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SEN's Indicator : a Tool for Measuring the Equity of Educational Systems

A Comparison of European Countries

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The equity of educational systems is an important political point. I will not develop theories of equity but one part of them is important for the presentation. The perspective adopted by Sen (1976) notably permits you to measure the equity by the proportion of individuals under a threshold. This approach permits you to take account of extrem situations, and particular students under a given level of capabilities.

I. Presentation of Sen's Indicator.

Initially, Sen's Indicator was built to measure the rate of poverty (Cohen Solal, Loisy, 2001). Its principal advantage is that it considers three dimensions simultaneously:

- The rate of poverty
- The intensity of poverty
- The inequality of income distribution among the poor

For the work of GERESE², SEN's Indicator has been adapted for the educational system. We have built two indicators : an indicator of weakness of the students and another for the excellence of the students. I will develop the indicator of weakness. The construction of the indicator of excellence is the same.

¹ Web site : www.u-bourgogne.fr/IREDU/

² **Groupe européen de Recherche sur l'Équité des Systèmes éducatifs / European Group of Research on Equity of Education Systems (EGREES)**. International coordination: Ariane Baye, Marc Demeuse, Anne Matoul, Julien Nicaise & Marie-Hélène Straeten (Université de Liège, Belgium).

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The report offers 29 indicators. A first version of the report has been published on the official website of the European Commission (http://europa.eu.int/comm/education/programmes/socrates/observation/equality_en.pdf).

For the indicator of weakness, we focus on the weakest students, while taking account of the percentage of students in this group, the average distance between this group and the minimum acceptable level, and the dispersion of results in this group. This indicator grows with the number of weak students, the intensity of weakness, and the dispersion of results. Sen's formula is the following :

$$S = T(I + (1 - I)G)$$

With **S**: Sen's Indicator

T : number of weakest students or the percentage of pupils below the knowledge threshold ; this threshold is fixed by the average of the scores obtained by 15% of weakest pupils at European level

I : Intensity of weakness, it's the distance between the threshold set previously and the average of scores of pupils whose score is lower than this threshold in the country

G : dispersion of the results for these weakest students. This Gini index is zero if all pupils obtain the same score, this component is close to 1 if the scores of the weak pupils are very dispersed.

A similar indicator was built for excellence. It deals with the best students .

II. Indicators of equity based on the students results

The two previous indicators were built using data from PISA (2000). Our work deals with the three disciplines evaluated in PISA (mathematics, reading, sciences). I will discuss only reading³. For this discipline, the indicator of weakness gave a range of results (table 1)

³ For more details, see Morlaix S.« L'indicateur de Sen, un outil pour mesurer l'équité des systèmes éducatifs », document de travail, IREDU/CNRS, mars 2005, 9p, or the web site of GERESE.

Table 1: Results for the indicator of scholastic weakness in reading

country	SEN's indicator	country	SEN's indicator	country	SEN's indicator
Belgium	1.3	France	1.1	Austria	1.3
Denmark	1.3	Ireland	0.7	Portugal	1.8
Germany	1.6	Italy	1.2	Finland	0.4
Greece	2.0	Luxemb.	3.2	Sweden	0.8
Spain	1.0	Holland	0.5	England	0.9
European Average : 1.2					

We have calculated an european average of weakness and can compare the different educational systems. Some educational systems, like Greece, Germany, Luxembourg, Portugal, are above the european average of weakness. It means that in these countries, the weakest students occupy a very unfavorable position. This situation is a consequence of a high percentage of weak students, and not a consequence of intensity or dispersion of weakness.

In a similar fashion, this weakness indicator permits you to find a number of countries under this european average. For example, educational system of Ireland, Holland, Finland, Sweden, and England seem particularly strong. The indicator of weakness of these countries shows not very high values. This situation is explained by the low percentage of week students.

An indicator of excellence was also calculated (table2).

