

Chapter 7. Indicator concepts and methodologies

This chapter aims to explain the concepts, methodologies and conventions used to calculate the educational statistics and indicators and the related measurement issues. The methodologies presented in this chapter are grouped according to their measurement objectives: general/international averages, graduation analysis, educational attainment analysis, labour force participation analysis, economic and social benefits of education, expenditure analysis, participation and access to education, continuing education and training analysis, learning environment and teacher working conditions analysis, education and work status of young people, equity in education.

This chapter aims to explain the concepts, methodologies and conventions used to calculate the educational statistics and indicators and the related measurement issues. It does not seek to describe in detail every indicator that appears or has appeared in *Education at a Glance* (OECD, 2018^[1]). Instead it focuses on the core indicators or groups of indicators which appear regularly in EAG with conceptual or methodological aspects which are worthy of explanation. It can be considered as a catalogue of indicator methodologies rather than a catalogue of indicators.

The methodologies presented in this chapter are grouped according to their measurement objectives:

- general/international averages
- graduation analysis
- educational attainment analysis
- labour force participation analysis
- economic and social benefits of education
- expenditure analysis
- participation and access to education
- continuing education and training analysis
- learning environment and teacher working conditions analysis
- education and work status of young people
- equity in education.

Apart from Section 7.1, each section starts with discussing the policy context, explaining the relevance of each objective in the debate on education. This is followed by an explanation of the calculation methodology used. Finally, each section closes with a description of the limitations of the proposed methodology and any additional paths that could be explored to broaden the analysis.

7.1. General/international averages

To enable comparisons across countries or group of countries, the EAG often calculates averages for OECD countries, OECD partner countries and countries belonging to the European Union.

The **OECD average** is calculated as the unweighted mean of the data values of all OECD countries for which data are available or can be estimated. The OECD average refers to an average of national values and can be used to answer the question of how an indicator value for a given country compares with the value for a “typical” or average country. The OECD average therefore does not take into account the size of the population in each country, with each country contributing equally from Luxembourg to the United States.

The **OECD total** is calculated as if it is a weighted mean of the data values of all OECD countries for which data are available or can be estimated. It reflects the value for a given indicator when considering the OECD area as a whole. This approach is taken for the purpose of comparing, for example, expenditure charts for individual countries with those

of the entire OECD area for which valid data are available, with this area considered as a single entity.

The OECD average includes current OECD members (a list of which can be found at www.oecd.org/about/membersandpartners/). The coverage of the OECD average will thus vary as OECD membership changes.

For instance, *Education at a Glance* 2018 covers 36 OECD members: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

Beyond the OECD average and total, most indicators provide averages and totals for the European Union (EU), partner countries and/or the G20. The countries covered by these will also vary also from one edition to another. The members of the EU or G20 should correspond to the membership as it was in the year to which the data relate and not the membership at the time of reporting the data. If the membership changed during the reference period, the data collection should stipulate whether the membership used was that at the start or the end of the reference period. For more information on the countries included, please refer to the Reader's Guide at the beginning of the EAG publication.

Note that both the average and the total can be significantly affected by missing data. No statistical methods are used to compensate for this.

7.2. Graduation analysis

Two measures are commonly used to analyse graduation: graduation rates and successful completion rates. These two terms are commonly confused. Concretely put:

graduation rate $\neq$ successful completion rate

$$\sum \frac{\text{Graduates}}{\text{Population}} \neq \sum \frac{\text{Graduates}}{\text{NewEntrants}}$$

The **graduation rate** measures the production of graduates from a certain level of education, relative to the country's population. The **successful completion rate** measures the ratio of graduates to new entrants into the same level of education. The following sections describe how to calculate each indicator in greater detail.

7.2.1. Graduation rate

Policy context

Graduation rates are a measure of the production of educational institutions and of the system in general. They record the flow of graduates who can potentially enter the labour market or further study. *Education at a Glance* typically provides graduation rates for upper secondary, post-secondary non-tertiary and tertiary levels of education.

Graduation rates represent the estimated percentage of an age cohort who are expected to graduate over their lifetime, and therefore indicate the extent to which education systems are succeeding in preparing students to meet the labour-market's minimum requirements or to access tertiary education. Not all graduates will pursue a tertiary degree or enter the

labour force immediately, however – see Section 7.10 on young people neither in employment, nor in education and training (NEETS).

Graduation rates do not capture the quality of education outcomes but may provide a picture of students' disengagement leading to them dropping out of the education system, meaning that they leave school without a qualification.

Calculation

The calculation of graduation rates is based on the age-specific distribution of graduates (see Chapter 4, Section 4.1.5) in a specific year. Graduation rates can be net or gross.

Net graduation rates represent the expected probability of individuals graduating from upper secondary or tertiary education over their lifetime if current patterns are maintained. The calculation uses the sum of the age-specific graduation rates and cross-section data of the current cohort of graduates by ages.

Net graduation rates:

$$\sum_{Age} \frac{Graduates_{EducLevel, Age}}{Population_{Age}} \times 100$$

Where $Graduates_{EducLevel, Age}$ is the number of graduates at a specific International Standard Classification of Education (ISCED 2011) level at a specific age and $Population_{Age}$ is the size of the population of that specific age.

As an example, for a given country and year, the number of graduates from an education level is broken down into age groups. The number of 15-year-old graduates is divided by the total number of 15-year-olds in the country; the number of 16-year-old graduates is divided by the total number of 16-year-olds in the country, etc. The total graduation rate is then calculated as the sum of the age-specific graduation rates.

Note that graduate data are only available broken down into single years between the ages of 11 to 49 years. For adults aged 50 to 64, graduation rates are estimated on the basis of 5-year age bands, and for those aged 65 and over, graduation rates are based on the cohort size for 65 year-olds and over (UNESCO-UIS / OECD / EUROSTAT, 2017_[2]).

Gross graduation rates measure the total number of graduates from the specified level of education regardless of their age, divided by the population at the typical age of graduation for that level. The typical age of graduation is the age that covers more than 50% of those graduating at each level of education.

Gross graduation rates:

$$\sum \frac{Graduates_{EducLevel}}{Population_{TypicalAge}} \times 100$$

Where $Graduates_{EducLevel}$ is the total number of graduates in the reference year at a specific ISCED level and $Population_{TypicalAge}$ is the number of people at the typical age of graduation.

In Education at a Glance, net graduation rates are always preferred to gross graduation rates where data are available. They are calculated for upper secondary, post-secondary non-tertiary, short-cycle tertiary, bachelor's or equivalent, master's or equivalent and doctoral level education.

First-time graduation rates may also be used in addition to graduation rates. This calculation is based on the number of first-time graduates (defined in Chapter 4, Section 4.1.5) in a given year. It has the advantage of eliminating double counting of graduates over time within the same level, which can otherwise lead to overestimating graduation rates.

Limitations and further considerations

- The interpretation of the graduation rate indicator is complex. It is not a measure of the proportion of graduates in a country at a specific time but a measure of the probability of someone in the country graduating in the long term, based on current graduation patterns. Therefore, graduation rates are sensitive to any changes in education systems, such as the introduction of new programmes or variations in a programme's duration, like those seen in many EU countries as a result of the implementation of the Bologna Process. If the pattern of graduation is seen to be changing due to temporary education system changes, the interpretation of the results can be difficult.
- Upper secondary graduation rates can be very high – even over 100% – during a period. This could be due to a large number of people graduating outside the typical ages (e.g. through second chance programmes), a change in the education system, such as changes in the duration of some programmes (which strongly affect graduation rates) or other reasons such as double counting of students (it is complex to identify first-time graduates without detailed registers). To resolve this issue, data report first-time graduation rates to general and vocational programmes as of *Education at a Glance* 2018.
- The analysis of graduation rates can be expanded by determining the profiles of first-time graduates. Such profiles look at the distribution of graduates by gender, age group, international status and ISCED level, or by fields of education at upper secondary and tertiary level.

7.2.2. Completion rates

Policy context

The **completion rate** describes the percentage of students who graduate from a certain educational programme a given number of years after they entered, as a share of those who entered. It is a measure of how efficiently students flow through a level of education (upper secondary or tertiary).

Calculation

Completion rate:

$$\sum \frac{Graduates_{EducLevel,Year}}{NewEntrant_{Year-n}} \times 100$$

Where $Graduates_{EducLevel,Year}$ is the number of graduates from a specific level of education in a specific year and $NewEntrant_{Year-n}$ is the number of new entrants (see the definition in Chapter 4, Section 4.1.2) at that level of education “n” years previously where “n” is the number of years of full-time study required to complete the qualification. It can also be calculated for a longer timeframe of n+2 or n+3 to account for students who had to repeat a grade or individual courses, or who studied part time and so on.

Limitations and further considerations

- Depending on data availability for the level of education of interest, the completion rate can be calculated using two different methods. The first method, true cohort, follows individual students from entry into a programme until a specified number of years later. Completion is then calculated as the share of entrants who have graduated in that timeframe. The second method, cross cohort, is used when individual data are not available. It calculates completion by dividing the number of graduates in a year by the number of new entrants to that programme a certain number of years before, when the number of years corresponds to the theoretical duration of the programme.
- Due to the difference in methodologies, caution must be used when comparing results. For example, consider a programme with a theoretical duration of two years. Completion rates could be calculated using the graduation cohort in 2014 and an entry cohort two academic years earlier, in 2012/13. For countries using cross-cohort data, the graduation cohort in 2014 will include the students who entered in 2012/13 and graduated on time (within two years) but also any others who entered before 2012/13 and graduated in 2014. As a result, in countries where a significant share of students takes longer to graduate, cross-cohort calculations will overestimate completion rates when compared to true-cohort ones, which have a more limited time frame.

7.3. Educational attainment of the population

7.3.1. Educational attainment of the population

Policy context

Educational attainment is a commonly used proxy for the stock of human capital – that is, the skills/knowledge available in the population. Qualifications certify and offer information about the type of knowledge and skills that graduates have acquired in formal education. Educational attainment provides a profile of the level of educational attainment of the population as a whole or subsets of it such as the labour force or specific age groups.

Calculation

Educational attainment rate is determined by the distribution of the population or subsets by the highest level of education attained.

Educational attainment rate:

$$\frac{Population_{Age,Gender,EducLevelAttained}}{Population_{Age,Gender,Total}} \times 100$$

Where $Population_{Age,gender,EducLevel}$ is the number of people in a particular age and gender group broken down by highest educational attainment level and $Population_{Age,Gender,Total}$ is the total population of the same group. *Education at a Glance* typically shows data for all educational levels as described by ISCED 2011.

Similar to graduation rates, attainment rates require the successful completion of a programme, rather than simply attending that programme. However, educational attainment differs from graduation in referring only to the highest degree of education an

individual has successfully completed. For educational attainment, only the recognised successful completion of the highest programme attended is counted.

The source for the data for most countries is that country's national labour force survey (LFS).

Limitations and further considerations

- People with unknown level of educational attainment are excluded from the calculation of the indicator.
- Trends in educational attainment of the population are important for assessing expansion of the education system, but are difficult to measure. Changes in the ISCED classification in 1997 and 2011 have created breaks in the series. Another way to measure trends in educational attainment is by looking at the educational attainment across age groups. The difference in the attainment of younger and older cohorts gives a good estimation of the expansion of the education system across generations. Example: "A comparison of educational attainment rate among younger (25-34 year-olds) and older (55-64 year-olds) age groups indicates marked progress in attaining tertiary education in most countries." (OECD, 2017^[3]). However, any results from countries reporting high participation in adult learning should be treated with caution.

7.4. Labour force participation

7.4.1. Labour force participation

Policy context

In recent decades, economies and labour markets have in many countries become increasingly dependent on a stable supply of well-educated workers to further their economic development and to maintain their competitiveness. This indicator provides a perspective on this effect by examining the labour force participation rates of groups with different levels of education. People with higher-level qualifications are more likely to be employed, as they are considered better equipped with the skills required in the labour market. On the other hand, while there is still work for those with lower levels of education, people with the lowest educational qualifications are at greater risk of being unemployed.

Calculation

The employment rate for a particular age group, gender and level of educational attainment is equal to the percentage of people of that same age group, gender and level of educational attainment who are employed.

The employment rate by level of education:

$$\frac{Employed_{Age,Gender,EducLevel}}{Population_{Age,Gender,EducLevel}} \times 100$$

Where $Employed_{Age,Gender,EducLevel}$ is the number of people employed within a specified age group and gender who have attained a certain education/ISCED level. Employed individuals are those who, during the survey reference week: 1) have worked for pay (employees) or profit (self-employed and unpaid family workers) for at least one hour; or

2) have a job but are temporarily not at work (through injury, illness, holiday, strike or lock-out, educational or training leave, maternity or parental leave, etc.).

Where $Population_{Age,Gender,EducLevel}$ is the total number of people in the population of the same age group, gender and educational attainment level.

The unemployment rate for a particular age group, gender and level of educational attainment, is equal to the percentage of the labour force of the same age group, gender and level of educational attainment who are unemployed.

The unemployment rate by level of education:

$$\frac{Unemployed_{Age,Gender,EducLevel}}{Labourforce_{Age,Gender,EducLevel}} \times 100$$

Where $Unemployed_{Age,Gender,EducLevel}$ is the number of unemployed people of a certain age group, gender and level of education. Unemployed individuals are those who are, during the survey reference week, without work (i.e. neither had a job nor were at work for one hour or more in paid employment or self-employment) and who were actively seeking employment (i.e. had taken specific steps during the four weeks prior to the reference week to seek paid employment or self-employment), and currently available to start work (i.e. were available for paid employment or self-employment before the end of the two weeks following the reference week).

Where $Labourforce_{Age,Gender,EducLevel}$ is the total number of employed and unemployed people within the same age group, gender and educational attainment level.

