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Abstract

Instead of pushing pupils to learn by rote, the education task should be to develop their cognitive capacities. In addition to education inputs, several ‘non tangible’ variables affect education acquirements, which lead to inefficiency of the education system. In order to evaluate inefficiency, we calculate the distance that separates each pupil from the "better practice border". We also attempt to identify the determinants of this gap, thus putting in evidence inefficiency factors of a particular pupil and his or her school. We use a parametric approach of inefficiency measure based on a Translog stochastic distance function. We estimate this Function for five Middle East and North Africa (MENA) countries (Tunisia, Turkey, Jordan, Qatar and United Arabs Emirates), using their respective PISA surveys (Program for International Student Assessment). We use plausible values in "Mathematics," in "Sciences", and in "Reading" in order to evaluate the education cognitive achievements of students. Our econometric estimation validates the existence of inefficiency effects on the performance of each MENA country’s education systems. The global efficiency mean is about 79%, which means that pupils of the region can increase their performance by 21%. However, we detect divergences between the five countries, the level of efficiency of the Jordan and Turkish pupils are of 83% but it decreases to 63% for Qatar. Marginal effects of school size are negative on inefficiency, but those of truancy and repeating years are positive. Students of international schools and private school are less inefficient in UAE, Qatar and Jordan. Students issued from urban areas and those living in small localities are less inefficient in Tunisia and Turkey.

JEL Classification: I2

Keywords: Education Systems, Inefficiency, MENA Countries

ملخص

بدلا من دفع التلاميذ للتعلم عن ظهر قلب، ينبغي أن تكون مهمة التعليم هي تطوير قدراتهم المعرفية. بالإضـــافة إلى مدخلات التعليم والعديد من المتغيرات "غير الملموســـة" التي تؤثر على متطلبات التعليم، مما يؤدي إلى عدم كفاءة النظام التعليمي. من أجل تقييم الكفاءة، نحسب المسافة التي تفصل كل تلميذ من "حدود الممارسة أفضل". نحاول أيضا التعرف على محددات هذه الفجوة، وبالتالي وضع ف أدلة عدم كفاءة تلميذ بعينه ومدرسته. نستخدم منهج حدودي لقياس الكفاءة على أساس وظيفة المسافة العشوائية وغاريتمية محولة. ونقدر هذه الوظيفة لمدة خمس دول الشرق الأوسط وشمال أفريقيا (MENA) (تونس، تركيا، الأردن وقطر والعرب المتحدة الإمارات)، وذلك باستخدام مسوحات PISA كل منها (البرنامج الدولي لتقييم الطلبة). نستخدم القيم المعقولة في "الرياضيات" في "العلوم"، وفي "القراءة" من أجل تقييم التعليم والإنجازات المعرفية للطلاب. لدينا تقدير اقتصـــادي يؤكد وجود آثار عدم الكفاءة على أداء نظم التعليم في كل بلد من بلدان المنطقة بالنسبة لمتوسط الكفاءة العالمي حوالي 79٪، وهو ما يعني أن التلاميذ في المنطقة يمكن أن تزيد من أدائها بنسبة 21٪. ومع ذلك، فإننا نكشف الاختلافات بين الدول الخمس، ومستوى كفاءة الأردن والتلاميذ الأتراك هم من 83٪ ولكنها تنخفض إلى 63٪ في قطر. الآثار الهامشية مثل حجم المدرسة تؤثر سلبيا على عدم الكفاءة، ولكن الآثار الأخرى مثل التغيب عن المدرسة وسنوات التكرار تؤثر ايجابيا. طلاب المدارس الدولية والمدارس الخاصة هم أكفأ في دولة الإمارات العربية المتحدة وقطر والأردن. أما الطلاب من المناطق الحضرية وأولئك الذين يعيشون في التجمعات الصغيرة هي أقل كفاءة في تونس وتركيا.

1. Introduction

Since their independence, several countries of the MENA region consider education to be an important human capital asset. The global education mean budget in this region is approximately 5.3% of their respective GDP in 2011. MENA education budget shares of the GDP are even greater than those of several countries such as Korea or Singapore (World Bank 2012). However, although there is an increase in the number of years of enrollment in school, MENA countries still suffer from a lack of labor skills. The shortage of skills in the MENA region is the highest according to an ordering of 8 regions (OECD (2014a)).

While measuring the level of education by the number of years spent studying in school, several empirical research (Benhabib and al. 1994; Hanushek and Kimko 2000; Pritchett 2001) deduced that the relationship between education and economic growth is not significant. Nevertheless, Deutsh and al. (2013) specify that the insignificance of this relationship is related to the choice of the education measure. Barro and Lee (2001) argue that quality of education is strongly correlated to economic growth. So it is necessary to use the quality of education in order to appreciate the cognitive requirements that will generate labor skills and allow productivity improvement and then (and consequently) economic growth.

The "popularization" of the education undertaken in MENA countries, reaching the biggest number of children, has facilitated their access to basic education. However, this expansion of basic education to all the population is a necessary but not sufficient condition to acquire the cognitive characteristics required to improve labor skills or productivity. Basic education should develop the cognitive capacities and a pupil's abilities. The education task should not limit itself to pushing the pupil to learn by rote. It must instead develop his or her cognitive capacities; pupils should be able to interpret the information received at school and learn how to integrate it within their own environment. The recent measuresfor cognitive capacities are summarized by estimated scores on the basis of surveys conducted on representative samples of pupils and schools from several countries. Two organizations, the OECD and the IEA (International Association for evaluation of Education Achievement) undertook sets of surveys in several countries in the world: the PISA (*Program for International Student Assessment*) and the TIMMS(*Trends in International Mathematics and Sciences*) surveys.

In 2012, five MENA countries (Tunisia, Turkey, Jordan, Qatar and United Arabs Emirates) were part of the PISA program. The results deduced from 2012 MENA surveys revealed that the scores of the five MENA countries were lower than the average of the 65 participating countries, far behind the scores of the Scandinavian countries and those of Southern-East Asia. Except Turkey and the Emirates, the three other countries were in critical situations; Tunisia, Jordan and Qatar were ranked by PISA in 2012 among the last ten (on a total of 65 countries) and their scores (lower than 390 points) were substantially lower than the PISA mean score (of 500 points). The results of these orderings show that the education systems of some countries in the MENA region do not sufficiently meet the challenges of the 21stcentury and they ought to be reviewed.

One cause explaining the bad ordering of MENA countries is the decrease of the quality of their education inputs. The comparison of the quality index of the school education resources[1](noted **Scmatedu** by PISA) of the MENA countries compared to those of countries at the top of the ranking is self explanatory. Let us take the case of Tunisia and Scandinavia; the index was "***0,84***" for Scandinavia, as opposed to"***-2,56***" for Tunisia.

[1]The index of the school Educational resources "Scmatadu" was derived from seven items measuring school principal's perception of potential factors hindering instruction in their school: shortage of laboratory equipment, instruction material, computers, internet connectivity, computer software, library materials and audio-visual materials.

