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Monitoring the Evolution of Education and Training Systems: A Guide to the Joint Assessment Framework

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Introduction

Six ET 2020 benchmarks

Launched in 2009 ([1]), the strategic framework for European cooperation in education and training (ET 2020) is designed to support national action and help address common challenges, such as ageing societies, skills deficits in the workforce, and global competition. ET 2020 now covers seven targets — or benchmarks — for 2020, with an eighth target on foreign language competences currently under discussion ([2]). Of the seven adopted benchmarks, only the benchmark on learning mobility is still awaiting the required cross-national data ([3]). The remaining six operational benchmarks (Table 1) are based on data from the EU Labour Force Survey, the UOE data collection and the OECD's Programme for International Student Assessment (PISA).

Table 1. Targets in education and training

				Current	Target
Headline target	**1**	Early leavers from education and training	The share of the population aged 18-24 fulfilling the following two conditions: (1) the highest level of education or training attained equals International Standard Classification of Education (ISCED) level 0, 1, 2 or 3c short; (2) respondents declared not having received any education or training in the four weeks preceding the survey. Data comes from the EU Labour Force Survey.	11.9 % (2013)	Below 10 % (2020)
	2	Tertiary education attainment	The share of the population aged 30-34 years who have successfully completed university or university-like (tertiary-level) education that equals International Standard Classification of Education (ISCED) level 5 or 6. Data comes from the EU Labour Force Survey.	36.8 % (2013)	At least 40 % (2020)
Other targets	**3**	Early childhood education and care	The share of the population aged four to the age when the compulsory education starts who are participating in early education. Data comes from the UOE data collection.	93.9 % (2012)	95 % (2020)
	4	Low achievement in reading, maths and science	The share of 15-year-olds failing to reach level 2 in reading, mathematics and science as measured by the OECD's Programme for International Student Assessment (PISA).	Reading: 17.8 % (2012) Maths: 22.1 % (2012) Science: 16.6 % (2012)	15 % (2020)
	5	Employment rate of recent graduates	The share of employed people aged 20-34 having successfully completed upper secondary or tertiary education 1 to 3 years before the reference year of the survey and who are no longer in education or training. Data comes from the EU Labour Force Survey.	75.4 % (2012)	82 % (2020)
	6	Adult participation in lifelong learning	The share of the population aged 25-64 who stated that they received formal or non-formal education or training in the four weeks preceding the survey. Data comes from the EU Labour Force Survey.	10.4 % (2013)	15 % (2020)

ET 2020 provides a substantial contribution to the broader Europe 2020 strategy ([4]) and its annual European Semester. The rate of early school leavers and tertiary education attainment are taken on board as the twofold Europe 2020 headline target on education and training, and the Joint Assessment Framework — the monitoring tool of the Europe 2020 strategy — is adopted for all six operational ET

([1]) OJ 2009/C 119/02.
([2]) SWD (2012) 372 final.
([3]) Pilot data will become available in the summer of 2015.
([4]) COM(2010) 2020 final.

2020 benchmarks. With its annual monitoring exercise, the Directorate-General for Education and Culture (EAC) provides input to the country-specific recommendations ([5]).

Developing the Joint Assessment Framework

The Joint Research Centre (JRC), the scientific and technical arm of the European Commission, has helped EAC to adapt the Joint Assessment Framework (or 'JAF') to the context of education and training. The JAF was introduced by the Directorate-General for Employment, Social Affairs and Inclusion (EMPL) in 2010 to standardise the monitoring of benchmarks and indicators under the Employment Guidelines. Since two of the Employment Guidelines concern education and training, EAC was directly involved in developing the methodology and has since introduced it into its own monitoring approach ([6]).

The JAF is a methodology to structure the monitoring of Member States' education and training systems and to ensure its consistency and transparency. In EAC's education and training policy coordination, the JAF methodology is used as a first step in the assessment of education and training systems across Europe. The JAF is used in the preparation of the annual *Education and Training Monitor* series and the accompanying country reports ([7]). The first two editions of the Education and Training Monitor have fed into each subsequent European Semester in support of EAC's country desk officers and their formulation of country-specific recommendations.

Firstly, the JAF entails a quantitative analysis ([8]), which aims to point towards policy levers, assess the broader context and shed light on closely related domains of interest. This is done through standard breakdowns and additional sub-groups, but more importantly through a standard set of about five quantitative sub-indicators, developed and subsequently monitored in cooperation between EAC and the JRC's Centre for Research on Lifelong Learning (CRELL). Secondly, the JAF covers a more qualitative analysis ([9]), which aims at identifying key challenges, good outcomes and major reforms in specific education and training policy areas by using a checklist of qualitative elements to annually monitor updates. The qualitative part of the JAF is undertaken in cooperation between EAC, Eurydice and Cedefop ([10]).

In the course of 2012, the quantitative JAF methodology was applied to the twofold Europe 2020 headline target ([11]). Two standard breakdowns were selected for each main indicator (male/female and native-born/foreign-born) and five contextual sub-indicators were chosen to shed light on the developments found across Member States. Throughout 2013, CRELL has been closely cooperating with EAC in developing the JAF for the remaining ET 2020 benchmarks. The quantitative part of the JAF is now fully operational for the six ET 2020 benchmarks, readily usable for the next Education and Training Monitor and feeding in to the 2015 European Semester. Subsequently, CRELL will perform the annual monitoring on the basis of the quantitative methodology, and cooperate with EAC on any future revisions or improvements necessary.

([5]) The 2013 country-specific recommendations, adopted by the Council on 19 June 2013, can be found at: http://ec.europa.eu/europe2020/making-it-happen/country-specific-recommendations/index_en.htm.

([6]) This means that there is a common Commission (EMPL and EAC) approach to chapters 8 and 9 of the Employment Guidelines.

([7]) Latest version: http://ec.europa.eu/education/monitor.

([8]) By using quantitative indicators, we address all the indicators that capture events/facts by quantifying them. In other words, it concerns measures with numbers. Examples: the number of participants, the percentage of graduates, the mean score in mathematics, etc.

([9]) By using qualitative checklists, we address all the indicators that capture events/facts by describing them. In other words, it concerns measures with features/types of things by the use of words. Examples: the requested diploma to be a teacher, the kind of political reforms a country does in a specific field, whether or not young graduates receive guidance to get a job, etc. Unlike quantitative sub-indicators, qualitative sub-indicators have a nominal type of measurement (unranked categories/classifications) or an ordinal type of measurement (ranked categories/classifications).

([10]) Throughout 2014, EAC, Eurydice and Cedefop will develop *qualitative checklists*, compiled of elements taken from recent and upcoming Eurydice and Cedefop reports.

([11]) See Badescu, M., d'Hombres, B., and A. Weber (2012), 'Monitoring the EU headline target in education and training — Methodology and country sheets', *JRC Scientific and Technical Reports No 70190*. Publications Office of the European Union, Luxembourg, 2012.

A Guide to the Joint Assessment Framework

This CRELL report completes the first phase of the development of the quantitative methodology. It details the theoretical and empirical justification for each of the quantitative sub-indicators chosen, and can be adopted as a manual on how to use the JAF, featuring explanations and examples from a user-perspective. The list of sub-groups and sub-indicators presented in this report are the result of extensive discussions between the horizontal and thematic units of EAC on the one hand, and the JRC researchers of CRELL on the other. The Standing Group on Indicators and Benchmarks (SGIB) was consulted throughout this process.

Questions about *the JAF methodology and its output* are answered in Part 1 of this report. Part 1 provides further details on the methodology of the JAF. It summarises the quality criteria of the underlying data and lists the selection criteria used for the adoption of sub-groups and sub-indicators in the quantitative assessment. Part 1 also covers the explanations on how to read the JAF charts and interpret their results. Questions about *specific sub-groups and sub-indicators* are answered in Part 2 of this report. Part 2 deals with each of the ET 2020 benchmarks separately and provides for each of them the theoretical and empirical justification of the sub-groups and sub-indicators. Further considerations or potential future improvements with regard to these sub-groups and sub-indicators are also mentioned here when relevant.

Three disclaimers were already implicit in this introduction but are best spelled out more concretely at the start of this report. Firstly, the quantitative assessment is to be complemented by a more qualitative assessment in order to gain a more complete picture of the evolution of education and training systems across Europe. In some cases, obvious contextual domains are not covered by the quantitative sub-indicators as it was decided that nominal or ordinal types of measurements would be more appropriate. In other cases, the quantitative sub-indicators tell only part of the story and their qualitative counterparts or complements should be consulted to better understand a particular contextual domain.

Secondly, the full JAF, covering the quantitative *and* qualitative monitoring, is only a first step in the monitoring exercise undertaken by EAC's country desk officers. It is not intended to replace the country-specific assessment of country desk officers or to provide any final answers. Rather, it is a way to structure the monitoring of Member States' education and training systems and to ensure the consistency and transparency of this monitoring exercise. This means that the first step in the assessment is exactly as thorough for all Member States, and that the standards by which this first assessment takes place are visible to all. After this first assessment, it is up to country desk officers — or any other users for that matter — to enrich the monitoring exercise by his or her own insights into the country-specific context, and by the use of further country-specific information available.

Finally, the JAF is a flexible methodology. The first phase of the quantitative methodology is finalised with this CRELL report to increase transparency and visibility, but these selections are not set in stone. Future revisions will remain possible, based on the user experiences of country desk officers and the feedback on this report. Revisions of the quantitative sub-indicators are also possible when development of the qualitative checklists leads EAC to do so.

PART 1
The JAF approach for ET 2020 benchmarks

This methodology builds on the Joint Assessment Framework (JAF) developed by the Directorate-General for Employment, Social Affairs & Inclusion (DG EMPL) and the Employment Committee (EMCO) to monitor and assess structural reforms under the Employment Guidelines through qualitative and quantitative methods. The JAF methodology has been adapted to analyse performance and progress in relation to the twofold Europe 2020 headline target on education and training as well as the additional ET 2020 benchmarks.

In order to go beyond the first snapshot provided by the six operational ET 2020 benchmarks, each indicator is broken down by *standard JAF sub-groups*: sex (male/female) and country of birth (foreign-born/native-born) ([12]). The purpose of the analysis of the benchmark by sub-group is to further investigate its behaviour: since very different situations can underlie the same overall performance of the country, it is fundamental to understand what is driving it. In particular, it is relevant to see whether all sub-groups are performing similarly, or whether on the contrary there are discrepancies between them, in which case the overall indicator is hiding inequalities within the country. If the latter is the case, special efforts might be required to improve the performance of these groups, thereby identifying the main country-specific challenges for reaching the targets.

The following step consists in the use of a standard set of about five quantitative sub-indicators to shed light on the overall country performance, in order to better explain the picture provided by the main indicator. The selected contextual sub-indicators are not necessarily determinants of the main indicator, and as such do not necessarily constitute policy levers that can be exploited to improve the country performance related to the benchmark. As mentioned before, the JAF is only a first step in an assessment of country performance, and additional, country-specific information is required to identify actual policy levers. Nevertheless, the selection of the sub-indicators has been carried out with the purpose of:

- Hinting at possible policy levers to be identified with additional, country-specific information;
- Assessing the broader context (socio-demographic characteristics, labour market and economic conditions, etc.), in order to evaluate to what extent the country-specific situation affects the performance in terms of the benchmarks;
- Shedding light on closely related domains of interest;
- Explaining the behaviour of the benchmark performance in the medium and long term.

It is worth pointing out that data availability and comparability across countries, was another key factor driving the selection of the sub-indicators.

Country achievements on the main indicators, sub-indicators, and sub-groups are summarised in tables and then visualised in graphs to allow a comparison to performance at the EU level. Tables and charts provide information on the country performance in the last year for which data is available (year *t*), and on the past value (referring to year *t-3*), in order to allow to evaluate not only the current position of the country, but also the recent evolution.

More in details, the outputs of the JAF methodology are:

1) **Tables**: Six summary tables, one for each benchmark, showing current and past absolute values for the main indicator and the five sub-indicators, for all 28 Member States (including flags and footnotes for missing data, breaks in series, reliability issues, and data adjustments when necessary);

([12]) Except for early childhood education and care, for which the latter breakdown is not available.

2) **Charts**: for each of the six benchmark indicators, four charts per country are provided, displaying:

   a. Standardised current performance in terms of the main indicator for the overall population and by sub-groups;

   b. Recent change in percentage for the main indicator for the overall population and by sub-groups;

   c. Standardised current performance for the main and sub-indicators;

   d. Recent change in percentage for the main and sub-indicators.

The tables represent the starting point of the analysis of the country situation, and present the national performance in absolute values, thereby allowing for a straightforward comparison with other countries but also with the other ET 2020 targets.

The purpose of the charts, on the other hand, is to show the country performance taking the EU28 as a reference point. In order to show the current performance, a standardisation procedure is implemented (see Box 1 for a description), which converts the different indicators to the same scale, thereby allowing for an easier evaluation of the country performance when compared to the European one. In order to monitor the recent development made by the country, on the other hand, the evolution over the past 3 years is not shown in standardised values, but in percentage change in the absolute values, for the sake of simplicity in the interpretation of the charts.

Box 1. The standardisation procedure used in the charts.

To be able to provide an informative visualisation of the achievements in each member state (for the six indicators, the sub-groups and the sub-indicators), country's performance is compared to the weighted average EU performance.

This stage consists in normalising the values of each indicator according to a common standardisation formula. The reason for this is to put the different indicators on the same scale and therefore to allow for an easier comparison and analysis. The calculation of a standardised value consists of simply subtracting the EU mean from the indicator value, and then divide by the EU standard deviation. More formally, it can be expressed as:

$$Standardised\ value = \frac{indicator\ value - EU28\ weighted\ average}{standard\ deviation}$$

The standardised values for the main indicators, the sub-groups, as well as the 5 sub-indicators are then used to produce a visual picture of the relative position of a country compared to the EU population weighted average.

Why are the tables and charts produced by the JAF methodology useful for the assessment of the country situation?

1) **Tables** offer the possibility to assess how a country is performing as regards each of the six benchmarks, compared to the set targets, compared to the EU average and compared to other Member States. Moreover, looking at past performance, it is possible to assess whether in the past three years there was an improvement or deterioration. Using the values reported for sub-groups, it is possible to understand whether a particular group of the population is over/under-performing. Furthermore, using the values for sub-indicators, it is possible to assess areas in which the country is performing well or not, and improvement/deterioration in the past three years.

2) **Charts**: thanks to the standardisation method, applied to all indicators and sub-indicators (centred on the EU weighted average), charts are a visualisation tool that facilitates the

assessment of whether current performance and the recent change have been favourable or less favourable (compared to the EU average).

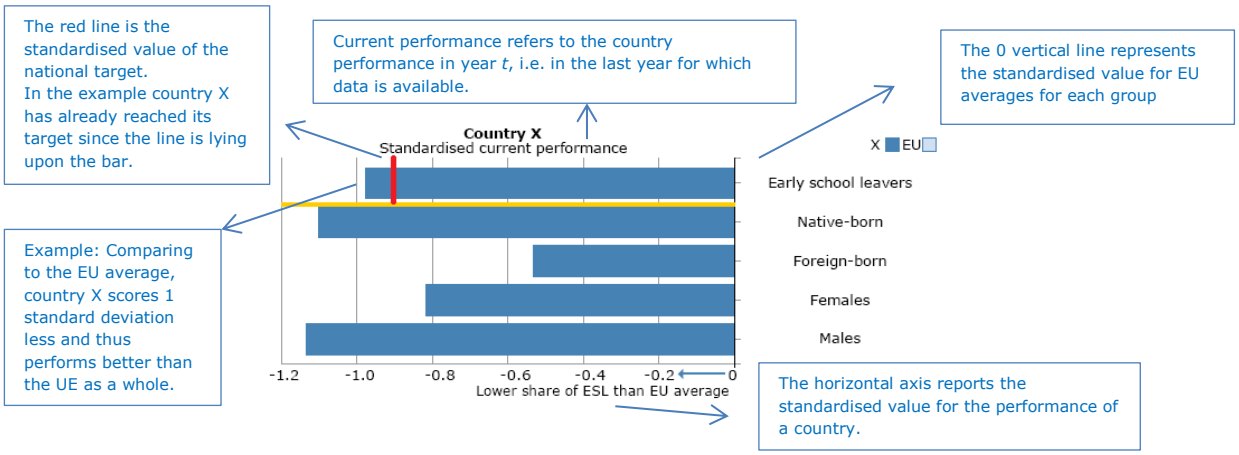
The tools proposed in this document should be used to flag and highlight challenges and bottlenecks faced by Member States in reaching the targets in the field of education and training. They are aimed at supporting DG EAC's informed dialogue with country desks and with Member States.

