

THE PERFORMANCE OF EDUCATIONAL SYSTEM IN MOROCCO: A SPATIAL ANALYSISIBOURK, Aomar¹
AMAGHOUS, Jabrane²**Abstract**

Education has been a key factor in the development of countries all over the world and the current differences in living standards are largely due to it. In the immediate post-independence period, Morocco was forced to face several a constraint among which is building an educational system³ that meets the growing needs of the society. Despite all the reforms implemented by the public authorities, the performance of the educational system remains very low (the persistence of illiteracy, the enrolment rates are still very low throughout all levels, high proportion of school drop-outs, lower achievement levels, unemployment among graduates and persistent inequalities). The purpose of this paper is to analyze the performance of the Moroccan educational system from a spatial perspective.

Any educational policy⁴ should aim to increase the level of the stock of human capital through investments in public infrastructures (schools, roads...) especially in rural areas in order to reduce disparities and also to ensure high quality education that meets the needs of the current era and the expectations of the society.

JEL Codes: C01, I24, R23

Keywords: spatial analysis, inequality, educational system, Morocco

1. Introduction

Education has been a key factor in the development of countries all over the world and the current differences in living standards are largely due to it. It is worth noting the example of the United States that managed to reach universal primary and secondary education since the second half of the 20th century. This is one of the reasons of the rapid development of the United States as stated by Denison (1962). Becker (1964, p. 12), did not hesitate to point out in these early researches that “no country has experienced a sustained economic growth without investing significantly in its workforce”. In this sense, education has proved to be very successful in explaining certain economic phenomena. The pioneering work of Schultz (1961, 1963), Becker (1964) and Mincer (1958) are considered to be the first attempts clarifying the economic role of education.

In Morocco, the low levels of development in health and education explain the weakness of the Human Development Index (0,646). Indeed, child mortality, that is to say, the mortality of children under 5 years old, is still relatively high (4,7%), and medical coverage is limited to 17% of the population. Despite recent progress in

¹ Aomar Ibourk, aomaribourk@gmail.com, Cadi Ayyad University, Morocco.

² Jabrane Amaghouss, jabrane_widadi@yahoo.fr, Cadi Ayyad University, Marrakech, Morocco.

³ All data on the Moroccan educational system derived from the supervising Ministry unless otherwise indicated.

⁴ All educational policies undertaken to present are based on the following principles: The generalization, Moroccanization, Arabization, decentralization and the unification of education.

expanding access to primary education, more than 40% of the adult population (15 +), representing some 10 million young people and adults were still illiterate and about 1.5 million children were not in school in 2004. In fact, most healthcare services, transport infrastructures and educational centers are located in Kenitra-Settat axis. Despite the fact that Morocco has been involved in a process of extended regionalization, the country's diversity (social, cultural and geophysics) and the complexity of its territory restricts the access to basic services and leads to unequal distribution of education.

Despite the efforts deployed, Morocco is still far from achieving the Millennium Development Goals. This is mainly due to the challenges of population growth, scarcity of resources⁵, weak institutional capacity, higher petroleum prices and volatile prices of food.

This article examines some basic aspects that mark the quantitative evolution of the Moroccan educational system. The second section will draw up a brief overview of the major reforms in Morocco. The third section is about the evolution of the main educational indicators whereby the focus is on spatial and gender disparities. The fourth section tackles the issue of educational inequality. Then we plot the Lorenz curve corresponding. To account for the dynamics of reducing inequalities in education, we opt for plotting a graph and an econometric test of the validity of the Kuznets "Spatial" curve. The sixth section discusses some implications in terms of economic policy.

2. Overview on Moroccan Educational Reforms

2.1 Reforms in formal education

After the independence, Morocco has introduced in 1957 the first Royal Commission charged with the reform of the educational landscape of Morocco. The main focused areas are: the unification, generalization, Moroccanisation and Arabization. In order to address the requirements of the national development and to cope with the growing demand of the primary and secondary education, a set of measures were taken during the reform of 1975 to target the improvement of educational opportunities through establishing new schools and offering the prerequisite training for Moroccan teachers especially in primary education. The 1985 reform comes to respond to the requirements of the application of the Structural Adjustment Program. Within this framework, public authorities have implemented a range of reforms aimed primary at encouraging private education and vocational training in addition to the limitation of foreign scholarships. This reform also stipulated the creation the system of academies and the reorganization of the system of exams in secondary education. Despite all the reforms implemented by the public authorities, the performance of the educational system is very low. In this context, the late King Hassan II established a Special Commission for Education and Training (COSEF) in charge of developing the first consensual project that meets the expectations of Moroccans. Since then, education has been declared one of the national priorities after the territorial integrity. The decade 2000-2009 declared to be the decade of education and training. The National Charter for Education and Vocational Training called for the effective spread of the preschool, elementary and secondary education especially in

⁵ The weak performance of the educational system may be due to hefty staff costs in the operating budgets, this portion represents 90% in 1998.

rural areas, the decentralization and devolution of educational facilities, the renewal of the educational aspect through reform program and teaching manuals. Attention is also focused on reducing gender inequalities.

2.2 Reforms within universities

Since the founding of the first polydisciplinary university (Mohammed V University) in 1959, higher education underwent several reforms:

The reform of 1963 has mainly focused on restructuring Al Quaraoyine University. That of 1975, which was largely inspired by the French university system, covered the general organization of universities with a joint between higher education and scientific research. This reform is mainly based on free education, the spread of scholarships and promoting language learning. The reform of 1978 focused on the structure of LLB law degree going from 3 to 4 years. This year witnessed the foundation of Cadi Ayyad University. The total number of students in the year 1979/1980 was over 74.000 and the number of teachers was around 2170 of which 18% were female. The reform of 1983 was a comprehensive review of programs and plans of examinations in order to link higher education with the requirements of the economic and social development of Morocco to ensure better integration within the global economy. The reform of 1989 aimed essentially at reorganizing the system in order to receive the first Arabized graduates. The number of students in 1989/1990 rose to more than 198000 and that of teachers increased to 6187 of which 22% were women. The reform of 1997 reviews the rationalization and consistency of the administrative and the pedagogical management to enable universities to play their full role in all areas. In general, the 1990's were characterized by the expansion of existing institutions (Faculty of Law at Salé, Settat, and Tangier), the foundation of new institutions (Science and Engineering Faculties, Higher School of Technology and National Schools of Commerce and Management) and the creation of new courses (Applied Degrees, Expression and Communication Technology).