However, besides the education inputs, several ‘non tangible’ variables, such as the management of these resources, the incentive of the agents involved in the process of education, or the structure of the education system itself affect education achievements. These 'non tangible’ factors lead mainly to a bigger inefficiency of the education system. However, several MENA education policies consider only the constraints imposed by the educational production technology but do not consider the role of the inefficiency component. So a bias characterizes their analysis and limits the range of education policy proposition as they ignore the possibility of inefficiency of the schools and pupils when the inputs in education results are transformed.

In order to tackle the issue of inefficiency in education, many studies use the deterministic non parametric approach, the DEA (Dates Envelopment Analysis). Other studies rather choose parametric stochastic approaches: the SFA or (Stochastic Frontier Analysis) or the SDF (Stochastic Distances Function).

A set of studies analyzing educational inefficiency are limited to information aggregated to the schools’ level. They consider the school as the unit of decision making (Deller and al. 1993; Grosskopf and al 1997). However, the recent approaches, based on individual data, consider the pupil as the center of decision since the impact of the educational policies can differ between various pupils of a same school (Summers and Wolfe 1977; Figlio 1999 and Perlman and al 2011).

In this paper we consider that education is a process in which the pupil uses his own inputs and those of his school. He transforms these inputs in academic results. However, this transformation is affected by the inefficiency of schools and pupils respectively. In order to evaluate inefficiency, we calculate the distance that separates each pupil from the "better practice border". Besides, we attempt to identify the determinants of this gap, by putting in evidence the factors of inefficiency of this pupil and his/her school. We use a parametric approach of inefficiency measure based on a Translog stochastic distance function (SDF-Translog). The use of the SDF efficiency approach measures helps adopt a multi-inputs multi-outputs analysis.

In order to illustrate the potentialities of our approach we provide an application to five MENA countries data from the PISA surveys implemented in 2012 by the OECD. The data is extracted from two questionnaires: (1) an individual questionnaire including several information on the pupils and on the acquirements of their families, (2) a questionnaire, filled by the directors or principal of the schools, relating some information on resources of their schools and on their selection policies and assessment of the pupils. The statistical information of the PISA surveys will help identifying the potential influence of different factors on the school’s performance. We estimate education output elasticity with respect to school inputs, student background, and student peer-group effect. We also investigate differences in student performances. So it will be possible to consider the divergences of the potential efficiencies between the five MENA countries which belong to the same region but have undertook different education policies and different school governance procedures throughout many years. The use of individual data to the pupil's level allows having information on the pupil's efficiency regardless of the education system efficiency or the school efficiency. Hence we can separate the effects due to the capacities of the pupil of those of his or her socio-economic environment.

The paper is structured as follows: Section 2 presents the MENA countries education systems illustrated by summary statistics on education outputs and inputs, but also on Education environment factors using the PISA data base. In section 3, we evaluate the MENA countries education efficiency based on our econometric estimation results. We analyze the effects of the different variables on the education performance and on education inefficiency. The last section concludes and suggests a set of education policies.

2. Education in MENA countries

2.1 The PISA data base

The PISA surveys, led by the OECD, give performance measures of education systems. PISA surveys consider three education fields: Mathematics, Science and Reading. These surveys were based on pupils aged between 15 years and 3 months, and 16 years and 2 months at the beginning of the survey. The surveys' sample sizes are between 4,500 and 10,000 pupils. These pupils are selected from a representative set of schools (public and private). Within each school, pupils are chosen based on different socio-cultural characteristics. The selected pupils must take written cognitive tests carried on “Reading” (language of country), “Mathematics” and “Sciences”.

The selection of the pupils and schools participating in the PISA survey is based on a two levels of stratified sampling plan. The first sampling level is on schools, which are the subject of a systematic sampling with probabilities of selection proportional to their size. The second sampling is on pupils of the selected schools in the previous sampling. After selection of the schools sample , we select a list of 15-years-old pupils. On average, thirty-five pupils are selected by school (OECD, 2014b).

Besides the results of the cognitive acquirements test, the PISA data base includes information on the pupils and on their families, collected from the pupil questionnaire. The survey also includes a second questionnaire, filled by the directors or the principals of the schools, giving information on their school’s resources, the number and the qualifications of their teachers, information regarding the ability of the school to make decisions on the education policies as well as its policy of selection and assessment of the pupils.

2.2 MENA countries PISA surveys

The PISA surveys on the MENA countries will allow evaluating the divergences of the potential efficiencies between five countries: United Arab Emirates (UAE), Jordan, Qatar, Tunisia and Turkey. Those countries belong to the same region but they undertake different educations policies. They accumulate various influences, such as autochthonous regime (Arabian or Turkish), but also French, British, American, German and even Indian regimes, as well as different kinds of schooling educational governance: public, private or mixed governances.

We based our empirical analysis on the 2012PISA surveys of the five MENA countries.We have a total sample of 37,202 pupils and 1,131 schools (Table 1).

2.3 MENA countries education systems

The five MENA countries launched five education policies. Table 1 indicates a first divergence in terms of educational policies. Jordan, but especially Tunisia and Turkey are characterized by the predominance of public schools. However, in Qatar and the UAE nearly half of the schools are private. The social structure of MENA countries must also be considered, Qatar, the UAE and Jordan have an extensive variety of nationalities, due to the great number of foreign workers. On the other hand, the education outputs of each county are affected by its local geographical structure. We will see that the economic and social structures between and within each country affect education performance and even its efficiency.

2.3.1 Qatari education

Nowadays and since 2000, the pedagogical control of Qatari schools is shared between the Ministry of Education and the Superior Council of Education (SCE). School financing by the Ministry of Education decreased. Consequently, several schools became governed by the SCE in order to improve the education quality, especially that of secondary schools, through the creation of independent and more privately governed schools (private schools, private schools

managed by the SCE and international schools).Table 2.-a indicates that 'independent' schools governed by the SCE are about 61.5%. However, the mean of their cognitive scores are less than those of international schools. In the other hand, immigrant students in Qatar are about 42%, their cognitive scores are higher than the native pupils scores.

2.3.2 Emirati education

The education system of the UAE may be a special case in relation to other MENA countries. The variety of nationalities in the country, caused by the high number of foreign workers, leads to an education system based on private schooling following various school programs: English; Arabic, Indian, French or German.

The international private schools' ratio is about 37.4% and have the better education scores. Immigrants students represent 60% and have better scores than those of native students. On the other hand, 61% of schools are in great localities, students in these localities have better scores than students from small localities.

2.3.3 Jordanian education

The Jordanian education system is inspired by the British system. Until the seventies, it had been targeted to children of wealthy families, as public budget had been reduced. In 1987started a plan to upgrade education, representing a big turn in the development of the education system. Between 1988 and 1995, Jordan recorded an important development of the school infrastructures and of the education basis. Since 1996 the Jordan authorities have undertaken additional efforts to improve school inputs quality (programs and education methods, pedagogy of teaching).

In Jordan, 58% of schools are in small localities, however they have lower scores of education than those of great localities. Alright only 20% of students are issued from immigration, those have better scores than native pupils. Only 11.4% of schools are private ones, but they have better education scores than the public ones.