1. INTERPRETATIONS: HOW TO READ THE JAF CHARTS?

The JAF approach produces four charts for each benchmark. The first two charts are related to the sub-groups (the standardised current performance and the recent changes in percentage). The last charts describe the sub-indicators (the standardised values and the recent change). Here below will follow some instructions on how to read each of these charts.
For the purpose of clarity, we will use the example of early school leavers (ESL) in a country X in the following interpretations. As the JAF is a harmonised methodology, all explanations can be applied to each benchmark presented in this report.
Each part of this chapter is dedicated to the description of a chart. It is described how the bars are calculated and which measurement units are used. Moreover, explanations are given on how these charts should be interpreted; the different interpretations that can be inferred from them and to which conclusions they should not lead.

1.1. Sub-groups

JAF Chart 1: Standardised current performance of country X on the indicator of ESL.



The first JAF chart reports the country's current performance (referred to year *t*, i.e. the last year for which data is available) as regards the rate of early school leaving both overall and by sub-groups. For the sake of comparability, indicators have been standardised against the EU average (see Box 2). Standardisation has also been done for each of the sub-groups. The standardised values are calculated relatively to the average share of early school leavers in the EU as a whole. The vertical line '0' represents the EU average for early school leavers and for each of the sub-groups. It is our point of reference for the interpretations. The horizontal axis stands for the standardised value of the overall share of early school leavers or its share within each sub-group.

Box 2. Standard deviation: definition and use.

The standard deviation (SD) of a random variable is the square root of its variance; in other words, it provides a measure of the variation from the average in the data. A higher value of standard deviation implies higher dispersion in the data.

A standard deviation and average can be used to 'standardise the data', which means to transform the data so that they have a mean equal to 0 and a standard deviation equal to 1. You can convert any normal distribution into a standardised normal distribution by simply subtracting the mean from each value of the distribution and then dividing this difference by the standard deviation of the distribution. In the case of the indicators presented in Charts 1 and 3, the average is the EU average, which is why we always compare country performance with the EU average, i.e. 0.

Relying on a standardised distribution can be helpful since there are some useful properties that can be exploited. In particular, we know that there is a 68 % chance that if you take a random draw of X from the population, its value will be between -1 and 1 standard deviation from the mean. In terms of cumulative probabilities, this means that the chances of getting a score up to SD = -1 is 16 %, the probability of getting a score up to SD = 1 is 84 %.

This helps the interpretation of the chart: as a matter of fact, if a country X value of indicator A is one standard deviation away from the EU mean, it means that country X is performing worse\better than the 84 % of the EU countries regarding indicator A. This statement however holds only assuming normality of the data.

For the interpretation, the first information to search is whether the standardised value is at the right (positive and bigger than) of the EU average line or at the left of this line (negative and lower than the EU value). The second step is to keep in mind the preferable 'sign' of the indicator, i.e. to think whether it is desirable that the given indicator increases or decreases. For 'early school leaving', the objective is to *reduce* the share of early school leavers, thus a *lower value* stands for better performance. On the contrary, in the case of 'tertiary attainment', the objective is to *increase* the share of individuals with tertiary education, thus a lower value stands for lower performance.

With this background information, various conclusions can be drawn about the share of early school leavers in a Member State and the share of early school leavers among one of the sub-groups (foreign/native born and males/females). The following sections provide the correct and incorrect interpretations of the first chart.

For the two headline indicators, ESL and TEA, countries have ad hoc national targets to be met by 2020. National targets have been set taking into account performance in 2011, reflecting different situations and circumstances.

In order to visualise how single countries are performing against their national targets we plot the standardised value of the national target in the charts. To standardise the national target we used the same values of mean and SD used for the benchmark, thus national targets are standardised against the EU average performance in the indicator considered. This is possible only for the two indicators for which a national target exists, i.e. early school leaving and tertiary education attainment. The target is represented by the red line lying in the same row of the first bar in Chart 1. To use the information provided by the national target line one should keep in mind the 'desirable sign' of the indicator (i.e. ESL should be as low as possible and TEA as high as possible) and the current performance compared to the EU average (whether the country is currently performing better or worse).

In the example above we notice that country X has already reached its national target since the red line is lying upon the bar, i.e. the current value of ESL in country X is already below the one set in the national target. If, for example, the red bar would have been further left, compared to the blue bar, it would have meant that country X did not yet reached the target. If, on the other side, the graph above was representing TEA, rather than ESL, country X would have been still far from the target, because the blue bar indicates a value which is lower than the target, which, under the TEA scenario, implies that the country has not yet reached its national target.

Interpretation on the main indicator

a. Comparison of country performance to EU average performance. Example: Country X is doing better than the EU average because it shows a lower share of early school leavers; indeed, the share of early school leavers in country X is 1 standard deviation lower than the EU average share.

b. It is **not** possible to draw conclusions on how close the indicator (or the sub-group values) is to the target value for the benchmark, but for the two headline indicator it is possible to conclude how close the main indicator to the national target is.

Box 3. Why can two blue bars not be compared?

From JAF Chart 1, we see that country X has a lower share of early school leavers than the EU average for both males and females; more specifically, 0.8 standard deviation points lower for females and around 1.2 standard deviation points lower for males. Although the deviation from their EU respective mean is higher for males than for females, from the information provided in the chart, you cannot say that in country X the share of early school leavers among males is lower than the share of early school leavers among females.

Assume two situations with exactly the same standard deviations criteria. In the first situation, the EU average share of early school leavers is 20 % for females and 30 % for males and 1 standard deviation corresponds in both cases to 5 percentage points. With this information, we can calculate the country share of early school leavers among males and females. It would be 24 % (30 – (1.2*5)) for males and 16 % (20 – (0.8*5)) for females. In conclusion, the share would be lower for females.

In the second situation, the EU share of early school leavers is 20 % for males and 30 % for females. Having the same standard deviation data as in the first situation, in country X the share would be 26 % (30 – (0.8*5)) for females and 14 % (20- (1.2*5)) for males. The share would this time be lower for males.

Situation 1			**Situation 2**	
Females	Males		Females	Males
20 %	30 %	**EU average**	30 %	20 %
-0.8	-1.2	**Standard deviation (=5 p.p.)**	-0.8	-1.2
16 %	24 %	**Country share**	26 %	14 %
Females < Males			Females > Males	

This illustration clearly demonstrates that the comparison of two sub-groups from their respective standard deviation values is not possible with any other additional information. The lower standard deviation for males (-1.2) than for females (-0.8) can either mean that the share of early school leavers among males is lower than among females or the total opposite. Both situations depend on the EU average share of early school achievers among males and females. Therefore, based on JAF Chart 1, a comparison of performance between sub-groups can be done only relatively to each sub-group's performance compared to the EU.

Interpretation on the sub-groups

c. Comparison to the EU average. An evaluation of the country performance can be done only as a comparison with the EU average (i.e. compare country X performance in each sub-group with the corresponding EU average). Example: It is possible to compare the share of early school leavers among females in country X with the average share of early school leavers among females in the EU. From the chart example, we conclude that females in country X do better than females in the EU, since country X's share of early school leavers among females is more than half a standard deviation (0.8) lower than the EU average share of female early school leavers.

d. Comparison between subgroups. It is not possible to compare the different sub-groups, i.e. a comparison between foreign- and native-born or between males and females. Since each sub-group's current performance is standardised relatively to the EU average of the reference sub-group, a direct comparison of whether females in country X are doing better than males is not possible (see Box 3). Example: Country X is performing better than the EU for both males and females, since both bars are negative ([13]).

SUMMARY

Always compare each sub-group with its EU average counterpart (i.e. compare a blue bar with the vertical line centred at 0 — the EU average). Never compare between different sub-groups (i.e. males vs. female). Never compare two blue bars. Additional information is needed to say something more on the absolute values and the target.

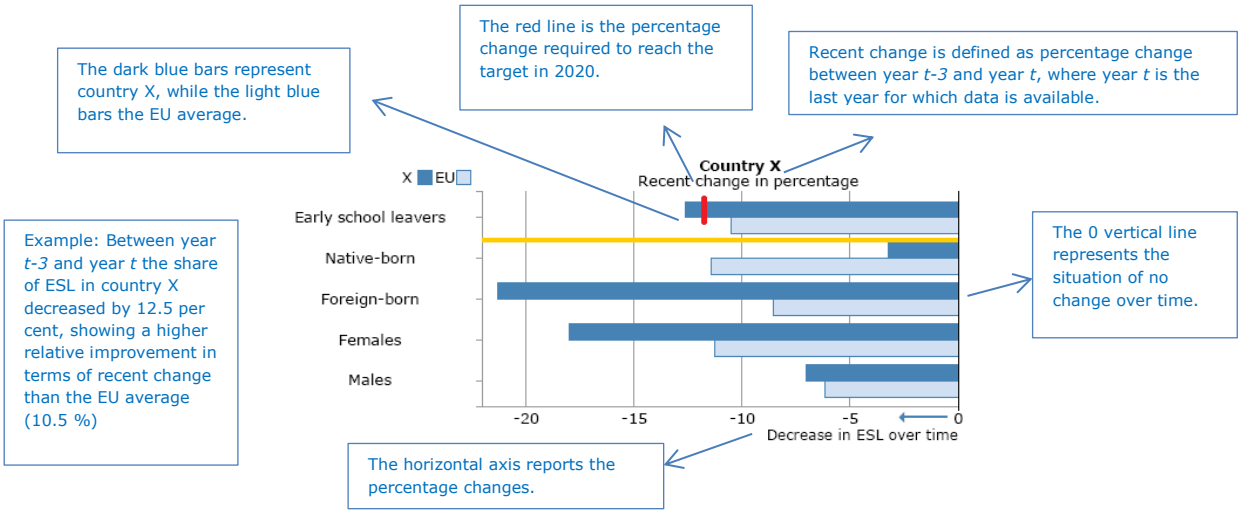
Do's:
— Comparison of country performance to EU average performance
— Comparison of country performance to EU average performance within each sub-group
— Compare how close the two headline indicators to the national target are

Don'ts
— Drawing conclusions on how close the indicator (or sub-group value) is to the target value
— Comparison between sub-groups (can be done only in relative terms)

Working on the Don'ts
— Additional information is needed to comment on the absolute performance (use tables)
— Additional information is needed to comment on the target (use tables)

([13]) Moreover — and again compared to the EU average — country X is performing relatively better in the share of early school leavers among males than among females, since the value associated to males is higher than the one associated to females.

JAF Chart 2: Recent percentage change of country X and EU in the indicator of ESL.



The second JAF chart reports the recent percentage change in the ESL indicator (and for each sub-group) for country X and for the EU average ([14]). The recent change is defined as the percentage change between year *t-3* and year *t*, where year *t* is the last year for which data is available. The percentage changes are reported overall and for the sub-groups. The dark blue bars represent country X while the light blue bars the EU average. On the horizontal axis the percentage changes are reported. If the percentage change is negative it means that country X in year *t* has a lower value of ESL than in year *t-3*, if the percentage change is positive it means that country X in year *t* has a higher value of ESL than in year *t-3*. As before, to interpret the chart it is important to keep in mind the sign of the indicator and whether a higher or lower value is preferable — and, as a consequence, whether an increase or a decrease is desirable. Note that the chart reports percentage changes, and not percentage point changes (see Box 4).

([14]) The JAF tables provided together with the charts also report the presence of breaks in series and other relevant data issues. When commenting on the change over time, it is necessary to take into account the presence of breaks in the time series, and any conclusion on country performance should be drawn accordingly.

Box 4. Change in percentage points and in percentage terms.

The change between years expressed in percentage points or in percentage provide the same information but with two different meanings.

The change expressed in percentage **points** is the result of the following calculus: a score for specific year (year *t*) minus the same score for another year (year *t-3*). From this, it is possible to say that the share of early school leavers has increased or decreased by X percentage point(s) in a country.

	Year *t-3*	**Year *t***
share of low achievers	20 %	15 %
percentage points	15-20= -5 p.p.	
percentage	(15-20)/20= -0.25=-25 %	

However, from the perspective of a country analysis, it is preferable to take into account this change relatively to the value of a reference year (year *t-3*). The change expressed in percentage **terms** is a relative number calculated relatively to a previous score (see above). In other words, the percentage change reveals how much a change is important for a country taking into account its starting position. A diminution of 5 points may be a relatively low percentage change in a country with a large rate of early school leavers while it will represent a large percentage change in a country with a low rate of early school leavers at the beginning.

From the chart we can capture information both about the main indicator and about the sub-groups. Below an explanation of the conclusions that can be drawn.

Interpretation of the main indicator

a. Country performance in terms of the main indicator. Example: Country X is performing well because between year *t-3* and year *t* the share of early school leavers has decreased by 12.5 per cent ([15]).

b. Comparison of change in the country with change in the EU. Example: Country X is showing a higher relative improvement (in terms of recent change) than the EU average because the percentage decrease in early school leaving is higher than the European one (12.5 % versus 10.5 %).

Interpretations on the sub-groups

c. Recent country performances in different sub-groups. Example: In terms of equity, country X is improving its performance because the share of early school leavers has decreased between year *t-3* and year *t* in all the considered sub-groups.

d. Comparison of the change of a specific sub-group in country X with the change of the same sub-group in the EU. Example: the percentage change for the native-born in country X has been lower than its percentage change in the EU. In other words, in country X the share of early school leavers among natives has decreased, but by a lower percentage when compared to the EU average.

e. Comparison of the change between sub-groups in country X. The comparison needs to be considered in terms of percentage change, while nothing can be inferred on the absolute values. Example: In country X the share of early school leavers among the foreign-born has decreased more than the share among the native-born, but it is not possible to say whether the former is higher or lower than the latter (see Box 5).

([15]) In the chart, recent change is reported in percentage terms, not in percentage points.

Box 5. Why can relative change not be pronounced in absolute terms?

Assume that the share among the foreign-born has decreased by around 20 % and among natives by around 4 % (as in JAF Chart 2) and that the share of early school leavers in year *t-3* was 30 % for the foreign-born and 20 % for natives. This means that the share of early school leavers in year *t* would be 19.2 % for natives (=20-(20*0.04)) and 24 % for foreign born (=30-(30*0.2)).

Situation 1			**Situation 2**	
Foreign	Natives		Foreign	Natives
-20 %	-4 %	**Percentage change**	-20 %	-4 %
30 %	20 %	**Share of ESL in year *t-3***	20 %	30 %
24 %	19.2 %	**Share of ESL in year *t***	16 %	28.8 %
Foreign > Natives			Foreign < Natives	

If, on the other side, the share of early school leavers in year *t-3* was 20 % for foreign born and 30 % for native, in year *t* the shares would be 16 (=20-(20*0.2)) and 28.8 % (=30-(30*0.04)) respectively. In other words, from the charts it is not possible to say anything about the performance levels, because there is no information provided about the absolute values of the shares.

