs of health are the life expectancy in the birth, the infant mortality and the rate of vaccinations of the children against the diseases contagious (measles and the DPT). The found results confirmed:

- ✓ Health systems in these countries are inefficient particularly regarding educational range of services and regarding health with regard to the countries of Asia and Latin America.

- ✓ The productivity of the educational public spending and the health in Africa are evolved but less proportional in comparison with countries of Asia and Latin America.
- ✓ The performance of health systems differs from a country in the other one. Certain African countries are more successful than the others: so healthcare costs and educational are associated with sanitary results raised for example in Gambia, in Guinea, in Ethiopia and in the Lesotho while they are associated with particularly low results in Botswana, in Cameroon, in Ivory Coast and in Kenya.
- ✓ The relation between the scores of efficiency and the levels of public spending is negative, what justifies the argument which the increase of healthcare costs is not an optimal solution where from the necessity of an improvement of the budgetary allowances 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 with orientation output). They divided the sample into two groups to solve the problem of heterogeneousness: a group of countries with a per capita income lower than $1500 and other groups with a per capita income included between $1500 and $4500. The used outputs are the life expectancy in the birth, corrected by the incapacity for the people, the life expectancy in the birth, corrected by the incapacity for the women and the infant mortality. An input is considered: healthcare costs a head (in $ international).

Their results show that the efficient countries are either countries where benefited from levels of outputs relatively high considering their level of spending (Bhutan, Bangladesh and Jamaica), or countries with levels of relatively low healthcare costs (Tanzania, Madagascar, Indonesia, China and Sri Lanka). Countries most inefficient are essentially African countries.

Afonso and Aubyn (2005) are interested in the efficiency of healthcare costs and educational for a sample of 24 countries of the OECD, in 2002. They used the method (DEA and FDH orientation input).

The used outputs are the infant mortality and the life expectancy in the birth. The inputs are physical; the number of doctors, the number of male nurses and the number of beds of hospitals (for 1000 inhabitants). The results show that the average efficiency of the Healthcare sector in the sample varies between 0.83 and 0.95 according to the used method. Eleven countries on twenty four are considered efficient with FDH while eight countries are it with DEA but the results obtained with both methods are globally comparable.

RESEARCH METHOD

We suppose that it exists k inputs and of m outputs for n (DMUs). For a (DMU) i, y_i is a vector column of the outputs and x_i is a vector column of the inputs. X (k×n) is the matrix of the inputs and Y (m×n) is the matrix of the outputs

The objective of the method DEA is to build a border not parametric so that all the observations are down or on this curve. Where from the necessity of introducing the ratios outputs/inputs into the specification. That is for every (DMU), we obtain a measure of all the inputs by reports in the outputs such as u' y_i / v' x_i where u is one (m×1) vector of the level-headedness of the outputs and v is one (k×1) vector of the level-headedness of the inputs. To realize optimal level-headedness's, we solve the following mathematical program:

Maximise **u,v** $\left(\frac{u'y_i}{v'x_i}\right)$

S /c $\frac{u'y_i}{v'x_i} \leq 1$, j= 1,…, N , (1)

u, v≥ 0

u and v coefficients associated to every (DMU) are such as the efficiency is maximized when it does not exceed an unit value. Nevertheless, the resolution of this program can give a multiplicity of solutions (for example if (u*, v*) is a solution, then (α u*, α v*) is it also). Thus, we need an additional constraint is necessary to avoid this problem.

The program can be rewritten in the following way:

Maximise u,v $(u'y_i)$

S /c $v'x_i$= 1

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

u, v≥ 0.

The duality of the linear programming allows us to divert a shape "envelopment" of this problem in the context of variable efficiencies of scale:

Minimize $\theta, \lambda\ \theta,$

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

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

n1′ λ=1

$\lambda \geq 0$

Where, θ is an angelfish and λ Vector of constants is one (n×1).

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

This shape of programming, which implies fewer constraints than the previous shape (k+m < n+1), is generally the favorite in the resolution of this type of problem.

The value obtained of θ the score of efficiency for a (DMU) i. She has to satisfy the condition θ ≤ 1. If θ = 1, then we are on the border of efficiency and the DMU is technically efficient.