2.3.4 Tunisian education

The Tunisian school programs and teaching procedures are inspired by the public French model. Since the country's independence in 1956, the different governments looked after the popularization of public education in different localities throughout the country. In the 60's and 70's, they allocated many grants to facilitate access to children from all social classes to public education.

In Tunisia, 78% of schools are in small localities; however schools in great localities have better education scores. Less than 3% of schools are private, with education scores lower than public ones. Urban schools, which are about 65%, have better scores, however this scores are lower in urban peripheries.

2.3.5 Turkish education

The Turkish education system is based essentially on public schools, launched with the foundation of the republic in 1923. A differentiation of the education pedagogy between disciplines (general teaching and technical and professional teaching) allowed an adaptation of resources to the specificities of the different types of education, hence improving cognitive acquirements. Turkish schools are managed to develop expertise and skills required by the labor market.

The majority of schools (99%) are public, although the few private schools have better scores. If we consider the nature of schools' education, we have 58% of schools in 'general secondary' with a score of 487 as opposed to 39% in 'professional and technical secondary schools' with a score of 429. If we consider regional disparities, 56% of schools are in great localities and have lower education scores schools in small localities.

2.4 Global performance of education systems

As mentioned above, we consider three outputs: students' scores in "Mathematics", "Sciences", and "Reading" international tests. The Students' cognitive achievement will be more complex and herder to measure.

Education does not limit itself to pupils' capacity to learn by rote, the pupil must be able to interpret the received information and to learn how to integrate it and to act in his environment. A pupil's cognitive achievement is summarized by the PISA cognitive tests scores.

The measurement of cognition quality structure is very diffuse. Cognition score is affected by special circumstances of the pupil and his environment up to the date of the exam (Cordero and al. 2011). Besides, cognition can have several levels and is affected by measurement errors as it is correlated with the pupil's position. PISA analysis uses measures based on the model of Rasch (1960), using 'plausible values[2]' instead of the mean values of a pupil's cognition scores.

Table 3 gives the mean values of 'plausible values' of the three cognitive tests on "Mathematics", "Reading" and "Sciences", as well as the ranking of each country in each of the three disciplines in relation to the set of countries participating in the PISA surveys. Thus we have an overview of the performances of each MENA country in relation to the international standard.

As reported in Table 3:

- The mean of the 'plausible values' in mathematics, sciences and readings of the five countries studied are distinctly lower than that of the 65 participating countries to the 2012 PISA surveys.
- Turkey, the only MENA country member of the OECD, has the best scores on the education outputs quality, even though it predominantly consists of public schools. Jordan and Tunisia's classification, where the majority of schools are public, are far behind.
- Pupils of Qatar and the Emirates, with a greater proportion of private schools, have a different 'plausible values' means. Qatar has the weaker 'plausible values'; it is classified among the last three in the PISA ranking, which refers to a weak performance of pupils in this country. The Emirates on the other hand have 'plausible values' means that are near enough that of Turkey.

As reported in (OECD, 2014a),'plausible values' of pupils from the MENA countries are lower than those of advanced countries such as Korea and Finland which are in the top of the PISA classification. But MENA pupils' cognitive requirements are also lower than those of pupils of the Northern Mediterranean Side countries such as Italy or Portugal. We will try to identify the causes of MENA cognitive weakness.

2.5 Education inputs

Three Education inputs are used in our investigation: (1) the "Economic, social and cultural status" (ESCS) index, measuring the pupil's socioeconomic conditions, (2) the " index of quality of school educational resources" (SCMATADU), measuring the school education

[2]Plausible values are imputed values that resemble individual test scores and have approximately the same distribution as the latent trait being measured. Plausible values were developed as a computational approximation to obtain consistent estimates of population characteristics in assessment situations where individuals are administered too few items to allow precise estimates of their ability. Plausible values represent random draws from an empirically derived distribution of proficiency values that are conditional on the observed values of the assessment items and the background variables (Technical report PISA 2012).

resources and (3) the "peer group effect" (EPG index), measuring the social, cultural and economic levels of the pupil's group.

- The PISA index of "economic, social and cultural status" (ESCS) was derived from the following three indices: "highest occupational status" of parents (HISEI), "highest education level of parents in years of education" (PARED), and "home possessions" (HOMEPOS). The index of home possessions (HOMEPOS) comprises all items on the "indices of Wealth", the "possession of education resources at home", as well as "books in the home". (PISA 2012).

- *The "index of quality of school educational resources" (SCMATEDU)* was derived from six items measuring school principals' perceptions of potential factors hindering instruction at their school. These factors are: i) shortage or inadequacy of science laboratory equipment; ii) shortage or inadequacy of instructional materials; iii) shortage or inadequacy of computers for instruction; iv) lack or inadequacy of Internet connectivity; v) shortage or inadequacy of computer software for instruction; and vi) shortage or inadequacy of library materials. As all items were inverted for scaling, higher values on this index indicate better quality of educational resources (PISA 2012).

- the "Peer groups effect" (EPG) is measured by the mean value of the ESCS of the all pupils of the school (Cordero and al., 2011). The EPG index summarizes the features of the pupil's group (all pupils of his school). A higher value of EPG indicates that the socio-economic conditions of the pupils' families in the school are better.

Table 4 reveals that the pupils from United Arab Emirates and Qatar, which have the greatest proportion of private schools, have wealthy school inputs. However in Tunisia and Turkey, two countries that popularized public education, pupils benefit from the weakest school inputs mean.

2.6 Other education features: environmental factors

Environmental factors are not included as inputs of the education production function but have obvious effects on the efficiency of the education system. Environmental variables do not influence the shape of the education production frontier, but they determine how far the pupil is located from the best practice of this function. We distingue two sets of environmental factors:

(1) Common environmental factors (Gender, Truancy, Repeating years and School size) which are met in each countries Education function (table 5),

(2) Specific environmental factors (resumed in table 3a, 3b, 3c, 3d and 3e) they represent peculiarities of the education system of each country.

Table 5 reports that:

- - In Tunisia and in Turkey the majority of schools are public ones, but in Qatar and Emirates more than half of schools are private.
- - The school size variables (means of the total number of the pupils in each school) effect is not obvious in the literature: Barnett and al. (2002) find that school size may improve the pupil's performance, as we have a sliding scale effect. However Hanushek and Luque (2003) show that the size of the school doesn't have a significant effect on its performance. We will test the effect school size in the MENA Education functions.
- - If a pupil has bad marks, he may repeat the year. "Repeating years" is a usual practice all over the world with the exception of some education systems that tried other strategies. In our analyses we incorporate the variable " Repeating Years " equal 1 if the pupil had repeated at least once and 0 if not. The majority of the studies concluded that 'repeating years' affects the performance of the pupils negatively (Jimerson and al. (1999)). Table 5 indicates that the Tunisian education system have the greatest frequency of 'year repeaters'

three time larger than the other MENA countries. According to (OECD, 2014a) Tunisia is in the 64th rank when we consider Frequency of 'year repeaters'.