For the two headline indicators, ESL and TEA, countries have ad hoc national targets that are supposed to be met by 2020. National targets have been set taking into account performance in 2009, reflecting different situations and circumstances.

For countries that have not yet reached the national target it is possible to calculate each year the year percentage change required to reach the target by 2020 (assuming a constant percentage change every year).

For example assume that the national target for early school leaving is 16 %, and that in 2010 the rate of tertiary education was 19 %. The average minimum annual progress required to reach 16 % in 10 years (2010-20) is 1.7 % ([16]). This number can be used to check if the percentage change in the past three years was in line with the minimum annual progress required to reach the benchmark in 2020. More in details, following the above example, the percentage change complying with the minimum annual progress required is 5.0 % ([17]).

Thus, the red line lying in the same row of the first bar in charts 2 represents the percentage change required to reach the target in 2020, and by comparing this line with the bar (the actual percentage change) we know whether countries are performing in line, above or below expectations. To assign a right interpretation to the red line one should have in mind the 'desirable sign' of the indicator, i.e. whether an increase (TEA) or a decrease (ESL) is necessary to reach the target.

In the example above, in country X, the percentage change in the past four years was larger than the minimum progress required to comply with the 2020 target.

([16]) The formula used to calculate the minimum annual progress required is:
$current\ value\ (1 + minimum\ annual\ progress\ required)^{number\ of\ years} = target\ value\ in\ 2020$

Thus in the example: $0.19\ (1+x)^{10} = 0.16$, from which: $x = \sqrt[10]{\frac{0.16}{0.19}} - 1 = -0.017$

([17]) Rearranging the previous formula and the formula used to calculate the percentage change we get: $\frac{0.19\ (1-0.017)^3 - 0.19}{0.19} = -0.05$

SUMMARY

Compare each sub-group's percentage change with what is desirable, i.e. whether we aim at an increase or a decrease. Compare each sub-group's percentage change with the EU average percentage change (i.e. compare blue bar with light-blue bar). Compare percentage change of different sub-groups (compare two blue bars). Without additional information, it is not possible to say anything about recent change in absolute terms, whether for the main indicator or the sub-groups.

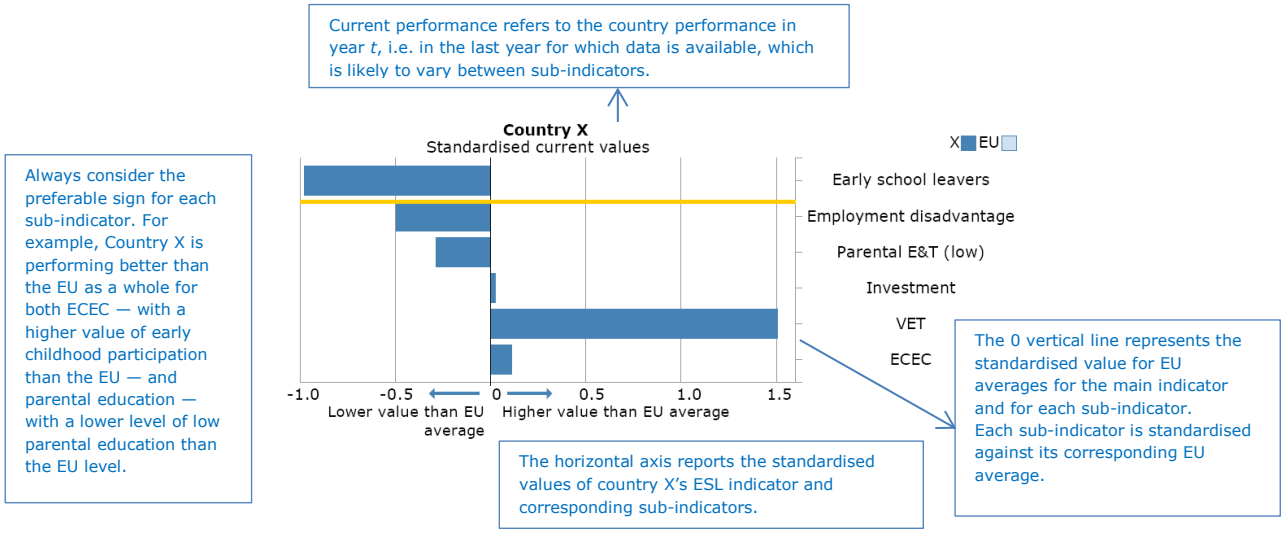
Do's:
— Comment on recent percentage change in country performance for the main indicator and sub-groups
— Comparison of recent percentage change in country performance vs. EU average change
— Comparison between percentage change in the different sub-groups
— Assess whether the country has reached the minimum progress required to comply with the 2020 national target (TEA and ESL)

Don'ts
— Comparison between recent country and EU absolute performances
— Comparison between sub-groups' absolute performances

Working on the Don'ts
— Additional information needed to comment on recent change in absolute terms (use tables)
— Additional information is needed to compare to the target (use tables)

1.2. Sub-indicators

JAF Chart 3: Standardised current performance of country X on main and sub-indicators



The third JAF chart reports the country's current performance in the considered indicator and in the selected sub-indicators ([18]). Each indicator and sub-indicator has been standardised against its corresponding EU average, so on the horizontal axis there is the standardised value of country X indicators. Standardisation has been done for each of the sub-indicators, thus the 0 represents the EU average in each of the sub-indicators.

When interpreting the chart attention must be paid to the preferable 'sign' of the sub-indicators. For example, a higher value of early childhood education is good, while a higher value of low parental education is not desirable.

From the chart we can capture information both about the main indicator and about the sub-indicators. Below an explanation of the conclusions that can be drawn.

Interpretation of the main indicator ([19])

a. Comparison of country performance to EU average performance. Example: Country X is doing better than the EU average because it shows a lower share of early school leavers; indeed, the share of early school leavers in country X is 1 standard deviation lower than the EU average share.
b. It is not possible to draw conclusions on how close the indicator is to the target value for the benchmark.

Interpretation of the sub-indicators

c. Comparison of country X performance on each sub-indicator to EU average performance on the same sub-indicator. Example: Country X is performing better than the EU average regarding participation in early childhood education and care (ECEC) because it shows a higher value of early childhood participation than the EU average. In addition, country X is also performing better than the EU average as regards parental education because it shows a smaller proportion of females aged between 45 and 54 with ISCED level 0-2 than the EU average.

([18]) This chapter deals with the interpretation of the charts. For an explanation on the specific sub-indicators themselves, please refer to Part 2 of this report.
([19]) NB: this part of the chart is the same as the top part of JAF Chart 1.

Nothing can be said to evaluate the performance in absolute terms (i.e. it is not possible to comment on the actual value of the indicator), only in relation to the EU performance.

d. Comparison of country X performance as regards two different sub-indicators. Example: When it comes to investment, Country X performs more or less equal to the EU average, but the country is doing much better than the EU regarding the participation in vocational education and training (VET). From this, nothing can be inferred on the performance in absolute terms.

SUMMARY

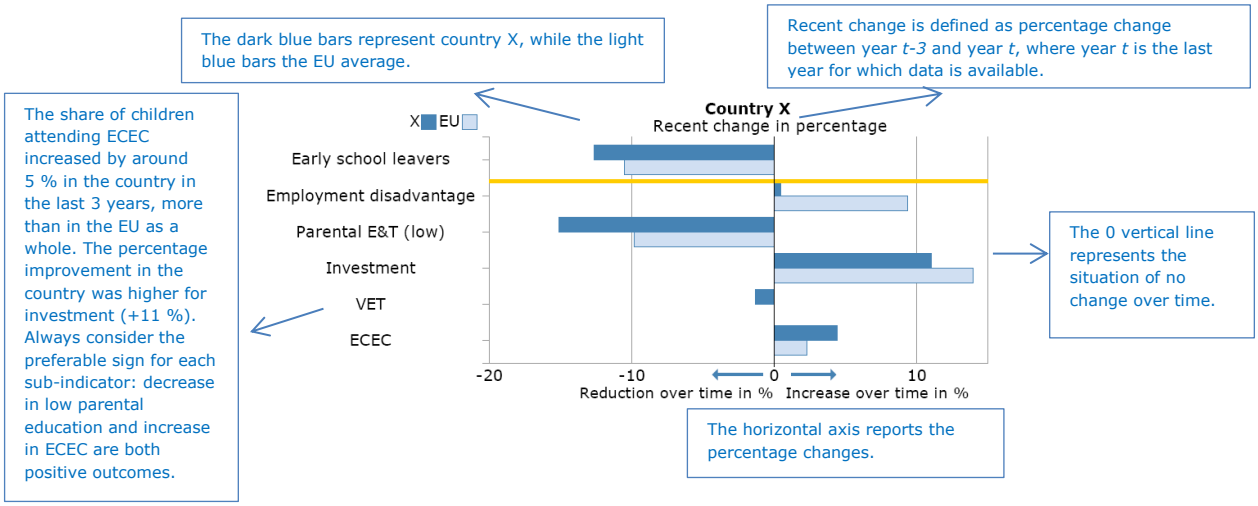
Always compare each sub-indicator to the EU average (i.e. compare each blue bar to the vertical line centred at 0).

Do's:
— Comparison of country performance to EU average performance
— For each sub-indicator, comparison of country performance to EU average performance
— Comparison of country performance in different sub-indicators relative to EU performance

Don'ts
— Drawing conclusions on how close the indicator is to the target benchmark value
— Comparison in the absolute performance of the country in different sub-indicators

Working on the Don'ts
— Additional information is needed to comment on the absolute performance (use tables)
— Additional information is needed to comment on the target (use tables)

JAF Chart 4: Recent change



The fourth and final JAF chart reports the percentage change between year *t-3* and year *t* (where year *t* is the last year for which data is available) in the main indicator for ESL and its sub-indicators, for country X and for the EU average ([20]). The dark blue bars represent country X while the light blue bars

([20]) It should be noted that for some sub-indicators, a different time frame rather than the 3-years change might need to be used. This is the case for example for sub-indicators based on the use of the CVTS (Continuing Vocational Training Survey) or AES (Adult Education Survey), which are carried out every five years.

are for the EU average. On the horizontal axis, the percentage changes are reported. If the percentage change is negative it means that the indicator for country X decreased between year *t-3* and year *t*, if the percentage change is positive it means that an increase took place in this time period. As before, to interpret the chart it is important to keep in mind the sign of the indicators and whether a higher or lower value is preferable — and, as a consequence, whether an increase or a decrease is desirable. Also note that the chart reports percentage changes, and not percentage point changes (see Box 4).

Interpretations on the main indicator ([21])

a. Country performance in terms of the main indicator. Example: Country X is performing well because between year *t-3* and year *t* the share of early school leavers has decreased by 12.5 per cent ([22]).

b. Comparison of change in the country with change in the EU. Example: Country X is showing a higher relative improvement (in terms of recent change) than the EU average because the percentage decrease in early school leaving is higher than the European one (12.5 % versus 10.5 %).

Interpretations on the sub-indicators

c. Recent country performance as regards the different sub-indicators. Example: Country X is improving its performance in ECEC participation, because in the past three years the share of children attending ECEC has increased by around 5 %.

d. Comparison of the percentage change of each sub-indicator in the country with the percentage change of the same sub-indicator in the EU. Example: Looking at ECEC participation, country X is performing better than the EU average in terms of improvement in recent years, because the percentage increase in the share of children attending ECEC is larger in country X than in the EU as a whole.

e. Compare the percentage change of two sub-indicators. Example: Country X has an increase of 11 % in investment and 5 % in ECEC, thus country X has improved more in the former sub-indicator than in the latter one. Again, this is in relative terms — nothing can be said about the performance in absolute terms, so even if a significant improvement has been registered, the actual value of the sub-indicator can still be far from acceptable.

Furthermore, as mentioned concerning Chart 2, when commenting on the change in country performance over time it is important to take into account the presence of breaks in the time series (reported in the JAF tables that accompany the charts).

([21]) NB: this part of the chart is the same as the top part of JAF Chart 2.

([22]) In the chart, recent change is reported in percentage terms, not in percentage points.

SUMMARY
Compare each sub-indicator's percentage change with what is desirable, i.e. whether we aim at an increase or a decrease. Compare each sub-indicator's percentage change with the EU average percentage change (i.e. compare blue bar with light-blue bar). Compare recent changes in different sub-indicators. Please remember that nothing can be inferred on the performance in absolute terms.

Do's
— Comment on recent percentage change in country performance for the different sub-indicators, comparing with the desirable outcome
— Comparison of recent percentage change in country vs. EU performance for each sub-indicator
— Comparison between percentage change in the different sub-indicators

Don'ts
— Comparison between recent country and EU absolute performances
— Comparison between sub-indicators' absolute performances

Working on the Don'ts
— Additional information needed to comment on recent change in absolute terms (use tables)
— Additional information is needed to compare to the target (use tables)

2. INTERPRETATION OF THE TABLES

Previous charts are accompanied by summary tables. As shown in Table 2, each table includes absolute values of the main indicator and associated sub-indicators, for all 28 European countries. The table contains absolute values related to the most recent year (2013 if available) and to 2010 (or *t-3*). The national target for the main indicator (ESL and TEA) is also included, in order to provide a quick reference about the distance between the actual situation of the country and the desired achievement at country level.
Each table also include the relevant flags and footnotes for missing data, breaks in series, reliability issues, and data adjustments when necessary.

Table 2. Summary table for Early School Leavers (ESL) indicator

Country	Main indicator			Sub-indicator 1		Sub-indicator 2		Sub-indicator 3		Sub-indicator 4		Sub-indicator 5	
	Early school leavers		National Target	Employment disadvantage		Parental E&T (low)		Investment		VET		ECEC	
	2013	2010	2020	2013	2010	2013	2010	2010	2007	2013	2010	2013	2010
AT	7.3	8.3	9.5	22.5	20.9	22.9	24.4	0.17	0.15	75.3	77.3	93.7	91.3
BE	11	11.9	9.5	21.8	20.7	27.9	33.1	0.10	0.09	72.8	72.8	98	99.3
BG	12.5	13.9	11	27.8	27.6	15.8	17.1	0.14	0.12	50.6	51.8	87.1	78.5
CY	9.1	12.7	10	9.7	6.4	22.3	28	0.23	0.18	13.2	12.8	83.8	86.4
CZ	5.4	4.9	5.5	32.7	29.6	8	12	0.13	0.11	72.7	73.3	86.1	90
DE	9.9	11.9	10	19.1	18.9	15.2	16	0.16	0.14	48.3	53.2	96.5	96
DK	8	11	10	17.9	15.2	20.3	27.4	0.20	0.18	46.1	47.3	98.3	91.9
EE	9.7	11.6	9.5	13.6	20.3	3.4	4.2	0.18	0.13	34.1	33	89.2	95.7
EL	10.1	13.7	9.7	3.0	3.1	36.6	40.4			33.1	30.9	73.2	70.2
ES	23.5	28.4	15	11.0	11.4	47.7	53.6	0.19	0.17	45.5	42.9	99.8	99.3
FI	9.3	10.3	8	19.3	17.8	8.9	12	0.17	0.15	70.1	68.8	75.1	71.9
FR	9.7	12.6	9.5	16.0	16.2	28.9	34.8	0.16	0.15	44.2	44.2	100	100
HR	3.7	3.7	4	18.1	15.6	23.3	28.6	0.01	0.13	71.3	72.5	71.1	68.8
HU	11.8	10.5	10	26.7	25.3	21.7	23.3	0.13	0.15	27.3	24.5	94.4	94.8
IE	8.4	11.5	8	16.5	16.4	24.5	29.2	0.20	0.15	32.2	34.4	98.7	72.8
IT	17	18.8	16	15.0	17.0	45.1	48.3	0.15	0.15	59.2	59	96.6	98.2
LT	6.3	7.9	9	26.9	29.2	2.1	2.6	0.16	0.14	28.7	26.4	84.8	79.6
LU	6.1	7.1	10	7.6	8.8	23.5	29.6	0.17	0.15	60.7	61.3	97.8	94.6
LV	9.8	13.3	13.4	17.4	16.2	3.5	4.5	0.16	0.14	39	36.1	93.2	89.6
MT	20.9	25.9	10	25.1	25.9	72.8	78.2	0.26	0.21	11.8	58.1	100	93.9
NL	9.2	10	8	16.6	17.7	27.7	31.1	0.18	0.16	69.5	67.1	99.6	99.5
PL	5.6	5.4	4.5	24.8	23.5	9.7	11.7	0.17	0.15	48.2	47.2	84.3	70.9
PT	19.2	28.7	10	6.5	2.2	67.3	75.5	0.20	0.18	43.6	38.4	96.7	88.2
RO	17.3	18.4	11.3	10.7	9.1	21.7	27.9	0.09	0.11	61.9	63.7	82	82.3
SE	7.1	6.5	10	20.0	16.1	16.2	19.5	0.18	0.17	49.4	56.4	95.9	94.7
SI	3.9	5	5	21.2	19.2	17.1	22	0.20	0.18	66.2	64.3	93.4	87.7
SK	6.4	4.7	6	36.1	37.3	8.9	11.7	0.12	0.09	70.3	71.6	77.1	77.9
UK	12.4	14.9		18.8	19.5	25.4	28.9	0.21	0.15	38.6	30.5	97.9	97.3
EU average	11.9	13.9	10	17.9	16.4	27.3	30.4	0.17	0.14	49.4	49.6	93.2	91.7

PART 2
The JAF approach for each ET 2020 benchmark

1. Early leavers from education and training

Europe 2020 headline target: The share of early leavers from education and training aged 18 to 24 should be less than 10 %.