The inactivity rate for a particular age group, gender and level of educational attainment is equal to the percentage of the population of the same age group, gender and level of educational attainment who are inactive.

The inactivity rate by level of education:

$$\frac{Inactive_{Age,Gender,EducLevel}}{Population_{Age,Gender,EducLevel}} \times 100$$

Where $Inactive_{Age,Gender,EducLevel}$ is the number of inactive people within a certain age group, gender and level of education. Inactive individuals are those who are neither employed nor unemployed during the reference week, i.e. individuals who are not looking for a job. The number of inactive individuals is calculated by subtracting the number of active people (labour force) from the total population.

Labour force participation rate: The labour force participation rate is computed as labour force participation rate = 100 – inactivity rate

The source of the data for most countries is the national LFS.

Limitations and further considerations

- Employment and unemployment rates by level of education do not show a causal relationship between education and employment/unemployment outcomes but do help to estimate the likelihood of being employed or unemployed. Employment and unemployment rates vary a lot from one country to another as labour-market conditions and overall economic situation vary.

- The work status refers to the International Labour Organisation definitions of employment, unemployment and not in the labour force. The type of employment refers to full-time or part-time employment based on a threshold definition of 30-usual-hours on the worker's main job. Full-time workers are those who usually work 30 hours or more on their main job. Some countries may refer to all jobs instead of a worker's main job, or part time may refer to less than 35 hours per week instead of 30 hours.
- As vocational education and training (VET) programmes may contain work-based components (such as apprenticeships or dual-system education programmes), special attention should be paid to the labour-market outcomes of individuals who graduated from such programmes to assess how relevant they are to the labour market.

7.5. Economic and social benefits of education

7.5.1. *Relative earnings advantage from education and percentage of people with earnings*

Policy context

One of the ways in which the market provides incentives for individuals to develop and maintain appropriate levels of skills is through wage differentials, in particular through the enhanced earnings accorded to people who complete additional education. Variations in relative earnings across countries reflect a number of factors, including the demand for skills in the labour market, the supply of workers at various levels of educational attainment, minimum wage laws, the strength of labour unions, coverage of collective-bargaining agreements, relative incidence of part-time and seasonal work and/or the age composition of the labour force.

Calculation

Relative earnings from employment are equal to the percentage of the mean annual earnings of an individual within a certain age group, gender and educational attainment relative to a baseline. Different relative earnings may be calculated for different analysis.

When analysing relative earnings from employment by educational attainment, the baseline usually considered is the mean earnings of individuals of the same age group and gender whose highest level of attainment is upper secondary education. Upper secondary attainment is an appropriate baseline as this is considered as a pivotal point in students' decisions to pursue higher education.

Average earnings can be calculated for people working full-time, full-year, or for all earners (i.e. including full-time, full-year earners and part-time earners) or for the entire population (i.e. including all earners and people with no earnings).

Relative earnings of employed compared to employed with upper secondary education:

$$\frac{Earnings_{Age,Gender,EducLevel}}{Earnings_{Age,Gender,UpperSec}} \times 100$$

Where $Earnings_{Age,Gender,EducLevel}$ is the mean earnings of individuals within an age group and gender whose highest level of educational attainment is $EducLevel$ and

$Earnings_{Age,Gender,UpperSec}$ is the mean earnings of individuals of the same age group and gender whose highest level of attainment is upper secondary.

It is also appropriate to analyse the relative earnings by gender for a given age group and educational attainment. In this case, the baseline considered is the mean annual earnings of men with the same age group and level of educational attainment.

Women's earnings relative to men:

$$\frac{Earnings_{Age,EducLevel,Women}}{Earnings_{Age,Educlevel,Men}} \times 100$$

Where $Earnings_{Age,EducLevel,Women}$ is the annual mean earnings of women of a particular age group and highest educational attainment level and $Earnings_{Age,Educlevel,Men}$ is the annual mean earnings of men of the same age group and level of educational attainment.

Level of earnings relative to median earnings:

The level of earnings relative to median earnings is defined as the ratio of the number of people with earnings within an earnings level relative to the median, and all people who have earnings from employment.

The distribution is calculated for all earners (i.e. including full-time, full-year earners and part-time earners).

Percentage of people with earnings:

$$\frac{Population_{EarningLevel}}{Population_{Earnings}} \times 100$$

Where $Population_{EarningLevel}$ is the number of individuals broken down into the following earning levels: 1) less than or half of the median; 2) more than half the median and less than or equal to the median; 3) more than the median and less than or equal to 1.5 times the median; 4) more than 1.5 times the median and less than or equal to twice the median; and 5) more than twice the median.

Where $Population_{Earnings}$ is the number of individuals with earnings.

In some cases, the relative earnings of students and non-students are computed. This is defined as the mean annual earnings of students divided by the mean earnings of non-students.

Relative earnings of students compared to non-students:

$$\frac{Earnings_{Students}}{Earnings_{Non-students}} \times 100$$

Where $Earnings_{Students}$ is the annual mean earnings of students and $Earnings_{Non-students}$ is the annual mean earnings of non-students.

Limitations and further considerations

- The presentation of relative earnings improves the comparability of data across countries, by avoiding the need to convert earnings into a single monetary unit. While earnings data should be based on annual, full-year earnings, before tax and excluding earnings from self-employment, this is not the case for all countries and therefore results should be interpreted with caution. For example, in countries

reporting annual earnings, differences in the incidence of seasonal work among individuals with different levels of educational attainment will have a different effect on relative earnings than in countries reporting weekly or monthly earnings. More details on specific country data on earnings can be found in Annex 3 of *Education at a Glance*.

- The earnings average for men plus women is based on earnings of the total population, i.e. it is not the simple average of the earnings figures for men and women. The earnings average for men plus women weights the average earnings figures separately for men and women by the share of men and women at different levels of attainment.
- The definition of full-time earnings is either based on a self-designated full-time status or a threshold value of typical number of hours worked per week.
- The distribution of earners can also be considered to understand relative earnings better. The share of students and non-students (individuals no longer in education) among all earners, or the share of full-time full-year earners, part-time earners and people with no earnings in the total population can all be considered.

7.5.2. *Financial incentive to invest in education*

Policy context

Putting time and money into education is an investment in human capital. Better chances of employment and higher earnings are strong incentives for adults to invest in education and postpone labour-market activities. Countries, in turn, benefit from having better-educated individuals, through reduced public expenditure on social welfare programmes and higher revenues earned through taxes (income tax and value-added taxes) paid once individuals enter the labour market (receive earnings and then buy consumption goods).

Rates of return can be measured from the private individual's point of view or from society's point of view. Private rates of return measure the future net economic payoff to an individual of increasing the amount of education undertaken, while public rates of return measure the benefits to society of additional education. The calculation formulae for both types of returns are the same; only the costs and benefits included differ between the two.

Calculation

In calculating the financial returns to education, two indicators can be used: net present value and internal rate of return.

Net present value (NPV):

$$\sum_{t=0}^{d-1} \frac{C_t}{(1+i)^t} + \sum_{t=d}^{64-a-d} \frac{B_t}{(1+i)^t}$$

Where C_t refers to costs at period t ($t \in 0, d-1$), B_t refers to benefits at period t ($t \in 0, d-1$), i refers to the discount rate, d refers to duration of studies (in years), a refers to age at beginning of education/training and 64 is assumed to be the age of the last year of activity in the labour market.

The net present value (NPV) expresses in present value terms cash transfers happening at different times, to allow direct comparisons of costs and benefits. In this framework, costs and benefits during a working-age life are transferred back to the start of the investment. This is done by discounting all cash flows back to the beginning of the investment using a fixed interest rate known as the discount rate that makes possible to compare costs or benefits (cash flows) over time. All the values presented in the tables in this indicator are in net present value equivalent, converted to USD using purchasing power parities (PPP). The PPP controls for different costs of living and price levels between countries, by equalising the purchasing power of different countries' currencies for a market "basket of goods".

The **internal rate of return (IRR)** is the discount rate i at which $NPV=0$.

The IRR looks at the issue of the financial returns to education from a different angle. The IRR is the discount rate at which the net present values of all cash flows is equal to the initial investment, or in other words, the rate at which the investment breaks even. Translated to education, the IRR can be interpreted as the interest rate an individual can expect to receive every year during their working life on the investment made on higher education. In project evaluation, a project is approved if the IRR is greater than the prevailing interest rate or the return from an alternative investment. The higher the IRR, the more attractive it is to pursue higher education.

The financial returns on investment in education are calculated from the age of entry into further education to a theoretical age of retirement, assumed to be 64. It considers two periods: 1) time spent in education during which the private individual and the government are paying the cost of education; and 2) time spent in the labour market during which the individual and the government are receiving the additional payments associated with further education.

These two indicators incorporate costs and benefits which need to be carefully determined.

The costs

Investing in a higher level of education has both direct and indirect costs. Direct costs are the upfront expenditure paid during the years of additional studies. Indirect costs for private individuals are the foregone earnings that they would have received if they had decided to work instead of pursuing an additional degree of education. Similarly, indirect costs for the public sector are the foregone tax revenues not received because individuals chose to pursue further education instead of entering the labour market:

private costs = direct costs + foregone earnings

public costs = direct costs + foregone tax revenues

The direct costs of education include all expenditures on education for all levels of government combined (public direct costs) and all education-related household expenditure (private direct costs).

Private direct costs are net of loans and grants, and public loans are not included in public direct costs. Excluding loans from public costs may lead to public costs being underestimated for some countries, particularly at the tertiary level. In cases where loans and grants cover more than the private direct costs, the private direct costs are set to zero.

Foregone earnings (FE) and foregone tax receipts (FT) are both indirect costs. Foregone earnings or taxes are the earnings/tax receipts lost during the years spent in education

weighted by the probability of being employed. For individuals, FEs are the additional earnings they would have had if they entered the labour force instead of pursuing a higher degree of education. From the government perspective, FTs are the additional foregone taxes the government is not collecting while the individual is studying instead of working.

Foregone earnings:

$$FE_{z,j,s} = (ES_{\text{non-student}, z-1} * E_{\text{non-student}, z-1} + UB_{\text{non-student}, z-1} * US_{\text{non-student}, z-1}) - (ES_{\text{student}, z-1} * E_{\text{student}, z-1})$$

Foregone tax receipts:

$$FT_{z,j,s} = (ES_{\text{non-student}, z-1} * T_{\text{non-student}, z-1} - UB_{\text{non-student}, z-1} * US_{\text{non-student}, z-1}) - (ES_{\text{student}, z-1} * T_{\text{student}, z-1})$$

Where ES stands for the employment rate, US for the share of the population who are unemployed and UB for unemployment benefits. $T_{\text{non-student/student}, z-1}$ is defined as the level of taxes required from an individual earning $E_{\text{non-student/student}, z-1}$.

The indicator assumes that the foregone earnings are equal to the difference between what individuals could expect to earn in the labour market and what they could get while studying. That is, the foregone earnings equal the average earnings of 15-24 year-old non-students ($E_{\text{non-student}, z-1}$) minus the average earnings of 15-24 year-old students ($E_{\text{student}, z-1}$). Where these data are not available, estimations are based on the total earnings of 15-24 year-olds. Given the specificities of the “student” status in many countries, in order to simplify calculations and ensure comparability across countries, the indicator assumes that students do not receive transfers or unemployment benefits from governments.

The benefits

The benefit of investing in education is the additional income associated with a higher level of education, given the probability of successfully finding a job. For private individuals, this additional income is the additional net earnings expected from an additional level of education, given that they successfully enter the labour market, and receive earnings until their retirement age, estimated as 64 years old for all countries. Public benefits are constructed to mirror private benefits. Public benefits are the sum of added tax revenues that accrue to the government from an individual with a higher level of education, provided that the individual successfully enters the labour market. Inactive individuals are assumed to receive zero earnings.

For j , the highest level of educational attainment, and $j-1$, a lower level of attainment, total public and private benefits can be written as:

Total private benefits_j

$$\begin{aligned} &= \{ \text{Expected net earnings at level } j \} \\ &- \{ \text{Expected net earnings at level } j-1 \} \\ &= \{ (1 - \text{Unemployment rate})_j * (\text{Net earnings})_j \\ &+ (\text{Unemployment rate})_j * (\text{Net unemployment benefits})_j \} \\ &- \{ (1 - \text{Unemployment rate})_{j-1} * (\text{Net earnings})_{j-1} \\ &+ (\text{Unemployment rate})_{j-1} * (\text{Net unemployment benefits})_{j-1} \} \end{aligned}$$

Total public benefits_j

$$\begin{aligned}
&= \{ \text{Expected tax receipts at level } j \} \\
&- \{ \text{Expected tax receipts at level } j-1 \} \\
&= \{ (1 - \text{Unemployment rate})_j * (\text{tax receipt})_j \\
&- (\text{Unemployment rate})_j * (\text{Net unemployment benefits})_j \} \\
&- \{ (1 - \text{unemployment rate})_{j-1} * (\text{tax receipt})_{j-1} \\
&- (\text{Unemployment rate})_{j-1} * (\text{Net unemployment benefits})_{j-1} \}
\end{aligned}$$

Decomposition of earnings and tax receipt effects: this indicator presents the decomposition of earnings and tax revenue effects, based on additional income associated with a higher level of attainment.