(1 - θ) the quantity of input is which it is necessary to reduce without modification of output to have an efficient production.

Choice of Inputs

The inputs are corresponding to factors used in the process of production. From the point of view of the health system and within the framework of the production of health, the inputs are many; they can be approached in physical terms (staff, medical equipment, etc.) or monetary and the results will be sensitive to this choice (Afonso and Aubyn, 2005).

The economists chose the variable total spending of health per capita in purchasing power ratio as a better used input because she allows to a certain extent to approach all the controllable inputs by health systems. But the choice of the inputs within the framework of a function of production health lifts debates not solved in the literature.

Authors demanded that the only consideration of healthcare costs is not sufficient to measure the efficiency of health systems. According to Tandon et al. (2003), next to the "direct" inputs (approximate by healthcare costs), the other "indirect" broken inputs participate in the production of health as the per capita income, the educational degree of the population, the quality of the food, the housing conditions or still the access to infrastructures (drinking water, toilets).

The health of the population can be besides strongly influenced by the other factors, such as the presence of certain vectors of disease, the gravity of the epidemic of the HIV/AIDS etc. but because of not availability of the data we adopt in our calculations the following inputs: we introduce a controllable input and a non-controllable input (by the health system), a variable of environment, the educational degree of the population, measured by the literacy rate of the adults. Indeed, even if this variable is not directly controllable by health systems, it is about a determining variable, closely correlated with the income, to explain the sanitary results of a country (Caldwell, 1985).

Choice of Outputs

The output of a health system should correspond at the level of health services offered to the population. According to the relevance of indicators correspond to the offered health services; we use three indicators of outputs to estimate the efficiency of health systems. Three characterize the levels of mortalities:

- ✓ Survival of the children of less than five years.
- ✓ The rates of the survival of the adults.
- ✓ The life expectancy in the birth.

Choice of the Method of Analysis of the Efficiency

The calculation of the scores of efficiency, by arguing with a hypothesis of constant efficiencies of scale bases itself on the model of Charnes et al. (1978). The hypothesis of constant efficiencies of scale is suitable when all the units of decision come true in an optimal scale.

However, an imperfect competition, the governmental regulations or the financial constraints can lead a unity of decision not to realize its production in an optimal scale. Numerous authors then suggested fitting the model DEA to constant efficiencies of scale to be able to take into account situations characterized by variable efficiencies of scale. Banker et al. (1984) so spread the measure of the efficiency to the variable efficiencies of scale by introducing an additional constraint of convexity into the program:

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

The advantage of the specification with variable efficiencies of scale allows is to calculate the net technical efficiency of the effects of efficiency of scale. The measures of efficiency of scale can be obtained for every unit of decision by realizing at the same time an analysis DEA with constant efficiencies of scale and with variable efficiencies of scale. The scores of technical efficiency obtained with constant efficiencies of scale are then decomposed into two elements: the one resulting from the inefficiency of scale and the other one resulting from a "pure" technical inefficiency (that is the technical efficiency with variable efficiencies of scale). If the scores with constant efficiencies of scale are different from those in variable efficiencies of scale for a unit of particular decision, then it means that the latter is characterized by an inefficiency of scale (Coelli et al., 2005).

Our analysis is based on the model with the hypothesis of the efficiencies on variable scales and the orientation input. The choice of the minimization of the inputs seems to suit because: in the first place, we consider that, as in the case of public services, services provided by the state to the citizens are supposed exogenous; secondly, the use of the resources by the studied countries, is generally made in a difficult budgetary context; and thirdly, this choice raises from the type of data that we possess. The values of the inputs are more scattered than those of the outputs; they so allow discriminating better between the scores of efficiency.

At the level of the choice of the efficiencies on scale, we make the hypothesis of the variable efficiencies of scale. It can justify itself on one hand, by the fact that, it is a general approach and, on the other hand, by the consideration of the character multi-outputs in the sector health. Besides, another argument comes to strengthen this choice. It is about the nature of the used data: the use of the included data makes difficult, the identification of the ineffectiveness's of scale.

RESULTS AND DISCUSSION

Analysis of the Scores of Efficiency

We use a combination of inputs and outputs. In our model, we retain as outputs, the life expectancy in the birth, Survival of the children of less than five years and the rate of adults' survival and as inputs, we chose healthcare costs, the literacy rate of the adults. Table 1 shows all scores of efficiency.

