

# International Comparison Program

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**[05.01]**

## **Linking Education for Eurostat- OECD Countries to Other ICP Regions**

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**8<sup>th</sup> Technical Advisory Group Meeting  
May 20-21, 2013**

**Washington DC**

## Contents

Introduction.....	2
Overview of the output approach.....	2
Data requirements .....	3
Selection of countries and availability of data .....	4
Estimated data.....	4
Results.....	6
Conclusion and proposal.....	8

## LINKING EDUCATION FOR EUROSTAT-OECD COUNTRIES TO OTHER ICP REGIONS

### Introduction

1. Eurostat and the OECD stopped using the input-price approach for education in 2008. It has been replaced by an output method or, more precisely, a quantity method with quality adjustment. A full description of this method can be found in chapter 8 of the Eurostat-OECD Methodological Manual on Purchasing Power Parities ([www.oecd.org/std/ppp/manual](http://www.oecd.org/std/ppp/manual)). This method differs from the method used by ICP regions where countries collect data for compensation of employees in the educational sector. Given that no data for compensation of employees have been collected by the Eurostat-OECD countries in 2011, Eurostat and the OECD suggested making some proposals for other possible links for education between the Eurostat-OECD region and other ICP regions.

2. The aim of this short note is to explain the results of the exercise conducted by Eurostat and the OECD in applying their calculation method to some selected countries from other ICP regions. This note presents which data is needed to handle the calculation and which countries were selected, the estimations made and the results of the calculation. A proposal is also made at the end to conclude on this study.

### Overview of the output approach

3. During 2006 and 2007, a Eurostat-OECD task force looked systematically into alternatives to the input price approach for non-market services, focusing in particular on education. The task force came up with a concrete proposal based on direct measurement of volumes (a quantity approach) with quality adjustment, in line with the concept of education output as defined in Eurostat's *Handbook on price and volume measures in national accounts*. This approach has been implemented in 2008 by Eurostat from reference year 2005 and by OECD from the 2008 benchmark calculation of PPPs and related indicators.

4. Education output is defined as "the quantity of teaching received by the students, adjusted to allow for the qualities of the services provided, for each type of education." Furthermore, the Handbook specifies that "[t]he quantity of teaching received by students can be measured by the number of hours they spent at being taught. This measure is referred to as the number of "student-hours" [...]. In the area of education, the output can be defined as the quantity of teaching (that is, the transfer of knowledge, successfully or not) for a pupil, whereas the related outcomes are the skill and knowledge that a pupil achieves".

5. Education services are viewed conceptually as the transfer of knowledge from teacher to student. The amount of knowledge transferred is approximated by the number of student-hours, assuming that one student-hour stands for a fixed amount of transferred knowledge. The definition of output also indicates that one should distinguish between different types of schools, for instance, between levels of education, because the fixed amount of knowledge transferred can differ between various types of schools.

6. The method is based on student numbers and Actual Individual Consumption (AIC) expenditure in education. In its simplified version, the model produces volume indices that reflect the *number of student hours per inhabitant* and PPPs based on the *expenditure per student*, adjusted for differences in the quality of teaching, in each participating country. Volumes are thus estimated directly, while PPPs are indirectly derived by dividing total AIC expenditure in education into the number of students.

7. As an approximation to "student hours", the number of students is measured in full-time equivalents (FTEs). While this measure is close to the concept of student hours, FTEs are not necessarily fully comparable across countries, because the number of hours within one FTE can differ from country to country. Nevertheless, the number of students in FTEs is taken as the basis for the calculations.

8. In order to account for productivity differences across countries, the quantity model outlined above is further refined through the introduction of *quality adjustment* (QA) based on results from the Program of International Student Assessment (PISA). A QA factor is calculated on the basis of each country's PISA score relative to the average of all countries. This adjustment factor is then applied to the implicit prices calculated on the basis of expenditures and student numbers. Since students take the PISA tests at the age of 15, only the data for ISCED 1 (primary education) and ISCED 2 (lower secondary education) are made subject to QA.

9. The quantity-based PPPs with quality adjustment that come out of this model are applied as spatial deflators for education expenditure, similar to the PPPs produced under the input-based approach.

### **Data requirements**

10. The method requires different sets of data:

- Education data:
  - ✓ Number of students (FTEs) at the various levels of education (ISCED)
  - ✓ Education expenditure data per level
- Quality adjustment factors
  - ✓ Calculated on the basis of PISA scores
  - ✓ Adjustment with ESCS factor
- Expenditure data : Actual individual consumption expenditure on education
- Auxiliary data: population figures, exchange rates.

The following paragraphs describe specificities of the data needed.