- Gross earnings benefits are the discounted sum of earnings premiums over the course of a working-age life associated with a higher level of education, provided that the individual successfully enters the labour market. In order to increase the stability of the indicator, data on earnings use a moving average combining three years of earnings.
- The income tax effect is the discounted sum of the additional amount of income tax paid by the individual and received by the government for a higher level of education. Income tax data are computed using the OECD Taxing Wages model (OECD, 2015_[4]), which determines the level of taxes based on a given level of income. This model computes the level of the tax wedge on income for several household composition scenarios. This indicator uses a single worker with no children.
- The social contribution effect is the discounted sum of the additional amount of employee social contributions paid by the individual and received by the government for a higher level of attainment. Employee social contributions are computed using the OECD Taxing Wages model's scenario of a single worker with no children, aged 40.
- The social transfers effect is the discounted sum of the additional amount of social transfers paid to individuals by the government for a higher level of attainment. Social transfers correspond to the sum of social assistance and housing benefits paid by the government to individuals. Social transfers are computed using the OECD Tax-Benefit model (OECD, 2015_[4]), under the assumption of a single worker with no children, aged 40.
- The unemployment benefit effect is the discounted sum of additional unemployment benefits associated with a higher education level over the course of a working-age life and received during periods of unemployment, taking into account the probability of being unemployed for the different levels of educational attainment. Unemployment benefits are computed using the OECD Tax-Benefit model, under the assumption of a single worker with no children, aged 40. Individuals are considered to be eligible for full unemployment benefits during unemployment.

Limitations and further considerations

- Data reported are accounting-based values only. The results will probably differ from econometric estimates using the same data at the micro level (i.e. data from

household or individual surveys) rather than a stream of earnings derived from average earnings during a working-age life.

- The approach used estimates future earnings for adults with different levels of education, based on knowledge of how average present gross earnings vary by level of attainment and age. However, the relationship between different levels of educational attainment and earnings may change in the future, as technological, economic and social changes may all alter how wage levels relate to education levels.
- The approach takes into account the effect of education on the likelihood of finding employment. However, this also makes the estimate sensitive to the stage in the economic cycle at which the data are collected. Given that more highly educated adults typically have better labour-market outcomes, the value of education generally increases in times of slow economic growth.
- The theoretical retirement age of 64 has been used to calculate returns over the lifetime. However, the age of eligibility for pensions varies widely between countries. A few years more or less in the labour market can make a substantial difference in the returns to education for an individual and the public.
- The model only considers the taxes and benefits directly linked to the earnings level of an individual, disregarding other taxes that may indirectly be incurred from activities individuals may engage in as a result of their higher income. For instance, as earnings generally increase with educational attainment, individuals with higher levels of education typically consume more goods and services, and thus pay additional value-added tax (VAT) on their consumption. This indicator thus underestimates the public returns.
- Individuals with higher earnings also tend to pay more into their pensions and so, after leaving the labour force, will have a further income advantage that the indicator does not take into account. In addition, in countries where a substantial part of the pension system is financed by employers through employer contributions added to salaries, the returns to higher education are typically underestimated compared to countries where pensions are paid for by the individual.
- Many governments have programmes that provide loans to students at low interest rates which provide a strong incentive for individuals to pursue their studies and reduce the costs of attaining higher education. Yet, as loans have to be repaid later, they also reduce the financial benefits of education. While currently not included in the calculation, these subsidies can often make a substantial difference to the public and private returns to education.
- Other factors not reflected in this indicator affect the returns to education. For instance, the financial returns may be affected by the field of study and by country-specific economic situations, labour-market contexts and institutional settings, as well as by social and cultural factors. Furthermore, returns to education are not limited to financial returns but also include other economic outcomes, such as increased productivity that boosts economic growth, and social outcomes, such as better health and well-being and higher social participation.
- The discount rate reflects the time-value of money and makes it possible to compare costs or payments (cash flows) over time. The discount rate can be

estimated either by raising it to the level at which financial benefits equal costs, which is then the internal rate of return (IRR), or by setting the discount rate at a required rate, which is then a net present value calculation (NPV) with the gains expressed in monetary units. Choosing an adequate interest rate for the net present value calculations is a difficult and critical issue as it should reflect the overall time horizon of the investment project and the cost of borrowing or the perceived risk of the investment. To keep things simple, and to make the interpretation of results easier, the same discount rate is applied across all countries.

7.5.3. Education and social outcomes

Policy context

Several social outcomes can be related to education through lifestyle choices by individuals which may be improved by the cognitive and socio-emotional skills developed through education. The social outcomes which are commonly analysed include health, work-life balance, social connections, civic engagement and governance, environment, personal safety, and subjective well-being.

Calculation

The relationship between education and social outcomes is measured in a similar way for different variables. Taking the example of education and health, the indicator calculates the percentage of adults reporting that they are in good health for a particular educational attainment level and/or numeracy or literacy proficiency level out of the total number of 25-64 year-olds with the same educational attainment and/or proficiency level.

Percentage of adults reporting that they are in good health:

$$\frac{GOOD\ HEALTH_{i,j}}{Population_{i,j}} \times 100$$

Where $GOOD\ HEALTH_{i,j}$ = the number of people who answered that they are in good or very good health who have attained i educational attainment level and/or who have j literacy or numeracy proficiency level and $Population_{i,j}$ = the total number of people in the population who have i educational attainment level and/or who have j literacy or numeracy proficiency.

Limitations and further considerations

- Cross-country variations in self-reported social outcomes and their associations with educational attainment need to be interpreted with care. This is because subjective measures may be affected by social and cultural factors which can vary both within and across countries.
- When interpreting the results and the differences between groups, special attention should be paid to the standard errors and the confidence interval. The statistical estimates are based on samples of adults, rather than the whole target population.

7.6. Expenditure analysis

Expenditure is commonly analysed through a framework built around three dimensions (see Chapter 4, Section 4.5.1):

- the type of goods and services provided or purchased (core and peripheral)
- the service provider (educational or other organisations, such as bus companies)
- the source of funds financing the provision or purchase of these goods and services (public or private sources).

In addition, there are four different types of expenditure:

- direct public, private and international expenditure on educational institutions
- private expenditure on educational goods and services purchased outside educational institutions
- subsidies to students from government and other private entities
- transfers and payments to other private entities.

Depending on the indicator being calculated, the type of expenditure, the nature of the goods and services purchased, the type of service provider and the source of funds considered may vary, as the following sections lay out in more detail.

7.6.1. Expenditure on educational institutions per student

Policy context

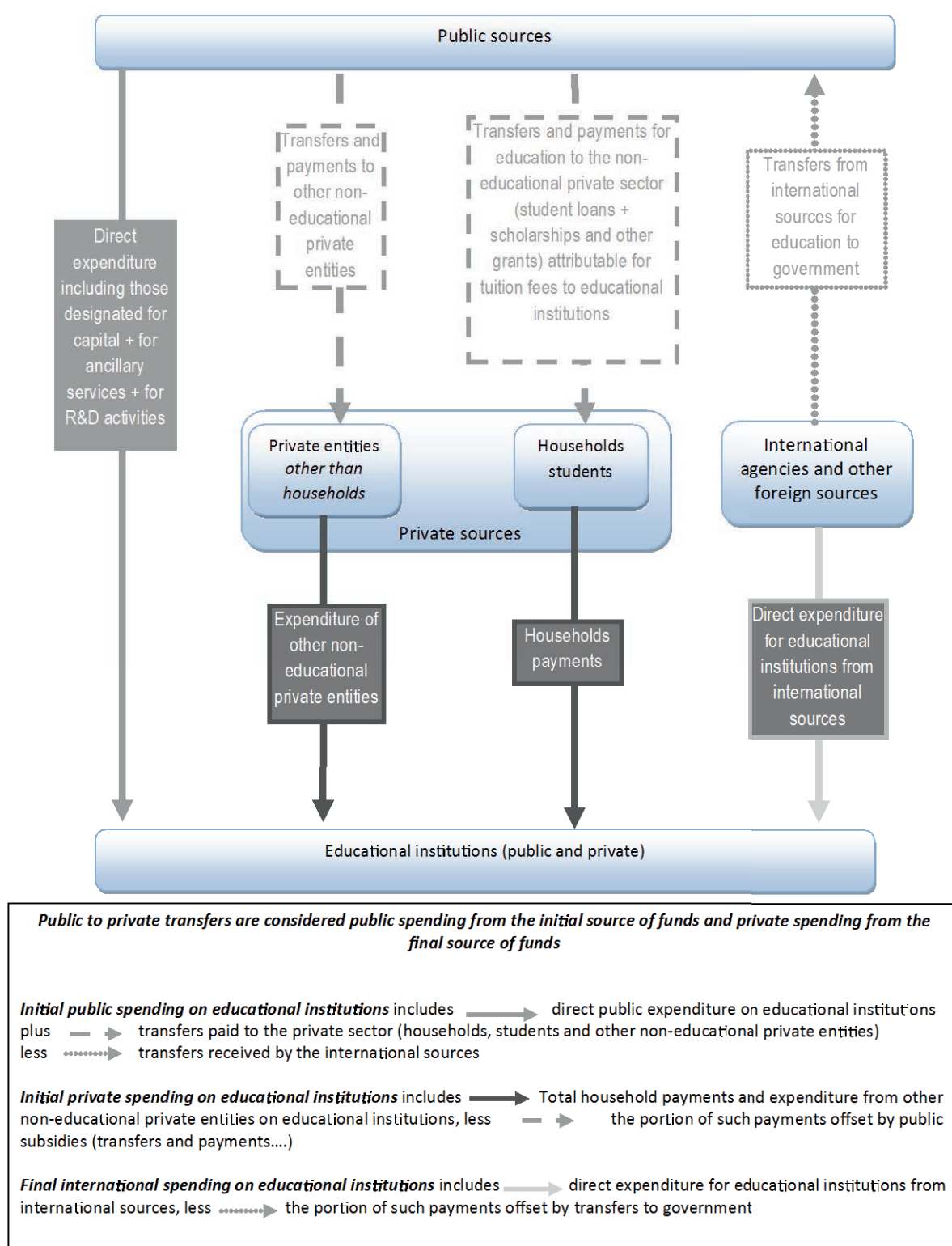
Effective learning requires the right combination of trained and talented personnel, adequate facilities, state-of-the-art equipment and motivated students ready to learn. Policy makers must balance the importance of improving the quality of education services with the desirability of expanding access to education opportunities.

It is difficult to assess the optimal resources needed to ensure optimal returns for either the individual or society as a whole. However, international comparisons of expenditure on educational institutions per student can provide a starting point for discussion on the extent of countries' investment in education in order to assess the effectiveness of different models of educational provision. It indicates the adequacy or efficiency of education funding relative to the system key unit: the student.

Calculation

This indicator calculates the total expenditure on educational institutions in relation to the number of full-time equivalent students enrolled in these institutions. It includes expenditure on staff compensation, and expenditure designated for capital investment, ancillary services and research and development (R&D), from public, private, and international sources (Figure 7.1). It excludes expenditure on servicing debts (i.e. payments of interests on the amounts borrowed for educational purposes and repayments of the principal) and tuition fees paid by households to regional or local government rather than directly to educational institutions (UNESCO-UIS / OECD / EUROSTAT, 2017^[2]).

Figure 7.1. Sources of funds considered in the calculation of public, private and international expenditure on educational institutions



Expenditure on educational institutions per student at a particular level of education for all education levels except for early childhood education and care (ISCED 0):

$$\frac{EDU_EXPENDITURE_{year_x} / PPP_{year_x}}{AdjustedFTE_ENRL_{year_x}}$$

This indicator can be disaggregated by the source of funds: public, private or international. The disaggregation of the indicator across public, private and international funds is presented both from the perspective of the *initial source* of funds before government transfers to the private sector, and from the *final source* of funds, after public transfers have been made to private entities.

Public expenditure on educational institutions per student:

$$\frac{EDU_EXPENDITURE_{public,year_x}/PPP_{year_x}}{AdjustedFTE_ENRL_{year_x}}$$

Private expenditure on educational institutions per student:

$$\frac{EDU_EXPENDITURE_{private,year_x}/PPP_{year_x}}{AdjustedFTE_ENRL_{year_x}}$$

International expenditure on educational institutions per student:

$$\frac{EDU_EXPENDITURE_{international,year_x}/PPP_{year_x}}{AdjustedFTE_ENRL_{year_x}}$$

$EDU_EXPENDITURE_{year_x}$ is the total expenditure (public, private and international) on educational institutions (Figure 7.1). It includes expenditure on core educational goods and services such as teaching staff, school buildings, and school books and teaching materials, and peripheral educational goods and services such as research and development services (R&D), ancillary services, general administration and other activities (see Chapter 4, Section 4.5 for definitions of educational expenditure).

$EDU_EXPENDITURE_{public,year_x}$ refers to total direct government expenditures on educational institutions for a specific year. When this is calculated from the *initial source* of funds, it includes public subsidies to households and other private entities for educational institutions. International expenditure on educational institutions may be included in public sources as this often represents a very small share of total funding on education.

$EDU_EXPENDITURE_{private,year_x}$ refers to total household payments to educational institutions, and total payments of other private institutions to educational institutions. When this is calculated from the *final source* of funds, it includes public subsidies to household and other private entities for educational institutions.

$EDU_EXPENDITURE_{international,year_x}$ refers to total expenditure for educational institutions from international sources. When this is calculated from the *final source* of funds, it includes transfers from international sources for education to government.

$EDU_EXPENDITURE_{year_x} / PPP_{year_x}$ is expenditure on educational institutions (in national currency) converted into equivalent USD by dividing the national currency figure by the purchasing power parity (PPP) index for gross domestic product (GDP). The PPP exchange rate is used because the market exchange rate is affected by many factors (interest rates, trade policies, expectations of economic growth, etc.) that have little to do

with current relative domestic purchasing power in different OECD countries. The PPP controls for the different costs of living and price levels by equalising the purchasing power of different currencies for a market “basket of goods”.