Table 1: Relation between healthcare costs and score of efficiency in 2010

Country	Healthcare costs in $	Score of efficiency
PRT	2578	0.91
FRA	3851	0.97
ITA	2836	1
ESP	2941	1
GRC	3010	0.97
BelG	4096	0.91
SLO	3622	0.95
DEN	4118	0.79
GER	3922	0.82
SW	3622	1
MAR	231	1
AL	437	1
TUN	501	1
LYB	502	0.91
EGY	261	0.88

To make out a will if the spending assigned to the public services of the health stimulates or not the economic growth, for a sample datum in panel of 15 countries of the south and north bank Mediterranean, over the period 1992-2010.

Variables Retained for the Analysis

In this part we are going to be interested in an indicator of technical efficiency of the healthcare costs and to know the effect of this variable on the economic growth. Thus our model declines in the following way: a variable in explained that is the gross domestic product per capita according to the following variables:

- ✓ The explained variable is: GDP per capita
- ✓ The explicative variables are:
- ✓ The physical capital.
- ✓ The rate of literacy of the adults.
- ✓ The life expectancy.
- ✓ The indicator of technical efficiency of health services.
- ✓ The rate of dependence.

Table 2 shows all descriptive statistics of all variables used in our study.

Econometric Implication

We built a specification of regression of the growth of the GDP/Capita in Barro (1991). We introduce the indicator of efficiency of sector health as measure of the quality of the public spending of health. We try to use the model following one:

Y= $AK^{\alpha}W^{\beta}$ (1)

Where;

Y: The Gross Domestic Product (GDP).

A: Represent the factor of total productivity (TFP).

K: The physical capital is.

W = EHL, where H is the capital of the workers of the man under the shape of the health, E is the human resources under the shape of the education and L is the number of workers.

The human resources consist of multiple components:

S: The rate of literacy of the adults.

RD: the rate of dependence.

EV: the life expectancy. : Variable health measured by: the indicator of technical efficiency of health services.

We can now rewrite the equation. (1) in the natural logarithm of the following shape:

$$\boldsymbol{LogYit = \theta i + \beta\_1ilog\, K_{it} + \beta\_2ilog\, S_{it} + \beta\_3iLogSeit + \beta\, 4iLRDit + \beta\_5iL\, EV_{it}\, \mu_{it}} \quad (2)$$

The methods of estimation: we estimate in this part the model represented in the relation (2) by using various methods. We propose at first classic values in the context of the data of panel such as the models with fixed or random effects (tables 3 and 4).

Table 2: Descriptive statistics

Variable	Mean	Median	Min	Max
PIB	15854.0	15766.0	626.000	44508.0
Capital	1.04475e+011	3.33997e+010	2.30594e+009	6.74904e+011
RD	55.1684	52.0000	45.0000	87.0000
TA	86.3404	88.0000	42.0000	100.000
EV	75.1719	77.0000	62.0000	82.0000
SE	0.939125	0.975094	0.607595	1.00000
Variable	**Std Div**	**C.V.**	**Asymmetry**	**Ex. aplatissement**
PIB	11376.2	0.717561	0.203442	-1.06781
Capital	1.49633e+011	1.43224	1.72779	1.95135
RD	9.68808	0.175609	1.52137	1.51403
TA	12.2862	0.142300	-1.99589	4.05275
EV	4.37043	0. 0581391	-0.792628	-0.176974
SE	0.0807419	0.0859757	-1.62880	2.91085

Table 3: Impact of score of efficiency of health on the economic growth of all the countries (Fixed effects)

Variable	Coefficient	Erreur Std	t de Student	p. critique	
Const	-20.9932	1.9053	-11.0183	<0.00001	***
LK	0.534368	0.0231764	23.0565	<0.00001	***
LS	0.496007	0.239344	2.0724	0.03921	**
LEV	2.99795	0.487955	6.1439	<0.00001	***
ln_inv_se_	0.530534	0.158261	3.3523	0.00092	***
LRD	0.464253	0.0924473	5.0218	<0.00001	***

* Significant at the Threshold of 10 %
** Significant at the Threshold of 5 %
*** Significant at the Threshold of 1 %