- - This table report also that Qatar and UAE have the greater proportion of pupils issued from immigration (60% in UAE, 46% in Qatar). These proportion decrease to 12% in Jordan and it is near zero in Tunisia and Turkey.
- - the ratio of Female and Males are nearly equivalent in all MENA countries.
- - Beside 'year repeating' Tunisia education system suffer for 'Truancy', more than 52% of pupils declare being in late at least one time.

3. Evaluation of Education Efficiency in MENA Countries

3.1 Assessment of education efficiency by the stochastic distances functions.

3.1.1 Educational production frontier

In most parametric studies, a common conceptual tool used to estimate the educational production function is s follows (Levin, 1974; Hanushek 1979):

$$Y_{is} = f(x_{is}\ , I_{is}) \qquad (1)$$

• Y_{is}: Education outputs of pupil “i” in school “s”.

• $x_{is}\ = (x_{1is}\ , x_{2s}, \dots\ , x_{Kis})$: vector of the K inputs of pupil “i” in school “s”.

• I_{is}: Non observed abilities and implications of pupil “i” in school “s”.

Two pupils from the same school, disposing of equal input endowments, can have different outputs, referring to differences in terms of efficiencies. The measure of this efficiency may be accomplished by drawing comparison with the output given by "better practice". We use a function of production frontier (Perlman and Santin 2011) to explain the output gap noted $D_{0is}$of pupil “i” of school “s” against output of the best practice of that education production frontier. We consider the function g(.) representing the best convenient technology used for the transformation of education inputs in outputs. It defines the best way to transform the inputs in education results.

$$D_{0is} = g\ (\ Y_{is}\ , x_{is}\ )I_{is} \qquad (2)$$

This equation, in absence of measurement errors, will allow us to distinguish two distinct effects affecting the school output: the inputs effects $g\ (\ Y_{is}\ , x_{is}\ )$and the inefficiency effect I_{is}. Figure1 gives a simple illustration of the distinction of the two effects for the case of two education outputs (Y_1 *and* Y_2).

Figure 1 represents the set of production possibilities for the case of two education outputs. It illustrates the case of two pupils A and B that benefited for equal quantities of input (same educational resources); however they produce two different levels of outputs.

Pupil B is considered efficient if $D_o(x, y_C) = 1$, since he is located on the educational production frontier. However pupil A is inefficient as he is located below the educational production frontier and then $D_o(x, y_A) = \frac{OA}{OB} < 1$.

3.1.2 Evaluation of the inefficiency

We can use two types of production frontiers, leading to two distinct paradigms of the construction and the evaluation of production frontiers. The first is based on deterministic and non parametric functions: The DEA (Dates Envelopment Analysis), developed by Charnes and al. (1978), the second considers stochastic parametric functions: the SFA (Stochastic Frontier Analysis) and the SDF (Stochastic Distance Function) developed by Aigner and al. 1977; Coelli and Perlman 1999.

The estimation of the educational production function parameters is based on a one year PISA survey. The survey's data is very sensitive to measurement errors due to several reasons: the surveyors' psychological condition, the treatment and the registration of the data and the problem of missing answers. It is therefore more adequate to be based on an approach integrating an error component in the specification of the educational production function. The stochastic parametric approaches (the SFA approach or the SDF approach) are the more suitable specifications. Additionally we note that the stochastic parametric approaches have the advantage, in relation to the non parametric approach (DEA), to allow making statistical inferences.

3.1.3 The SFA Approach

The SFA approach has been introduced initially in 1977 by Aigner, Lovell and Schmid in a context of production frontier analysis. It can be written as:

$$Y_i = f(X_i, \beta) + V_i - U_i \quad (3)$$

Y_i aproduction output, X_i a vector of inputs and β a vector of technological parameters. We have a composite error term $\varepsilon_i = v_i - u_i$, where v_i capture the uncertain effects,we suppose that $v_i \rightsquigarrow N(0, \sigma_v^2)$ and $v_i$are iid. However the second component u_i, captures the effects of technical inefficiency, it is no negative, $u_i \rightsquigarrow N_+(0, \sigma_u^2)$. The term u_i is supposed to be independently distributed from v_i.

3.1.4 The SDF approach

The stochastic distances functions (SDF), which is an extension of SFA for the case of several output (multi-output), have been introduced initially by Shephard (1970). They are the object of an increasing number of applications in different fields such as education, banking and transportation. We approximate our SDF function using a flexible Translog distance function whose coefficients estimate outputs-outputs, input-inputs and input-outputs elasticity in all points of the sample (Perlman and Santin (2011)).

The Translog distances function, for a model of K inputs and M outputs, is defined as such:

$$\ln D_{oi}(x,y) = \alpha_0 + \sum_{m=1}^{M} \alpha_m \ln y_{mi} + \frac{1}{2} \sum_{m=1}^{M} \sum_{n=1}^{M} \alpha_{mn} \ln y_{mi} \ln y_{ni} + \sum_{k=1}^{K} \beta_k \ln x_{ki} + \frac{1}{2} \sum_{k=1}^{K} \sum_{h=1}^{K} \beta_{kh} \ln x_{ki} \ln x_{hi} + \frac{1}{2} \sum_{k=1}^{K} \sum_{m=1}^{M} \delta_{km} \ln x_{ki} \ln y_{mi} \quad (4)$$

y_m $(m = 1,2 \ldots M)$ and $x_k (k = 1,2 \ldots K)$ represent the education vectors of outputs and inputs respectively. The indexes i, m and k represent pupil, output and inputs orders respectively and $\alpha_m, \alpha_{mn}, \beta_k, \beta_{kh}$ and $\delta_{km}$are unknown parameters. The parameters of the bove distance function must satisfy some restriction of symmetry ($\alpha_{mn} = \alpha_{nm}$ et $\beta_{kh} = \beta_{hk}$) and homogeneity of degree one ($\sum_{m=1}^{M} \alpha_m = 1$, $\sum_{n=1}^{M} \alpha_{mn} = 0$ and $\sum_{n=1}^{M} \delta_{mn} = 0$) (Cordero et al. 2011).

In equation (4) the endogenous variable D_{0is} is not directly observed. However this problem may be escaped using the property of homogeneity of the distance function. In itself, the normalization of the distance function by an output y_M is equivalent to impose a degree one homogeneity condition (Lovell and al (1994)). The distance function becomes:

$$\ln(D_{oi}(x,y)/\mathbf{y_{Mi}}) = \mathrm{TL}\left(x_i, \frac{y_i}{y_{Mi}}, \alpha, \beta, \delta\right)$$

Where,

$$\mathrm{TL}\left(x_i, \frac{y_i}{y_{Mi}}, \alpha, \beta, \delta\right) = \alpha_0 + \sum_{m=1}^{M-1} \alpha_m \ln\left(\frac{y_{mi}}{y_{Mi}}\right) + \frac{1}{2} \sum_{m=1}^{M-1} \sum_{n=1}^{M-1} \alpha_{mn} \ln\left(\frac{y_{mi}}{y_{Mi}}\right) \ln\left(\frac{y_{ni}}{y_{Mi}}\right) + \sum_{k=1}^{K} \beta_k \ln x_{ki} + \frac{1}{2} \sum_{k=1}^{K} \sum_{h=1}^{K} \beta_{kh} \ln x_{ki} \ln x_{hi} + \frac{1}{2} \sum_{k=1}^{K} \sum_{m=1}^{M-1} \delta_{km} \ln x_{ki} \ln\left(\frac{y_{mi}}{y_{Mi}}\right) \quad (5)$$

The re-arrangement of the equation (5) terms gives us:

$$-\ln(Y_{Mi}) = TL\ (x_i, \frac{y_i}{y_{Mi}}, \alpha, \beta, \delta) - \ln D_{oi}(x, y) \quad (6)$$

Where $-lnD_{oi}(x,y)$ represent the radial distance function corresponding to the score of inefficiency.

