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Equity and Grade Repetition – a Challenge for Education

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Abstract

Education systems are facing the enormous challenge of meeting high quality standards while ensuring that every student completes successfully nine (or more) years of schooling. The concern for equity underlies the education for all paradigm which is now universally accepted as a key policy to promote sustainable socioeconomic development.

An important source of inequity in some education systems is the strategy of compelling students to repeat a grade when they do not meet predefined curriculum objectives. According to OECD, grade repetition is particularly frequent in France, Belgium, Portugal, Spain and Luxembourg, very infrequent in Finland, Iceland, Slovenia and the United Kingdom, and a non-existing phenomenon in Japan, Korea and Norway [1]. (In certain countries there are no limits to the application of this mechanism so it is conceivable – and, in some cases, frequent – to find 15 year old students in primary schools).

Considering the vast impact of grade repetition in terms of education system cost, on the one hand, and student distress, discouragement, and dropout, on the other, and taking into account the recognized inefficacy of this strategy, it seems useful to study this phenomenon and to monitor its evolution along time.

To objectively measure grade repetition inequity, a modified Gini index (MGI), using the method developed by Vinod Thomas, Yan Wang, and Xibo Fan [2], specifically aimed at assessing inequality in education is suggested. (The Gini index has been applied in the macroeconomics context – since the beginning of the 20th century – to assess inequality in country's population income distribution).

The proposed application of the modified Gini index to measure grade repetition inequity is base on a methodology comprising, (i) the estimation of the PISA scores in mathematics (math plausible values) for each school grade (7th to 11th), to OECD countries, together with (ii) the computation of the percentage of students belonging to each one of the mentioned grades. After the calculation of the MGI for the chosen set of countries, with the time frame 2003-2012 – corresponding to two major math evaluations of the PISA programme – a preliminary analysis of the index evolution is presented.

Albeit being a helpful analytical approach, the mere utilization of a scalar quantity (MI) to characterize such a complex phenomenon cannot explain the whole picture. A first candidate to explore is the relationship between the PISA ESCS (index of Economic, Social and Cultural Status) and the MGI. The results obtained from this analysis indicate that other dimensions should be considered within or outside the framework of grade repetition.

1. Introduction

Inclusive education systems monitor the performance evolution of their students, mainly to prematurely detect learning difficulties, therefore demanding the adoption of remedial strategies. As a consequence, in this kind of systems, student assessment aims at providing feedback to students, teachers and school principals to improve knowledge acquisition. On the other hand, selective education systems tend to consider student evaluation as a mechanism to find those who did not study. As a consequence, low performers are labelled as lazy students who ought to be punished. For those who did not meet the required learning objectives, the ultimate sanction in the end of the year is to repeat the grade – in certain cases, for the second or even the third time. These two models are extreme cases; however, in reality, there is a continuum between them, and to be fair, the vast majority of contemporary education systems have approached the inclusive perspective.

In traditional industry-based economies, the *unconfessed* aim of grade repetition was to force student dropout, thus providing a "natural" way to impose society stratification. Modern economies, based on knowledge intensive activities, have adopted compulsory basic education in order to maintain students in the school and to develop, at maximum, their potential. This policy corresponds to the recognition that equity – beyond being a matter of ethics – is a fundamental element of sustainable social and economic development. It is obvious that grade repetition is an anachronistic mechanism which should not coexist with compulsory education: it does not make sense to promote, simultaneously, early school leaving and the obligation of school attendance till the age of 15 years old (or 18 in certain countries, as it is the case of Portugal).

Furthermore, despite government efforts, student failure, grade repetition and early school leaving linger in a considerable number of countries. The persistence of this phenomenon may be explained by several reasons – inertia, lack of understanding of role education plays in economic development; a public opinion unaware of the relevance equity exerts on social promotion, and irrational claims for a return to the *good old days* in education, among others.

There are several consequences resulting from compelling students to repeat grades: an immediate effect is the creation of classrooms including students of very different ages, with all the negative impacts on discipline and consequently, on learning results. On the other hand, such education systems should be over-dimensioned to accommodate a higher stock of students, with an immense financial impact. Of course, the worst problems resulting from grade repetition will arise in the future, with the lack of population qualification, thus unsuited to face the future challenges.