1.1. Main indicator and standard JAF sub-groups

Description of the main indicator

Early school leaving ([23]) is part of the twofold Europe 2020 headline target on education and training, which was approved with the aim of 'helping young people to achieve their full potential in training and education and thereby improve their employment prospects' ([24]). Early school leaving refers to persons aged 18 to 24 fulfilling the following two conditions: (1) the highest level of education or training attained is ISCED 0, 1, 2 or 3c short; and (2) respondents have declared not having received any formal and/or non-formal education or training in the four weeks preceding the survey ([25]) The definition includes those who have never enrolled, those who have dropped out of education and training, those who do not continue education and training after finishing lower secondary education and those who failed final exams at the end of upper secondary education.

Investing in reaching this headline target is fundamental for Member States, since it is widely recognised that upper secondary education is the minimum entrance qualification to successfully access the labour market. Prevention of early school leaving is an objective justified by a number of findings on the benefits from education — both monetary and non-monetary. There is substantial evidence quantifying the monetary returns to education. Most studies provide estimates of around 10 % increase in annual earnings due to an additional year of schooling (with US data in Angrist and Krueger, 1991; with Spanish data in Alba-Ramirez and San Segundo, 1995; with UK data in Oreopolous, 2006) ([26]). At the country level, empirical evidence finds highest returns to education for low-income and middle-income countries (Patrinos and Psacharopoulos, 2002). Apart from the monetary benefits from education, more educated individuals could also experience improvements in health, fertility control, cognitive development or social behaviour (e.g. Brunello and De Paola, 2013).

On behalf of the Commission, the European Expect Network on Economics of Education has recently produced a comprehensive overview of the literature on the private, fiscal and social costs of early school leaving (EENEE, 2013). Costs due to lost private benefits include the expected gains in earnings and wealth, improved health and life expectancy and higher lifetime satisfaction. Costs related to lost fiscal benefits include increased tax payments, lower reliance on government transfers and reduced expenditures on criminal justice. Social costs related to lost social benefits

([23]) The terms early school leaving and early leavers from education and training are used interchangeably in this report.
([24]) Council conclusions on the role of education and training in the implementation of the 'Europe 2020' strategy (OJ 2011/C 70/01).
([25]) The reference group to calculate the early school leaving rate (i.e. the denominator) consists of the total population of the same age group (18 to 24).
([26]) As Vila (2005) discusses, the most reliable estimates of monetary rates of return to education seem to come from studies on samples of twins, such as those of Ashenfelter and Rouse (1998), Ashenfelter and Krueger (1994) and Miller et al. (1995).

include productivity externalities, the social value of better health and the gains from reduced crime.

In another more recent literature review on early school leaving, De Witte et al. (2013) point out that although early school leaving gains increasing attention from policy-makers, the issue remains grave. In the OECD countries, on average 72 % of all 25- to 34-year olds had completed a year 12 equivalent in 1999 ([27]). In the EU a year 12 equivalent level of education is reported for 77.3 % of the population in 2005, which marks only a slight improvement since 2000 ([28]). There is growing evidence showing that early school leavers, compared with their graduated peers, are more at risk of experiencing problems such as unemployment and social exclusion. More specifically — early school leaving has also been associated with poverty, dependence on public assistance, single parenthood (for females), political and social apathy, and crime (De Witte et al., 2013). In the long run, early school leaving has negative effects on social development and economic growth.

Sources, coverage and descriptive statistics

All measurements come from the EU Labour Force Survey (LFS), and are publicly available on Eurostat ([29]). Data are available on annual basis up to 2013 for all European Countries (no missing data). The latest data, referring to 2013 show that the country where early school leaving is the lowest is Croatia (3.7 %) and the country where it is the highest is Spain (23.5 %). The European average is 11.9 %.

Table 1.1. Descriptive statistics on the main indicator

Data source and release date	Eurostat (LSF), online data code t2020_40	
Coverage (time, countries)	Latest data 2013, all countries	
Sample size problems		
Variation over countries for year 2013	**Min**	3.7 (HR)
	Max	23.5 (ES)
	Mean(EU weighted)	13.9
	Stdv	5.0

Standard JAF sub-groups

Early school leaving rates are monitored for male/female and native-born/foreign-born sub-populations ([30]). Firstly, it is important to take into account gender differences in early school leaving. Similar to other education indicators (tertiary and secondary graduation rate, attainment, etc.), the trends show that there is an 'education reverse gender gap'. This means that males are more likely than females to leave school before reaching an upper secondary degree (OECD, 2013). Secondly, it has been widely acknowledged in various assessments of educational performance that students with a migrant background tend to perform worse than natives (Dunne and Souto Otero, 2013; OECD, 2013). As such, it is important to consider this breakdown also in the early school leaving indicator.

([27]) Business Council of Australia, 2002a cited in De Witte et al. (2013).
([28]) European Commission (2006) cited in De Witte et al. (2013).
([29]) Online data code *t2020_40*. The online data codes mentioned in this chapter refer to the Eurostat online data base. The respective data can easily be found by using the online data code as a search term when using the search function on the Eurostat webpage (http://ec.europa.eu/eurostat).
([30]) For the annual *Education and Training Monitor*, additional sub-groups and breakdowns are considered. Additional sub-groups are early school leaving rates by regions (NUTS2) and by single age (18, 19, 20, 21, 22, 23, and 24). Additional breakdowns are by employment status (employed, unemployed, and inactive) and by ISCED level (0, 1, and 2).

1.2. Sub-indicators

The dimensions considered for the sub-indicators

Previous studies have shown that the determinants of early leaving are to be found both at the individual and at the institutional level. At the individual level, early school leaving is typically caused by a cumulative process of disengagement as a result of personal, social, economic, geographical, education or family-related reasons. In particular, research has consistently found that socioeconomic status, most commonly measured by parental education and income, is one of the most powerful predictor of school achievement and dropout behaviour (McNeal, 1999; Rumberger, 1995; Rumberger, 2001). Also, participation in early education is usually a good predictor of educational attainment (Brilli et al., 2013).

The institutional setting of the educational and labour market system also contributes to early school leaving. Countries with well-functioning vocational programmes show lower rates of early school leaving for instance. In the choice of the sub-indicators focus is put on factors related to the individual level and the system (educational and labour market) level.

Sub-indicator 1: Employment disadvantage

Definition: Difference in employment rate in percentage points between individuals 20-64 with ISCED 0-2 compared to individuals with ISCED 3-4.

The difference in employment rates between individuals with low education and individuals with high education should provide an indication of the labour market returns to upper secondary education. A higher return to education should increase the incentive to stay longer in the educational system (for a discussion on the monetary returns to education, see Boarini et al., 2008, Biagi and Lucifora, 2008). Accounting for variation in employment disadvantage, Psacharopoulos (1994) finds that returns to education vary between different occupations — for example, public employment tends to give smaller returns than private employment. Besides, marginal returns to education tend to be falling both with the level of education of the individual and with the level of economic development of society.

It is to be expected that higher values of employment disadvantage (in absolute terms), which could reflect higher returns to education and/or well-functioning labour market institutions, are associated with a lower rate of early school leaving. This is because, in this scenario, individuals have higher incentives to study longer, due to the higher probabilities of finding a job later on.

Sources, coverage and descriptive statistics

Data on this sub-indicator is available from Eurostat ([31]). The source of this data is the EU-LFS. Data are recorded annually up to 2013 for all Member States.

Table 1.2. Descriptive statistics on the sub-indicator 'Employment disadvantage'

Data source and release date	Eurostat, Labour Force Survey (lfsa_ergaed)	
Coverage (time, countries)	Up to 2013 All European countries; no missing data.	
Sample size problems	-	
Variation over countries for year 2013	**Min**	36.1 (SK)
	Max	3 (EL)
	Mean (EU weighted)	17.9
	Stdv	7.7

([31]) Online data code *lfsa_ergaed*.

Sub-indicator 2: Parental E&T (low)

Definition: Proportion of females aged between 45 and 54 with low education attainment (ISCED 0-2).

The educational attainment of females aged 45-54 is a robust proxy for the family background of the population captured by the main indicator. There is a vast literature highlighting the importance of the family environment as a key determinant for explaining differences in educational attainment (see for instance Koucky et al., 2009). Research has consistently found that socioeconomic status, most commonly measured by parental education and income, is a powerful predictor of school achievement and dropout (Dalton et al., 2009). There are studies that have found a causal relationship between family income and education attainment (both with UK data: Blanden, 2004, Chevalier et al., 2005). Other findings are the effect of parental background on intra-associated dimensions such as profession and education (Dustmann, 2004), cultural capital (Rumberger, 1983) and the emotional climate of parent-child relationship (Duchesne et al., 2005 quoted in De Witte et al., 2013). Reading behaviour (De Graaf et al., 2000) and the use of educational resources (Teachman, 1987) have also been identified as possible predictors of school dropout.

The literature suggest that the influence of the mother's education is somewhat stronger than that of the father (see for instance Haveman and Wolfe, 2005; Black et al., 2005; Chevalier et al., 2005). This explains the choice of the education attainment of females as a proxy for the family environment. It is expected that the association between this sub-indicator and the main indicator is positive, since higher proportions of low educated females are associated with higher shares of early leavers.

Sources, coverage and descriptive statistics

Data on this sub-indicator is available on Eurostat ([32]). The source of this data is LFS. Data are recorded annually up to 2012 for all Member States.

Table 1.3. Descriptive statistics on the sub-indicator 'Parental E&T (low)'

Data source and release date	Eurostat, Labour Force Survey (edat_lfs_9903)	
Coverage (time, countries)	Up to 2012 All European countries; no missing data.	
Sample size problems	-	
Variation over countries for year 2013	**Min**	2.1 (LT)
	Max	72.8(MT)
	Mean (EU weighted)	16.5
	Stdv	16.9

([32]) Online data code *edat_lfs_9903*.

Sub-indicator 3: Investment

Definition: Annual expenditure on public and private educational institutions in EUR PPS at primary and secondary levels (ISCED 1 to 2) divided by the size of the cohort aged 6 to 18 and compared to the GDP per capita in EUR PPS.

Social returns to education for current and future generations are the main rationale, on efficiency grounds, for the public support of education. The level of public expenditure can vary across countries depending on the value of education perceived by policy-makers. Most public funds go to public institutions but in some cases a significant part of the public budget may be spent on private educational institutions ([33]). Recent empirical literature emphasises that investment activities in education are essential for enhancing the level of technological innovation in an economy and for fostering economic growth ([34]).

Spending, as a percentage of GDP, constitutes a measure of the investments in education and training systems and a proxy for the quality of the supply of education. DG EAC ([35]) used low performance on the two headline targets in relationship to low investment in education as the principal guide for identifying countries that entered the economic and financial crisis in a challenging situation. National policy-makers are under constant pressure to expand access to educational opportunities, in particular at the tertiary level. Adequate investment levels are important in order to face the increasing proportion of population which participates in education and to ensure an educational system of good quality (see OECD, Education at a Glance, 2011). While returns to educational quantity decrease with an individual's time in the labour market, returns to educational quality increase (Altonji and Pierret (2001)) and hence investment in education can be crucial. For empirical evidence amongst others, we can refer to Steele and Jenkins (2007) who show that better funded schools in the UK, and those with lower pupil-teacher ratios, have higher pupil attainment *ceteris paribus* than schools with lower levels of resources.

Sources, coverage and descriptive statistics

The data on expenditure are provided by Eurostat though a special extraction which gives information on expenditure on ISCED 1 and 2 ([36]). The main source of this data is the joint UIS (Unesco Institute of Statistics)/OECD/Eurostat (UOE) questionnaires on education statistics. The other variables used to build this sub-indicator are the census population for the considered age groups ([37]) and real expenditure per capita ([38]). The main variable is missing for Greece and Luxemburg for the years needed. The latest data available is 2010.

Table 1.4. Descriptive statistics on the sub-indicator 'Investment'

Data source and release date	Eurostat, educ_fiabs, demo_pjan, prc_ppp_ind	
Coverage (time, countries)	Missing Greece; latest data available 2011	
Sample size problems	-	
Variation over countries for year 2011	**Min**	0.078 (RO)
	Max	0.238 (CY)
	Mean	0.160
	Stdv	0.037

([33]) Education at a Glance, OECD 2011.
([34]) Joint Report by the Economic Policy Committee (Quality of Public Finances) and the Directorate-General for Economic and Financial Affairs, forthcoming European Economy Occasional Papers No 70.
([35]) In its quantitative evaluation of national reform programmes, and in the support it provided to its country network.
([36]) Online data code *educ_fiabs*, which provides information on expenditure for different ISCED categories.
([37]) Drawn from the online data *demo_pjan*.
([38]) Drawn from the online data *prc_ppp_ind*, selecting as *INDIC_NA* 'real expenditure per capita EU28'.

Sub-indicator 4: VET

Definition: Proportion of students at ISCED 3 level in vocational education.

The potential contribution of vocational programmes to reducing early leaving from education and training has already been discussed for some time ([39]). Countries with 50 % or more students in ISCED 3 vocational programmes show lower values of early leavers from education and training. For countries where comparable data are available for several years the analysis suggests that the correlation between students in VET and not dropping out before completing upper secondary education has grown stronger ([40]).

A 2012 report from the European Expert Network on Economics of Education argued that in countries where vocational education can be obtained in full-time vocational schools, measures to improve the quality as well as to expand the availability of these schools might be an important way to improve school-to-work transitions (EENEE, 2012). In contrast to active labour market policies (ALMPs), this particular policy response is schooling-focused: it explicitly takes young people off the labour market and aims at improving long-run labour market outcomes. This labour market improvement is meant to arise through better skills and knowledge, which better match the labour requirements of firms.