11. The Eurostat-OECD output method requires education to be stratified into homogeneous groups by education levels and educational fields as this will improve comparability between countries and facilitate quality adjustments. The international classification of education currently used in participating countries is ISCED-97. It identifies seven education levels and 25 education fields. In practice, a lack of comparable basic data across participating countries limits detailed stratification. Only the following levels of education are used by Eurostat and the OECD:

- ISCED 0: Pre-primary education;
- ISCED 1: Primary education;
- ISCED 2: Lower secondary education;
- ISCED 3+4: Upper secondary education and post-secondary non-tertiary education;
- ISCED 5+6: First and second stage of tertiary education (and unclassified).

12. As explained before, among existing studies, the Programme for International Student Assessment (PISA) was determined to be the one which would best measure the quality of education. Eurostat and the OECD make quality adjustments only for education levels ISCED1 and ISCED2.

13. Expenditure on tertiary education (ISCED5+6) includes expenditure on education and expenditure on research. Since it is education expenditure that is being compared, the expenditure on research has to be deducted.

14. Almost all the data for the selected ICP countries come from the UNESCO-Eurostat-OECD (UOE) data collection on education statistics, compiled on the basis of national administrative sources, reported by Ministries of Education or National Statistical Offices. Population figures also come from this source. Expenditure on education was provided by the World Bank and exchange rates have been extracted from their databank.

### **Selection of countries and availability of data**

15. Table 1 shows the availability of data for ICP countries. The first selection was made on countries for which PISA data is available. A list of 17 countries was established. In this list, only countries with available (or partially available) detailed data by ISCED were considered. The table shows that the part of the tertiary education dedicated to research is not available for the ICP countries. It was then decided to use the non-adjusted figures.

16. Given these data constraints, ten countries were selected in the end, with a distribution by region as follows:

- Africa: 1 country
- Asia & Pacific: 4 countries
- Latin America: 5 countries
- CIS, Pacific Islands and Western Asia: 0 countries.

### **Estimated data**

17. As mentioned above, some of the selected countries presented incomplete sets of data which needed to be completed to allow the overall calculation. The following estimations have been made:

- Number of students per ISCED for Singapore, Thailand and Tunisia: there was no figure for ISCED0 for any of these 3 countries, so an average ratio of the number of students in ISCED0 and ISCED1 was applied (Number of students in ISCED0=20% of the sum of the number of students in ISCED0 and ISCED1).
- Expenditure on Education: this aggregate is not available for all the countries, and when available, it is not always for all the ISCED levels. The UOE data collection comprises the percentage of expenditure by ISCED in total educational expenditure. Data provided by the World Bank on the expenditure on GDP and on Education (except for Peru, but it was found on their Internet site databank) allowed to calculate the percentage of the educational expenditure in the GDP expenditure. The expenditure by ISCED could then be calculated.
  - China-Hong Kong, Indonesia, Panama and Peru presented very poor detailed data by ISCED, so the same breakdown as the number of students breakdown was used.

**Table 1. Data availability**

	Number of students per ISCED	Number of students per ISCED for 2011	Expenditure on Education per ISCED	% Education in GDP	Research adjustment	PISA ESCS adjustment	Possible calculation
<b>Azerbaijan</b>	X	X	incomplete	X	N.A.	Available for 2009	
<b>Brazil</b>	X	X	X	X	N.A.	Available for 2009	OK
<b>China, Hong Kong</b>	X	X	X (some estimates)	X	N.A.	Available for 2009	OK
<b>Colombia</b>	X	X	X	X	N.A.	Available for 2009	OK
<b>Indonesia</b>	X	X	X	X	N.A.	Available for 2009	OK
<b>Jordan</b>	X	X	N.A.	X	N.A.	Available for 2009	
<b>Kazakhstan</b>	X	X	incomplete	X	N.A.	Available for 2009	
<b>Kyrgyzstan</b>	X	X	incomplete	X	N.A.	Available for 2009	
<b>Panama</b>	X	X	X (some estimates)	X	N.A.	Available for 2009	OK
<b>Peru</b>	X	X	X (some estimates)	X	N.A.	Available for 2009	OK
<b>Qatar</b>	X	X	N.A.		N.A.	Available for 2009	
<b>Singapore</b>	incomplete	X	X	X	N.A.	Available for 2009	OK
<b>Thailand</b>	incomplete	X	X	X	N.A.	Available for 2009	OK
<b>Tunisia</b>	incomplete	X	3 ISCED = 100%	X	N.A.	Available for 2009	OK
<b>United Arab Emirates</b>	X	X	N.A.	X	N.A.	Available for 2009	
<b>Uruguay</b>	X	X	X	X	N.A.	Available for 2009	OK

- Data for Singapore was incomplete. Only about 80% were allocated. The remaining 20% were redistributed in the missing levels (ISCED0 and ISCED3-4 with the same structure as in China).
- Data for Tunisia was not disaggregated enough, so we allocated some expenditure to ISCED0 (applying the same ratio as the average ratio to ISCED 0 and ISCED1: expenditure in ISCED0=25% of expenditure of the sum of expenditure on ISCED0 and ISCED1) and ISCED 3-4 (expenditure on secondary level split in two between ISCED2 and ISCED3-4)
- Data for Thailand did not sum up to 100, but ISCED3-4 was not available. It was then complete with the difference to the sum of other ISCED to 100).

