

**DETERMINANTS OF EDUCATIONAL ACHIEVEMENT IN MOROCCO : A
MICRO-ECONOMETRIC ANALYSIS APPLIED TO THE PIRLS STUDY**
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Abstract.

Based on data from international surveys measuring learning (PIRLS), this article focuses on the analysis of the academic performance Moroccan students. The results of the econometric model show that the students' characteristics, their family environment and school context are key determinants of these performances. The study also shows that the Moroccan educational system is segmented: urban versus rural and public versus private. This double duality illustrates clearly that the Moroccan education system is a juxtaposition of a "categories" rather than a "unified" market.

JEL Codes: I21, I28; C13

Keywords: Morocco, Education, academic achievement, PIRLS, quantiles regressions

1. Introduction

The educational system in Morocco has undergone several reforms (Amaghouss & Ibourk, 2012). In order to accelerate the implementation of the National Charter of Education and Training, an Emergency Plan (2009-2012) has been implemented. Quantifications achievements of this program are significant on several levels:

- Expanding the reception capacity of: Between 2007/2008 and 2010/2011, the inauguration of 499 establishing which 205 primary schools, 158 colleges and 136 high schools. Or a growth rate of 5.42%. For preschool, 903 structures were created. The coverage rate of rural communities in colleges increased from 49.7% to 56% for the same period.

- In access level: The number of enrolled in preschool increased 10.58% nationally over the same period, the rate of female enrollment in preschool has increased by 8.59%. The enrollment rate at primary, college and qualifying has grown from 5.80% in 2010/2011. The number of new entrants in the first year has brought a growth rate of around 1.9%. This positive development is mainly seen in girls.

For the education of the tranche âge 12-14 years, the rate of achievement was 106.17% in 2010. A marked improvement in enrollment of the age 15-17 years was observed (109%). For female, this rate exceeds 110%.

- At the level of retention: The phenomenon of repetition is still high for both the primary and secondary levels. However, this rate has declined by more than 25%. The rate of school dropout knows a dramatic change. Thus, the dropout rate has experienced a significant decrease between 2006/2007 and 2009/2010 of 42%, 19% and 36% respectively for primary, college and qualifying (the number of students who drop out has decreased by almost 140 000 between 2006/2007 and 2009/2010). Regarding the completion, improvement is also observed in all three cycles (86.50% for primary, 64.60% for college and 36.20% for secondary schools).

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- At the level of gender: Achieving gender equality in schooling is a major challenge for the government (2013a). The enrollment ratios of girls in primary and secondary education have increased significantly. This improvement is due to the expansion of educational opportunities for girls in primary school. The ratio of gender between rural and urban preschool was decreased between 2007/2008 and 2010/2011. Parity between rural and urban areas is satisfactory for the primary, but the rate recorded in the secondary (college and qualifying) remains low. An important part of the rural population is school age enrolled in secondary schools in urban areas because of the low coverage and secondary schools in rural areas.

However, these achievements are insufficient in relation to the requirements of the strategy of sustainable human development that the country claims (Amaghous & Ibourk, 2013b). The dropout rates remain high "23% of a cohort of first-year elementary able (with repetition) in the final year of secondary education and 13% earn a bachelor's degree" (CSE, 2008). Morocco's poor performances in international surveys of learning measures (TIMSS, 1999, 2003, 2007 and PIRLS 2001, 2006) justify the qualitative delay.

This paper analyzes how some factors, such as family background, type of school and even student himself, affect educational achievements. Moreover, the question raised by this paper is how these factors behave among good students, average students and poor students.

The econometric approach proposed in this paper is innovative. However, endogenous variable presents many variations, so linear regression based on the mean estimation is not appropriate. That there is more than a single slope (rate of change) describing the relationship between endogenous variable and exogenous variables. We show in this paper that quantile regression approach which estimates multiple rates of change (slopes) from minimum to maximum response, provide a more complete picture of the relationship between variables missed by linear regression.