All the reforms that were initiated in Morocco since 1957 have resulted in a blatant failure related to series of problems: very low enrolment rates, rising unemployment among graduates and general mismatch between the educational system and the demands of the labor market.

In this context, The National Charter for Education and Vocational Training was adopted by all the prominent forces that represent the Moroccan people to cope with the new social challenges related to the economic and knowledge globalization. This new system builds upon the necessity of reforming the educational system based on the progressive development of the LMD (Licence, Master and Doctorate), reformulation of the objectives and mission of the universities, strengthening the autonomy of universities, opening up the universities to their socio-economic surroundings and defining the rights and obligations of students.

Despite the strong commitment and deployed efforts and despite few tangible results in some areas, expectations remain strong and there still much to do.

In this difficult situation, an Emergency Plan was implemented for the period 2009-2012. It was a detailed road map which aims at accelerating achieving the objectives of the National Charter for Education and Training.

2.3 Emergency Plan: First review

The first achievements of the Emergency Plan occur in formal as well as university education.

At the level of formal education:

- The construction of 499 new schools between 2007-2008 and 2010-2011;
- The qualification of 2035 school units and 267 boarding schools;
- The supply of drinking water facilities to 2314 establishments and electricity to 632 ones;
- The training and motivation of human resources;
- The improvement of the educational system through the implementation of some actions to improve the quality of education by effective establishment of the integration pedagogy, the improvement of information and guidance system, the promotion of educational research and the spirit of excellence by founding schools of excellence, the establishment of the system of individual follow-up of students and equipping schools with new ICT tools;
- The dropout rate was reduced to 42% for the primary, 19% for the middle school and 36% for secondary schools;
- The increase in the investment budget and the capital recurrent outside the salary expenses to 150% between 2008 and 2011;
- The dynamics of the new reform consider the free distribution of school supplies for primary school learners and for high schools located in rural areas;
- The introduction of financial transfer systems to the poorest rural municipalities. More than 357,000 families and 590.000 students have benefited from this transaction;
- The enrolment rate of the aged 6-11 increased from 84.6% in 2000 to 97.5% in 2010. This increase was of benefit to rural areas (76.7% in 2000 to 95.4% in 2010);

At the level of higher education:

- The increase of educational opportunities in higher education. Also, the total number of students increased from 336.000 in 2007-2008 to reach 370.000 in 2009-2010, which represents an increase of 9%. The number of students enrolled in technical and scientific fields was increased to 54% between 2007-2008 and 2009-2010;
- At the level of diversification and professionalization of university education, the number of students enrolled in professional licences increased to 78% between 2008-2009 and 2009-2010. The academic year of 2009-2010 witnessed the accreditation of 1660 courses with an increase of 47% compared to 2007-2008;
- Progress has also been made in the framework of the 10,000 engineers initiative;
- The launch of the 3300 doctors per year initiative;
- The increase in the number of the scholarship holders between 2007-2008 and 2009-2010 by 27%;
- The increase in the capacity of university halls reception 10.5% in 2008-2009, creating more than 4000 new beds;
- 11,000 students enrolled in the Master possess a scholarship in 2010-2011;

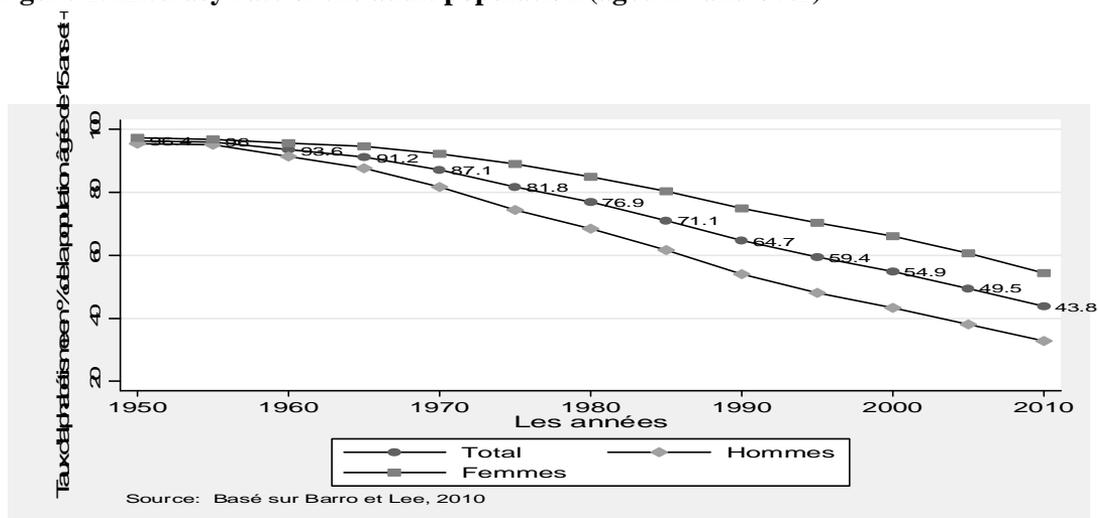
3. The main educational indicators in Morocco

3.1 The persistence of illiteracy

According to Figure 1, there is a continuous decrease in the illiteracy rate in the past five decades. In 2010, this rate touches approximately 43.8% of the population aged 15 and over as it stood at 96% the day after the independence. An overall decrease of 52.2 points in 50 years (Figure 1). This decline in the illiteracy rate however is accompanied by an increase in absolute numbers of illiterate population. This rapid increase in the number of illiterates is due to the weakness of schooling that Morocco knew between 1960 and 2000. Indeed, the number of uneducated people who exceeded 6 million in 1960 amounted in 1990 to 9.6 million. It is in 2010 nearly 10.5 million.

