Equity in Five Mediterranean Countries Education Systems

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Abstract

Public education systems ought to be equitable, ensuring equal opportunities to all students, irrespective of the socioeconomic status of their families. This political desideratum is based upon, not only on ethical considerations, but also – and mainly – by the need of fostering economic development and progress. To develop, at maximum, the potential of each and every individual in a community, it is imperative to reduce human resource lost and, consequently, to improve wealth creation.

However, there exists the belief that the more equitable an education system is, the poorer it behaves in terms of learning standards. In fact, relevant empirical evidence points on the opposite direction: according to PISA – Programme for International Student Assessment, countries like Korea, Finland, Canada and Japan, "combine high average performance with equity and have a large proportion of top-performing students, which demonstrates that excellence and equity can go together" [1].

According to OECD, "Equity in education has two dimensions. The first is fairness, which implies ensuring that personal and social circumstances – for example gender, socioeconomic status or ethnic origin – should not be an obstacle to achieving educational potential. The second is inclusion, which implies ensuring a basic minimum standard of education for all – for example that everyone should be able to read, write and do simple arithmetic." [2].

The present research lies on the utilization of a set of indicators to encompass different factors and sources of inequity. To understand these factors, four groups of students were identified, considering the economic, social and cultural status of their families (low or high) and the performance (low or high) they exhibit in the PISA mathematics tests (in 2003 and 2012), Taking into consideration the percentage of each one of these groups it is possible to perform a risk analysis (calculating relative risks, attributable risks, and odds ratio).

This research aims at improving the understanding of the factors which affect the performance of education systems, in particular, those related with (i) unequal distribution of school resources, (ii) differences between public and private schools, and (iii) dissimilar conditions between rural and urban schools. In this research a set of variables were selected and analysed in order to study three different levels of analysis: individual (gender, grade repetition, and immigrant status), family (economic, social and cultural status), and school (public/private, location, class size, and resources), for five Mediterranean countries.

1. Introduction

The main orientation in what concerns education policies proposed by the Organization for Economic Co-operation and Development can be summarized in two words: quality and equity.

According to UNICEF, *quality* in education encompasses: (i) *students* (family, community support, motivation), (ii) *school environment* (safety, equality, adequate resources), (iii) *content* (relevant curriculum, adequate materials), (iv) *processes* (competent teachers, innovative methods) and, (v) *results* (knowledge, competences, attitudes) [3].

According to OECD, equity in education includes, as mentioned, *fairness* and *inclusion* [2]. These two dimensions are strongly intertwined: the overcoming of school failure contributes to mitigate the effects of social disadvantage [2].

An essential factor with profound impact on equity is the economic, social and cultural status of the students' families. To analyse this contextual aspect, the PISA database includes a variable – the ESCS – the Index of Economic, Social and Cultural Status. The ESCS is standardized with zero mean and unit standard deviation. In what concerns the students' scores (in reading, mathematics and science), the corresponding variables are also standardized so that the OECD countries mean is 500 and the standard deviation is 100. For each disciplinary domain, six levels of proficiency are defined (from 1 to 6). Combining ESCS and mathematics scores, four groups regarding the status of each

student can be defined: low ESCS – low performance (LL); low ESCS – high performance (LH); high ESCS – low performance (HL); high ESCS – high performance (HH).

2. Methodology
The data provided by PISA, in particular with respect to the time frame 2003-2012, restricted to five Mediterranean countries – Portugal, Spain, France, Italy and Greece, will be utilized in this research. It includes the scores obtained by students in mathematics and their socioeconomic background expressed by the ESCS.

In a first approach to evaluate equity, three indices respecting risk analysis are calculated and presented: relative risk (RR), attributable risk (AR) and odds ratio (OR). These analyses aim at evaluating the risk of having a certain output given a certain condition with respect to someone who does not have that condition or being exposed to a given risk factor with respect to someone who does not is exposed to this risk factor.

To identify the characteristics determining risks about mathematics performance, the following variables were utilized: regarding students – grade repetition, gender, and immigration status; regarding schools – public/private, location, quality of educational resources, and class size.

2.1 Relative risk (RR)
The question to be answered regarding *relative risk* can be synthesized as: *in what extent a low socioeconomic and cultural status is a risk factor for obtaining a poor result in mathematics?*
Let *a* be the number of LL students in the population; let *b* be the number of LH students in the same population; let *c* be the number of HL students in the same population; let *d* be the number of HH students in the population.
RR is defined as:

$$RR = \frac{\frac{a}{a+b}}{\frac{c}{c+d}}$$

The fraction in the numerator of the expression represents the proportion of LL individuals with respect to the total number of individuals exposed to the risk factor (belonging to low ESCS families). On the other hand, the fraction in the denominator of the expression represents the proportion of LH individuals with respect to the total number of individuals not exposed to the risk factor (not belonging to low ESCS families).