If we note u_i = - *ln* $D_{oi}(x,y)$ and if we add an error term v_i to consider other errors aside from technical inefficiency in the specification of the distance function, we will find the original shape of the SFA approach proposed by Aigner, Lovell Schmidt and (1977):

$$-ln(Y_{Mi}) = TL\ (x_i, \frac{y_i}{y_{Mi}}, \alpha, \beta, \delta) + u_i + v_i \quad (7)$$

The error term $\boldsymbol{v_i}$ will capture the unobserved features of the pupils and the error term $\boldsymbol{u_i}$, resuming the efforts and the incentives of the pupils, teachers and organization not explained by input endowments. We use the estimated parameters from equation (7) to approximate values of the efficiency term $\boldsymbol{u_i}$, noted $E(\boldsymbol{u_i})$. The different environmental variables, affecting inefficiency, will be noted Z_i. So we deduct the following inefficiency equation:

$$E(u_i) = \delta_0 + Z_i\delta \quad (8)$$

3.1.5 SDF approach implementation

Parametric stochastic efficiency measurements are carried out through two stages. In the first stage the scores of inefficiency are supposed to be *i.i.d* (identically and independently distributed) in order to use the approach of Jondrow and al (1982) predicting the inefficiency scores $\boldsymbol{E(u_i)}$, based on estimated parameters of equation (7). In the second stage, we regress the predicted score on a set of variables Z_i, equation (8), using either the Ordinary Least Square (OLS) or the Tobit model. However, the predicted scores are supposed to be function of some specific factors Z_i, they are not identically distributed, unless all coefficients of the factors are simultaneously equal to zero , thus the OLS regression is not permitted (Coellis and Bats 1993). An incoherence of the hypotheses may occur if we use efficiency distribution in the two stages. In order to resolve this problem, a simultaneous evaluation in only one stage is proposed by Coellis and Bats (1995) and integrated in the "Frontier program 4.1" software.

The “Frontier program4.1" also helps testing in a first stage the existence of inefficiency, measured by σ_u^2. When we reject the hypothesis $\sigma_u^2 = 0$, we must use an error correction method based on a Maximum Likelihood (ML) estimator. The ML estimator in only one step of Battes and Corra (1977), use the following likelihood function:

$$L(\beta, \sigma^2, \gamma, y) = -\frac{1}{2}Tln\left(\frac{1}{2}\pi\right) - \frac{1}{2}Tln\sigma^2 + \sum_{t=1}^{T}\ln[1 - \Phi(z_t)] + \frac{1}{2}\sum_{t=1}^{T}(y_t - x_t\beta)^2/\sigma^2 \quad (9)$$

where $z_t = \left[\frac{y_t - x_t\beta}{\sigma}\right]\left[\frac{\gamma}{1-\gamma}\right]^{\frac{1}{2}}$, $\sigma^2 = \sigma_u^2 + \sigma_v^2$, $\gamma = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2}$. and $\Phi(.)$ denotes the distribution function for the standard normal random variable.

The use of the OLS estimation is possible if and only if $\sigma_u^2 = 0$, which is equivalent to the hypothesis that $\gamma = 0$ in equation (9).

3.1.6. Decomposition of pupil inefficiency sources

In our analysis we won't limit ourselves to the evaluation of a score of inefficiency of every pupil regardless of his potential inputs and his environment. We should instead detect sources of this inefficiency. We dissociate inefficiency due to the pupil's effort in one hand and inefficiency explained by his school characteristics on the other hand.

The decomposition of inefficiency will be done through an analysis of the variance of the inefficiency term $\boldsymbol{u_i}$. We suppose that an inefficiency difference between schools (between

efficiency) is correlated with school inefficiency, whereas the differences between the pupils belonging to the same school (within efficiency) are correlated to the pupil's individual inefficiency. So the decomposition of the variance of inefficiency using variance analysis may be written as:

$$S_u^2 = S_{u,B}^2 + S_{u,w}^2 \quad (10)$$

Between school inefficiency variance ($S_{u,B}^2$) summarize the effects of the features of the schools and the incentives of the teachers, the used educational methods and the management strategies. However within school inefficiencies ($S_{u,w}^2$) summarize the effect of the pupil efforts and his implication as well as those of his family.

3.2 Estimation of the parametric distance function parameters

We estimate a Translog-SDF production function with three outputs (Plausible Values in "Mathematics", "Sciences" and "Reading" respectively) and three inputs (ESCS, SCMATADU and EPG indexes) to analyze the education system in the five MENA countries. All variables are deviated to their mean values, so the coefficients of our *Translog* production function are interpreted as elasticity on the mean point (Cordora and al. 2011). Table 6 gives the estimation results of the Translog-SDF parameters.

3.2.1 Significance of inefficiency behavior

All the gamma (γ) parameters of inefficiency are significantly different from 0. This result rejects the hypothesis that the "variances of inefficiency σ_u^2 be equal zero". Therefore, the estimations of the parameters by the least squares estimator will be inadequate. This result justifies the decomposition of the error term, thus we must add the inefficiency terms $\boldsymbol{u_i}$ to the error term (equation 7above).

3.2.2 Outputs and inputs effects

The parameters associated to the plausible values in Mathematics, in Sciences and in Reading are all positive which mean that efficiency increase when, ceteris paribus, the performance in this plausible value improves. On the other hand, the coefficients of the inputs factors have all significant and negative effects, indicating that an inputs expansion leads to reduction in student efficiency keeping the output vector fixed (a result similar to the one of Condero and al. 2011 and Perlmen and Santins 2011).

3.2.3 Efficiency mean values

The estimation of the distance function helps to identify scores of efficiency assigned to each pupil. The scores of this estimation vary between 0 and 1. When this score equal to 0, the education system is totally inefficient. On the other hand if the score is equal to one, we have perfect efficiency.

Table 6 shows that, the mean level of efficiency of the MENA countries pupils is 0.79, which means that the pupils are considered efficient to 79% in relation to the "best practices". Thus pupils of the MENA region may increase their education performance by 21%. However, we detect divergences between the five countries, the level of efficiency is equal to 83% in Jordan and in Turkey but only 63% in Qatar.