- At the beginning of the independence, illiteracy men and women rate exceeds 91% of the adult population (91.5% for men and 96.9% for women). Despite the positive developments during the period 1960-1950 for both sexes, the phenomenon of illiteracy is still significant for women. In 2010, the breakdown of this rate masks flagrant disparities: illiteracy affects nearly a third of men (32.8%) and more than half of women (54.4%).

Figure 1. illiteracy rate of the adult population (aged 15 and over)



In terms of spatial disparities, the gap between urban and rural areas is very important. According to the results of the General Census of Population and Housing 2004, the illiteracy rate concerns 61% of the rural population (75% in 1994) and only 29% of the urban population (37% in 1994).

The evolution of the illiteracy rate by age brackets (Figure 2) shows that the fall in the illiteracy rate is mainly due to its decline in youth. In addition, for 15-19 years, the illiteracy rate dropped from 93.7% in 1960 to 49.3% in 1990, it was 25.1% in 2010. For the 65-69 years and 70-74 years, the illiteracy rate (respectively of 86.9% and 86.2% in 2010) is still very high.

Figure 2. illiteracy in Morocco by age bracket

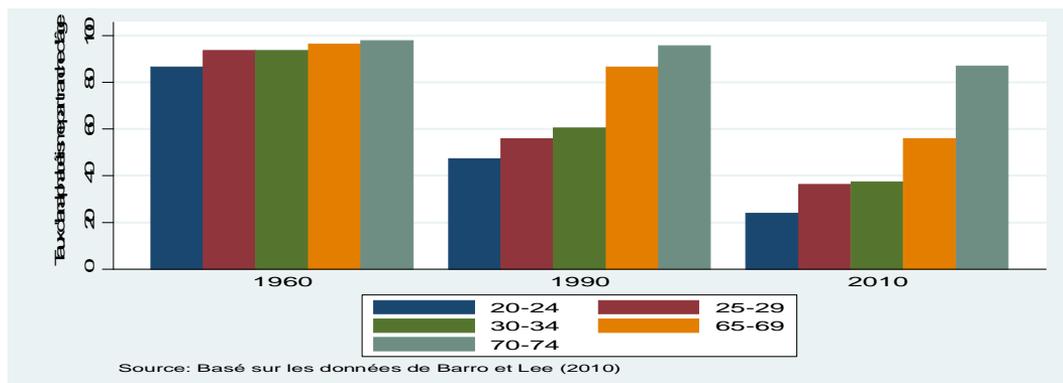


Table 1. Illiteracy rate (in %) by region, population aged 25 and over

Regions	Literacy rate
Oued Ed dahab Lagouira	47,4
Laayoune Boujdour Sakia El Hamra	42,9
Guelmim Essemara	59,3
Souss Massa Draa	63,8
Gharb Chrarda Beni Hssen	59,4
Chaouia Ouardigha	60,5
Marrakech Tensift Al Haouz	65,2
Oriental	56,6
Grand Casablanca	34
Rabat Sale Zemmour Zear	42,7
Doukkala Abda	65,3
Tadla Azilal	68,3
Meknès Tafilalet	55,9
Fès Boulemane	53,5
Taza Al Hoceima Taounat	70,3
Tanger Tétouan	54,1

Source : General Census of Population and Housing 2004

It is readily apparent that the regions realizing high rates of illiteracy are characterized by dominantly rural population, while these rates are less elevated in areas where there is a high concentration of the urban population. Indeed, the evolution of the rate of literacy in Morocco hides disparities between mountainous regions and the other regions (Table1). Thus in 2004, the regions with the highest illiteracy rates are Souss Massa Draa (63.8%), Marrakech Tensift AlHaouz (65.2%), Tadla Azilal (68.3%) and Taza AlHociema Taounat (70.3%).

The geographical nature of these regions makes it difficult to access to education for a large proportion of the population either by lack of infrastructure, by lack of

teachers⁶, or by the reluctance of parents to send their children to school. In these mountainous regions dominates the spirit of the traditional society that considers the school as a foreign element from their locality.

In addition, these five regions are precisely those where the proportion of the Amazigh population is the highest. The Amazigh learn all the more difficultly to write and read Arabic that is not their mother tongue. It is not surprising in these circumstances that the rate of illiteracy in 2004 was the highest in Morocco. The lowest illiteracy rates are recorded in the regions of Greater Casablanca and Rabat-Salé-Zemmour Zear with rates of 34% and 42.7% respectively: These two regions are the most developed and the most potential economic.

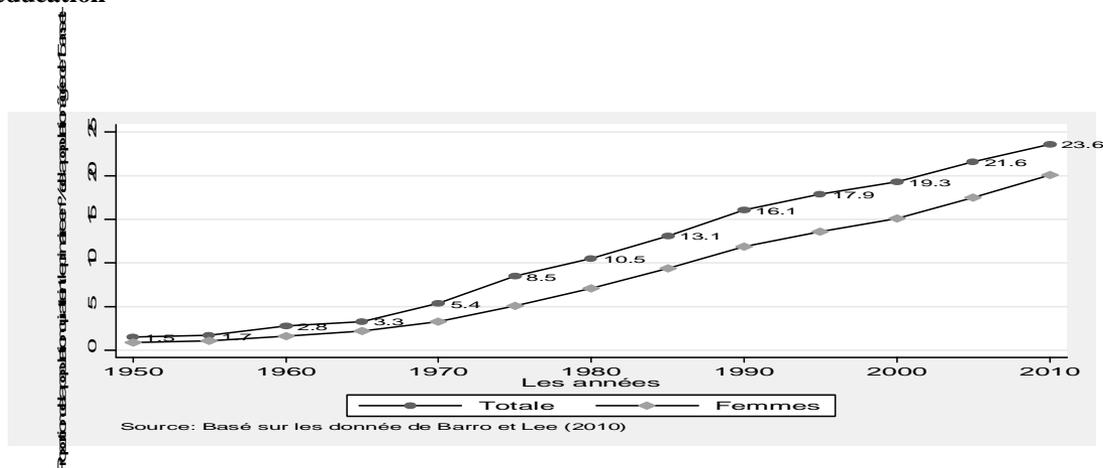
It is interesting to note the decrease in illiteracy rates in regions of the Moroccan Sahara particularly in the regions of OuedEd-Dahab-Lagouira, Laayoune-Boujdour-Sakia AlHamra and Guelmim-Smara, and that is because of the progress made in the field of education in these areas.