The remainder of this paper proceeds as follows. The first section exposes, through a literature review, how education can explain several economic phenomena. The second recalls the main descriptive results. The third section presents the data used as well as the methodology adopted. The fourth section shows the econometric estimations followed by some comments. The last section is dedicated to policy implications and some recommendations.

household behaviour and family economics, human resources, incomes distribution, human development, migration, business management, marketing, consumer behaviour It also provides a friendly platform for academic and application professionals from crossing fields to communication together.

2. Literature review: The determinants of the students' performance in reading skills

Several studies have dealt with the supposed factors that may influence the mastery level of reading skills among students. Baker, Dreher, & Guthrie (2000); Snow, Burns and Griffin (1998) have raised the role of attitudes and motivation. Thus, a positive attitude towards reading is crucial to reach the good mastering over reading skills (PIRLS, 2001). However, the behavior towards reading is influenced by several factors including the cultural ones.

In this respect, Chen et al. (1995); Ogbu (1981); Wang & Guthrie (2004) have examined specific aspects of literacy between different cultures. For example, the cultural values of Asian Americans have a strong impact on their attitude towards reading. Parents are considered to be the significant transmitters of the cultural values. Indeed, Studies of Baker, Scher and Mackler (1997) have provided us with the empirical evidences which confirm that the attitude of parents towards reading is highly correlated with that of their children regardless of their socioeconomic status. On their side, Guthrie and Greaney (1991) have shown that parents visiting libraries with their children affect positively the latter's behavior towards reading.

A person's family background plays also an integral role. Students belonging to families where literacy-related activities in their homes are dominant tend to adopt favorable attitudes towards reading. In fact, Hansen (1969) have analyzed the relationship between the attitude of the fourth grade pupils towards reading and reading in an independent manner. The outcome suggest that students' home literacy environment has significantly correlated to the independent reading.

In the same way, Rowe (1991, 1992) has analyzed the behavior of about 6000 students aged 5 to 14 years old in Australia. The out-findings suggest that there is a strong relationship between home reading activities and the attitude of these students towards reading. Neuman (1986) have affirmed that the parental support and encouragement for reading affects positively the fifth grade pupils' performances in reading.

The impact of the pupil's family background differs from a culture to another. Indeed, according to Oyserman, Coon & Kimmelmeyer (2002), autonomy and personal independence is appreciated considerably in Western culture. Yet, the individual interdependence dominates the nature of relationship that links between parents and their children (Markus & Kitayama (1991 (6)).

These various cultures are intensified by language differences. As a matter of fact, western languages are considered to be phonetically and graphically more regular in comparison with Asiatic languages and at the same time they less complicated in terms of spelling. Another highlight is that Asians have higher expectations for the academic achievements of their children otherwise Western parents.

3. Morocco's Result in PIRLS

In 2006, PIRLS included 45 participants divided into 40 countries 2 Belgian education systems and 3 Canadian regions. As table 1 shows, Russia is the most performing country in reading comprehension (565) followed by Hong Kong (564) and Singapore (558). Down in the bottom, Morocco detains a score of 323 and thus ranks second to last, just before South Africa which has the lowest score (302). The three other MENA participants have score slightly better than Morocco : Kuwait (330), Qatar (353) and Iran (421).

The table shows also the Human Development Index relative to each country. One can note that all countries, scoring below 500, have a HDI that range between 0.65 and 0.87. For instance, Morocco and South Africa have the lowest HDI among the participants. The fact that HDI is positively correlated to PIRLS scores is straightforward to understand since this index is based on life expectancy, rate of analphabetism and GDP

per capita among other indicators. However, Russia, which detains the first score, has only a HDI of 0,79.