- PISA data: all the countries have PISA scores and ESCS adjusted scores for 2009. Different PISA rounds should be used to calculate the adjustment factor because the collection of ESCS scores is done on only one of the three categories (reading, literature and science) each time. As only 2009 data were available, only the ESCS adjustment factor for the reading scores have been used. It has been applied to the literature and science scores.

18. The calculation refers to the year 2011. When 2011 figures were not available, the following estimates have been done:

- Number of students: the latest data available were for 2009 for Singapore and Tunisia and for 2010 for Brazil, Indonesia, Panama, Peru and Uruguay. These figures have been converted to 2011 data with the population growth rate between 2009 and 2011 and between 2010 and 2011 respectively.
- Data for total expenditure on education was available for the year 2011 for all the countries, but the breakdown by ISCED from the latest available year had to be used: 2006 for Uruguay, 2008 for Tunisia, 2009 for Brazil and Singapore and 2010 for Indonesia, Panama, Peru and Thailand.

## Results

19. Using quality-adjusted expenditure per student and ISCED level as price input, and expenditure per ISCED level as weights, the standard EKS procedure produces a set of PPPs that can be applied to deflate AIC in education and derive per capita volume indices and price level indices.

20. Before analysing the main results, let us look at Table 2 which shows a simple quantity indicator: the total number of FTE students without any breakdown by level of education and without any quality adjustment. The per capita volume is then simply the ratio of the number of students to the total population. Though basic, this indicator is quite useful to analyse the plausibility of the results. It shows that the highest per capita volume indices are in general observed in low income countries where the demographic effect is quite strong. The proportion of 0-15 year olds (also shown in the table) confirms the overall picture. In general, the higher the proportion of population below 15 is the higher the volume index tends to be.

21. Looking at countries outside the Eurostat-OECD region, we can notice that results for Latin America look consistent, as very high volume indices go along with high shares of 0-15 year olds (they are also comparable with results from Chile and Mexico). Results for Asia look also plausible (with the exception of Thailand where the number of students appear underestimated when compared to the proportion of 0-15 year olds), as well as Tunisia where the index is 117.

22. Table 2 also shows the share of education services in % of GDP for all countries but these figures should be analysed with caution as data are still preliminary (eg. Peruvian data look weak). When proper national expenditure data will be available later in the year, the situation should improve.

23. Table 3 and Chart 1 compare the per capita volume indices calculated weighted and unweighted, as well as with and without quality adjustment for the 57 countries of the study. Per capita volume indices without adjustment range from 66 in Thailand

**Table 2. Education related indicators, 2011**

	Per capita volume indices (direct calc.) OECD47=100	Students as % of total population	Percentage of 0-15 year olds in total population	Expenditure on education in % of GDP
Brazil	164	34.9	25.0	5.8
Mexico	147	31.4	29.0	5.2
Peru	145	30.9	29.6	2.6
Iceland	138	29.5	20.7	6.8
Israel	136	29.1	27.2	7.7
Colombia	132	28.2	28.4	5.9
Uruguay	129	27.4	22.3	4.1
Chile	128	27.4	21.7	5.7
Panama	127	27.2	28.6	5.3
Turkey	126	26.9	26.0	3.9
New Zealand	120	25.6	20.4	5.7
Norway	117	25.0	18.6	4.1
Denmark	117	25.0	17.8	6.2
Tunisia	117	25.0	23.2	5.7
Ireland	117	24.9	21.3	4.1
Indonesia	116	24.7	26.7	6.3
Finland	115	24.5	16.5	5.3
Albania	114	24.4	22.0	2.8
Belgium	112	24.0	16.9	6.2
Sweden	109	23.2	16.6	6.3
Korea	107	22.8	15.9	6.6
France	107	22.7	18.4	5.2
Netherlands	106	22.7	18.0	5.0
United States	106	22.7	20.1	6.4
Portugal	106	22.6	15.0	5.6
Montenegro	105	22.4	19.1	4.0
Lithuania	103	21.9	14.7	5.3
Estonia	102	21.7	15.6	4.8
Australia	101	21.6	18.9	5.3
OECD47	<b>100</b>	<b>21.6</b>	<b>17.2</b>	<b>5.0</b>
Slovakia	100	21.3	15.0	3.5
United Kingdom	99	21.0	17.3	4.8
Poland	97	20.7	14.7	5.1
Latvia	97	20.7	14.0	4.7
Cyprus	97	20.6	17.4	7.5
Hungary	95	20.3	14.7	4.0
Czech Rep	94	20.1	14.1	4.2
Spain	93	19.9	15.1	5.1
Germany	93	19.8	13.4	3.9
Romania	93	19.7	15.0	2.9
Austria	91	19.5	14.5	5.0
Malta	91	19.3	14.6	4.2
Luxembourg	90	19.3	17.5	4.2
Greece	90	19.2	14.6	5.4
Switzerland	89	19.1	15.1	5.0
Macedonia	88	18.9	17.3	4.8
Slovenia	88	18.8	13.9	6.1
Canada	87	18.7	16.3	5.7
Italy	87	18.5	14.1	4.3
China, Hong Kong	84	17.9	11.2	2.0
Croatia	83	17.6	14.8	5.8
Serbia	80	17.1	17.5	4.7
Singapore	78	16.7	16.8	3.4
Bulgaria	77	16.5	13.9	3.4
Japan	72	15.4	13.3	3.8
Bosnia	72	15.3	14.7	4.8
Russia	69	14.7	15.3	3.2
Thailand	68	14.6	20.2	4.3