$AdjustedFTE_ENRL_{year_x}$ is the number of full-time students enrolled in educational institutions adjusted to the financial year. Using different reference periods for the expenditure and enrolment data would bias the expenditure on educational institutions per student. Therefore, it is necessary to estimate student numbers for the reference period that coincides with the financial year. This involves taking a weighted average of the full-time equivalent number of students in the two adjacent academic years that overlap with the financial year.

$AdjustedFTE_ENRL_{year_x} =$

$$W_{year_x-1/x} * FTE_ENRL_{year_x-1/x} + W_{year_x/x+1} * FTE_ENRL_{year_x/x+1}$$

Where $W_{year_x-1/x}$ is the weight representing the portion of the academic year (x-1) that overlaps with the financial year x; $W_{year_x/x+1}$ is the weight representing the portion of the academic year (x+1) that overlaps with the financial year x; and $FTE_{year_x-1/x}$ is the number of full-time equivalent students enrolled in educational institutions in the academic year x-1 /x; and $FTE_{year_x/x+1}$ is the number of full-time equivalent students enrolled in educational institutions in the academic year x/x+1.

For example, in Austria, aligning school enrolment data with the 2001 financial year involves adding 8/12ths of the 2000/01 school year full-time equivalent (FTE) enrolment data and 4/12ths of the 2001/02 school year FTE enrolment data.

Expenditure on educational institutions per student can also be expressed relative to GDP per capita to measure the relative proportion of a nation’s wealth per capita that is invested in educational institutions.

Expenditure on educational institutions per student as a percentage of GDP per capita:

$$\frac{EDU_EXPENDITURE_{year_x}}{AdjustedFTE_ENRL_{year_x}} / \frac{GDP_{year_x}}{Population_{year_x}}$$

Expenditure on educational institutions in the national currency is divided by GDP per capita in the national currency. See more details in next section.

Limitations and further considerations

- All expenditure data as well as the GDP are adjusted to latest year available prices using the GDP price deflator.
- In the cases where the financial year data do not align to the reference year (calendar year), the financial year data are updated to the intended reference period using the appropriate GDP deflators. As a result, adjusted FTE figures might differ from FTE figures in other indicators.
- Not all spending on instructional goods and services occurs within educational institutions. For example, families may purchase commercial textbooks and materials or seek private tutoring for their children outside educational institutions. At the tertiary level, students’ living expenses and foregone earnings can also account for a significant proportion of the costs of education. This

indicator excludes all expenditure outside educational institutions, even if publicly subsidised.

- At higher levels of education, this measure is more difficult to interpret because student enrolment rates vary widely among countries. At tertiary level, for example, OECD countries may rank relatively high on this measure if a large proportion of their wealth is spent on educating a relatively small number of students.
- Expenditure on programmes not distributed by ISCED level were excluded from the calculation of total education expenditure.
- When spending per student is calculated at the level of early childhood education and care programmes (ISCED 0) per child, headcounts are used instead of FTE.

7.6.2. *Expenditure on educational institutions as a percentage of GDP*

Policy context

Expenditure on educational institutions is an investment that can help to foster economic growth, enhance productivity, contribute to personal and social development, and reduce social inequality. The proportion of total financial resources each country devotes to education is one of the key choices governments make. This indicator provides a measure of the proportion of their wealth (GDP) that nations invest in educational institutions and therefore allows countries' investment to be valued as a function of their relative ability to pay. The “domestic” approach (relative to GDP) is preferred to the “national” approach (relative to gross national product, GNP) because it is consistent with other concepts used in education statistics and in the UOE data collection.

Calculation

This indicator represents expenditures on educational institutions in relation to the wealth of nations as measured by GDP. It includes expenditure on staff compensation, and expenditure designated for capital investment, ancillary services and R&D, from public, private and international sources (detailed in Figures 7.1, 7.2 and 7.3). It excludes expenditure on servicing debts (i.e. payments of interests on the amounts borrowed for educational purposes and repayments of the principal) and tuition fees paid by households to regional or local government rather than directly to educational institutions.

Expenditure on educational institutions as a percentage of GDP:

$$\frac{EDU_EXPENDITURE_{year_x}}{GDP_{year_x}}$$

This indicator can be disaggregated by sources of funds – public, private or international. The disaggregation of the indicator across public, private and international funds is presented both from the perspective of the **initial source** of funds before government transfers to the private sector, and from the **final source** of funds, after public transfers have been made to private entities (Figure 7.1).

Public expenditure as a percentage of GDP:

$$\frac{EDU_EXPENDITURE_{public,year_x}}{GDP_{year_x}}$$

Private expenditure as a percentage of GDP:

$$\frac{EDU_EXPENDITURE_{private,year_x}}{GDP_{year_x}}$$

International expenditure as a percentage of GDP:

$$\frac{EDU_EXPENDITURE_{international,year_x}}{GDP_{year_x}}$$

Where $EDU_EXPENDITURE_{public,year_x}$ refers to total direct government expenditure on educational institutions for a specific year. When this is calculated from the **initial source** of funds, it includes public subsidies to households and other private entities for educational institutions. International expenditure on educational institutions may be included in public sources as this often represents a very small share of total funding on education.

$EDU_EXPENDITURE_{private,year_x}$ refers to total household payments to educational institutions, and total payments of other private institutions to educational institutions. When this is calculated from the **final source** of funds, it includes public subsidies to household and other private entities for educational institutions.

$EDU_EXPENDITURE_{international,year_x}$ refers to total expenditure for educational institutions from international sources. When this is calculated from the **final source** of funds, it includes transfers from international sources for education to government.

GDP_{year_x} refers the gross domestic product for a specific year, or the producers' value of the gross outputs of resident producers, including distributive trades and transport, minus the value of purchasers' intermediate consumption plus import duties. GDP is expressed in local currency (in millions).

Limitations and further considerations

- For countries which provide this information for a reference year that is different from the calendar year (such as Australia and New Zealand), adjustments are made by linearly weighting their GDP between two adjacent national reference years to match the calendar year. The data are derived from the National Accounts Database.
- The student enrolment data are aligned to the financial year reference period. It may not be necessary to use an inflation adjustment to bring the financial year in line with the reference year if the GDP per capita figures refer to the same reference year as the finance data.
- As in the previous indicator, not all spending on instructional goods and services – such as on textbooks and private tutoring – occurs within educational institutions. This indicator excludes all expenditure outside educational institutions, even if publicly subsidised.
- Expenditure on programmes not distributed by ISCED level are excluded from the calculation of total education expenditure.
- The theoretical framework underpinning the calculation of GDP has been provided for many years by the United Nations' publication, *A System of National Accounts*, which was released in 1968. Updated versions were released in 1993 and 2008 (commonly referred to as SNA93 and SNA2008).

7.6.3. *Relative proportions of public, private and international expenditure on educational institutions*

Policy context

How costs are shared between participants in the education system and society as a whole is an issue under discussion in many countries. This question is especially relevant at the beginning and end of a student's education – early childhood and tertiary education – where full or nearly full public funding is less common in some countries. This indicator illustrates how the cost of education is shared between the public and private sectors, including the amounts invested by one sector relative to the other and the extent of transfers of educational funds between them.

Calculation

This indicator represents the relative proportions of disaggregated public, private and international expenditure on educational institutions. It includes expenditure on staff compensation, and expenditure designated for capital investment, ancillary services and R&D, from public, private, and international sources (detailed in Figure 7.1). It excludes expenditure on servicing debts (i.e. payments of interests on the amounts borrowed for educational purposes and repayments of the principal) and tuition fees paid by households to regional or local government rather than directly to educational institutions.

The attribution of spending to public, private and international funds is presented both from the perspective of the **initial source** of funds before government transfers to the private sector, and from the **final source** of funds, after public transfers have been made to private entities.

Relative proportion of public sources:

$$\frac{EDU_EXPENDITURE_{public}}{EDU_EXPENDITURE} \times 100$$

Relative proportion of private sources:

$$\frac{EDU_EXPENDITURE_{private}}{EDU_EXPENDITURE} \times 100$$

Relative proportion of international sources:

$$\frac{EDU_EXPENDITURE_{international}}{EDU_EXPENDITURE} \times 100$$

Where $EDU_EXPENDITURE_{public}$ refers to public expenditure on institutions including expenditure on ancillary services and R&D. It excludes expenditure not directly related to education (such as on culture, sports and youth activities) unless provided as ancillary services. When this is calculated from the **initial source** of funds, it includes public subsidies to households and other private entities for educational institutions.

$EDU_EXPENDITURE_{private}$ refers to expenditure by the private sector (students, households and other private entities as defined in Chapter 4, Section 4.5.4) on educational institutions. When this is calculated from the **final source** of funds, it includes public subsidies to households and other private entities for educational institutions.

- $EDU_EXPENDITURE_{international}$ refers to funds from public multilateral organisations for development aid to education. These organisations include multilateral development banks (the World Bank and regional development

banks), United Nations agencies and other intergovernmental organisations, bilateral development co-operation government agencies, and international non-governmental organisations (NGOs) established in the receiving country. International expenditure on educational institutions may be included in public expenditure as this often represents a very small share of total funding on education.

- *EDU_EXPENDITURE* refers to total public, private and international spending on educational institutions as defined above.

Limitations and further considerations

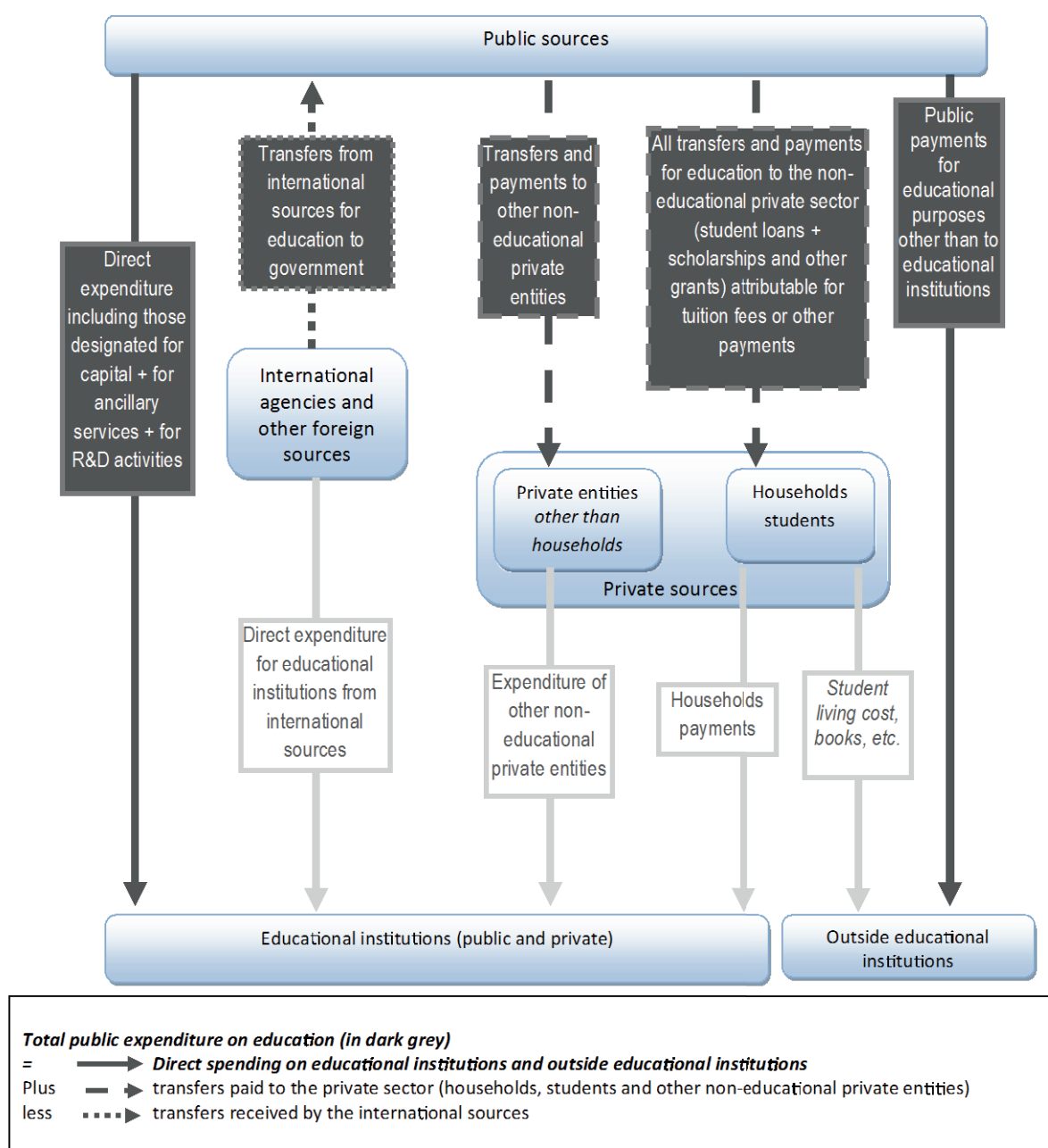
- As with the previous two indicators, not all spending on instructional goods and services occurs within educational institutions. This indicator excludes all expenditure outside educational institutions, even if publicly subsidised.
- Expenditure on servicing debts (i.e. payments of interests on the amounts borrowed for educational purposes and repayments of the principal) is excluded from the calculation.
- Tuition fees that the families of students enrolled in public educational institutions are paying to regional or local government rather than directly to educational institutions are excluded to avoid double counting as they are included under household payments to institutions.
- Expenditure on programmes not distributed by ISCED level were excluded from the calculation of total education expenditure.