Table 1. PIRLS results, selected countries

Country	Score	Rank	HDI
Russia	565	1/45	0,797
Hong Kong	564	2/45	0,927
Canada, Alberta region	560	3/45	0,795
Singapore	558	4/45	0,916
France	522	27/45	0,942
Iran	421	40/45	0,746
Qatar	353	42/45	0,844
Kuwait	330	43/45	0,87
Morocco	323	44/45	0,64
South Africa	302	45/45	0,653

Source: Based on PIRLS 2006

In order to analyze the Morocco's trend, a comparison between the 2006 and 2001 results is done. Table 2 depicts the change in scores between these two periods. While some countries' score such as Russia, Hong Kong and Singapore has been improved, Morocco records the worst decrease. This downward trend reaches -37 points. The score of other countries has also decreased like England (-12 pt) and Sweden (-12 pt).

Table 2. PIRLS trend 2001-2006

Country	PIRLS 2006	PIRLS 2001	Difference between 2001 and 2006	Difference ranking
Russia	565	528	+37	1/29
Hong Kong	564	528	+36	2/29
Singapore	558	528	+30	3/29
Sweden	549	561	-12	27/29
England	539	553	-13	28/29
Romania	489	512	-22	28/29
Morocco	323	350	-37	29/29

Source: Based on PIRLS 2006

4. Empirical Study

4.1. Data and Methodology

Data.— The empirical work led uses the TIMSS database.

Each observation (student) is described by the following factors:

Student characteristics: For some researchers, difference, in achievement, between students is partly explained by sex, innate abilities. They consider that educational outcomes are positively correlated to Intellectual Quotient (IQ). We also support that motivation and self-confidence have a tight link with educational success. In this study, *Student characteristics* is approached by the sex of the student.

Family background: Several works have investigated the impact of family background, with a special focus on cultural heritage. Educational performance is assumed to rely on the linguistic and cultural background of the family. We agree with the idea that student achievement is directly dependent upon his social class. Blue collar's children tend to be the poorer students whereas white collar's children tend to get the highest grades. In this study, Family background is approached by Parents' job, Computer at home and Books at home.

School climate: Even though, external factors impact heavily educational outcomes, internal ones have also an important role. Factors such Class size, facilities, location area, and type of school seem to play a role in the explanation of educational achievement. In this study, *School climate* is approached by the location area of school (urban vs rural) and the type of school (Private vs Public).

Methodology.— The objective is to estimate the impact of exogenous variables on the test scores by means of quantile regression. More specifically, this method allows to explore how covariates affect the whole conditional distribution of the dependent variable. Furthermore, quantile regression does not assume neither homoscedasticity nor normality, thus, the results are more accurate when data contain these features. A quantile can be defined as :

Let Y be a random variable, $Y \in \mathbb{R}$, distributed as follows : $F(y) = \text{Prob}(Y \leq y)$.

Holding $0 < \tau < 1$:

$$Q_\tau = \inf\{y: F(y) \geq \tau\} \quad (1)$$

Applying this definition to education, the quantile 0.5, called median, corresponds to the student who divides the distribution into two equal parts. Hence, half of the students have a higher score than the median student while the second half has a lower score than the median student. Empirically, the quantile regression is formulated as follows :

$$y_i = \beta_0^\tau + \beta_1^\tau x_i + \varepsilon_i^\tau \quad (2)$$

$$Q_\tau(y_i | x_i) = \beta_0^\tau + \beta_1^\tau x_i \quad (3)$$

Where x is a vector of exogenous variable. The covariates used in the regressions are the age, sex of the student, schooling level of parents, type of school and its location, student's endowments (dictionary, computer at home, desk and internet) and student's

characteristics (preparation of homework, self-confidence) while $Q^k(\cdot)$ is the conditional quantile function. The regression used in this paper is based on the Koenker and Bassett (1978) article:

$$Q^k(Y_i(L), k | X) = X_i' \beta^k + \epsilon_i^k \quad (4)$$

The usual quantile regression model assumes exogeneity, however, the context studied is particular since schools interacts with its environment. Hence, the problem of endogeneity is omnipresent. Knowing that the variables of TIMSS and PIRLS contain a huge amount of missing data, it is very difficult to adopt methods that fix endogeneity, thus the most that can be said is that adopting this method is rough. It's worth noting that results should be interpreted carefully.