Considering the negative pedagogic, financial and economic impacts of this phenomenon, the monitoring of its evolution along time is critical, in order to call the attention of policy decision makers and to help improving people's awareness. To do so, an objective index of equity, specifically defined and implemented to take into consideration grade repetition is presented.

2. Methodology

Recalling that the Programme for International Student Assessment – PISA – tests 15 years old students, irrespective of the grade they are enrolled, there are two ways of estimating grade repetition in education systems of participating countries: (i) analyzing the grades in which 15 years old students are enrolled, and (ii) considering student answers to the context questionnaires which include questions on this subject. Each one of these approaches has advantages and shortcomings: in this paper, the former is taken.

The aforementioned first approach allows the calculation of the Gini index which objectively measures in what extent a certain resource is dissimilarly distributed in a given population. This index was introduced by Italian researcher Corrado Gini in 1912, in order to assess the income inequality in a society [3]. In the present research a modified Gini index (MGI) is applied, using a method specifically developed to assess inequity in education [2].

The basic idea underlying the definition of the Gini coefficient is very simple. Imagine that each element of a population has a certain amount of a given resource. Consider now that the amounts are sort (from minimum to maximum). Now, depict a graph with two axes, one representing the percentage of the population (from zero to 100%) and the other the percentage of the total accumulated amount of the given resource (also from zero to 100%). Each considered element of the population contributes to the accumulated population percentage with the corresponding accumulated percentage of the resource amount. When the resource is uniformly distributed, the plotted graph is a straight line segment with a 45º slope. When the resource is not equally distributed, the corresponding graph is a curve which is located under the 45º straight line segment. The area *A* circumscribed by this curve and the straight line segment, expresses the inequality in the resource distribution. As a consequence, when the distribution is uniform, this area is zero (and the Gini index also equals zero). When the distribution is such that only one element of the population has all the amount of the resource, the area is maximal and the coefficient is one (representing maximum inequality). The resulting graph, called Lorenz curve - is presented in Figure 1.

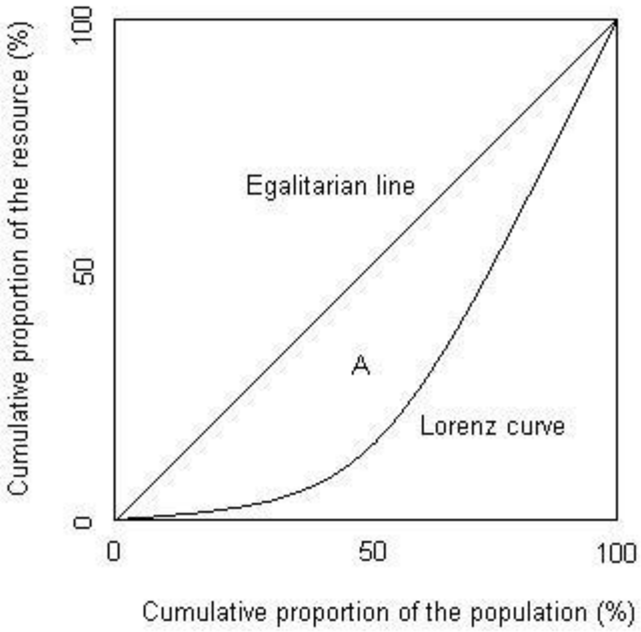

Figure 1. The Lorenz curve

To calculate the modified Gini coefficient, the following equation will be applied to data [2]:

$$E_L = \left(\frac{1}{\mu}\right)\sum_{i=2}^{n}\sum_{j=1}^{i-1} p_i \left|y_i - y_j\right| p_j$$

Where:

E_L is the education Gini;

μ is the average of the scores of each grade weighted by the proportions of the grade;

p_i and p_j are the proportions of the population enrolled in each grade;

y_i and y_j are the scores for each considered grade;

n is the number of grades in the population.

For each OECD country and for each grade (from 7th to 12th), student scores on mathematics were computed. These calculations were performed for years 2012 and 2003 – which correspond to PISA cycles with the particular focus on mathematics. Tables 1. and 2. present, for each OECD country, the percentage of students in each school grade, and the corresponding score, for cycles 2012 and 2003, respectively. The methodology to replicate the score point calculations can be done consulting reference [4].