7.6.4. Total public expenditure on education

Policy context

Public expenditure on education as a percentage of total public expenditure indicates the value of education spending relative to that of other public investments such as health care, social security, and defence and security. To some extent, it can be interpreted in terms of relative priorities between different functions of the public sector and the abilities of the private sector to deliver on them. However, the role and mandate of the public sector varies greatly from country to country, according to their specific circumstances. For instance, nationwide health or security crises may result in comparatively lower spending on education relative to health or defence, even though education may remain a high priority for the public agenda.

Figure 7.2. Sources of funds considered in the calculation of total public expenditure on educational as a share of total government expenditure



Calculation

Contrary to previous indicators, which focused solely on expenditure on educational institutions, this indicator looks at total public educational expenditure (see Figure 7.2). This includes subsidies for expenditure outside institutions (such as for students' living costs) and by all public entities, not just ministries of education.

Total public expenditure in education:

$$\frac{EDU_EXPENDITURE_{public}}{ALL_EXPENDITURE_{public}}$$

Where $EDU_EXPENDITURE_{public}$ is total public spending on educational institutions and outside educational institutions. It includes all public-to-private transfers including loans for tuition, loans and subsidies for students' living costs and for other private expenditure outside institutions (subsidies for education to private entities). It includes expenditure by all public entities at central (national) government level including ministries other than ministries of education, local and regional governments, and other public agencies.

$ALL_EXPENDITURE_{public}$ is general government spending and corresponds to the non-repayable current and capital expenditure of all levels of government: central, regional and local.

Limitations and further considerations

- The data can also be presented broken down by government sources of expenditure on education, apart from international sources, classified into three levels: central (national) government, regional government (province, state, Land etc.) and local government (municipality, district, commune etc.). The terms “regional” and “local” apply to governments whose responsibilities are exercised within certain geographical subdivisions of a country. They do not apply to government bodies whose roles are not geographically circumscribed but are defined in terms of responsibility for particular services, functions or categories of students (see Chapter 4, Section 4.5.4 for more detail on the levels of government).
- Although expenditure on debt servicing (e.g. interest payments) is included in total public expenditure, it is excluded from public expenditure on education. The reason is that some countries cannot separate interest payments for education from those for other services. This means that public expenditure on education as a percentage of general government expenditure may be underestimated in countries where interest payments represent a large proportion of total public expenditure on all services.
- This indicator is usually calculated for public expenditure on primary to tertiary education.
- Expenditure on programmes not distributed by ISCED level were excluded from the calculation of total education expenditure.

7.6.5. Financial support to students and tuition fees charged by educational institutions*Policy context*

Policy decisions related to tuition fees affect both the cost of tertiary education to students and the resources available to tertiary institutions. Policies aimed at supporting students and their families enables governments to encourage participation in education – particularly among low-income students – by covering part of the cost of education and

related expenses. In this way, governments can address issues of access and equality of opportunity.

Calculation

Two indicators can be calculated: average tuition fees and the share of students benefitting from financial aid.

The estimated annual average tuition fees charged by educational institutions:

$$\frac{\text{Annual average tuition fees}_{\text{EducationLevel, fields of education, institution type, student nationality}}}{PPP}$$

Where the annual average tuition fees for full-time students (broken down by levels of education, fields of education or the international/national status of students) in national currency are converted into equivalent USD by dividing by the PPP index for GDP. The PPP controls for the different costs of living and price levels by equalising the purchasing power of different currencies for a market “basket of goods”.

The percentage of students benefitting from financial aid:

$$\frac{\text{Students benefitting from public loans AND/OR scholarships/grants}_{\text{EducationLevel}}}{\text{Full – time students enrolled in education}_{\text{EducationLevel}}}$$

Limitations and further considerations

- Amounts of tuition fees and associated proportions of students should be interpreted with caution as they represent the weighted average of the main tertiary programmes and do not cover all educational institutions. Nonetheless, the figures reported can be considered as good proxies of the differences across countries in tuition fees charged by the main educational institutions and for the majority of students. Data in national currencies have been converted to USD using purchasing power parities.
- While data are available on the amounts of average loans and the proportion of students who have a loan, interest rates, repayment details, average debt at graduation, and remission/forgiveness possibilities, no data are published on average amounts for scholarships or grants.
- Public subsidies and support can be mostly directed towards national students, with countries setting different tuition fees for national and international students – or students coming from a specific group of countries may pay the same tuition fees as national students. To identify countries aiming to encourage international students, data can also be broken down by country of origin.

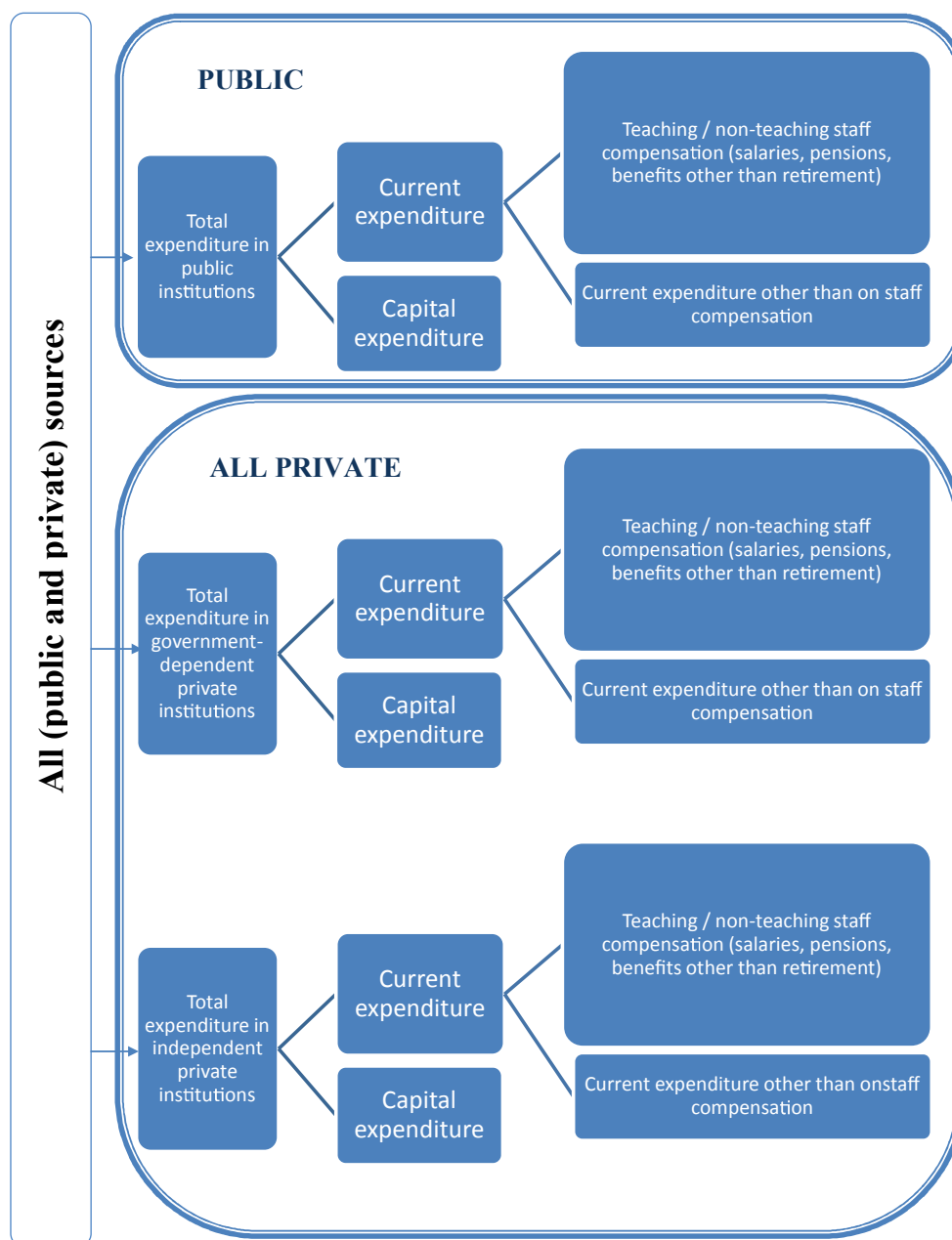
7.6.6. Share of current and capital expenditure on education

Policy context

Decisions about how resources are allocated affect the material conditions in which students are taught and can also influence the nature of instruction. This indicator shows how funding for educational institutions is spent on resources and services by breaking it down into capital and current expenditure (see definitions in Chapter 4, Section 4.5.5). Capital expenditure refers to spending on assets that last more than one year. It includes spending on construction, renovation and major repairs of buildings. Current expenditure

covers spending on resources used each year to operate the educational institution. It includes such spending as the pay of teachers and institution staff, maintenance of buildings, school meals, and the rental of buildings and other facilities.

Figure 7.3. What current and capital expenditure on education covers



Calculation

Relative proportion of current expenditure:

$$\frac{EDU_EXPENDITURE_{current,EducLevel}}{EDU_EXPENDITURE} \times 100$$

Relative proportion of capital expenditure:

$$\frac{EDU_EXPENDITURE_{capital,EducLevel}}{EDU_EXPENDITURE} \times 100$$

$EDU_EXPENDITURE_{current,EducLevel}$ refers to spending on goods and services consumed at a certain level of education within the current year and requiring recurrent production in order to sustain educational services. Other than salaries, current expenditure by educational institutions includes expenditure on subcontracted services such as support services (e.g. maintenance of buildings), ancillary services (e.g. preparation of meals for students) and rental of buildings and other facilities. It also includes expenditure on other resources and covers the purchases of other resources used in education, such as teaching and learning materials, other materials and supplies, items of equipment not classified as capital, fuel, electricity, telecommunications, travel expenses, and insurance, and required payments other than expenditure on educational resources and services. For example, this indicator includes the property taxes that educational institutions are required to pay in some countries. These services are obtained from outside providers, unlike the services provided by the education authorities or by the educational institutions using their own personnel. All sources of funding are considered in this definition, public and private.

$EDU_EXPENDITURE_{capital,EducLevel}$ refers to spending on assets at a specific level of education that last longer than one year. It includes construction, renovation or major repair of buildings and new or replacement equipment. It represents the value of educational capital acquired or created during the year in question – that is, the amount of capital formation – regardless of whether the capital expenditure was financed from current revenue or through borrowing. For example, if a school building costing EUR 10 millions is constructed in 2010, the full amount should be reported as capital expenditure for 2010, even if the building is financed by a loan with repayments spread over 20 years. If the building was constructed over two years, 2009-10, with EUR 7 million paid towards the cost of construction in the first year and EUR 3 million in the second year, capital outlays of EUR 7 million should be included in the 2009 data and EUR 3 million in the 2010 data. All sources of funding are considered in this definition, public and private.

$EDU_EXPENDITURE$ refers to total educational expenditure at all levels of education, including public and private sources.

Limitations and further considerations

- Neither current nor capital expenditure includes debt servicing (e.g. interest payments or repayments of the principal). This means that neither interest payments nor repayments of the principal should be counted as part of capital or current spending.

7.6.7. Factors influencing the level of expenditure on education

Policy context

Governments have become increasingly interested in the relationship between the amount of resources devoted to education and student learning outcomes. Governments seek to provide more and better education for their populations while also ensuring that public funding is used efficiently, particularly when public budgets are being tightened. Teachers' pay usually makes up the largest share of expenditure on education and thus of expenditure per student. Teachers' salary costs are a function of students' instruction time, teachers' teaching time, teachers' salaries and the number of teachers needed to teach students, which depends on estimated class size. This indicator seeks to explain the contribution of each of the four factors mentioned to the salary cost of teachers per student in primary and secondary education.

Calculation

Salary cost of teachers per student:

$$SAL \times instT \times \frac{1}{teachT} \times \frac{1}{ClassSize} = \frac{SAL}{Ratiostud / teacher}$$

Where *SAL* refers to teachers' salaries, estimated as the statutory salary after 15 years of experience. Teachers' salaries in national currencies are converted into equivalent USD by dividing the national currency figure by the purchasing power parity (PPP) index for private consumption.

instT refers to instruction time of students, estimated as the annual intended instruction time, in hours, for students.

teachT refers to teaching time of teachers estimated as the annual number of teaching hours for teachers.

ClassSize is computed based on the ratio of students to teaching staff and the number of teaching hours and instruction hours.

Ratiostud/teacher refers to the ratio of students to teaching staff.

Contribution of various factors to explain the difference between two variables

The analysis of the contribution of various factors to a difference between two variables is assessed, based on an assumption relating to the mathematical relationship between these variables and the explanatory:

$$X_1 = Q_1 \times R_1 \times S_1 \times T_1$$

$$X_2 = Q_2 \times R_2 \times S_2 \times T_2$$

then:

$$\frac{X_2}{X_1} = \frac{Q_2 \times R_2 \times S_2 \times T_2}{Q_1 \times R_1 \times S_1 \times T_1}$$

and,

$$1 + \frac{X_2 - X_1}{X_1} = \left(1 + \frac{Q_2 - Q_1}{Q_1}\right) \times \left(1 + \frac{R_2 - R_1}{R_1}\right) \times \left(1 + \frac{S_2 - S_1}{S_1}\right) \times \left(1 + \frac{T_2 - T_1}{T_1}\right)$$

Which can also be written as:

$$1 + V = (1 + U) \times (1 + W) \times (1 + Y) \times (1 + Z)$$

Where

$$V = \frac{X_2 - X_1}{X_1}, U = \frac{Q_2 - Q_1}{Q_1}, W = \frac{R_2 - R_1}{R_1}, Y = \frac{S_2 - S_1}{S_1}, Z = \frac{T_2 - T_1}{T_1}$$

The right hand side of the equation can also be written as:

$$V = U + W + Y + Z + UW + UY + UZ + WY + WZ + YZ + UWY + UYZ + WYZ + UWYZ$$

where V is the relative variation between X_2 and X_1 ($V = (X_2 - X_1)/X_1$).