4.2. Results

Tableau 1: Quantile regression

Variables	OLS	Quantile Regression		
		0.05	0.5	0.95
intercept	328.0*** (5.684)	186.5*** (9.946)	322.4*** (7.818)	489.7*** (11.03)
Girl	15.78*** (3.806)	11.91 (8.669)	20.47*** (5.779)	11.31 (9.827)
Computer at home	-18.94*** (4.609)	-15.06 (12.13)	-19.03*** (6.797)	-18.35** (8.349)
Books at home	13.87*** (4.042)	8.460 (8.570)	17*** (4.880)	4.750 (11.88)
<u>Parents' job :</u>				
No one works in a full-time paying job	-31.19*** (10.05)	-36.70* (20.30)	-29.14* (16.92)	-67.24** (28.12)
One of them works in a in a full-time paying job	17.20*** (4.607)	16.19 (10.31)	20.65*** (5.403)	4.590 (12.52)
Both of the work in a full-time paying job	26.75*** (7.012)	26.09** (10.31)	28.98*** (8.067)	20.94 (14.79)
<u>School characteristics</u>				
Private schools	93.93*** (7.453)	106.4*** (13.65)	90.91*** (8.382)	76.26*** (11.08)
Rural schools	-52.03*** (4.322)	-35.47*** (6.923)	-63.09*** (4.759)	-27.80*** (9.455)
Observations	2,106	2,106	2,106	2,106
R-squared	0.201			

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Girls seem to do better in reading than boys as revealed in table 5, the difference between girls' and boys' score is estimated, in average, by 15.78. however, this difference is only observed among median students and it is estimated at 20.47 which is

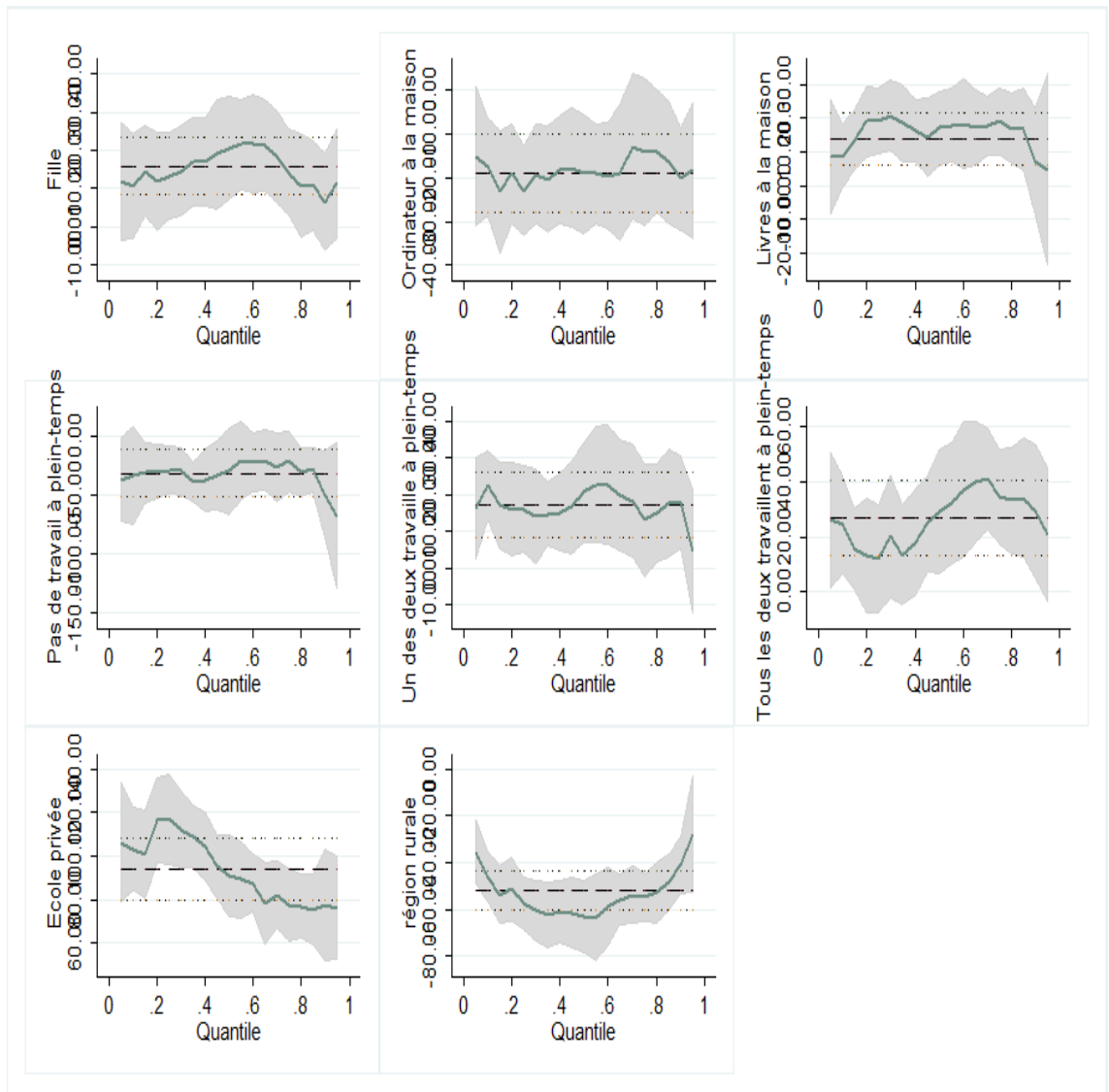
higher than what is suggested by the OLS regression. For those whose performance is low or high, no difference between girls and boys is noted.