2.2 Attributable risk (AR)
The question to be answered in the case of *attributable risk* is the following: *what proportion of low performing students come from low ESCS families?* AR represents the proportion of the total number of negative events, which can be attributed to the given risk factor, in this case, a low ESCS.
AR is defined as:

$$AR = \frac{a}{a+b} - \frac{c}{c+d}$$

These two fractions have the same meaning as the ones presented in the relative risk analysis. Notice that in this case, the calculated risk is absolute instead of relative.

2.3 Odds ratio (OR)
This indicator allows the calculation of in what extent a certain result (for instance, the incidence of low performance students) is related with a particular condition (for instance, the low ESCS of their families). The value *a/b* represents the ratio of students who are low performers with respect to students who are high performers, given that they both have low ESCS. The value *c/d* represents the ratio of students who are low performers with respect to students who are high performers, given that they both have high ESCS. The ratio between these two ratios is the odds ratio.
OR is defined as:

$$OR = \frac{ad}{bc} = \frac{\frac{a}{b}}{\frac{c}{d}}$$

Consider for instance that the number of low performers is ten times higher than the number of high performers in the low ESCS group. In this case, the odds of being a low performer are 10 to 1. Assume now that the number of low performers is two times higher than the number of high performers, in the high ESCS group. In this case the odds of being a low performer are 2 to 1. Therefore, the odds ratio is 5, meaning that the odds of having a low performance is 5 to 1 if a student belongs to the low ESCS group.

2.4 Levels of analysis

PISA data provides a set of variables for each one of the three aforementioned levels of analysis: individual, family, and school.

In the context of this research, students with low ESCS are the ones having in this index less than -1.5, whereas students with average/high ESCS are the ones having a value equal or greater than -1.5. In what respects mathematics literacy, students with low performance are the ones who perform at level 1 or below, whereas students with average and high performance are the ones who perform at level 2 or above. Students with an ESCS below -1.5 in the OECD scale fall in the bottom 11.3% of all OECD students and in the bottom 7.1% of all considered Mediterranean students. Students with a mathematics performance level of 1 or below in the OECD scale fall in the bottom 26.0% of all OECD students and in bottom 23.8% of considered Mediterranean students.

3. Results and findings

The mentioned risk analyses are presented in Table 1. The results for RR show that the values range from 2.09 (Greece) to 3.10 (France), in 2012. For instance, in Portugal and Spain, a student belonging to the risk group has a probability of getting a low math score 2.25 times the probability of someone else not in the risk group. In what concerns to AR values range from 0.24 (Portugal) to 0.43 (France), in 2012. This means that if it were possible to eliminate the socioeconomic and cultural underdevelopment in Portugal and France, the reduction in the group of low performance in mathematics would be 24% and 43%, respectively. The OR indicator range from 3.21 (Portugal) to 6.8 (France), meaning that the odds of a French student with low ESCS getting a low performance in mathematics is about 7 times the odds of a colleague with an average/high ESCS. It is interesting to notice that the OECD countries show a positive evolution in the analysed period of time, in average, in all risk indicators.

	RR(2003)	RR(2012)	AR(2003)	AR(2012)	OR(2003)	OR(2012)
France	3.60	3.10	0.36	0.43	6.24	6.80
Greece	1.88	2.09	0.31	0.36	3.68	4.52
Italy	2.24	2.21	0.35	0.27	4.41	3.40
Portugal	2.04	2.25	0.24	0.24	2.97	3.21
Spain	2.49	2.25	0.27	0.26	3.76	3.33
OECD	3.13	2.63	0.46	0.36	7.53	4.83

Table 1. Relative Risk (RR), Attributable Risk (AR) and Odds Ratio (OR) – (2003 and 2012)

Table 2 presents, in columns 1, the percentages of boys in each of the aforementioned groups (LL, LH, HL, and HH). Unsurprisingly, in this domain – mathematics – boys outperform girls. It should be stressed that this unfavourable results in what respects girls are even worse when a low ESCS is the case.

In what immigrant status is considered (columns 2), the percentage of immigrant students in low ESCS groups is higher when compared with high ESCS groups.

Columns 3 relate to grade repetition. In PISA, students report if they *repeat one or more years of schooling in* ISCED1, ISCED2, and ISCED3 and across OECD countries, almost 12% of 15-year-old students reported that they have repeated a grade at least once during their schooling in compulsory education. Data show that grade repetition is a more frequent phenomenon in low performing students, and it is even worse when a low ESCS is the case. In France, Portugal and Spain, very high percentages of grade repetition are found.