However within countries efficiency are different among countries of residence, Economic, and social status (table 7). In UAE students issued from immigration are more efficient than native and students studying in International schools are more efficient than those of other schools. In Jordan also students issued from immigration are more efficient than native, students of great localities are more efficient than those of other localities, and students of private school are more efficient than those of public ones. In Turkey students living in villages and small town are more efficient than those of other localities, student in 'general secondary schools are more efficient than those of other schools. In Tunisia also students living in villages

and small town are more than efficient those of other localities, but urban Tunisian students are more efficient than rural ones. In Qatar, as in UEA, students issued from immigration are more efficient than native and students studying in International school are more efficient than then those of other schools.

3.2.4 Environmental variable marginal effects on inefficiency

The analysis of the effects of the environmental variables (table 8) helps to develop education policies propositions to reduce the inefficiency of education systems in the MENA countries.

Effect of common factors

Table 8 shows that:

- an increase of "school size" contributes to inefficiency reduction in all countries except Turkey. We can say that in the four other MENA countries, governments may have a sliding "economics scales" by increasing School sizes.
- "Female student" are more efficient in Turkey and UAE but more inefficient in the three other MENA countries.
- In all countries "truancy of student" increases inefficiency of education systems.
- *A*s well as "truancy", "Repeating years**"** contribute to inefficiency increases.

Effects of country's specific factors

- *Factors specific to Tunisia***:** Student in "Village and small town" are less inefficient than pupils in "Cities". However pupils in urban areas are less inefficient then those in rural and periphery zones.
- *Factors specific to Turkey***:** As Tunisia, Turkish student in "Village and small town" are less inefficient than pupils in "Cities". On the other hand, student of "general secondary" education are less inefficient than "technical secondary" and "primary education".
- *Factors specific to Jordan***:** Contrary to Tunisia and Turkey, in Jordan student in "Village and small town" are more inefficient than pupils in "Cities". On the other hand, student issued from immigration and student of private schools are less inefficient then others.
- *Factors specific to UAE***:** Student issued from 'immigration' are less inefficient. On the other hand student going to 'international private school' and 'public school' are also less inefficient. However, student in large cities are more inefficient then does in small localities.
- *Factors specific to Qatar***:** As in UAE and in Jordan Student issued from immigration are less inefficient. However, student going to public school are more inefficient then those going to private ones. On the other hand student living in large city are more inefficient than those of small ones. International school have less inefficient student than of other schools.

To sum up, we say that among the peculiar results of table 8 we highlight the effect of migration, which entails a decrease of inefficiency. So if pupil's parents are descended of migration this drives to the reduction of inefficiency. The migrants' families may consider that education could be a social elevator. However effects of "migration" in table 8 are of opposed sign than the ones recovered for Spain (Cordero and al. 2011). This result may be due to the fact that in Qatar and in Emirates migrants have better living standards then the migrants in Spain.

Many Qatar and Emiratis households prefer putting their children in private schools. Our estimation reveals that access to the private school permits a reduction of the pupil's inefficiency.

The five MENA countries launched five education policies. The analysis of marginal effects on inefficiency by country will help to inform about best policies that might be more suitable

for the future education policies in each country. Table 8 reveals that the country of origin and the geographical location also affect the efficiency of the education policies. Thus, if we keep all the input and environmental variables unchanged, the Turkish pupils and the Tunisian are more efficient than the Jordanian, the Qataris and the Emiratis. This result makes evidence of the previous acts of the public education policies in Turkey and in Tunisia. A second explanation is connected to the first date of launching these education policies.

Finally, table 8 shows that the efficiency levels change within countries according to the geographical localization sheltering schools. Student living in “cities” with more than 100000 habitants, are more inefficient than those of small localities, except in Jordan where we have an opposite effect.

3.2.5 Analysis of inefficiency origin using variance decomposition

A second level of the inefficiency analysis can be undertaken while distinguishing the level of inefficiency explained by the effort of the pupil from the school inefficiency. We undertake a variance analysis that differentiate (1) the mean inefficiency of the pupils belonging to a same school (between variance), due to the inefficiency of the school and (2) the variance between the pupils of a same school (within variance) which is due to pupil effort and his engagement as well as those of his family.

Table 9.a show that within school inefficiency are more important than between school efficiency. However, some differences exist between the schools of the five countries. In Jordan, within school inefficiency are about 70%. However in Qatar within and between school variances inefficiency are about 50%.

We must differentiate between Variance of Education inefficiency and variance of Education performance or Education inputs. Tables 9.b give between and within variance of school performance measured by plausible values and Inputs performance measured by ESCS (Economic social and cultural status of student). Conclusions of table 9.b differ from those of table 9.a. In all countries, between school variance of plausible value are more important than between variance of 'education performance', especially in Turkey where between school variance of plausible value are large than 65%. In the other hand, within school variances of inputs are larger than between variance of inputs for all MENA countries. They reach 75% in Qatar and 77% in Jordan.

Results reported in Table 9a show that the greater proportion of inefficiency detected are student inefficiency, except in Qatar. Average school inefficiency is almost 40%. So MENA countries proportion of between variances is greater than those of the Developed countries. In Spain Inefficiency Between variance are about 13% (Cordero et al. 2011). Then MENA have greater inequality of opportunities between schools. Parents in MENA countries have incentives to select less inefficient schools. In Tunisia urban schools are less inefficient than rural ones. In Turkey 'general secondary schools have le lower level of inefficiency. In Jordan and Qatar private schools are less efficient than public ones. However in UAE international school and the less inefficient.

Average proportion of within school inefficiency is about 60%. Then 60% of inefficiency are related to students efforts. All MENA countries must reduce the students 'Truancy', which is a phenomena largely developed in public schools. They must also change policies against less performing students by escaping 'repeating year' strategy, which contribute to more inefficiency of the education system. These conclusions recommend to implement specific policies to improve the academic performance of these students, by hiring support teachers and strangling the role of social workers. But to reduce truancy we must improve public transport of some students, and make incentives toward students to be in time at schools.

4. Conclusion and Education Policies Recommendations

The paper gives a new vision about the determinants of the cognitive acquirements in five MENA countries. We considered an education production function separating inefficiency from input effects and analyze the divergences and similarities of their students results in PISA 2012 through an educational framework. We did our analysis of every pupil's individual efficiency while integrating the information referring to the education system of the country of origin and on the governance of schools.

To detect inefficiency, we started by the estimation of a “stochastic parametric distance” function considering the pupil as the unit of decision, because of the uncertain environment of the educational production function . We measured the pupils efficiency in the MENA region when they transform the school inputs in education outputs, using education performance measured by plausible values as education output. We measured this performance by scores generated by that collected from pupil’s cognitive tests on mathematics, sciences and reading. Our econometric estimation validates existence of inefficiency in the MENA countries education systems.