Having a computer at home is, seemingly, decreasing students' score since its coefficient is estimated at -18.94. In other words, students, who possess a computer, have a score less than those, who don't have it, by 18.94 points in average. In fact, median students are those who suffer the more, as the coefficient related to possessing a computer is estimated at -19.03, followed nearly by students with high performance (-18.35). However, those whose performance is low are not affected by this phenomenon. Thus, the use of computer is, somehow, inappropriate in the sense that it is used for entertainment rather than acquiring knowledge.

Regarding parents' job and according to the OLS regression, all jobs categories are statistically significant and have the expected signs. Children of parents, who don't have a fulltime job, have a score lower as indicated by the coefficient estimated at 31.19 in average. However, if one of the parents works in a full time job, student's score increases in average by 17.20 whereas the score increases in average by 26.75, if both parents work in a full time job. Hence, scores are affected whether parents have a reliable job or not. Nevertheless, this link is not homogeneous along the whole conditional distributions, as one may expect. When both parents don't have a full time job, only student who are doing well in school seem to be affected by their parents' condition, as reflected by the coefficient estimated at -67.24 much more than estimated by the OLS. Furthermore, if one of the parents have a full time job, only median students benefit from this condition, as one reads table 5 the inherent coefficient amounts 20.65. At last, if both parents have a full time job, student's whose performance is median or low tend to do better by 28.98 and 26.09 respectively. Thus, when basing the analysis on students' categories, good students are negatively affected by parents job only if the latter is tenuous. Indeed, if parents' job is decent, the score for this category does not seem to be affected neither positively nor negatively.

Focusing on school characteristics reveals that its inherent variables explain an important part of the scores. First, Private schools outperform largely public ones, as the difference is estimated, by OLS, at 93.93 points. Similarly to mathematics, the coefficient, related to private schools, tends to decrease as the student performance increases, going from 106.4 points among low students to 90.91 among median students and then decreasing to 76.26 points among students with high performance. Second, rural schools undermine dramatically students score : the coefficient is established at -52.03 in average. Yet this difference doesn't affect students homogeneously according to quantile regressions. Actually. The ones who suffer the most are median students, their scores are lower by -63.09 points. For the tails of the conditional distributions, the negative effect is more moderated, amounting to -35.47 and -27.80 respectively for low performance students and high performance ones. In a nutshell, low performance students are the ones who take advantage the most from private schools whereas rural schools affects heavily median students.