	LL			LH			HL			HH		
	1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
France	32.7	46.4	81.2	54.8	60.5	26.0	51.5	28.9	75.3	48.2	9.9	15.2
Greece	45.4	23.7	20.7	50.3	15.2	3.6	48.1	16.5	9.7	50.5	6.5	0.7
Italy	48.7	19.9	47.7	50.4	13.6	18.9	47.8	12.4	35.0	53.1	5.3	10.5
Portugal	46.8	12.4	85.8	50.7	5.0	37.3	49.7	12.5	79.8	51.3	5.1	16.0
Spain	43.1	23.6	85.4	54.9	10.5	39.1	49.0	17.4	72.3	51.4	7.0	18.8
OECD	45.4	12.0	32.4	50.4	16.2	9.6	49.8	14.6	30.4	51.3	10.0	8.2

Table 2. Percentages of Boys (col. 1), Immigrants (col. 2), Repeaters (col. 3) by student groups (2012)

The high performance differences between native and immigrant students within the five Mediterranean countries suggest that school systems are very dissimilar in what regards this aspect of equity. A first approach to the mathematics performance of immigrant students is presented in Figure 1, which shows the odds of immigrants to get low performance when compared with native students. An OR equals to 3.7 (France) means that the chance of an immigrant student getting a low performance is almost four times the one of a French native student.
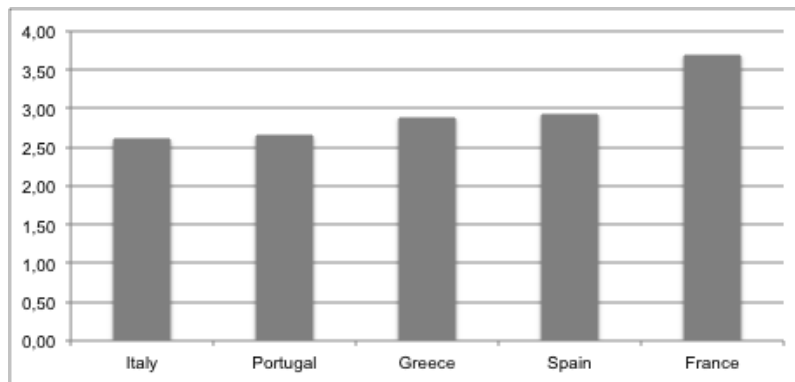

Figure 1. Odds ratio by immigrant status for five Mediterranean countries (2012)

Figure 2 represents the values of OR for first and second-generation immigrants in getting low performance in mathematics with respect to native students. This segmentation allows a better insight about the performance of immigrants in five Mediterranean countries in PISA 2012. In this case it is possible to find big differences between generations for France and Spain. In Spain, second-generation immigrants have odds, which are less than half of the first-generation.
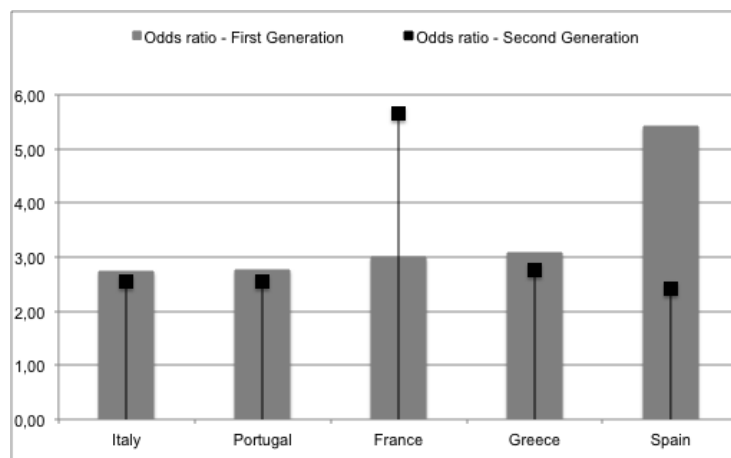

Figure 2. Odds ratio for first and second-generation immigrants in five Mediterranean countries (2012)

In what regards school characteristics, correlation analysis were performed in order to find out where the process of resource allocation either promotes or compromises equity (Table 3).

	Public/Private	School location	Quality of resources	Class size
France	0.18	0.12	0.05	0.34
Greece	0.24	0.23	0.12	0.03
Italy	0.08	0.15	0.05	-0.02
Portugal	0.24	0.26	0.08	0.17
Spain	0.27	0.18	0.05	0.06

Table 3. Correlation between school ESCS and school characteristics in five Mediterranean countries (2012)

A high correlation between public/private and school ESCS means that students from families with high socioeconomic and cultural status are more frequently enrolled in private schools. In Italy, as the value of correlation is very low, student stratification is not statistically relevant.

In what concerns school location a higher correlation between this variable and the school ESCS indicates that students from urban areas are more likely to come from advantages socioeconomic and cultural families. This correlation is higher in Portugal and Greece.

It should be pointed out that in the case of class size in France, students with low socioeconomic and cultural status are more frequently placed on classes with a large number of students.

Finally, in what regards the quality of educational resources, high correlation values mean that the higher the school ESCS the better the quality of school available resources. In the five Mediterranean countries, the low values found for this correlation indicates a considerable equity in the distribution of school resources.

References

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