Table 2 : Results for the indicator of scholastic excellence in reading

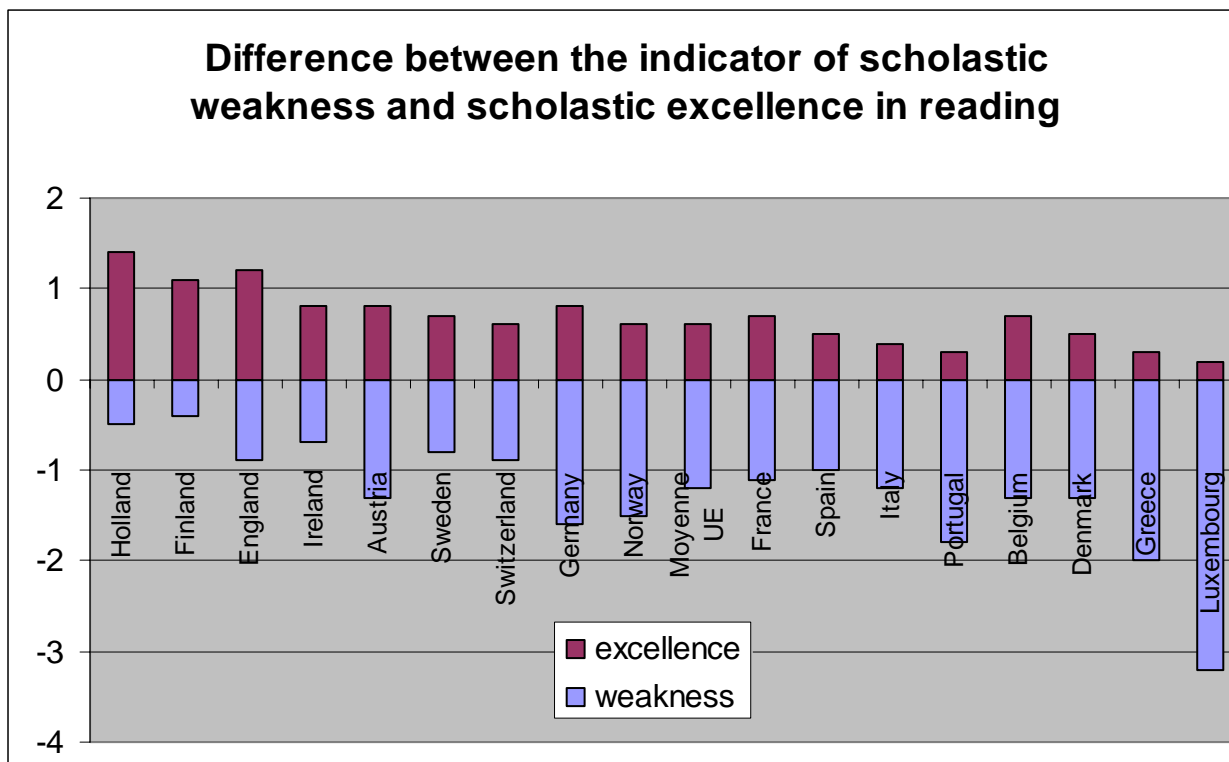
country	SEN's indicator	country	SEN's indicator	country	SEN's indicator
Belgium	0.9	France	0.6	Austria	0.6
Denmark	0.6	Ireland	1.1	Portugal	0.4
Germany	0.8	Italy	0.4	Finland	1.3
Greece	0.3	Luxemb.	0.2	Sweden	0.8
Spain	0.3	Holland	1.3	England	1.2
European average : 0.7					

Educational systems which present a good indicator of excellence compared to european average are Germany, Belgium, Holland, Finland, Sweden, England. Exceped for Germany and Belgium, these are the same countries which showed a low indicator of weakness. This high scores are explained by a high percentage of excellent students; other educational systems (like Greece, Italy, Luxembourg, Portugal, Spain) are characterised by an indicator of excellence above the european average. We find here the educational systems which showed a relatively high indicator of weakness; this countries showed simultanously a bad situation for the weakest students and for the best students.

III. Measuring equity of educational systems from indicators of scholastic weakness and scholastic excellence

From these two previous indicators of weakness and excellence, the difference between the two groups of students can be measured. This third indicator is the sum of the two previous indicators. It is represented graphically (graph 1).

Graph 1 : Difference between the indicators of scholastic weakness and scholastic excellence in reading



For each country, the indicators of weakness and excellence, showed in this graph, are given by the previous tables. The height of columns gives the difference between the two indicators. For the discipline of reading, the european average of this indicator, is 1.9. Some countries, for example Finland, Spain, Italy, Sweden, showed a relatively small difference between the strongest and the weakest students. This difference is biggest in the following countries Belgium, Germany, Greece, Luxembourg. This value could be due to a high indicator of weakness (the greek system for example), or due to a high indicator of excellence (such as Germany).

Educational systems which showed a high level of excellence and a low level of weakness (such as Finland or Sweden) don't seem, according to the indicator, to be particularly elitist. On the contrary, the difference between the weakest and the strongest is lower than the european average.

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