Graphic analysis emphasizes the downward trend of private school coefficient. In addition, the curve inherent to rural schools takes a U-shape, meaning that the effect is lower at the tails of the distribution since the coefficient is negative. Regarding other variables, most coefficients are oscillating around the OLS horizontal line, hence no reliable interpretation can be made.



5. Conclusion

Although Morocco is showing, through these last years, a real will to improve its educational system, the results revealed by TIMSS and PIRLS give emphasis to several weaknesses of education in this country. This paper investigated the determinants of this low performance by using the quantile regression method. The latter revealed that a homogenous effect of covariates on the whole conditional distribution is seldom found. That is, several factors are affecting students differently according to their performance, which make the problematic more difficult.

Furthermore, Morocco's educational system is by no means uniform, since there is a huge difference in performance whether the school is private or public, not to mention the

gap between rural and urban areas. In other words, private schools outperform, by far, other types of schools while those located in rural areas have the lowest scores. Regarding rural schools, the students who suffer the most belong to the high performance category in mathematics, while in the case of reading, the median students are the ones that suffer the most. On the other hand, private schools presents the same pattern, namely a downward trend, in mathematics as well as in reading.

The gender gap is the most outstanding example concerning how some factors can affect scores differently from a discipline to another. In mathematics, boys on average, generally, do better than girls, however this fact is inverted regarding reading. Moreover, parents profession has a direct impact on reading ability, yet not in a homogeneous fashion through the whole conditional distribution. Students, who are generally doing well in school, seems only negatively affected when their parents have a tenuous job. When one or both parents have a full time job, no difference in scores is noticed. On the other side, poor students' score is only ameliorated when both parents have a full time job.

Throughout the elaboration of this paper, several problems were encountered mainly related to the quality of data. Even though some variables were wonderfully designed, such as teachers variables, their use was, unfortunately, impossible since several missing data were noticed. Note that the latter was not missed at random, and hence no method can be reliable to fulfill these missing data. In addition, several variables in TIMSS are not present in PIRLS, which lets only a few room to comparisons. Hence, all these facts diminish dramatically the scope of the analysis, nonetheless, several aspects regarding quality of education were revealed.

Indeed, the main conclusions, that can be drawn from this research, give emphasis to the danger of centralized policies and also the danger of focusing objectives exclusively on a quantitative basis. Through this article, one can notice that several phenomena affect differently schools, disciplines and even students. Thus, a totally centralized policy, that occults school specificities and students characteristics, is likely deemed to failure. In order to achieve more accurate policies, it is important to implicate all the stakeholders (parents, unions, students), and providing more autonomy to regional departments, since the latter are supposed to be more aware of school's environment.

The fact that almost all developing countries are focused on quantity of schooling may have an hazardous effect on education. In fact, generalizing the access to a failing educational system can only amplify inequalities. It is worth noting that giving children access to school is one thing, teaching them values and knowledge is another. There are complementary, and hence government efforts should be oriented towards both sides of education, in order to achieve something more concrete. Unfortunately, Morocco's educational system became dichotomous in ways that there is two kind of education supply. The first one is public education providing a low quality and addressed to the majority of the population, meanwhile the second, which is private and more selective, provide a high quality education that can be comparable to some OECD countries. This situation leads generally to an amplified intergenerational inequality.

It is true that improving the quality of education is a hard task, however ignoring it would entail several social problems. Based on the findings, rural schools should receive

a specific attention in order to diminish the existing gap between those school and urban schools. In order to upgrade the quality of education, many paths can be explored.

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