3. Data analysis

The inspection of Tables 1. and 2. primarily shows a remarkable disparity among education systems. The modal school year of Poland, Sweden, Finland, Denmark, among others is the 9th, whereas United Kingdom and New Zealand have the majority of their 15 years old students enrolled in the 11th grade. On the other hand, Japan, Iceland, Norway, and Canada, are those countries where almost all 15 years old students attend the 10th grade: also, a majority of countries have this grade as the modal school year. Interestingly, modal school year for 15 years of students does not seem to be related with country performance.

Another characteristic deserving attention is the pronounced difference in performance between two consecutive school years: for instance, in certain countries this difference almost reaches a hundred score points. On the other hand, there are countries where these differences are relatively small. However, it is

important to notice that the relationship between school year of enrolment, grade repetition and performance score is not a simple case of cause-effect. In fact, straightforward causality direction cannot be established.
A third interesting aspect of data in these tables is the notable difference among countries in what relates the score point differences among countries for the very same school year of enrolment. Even when the comparison is performed between two countries with similar score points in mathematics, notable differences arise demonstrating that certain education systems are more "demanding" than others.
When comparing differences between PISA cycles 2003-2012, it is evident the clear reduction in the percentage of students enrolled in grade 7 and the rise in the percentage of students enrolled in grade 12. This shows an improvement in the overall performance of countries in mathematics between these two cycles.

Grades	**7**		8		9		10		11		12		
Countries	%	Score	%	Score	%	Score	%	Score	%	Score	%	Score	GINI
Australia	0.0	176	0.1	363	10.8	469	70.0	503	19.1	528	0.0	555	0.015
Austria	0.3	341	5.4	409	43.3	492	51.0	528	0.1	661			0.027
Belgium	0.9	356	6.4	404	30.9	455	60.8	562	1.0	647	0.0	727	0.058
Canada	0.1	398	1.1	413	13.2	487	84.6	524	1.0	575	0.1	632	0.012
Czech Rep.	0.4	323	4.5	372	51.1	491	44.1	523					0.027
Denmark	0.1	364	18.2	461	80.6	509	1.0	535					0.015
Finland	0.7	360	14.2	468	85.0	528			0.1	690			0.017
France	0.0	286	1.9	354	27.9	406	66.6	531	3.5	589	0.1	661	0.059
Germany	0.6	355	10.0	420	51.9	499	36.7	560	0.8	586			0.044
Greece	0.3	308	1.2	321	4.0	373	94.5	458					0.012
Hungary	2.8	349	8.7	402	67.8	480	20.6	517					0.033
Iceland							100.0	493					0.000
Ireland	0.0	357	1.9	447	60.5	495	24.3	523	13.3	502			0.010
Italy	0.4	331	1.7	370	16.8	433	78.5	499	2.6	522	0.0	443	0.025
Japan							100.0	536					0.000
Luxembourg	0.7	387	10.2	417	50.7	460	38.0	549	0.5	647			0.053
Mexico	1.1	329	5.2	346	30.8	393	60.8	429	2.1	456	0.1	425	0.028
Netherlands			3.6	436	46.7	495	49.2	555	0.5	680			0.034
New Zealand					0.1	402	6.2	456	88.3	501	5.3	535	0.009
Norway					0.4	428	99.4	490	0.2	534			0.001
Poland	0.5	380	4.1	415	94.9	522	0.5	669					0.011
Portugal	2.4	358	8.2	396	28.6	462	60.5	536	0.3	621			0.050
Slovak Rep.	1.7	311	4.5	347	39.5	474	52.7	501	1.6	597			0.033
Spain	0.1	329	9.8	380	24.1	433	66.0	519	0.0	595			0.050
Sweden	0.0	331	3.7	372	94.0	480	2.2	564					0.012
Switzerland	0.6	374	12.9	447	60.6	530	25.6	577	0.2	683			0.036
Turkey	0.5	365	2.2	369	27.6	398	65.5	471	4.0	470	0.3	439	0.036
USA			0.3	370	11.7	407	71.2	487	16.6	509	0.2	556	0.024
UK					0.0	512	1.3	523	95.0	493	3.6	498	0.000