Indeed, it is widely acknowledged that VET facilitates the transition from school to work, but, in doing so, it is not straightforward whether VET actually decreases or increases early school leaving rates in the short run ([41]). What is clear is that well-developed vocational programmes can help to make education and training systems more *socially inclusive* and to provide alternatives for those who cannot find motivation in general education. As such, a higher prevalence of VET provision is expected to — directly or indirectly — contribute to reaching the Europe 2020 goal of reducing early leavers from education and training ([42]).

Sources, coverage and descriptive statistics

Data on proportion of students in vocational education are available on Eurostat ([43]). The main source of this data is the UOE data collection. Data are available for all countries up to 2011 (except for Greece, with missing data for 2009).

Table 1.5. Descriptive statistics on the sub-indicator 'VET'

Data source and release date	Eurostat, educ_ipart_s	
Coverage (time, countries)		
Sample size problems	-	
Variation over countries for year 2012	**Min**	11.8(CY)
	Max	75.3 (AT)
	Mean(EU weighted)	50.4
	Stdv	17.85

([39]) European Commission (2005), Achieving the Lisbon goal: The contribution of VET.
([40]) Ibid.
([41]) A study commissioned by Cedefop is to provide an answer to this question. Its aim is not only to understand the phenomenon of drop-out and early leaving *from* VET but also to analyse the role of VET in *reducing* early leaving from education and training. To this end, the study is to analyse policies and measures to tackle early leaving from education and training through VET and to identify good practices and tools to support policy-making at national and EU levels.
([42]) See also *Reducing Early School Leaving in the EU*, authored in 2011 by GHK at the request of the European Parliament; and the Final Report of the Thematic Working Group on Early School Leaving (2013): *Reducing early school leaving: Key messages and policy support*.
([43]) Online data code *educ_ipart_s*, selecting INDEC_ED = PS01_2.

Sub-indicator 5: ECEC

Definition: Proportion of students between 4 and starting age of compulsory education participating in early education.

There is a considerable body of literature showing that investment in early childhood education and care (ECEC) is fundamental for children's development of cognitive and non-cognitive abilities (Heckman and Cunha, 2007; Almond and Currie, 2011). Access to good quality education at an early age increases educational achievements and reduces the risk of early school leaving at a later stage ([44]). The OECD's PISA ([45]), but also the IEA's TIMSS and PIRLS ([46]) show that for most countries, students who have attended pre-primary education have higher subsequent skills levels than those who have not. ECEC participation is particularly important for children coming from a low socioeconomic background, since being involved in early childcare can reduce the impact of poor family background. Indeed, support measures for disadvantaged children exist in most European countries as part of the ECEC provision (Eurydice, 2014). The positive effects of ECEC have been found to be both short term (on school achievement) and long term (on college completion, years of education, wages) ([47]).

The difficulty of overcoming disadvantage later in life-through job training programs for early leavers from education and training makes earlier intervention even more desirable (Currie, 2001). Public sector efforts to train low-skilled adult workers have generally found very small returns (Currie, 2001). Psacharopoulos (2006) emphasised that effectiveness of education policies is possible when priority is given to investment in the lower levels of education, including ECEC.

Sources, coverage and descriptive statistics

Data for monitoring country performances in ECEC participation are provided by the Unesco/OECD/Eurostat (UOE) database on education statistics, compiled on the basis of national administrative sources, reported by Ministries of Education or National Statistical offices according to international standards, definitions and classifications. The data are available from Eurostat ([48]). The latest figures currently available refer to 2011, and they cover all EU28 countries ([49]).

Table 1.6. Descriptive statistics on the sub-indicator 'ECEC'

Data source and release date	Eurostat, educ_ipart	
Coverage (time, countries)		
Sample size problems	-	
Variation over countries for year 2011	**Min**	69.2 (HR)
	Max	100 (FR, MT)
	Mean(EU weighted)	94.2
	Stdv	8.41

([44]) Final Report of the Thematic Working Group on Early School Leaving (2013): Reducing early school leaving: Key messages and policy support. The 2011 Communication on early childhood education (COM(2011) 66) also underlined the importance of pre-school education.
([45]) OECD (2012), *Starting strong III: a quality toolbox for Early Childhood Education and Care*.
([46]) Reports available at http://www.iea.nl/.
([47]) For a comprehensive review of the effect of ECEC on children outcomes see Brilli et al. (2013).
([48]) Online data code educ_ipart.
([49]) This sub-indicator is identical to the ECEC benchmark (see Chapter 3).

1.3. Further considerations: DG EMPL alignment and NEETs

The JAF was first introduced by DG EMPL in 2010 to standardise the monitoring of benchmarks and indicators under the Employment Guidelines. There are two policy areas that are of common interest: 'improving skills supply and productivity, effective life-long learning', and 'improving education and training systems'. Both policy areas are covered by two main indicators. The two main indicators of the second policy area are early leavers from education and training and tertiary education attainment. DG EAC and DG EMPL share a common JAF approach as regards the twofold Europe 2020 headline target on education and training. In other words, the standard JAF sub-groups and the sub-indicators discussed in this chapter are used by DG EMPL as well.

DG EMPL has, however, added the NEET rate (15 to 24-year-olds not in employment, education or training) as a sub-indicator for early leavers from education and training. Although the NEET rate is often confused with the early school leaving rate, the two indicators have two crucial differences besides the somewhat diverging age categories. Firstly, the early school leaving indicator imposes a restriction on the education attainment of the captured population, whereas the NEET indicator does not. Secondly, the NEET indicator imposes a restriction on the employment status of the captured population, whereas the early school leaving indicator does not. As a consequence, the early school leaving indicator, through its strong education-perspective, is concerned with the long-term investments of young people, whether or not they are currently employed ([50]). An upcoming JRC-CRELL technical briefing will look into the comparison more closely, and investigate the overlaps and differences as regards the characteristics of the populations captured by each of the indicators.

([50]) Nonetheless, about 40 % of early school leavers are currently unemployed, as shown in the Education and Training Monitor 2013 (http://ec.europa.eu/education/monitor).

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2. Tertiary education attainment

Europe 2020 headline target: 'By 2020, the share of 30-34 year olds with tertiary educational attainment ([51]) should be at least 40 %' ([52]).

2.1. Main indicator and standard JAF sub-groups

Description of the main indicator

Increasing tertiary education attainment has been identified by the Commission as one of the pivotal features for a smart, sustainable and inclusive growth (as stated in the Europe 2020 strategy). In the face of rapid technological change and of the increasing investments of emerging countries in education, research and innovation, the need to maintain and increase the level of qualification of European workers is crucial for keeping Europe as a competitive economy based on knowledge and innovation.

The rapid changes occurring in the globalised world require individuals to be able to update and adapt their skills quickly to the demand of the labour market in order to compete in terms of productivity, but also in order to assure quality in the job and to foster innovation in economic systems. European labour market projections ([53]) foresee that by 2020 around 34 % (36 % in 2025) of all jobs will require tertiary level qualifications, while by 2013 only 31.4 % of the European labour force holds such a qualification ([54]).

Besides, when compared to other leading industrialised countries (e.g. US, Canada, Japan…) Europe shows a lower proportion of tertiary graduates, which may hinder Europe's potential to generate smart growth (COM(2010) 2020 final)

Furthermore, on an individual level, better educational levels improve employability and better occupational outcomes (mirrored in higher employment rates) and help reduce the risk of poverty. In terms of social outcomes, high levels of education contribute to the achievement of self-fulfilment and to developing behaviours of active citizenship.

Yet, although the importance of increasing tertiary level attainment is widely recognised, few Member States achieve the target of 40 % of young adults with tertiary level education, and some of them lie far behind the target ([55]) (EAC 2013).

The literature is consistent in showing that (successful) participation in higher education brings several benefits both at micro (individual) and macro (collective) level (Winkleby et al. 1992, Collins 2000, Dee 2004). There is a large body of literature showing that on an individual level, returns to higher education results in better chances of being employed, a reduced risk of unemployment and increased long term wage differential (compared to upper secondary graduates). Also, tertiary level education brings about a series of positive effects on the society on a macro level: for example, well educated people show better health conditions (Winkleby et al., 1992) and higher levels of civic behaviour and socio-political participation (Dee, 2004).

([51]) The percentage of those aged 30-34 who have successfully completed tertiary level education (ISCED levels 5 and 6).
([52]) (Council Conclusions 12 May 2009, OJ C 119/2 28.5.2009)
([53]) http://www.cedefop.europa.eu/EN/about-cedefop/projects/forecasting-skill-demand-and-supply/skills-forecasts/main-results.aspx?CountryID=32&case=ETBQ
([54]) http://www.cedefop.europa.eu/EN/about-cedefop/projects/forecasting-skill-demand-and-supply/skills-forecasts/main-results.aspx?CountryID=32&case=LFBQ
([55]) In 2012, only 12 out of 28 Member States reached or exceeded the EU target: BE, DK, IE, ES, FR, CY, LT, LU, NL, FI, SE and UK.

Sources and coverage

The indicator measures the percentage of young adults, among the total of those aged between 30 and 34, holding a tertiary education qualification (adding up ISCED levels 5 and 6 attainment).

Data are drawn from Eurostat, based on the EU Labour Force Survey ([56]). Data are available on annual basis for all European Countries. There is no missing data and the annual data is normally published in April, *t+1*.

Table 2.1. Descriptive statistics on the main indicator: Tertiary education attainment

Data source and release date	Eurostat, Labour Force Survey 't2020_41'	
Coverage (time, countries)	Frequency: annual Last data: 2013 Missing: no Mean: EU27 and EU28 available.	
Sample size problems		
Variation over countries for year 2013	**Min**	22.4 (IT)
	Max	52.6 (IE)
	Mean	EU28 (weighted): 36.8
	Stdv	EU28 (unweighted): 9.5

Standard JAF sub-groups

The indicator for tertiary education attainment is also monitored for the male/female and native-born/foreign-born sub-populations ([57]). Firstly, a typical feature of the expansion of the participation in tertiary education which has characterised the last four decades is the increase of female participation. In OECD countries women's enrolment in tertiary education has increased sharply since the 1970s, — and in late 1980s the number of women overtook the number of men (Checchi 2006). Also, more women graduate than men: not only do they enrol in higher numbers but they have higher rates of successful completion of higher education ('Education at a Glance 2013: OECD Indicators'). Considering that women, taken as a separate group, have already achieved the 40 % target at the EU level (Education and training Monitor 2013, EAC), a distinction between male and female is necessary.

Secondly, in the education process, migration status is a key variable to explain education outcomes. Ethnic identity and immigrant background (for those countries where immigration is a more recent phenomenon) are most often negatively associated to tertiary enrolment and tertiary attainment. This subgroup thus enables us to show the disadvantage for foreign-born students and to deliver more targeted analyses.

([56]) Online data code *t2020_41*. The online data codes mentioned in this chapter refer to the Eurostat online data base. The respective data can easily be found by using the online data code as a search term when using the search function on the Eurostat webpage (http://ec.europa.eu/eurostat).

([57]) For the annual Education and Training Monitor, additional sub-groups and breakdowns are considered. Additional sub-groups are tertiary attainment rates by regions (NUTS2) and by single age (30, 31, 32, 33 and 34). Additional breakdowns are by employment status (employed, unemployed, and inactive), by ISCED level (4, 5 and 6) and by field of study.

2.2. Sub-indicators

The dimensions for the sub-indicators

Tertiary attainment has several determinants at different levels of explanation. Literature has pointed out that individual characteristics and institutional factors interact in determining the final outcome. Assuming no differences in the level of ability of students, several individual characteristics are commonly associated with the completion of tertiary education. In this respect, the socioeconomic background and the educational attainment of parents are key variables affecting the chances of accessing higher education (Shavit et al., 2007).

While individual determinants are more often mentioned, the institutional configuration of the educational system also contributes to tertiary attainment. For an analysis at the country level, such indicators are more appropriate as the individual indicators might make a difference at the individual level and not at the aggregate level. These institutional indicators take into account that individuals take their decisions in a socially structured environment, which provides them with incentives or constrains. As an example, an increase in public spending for a certain educational level does not assure an increase in the attainment, but it is a good indicator of the commitment of governments toward education. Besides, the structure of the labour market can vary a lot between countries: the levels of participation and the returns to higher education are affected by the institutional regulation of the labour market (Esping-Andersen and Regini, 2000), thus resulting in different incentives to participate. For example, youth unemployment levels particularly affect some countries belonging to the Southern European welfare model (e.g. Italy, Spain, Greece and Portugal), while the regulation of labour in some other countries provide a quicker entrance (e.g. countries as UK and Ireland in the liberal welfare model) (Esping-Andersen, 1990, Ferrera, 1996); similarly, wage gaps between different educational qualifications may differ significantly among labour market regimes. Due to the fact that our analysis relies on aggregate data recorded at country level, most of the sub-indicators considered here refer to institutional factors.

Sub-indicator 1: Completion rate

Definition: Proportion of those entering a tertiary type A programme and go on to graduate from a first tertiary type A programme.

This sub-indicator measures the share of students who complete their studies among all students who enter a tertiary programme. Completion refers to two situations:

- A student who enters a tertiary type A programme and graduates with a tertiary type A qualification.
- A student who enters a tertiary type B programme and graduates a tertiary type B qualification ([58]) (OECD 2013).

This sub-indicator has been selected for its complementarity with the main indicator. First of all, there is a clear link between those who successfully complete tertiary education (qualify / graduate) and the overall percentage of graduates in the population of 30-34 years old. Moreover, the indicator provides additional information about the nature (effectiveness) and quality of tertiary education attainment in a given country. Completion rates may be used as a measure for academic dispersion, highlighting those who enrol to tertiary education and then do not complete the cycle as the drop outs. The percentage of enrolled students who complete the cycle can also be considered as a proxy of internal efficiency of the country's tertiary education system. Thus, the analysis of the completion rate in tertiary education allows contrasting countries in terms of the internal efficiency of the tertiary education system.

Sources, coverage and descriptive statistics

Data about completion rate of tertiary education are computed in the framework of the UOE data collection (jointly carried out by Unesco, OECD and Eurostat), but is usually disseminated by OECD ([59]). They are published in OECD's 'Education at a Glance', under the section 'The Output of Educational Institutions and the Impact of Learning'. The variable COMPL_GEI5A in Eurostat dataset 'educ_bo_ou_comp' records the percentage of people who completed at least a first 5A programme over the total of enrolled people.
The data are available for 21 European countries and other OECD countries, but some European countries (BG, HR, CY, LV, LT, MT, RO) are missing. The latest year available is 2011.

Table 2.2. Descriptive statistics on the sub-indicator 'Completion rate'

Data source and release date		UOE as published in OECD, Education at a glance Indicator 4.A educ_bo_ou_comp [COMPL_GEI5A]
Coverage (time, countries)		Frequency: every three years Last data: 2011 Missing: BG, HR, CY, LV, LT, MT, RO (not in the list of countries); EE, EL, LU missing data; Mean: EU28-EU27 missing
Sample size problems		
Variation over countries for year 2011	**Min**	53 (HU)
	Max	81 (DK)
	Mean	EU21 (unweighted): 69
	Stdv	EU21 (unweighted): 9

([58]) Tertiary-type A programs (ISCED 5A) are largely theory-based and are designed to provide sufficient qualifications for entry to advanced research programs and professions with high skill requirements, such as medicine, dentistry or architecture. Tertiary type A programs have a minimum cumulative theoretical duration of three years' full-time equivalent, although they typically last four or more years. Tertiary-type B programs (ISCED 5B) are typically shorter than those of tertiary type A and focus on practical, technical or occupational skills for direct entry into the labour market, although some theoretical foundations may be covered in the respective programs. They have a minimum duration of two years full-time equivalent at the tertiary level. (OECD Glossary).

([59]) Data from OECD are accessible here: http://www.oecd-ilibrary.org/education/education-at-a-glance-2013/completion-rates-in-tertiary-education-2011_eag-2013-table27-en.