3.2 Key indicators in primary cycle, secondary and higher

3.2.1 The primary cycle

Figure 3 plots the evolution of the proportion of the population with primary education.

Figure 3. Proportion of the population aged 15 and Over Having the level of primary education



The day after the independence, the Moroccan children do not generally follow the primary education cycle. In 1960, according to data from Barro and Lee (2010), the proportion of the population with primary level was equal to 2.8%. In 2010, the rate is 23.6%. This reflects the efforts that have been made by policy makers to provide the population with a minimum level of education. However, this positive evolution remains insufficient if we compare Morocco with other countries with similar levels of

⁶ In 2011, more than half of the graduates of training centers for teachers of primary education are affected in these regions

development in the 1960s. Thus, this rate is equal, in 2010, to 28.1% in Tunisia, 59.7% in Syria and 38.8% in Algeria.

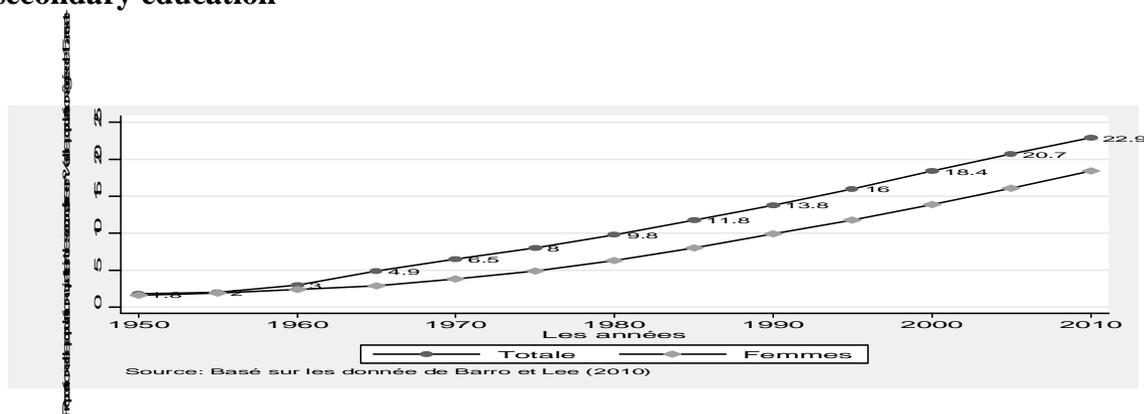
Gender disparities recorded in literacy explain those related to access to primary education. If this disparity remains low until 1960, it began to widen in 1965 before stabilizing from 1990 to decrease slightly in 2010 due to the application of the guidelines of the National Charter for Education and Training which provided for the reduction of gender disparity in access to primary education.

3.2.2 The secondary cycle

In the period between 1950 and 1965, the proportion of the population with secondary (middle school and high school) remained almost stable. From 1965 on, this rate had a very significant rise to triple between 1965 and 1980. This period corresponded to the creation of the Higher Normal Schools, the creation of the Ministry of Secondary and Technical Education in 1968 and the beginning of the program of Moroccanization of secondary education starting from 1978. Between 1980 and 2005, it was barely doubled from 9.8% to 20.7% (Figure 4). This slow evolution reflects the long crisis that Morocco entered. This period coincided with the implementation of the Structural Adjustment Program that aimed at, inter alia, the reduction of expenditures allocated to education.

Before the independence, access to secondary education inequalities was low. Starting in 1960, new education and training policies have neglected the education of girls. Most high schools and middle schools were located in urban areas, which prevented rural girls to pursue their secondary education.

Figure 4. Proportion of population aged 15 and Over Having the level of secondary education



3.2.3 Higher education cycle

Until 1970, the rate of the population with higher level did not exceed 1%. After the 1975 reform, the educational offer experienced an unprecedented development in the history of higher education. Thus, this rate increased from 1.6% in 1975 to 5.4% in 1990 (Chart 5).

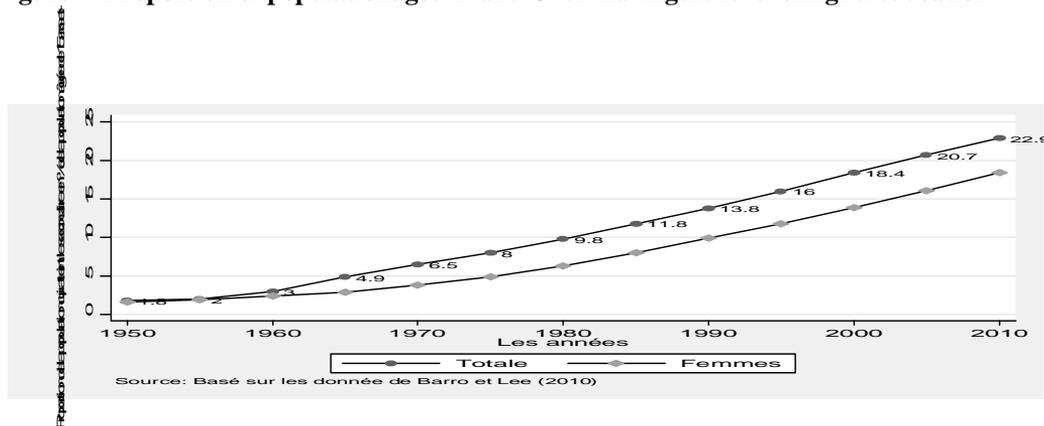
Despite international economic circumstances of the 1990s, higher education has continued its quantitative expansion initiated in the 1970s. Indeed, the total number of students increased from 235,030 in 1993-1994 to 277,428 students in 2003-2004.

Compared to the size of the population aged 15 and over, the number of people with the higher education level is 9.6% in 2010.

The enrollment of women in higher education was characterized by a remarkable evolution in the extent that the percentage of female students has increased from 40% in 1993-1994 to 45% in 2003-2004. However, these developments remain weak since in 2010 only 7% of women aged 15 and over have the higher education level.