Table 4: Impact of score of efficiency of health on the economic growth of all the countries (Random Effects)

Variables	Coefficient	Erreur Std	t de Student	p. critique	
Const	-24.5469	2.36806	-10.3658	<0.00001	***
LK	0.455186	0.0265265	17.1597	<0.00001	***
LS	0.864284	0.264255	3.2706	0.00121	***
LEV	3.85422	0.60582	6.3620	<0.00001	***
LRD	0.463361	0.116058	3.9925	0.00008	***
ln_inv_se_	0.502512	0.196095	2.5626	0.01092	**

* Significant at the Threshold of 10 %
** Significant at the Threshold of 5 %
*** Significant at the Threshold of 1 %

A. Hausman Test

Useless hypothesis: the values of the MCG are biased.

Asymptotic statistics of test: Chi-2 (7) = 190,258 with p. critic = (0.0000).

We now have to choose the test that we go it to opt while basing itself on the test of Hausman which makes the comparison between the fixed effects and the random effects with 7 degrees of freedom. It consists in testing the no hypothesis of independence between the errors and the explanatory variables with the aim of seeing which test we are going to opt. And because Prob Chi-2 (7) = (0.0000) < 5 %, we have to reject the no hypothesis. In other words the errors depend on explanatory variables. And consequently we are going to accept the test with fixed effect that is all the countries have the same individual effect.

B. Test of Stationary

Before testing the signification of every variable of health and its impact on the economic growth, it turns out very important to test its stationary in other words, if it varies in the tour of its average in time or not. So, we are going to make two tests of stationary know the test Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS).

The standard approach to test the existence or not of a unit root it is the regression Augmented Duckey-Fuller (ADF):

$$\Delta y_{it} = \delta_i + \alpha_i t + \beta_{it} + y_{it-1} + \sum_{j=1}^{p_i} \rho_{ij} \Delta y_{it-j} + \varepsilon_{it}$$

i= 1,…, N
t= 1,…, T

Where:
Δy_{it}=y_{it}-y_{it-1}
t: Linear trend
p: Number of residuals

Test of Levin-Lin-Chu (LLC):

And among the tests of unit root which we apply in this study will be the test of Levin and Al (2002) that is an extension(extra time) of Levin and Linen (1993), and the test (IPS) of Im and al (1997 and 2003). The structure of the test LLC supposes that every individual unit in the panel shares the same coefficient AR (1), but it takes into account individual effects, effects of time and the possibility of a trend of time.

$$\Delta y_{it} = \delta_i + \theta_t + \alpha_{it} + \beta_i y_{it-1} + \sum_{j=1}^{p_i} \rho_{ij}\, \Delta y_{it-j} + \varepsilon_{it}$$

The useless hypothesis H_0 : β_i=0 for all (i).

The delays of the dependent variable are presented to take into account the periodic correlation in the errors.

The statistics of this test LLC is given by:

$$t_\beta^* = t_{\beta=0} - N\widetilde{T}\ \widetilde{S_{NT}}\ \widetilde{\sigma_\varepsilon^{-2}}\ RSE(\widetilde{\beta})\alpha_{\tilde{t}}$$

Or $t_{\beta=0}$ is the statistics associated in $\widetilde{\beta}_i$ under the useless hypothesis of βi=0.

$\widetilde{T}$ = $(T - \overline{p}$ -1) et $\overline{p} = N^{-1}\sum_{i=1}^{N} P_i$

$\widehat{s_{NT}^2}$: is the variance standardized of y_{it}

$\widehat{\sigma_{NT}^2}$: is the variance of the residual

RSE ($\hat{\beta}$): the standard residue is by considering $\hat{\beta}_i$

Under the hypothesis no that is (βi = 0), the test of panel t_β* is distributed as being that normal.