The contribution of the different explanatory factors to the relative variation between X_2 and X_1 is therefore:

i) for factor Q:

$$U + \frac{UW}{2} + \frac{UY}{2} + \frac{UZ}{2} + \frac{UWY}{2} + \frac{UWZ}{2} + \frac{UYZ}{2} + \frac{UWYZ}{2} = A$$

ii) for factor R:

$$W + \frac{UW}{2} + \frac{UY}{2} + \frac{UZ}{2} + \frac{UWY}{3} + \frac{UWZ}{3} + \frac{UYZ}{3} + \frac{UWYZ}{4} = B$$

iii) for factor S:

$$Y + \frac{WY}{2} + \frac{UY}{2} + \frac{YZ}{2} + \frac{UWY}{3} + \frac{UYZ}{3} + \frac{WYZ}{3} + \frac{UWYZ}{4} = C$$

iv) for factor T:

$$Z + \frac{UZ}{2} + \frac{WZ}{2} + \frac{YZ}{2} + \frac{UWZ}{3} + \frac{UYZ}{3} + \frac{WYZ}{3} + \frac{UWYZ}{4} = D$$

where $A + B + C + D = V$

With this method, we can measure the direct and indirect contribution of each factor to the variation of the variable between the two countries. For example, if a worker receives a 10% increase of the hourly wage and increases the number of hours of work by 20%, his earnings will increase by 32%, resulting from the direct contribution of each of these variations (0.1 + 0.2) and the indirect contribution of these variations due to the combination for these two factors (0.1*0.2).

The contribution of explanatory factors to the absolute difference between the two variables ($X_2 - X_1$) is:

i) for factor U:

$$\frac{A}{V} \times (X_2 - X_1) = AX_1 = a$$

ii) for factor R:

$$\frac{B}{V} \times (X_2 - X_1) = BX_1 = b$$

iii) for factor S:

$$\frac{C}{V} \times (X_2 - X_1) = CX_1 = c$$

iv) for factor T:

$$\frac{D}{V} \times (X_2 - X_1) = DX_1 = d$$

With

$$a + b + c + d = X_2 - X_1$$

Limitations and further considerations

- Class size is an estimated proxy for the average number of students that are grouped together in classrooms. It is estimated on the basis of the ratio of students to teaching staff and the number of teaching hours and instruction hours. As a proxy, this estimate should be interpreted with caution.
- The salary cost of teachers per student is estimated based on theoretical values: statutory salaries at a specific point in the salary scale, theoretical students' instruction times and statutory teachers' teaching times, and estimated class sizes. As a consequence, this measure may differ from the actual teachers' salary costs resulting from the combination of actual average values for these four factors.

7.7. Participation and access to education

A well-educated population has become a defining feature of a modern society. Education is seen as a mechanism for instilling civic values, and as a means for developing individuals' productive and social capacity. Early childhood programmes prepare young children socially and academically for primary education. Primary and secondary education provides basic skills that serve as a foundation for young people to become productive members of society. Tertiary education provides opportunities to acquire

advanced knowledge and skills, either immediately after initial schooling or later. This section outlines the main methodologies used to report access and participation in education using enrolment rates, expected number of years in education and first-time entry rates. It also covers the international dimension of higher education.

7.7.1. Enrolment rates – from early childhood to tertiary education

Policy context

Information on enrolment rates at various levels of education provides a picture of the structure of different education systems, as well as access to educational opportunities in those systems.

In addition to analysing the paths of individuals through the educational system, enrolment rates provide additional information such as the prevalence of part-time study, vocational education and training, and formal education of adults beyond the typical enrolment age group.

Calculation

The enrolment rates in *Education at a Glance* are net enrolment rates and are calculated by dividing the number of students of a particular age or age group enrolled in all levels of education by the number of people in the population in that age or age group (UNESCO-UIS / OECD / EUROSTAT, 2017^[2]).

Enrolment rate:

$$\frac{ENRL_{Age,Gender,EducLevel,general/vocational,part-time/full-time}}{Population_{Age}} \times 100$$

Where $ENRL_{Age,Gender,EducLevel,general/vocational,part-time/full-time}$ is the number of people of a specific age or age group who are enrolled in a particular level of education. This figure can further be broken down by gender, programme orientation (general/vocational) and intensity (part-time/full-time).

$Population_{Age}$ is the corresponding population of the same age or age group.

This indicator is typically calculated for single ages (15, 16, 17, 18, 19, etc.) or age groups (5-14 year-olds, 15-19 year-olds, 20-29 year-olds, 25-64 year-olds).

Limitations and further considerations

- Enrolment data and population data must refer to the same time period, as differences in the reference dates between those data can lead to errors in calculation and rates exceeding 100%. Students' ages used in the enrolment data usually refer to their age on the 1st of January of the reference year (see Chapter 4, Section 4.1.7 for more details).

7.7.2. Expected years in education

Policy context

Expected years in education is an estimate of the number of years an individual may expect to be in education. This comprises enrolment in all forms of formal education, including non-continuous and incomplete participation.

Calculation

Expected years in education is measured as the sum of the age-specific probabilities of enrolment of the total population of a given country. It provides a realistic approximation of the number of years spent in school for levels of education in which the majority of the population at the typical age is enrolled.

Option 1: Expected years in education

$$\sum_{Age=5,...,39} \frac{ENRL_{Age,Gender}}{Population_{Age,Gender}} \times 100$$

Where $ENRL_{Age,Gender}$ is the number of students aged 5 to 39 enrolled in education in the reference year.

$Population_{Age,Gender}$ is the population at age 5 to 39.

Expected years in education can be calculated separately by gender.

Option 2: Expected years in education and at work between the ages of 15 and 29

$$\frac{STUDENT_{15-29Yrs,Gender}}{Population_{15-29Yrs,Gender}} \times 15$$

Where $STUDENT_{15-29Yrs,Gender}$ is the number of 15-29 year-olds in education and $Population_{15-29Yrs,Gender}$ is the 15-29 year-old population

This calculation is not based on the sum of the age-specific probabilities of enrolment, but rather on the share of 15-29 year-olds in each category multiplied by 15 (the number of years between 15 and 29). For example, if 50% of 15-29 year-olds are in education, the expected number of years in education is 7.5 years (0.50×15).

Expected years in education can be calculated separately by gender.

For this option, the data sources are the national labour force surveys.

Limitations and further considerations

- In *Education at a Glance*, the expected years in education is calculated for the population aged 5 to 39 and estimates the number of years in which an individual is expected to be enrolled in an educational programme (either part-time or full-time) during those ages. This interpretation assumes that the current patterns of enrolment will remain unchanged over time.
- The expected years in education cannot be interpreted as a measure of educational attainment.
- When comparing data on expected years of education across countries, it must be borne in mind that neither the length of the school year nor the quality of education is necessarily the same in each country. In addition, unless specified, this indicator makes no distinction between full and part-time study and these are given equal weight in the calculation.

7.7.3. *Share of repeaters and share of over-age students*

Policy context

The way educational systems cope with students who repeat grades may differ greatly between countries and within the same countries across ISCED levels, programmes, rural or urban areas, socio-economic conditions or other factors. The existence of repeaters and their distribution across different grades varies greatly from country to country.

The number of repeaters is closely linked to the number of over-age students (i.e., students at least two years older than the intended age for a grade), as in most countries the main reason for having a large share of over-age students is the accumulation of students who have repeated at least one year in one grade or another. The share of over-age students is thus a complementary metric to the share of repeaters. Over-age students in the final grade of any level are likely to enter the labour market with a disadvantage.

Calculation

The share of repeaters is the number of repeaters in a grade and year compared to the total number of students enrolled in the same grade and year.

The share of over-age students is the number of students at least two years older than the intended age for a grade compared to the number of students enrolled in the same grade. The intended ages of enrolment for each grade are available in each country's ISCED mapping.

Share of repeaters:

$$\frac{\sum_{grade} RPTR}{\sum_{grade} ENRL} \times 100$$

Share of over-age students:

$$\frac{\sum_{grade} OVERAGE}{\sum_{grade} ENRL} \times 100$$

Where RPTR is the number of repeaters enrolled in a given grade and ISCED level and OVERAGE is the number of over-age students in a given grade and ISCED level, i.e. at least two years older than that grade's intended age of enrolment. ENRL is the number of students enrolled in initial education, i.e. before their entry into work.

The calculation is limited to the last grade of each ISCED level.

Limitations and further considerations

- The share of repeaters differs from the repetition rate as it is calculated by comparing repeaters to the total number of students enrolled in the grade and year in which they are re-enrolled rather than to their original grade and year. This indicator thus measures the relative presence of repeaters in an educational system, but not the rate of failure of a given grade or ISCED level.
- The calculation of the share of over-age students is based on data on enrolment by age and is indicative of the share of students who are likely to enter the next grade or ISCED level after a delay. However, for some countries, any misalignment between the reference ages of the data on enrolment by age and the intended ages

recorded in the ISCED mappings may result in an under- or over-estimation of the share of over-age students. For example, if students are allowed to enrol in a grade if they are 12 years old on 30 June 2015, but their enrolment is measured on 1 January 2016, it is likely that half of the students will have turned 13 by then and the share of over-age students is likely to be over-estimated.

7.7.4. Entry rates to tertiary education

Policy context

Entry rates to tertiary education estimate the proportion of people from a specified age cohort who enter a certain level of tertiary education. Entry rates are currently only calculated at the tertiary level, where the policy relevance is greatest. It provides information on the accessibility of tertiary education, the perceived value of attending tertiary programmes, and the degree to which a population is acquiring the high-level skills and knowledge that can create and fuel knowledge-based economies.

Calculation

Entry rates are calculated for each ISCED level of tertiary education. The first-time entry rate into tertiary education as a whole is also estimated.

Entry rates are calculated as net entry rates unless lack of data prevents this in which case they are calculated as gross entry rates.

The net entry rate for a specific age group is obtained by dividing the number of new or first-time entrants in that age group for each type of tertiary education by the total population in the corresponding age group. The overall net entry rate is calculated by adding the rates for each age group. The result represents an estimate of the probability that a young person will enter tertiary education in his or her lifetime if current age-specific entry rates continue.

Net entry rate:

$$\sum \frac{NewEntrants_{EducLevel, Age}}{Population_{Age}} \times 100$$

Where $NewEntrants_{EducLevel, Age}$ is the number of new entrants at a specific age to tertiary education for each of the following education levels: short-cycle tertiary programmes, bachelor's level or equivalent, master's level or equivalent and doctoral programmes.

$Population_{Age}$ is the number of people in the population of the same age.

Since data by single years are only available for ages 11 to 49, the net entry rate for older students is estimated from data for 5-year age bands until the age of 64, and the whole cohort for 65 year-olds and over.

When data on new entrants are not available by age, the **gross entry rate** is calculated. This is the ratio of all new entrants, regardless of their age, to the size of the population at the typical age of entry.

Gross entry rate:

$$\sum \frac{NewEntrants_{EducLevel, All Ages}}{Population_{Typical Age}} \times 100$$

Where $NewEntrants_{EducLevel, All\ Ages}$ is the total number of new entrants to tertiary education for each of the following education levels: short-cycle tertiary programmes, bachelor's level or equivalent, master's level or equivalent and doctoral programmes, irrespective of their age.

$Population_{Typical\ Age}$ is the number of people in the population that are at the typical age of entry to that level (see Chapter 4, Section 4.1.7 for more details).

Not all countries can distinguish between students entering a tertiary programme for the first time and those transferring between different levels of tertiary education or repeating or re-entering a level after an absence.

First-time entry rate at tertiary level:

$$\sum \frac{NewEntrants_{TertiaryLevel, AgeGroup}}{Population_{AgeGroup}} \times 100$$

Where $NewEntrants_{TertiaryLevel, AgeGroup}$ is the number of new entrants to any level of tertiary education at a specific age group and $Population_{Age}$ is the number of people in the population of the same age group.

Rates for each level of tertiary education cannot simply be added together to form a total tertiary-level new entrants rate because it would result in counting entrants twice.

Entry rates can be disaggregated by gender and national origin. The profile of new entrants can also be disaggregated by fields of education.

Limitations and further considerations

- Entry rates represent the percentage of an age cohort that is expected to enter a tertiary programme over a lifetime. This estimate is based on the number of new entrants in a reference year and the age distribution of this group. Therefore, the entry rates are based on a “synthetic cohort” assumption, according to which the current pattern of entry constitutes the best estimate of the behaviour of today's young adults over their lifetime. Entry rates are sensitive to changes in the education system, such as the introduction of new programmes. For example, during the implementation of the Bologna Process, some students in European countries stayed longer than expected in tertiary education, while others postponed their entrance in order to earn a degree under the new classification. Entry rates can be very high, and even greater than 100% (thus clearly indicating that the synthetic cohort assumption is implausible), during a period when there are an unexpectedly high number of entrants.
- In interpreting these indicators, it must be remembered that student numbers are reported on a domestic basis. In countries with limited tertiary study opportunities, entry/participation rates will appear low.
- The entry rate adjusted for international students calculates the entry rate while excluding international students in the numerator of each age-specific entry rate. In several countries, all international students enrolling for the first time in that country are counted as new entrants, regardless of their previous education in other countries. To highlight the impact of international students on entry rates, both unadjusted and adjusted entry rates (i.e. the entry rate when international students are excluded from consideration) should be considered.

7.7.5. *International students in tertiary education*

Policy context

The term “international students” refers to students who have crossed borders specifically for the purpose of study. Tertiary education is becoming more international, not just through student mobility, but also through a number of other factors such as distance education, international education-related internships and training experiences, cross-border delivery of academic programmes and offshore satellite campuses.