On the other hand, the analysis of the effects of the environmental variables on the pupil's inefficiency shows that the increase of the school size contributes to the reduction of inefficiency. This result disregards all politics that pushes to reduce sizes of high schools. However Student's Truancy and ‘Year repeating’ didn't bring the obvious proof to improved education performance. Besides, ‘year repeating’ is an expensive solution against pupil’s difficulty: the repeaters are more exposed to the school unhooking risk or to remain longer in the school system, which delays their entry in the active life. Several countries overcame this practice in favor of a more intensive and precocious support to the pupils in difficulty.

To sum up, we consider our results may have implications for MENA Countries educations systems, whose guideline should be focus on enhancing students efforts and reducing inequalities of opportunities between schools. Our paper reveals also that the country of origin and the geographical localization act on the efficiency of the education policies.

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Figure 1: Possibility of Production

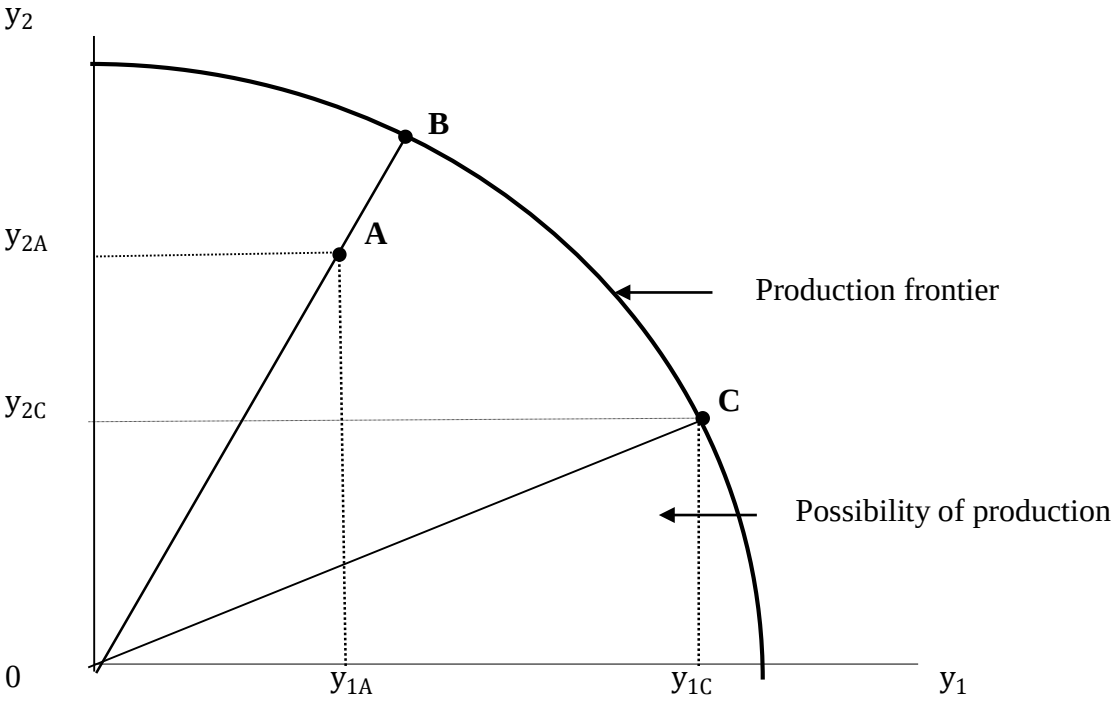

Table 1: Descriptive Statistics on Pupils And School Numbers in PISA Surveys of MENA Countries

Country	Pupil	School	% public	% private
United Arab Emirates (UAE)	10530	422	42	58
Jordan	6813	233	88	12
Qatar	10766	157	57	43
Tunisia	4296	152	97	3
Turkey	4797	167	99	1
Total	37202	1131	69	31

Source : Data base PISA 2012

Table 2a: Education Features in Qatar

	All the Country	Status of pupils		Governance of schools	
		Native	Immigrant	International	Independent
% of pupils	100 %	58.1%	41.9%	35.4%	61.5%
Education output score	385	339	424	460	347

Source: Data base PISA 2012

Table 2b: Education in UAE

		Regional Disparities		Status of pupils		Governance of schools		
	All the Country	Great localities (>100000 hbt)	Small localities (< 100000 hbt)	Native	Immigrant	Local private	International Private	Public
% of pupils	100%	61.2%	38.8%	40%	60%	20%	37.4%	42.7%
Education output score	439	452	419	404	464	463	480	407

Source: Data base PISA 2012

Table 2c: Education in Jordan

	All the Country	Regional Disparities		Status of pupils		Governance of schools	
		Great localities (>100000 hbt)	Small localities (< 100000 hbt)	Native	Immigrant	Private	Public
% of pupils	100%	42.2%	57.8%	80	20%	11.4%	88.6%
Education output score	400	415	387	398	418	447	394

Source: Data base PISA 2012

Table 2d: Education in Tunisia

	All the Country	Regional Disparities					Governance of schools	
		Urban	Urban periphery	Rural	Great localities (>100000 hbt)	Small localities (< 100000 hbt)	Private	Public
% of pupils	100%	41.9%	22.6%	35.5%	21.9%	78.1%	3%	97%
Education output score	396	409	397	380	417	390	334	396

Source: Data base PISA 2012

Table 2e: Education in Turkey

	All the Country	Regional Disparities		Governance of schools		Nature of schools Education			
		Great localities (>100000 hbt)	Small localities (< 100000 hbt)	Private	Public	Primary	General secondary	Technical secondary	Police education
% of pupils	100%	56%	44%	1%	99%	2%	58%	39%	1%
Education output score	463	457	471	503	463	368	487	429	605

Source: Data base PISA 2012

Table 3: School Outputs: Plausible values (VP) in Mathematical, Science and Reading

Pays	Statistics	Math plausible values*	Science plausible values*	Reading plausible values*
UAE	Mean	432.9	447.0	439.7
	PISA classification	48th / 65	44th/ 65	46th / 65
Jordan	Mean	385.9	408.1	401.2
	Standard error	69.7	75.7	82.7
	PISA classification	61th / 65	57th / 65	58th / 65
Qatar	Mean	378.1	385.5	389.5
	PISA classification	62th / 65	63th / 65	64th / 65
Tunisia	Mean	388.9	399.3	405.2
	PISA classification	59th / 65	61th / 65	56th / 65
Turkey	Mean	449.9	464.5	476.7
	PISA classification	44th / 65	43th / 65	41th / 65
MENA countries	Mean	406	419	419
All countries in PISA program	Mean	496	501	493

Notes: ***** The different plausible values represent the averages of the five VP defined by PISA for every pupil and domains of expertise.
Source: PISA surveys 2012

Table 4: Mean of Education Inputs in MENA Countries

	ESCS	SCMATADU	EPG
UAE	4.914	4.974	4.916
Qatar	5.45	5.37	5.45
Turkey	4.2067	4.2111	4.1988
Tunisia	4.7429	3.1929	4.7428528
Jordan	5.8769	4.0882	5.8857