The slow evolution of these different rates significantly affects the average year of schooling of Moroccans. This number increased from 6 months in 1960 to 5 years in 2010.

Figure 5. Proportion of population aged 15 and Over Having the level of higher education



3.3 The main educational indicators in Morocco by region

In 2004, the proportion of the population with primary education at the national level is 17.6%, but less than 15% for Doukkala Abda, Tensift AlHaouz Marrakrch, Tadla Azilal El Hoceima and Taza Taounat; it is more than 19% in the region Rabat-Salé-Zemmour-Zair, Meknes Tafilalet, Laayoune Boujdour, Oriental and Grand Casablanca. These developments mark the existence of very deep regional disparities that will continue until the level of middle and secondary levels.

Regional disparities in access to primary education condition those in middle school education since it is in Grand Casablanca, Laayoune and Boujdour, Rabat Salé Zemmour Zair where the highest rates are observed respectively of the order 14, 4%, 12.9% and 11.2%. It is again in the region ElHoceima Taza Taounat that displays the lowest value.

These same disparities will be observed at the secondary and tertiary cycle. It should be noted that two categories of regions can be distinguished according to the rate of population having higher education:

- Those where the rate is higher than the one recorded at the national level, these regions are: Rabat Sale Zemmour-Zear, Fes-Boulmane, Grand Casablanca, as to the region Laayoune Boujdour Sakia El Hamra it recorded an equal rate to the one of national level ;

- Those whose rate is lower than the one recorded at national level;

This is explained by the concentration of educational provision in these areas. In 2004, more than half of the university institutions were located in these regions.

Table 2. Proportion of the population according to educational attainment by region (25 and over), 2004

Regions	primary	lower secondary	secondary	higher
Oued Ed dahab Lagouira	18,4	11,9	11,1	5,5
Laayoune Boujdour Sakia El Hamra	19,9	12,9	12,4	6,1
Guelmim Es semara	16,5	7,5	7,1	4,4
Souss Massa Draa	16	6,3	5,4	3,8
Gharb Chrarda Beni Hssen	17,4	7,6	7	4,6
Chaouia Ouardigha	16,4	8,5	7,5	4,3
Marrakech Tensift Al Haouz	13,7	6,3	5,9	4,4
Oriental	20,2	8,2	6,7	5,2
Grand Casablanca	23,8	14,4	14,6	10,6
Rabat Sale Zemmour Zear	19,2	11,2	12,4	11,6
Doukkala Abda	14	7	6,5	3,9
Tadla Azilal	13,3	6,4	5,7	3,6
Meknes Tafilalet	19,3	8,9	7,7	5,9
Fes Boulemane	19	9,2	8,3	7,5
Taza Al Hoceima Taounat	12,9	5,2	4,2	3,2
Tanger Tetouan	16,9	7,6	6,8	5,5
National	17,6	8,7	8,2	6,1

Source: General Census of Population and Housing 2004

4. An alternative measure: Inequality in Education

Although the amount of education measured by the proportion of the population with a given level of education is generally used to evaluate the performance of education systems, some research is focused to identify an alternative measure that takes into account the inequalities in terms of education. This measurement is generally approximated by the Gini index of education. Thomas, Wang and Fan (2002) define the Gini coefficient for education as compared to the average (average number of years of education) differentials in schooling between all possible pairs of people; it estimates the distribution of the years of schooling across the population:

$$Egini = \frac{1}{\mu} \sum_{i=2}^n \sum_{j=1}^{i-1} P_i \langle Y_i - Y_j \rangle P_j \tag{1}$$

The standard deviation is defined as follows :

$$SDS = \sqrt{\sum_{i=1}^n p_i (y_i - (\sum_{i=1}^n p_i y_i))^2} \tag{2}$$

The number of years of schooling μ is defined as follows :

$$\mu = \sum_i^N p_i y_i \quad (\mu = \sum_{i=1}^{i=7} P_i Y_i). \tag{3}$$

With Egini the index of Gini for education based on education level. μ the average number of years of study of the concerned population. P_i and P_j denote the proportion of the population with education i and j (data available in Barro and Lee (2010)). Y_i and Y_j are the accumulation of years of schooling according to each level of education. n is the number of levels of education. Classification of Barro and Lee (2010) identifies seven levels of study.

4.1 Evolution of the Gini index of education in Morocco

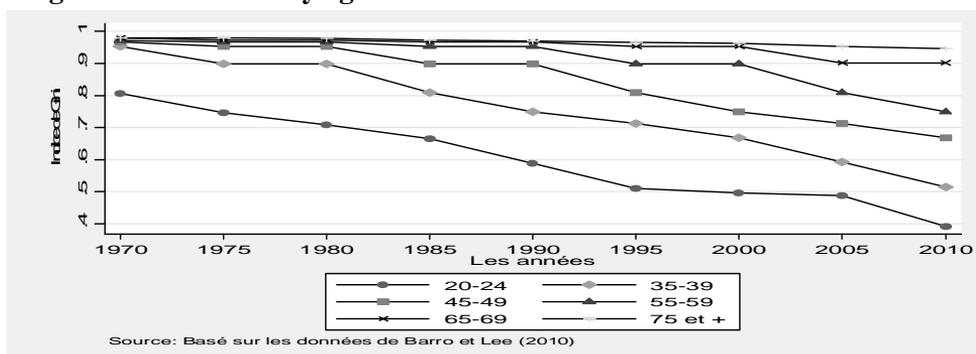
The calculation of the average years of schooling of the population aged 15 and over shows a steady increase in the level of education of Moroccans, thus, moving from 0.28 years in 1950 to five years in 2010. A performance below the average recorded by some countries of the MENA region (Algeria (7.7) Egypt (7.07), Jordan (9.22), Tunisia (7.32)). On his side, the Gini index of education decreased between 1950 and 2010 from 0.97 to 0.56. This reduction is explained by the decline of illiteracy and expansion of the access to primary education. Based on the same methodology, we calculated the Gini index for both sexes. The results show that it has decreased for both sexes between 1950 and 2010. However, the decline in the inequality of women is slower than that of men. Indeed, the Gini index of education for men in 1995 corresponds to that achieved by women in 1980.