Table 1. Percentage of students enrolled per grade and mathematics scores (2012)

Grades	7		8		9		10		11		12		
Countries	%	Score	%	Score	%	Score	%	Score	%	Score	%	Score	GINI
Australia	0.0	212	0.1	362	8.3	466	72.3	522	19.2	560	0.1	699	0.020
Austria	0.3	332	5.1	406	43.2	502	51.5	520					0.019
Belgium	0.3	335	3.7	369	29.6	457	65.5	571	0.8	640			0.056
Canada	0.6	365	2.5	432	13.7	493	82.0	546	1.2	581	0.0	586	0.019
Czech Rep.	0.2	369	2.8	400	44.7	502	52.4	535					0.022
Denmark	0.1	315	9.1	452	87.0	519	3.8	560	0.0	592			0.014
Finland	0.3	367	12.4	499	87.3	551							0.011
France	0.2	385	5.4	397	34.9	454	57.3	553	2.2	612	0.0	595	0.055
Germany	1.7	362	15.0	419	59.9	505	23.2	566	0.1	653			0.048
Greece	0.2	296	2.1	354	6.6	379	76.1	450	15.0	465			0.019
Hungary	1.1	346	5.0	402	65.1	485	28.8	521	0.0	738			0.026
Iceland							100.0	515					0.000
Ireland	0.0	355	2.8	407	60.9	492	16.7	543	19.6	515			0.019
Italy	0.2	279	1.4	326	14.2	407	80.0	478	4.3	486			0.024
Japan							100.0	534					0.000
Luxembourg			14.9	444	55.8	474	29.3	554	0.1	677			0.042
Mexico	3.6	286	11.0	327	40.8	369	43.7	421	0.9	456	0.0	552	0.052
Netherlands	0.1	369	4.4	441	45.6	507	49.3	575	0.5	678	0.0	622	0.038
New Zealand			0.1	353	6.8	456	89.4	526	3.7	582	0.0	640	0.012
Norway					0.6	436	98.7	495	0.7	550			0.002
Poland	0.7	306	3.1	381	95.7	495	0.5	581					0.010
Portugal	4.2	330	10.6	374	20.3	417	64.3	504	0.6	591			0.059
Slovak Rep.	0.6	295	0.9	364	37.1	489	60.9	507	0.5	643			0.014
Spain	0.0	560	3.2	352	27.0	428	69.7	513	0.0	461			0.042
Sweden	0.0	369	2.4	407	93.0	509	4.6	563					0.009
Switzerland	0.7	406	16.9	450	62.8	535	19.4	570	0.2	645			0.035
Turkey	0.8	280	4.4	318	3.2	422	52.1	428	39.2	433	0.3	427	0.017
USA					0.0	493	33.8	497	63.6	513	2.6	534	0.007
UK	0.3	335	2.4	380	29.7	458	60.6	497	7.0	507			0.024

Table 2. Percentage of students enrolled per grade and mathematics scores (2003)

4. Results, conclusions and future work

The results obtained from the application of the MGI according to the methodology previously introduced are presented in the last column of Tables 1. And 2. From the first inspection of these columns it is salient that the values of the MGI are exiguous – but no negligible – ranging from zero (Japan and Iceland in both cycles) to a maximum value of 0.059 (France, 2012 and Portugal, 2003). This indicates that, as far as grade repetition is concerned, the inequity is not very high in OECD countries, except for France, Portugal, Belgium, Spain and Luxembourg.

Of more concern is the fact that off the 29 countries considered in this analysis, only 11 exhibit better figures in 2012 than in 2003. On the other hand,16 countries are in 2012 worse off, in particular, United States, Slovak Republic, Turkey, Finland, Austria and Sweden. This drastic change in the MGI index deserves further scrutiny to determine the reason(s) underlying these observations. As repetition rates only increase as a result of policy measures, it should be interesting to understand what orientations were transmitted to these education systems to explain such a change.

Of course, the inequity derived from grade repetition is just the tip of the iceberg. There are other perspectives to monitor, analyse, and understand equity, in particular to find out the mechanisms which underlie dissimilar results among students, namely the social-economic and cultural status of their families. In further analyses the focus of this research will be on how inequity in community income is related with dissimilarities in school attainment.

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