to 154 in Brazil. For non OECD-Eurostat countries, the pattern is broadly similar to the one of the direct index shown in Table 2 where Latin American countries display high indices (but lower than in Table 2) and Singapore, Hong-Kong, Thailand show indices below 100.

24. The PISA quality adjustment influences the results especially for the non-OECD countries as it can be seen from the table and the graph. The biggest adjustment is for Panama where the index goes down by 11 % from 127 to 114. The index goes down for all Latin American countries, Tunisia, Indonesia and Thailand but goes up for Hong Kong and Singapore (+ 7 %). All in all, when compared with the OECD countries, results look consistent with the exception of Thailand which presents a very low index. However, it is worth noting that the QA does not significantly affect the ranking of countries and the spread of the index.

### **Conclusion and proposal**

The exercise described above has been carried out for the purpose of linking the Eurostat-OECD countries with the other ICP regions for education expenditures. (Hence, the results will not affect any of the regional results for education.) Apart from the countries in the Eurostat-OECD region, 10 other countries were included on the basis of data availability. With the exception of Thailand, for which the data on student numbers do not appear in line with demographic data, the preliminary results look plausible.

However, in view of the limited number of countries outside the Eurostat-OECD comparison for which results could – at this moment – be established, it will not be possible to link Eurostat-OECD to *all* other regions. In fact, only for two regions, Asia and Latin America, there is a sufficient number of countries included. For Asia, however, Singapore and Hong Kong may be seen as not representative for their regions, whereas for Thailand the results are not (yet) good.

Eurostat and OECD therefore consider that the best option to link their countries to the rest of ICP is through a “bridge” with the countries in Latin America that are included in the exercise presented in this paper.

**Table 3. Comparison of weighted/unweighted per capita volume indices, with and without quality adjustment**

	Per capita volume indices, OECD 47=100		
	Unweighted	Weighted	
	without QA	without QA	with QA
Brazil	164	154	145
Iceland	138	139	137
Peru	145	145	134
Mexico	147	135	131
Chile	128	131	129
Israel	136	132	129
Turkey	126	127	127
New Zealand	120	120	123
Colombia	132	131	122
Uruguay	129	126	121
Ireland	117	119	119
Finland	115	114	118
Denmark	117	117	116
Norway	117	117	115
Korea	107	109	114
Panama	127	127	114
Belgium	112	112	112
Netherlands	106	107	108
United States	106	109	108
Portugal	106	107	108
Tunisia	117	116	108
Sweden	109	108	107
France	107	106	106
Albania	114	116	106
Lituania	103	106	105
Australia	101	102	104
Indonesia	116	115	104
Estonia	102	102	103
United Kingdom	99	100	100
Slovakia	100	100	100
Poland	97	98	99
Latvia	97	97	96
Cyprus	97	97	96
Montenegro	105	106	96
Hungary	95	96	96
Germany	93	95	95
Czech Rep	94	96	95
Malta	91	93	93
Switzerland	89	91	93
Austria	91	93	91
Spain	93	91	91
Luxembourg	90	92	90
China, Hong Kong	84	85	90
Slovenia	88	88	88
Greece	90	89	88
Romania	93	93	87
Italy	87	87	86
Macedonia	88	90	84
Croatia	83	84	82
Singapore	78	77	82
Canada	87	79	80
Serbia	80	81	77
Japan	72	73	76
Bulgaria	77	79	75
Russia	69	71	70
Bosnia	72	73	69
Thailand	68	66	63

**Note: data sorted by per capita weighted QA volume indices**

Graph 1. Per capita volumes indices with and without adjustment, OECD47=100, 2011