Sub-indicator 2: Upper secondary

Definition: Percentage of population aged 20-24 having completed at least upper secondary education

Rising skill demands in European countries have made qualifications at the upper secondary level the minimum credential for successful labour market entry. Attainment of upper secondary education (corresponding to the ISCED level 3 — Upper secondary education — or ISCED level 4 — Post-secondary non-tertiary education) serves as the foundation for advanced learning and training opportunities.

Since upper secondary qualification is a pre-requisite for entering tertiary education, it informs about the pool for new entrants into higher education e.g. normally only those who attained an upper secondary degree. The sub-indicator on upper secondary attainment is therefore essential when discussing the evolution of the headline indicator as it shows the potential input flow for tertiary education. The higher the number of potential 'consumers' of higher education implies a higher number of potential students which in turn, implies a higher pool of individuals which may attain tertiary education qualifications (although some drop out can occur along the way). On the contrary, a country showing very poor rates of upper secondary attainment, will have lower probability to attain the tertiary education target, since it will start with a little pool of potential higher education students which can successfully complete the entire cycle and integrate the share of individuals aged 30-34 with tertiary education attainment (the main indicator).
The age range between 20 and 24 years has been chosen in order to allow some time lag for the end of high school (which typically ends between 18 and 20 years old) but still remaining in the age bracket of young people, which is the age range in which most of the students enrol to university-like education (the median age of participation to higher education in EU27 was 22.1 years old in 2011, and only 15 % of the people participating in tertiary education was 19 years old ([60]).

Sources, coverage and descriptive statistics

Data about the percentage of young people (aged 20-24) holding a upper secondary qualification is recorded by Eurostat, Labour Force Survey (EU-LFS) ([61]). Data are recorded on annual basis for all Member States. Annual data are normally published in May-June *t+1*.

Table 2.3. Descriptive statistics on the sub-indicator 'Upper secondary'

Data source and release date		Eurostat, Labour Force Survey 'edat_lfse_06'
Coverage (time, countries)		Frequency: annual Last data: 2013 Missing: no Mean: EU27 and EU28 available.
Sample size problems		
Variation over countries for year 2013	**Min**	41.9 (ES)
	Max	87.9 (HR)
	Mean	EU28 (weighted): 64.8
	Stdv	EU28 (unweighted): 10.8

([60]) Online data code: *educ_itertp*, selecting TP06_2.
([61]) Online data code: *edat_lfse_06*.

Sub-indicator 3: Investment

Definition: Annual expenditure on tertiary level in EUR PPS (Purchasing Power Standards) divided by the size of the cohort aged 20 to 24 compared to the GDP per capita in EUR PPS

National policy-makers are under constant pressure to expand access to educational opportunities, in particular at the tertiary level. Adequate investment levels are thus especially important in order to face the increasing proportion of population which participates in tertiary education and to ensure an educational system of good quality (see OECD, Education at a Glance, 2011).

In this respect, DG EAC used low performance on the two headline targets (early leavers from education and training and tertiary education attainment) in relationship to low investment in education as the principal guide for identifying countries that entered the economic and financial crisis in a challenging situation.

Expenditure on education is a real issue for the education outcomes. There are several measures of expenditure on education but this sub-indicator tackles investment with a specific angle. Spending per individual in relevant age-group for each level of education compared to the GDP per capita constitutes a measure of society's investment in education and training systems and is a proxy for the quality of the supply of education. This approach is slightly different from the more common 'spending as a percentage of GDP' or 'spending per student' and has been selected in order to take into account the demographic effect. It avoid to penalise countries with a high share of students but that spend less on a per capita basis compared to other countries that spend a lot on few students.

Sources, coverage and descriptive statistics

Annual expenditure on tertiary level education is computed combining four different datasets from Eurostat. The first dataset ([62]) records the Annual expenditure on public and private educational institutions per student in PPS, at tertiary level of education (ISCED 5-6). The second dataset ([63]) records the number of students enrolled in ISCED level 5-6 per country. The third dataset ([64]) collects data about population on 1 January (in this case we select the cohort 20-24 only) and data are available up to 2013 for all European countries. Finally, the fourth dataset ([65]) provides measure of Gross Domestic Product (GDP) per capita in EUR PPS. The resulting measure 'investment', combining the four above mentioned data, is missing for IE, EL, LU, HU in 2010.

Table 2.4. Descriptive statistics on the sub-indicator 'Investment'

Data source and release date		Eurostat, Labour Force Survey educ_fitotin, educ-ilev, demo-pjangroup, nama_gdp_c
Coverage (time, countries)		Combined sub-indicator 'investment': latest data available 2010; Missing: IE, EL, LU, HU Mean: EU27 available, EU28 not available.
Sample size problems		
Variation over countries for year 2010	**Min**	0.17 SK
	Max	0.43 FI
	Mean	EU27 (weighted): 0.25
	Stdv	EU27 (unweighted): 0.07

([62]) Online data code: *educ_fitotin* (FT01_04).
([63]) Online data code: *educ_ilev*.
([64]) Online data code: *demo_pjangroup*.
([65]) Online data code: *nama_gdp_c* (B1GM and PPS_HAB).

Sub-indicator 4: Parental E&T (high)

Definition: Proportion of female aged between 55 and 64 with ISCED 5-6 attainment level

The educational attainment of females aged 45-54 and 55-64 has been introduced as a sub-indicator as it can be considered as proxy for family background of the target population of the headline indicator. There is a vast literature highlighting the importance of the family environment as a key determinant for explaining differences in educational attainment (see for instance Koucky et al., 2009). Literature shows that there is a strong effect of educational attainment of parents on the educational attainment of children (Shavit and Blossfeld, 1993, Haveman and Wolfe, 2005, Black et al., 2005, Hertz et al., 2007). Whether it is somewhat bigger the influence of father's or mother's education is still a debated issue (Pronzato, 2009). In any case, the overall level of education of the family does matter on the future educational attainment of children. The conventional results in the literature suggest that the influence of the mother's education is somewhat bigger than that of the father (see for instance Haveman and Wolfe, 2005, and Black et al., 2005, Chevalier et al., 2005). This explains why we chose the educational attainment of females as a proxy for the family environment.

Sources, coverage and descriptive statistics

Data about the proportion of females aged between 55 and 64 with ISCED 5-6 level are made available by Eurostat ([66]). The dataset records data on persons with a given education attainment level by sex and age groups (in our case the selection is for females only, aged 55 to 64, ISCED level 5-6). Data are available up to 2012 for all European countries, with no missing data. The European averages (EU27 and EU28) are also provided.

Table 2.5. Descriptive statistics on the sub-indicator 'Parental E&T (high)'

Data source and release date		Eurostat 'edat_lfs_9903'
Coverage (time, countries)		Frequency: annual Last data: 2013; Missing: no Mean: EU27 and EU28 available
Sample size problems		
Variation over countries for year 2013	**Min**	7.6 (RO)
	Max	39.6 (EE)
	Mean	EU28 (weighted): 19.5
	Stdv	EU28 (unweighted): 8.5

([66]) Online data code *edat_lfs_9903*.

Sub-indicator 5: Employment advantage

Definition: Difference in employment rate (in percentage points) between individuals (aged 20-64) whose educational attainment is equal to ISCED5-6 and those whose educational attainment corresponds to ISCED3-4.

The difference in employment rates between (i) individuals (aged 20-64) with low and medium education and (ii) individuals (aged 20-64) with medium and high education gives an indication of the labour market returns to upper secondary education and to higher education.
A basic assumption of labour economic literature is that the demand for education depends on the economic incentives associated to studying (Becker, 1967; Freeman, 1986; Boarini and Strauss, 2007). These incentives are calculated as internal rates of return, which indicate how profitable is for an individual to pursue additional years of schooling, since they give origin to three kinds of premia: wage and experience premium, foreseeing a higher wage for tertiary graduates compared to upper secondary graduates, and employability premium, which is the one observed in this fifth sub-indicator. The employability premium is measured as a lower probability of suffering of unemployment for university graduates compared to upper secondary graduates (for a discussion on the monetary returns to education, see Boarini et al., 2007, or Lucifora and Biagi, 2008).
Therefore, as a higher return to education should increase the incentive to stay longer in the educational system ([67]), we decided to introduce the relative employment advantage as a proxy for incentives to start and complete higher education.

Sources, coverage and descriptive statistics

The employment advantage is computed by referring to data about employment rates by age and educational attainment. Data are drawn from Eurostat database ([68]), recording employment rates by sex, age and highest level of education attained. The difference between employment rate of university graduates and employment rate of high school graduates represents the sub-indicator of interest. Data are available up to 2012 for all European countries, with no missing data.

Table 2.6. Descriptive statistics on the sub-indicator 'Employment advantage'

Data source and release date		Eurostat 'lfsa_ergaed'
Coverage (time, countries)		Frequency: annual Last data: 2013 Missing: no Mean: EU27 and EU28 available Data for NL are provisional
Sample size problems		
Variation over countries for year 2013	**Min**	6.3 (SE)
	Max	23.6 (LT)
	Mean	EU28 (weighted): 12.4
	Stdv	EU28 (unweighted): 4.5

([67]) Note that in countries with a high proportion of young adults entering higher education, the employment rate might be lower because young adults are still studying.
([68]) Online data code: *lfsa_ergaed*.

2.3. Further considerations

The JAF was first introduced by DG EMPL in 2010 to standardise the monitoring of benchmarks and indicators under the Employment Guidelines. There are two policy areas that are of common interest: 'improving skills supply and productivity, effective life-long learning', and 'improving education and training systems'. Both policy areas are covered by two main indicators. The two main indicators of the second policy area are early leavers from education and training and tertiary education attainment. DG EAC and DG EMPL share a common JAF approach as regards the twofold Europe 2020 headline target on education and training. In other words, the standard JAF sub-groups and the sub-indicators discussed in this chapter are used by DG EMPL as well.

As a further consideration, we may think to revise the issue of investment in HE (in particular focusing on the exact measure of expenditure per student) if/when our Indicator Expert Group will propose alternative useful findings.

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3. Early childhood education and care

ET 2020 benchmark: 'At least 95 % of children between 4 years old and the age for starting compulsory primary education should participate in childhood education' (adopted 2009).

3.1. Main indicator and sub-groups

Description of the main indicator and its sub-groups

The early childhood education and care (ECEC) benchmark was adopted in 2009 within the ET 2020 strategic framework 'with a view to increasing participation in early childhood education as a foundation for later educational success, especially in the case of those from disadvantaged backgrounds' ([69]). The indicator used to measure the main indicator is the share of the population aged 4 to the age when compulsory education starts that is participating in ECEC. The country-specific entrance age for primary education and the age range used to calculate the participation rate in ECEC for each country are presented in the table below.

Table 3.1. Entrance age to compulsory primary education and age range of the indicator.

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Entrance age	6	6	7	6	6	6	6	7	6	6	7	6	7	6
Age range	4-5	4-5	4-6	4-5	4-5	4-5	4-5	4-6	4-5	4-5	4-6	4-5	4-6	4-5
	IE	**IT**	**LT**	**LU**	**LV**	**MT**	**NL**	**PL**	**PT**	**RO**	**SE**	**SI**	**SK**	**UK**
Entrance age	6	6	7	6	7	5	5	7	6	6	7	6	6	5
Age range	4-5	4-5	4-6	4-5	4-6	4	4	4-6	4-5	4-5	4-6	4-5	4-5	4

Source: Eurostat ([70]).

ECEC covers pre-primary education (ISCED 0). According to the Unesco/OECD/Eurostat data collection, ISCED 0 is defined as 'the initial stage of organised instruction, designed primarily to introduce very young children to a school-type environment, that is, to provide a bridge between home and a school-based atmosphere' (UOE, 2013). The boundary between education and childcare can be hard to establish ([71]); as a general rule, an early childhood programme can be classified as ISCED 0 if: *(a)* it is centre or school-based; *(b)* it is designed to meet the educational and developmental needs of children; *(c)* it typically caters for children at least three years of age; and *(d)* it has staff that are adequately trained (i.e. qualified) to provide an educational programme for the children. Early childhood programmes that fail to meet these criteria are generally not classified as ISCED 0.

([69]) Official Journal of the European Union, 2009/C 119/02.
([70]) See: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00179&plugin=1.
([71]) 'Some countries internally define pre-primary or early childhood education more broadly than others. Thus, the comparability of international statistics on pre-primary education depends on each country's willingness to report data for this level according to a standard international definition, even if that definition diverges from the one that the country uses in compiling its own national statistics. The distinction between programmes that would fall into ISCED 0 and programmes that would be outside of the scope of ISCED-97 rests primarily on the educational properties of the programme. As the educational properties are difficult to assess directly, several proxy measures should be used to determine whether or not a programme should be classified at this level' (UOE, 2013).

Sources and coverage

Data for monitoring country performances in ECEC participation are provided by the UOE database on education statistics ([72]), compiled on the basis of national administrative sources, reported by Ministries of Education or National Statistical offices according to international standards, definitions and classifications ([73]). Each spring, UOE data on ECEC is published for the reference period two years prior; e.g. the 2011 ECEC data was published in 2013 and the 2012 ECEC data will be published in 2014. The UOE data on ECEC cover all EU28 countries.

Descriptive statistics on the main indicator

The latest data available when writing this report, referring to 2012, show that some Member States have ECEC participation rates at or close to 100 % (FR, IT, MT, NL). Others show lower rates, under 80 % (HR, FI, EL, SK), but this is partly due to the availability of alternative types of provision such as family day care. The EU28 average coverage in 2012 was 93.9 %. For a more comprehensive descriptive analysis of country performance (for 2011 and previous years), see Section 3.2 of the Education and Training Monitor 2013 ([74]) and European Commission/EACEA/Eurydice/Eurostat (2014) ([75]).

Table 3.2. The main indicator: Early childhood education and care

Data source and release date	Eurostat UOE (*educ_ipart*)	
Coverage (time, countries)	Release: every year Latest data: 2012 For IE and EE, a change in definitions in 2010-11 makes data over time not comparable ([76]). For MT, break in series in 2011.	
Sample size problems	-	
Variation over countries for year 2012	**Min**	71.7 (HR)
	Max	100 (FR, MT)
	Mean	91.1 (unweighted), 93.9 (weighted)
	Stdv	8.5

([72]) Online data code: *educ_ipart.*
([73]) It is worth mentioning that according to OECD (2006), 'although member countries are committed "to making all reasonable efforts to report according to the definitions, classifications, and coverage specified in the current document, and to report deviations from these standards in their data collection protocols", data supplied for pre-primary education often lack comparability.' The reason for this can partially be traced back to the ISCED 1997 definition of early childhood education, and on the distinction drawn between education and care. The definition of ISCED Level 0 programmes reported above often leads countries to 'use different proxy measures to determine whether a programme should be classified as educational or not. Variation in these proxy measures undermines comparability'.
([74]) Available at: http://ec.europa.eu/education/monitor.
([75]) Available at: http://eacea.ec.europa.eu/education/eurydice/documents/key_data_series/166EN.pdf.
([76]) http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/educ_esms_an15.pdf

Subgroups ([77])

Gender: boys/girls

The presence of gaps in ECEC participation between female and male children might provide some interesting insights. The difference in participation rate by boys and girls can be explained by cultural factors, and have an impact in terms of future outcomes by gender.

Age: 4year-olds/5-6-year-olds

The age of the children also matters and influences the decisions of the parents and is a determinant of access depending on the institutional settings of each country or subnational organisation (see e.g. Seo, 2003; Pungello and Kurtz-Costes, 1999). Whether countries will reach the benchmark might depend on different attendance rates of, for example, children aged 4 years versus those who are 5-6 years.