Table 3: Average number of years of schooling and Gini index

year	Average years of schooling	Gini index	Gini index for men	Gini index for women
1950	0,28	0,97	0,97	0,98
1955	0,31	0,97	0,96	0,98
1960	0,47	0,95	0,94	0,97
1965	0,69	0,93	0,91	0,96
1970	0,99	0,9	0,86	0,94
1975	1,37	0,87	0,81	0,92
1980	1,79	0,83	0,77	0,89
1985	2,33	0,79	0,72	0,85
1990	2,91	0,74	0,66	0,81
1995	3,45	0,69	0,61	0,77
2000	3,90	0,65	0,57	0,74
2005	4,41	0,61	0,52	0,69
2010	5,00	0,56	0,48	0,64

Source: based on data from Barro and Lee (2010)

Figure 6: Gini index by age bracket in Morocco



The data base of Barro and Lee (2010) provides educational data by age bracket, which makes it possible to calculate the Gini index for all age groups starting from 15 years. The first finding is that inequalities have declined for all age groups. The second finding suggests that the inequalities sharply dropped in age groups 15-19 and 25-24 years. This result can be explained by the fact that they have benefited from progress, quantitative, realized in primary and secondary education. In general, the results show that the more one belongs to a higher age group the more Gini index increases.

4.2 The elusive inequality of Moroccans

Table 4 shows the evolution of the Gini index for some countries of the MENA region between 1970 and 2010. Indeed, in 1970, the countries of the MENA region have very high index of inequalities in education. Countries where education inequalities are most pronounced are Morocco (0.90), Egypt (0.88) and Iraq (0.87). In 2010, the situation has improved significantly for all countries in the MENA region. This finding is largely shared with the results of Thomas et al. (2001). However, the rate of decline in the Gini index for education varies between countries. For countries like the United Arab Emirates, Bahrain, Jordan and Algeria, the Gini index has at least declined by 50% between 1970 and 2010. For other countries such as Morocco, the Gini index declined slowly between 1970 and 2010. The divergences observed between the countries of the MENA region reflect the divergences of the effectiveness of efforts devoted by each country to reduce inequalities in access to different levels of education. The table shows that Morocco, compared to the sample of this study, is the country where the educational inequalities are most pronounced. This finding is easily understood if one takes into consideration the fact that it is in Morocco, where we witness the highest illiteracy rate and the lowest average number of years of schooling in the sample.

Table 4: Evolution of the Gini index of education in the MENA region, 1970-2010

Pays	1970	2010
Algeria	0,82	0,38
Bahrain	0,71	0,20
Egypt	0,88	0,42
Iran	0,82	0,36
Iraq	0,87	0,49
Jordan	0,68	0,30
Kuwait	0,62	0,33
Libya	0,76	0,40
Morocco	0,90	0,56
Qatar	0,71	0,42
Saudi Arabia	0,69	0,30
Syria	0,71	0,37
Tunisia	0,82	0,41
Turkey	0,66	0,30
UAE	0,80	0,28

Source: Authors' calculations based on data from Barro and Lee (2010).

Thomas et al. (2001) point out that even if the countries of the MENA region have managed to reduce the Gini index of education between 1960 and 2000, they are still far from the performance achieved by countries in other regions of the world especially countries of East Asia and Latin America.

5. The dynamics of educational inequalities: a spatial analysis of Kuznets curve

After the pioneering work of Kuznets (1955), a wide range of empirical studies have focused their analyses on the relationship that links the economic inequality-growth through an inverted U-shaped curve. With regard to our problem, our objective is here to provide an overview of Kuznets curve in the field of education.

The seminal contribution of Kuznets (1955) has suggested that income inequality increases as gradually as the average income till it reaches a certain level (which is called the turning point) where it begins to decline as the average income rises further.

Much has been written on the relationship between income inequality and economic growth after the works of Simon Kuznets. In the recent few years, there has been a widely documented literature on Kuznets curve in the field of education. The first applications implemented on Kuznets curve in education went back to Ram (1990) and Londono (1990). Their results have suggested the corroboration of Kuznets hypothesis applied in the field of education. The dispersion of education increases within population as the average of schooling years rises to a level (called critical point) where it decreases through the course of its evolution. Relying on the data of Deininger and Squire (1996) and using a panel model of 108 observations (45 countries), Forbes (2000) confirms the Kuznets hypothesis in the short and medium term.

In a recent work, Thomas et al (2009) have found a significant negative relationship between Gini index for education and the average number of years of schooling. The implementation of Kuznets hypothesis in the field of education has stipulated that reducing inequality in access to education is reached at the end of a mass schooling process.

For the spatial data, we propose to test the relationship between the level of inequality in education and the schooling year number. The specification of Kuznets curve in the field of education for a range of provinces is given by:

$$ei_{it} = a + b\mu_{it} + c\mu_{it}^2 + \varepsilon_{it} \tag{4}$$

ei_{it} is a measurement of inequality in education, i represents the provinces and t indicates the date. In order to study the shape of spatial curve of Kuznets in education for the long term, we opt for two measurements: Standard Deviation of Schooling (SDS) (De Gregorio and Lee, 2002; Lim and Tang, 2008; Morrisson and Murtin, 2010) and Gini index (GI) as calculated in the third section.