Source : PISA surveys 2012

Table 5: Common Factors for all Countries

Country	Gender		Truancy				Years Repeating	School Size
	Male (%)	Female (%)	None (%)	One or two times (%)	Three or four times (%)	Five or more times (%)	More than one (%)	
UAE	49	51	68.6	22.9	5	3.5	12	897.21
Jordan	47.4	52.6	62.7	26.1	6	5.2	7.9	676.28
Qatar	50.7	49.3	60.7	26.9	7.5	4.9	13.3	811.71
Tunisia	54.2	45.8	47.7	39.4	7.4	5.4	38.7	794.56
Turkey	51	49	56.6	29.9	8.4	5.2	14.2	830.58

Table 6: Translog Distance Function Estimations

			UAE		Jordan		Turkey		Tunisia		Qatar	
			Coef	***T-ratio***	**Coef**	***T-ratio***	**Coef**	***T-ratio***	**Coef**	***T-ratio***	**Coef**	***T-ratio***
Outputs	α_0	Constant	-0.27	*-31.4*	-0.18	*-22.3*	-0.20	*-29.5*	-0.22	*-20.4*	-0.43	*-24.2*
	α_1	*Ln* Y_1 (Plausible Values in Mathematics)	0.33*		0.42*		-0.10*		0.37*		0.58*	
	α_2	*Ln* y_2 (Plausible Values in Sciences)	0.21	*9.75*	0.31	*12.2*	0.51	*20.1*	0.42	*17.1*	0.25	*11.9*
	α_3	*Ln* Y_3 (Plausible Values in Reading)	0.46	*22.7*	0.27	*11.9*	0.59	*28.9*	0.21	*9.84*	0.17	*9.30*
Inputs	β_1	*Ln X1* (Economic, Social and Cultural Status)	-0.16	*-13.9*	-0.23	*-19.5*	-0.04	*-5.82*	-0.02	*-2.27*	-0.15	*-9.92*
	β_2	*Ln X2* (Quality of school education resource)	-0.05	*-7.49*	-0.02	*-2.78*	-0.01	*-0.55*	-0.04	*-4.34*	0.01	*0.44*
	β_3	*Ln X3* (Economic and social mean value of pupils' group)	-0.55	*-25.7*	-0.24	*-11.1*	-0.48	*-32.9*	-0.32	*-22.3*	-0.62	*-20.86*
	σ_u^2		0.03		37. 6		0.03		19.0		0.02	
	Gamma (γ)		0.81		40.8		0.75		36.5		0.86	
	Mean Efficiency		0.771		0.834		0,835		0.797		0.629	

Note: (*) Homogeneity of degree is verified by our estimated specification.

Table 7: Mean efficiency for the Specific Control Variables of Each Country

		Mean	S.E
UAE	Great localities (>100000 hbt)	0,783	0,101
	Small localities (< 100000 hbt)	0,787	0,103
	Native	0.738	0.097
	Immigrant	0.815	0.093
	Local private school	0.796	0.103
	International Private school	0.812	0.100
	Public school	0.770	0.100
Jordan	Great localities (>100000 hbt)	0.861	0.094
	Small localities (< 100000 hbt)	0.832	0.078
	Village and Small Town	0.830	0.095
	Native	0.840	0.090
	Immigrant	0.862	0.082
	Public school	0.840	0.089
	Private school	0.878	0.076
Turkey	Great localities (>100000 hbt)	0.838	0.083
	Small localities (< 100000 hbt)	0.866	0.084
	Village and Small Town	0.889	0.076
	Primary school	0.803	0.093
	General Secondary school	0.864	0.081
	Technical Secondary school	0.828	0.089
	Police education school	0.886	0.037
Tunisia	Great localities (>100000 hbt)	0.845	0.082
	Small localities (< 100000 hbt)	0.841	0.087
	Village and Small Town	0.844	0.085
	Urban	0,846	0,086
	Urban Periphery	0,844	0,081
	Rural	0,840	0,089
Qatar	Great localities (>100000 hbt)	0.655	0.123
	Small localities (< 100000 hbt)	0.649	0.121
	Native	0.567	0.089
	Immigrant	0.707	0.114
	International school	0,749	0,107
	Private school	0,604	0,100
	Independant schol	0,598	0,094

Table 8: Factors of Education Inefficiency

		UAE		Jordan		Turkey		Tunisia		Qatar	
		Coef	**T-ratio**	**Coef**	**T-ratio**	**Coef**	**T-ratio**	**Coef**	**T-ratio**	**Coef**	**T-ratio**
Constant		0.57	22.9	-0.01	-23.6	0.06	1.96	0.19	5.49	0.51	17.6
Factors for all countries											
Z_1 (gender:Female)		-0.10	-15.9	0.18	11.8	-0.07	-9.42	0.03	3.45	0.06	14.3
Z_2 (late for school)		0.04	13.3	0.08	6.01	0.01	2.88	0.01	0.80	0.04	15.6
Z_3 (Repeating years)				0.18	10.9	0.14	16.9	0.15	15.2	0.92	17.4
Z_4 (School size)		-0.04	-9.81	-0.04	-5.19	0.02	20.5	-0.01	-3.45	-0.01	-1.97
Factor specific for each country											
Z Stratum	***Factors specific to Tunisia***										
	City *(More then 100000 hbt)*							0.01	1.31		
	Village & Small town							-0.05	-9.76		
	urban							-0.01	-2.01		
	Factors specific to Turkey										
	City *(More then 100000 hbt)*					0.02	2.05				
	Village & Small town					-0.06	-4.87				
	General Secondary					-0.05	-7.31				
	Primary					0.02	0.15				
	Factors specific to Jordan										
	Immigrant			-0.03	-3.42						
	City *(More then 100000 hbt)*			-0.02	-2.02						
	Village & Small town			0.02	2.34						
	Private			-0.03	-3.34						
	Factors specific to UAE										
	immigrant	-0.12	-20.8								
	City *(More then 100000 hbt)*	0.02	3.32								
	Private International	-0.08	-10.1								
	public	-0.08	-8.99								
	Factors specific to Qatar										
	Immigrant									-0.11	-24.9
	City *(More then 100000 hbt)*									0.01	1.59
	Private									-0.01	-3.03
	International									-0.18	-31.6

Table 9a: Analysis of the Origin of Efficiency by a Decomposition of the Variance

		Tunisia (%)	Turkey (%)	Jordan (%)	UAE (%)	Qatar (%)
Inefficiency	Between school	45.3	40.5	30.1	43.3	49.8
	Within school	54.7	59.5	69.9	56.7	50.2

Table 9b: Analysis of the Variance of Plausible Value and Inputs

VPM	Between school (%)	55.9	68.9	38.9	50.1	51.9
	Within school (%)	44.1	31.1	61.1	49.9	48.1
VPS	Between school (%)	51.6	64.9	39.6	49.3	51.3
	Within school (%)	48.4	35.1	60.4	50.7	48.7
VPL	Between school (%)	58.0	62.7	46.2	55.4	52.3
	Within school (%)	42.0	37.3	53.8	44.6	47.7
Input (PESCS)	Between school (%)	35.4	31.2	22.4	32.0	24.8
	Within school (%)	64.6	68.8	77.6	68.0	75.2