Student mobility is of great interest to both governments and university leaders. From the government’s perspective, higher student mobility provides increased access to an international talent pool during the course of study and after graduation. From the university’s perspective, higher student mobility provides increased funding in terms of tuition fees, and international diversity contributes to the dynamism of an educational programme which in turn fosters an attractive environment for talented students and academic staff.

Student mobility has increased dramatically over the past years which raises some policy questions and has increased the need for monitoring.

Calculation

Student mobility can be calculated from the perspective of the country of origin or of the country of destination. International students are those who received their prior education in another country and are not residents of their current country of study (see definitions in Chapter 4, Section 4.1.8). When information on international students is not available, foreign students – students who are not citizens of the country in which they study – can be used as a proxy.

Foreign and international student enrolment provides evidence of the extent of student mobility in tertiary education. This indicator shows international enrolment as a proportion of the total enrolment in the destination (host) country at tertiary level.

International or foreign enrolment:

$$\frac{ENRL_Foreign/International_{EducLevel, EducField, Gender, DestA}}{ENRL_{EducLevel, EducField, DestA}} \times 100$$

Where $ENRL_Foreign/International_{EducLevel, EducField, Gender, DestA}$ refers to the number of international and foreign students of a particular education/ISCED level, field of education, and gender, enrolled in a given destination country.

$ENRL_{EducLevel, EducField, DestA}$ refers to the total enrolment at the same education/ISCED level, field of education, and destination country, including local, international, and foreign students.

The data can be broken down by gender, by different tertiary levels of education (short-cycle tertiary, bachelor’s or equivalent, master’s or equivalent, doctoral or equivalent) or by fields of education, indicating the relative attractiveness of tertiary programmes for international students in each country.

The distribution of international or foreign students in OECD countries at tertiary level by country of destination identifies the major destinations of international students by

estimating the proportion of international students enrolled in each OECD country as a proportion of all international students enrolled in OECD countries.

Distribution of foreign and international students by country of destination:

$$\frac{ENRL_Foreign/International_{DestA,OriginALL}}{ENRL_Foreign/International_{OECDTotal}} \times 100$$

Where $ENRL_Foreign/International_{DestA,OriginALL}$ refers to the total number of international or foreign students enrolled in a given country of destination.

$ENRL_Foreign/International_{OECDTotal}$ refers to the total number of international or foreign students enrolled in OECD countries.

The distribution of destinations of international or foreign students at tertiary level by country of origin identifies the major destinations of international or foreign students.

Distribution of destinations of international or foreign students by country of origin:

$$\frac{ENRL_Foreign/International_{DestA,OriginB}}{ENRL_Foreign/International_{DestALL,OriginB}} \times 100$$

Where $ENRL_Foreign/International_{DestA,OriginB}$ refers to the number of international or foreign students enrolled in destination country A from country of origin B.

$ENRL_Foreign/International_{DestALL,OriginB}$ refers to the number of all international or foreign students from country of origin B who are enrolled abroad.

The distribution of the origins of international or foreign students at tertiary level by country of destination indicator identifies the main regions of origin of international or foreign students for a given country as a percentage of all international or foreign students enrolled in that country. This analysis can be used to assess the extent of cross-border mobility (the percentage of international or foreign students coming from neighbouring countries).

Distribution of the origins of international or foreign students by country of destination:

$$\frac{ENRL_Foreign/International_{DestA,OriginB}}{ENRL_Foreign/International_{DestA,OriginALL}} \times 100$$

Where $ENRL_Foreign/International_{DestA,OriginB}$ refers to the number of international or foreign students enrolled in destination country A from country of origin B.

$ENRL_Foreign/International_{DestA,OriginALL}$ refers to the total of all international or foreign students enrolled in destination country A.

The percentage of national tertiary students enrolled abroad indicator identifies the share of national students enrolled abroad as a share of all tertiary students.

Percentage of national tertiary students enrolled abroad:

$$\frac{ENRL_Foreign/International_{DestALL,OriginB}}{ENRL_{OriginB}} \times 100$$

Where $ENRL_Foreign/International_{DestALL,OriginB}$ refers to number of international or foreign students from country B who are enrolled abroad.

$ENRL_{OriginB}$ refers to total tertiary enrolment of students from country B.

The global balance of student mobility indicator identifies in relative terms the number of international students in country A, compared to the number of students from country A studying abroad. In other words, this indicator measures the balance for a given country between incoming international or foreign students and outgoing national students studying abroad.

Global balance of student mobility:

$$\frac{ENRL_Foreign/International_{DestA,OriginALL}}{ENRL_Foreign/International_{DestALL,OriginA}} \times 100$$

Where $ENRL_Foreign/International_{DestA,OriginALL}$ refers to the number of international or foreign students enrolled in country A.

$ENRL_Foreign/International_{DestALL,OriginA}$ refers to the number of international or foreign students from country A who are enrolled abroad.

Change in the inflow of international or foreign enrolment (since 2013):

$$\frac{ENRL_Foreign/International_{DestA,OriginALL,2016}}{ENRL_Foreign/International_{DestA,OriginALL,2013}} \times 100$$

Where $ENRL_Foreign/International_{DestA,OriginALL,2016}$ refers to the number of international or foreign students enrolled in country A in 2016.

$ENRL_Foreign/International_{DestA,OriginALL,2013}$ refers to the number of international or foreign students enrolled in country A in 2013.

Change in the outflow of international or foreign enrolment towards OECD countries (since 2013):

$$\frac{ENRL_Foreign/International_{DestALL,OriginA,2016}}{ENRL_Foreign/International_{DestALL,OriginA,2013}} \times 100$$

Where $ENRL_Foreign/International_{DestALL,OriginA,2016}$ refers to the number of international or foreign students from country A enrolled in OECD countries in 2016.

$ENRL_Foreign/International_{DestALL,OriginA,2013}$ refers to the number of international or foreign students from country A enrolled in OECD countries in 2013.

Limitations and further considerations

- The data on students studying abroad are provided by the countries of destination. As a result, the data by country of origin are normally comprehensive and cover most of the countries in the world where students originate from. Data by country of destination are not as complete, as the destinations include only the OECD countries.
- There is a distinction between “international students” and “foreign students”. The measurement of student mobility depends to a large extent on country-specific immigration legislation and constraints on data availability. Countries are free to define “international students” as those who are not residents of their country of study or as students who received their prior education in another country. Some countries, which do not have information on international students,

submit data on foreign students or students who are not citizens of the country in which the data are collected. Using data on foreign students can overestimate the number of tertiary students who go to a particular country for the purpose of study.

- Indicators are often presented with details by country of origin and by country of destination. To identify results “by destination”, the total for all destinations should reach 100%, and “by origin”, the total for all countries of origin should reach 100%.
- The distribution of international students among destination countries identifies the top receiving countries in absolute terms but does not reflect the percentage of international/foreign students in relative to tertiary enrolment in the host country. For example, the United States is an attractive region for international students, as the United States accounts for 18.6% of the total OECD destinations (OECD, 2016^[5]) but international students make up only 4% of students in the United States.

7.8. Participation of adults in education

7.8.1. Participation of adults in education

Policy context

As a result of globalisation and the development of new technologies, competition for skills is fierce, particularly in high-growth, high-technology markets. In order to function effectively in this context, an ever-larger segment of the population must be able to adapt to changing technologies, and to learn and apply a new set of skills tailored to meet the needs of the changing labour market.

As part of lifelong learning, adult learning is essential for upgrading the skills of the labour force and considered crucial for meeting the challenges of economic competitiveness and demographic change, and for combating unemployment, poverty and social exclusion.

Calculation

This indicator measures the percentage of adults aged 25-64 participating in learning activities to improve their technical or professional qualifications; further develop their abilities; enrich their knowledge to complete a level of formal education; or to acquire, refresh or update their knowledge, skills and competencies in a particular field. This also includes what may be referred to as “continuing education”, “recurrent education” or “second chance education”.

Distribution of the population participating in adult education:

$$\frac{\text{Population}_{25-64 \text{ who participated in learning activities}}}{\text{Population}_{25-64}}$$

This indicator can be calculated for different age groups, or by gender, educational attainment level, literacy or numeracy proficiency level and employment status.

All data are based on the Survey of Adult Skills (PIAAC). PIAAC is the OECD Programme for the International Assessment of Adult Competencies. For more information on PIAAC please consult (OECD, 2016^[6]).

Limitations and further considerations

- The large variation in adult learning activities and participation among OECD countries at similar levels of economic development suggests that there are significant differences in learning cultures, learning opportunities at work and adult education structures.

7.9. Learning environment and teacher working conditions analysis

Five main indicators have been developed to describe the learning environment and teachers' working conditions: instruction time in compulsory education, average class size and student-teacher ratio, teachers' salaries, teaching time, and the age and gender profiles of teachers.

7.9.1. Instruction time*Policy context*

Providing instruction in formal classroom settings accounts for a large portion of public investment in education. Countries make various choices about the duration of compulsory education, the overall amount of time devoted to instruction and which subjects are compulsory. These choices reflect national and/or regional priorities and preferences concerning what material students should be taught and at what age. Countries usually have statutory or regulatory requirements regarding hours of instruction. These are most often stipulated as the minimum number of hours of instruction a school must offer, and are based on the understanding that sufficient instruction time is required for good learning outcomes. Matching resources with students' needs and making optimal use of time are central to education policy. Teachers' salaries, institutional maintenance and provision of other educational resources constitute the main costs of education. The length of time during which these resources are made available to students (as partly shown in this indicator) is an important factor in determining how funds for education are allocated.

Calculation

Instruction time refers to the number of hours per year of the compulsory and non-compulsory part of the curriculum that students are entitled to receive in public schools.

Instruction time at primary and/or lower secondary education:

$$\sum \text{Instruction time at a given level of education}$$

The intended curriculum can be based on regulations or standards of the central (or top-level) education authorities or may be established as a set of recommendations at the regional level (see definition of instruction time in Chapter 4, Section 4.3.1).

Limitations and further considerations

- Data only cover compulsory education from the first year of primary education until the end of full-time compulsory education for all students. In grades where vocational and general programmes co-exist, it only refers to the general programmes. Pre-primary education programmes, even if compulsory, are not within the scope of the present data collection.

- The compulsory curriculum refers to the amount and allocation of instruction that has to be provided in almost every public school and must be attended by almost all public sector students. The compulsory curriculum may be flexible, with local authorities, schools, teachers and/or pupils having varying degrees of freedom to choose the subjects and/or the allocation of compulsory instruction time. It does not show the actual number of hours of instruction that students receive and does not cover learning outside of the formal classroom setting. The regulatory minimum hours of instruction and the actual hours of instruction received by students may differ from country to country.
- Non-compulsory instruction time (within compulsory education) could also be measured but is rare across OECD countries. The non-compulsory part of the curriculum refers to the total amount of instruction time to which students are entitled beyond the compulsory hours of instruction and which almost every public school is expected to provide. Subjects can vary from school to school or from region to region and take the form of elective subjects. Students are not required to choose one of the elective subjects, but all public schools are expected to offer the option.

7.9.2. Average class size and student-teacher ratio

Policy context

Student learning and academic achievement could be improved when fewer students are participating together in learning activities. The basic rationale is that teachers who have fewer students can devote more time and attention to each student, including identifying their specific learning needs, and that the burden of managing large numbers of students (such as classroom disruptions) is lower. But the predominance of teachers' salary costs in educational expenditure means reducing class sizes leads to increases in the costs of education. Two indicators provide empirical evidence to this debate: student-teacher ratio and class size.

Calculation

The concept of student-teacher ratio is different from that of class size. Student-teacher ratio provides information on the level of teaching resources available in a country, whereas class size measures the average number of students are grouped together in classrooms.

Average class size:

$$\frac{Students_{EducLevel}}{Classes_{EducLevel}}$$

Where $Students_{EducLevel}$ is the total number of students enrolled at a specific level of education and $Classes_{EducLevel}$ is the total number of classes at the same level of education, excluding those taught in subdivisions and excluding special needs classes.

Ratio of students to teaching staff:

$$\frac{FTE\ Students_{EducLevel}}{FTE\ Teachers_{EducLevel}}$$

Where $FTE\ Students_{EducLevel}$ is the total number of full-time equivalent students enrolled at a specific level of education and $FTE\ Teachers_{EducLevel}$ is the total number of full-time equivalent teachers enrolled at the same level (see the definition of FTE in Chapter 4, Section 4.1.9). Teachers refer to professional personnel directly involved in teaching students: classroom teachers, special education teachers and other teachers who work with students as a whole class in a classroom, in small groups in a resource room, or in one-to-one teaching inside or outside a regular classroom. This does not include teachers' aides and other paraprofessional personnel.

Limitations and further considerations

- Although one country may have a lower ratio of students to teaching staff than another, this does not necessarily mean that classes are smaller in the first country or that students in the first country receive more teaching. The relationship between the ratio of students to teaching staff and average class size is complicated by many factors, including differences between countries in the length of the school year, the annual number of hours for which a student attends class, the annual time teachers are expected to spend teaching, the grouping of students within classes and the practice of team teaching.
- Calculating the number of classes over the course of a school year can be complicated if classes subdivide into groups for certain parts of the curriculum. For example, if a class of 20 students receive tuition together for all but 1 lesson when the class splits into 2 groups of 10, it would be misleading to give the 2 classes of 10 students equal weight to the single class with 20 students. For simplicity, when calculating class size at primary and lower secondary, where such splitting of classes is less prevalent, the advice given is to exclude the subdivisions from the calculation. On the other hand, at upper secondary level it would be advisable to weight the subdivisions according to the proportion of the school week they account for, though a methodology has not yet been established for this.
- For the ratio of students to teachers to be meaningful, consistent coverage of personnel and enrolment data are needed. For instance, if teachers in religious schools are not reported in the personnel data, then students in those schools must also be excluded.
- Because of the difficulty of constructing direct measures of educational quality, this indicator is also often used as a proxy for quality, on the assumption that a smaller ratio of students to teaching staff means better access by students to teaching resources. However, a low ratio of students to teaching staff does not necessarily mean better access to teaching and to educational support and may simply be a symptom of ineffective use of human resources. On the other hand, a very high ratio of students to teaching staff certainly suggests insufficient professional support for learning, particularly for students from disadvantaged home backgrounds. Such inferences need to be made with great care since many other factors influence learning outcomes. A reduction in the ratio of students to teaching staff may have to be weighed against higher salaries for teachers, greater investment in teaching technology, or more widespread use of assistant teachers and other paraprofessionals, whose salaries are often considerably lower than those of qualified teachers.