The determination of the turning point μ^* is given from the deviation of equation (4):

$$\frac{\partial ei}{\partial \mu} = b + 2c\mu \tag{5}$$

The first order condition enables us to write:

$$\begin{aligned} \frac{\partial ei}{\partial \mu} = b + 2c\mu^* &= 0 \\ \mu^* &= \frac{-b}{2c} \end{aligned} \tag{6}$$

The second order condition enables us to write:

$$\frac{\partial^2 ei}{\partial \mu^2} = 2c \tag{7}$$

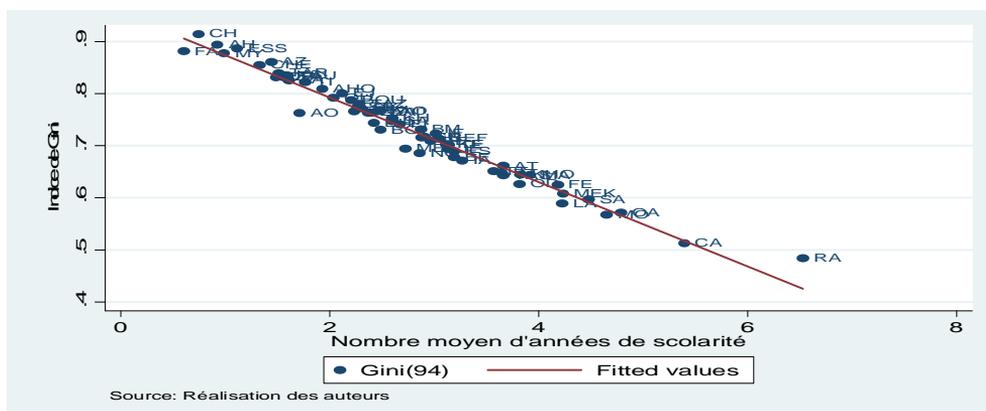
Table 5. The estimate of Kuznets “spatial” curve in Morocco, 1994-2004

	1994	2004		
		Rural	Urbain	Total
μ	1.202***	1.013***	0.891***	0.903***
μ^2	-0.100***	-0.085**	-0.055**	-0.0604***
const	15.901***	1.740***	1.905***	2.043***
F test	F(2,58) = 270.39	F(2,56)=247.15	F(2,57)=86.53	F(2,58) = 270.39
	Prob>F=0.0000	Prob>F=0.0000	Prob>F=0.0000	Prob>F=0.0000
R-sq	0.9418		0.78	0.91
Turning point	6.01	5.96	8.1	7.53

Source: Authors' achievement

The econometric results have clearly shown the verification of the inverted U-shaped Kuznets curve for both periods and regardless the place of residence. The results also provide an estimate of the turning point. This turning point is defined as the optimal value of the average number of schooling years that government may need to target. Comparing the number of schooling years of each province with the optimal value could therefore help to redefine the priorities of public education policies. In 2004, the turning point is estimated at 7.53 years versus about 6 years in 1994. The figure has clearly shown that only two provinces that reach beyond this “inflection point” are Casablanca and Rabat. These two provinces have entered therefore a second phase which is characterized by the reduction of the standard deviation of schooling as the average of schooling years increases further. Yet, other provinces are still in their early stage of development. In these provinces, enrollment in primary and secondary levels leads to the enlargement of the standard deviation of education and also increases the educational attainment of the population. The provinces of Fchs-Angra, Chichaoua, Al Haouz and Moulay Yacoub are far from reaching the optimal value of the average schooling in both 1994 and 2004. These results indicate a remarkable divergence among the provinces. The validity of Kuznets curve is fundamentally depending on the used measure to approximate inequality. Thanks to this; when we use the Gini index, the shape of the figure (8) indicates the invalidity of the Kuznets curve of education in 1994 and 2004.

Figure 8 Kuznets “spatial” curve for education, an estimate by the Gini index 1994



If the current trend continues, Morocco will not achieve the Millennium Development Goals (MDGs), especially in the part relating to education. If the goal Education for All is almost reached, the promotion of inequality, reducing disparities in primary and secondary cycles respectively, if feasible in higher education cycle, is far from being feasible.

The emergency plan, which involved very large sums, has reached its last year. Policymakers must now think about other alternative reforms (including our suggestions cited in Section 6) so that in 2015; the MDGs will be a reality and not a myth.

In Morocco, the education system is in a difficult situation. The efforts made are remarkable, but the situation remains alarming for many individuals who are still outside the education system. The high illiteracy rate may push Morocco into underdevelopment. In this context, the scarcity of qualified human resources substantially alters the profitability of the educational system and therefore reduces the potential for economic development via a weak externality on the other channels of development.

Any educational policy⁸ should aim to increase the level of the stock of human capital through investments in public infrastructures (schools, roads ...) especially in rural areas to reduce the disparities already mentioned above. In these areas, the lack of infrastructure hinders the improvement of the living conditions where the persistence of low levels of education that annihilates all reform efforts and therefore seriously handicaps the development process.

Although the level of accumulation of human capital contributes to economic growth of countries (Mankiw et al 1992. Aghion and Howitt, 1998; Spiegle, 2005), its accumulation at the local level could be a good way to measure the evolution of economic performance of regions (Cardenas and Pontoon, 1995). For example, wage differences between regions are largely due to the level of human capital accumulation in Brazil (Azzoni and Servo, 2002). In general, regions that invest more in human capital accumulation are growing rapidly (Rey and Janikas, 2005). We hereby ask the following question: to what extent these inequalities are related to socioeconomic inequalities? The response to this question will be discussed in future work.

References

- Aghion, P. & Howitt, P. (1998). *Endogenous Growth Theory*. Cambridge, MA. MIT.
- Alama, A. et Vélaz de Medrano, C. (Dir) et Chedati, B. (2008). *Equidad y políticas públicas en educación y formación básicas en Marruecos*. En C. Vélaz de Medrano (Dir.), A. Alama, A. Euceda, N. Massé y M^a J. Vitón (Coords.).
- Azzoni C. R., Servo L. M. (2002) Education, cost of living and regional wage inequality in Brazil. *Papers in Regional Science*, 81(2), 157-175.

⁸ All the educational policies conducted until today based on the following principles :The generalization, Moroccanization, Arabization, decentralization and the unification of education.