Test of Im-Pesaran-Shin (IPS)

Another test of Im and al (1997 and 2003) called test (IPS) was made to confirm better the results found by the test (LLC). This test represents an extension and a generalization of the test (LLC) this model is represented by the following equation:

$$\Delta y_{it} = \delta_i + \theta_t + \alpha_{it} + \beta_i y_{it-1} + \sum_{j=1}^{p_i} \rho_{ij}\, \Delta y_{it-j} + \varepsilon_{it}$$

The useless hypothesis H_0 : β_i=0 for everything i is examined against the alternative hypothesis H_1 : β_i< 0 for i this test takes into account the heterogeneousness of β_i. While basing itself in the objectives of Pesaran and Smith (1995) on the use of the valuers shared by panel. Thus the test IPS proposes the use of the statistics of t-bar:

$$Z_i = N^{\frac{1}{2}}(\bar{t}\ NT - E(\bar{t}\ \mathrm{NT}))/(\mathrm{var}\ (\bar{t}\ \mathrm{NT}))^{\frac{1}{2}} \quad \text{Où}$$

Where:

$$\bar{t}\ NT(\rho_i) = \frac{1}{N}\sum_{i=1}^{N} t_{iT}\ (\rho_i)$$

And t_{iT} (p_i) is the individual t-statistics to test β_i =0 for quite (i).

Tightened that E ($\overline{T_{NT}}$) and var($\overline{T_{NT}}$) is obtained by the stochastic simulation.

Under the useless hypothesis H_0 of not - stationnarité, $Z_{\overline{T}}$-statistic converges on a normal distribution Z_T→N (0,1).

Results of Test of Unit Root in Panel: (Case of CNMR)

Table 5 shows the results of two tests of unit root in panel; IPS and Levin-Lin.

According to these results, we notice that all the variables are still at level in the threshold 5% that in the threshold 10% because p-value < 0.05. What prevents us from spending in the stage of cointegration which requires that all the variables must be not still?

So and for these reasons we use the method of the data of static panel for 10 countries of the north bank Mediterranean over the period 1992-2010 (table 6).

Table 5: Tests of unit root in panel: Country of the North Mediterranean Region (CNMR)

Test of unit root in panel					
Variables	IPS		Levin Lin		Stationary
	Coefficients	p- value	Coefficients	p- value	
LPIB	-4.235	000	-3.055	0.001	Stationary at level
LK	-3.971	0.000	-2.4815	0.0065	Stationary at level
LS	-4.333	0.000	-2.866	0.0021	Stationary at level
LEV	-6.311	0.000	-5.909	0.000	Stationary at level
LRD	-6.467	0.000	-3.4535	0.000	Stationary at level
L_{INSE}	-5.733	0.000	-3.552	0.002	Stationary at level

Table 6: Impact of score of efficiency on the economic growth case of the Country of the North Mediterranean Region (Random effects and fixed effects)

Dependent Variable GDP	Fixed Effects	Random Effets
C	(-30.28)***	(-34.581)***
L K	(0.41)***	(0.29)***
L TS	(0.57)***	(0.94)*
LEV	(5.67)***	(6.93)***
LRD	(0.509)**	(0.499)**
LINVSE	(0.54)**	(0.725)**
Degré de liberté (K)	5	5
Nombre d'année	19	19
Nombre des pays	10	10
Nombre d'observations	190	190
Prob>**chi2**(5)	0.0000	

* Significant at the Threshold of 10 %
** Significant at the Threshold of 5 %
*** Significant at the Threshold of 1 %

Table 7 shows the results of the method GLS used in our study.

Table 7: Impact of score of efficiency on the economic growth case of Country of the North Mediterranean Region

LGDP	Coefficient	Std Div	Z_stat	P>|Z|
Constant	-56.35047	3.46506	-16.26	0.000 ***
LK	0.0195335	0.0147706	2.32	0.08 *
LS	0.28702	0.5436941	2.53	0.098 *
LEV	12.47359	1.097937	11.36	0.000 ***
LRD	1.7892	0.2224668	8.04	0.000 ***
LINVSE	2.978649	0.3044694	9.78	0.000 ***

* Significant at the Threshold of 10 %
** Significant at the Threshold of 5 %
*** Significant at the Threshold of 1 %

Then, we make the test of unit root in panel for the Country of the South Mediterranean Region (table 8).