7.9.3. School heads' and teachers' salaries

Policy context

The recruitment and retention of an educated and skilled teaching workforce is of major concern to most OECD countries. Salaries and working conditions are key determinants of the supply of qualified school heads and teachers, including starting salaries and the structures of pay scales, and the costs incurred by individuals in becoming school heads or teachers, compared with the salaries and costs involved in other occupations. Both factors affect the career decisions of potential school heads and teachers and the type of people attracted to the teaching profession.

Teachers' salaries represent the largest single cost in formal education and have a direct impact on the attractiveness of the teaching profession. The compensation of teachers is thus a critical consideration for policy makers seeking to maintain the quality of teaching and a balanced education budget. School heads' salaries also have an impact on the attractiveness of the profession. The compensation of school heads is thus also a critical consideration for policy makers seeking to maintain the good management of schools within a balanced budget.

Calculation

Statutory salaries as reported by most of the countries must be distinguished from actual expenditures on wages by governments and from **actual average salaries**, which are influenced by factors such as the level of experience of the workforce and the prevalence of bonuses and allowances in the compensation system (see the definition of teachers' salaries in Chapter 4, Section 4.2.7 which also applies to school heads' salaries).

To allow for comparison, salaries are presented in equivalent US dollars adjusted for cross-national differences using purchasing power parities (PPPs) for private consumption from the OECD National Accounts Database. The PPP exchange rate compares different countries' currencies through a market "basket of goods". PPP controls for the different costs of living and price levels across countries.

Salaries in equivalent US dollars:

$$\frac{SALARY}{PPP}$$

Where *SALARY* is the annual gross statutory or actual salaries of school heads and teachers. The data can be presented by the level of education taught/managed, years of experience and level of qualification, gender, and age groups.

Salaries relative to similarly educated workers:

$$\frac{Salary}{Average\ tertiary\ earnings}$$

Relative salaries refer to the ratios of teachers' or school heads' salaries relative to the earnings of similarly qualified workers. In most OECD countries, a tertiary degree is required to become a teacher or a school head at all levels of education, so the likely alternative to teacher education is a similar tertiary education programme. Thus, to interpret salary levels in different countries and reflect comparative labour-market conditions, salaries are compared to earnings of tertiary-educated professionals: 25-64

year-old full-time, full-year workers with a similar tertiary education. Two methodologies are available when considering the average tertiary earnings to be used in the computation of relative salaries:

- **The ratios based on weighted averages.** This methodology is used to ensure that the comparison between teachers' salaries and earnings of tertiary-educated workers is not distorted by differences between the distribution of teachers by tertiary attainment and the distribution of tertiary-educated workers by attainment level. According to this method, the salaries of teachers are compared to a weighted average of earnings of similarly educated workers. The weighted average is calculated based on the distribution of teachers with each level of attainment. This weighted average is then used as the denominator when data are available on the wages (i.e. the earnings of full-time full-year workers) broken down by ISCED level of tertiary attainment.
- **The ratios based on average earnings of all tertiary-educated workers.** This method is used when the distribution of teachers by attainment level is not available and/or the earnings of tertiary-educated workers by tertiary attainment are not available.
- These methods are used to calculate relative salary of teachers or school heads for both statutory and actual salaries.

When data on earnings of workers refer to a different reference year than the year used for teachers' salaries, a deflator is used to adjust the earnings data to the same reference year as that of teachers.

Limitations and further considerations

- School heads' and teachers' salaries refer to salaries in public pre-primary, primary, lower and upper secondary institutions.
- School heads' and teachers' salaries can also be presented relative to earnings for similarly educated workers (based on the two different methods noted above). Data on workers' earnings take account of earnings from work of all individuals during the reference period, including those of teachers. In most countries, the population of teachers is large and may impact the average earnings of workers.
- Teachers' statutory salaries are given at four different points in their careers to provide a relative range of earnings: starting salaries, salaries after 10 years of experience, salaries after 15 years of experience and salaries at the top of the scale. Statutory salaries are also presented for three qualification levels of teachers. In addition to salary ranges, most countries use a complex system of bonuses to increase basic salaries and reward qualifications and performance in teaching. These additional payments, which are currently not reflected in this indicator, may explain certain differences between statutory scheduled salaries and actual average salaries. As a result, the international comparison of basic salaries will be a biased approximation of actual teachers' monetary incentives depending on countries' relative emphasis on bonuses or base salaries.
- Teachers' salaries per hour of net contact (teaching) time after 15 years of experience are also given. This provides a measure of statutory salary relative to the number of hours per year that a full-time teacher teaches a group or class of students according to the formal policy in that country. However, this does not

adjust for the amount of time that teachers spend in various non-teaching activities. As the breakdown of teaching and non-teaching time varies considerable across OECD countries, statutory salaries per hour of net teaching time must be interpreted with caution.

7.9.4. Teaching time

Policy context

Statutory working hours and teaching hours offer valuable insight into teachers' actual workload. Where a large proportion of statutory working time is spent teaching, teachers may have less time to devote to tasks such as assessing students and preparing lessons. It also could indicate that teachers have to perform these tasks on their own time and to work more hours than required by statutory working time. The amount of time teachers spend teaching also affects the financial resources countries need to allocate to education.

Calculation

Teaching time per year measures the time spent teaching students in a classroom. It is equal to the number of school weeks per year (net of holidays, days off, festivities etc.) converted into days, multiplied by the number of hours a teacher teaches per day (converted into 60-minute periods and excluding lunch breaks and short morning or afternoon breaks of ten minutes or longer). See Chapter 4, Section 4.2.6 for more details.

Limitations and further considerations

- Teaching time is given for teachers in public pre-primary, primary, lower and upper secondary institutions.
- Reported teaching time refers to net contact time, excluding periods of time formally allowed for breaks between lessons or groups of lesson and preparation time. Some countries include breaks for pre-primary and primary classroom teachers if they are responsible for the class during these breaks, which may explain some differences across countries. The number of teaching hours per day can be given in various ways – as an average, minimum, typical or maximum figure – which may further explain discrepancies across countries.
- It is worth distinguishing between teachers' statutory teaching and working time and their actual teaching time. Actual teaching time is the annual average number of hours that full-time teachers teach a group or a class of students, including overtime, and thus provides a picture of teachers' actual teaching load.

7.9.5. Teachers' age and gender distribution

Policy context

Understanding who a country's teachers are is important when setting policies to encourage effective teachers to continue teaching. Several OECD countries have a large proportions of their teachers set to reach retirement age in the next decade, while others face a projected increase in the size of the school-age population. Governments are thus under pressure to recruit and train new teachers. The gender profile of the teaching workforce also provides information about its diversity which can then contribute towards the design of effective teacher-retention or teacher-hiring policies.

Calculation

The same methodology is used to estimate age and gender distributions.

The age distribution indicator measures the share of teachers of a given age out of the total teaching workforce at a given ISCED level (UNESCO-UIS / OECD / EUROSTAT, 2017^[2]).

Age distribution of teachers:

$$\frac{Teachers_{Age, EducLevel}}{Teachers_{Total, EducLevel}}$$

Where $Teachers_{Age, EducLevel}$ is the number of teachers in public and private institutions based on head counts, by age group and by level of education.

$Teachers_{Total, EducLevel}$ is the total number of teachers at that level of education minus the number of teachers reported as “age unknown”.

This gender distribution indicator measures the share of teachers by gender out of the total teaching workforce at a given ISCED level.

Gender distribution of teachers:

$$\frac{Teachers_{Gender, EducLevel}}{Teachers_{Total, EducLevel}}$$

Where $Teachers_{Gender, EducLevel}$ is the number of teachers in public and private institutions based on head counts, by gender and by level of education.

$Teachers_{Total, EducLevel}$ is the total number of teachers at that level of education.

Limitations and further considerations

- If the number of teachers reported as “age unknown” is 30% or more of the total number of teachers then the age distribution is not calculated.
- It would be worth studying the potential impact of gender imbalances in the teaching profession on student achievement, student motivation and teacher retention, especially in countries where few men are attracted to the profession, but there is little evidence that a teacher’s gender has an impact on student performance.

7.10. Education and work status of young people: The NEET rate

7.10.1. Education and work status of young people: The NEET rate

Policy context

The transition of younger individuals from education to working life varies with education opportunities and social and economic contexts. The percentage of people neither employed, nor in education or training (NEET) provides a clear picture of the labour-market situation of young people across different education pathways.

Calculation

This indicator analyses the situation of young people in transition: whether they are in education, employed or are neither employed nor in education or training during the reference period. This includes not only those who have not managed to find a job (unemployed NEETs), but also those who are not actively seeking employment (inactive NEETs).

$$\frac{NotInEducation_{Age,Gender} \cap [Unemployed_{Age,Gender} + Inactive_{Age,Gender}]}{Population_{Age,Gender}}$$

Where $NotInEducation_{Age,Gender} \cap [Unemployed_{Age,Gender} + Inactive_{Age,Gender}]$ is the number of young people of a given age (between 15 and 29 years old) and gender not in education and unemployed or inactive, and $Population_{Age,Gender}$ is the total population of younger adults of that age and gender.

The sources for these data for most countries are the national labour force surveys (LFSs).

Limitations and further considerations

- Data disaggregated by educational attainment may underestimate or overestimate certain educational levels as a significant share of 15-29 year-olds are still in education and gaining a higher educational attainment level.
- Education status is understood in terms of education and/or training currently being received in the regular educational system, which could be during the previous four weeks (including the survey reference week) or over a shorter period. Some countries may include some people who are not classified as being in formal education, but who are in training (or education) for employment or for tertiary entrance examinations.

7.11. Equity in education: Intergenerational mobility indicators

7.11.1. Equity in education: Intergenerational mobility indicators

Policy context

Education opportunities can promote inclusive growth and reduce inequality in societies through improved employment opportunities, higher earnings and overall wealth. However, inequalities in educational attainment sometimes persist over generations, leading to widening inequality. To facilitate social inclusion, mobility and improve socio-economic outcomes now and for future generations, countries need to assure students have access to quality education. One way to measure this is through the progress in educational attainment across different generations, also known as intergenerational educational mobility.

Calculation

Intergenerational mobility in educational attainment refers to the proportion of individuals whose highest level of qualification is different (whether higher or lower) from their parents.

Downward mobility is when individuals in a specific age group have a lower educational attainment than that reached by both parents:

$$\frac{\text{Population}_{\text{Age group, With educational attainment} < \text{parents' educational attainment}}}{\text{Population}_{\text{Age group}}} \quad (1)$$

Upward mobility is when individuals in a specific age group achieve a higher educational attainment level than that reached by either of their parents:

$$\frac{\text{Population}_{\text{Age group, With educational attainment} > \text{parents' educational attainment}}}{\text{Population}_{\text{Age group}}} \quad (2)$$

Status quo is when individuals in a specific age group achieve the same level of educational attainment as their parent with the highest level of educational attainment:

$$\frac{\text{Population}_{\text{Age group, With educational attainment} = \text{parents' educational attainment}}}{\text{Population}_{\text{Age group}}} \quad (3)$$

Where (1) + (2) + (3) = 100%.

These indicators can help to estimate the number of **first generation tertiary-educated adults**. This refers to the share of adults in a given age group and gender who attained tertiary education when neither parent achieved this level:

$$\frac{\text{Population}_{\text{Age, Gender, TertiaryEducLevel whose parents have no tertiary education}}}{\text{Population}_{\text{Age, Gender, TertiaryEducLevel}}}$$

Where $\text{Population}_{\text{Age, Gender, TertiaryEducLevel whose parents have no tertiary education}}$ is the number of tertiary-educated individuals of a given age group and gender who have no parent with a tertiary education.

$\text{Population}_{\text{Age, Gender, TertiaryEducLevel}}$ is the total number of individuals of the same age group and gender with a tertiary education.

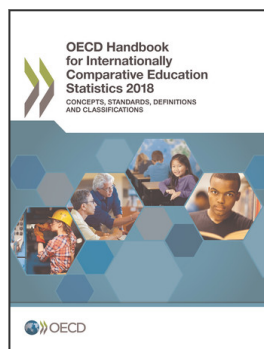
These indicators can be calculated for different age groups, gender and parents' immigration status (native-born parents versus foreign-born parents). Data are based on the Survey of Adult Skills (Programme for the International Assessment of Adult Competencies, PIAAC).

Limitations and further considerations

- As the share of adults with a high level of education increases, fewer young adults will show upward educational mobility.
- In some countries, limited upward mobility can be explained by the fact that upper secondary or post-secondary non-tertiary education plays a relatively important role in providing well-recognised labour-market qualifications.
- The analysis aggregates the levels of educational attainment considered (below upper secondary education, upper secondary or post-secondary non-tertiary education and tertiary education) so it does not reflect mobility within these levels, which does occur to a large extent in some countries.
- For some of these data, the resulting sample can be small resulting in larger-than-usual standard errors. Caution should be used when interpreting the results.

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