3.2. Sub-indicators

The dimensions considered for the sub-indicators

A substantial body of research over the last decade from different fields of knowledge has underlined the effects of ECEC, and illustrates why this benchmark is closely aligned with the objectives of Europe 2020 as regards social cohesion and smart growth ([78]). As mentioned in the 2011 Communication on Early Childhood Education and Care (European Commission, 2011), ECEC 'is the essential foundation for successful lifelong learning, social integration, personal development and later employability. […] If solid foundations are laid in the early years, later learning is more effective and is more likely to continue life-long, lessening the risk of early school leaving, increasing the equity of educational outcomes and reducing the costs for society in terms of lost talent and of public spending on social, health and even justice systems. […] ECEC has a crucial role to play in laying the foundations for improved competences of future EU citizens, enabling us to meet the medium- and long-term challenge, and to create a more skilled workforce capable of contributing and adjusting to technological change as set out in the flagship "Agenda for new skills and jobs".'

Even though the literature on the determinants of pre-school participation is less established than that on its outcomes later in life, it contains some relevant insights which are fundamental to explain what causes parents and governments to ensure children attend pre-school and can be complemented by the findings of research on outcomes and on household decision-making.

Since it is not mandatory in most countries, the participation in pre-school education can be analysed under the framework of a series of policy instruments that governments use in order to influence the environment for the decisions taken by the parents. The decision of parents to enrol their children in preschools is dependent not only on the quality of childcare, but also on various factors such as the characteristics of the labour market, social policies and family planning, and decisions in all these areas are found to be often jointly taken (Blau and Currie, 2006; Jaumotte, 2003).

([77]) Note that the distinction between foreign-born and native-born is not available in the UOE data collection.
([78]) For a review of the scientific literature on the issue, see e.g. Eurydice (2009), Brilli et al. (2013).

Sub-indicator 1: Barcelona target

Definition: Number of children aged 0-2 cared for (under formal arrangements other than by the family) as a proportion of all children in the same age group.

The first sub-indicator is one of the Barcelona objectives concerning childcare. At the 2002 Barcelona summit, the European Council agreed that 'Member States should remove disincentives to female labour force participation and strive, taking into account the demand for childcare facilities and in line with national patterns of provision, to provide childcare by 2010 to at least 90 % of children between three years old and the mandatory school age and at least 33 % of children under three years of age' (European Council, 2002).

The Barcelona target was initially established with a view to achieving equal opportunities in employment between women and men. However, affordable and good-quality childcare services may not only improve the reconciliation of work and family life, thereby fostering labour market participation and gender equality, but also promote the socioeconomic integration of children, and the development of their skills.

The indicators for monitoring the Barcelona childcare targets were agreed in 2004 by the Employment Committee, and EU-SILC was chosen as the European statistical source for measuring them. The selected indicator is 'Children cared for by *formal arrangements* other than by the family up to 30 hours a usual week / 30 hours or more a usual week as a proportion of all children in the same age group'. Formal arrangements include pre-school or equivalent, compulsory education, centre-based services outside school hours, a collective crèche or another day-care centre, including family day-care, and professional certified child-minders. In other words, formal arrangements include all kinds of care organised and/or controlled by a structure (whether public or private). Care provided by child-minders without any structure between the carer and the parents (direct arrangements) has been excluded from the definition of 'formal care' in order to take count only childcare recognised as fulfilling certain quality criteria. It should also be pointed out that the coverage rates expressed by the indicator measure the actual use of existing childcare provision in the EU and not directly the provision by Member States for instance in terms of number of childcare places.

Two different age groups are covered by the Barcelona target: *(1)* children aged under three (0-2 years); and *(2)* children aged between three years and the mandatory school age. The first sub-indicator adopted for the ECEC benchmark is the one relating to the first age group (children aged 0-2). The distinction in terms of number of hours (1-29/30+) in the indicators adopted by the Employment Committee was originally drawn because care provided part-time, i.e. for less than 30 hours per week, does not necessarily allow parents to have a full-time job. While this distinction is relevant with a view to reconciliation between work and family life to promote female employment, it is not as meaningful for our purposes, so the sum of the two categories will be taken into account.

This sub-indicator provides important additional information on Member States' approach towards childcare and early childhood education. Formal childcare below age three is much less common that ECEC from the age of four (simply compare the means in Tables 3.2 and 3.3), and it shows a consistently higher variability between countries; also for this reason, childcare coverage for the age group 0-2 can provide some useful insight into the country attitudes towards ECEC, especially for those countries where this sub-indicator is particularly high or low.

Table 3.3. The sub-indicator 'Barcelona target'.

Data source and release date	Eurostat, based on EU-SILC micro data (online data code *ilc_caindformal*)	
Coverage (time, countries)	Release: Every year Latest data: 2011 Missing: HR before 2010 Break in series for FI (2010).	
Sample size problems	**-**	
Variation over countries for year 2012	**Min**	3 (CZ)
	Max	67 (DK)
	Mean	25.5 (unweighted), 28 (weighted)
	Stdv	16.4

Descriptive statistics on the sub-indicator

In 2012, the average childcare coverage at the EU 28 level for the age group 0-2 was 28 % (down from 30 % in the previous year), but the sub-indicator shows a great variability between countries, ranging between a minimum of 2 and a maximum of 67 %. The highest value in the reference year was found in DK, followed by SE (52 %), while the lowest figures were registered in CZ and SK (with share of 3 and 5 % respectively).

Sub-indicator 2: Investment

Definition: Total public expenditure on education at ISCED level 0 in EUR PPS, divided by the size of the cohort aged four to the country-specific starting age of primary schooling, compared to the GDP per capita in EUR PPS.

Government spending is an important factor for the supply of early childhood education and care. Public expenditure on pre-primary level is a sign of the level of commitment and effort of countries to implement ECEC programmes, and also to guarantee an acceptable quality of the service.

This sub-indicator is measured as a ratio between total public expenditure on education at pre-primary level of education (ISCED 0) ([79]) and the size of the cohort aged four to country-specific starting age of primary schooling ([80]), compared to the GDP per capita in EUR PPS ([81]). This is multiplied by 1 000 000 to avoid too small scales for the indicator. Note that spending on education is divided by the cohort size, and not by number of students. This is because this sub-indicator is specifically meant to capture how much a country spends on all potential students. Using the number of actual students as the denominator would implicitly favour countries where only a small proportion of potential students (i.e. of the cohort) attend school.

Table 3.4. The sub-indicator 'Investment'.

Data source and release date	Special extraction by Eurostat from UOE data. Eurostat *demo_pjan* and *prc_ppp_ind*	
Coverage (time, countries)	Release: Every year Latest data: 2011 for public expenditure Missing: for public expenditure, EL; as a consequence, the EU28 aggregate excludes data from EL, since the country does not provide data on education expenditure since 2006. Ireland (2007-08): the figures for ISCED 0 refer to only a very tiny proportion of overall ISCED 0 provision, so they could not be considered reflective of the sector.	
Sample size problems	**-**	
Variation over countries for year 2011	**Min**	0.04 (IE)
	Max	0.58 (DK)
	Mean	0.26 (unweighted, weighted)
	Stdv	0.11

Descriptive statistics on the sub-indicator

In 2011, the highest value of the indicator was found in DK (0.58), followed by MT (0.46), while the lowest levels were registered in IE (0.04) and FI (0.12). The EU28 average was 0.26.

([79]) A future revision of this sub-indicator, based on ISCED-2011 rather than ISCED-97, could further specify the measurement to cover 'ISCED 0.2', which refers directly to the correct age cohort, i.e. aged four to the mandatory schooling age.

([80]) Data code: Eurostat dataset Population on 1 January by age and sex, *demo_pjan*. See Section 3.1 for the country-specific starting age of primary schooling.

([81]) Data code: Eurostat dataset Purchasing power parities (PPPs), price level indices and real expenditures for ESA95 aggregates, *prc_ppp_ind*, selecting as *INDIC_NA* 'Real expenditure per capita (in PPS_EU28)'.

Sub-indicator 3: Inadequacy ([82])

Definition: Women aged 15-64 who would like to work but are not searching for a job/who work part-time due to their care responsibilities and lack of suitable care services, as a percentage of women with care responsibilities

Besides the availability of care arrangements as such, a fundamental issue in the decision of parents to send children to pre-primary educational institutions is whether existing arrangements are perceived as suitable and/or affordable by the potential users of the services. The sub-indicator *Inadequacy* refers to the availability of adequate ECEC provision, by which we mean suitable (referring to its quality) and affordable (referring to its cost for families).

The cost of the arrangement is an essential component in the willingness and ability of parents to enrol their children in pre-school. Being able to afford pre-school is particularly important for children raised in less favourable environments because resources are scarce and these children are likely to be the ones that benefit the most from pre-school participation (Bjorklund and Salvanes, 2010; Lazzari and Vandenbroeck, 2012; RAND Europe, 2013). The quality of the pre-school substantially influences whether parents send their children to a pre-school institution, since it influences both the perceived and real benefits that determine participation of children from all backgrounds (on the issue of quality, see OECD, 2012).
For the purposes of this sub-indicator, the inadequacy of ECEC provision manifests itself as inactivity on the labour market or as part-time work, due to care responsibilities and a lack of suitable services. More specifically, the selected sub-indicator provides evidence on the share of women — among those with care responsibilities — who either would like to work but are not searching for a job or work part-time because of their care responsibilities and because of the lack of suitable care services ([83]). The individuals considered as the nominator are those who stated they are either working part-time or not searching an employment because 'Suitable care services for children are not available or affordable'. At the denominator, women aged 15-64 with care responsibilities are included. This sub-indicator is consistent with the work of DG EMPL's Employment Committee Indicator Group (EMCO IG), which however approaches ECEC from the perspective of labour market participation, and therefore takes into account the lack (or unaffordability) of suitable services not only for children, but also for other dependants

Table 3.5. The sub-indicator 'Inadequacy'.

Data source and release date	Special extraction from Eurostat	
Coverage (time, countries)	Release: every year Latest data: 2013	
Sample size problems	Not published due to small sample size: DK (2010, 2012-13), MT (2010-12). Reliability issues due to small sample size concern data for BG (2011-13), DK (2011), LT (2012), MT (2013), SI (2010-12).	
Variation over countries for year 2013	**Min**	0.3 (FI, MT)
	Max	4.3 (IE)
	Mean	1.55 (unweighted), 1.7 (weighted)
	Stdv	0.99

Descriptive statistics on the sub-indicator

In the EU28 on average, the share of women aged 15-64 with care responsibilities who were inactive or working part-time due to lack of care services (and in particular because suitable care

([82]) For the domain of availability/affordability, fees for pre-schooling and household expenditure in pre-primary education (ISCED 0) were considered as alternative sub-indicators. However, no comprehensive data is available. Some data on the former was collected by Eurydice, but this data is more qualitative in nature and only a cross-section. Figures for the latter were deemed of very poor quality, and were available only for a limited number of countries.

([83]) It is worth noting that the indicator does not provide information on the dimension of the population or of the labour force which is affected by care responsibilities.

services for children are not available or affordable) was 1.7 % in 2013. The highest share is found in IE (4.3 %), followed by CY (3.6 %). The lowest figure (0.3 %) is registered in FI and MT, followed by BG and SE, with 0.5 %.

Sub-indicator 4: Informal care ([84])

Definition: Country average of the sum of alternative care, i.e. 'babysitters' and 'grandparents' (=RL050+RL060) for children aged three to country-specific starting age of primary schooling ([85]).

The use of informal care structures, such as by babysitters, au pairs or grandparents, can provide some additional insight into the overall situation of childcare in a country. As a matter of fact, a scarcity of formal early childhood education and care, or forms of care that are perceived as either too expensive or inadequate in terms of quality or location, can lead to a higher recourse to different forms of care. An indicator on alternative care is already used by the European Commission, namely by DG Justice in the report on childcare services and the Barcelona objectives (European Commission, 2013). In this report, the percentage of children from three years old to the mandatory school age in informal childcare is presented. Informal childcare is defined as care by independent childminders in the child's or the childminder's home, or care by grandparents, household members (who are not the parents), friends, neighbours or relatives. Here, the indicator is expressed as the average number of hours in alternative care.

This sub-indicator is measured using EU-SILC microdata. It is a combination of two specific variables, namely childcare by a professional child-minder at the child's home or at the child-minder's home ([86]) and childcare by grand-parents, other household members (outside the parents), other relatives, friends or neighbours ([87]). The latter variable refers to unpaid care (free or informal arrangements such as exchange of services), whereas the former includes direct arrangements between the carer and the parents, without a structure that organises or controls the care. In this instance parents are often employers and directly pay the carer, without control of the qualifications of the childminder by an organised structure. A 'professional' childminder is to be understood as a person for whom looking after the child represents a paid activity, without implying a notion of qualifications or of quality of the care. Baby sitters and *au pairs* are also included here.

It is worth bearing in mind that this sub-indicator could present some comparability issues with respect to the main indicator, which as explained above is drawn from UOE data and therefore based on administrative sources rather than EU-SILC survey microdata. In EU-SILC, alternative care is represented by types of care other than those considered 'formal arrangements' ([88]), which can differ from the arrangements included under ISCED 0 in the UOE dataset.

([84]) It was considered to incorporate only one of the two variables covered by this indicator (childcare by a professional child-minder and childcare by grand-parents, others household members, other relatives, friends or neighbours). However, combining the two variables results in better statistical properties and is more comprehensive.
([85]) See Section 3.1 for country-specific starting age of primary schooling.
([86]) EU-SILC variable 'RL050'.
([87]) EU-SILC variable 'RL060'.
([88]) According to European Commission (2008), formal arrangements include 'EU-SILC reply categories 1 to 4 (pre-school or equivalent, compulsory education, centre-based services outside school hours, a collective crèche or another day-care centre, including family day-care, professional certified childminders). Therefore, formal arrangements include all kinds of care organised and/or controlled by a structure (whether public or private). Care provided by childminders without any structure between the carer and the parents (direct arrangements) has been excluded from the definition of 'formal care' in order to take count only childcare recognised as fulfilling certain quality criteria.'

Table 3.6. The sub-indicator 'Informal care'.

Data source and release date	Eurostat based on EU-SILC [*ilc_camnothall*]	
Coverage (time, countries)	Release: every year Latest data: 2012 Missing: IE (2012), HR up to 2009 ([89])	
Sample size problems	-	
Variation over countries for year 2012	**Min**	0.20 (DK)
	Max	15.20 (RO)
	Mean	4.7 (unweighted), 4.4 (weighted)
	Stdv	3.09

Descriptive statistics on the sub-indicator

In 2012, the average number of hours in alternative care in the EU28 was 4.4. The lowest figure was found in DK (0.2) and SE (0.7), while the highest use of this type of care was registered in RO (15.2), followed by PL and EL (7.9 and 7.6 respectively).

([89]) https://circabc.europa.eu/sd/a/96f813f9-bd64-4c81-bb6e-78849c74355b/Countries %20in %20UDB %20X-sectional.xls.

Sub-indicator 5: Inequality ([90])

Definition: Difference in ECEC rate between the region with lowest ECEC and the national average (in p.p.)

This sub-indicator is used to highlight equity issues in early childhood education and care. Unequal access to or participation in ECEC might be captured by comparing ECEC participation between regions. In many countries, responsibility for ECEC is decentralised. While this allows local authorities to diversify the services they provide in order to better meet local needs and preferences, it is also true that this devolution of powers and responsibilities can widen differences of access and quality between regions. As a consequence, it is important that governments set up coordinated policy frameworks at centralised and decentralised levels, in order to guarantee quality and access standards across regions, within a coherent national approach to goal setting, legislation and regulation, financing, staffing criteria, and programme standards (OECD, 2001 and 2006).

The selected sub-indicator for inequality is based on the benchmark figure, i.e. the share of children aged four to the age when compulsory primary education starts who is participating in early childhood education, disaggregated by NUTS2 regions. It is defined as the percentage points difference in this share between the region with the lowest figure and the mean national ECEC level.