Table 8: Tests of unit root in panel: Country of the south Mediterranean Region

Test of unit root in panel					
Variables	**IPS**		**Levin lin**		**Stationnarité**
	Coefficients	**p- value**	**Coefficients**	**p- value**	
LGDP ΔLGDP	- 1.144 -1.484	0.126 0.068	-1.388 -1.728	0.085* 0.041**	Stationary at first difference
LK	-1.491	0.0364	-1.87	0.030 **	Stationary at level
LS	-1.763	0.0225	-1.842	0.0327**	Stationary at level
LEV	-1.3382	0.067	-2.726	0.003**	Stationary at level
LRD	-1.571	0.043	-1.082	0.033**	Stationary at level
LINSE ΔLINSE	0.237 -1.366	0.594 0.042	-1.447 -1.578	0.073* 0.050**	Stationary at first difference

* Significant at the Threshold of 10 %
** Significant at the Threshold of 5 %
*** Significant at the Threshold of 1 %
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C. *Test of Cointegration in Panel*

On the basis of the results of the test of unit root in panel, we proceed to the test of cointegration in panel; we consider that globally, all the variables are integrated of ordre1. The concept of cointegration fear to be defined as long-term systematic Co-movement between two or several economic variables, (Yoo, 2006). The tests of Granger (1981) and Johansen (1988), are indicated for the temporal series and do not handle the data of panel.

Several tests are elaborated within the framework of panels: the tests of absence of cointegration on data of panel proposed by Pedroni (1995, 1997, 1999, 2004), Kao (1999) and Bai and Ng (2001) are residual tests similar to the tests proposed by Engle and Granger (1987) within the framework of the temporal series. Larsson and Ali (2001) and Groen and Kleibergen (2003), were inspired as for them by the works of Johansen (1991, 1995) to propose tests based on the report of credibility in a system where a priori the number of relations of cointegration is not known.

Besides, Pedroni (1995, 1997) proposed diverse tests of cointegration in two stages to arrest the no hypothesis of absence of intra-individual cointegration at the same time for homogeneous and heterogeneous panels in the presence of the only one regresses in the relations of cointegration, Pedroni (1999, 2004) proposes an extension in case the relations of Cointegration include more than two variables and develop seven (7) tests based on the estimation of the residues of the long-term model.

The tests of Pedroni nor take into account the heterogeneousness by means of parameters which can differ between the individuals. So, under the alternative hypothesis, there is a relation of cointegration for every individual, and the parameters of this relation of cointegration are not inevitably the same for each of the individuals of the panel (Hurlin and Cute, 2007). Besides, Kao (1999) also proposed tests of the no hypothesis of absence of cointegration: test of type Dickey-Fuller and test of type Augmented-Dickey-Fuller.

Contrary to the tests of Pedroni, Kao considers the particular case where the vectors of cointegration are supposed homogeneous between the individuals. In other words, these tests do not allow taking into account the heterogeneousness under the alternative hypothesis and are not besides valid only for a bivariate system (i.e. when the only one regresses' is present in the relation of cointegration). Finally, McCoskey and Kao

(1998) have as for them, proposed a test of the no hypothesis of cointegration in heterogeneous panels. It is about a residual test of the multiplier of Lagrange that we can move closer to the test of Shin (1994) elaborated in the case of the temporal series.

Westerlund (2007) then developed four tests of cointegration in panel, the underlying idea being to test the absence of cointegration while determining if the individuals of the panel can adopt each a model with correction of error.

Let us consider the model with correction of following error:

$$\Delta y_{it} = c_i + a_{i1}\Delta Y_{it-1} + a_{i2}\Delta Y_{it-2} + \dots\dots\dots a_{ip}\Delta Y_{it-p} + \dots b_{i0}\Delta X_{it} + b_{i1}\Delta X_{it-1} + \dots b_{ip}\Delta Y_{it-p} + a_i(Y_{it-1} - b_i X_{it-1}) + \mu_{it}$$

a_i it for the series i is the strength of reminder towards the long-term balance $y_{it} = -(b_i / a_i) X_{it}$.

Table 9 shows the results of test of cointegration of Westerlund (2007).

By the result of cointegration we observe four statistics of Westerlund (2007) built with the data five (CSMR). We notice the statistics Gt, Ga, Pt and Pa evokes on one hand the rejection of the hypothesis H_1 of cointegration between the GDP and the variable score of efficiency for the whole panel.