- Banque Mondiale, (1999). Stratégie du secteur éducatif. Washington D.C, The World Bank Human Development Network.
- Banque Mondiale, (2003). Rapport Mondial sur le Développement. *Oxford University Press*, New York.
- Barro R.J. et Lee J.W. (2001), International Data on Educational Attainment: Updates and Implications, *Oxford Economic Papers*, 53(3), Academic Research Library, 541-563.
- Barro R.J. et Lee J.W. (2010), A New Data Set of Educational Attainment In The World. 1950–2010, *NBER Working Paper series 15902*.
- Becker G. (1964), Human Capital, *the University of Chicago Press*, Chicago.
- Cardenas M, Pontoon A. (1995). Growth and convergence in Colombia: 1950-1990. *Journal of Development Economics*, 47, 5-37.
- COSEF (1999), Charte Nationale de l'Education et de la Formation .
- Conseil Supérieur de l'Enseignement (2008), Etat et Perspectives du Système d'Education et de Formation, *Réussir l'Ecole Pour Tous* Vol. 1.
- De Gregorio, J., & Lee, J. W. (2002). Education and Income Distribution: New Evidence from Cross-Country Data. *Review of Income and Wealth*, 48(3), 395-416.
- Deininger K, and Squire, L. (1996), A New Data Set Measuring Income Inequality, *World Bank Economic Review*, Vol. 10 (September), pp. 565–91.
- Dessus S. (2000), Capital humain et croissance : le rôle retrouvé du système éducatif, Institut D'Economie Publique (IDEP) , *Economie publique*, p 95-114, Février, Paris.
- Equidad y políticas públicas en educación y formación básicas: estudio de casos en América Latina, África Subsahariana y Magreb. Madrid. Ed. Siglo XXI Fundación Carolina. Cap. 5.3.
- Forbes, K. J. (2000). A Reassessment of the Relationship between Inequality and Growth. *American economic review*, 90(4), 869-887.
- Gurgand M. (2005), *Economie de l'éducation, édition la découverte*, Paris.
- Haut Commissariat au Plan (HCP), Rapport de développement humain (RDH50).
- Kuznets, S. (1955). Economic Growth and Income Inequality. *American Economic Review*, 65(4), 1–28.
- Lim, A. S. K., & Tang, K. K. (2008). Human Capital Inequality and the Kuznets Curve. *The Developing Economies*, 46(1), 26-51.
- Londoño, J. L. (1990). Kuznetsian Tale With Attention to Human Capital, Paper presented at The Third Inter-American Seminar in Economics, Rio De Janeiro, Brazil.
- Mankiw, G., Romer, D., & Weil, D.N. (1992). A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics*, 107(2), pp.407-437.

- Ibourk, A., Amaghouss, J. *The Performance of Educational System In Morocco: A Spatial Analysis*
- MEN (2005). Réforme du système éducatif : bilan et perspectives, département de l'éducation nationale, ministère de l'éducation nationale, de l'enseignement supérieur, de la formation des cadres et de la recherche scientifique, Rabat.
- MEN (2007). Bilan à mi-parcours de l'Education pour tous 2000-2007, Rabat.
- Mincer, J. (1974). *Schooling, Experience, and Earnings*, New York: NBER Press.
- Morrisson, C., & Murtin, F. (2010). The Kuznets Curve of Education: A Global Perspective on Education Inequalities. Centre for the Economics of Education, CEE DP 116.
- PNUD (2007). *Rapport Mondial sur le Développement Humain 2007/2008*, New York
- Ram, R. (1990). Educational Expansion and Schooling Inequality: International Evidence and Some Implications, *The Review of Economics and Statistics*, 72(2), 266-27.
- Rey S. J, and Janikas M. V. (2005) Regional convergence, inequality, and space. *Journal of Economic Geography*, 5(2), 155-176.
- Royaume du Maroc (2005). Initiative Nationale de Développement Humain (INDH), Rabat.
- Royaume du Maroc (2005). *Rapport national sur les Objectifs du Millénaire pour le développement*, Rabat.
- SECAENF (2007). Enquête Nationale sur l'analphabétisme, la non scolarisation et la déscolarisation au Maroc, décembre 2006, Rabat.
- Schultz T. W.(1961). Investment in Human Capital, *American Economic Review*, vol. 51, p. 1-17.
- Tawil, S. et S. Cerbelle (2010). *Education au Maghreb : Tendances, défis et perspectives*. Rabat. Bureau multipays de l'UNESCO.
- Thomas, V. & Yan, W. (2009). *Distribution of Opportunities Key to Development*. In "Inequality in education, Comparative and International Perspectives". Edited by Donald B. Holsinger & W. James Jacob. Springer.
- UNESCO/ BRED A, (2007). *Education Pour Tous en Afrique : L'urgence de politiques sectorielles intégrées*. Rapport Dakar + 7, résumé exécutif, Dakar.
- UNESCO/BREDA, (2006). *Education Pour Tous en Afrique, statistiques et Analyses sous régionales*, Rapport Dakar + 6, Pôle de Dakar, Bureau Régional pour l'Education en Afrique (BREDA).

Annex.**Table 7 List of provinces**

Province	code	Province	code
Agadir Ida Ou Tanane	AT	Khouribga	KHO
Al Haouz	AH	Laayoune	LA
Al Hoceima	AHO	Larache	LAA
Aousserd	AO	Marrakech	MA
Assa Zag	AZ	Mediouna	ME
Azilal	AZ	Meknes	MEK
Beni Mellal	BM	Mohammedia	MO
Benslimane	BE	Moulay Yacoub	MY
Berkane	BE	Nouaceur	NO
Boujdour	BO	Ouarzazate	OU
Boulemane	BOU	Oued Ed Dahab	OD
Casablanca	CA	Oujda Angad	OA
Chefchaouen	CHE	Rabat	RA
Chichaoua	CH	Safi	SA
Chtouka Ait Baha	CB	Sale	SA
El Hajeb	EH	Sefrou	SEF
El Jadida	EJ	Settat	SE
El Kelaa Sraghna	KS	Sidi Kacem	SK
Errachidia	ER	Skhirate Temara	ST
Es Semara	ES	Tan Tan	TT
Essaouira	ESS	Tanger Assilah	TAS
Fahs Anjra	FA	Taounate	TAU
Fes	FE	Taourirt	TAO
Figuig	FI	Taroudannt	TAR
Guelmim	GU	Tata	TA
Ifrane	IF	Taza	TAZ
Inezgane Ait Melloul	IA	Tetouan	TE
Jerada	JE	Tiznit	TI
Kenitra	KE	Zagora	ZA
Khemisset	KH		
Khenifra	Kh		