As variables are not cointegrate we considered the model with the command xtgls of Stata 12 who is suited to consider the models in section transverse longitudinal and, at the same time, allows to include the options panels (heteroskedastic) to specify the heteroskedastic structure without transverse correlation of the errors and Corr (AR1) to specify that inside panels, there is autocorrelation of order (1) (table 10).

Table 9: Test of cointegration of westerlund (2007)

Test of cointegration of westerlund (2007)						
Statistics	**LGDP & LK**		**LGDP & LS**		**LGDP & LEV**	
	Coefficients	**p- value**	**Coefficients**	**P- value**	**Coefficients**	**P- value**
Gt	-2.699	0.180	-1.018	1.000	-1.260	0.999
Ga	-7.74	0.921	-3.874	0.996	-3.057	0.998
Pt	-6.046	0.065 **	-1.955	0.999	-1.670	1.000
Pa	-9.795	0.377	-2.550	0.990	-2.205	0.993

Statistics	**LPIB & LRD**		**LPIB & LINVSE**	
	Coefficients	**P- value**	**Coefficients**	**P- value**
Gt	-2.216	0.661	-0.639	1.000
Ga	-1.993	1.000	-1.940	1.000
Pt	-5.825	0.104	-1.534	1.000
Pa	-3.009	0.985	-2.029	0.994

* Significant at the Threshold of 10 %

** Significant at the Threshold of 5 %

*** Significant at the Threshold of 1 %

Table10: Impact of score of efficiency on the economic growth case of the Country of the south Mediterranean Region

LGDP	Coefficient	Std Div	Z_stat	P>ǀZǀ
Constant	-46.97538	13.42692	-3.50	0.000 ***
LK	0.1042519	0.0823783	-1.27	0.206
LS	0.1639167	0.3064924	0.53	0.593
LEV	12.62233	2.681188	4.71	0.000 ***
LRD	0.795643	0.5804236	1.37	0.170
LINVSE	0.5235684	2.4057995	2.56	0.070 **

* Significant at the Threshold of 10 %

** Significant at the Threshold of 5 %

*** Significant at the Threshold of 1 %

CONCLUSION

The public spending in health services represent a very important part in the totality of the public spending. This spending stimulates the economic growth if this spending is assigned in an effective way. The scores of efficiency calculated by the method of DEA show that Mediterranean countries are efficient and their scores of efficiency are close to the unit. What translates the good quality of the sanitary services in these countries? The theoretical approaches confirm that when the quality of health services is good. The spending assigned to the sector of health is carriers of economic growth.

The estimation of the relation to be growth of GDP and the quality of healthcare costs are carriers of the economic growth in countries Mediterranean. In our empirical part we notice that the variable healthcare costs are significant and sets a positive sign. These results confirm the conclusions of Ullmann (2003) which stipulate that in the countries of two Mediterranean banks healthcare costs are assigned in an effective way. Except the case of Egypt and Libya where the quality of health services is modest. When we use your totality both groups of countries. We notice that any increase of 10 % of the quality of the care entrained an increase of 5 % of the GDP.

In a general way and before testing the significance of every variable of health and its impact on the economic growth, it turns out very important to test its stationary in other words, if it varies in the tour of its average in time or not.

So, we are going to make two tests of stationary know the test Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS).

The found results show that variables are still at level for the example of the countries of the north Mediterranean bank. So and for these reasons we use the method of the data of static panel for 10 countries of the north bank Mediterranean over the period 1990-2008. We so notice that any increase of 10 % of the quality of health entrain an improvement of the 5.4% GDP.

Concerning countries (PRSM), all the variables are still in first difference. On the basis of the results of the test of unit root in panel, we proceed to the test of cointegration. We use the test is of cointegration of Westerlund (2007). Four statistics of Westerlund (2007) Gt, Ga, Pt and Pa take up on one hand the rejection of the hypothesis H_1 of cointegration between the GDP and the variable score of efficiency for the whole panel.

As variables are not cointegrated we considered the model with the command xtgls of Stata 12 who is suited to consider the models in section transverse longitudinal and, at the same time, allows to include the options panels (heteroskedastic) to specify the heteroskedastic structure without transverse correlation of the errors and Corr (AR1) to specify that inside panels, there is autocorrelation of order. The found result confirms that any increase of score of efficiency of 10 % health engenders an increase of 5.2 % economic growth.

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