Table 3.7. The sub-indicator 'Inequality'.

Data source and release date	Special Eurostat extraction from UOE data	
Coverage (time, countries)	Release: every year Latest data: 2012 Indicator not computed for CY, EE, HR, LT, LU, LV and MT due to missing data at NUTS 2 level. NUTS 1 level used for DE and UK. Missing: BE, EL, NL (2009-10); IT, FI (some regions, 2009-10).	
Sample size problems	-	
Variation over countries for year 2012	**Min**	-51.3 (UK)
	Max	-0.6 (SE)
	Mean	-8 (unweighted, weighted)
	Stdv	10.5

Descriptive statistics on the sub-indicator

The lowest difference between the region with the lowest ECEC level and the national mean in 2012 is found in SE (-0.6 p.p.) and SI (-1.2 p.p.), while the highest gaps are registered in the UK, where Scotland had a 51.3 p.p. lower ECEC level than the national level. The EU 28 average indicator was -8 p.p.

([90]) For the Inequality sub-indicator, various different measures were considered using the EU-SILC. These measures compared the country average ECEC participation rate with the ECEC participation rate of those below the national poverty line, or of the richest 20 %. However, the equivalent ECEC measure in the EU-SILC was deemed incomparable and — more importantly — unstable over time.

3.3. Further considerations

As previously mentioned, research associates children's participation to early education with multiple advantages for their later educational life However, ECEC is also a relevant factor for parents' participation to the labour market. It was nevertheless decided to focus DG EAC's JAF approach to ECEC on the educational dimension, i.e. approaching ECEC from the perspective of the child profiting from these services ([91]). As a consequence, various sub-indicators were considered but eventually omitted. One example, consistent with the work of the Employment Committee, is the employment impact of parenthood, defined as the difference in percentage points between employment rates of individuals aged 20-49 without the presence of any children and with presence of a child aged 0-6 ([92]).

From the educational perspective, the quality of provision was a considered domain as well. For example, sub-indicators featuring information on required qualifications or education level for pre-school carers. Indeed, the importance of carers to improve education quality is widely acknowledged. However, it is difficult to quantify quality of provision, and the domain will have to be picked up in the qualitative component of the JAF. These qualitative checklists could also cover support to parents and targeted measures for children in need of specific support, further strengthening the equity dimension in the monitoring exercise.Other sub-indicators that were considered included the fertility rate and the cohort size (children aged four to country specific starting age of primary school). However, in comparison to the other sub-indicators this indicator seemed to add little to the discussion and the cohort size is already partially covered in the first indicator, i.e. spending per cohort.

([91]) DG EMPL's Employment Committee Indicator Group (EMCO IG) approaches ECEC from the perspective of parental labour market participation.

([92]) In this context, various other indicators on female labor participation rates and related costs for childcare were considered, such as: *(1)* the difference in share of part-time employment between males and females; *(2)* employment rate of females (25-44 years old); and *(3)* long-term unemployment rate differentials males-females.

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4. Low achievement in reading, mathematics and science

ET 2020 benchmark: 'The share of 15-years olds with insufficient abilities in reading, mathematics and science should be less than 15 %' (adopted May 2009).

4.1. Main indicator and sub-groups

Description of the main indicator

This ET 2020 benchmark, adopted in 2009 with a view to 'ensuring that all learners attain an adequate level of basic skills ([93])', targets the reading, mathematics and science skills of 15-year olds. The benchmark is monitored using the OECD's Programme for International Student Assessment (PISA), which has been released every three years since 2000. An 'adequate level' is defined as scoring at level 2 or higher on the PISA achievement scale ([94]). Anything below PISA level 2 is regarded as low achievement.

Achievement below these baselines in reading, mathematics and science means that students have difficulties to demonstrate their knowledge and to adopt this knowledge in a set of different situations. In mathematics, low achievement means that these 15-year olds are not able to extract relevant information from a single source, to employ basic algorithms, formulae procedures, conventions, or direct reasoning, or to make literal interpretations of the results. In science, low achievers do not demonstrate the scientific knowledge and skills that will enable them to participate actively in daily-life situations related to science and technology. Finally, in reading, these students are not capable of solving basic reading tasks, such as locating straightforward information, making low-level inferences, working out what a well-defined part of a text means and using some outside knowledge to understand it. The best performing country in all three subjects is Estonia, and the worst are Bulgaria (Mathematics and reading) and Romania (Science).

Sources and coverage

PISA data have been released every three years since 2000. Each PISA round adopts a focus on one of the three main domains (starting with reading in 2000). The latest release was in December 2013, which was the 2012 survey primarily focused on mathematics skills. In 2012, PISA covered around 70 countries all over the world, among which most European countries. In 2003, 19 Member States took the survey ([95]). In 2006, this increased to 26 ([96]) and 27 Member States participated in 2009 ([97]) and 2012 ([98]).

([93]) Official Journal of the European Union, (2009/C 119/02)

([94]) For each field, the PISA scores are ranged along a scale of 6 main levels which are defined starting from the row scores. The thresholds used to define level 2 are score < 407.47 for reading; score < 420.07 for mathematics and score < 409.54 for science.

([95]) BE, CZ, DK, DE, IE, EL, ES, FR, IT, LV, LU, HU, NL, AT, PL, PT, SK, FI and SE.

([96]) The 2003 participants plus BG, EE, HR, LT, RO, SI and UK.

([97]) MT participated in the survey in 2010 instead of 2009.

([98]) The EU 28 minus MT.

Table 4.1. Descriptive statistics on the main indicator.

Data source and release date	**OECD, PISA** PISA data are released every three years since 2000. The latest release is PISA 2012. Variables used: PV1-5MATH, PV1-5SCIE and PV1-5READ			
Coverage (time, countries)	Missing: 2003: BG, RO, EE, HR, LT, SI, UK, MT, CY 2006: MT CY 2009, 2012: CY 2012; MT			
Sample size problems	Data for foreign born are not reliable for PL and RO in both years ([99])			
Variation over countries for year 2012		**Mathematics**	**Reading**	**Science**
	Min	10.5 % (EE)	9.1 % (EE)	5.0 % (EE)
	Max	43.8 % (BG)	39.4 % (BG)	37.3 % (BG)
	Mean(weighted)	21.9 %	17.7 %	16.5 %
	Stdv	8.02	7.17	7.64

Subgroups

The benchmark for low achievers is analysed for the following subgroups:

Gender: male/female ([100])

Evidence on the gender gap for literacy illustrates that girls are outperforming boys in their reading skills by almost a year by the time they are 15 ([101]). As shown by PIRLS ([102]) 2011, this gap emerges at early stages. Among 47 of the 53 education systems measured by PIRLS (of which 23 EU education systems) there is a significant gender difference in favour of fourth-grade female students (US Department of Education, 2012). In contrast, gender differences for performance in mathematics are more varied. According to TIMSS ([103]) 2011, there is no statistically significant gender gap in mathematics performance among eighth-grade students in many countries, while according to PISA data there is slight male advantage in mathematics and even a small advantage of girls in science. In addition, the trends are going towards a narrowing of the gender gap in mathematics.

Migrant background: native-born/foreign-born ([104])

As for the native-born/foreign-born breakdown, it has been widely established in various assessments of education performance that students with a migrant background tend to perform worse than natives (Dunne and Souto Otero, 2013). This performance difference persists even when taking into account other factors such as socioeconomic background (see for example OECD, 2009). It should be noted that the size of the performance gap varies significantly across countries, and also that second generation migrant students largely perform better than first generation migrant students.

(99) In order to be considered reliable information should come from at least 30 students in 5 schools. In PL and RO the number of foreign born students is very limited and does not comply with this threshold.
(100) Variable considered is ST04Q01 in both years.
(101) EU High Level Group on Experts in Literacy (2012).
(102) The IEA's Progress in International Reading Literacy Study. See: http://www.iea.nl/pirls_2011.html.
(103) The IEA's Trends in International Mathematics and Science Study. See: http://www.iea.nl/timss_2011.html.
(104) Variables considered are ST17Q01 in 2009 and ST20Q01 in 2012.

Participation in early childhood education and care (ECEC)

There is a considerable body of literature which has established that investment in early education is fundamental for children's development of cognitive and non-cognitive abilities (Heckman and Cunha, 2007; Almond and Currie, 2011). Therefore, participation in ECEC has a huge potential impact, especially for children coming from a low socioeconomic background, since being involved in early childcare can reduce the impact of poor family background. The positive effects of ECEC have been found to be both short term (on school achievement) and long term (on college completion, years of education, wages). For a comprehensive review of the effect of ECEC on children outcomes see Brilli et al. (2013) ([105]).

[105] The positive effect of early learning activities before primary schooling on subsequent skills development has also been established by the aforementioned PIRLS and TIMSS.

4.2. Sub-indicators

The dimensions considered for the sub-indicators

Research on the performance of this age cohort shows considerable variations across education systems and countries, with consistent patterns of differences noted in achievement according to population subgroups. As such, it is important for policymakers and education providers to gain additional information about the determinants of performance in reading, mathematics and science in order to implement policies which will allow for the 'less than 15 %' benchmark to be reached ([106]).

Much of the existing evidence on the determinants of student achievement deals with factors operating at the class or school level (see Dunne and Souto Otero, 2013 for a comprehensive review). However, since the JAF is an assessment tool for the country level, many of these class and school level factors (e.g. teaching practices, student-teacher ratios, class size, etc.) are not taken into account, unless country aggregates are thought to be meaningful. This is because these particular factors yield strong variation between classes or between schools, but not necessarily between countries. Indeed, country aggregates of class and school level factors might not capture the strong variance that these factors show at the actual level of measurement. The sub-indicators chosen here either operate at the country level, or have proven to show a country level variation that is arguably more important that the within-country variance.

[106] Data from 2012 shows that the EU as a whole is on track when it comes to achievement in reading and science, but is lagging behind in mathematics. For a first analysis of progress on the ET 2020 benchmark, see: http://ec.europa.eu/education/policy/strategic-framework/doc/pisa2012_en.pdf.

Sub-indicator 1: Investment

Definition: Annual expenditure on public and private educational institutions at primary and secondary levels (ISCED 1 to 2) divided by the size of the cohort aged 6 to 18 compared to the GDP per capita in EUR PPS ([107]).

Government spending is an important factor for ensuring high learning outcomes. Lee and Barro (2001), in a study including several countries observed over time, show that the salary of teachers is positively associated to student test scores. With 77 % of the annual expenditure on public and private educational institutions per student devoted to personal expenditure ([108]), the former is a good proxy for the latter. But more importantly, as is the case for the equivalent sub-indicators of the other ET 2020 benchmarks, the annual expenditure can be seen as the value that a country puts upon its education and training system, or the willingness to invest in its performance ([109]).

Sources and coverage

The data on expenditure are available from Eurostat ([110]). The main source of this data is the joint Unesco/OECD/Eurostat (UOE) questionnaires on education statistics. The other variables used to build this sub-indicator are the census population ([111]) for the considered age groups and real expenditure per capita ([112]). When constructed, this sub-indicator shows an important variance across Member States. According to the data, the country that invests the most is Cyprus, and the one that invests the least is Romania. The correlations between the sub-indicator and the benchmarks are negative, meaning that the more a country invest, the lower is the proportion of low achievers.

Table 4.2. Descriptive statistics on the sub-indicator.

Data source and release date	Eurostat, educ_fiabs, demo_pjan, prc_ppp_ind	
Coverage (time, countries)	Missing: EL Latest data available: 2010	
Sample size problems	-	
Variation over countries for year 2010	**Min**	0.078 (RO)
	Max	0.234 (CY)
	Mean	0.157
	Stdv	0.038

([107]) We divide by cohort size instead of number of students, since we want to know how much a country spends on all potential students.
([108]) At the EU level: 2009 value. See chapter 2 of the Education and Training Monitor 2013 (http://ec.europa.eu/education/monitor).
([109]) See also JRC (2013) for a discussion on public financing of education in EU countries.
([110]) Online data code: educ_fiabs.
([111]) Online data code: demo_pjan.
([112]) Online data code: prc_ppp_ind, selecting as INDIC_NA 'real expenditure per capita EU28'.

Sub-indicator 2: Learning time

Definition: Learning time in reading, mathematics and science per week. More precisely, learning time in test language (LMINS) is computed by multiplying the number of minutes on average in the test language class by number of test language class periods per week. Comparable indices are computed for mathematics (MMINS) and science (SMINS).

Understanding the relationship between learning time and achievement is not a simple task, since the effectiveness of the instruction time may depend on a variety of factors that influence the actual learning (Dunne and Souto Otero, 2013). Nevertheless, several studies have tried to disentangle the effect of instruction time on students' test scores. Using TIMMS data for 39 countries, Wossmann (2003) demonstrates a positive — though small — effect of instruction time. With a sample of students from more than 50 countries that participate in PISA, Lavy (2010) finds that instruction time has a positive — again small — effect on test scores. Perhaps more importantly, the OECD finds that a higher number of hours in science can enable disadvantaged students to reduce the gap with their more advantaged peers.

Since learning time is indeed a rather crude measure of what happens inside the classroom, it is to be complemented with measures of curriculum and teaching approaches to be taken up in the qualitative checklist (see also Section 4.3).

Source and coverage:

This sub-indicator is computed from PISA micro data, aggregating student observations at the country level ([113]).

Table 4.3. Descriptive statistics on the sub-indicator

Data source and release date	OECD, PISA, variables LMINS, MMINS and SMINS			
Coverage (time, countries)	Release: every three years Latest data: 2012 Missing: 2003: BG, RO, EE, HR, LT, SI, UK, MT, CY 2006: MT CY 2009: CY 2012: MT			
Sample size problems	In 2012 the variables used are missing for the 40 % of the students, but reliability thresholds are met.			
Variation over countries for year 2012		**Mathematics**	**Reading**	**Science**
	Min	133 (BG)	140 (BG)	135 (IT)
	Max	287 (PT)	314 (DK)	320 (LT)
	Mean(weighted)	205	212	205
	Stdv	33	39	44

([113]) Refer to the main indicator for details on data coverage.

Sub-indicator 3: Accountability ([114])

Definition: Percentage of students in schools that post achievement data publicly.

School accountability is the process of evaluating school performance on the basis of student performance measures. Various reports show that school accountability is positively related to learning outcomes ([115]), and therefore an important factor to monitor. A large part of the evidence on the effect of school accountability on school and student performances come from studies focusing on US data ([116]). A paper by Hanushek and Raymond (2005) shows that accountability systems introduced during the 1990s had a clear positive impact on student achievement. Dee and Jacob (2009) come to the same conclusion, showing that accountability measures appear to translate into improved student outcomes. Including also European countries, Woessmann et al. (2009) offer evidence from PISA 2003 and conclude that students perform significantly better in countries with greater levels of accountability.

Sources and coverage

This sub-indicator resembles one of the OECD indices ([117]), and it is built with the PISA data ([118]). Accountability is measure as the percentage of students that post achievement data publicly, and thus can vary between 0 and 100. In the EU countries in 2012, it varies between 1.6 in FI and 90.5 in the NL.

Table 4.4. Descriptive statistics on the sub-indicator.

Data source and release date	OECD, PISA. Variables used: SC22Q01 in 2009 and SC19Q01in 2012	
Coverage (time, countries)	Release: every three years Latest data: 2012 Missing: 2003: BG, RO, EE, HR, LT, SI, UK, MT, CY 2006: MT CY 2009: CY 2012: MT This sub-indicator is missing for FR in 2009.	
Sample size problems	-	
Variation over countries for year 2012	**Min**	1.6 (FI)
	Max	90.5 (NL)
	Mean(weighted)	43.5
	Stdv	25.2

([114]) For the sub-indicator Accountability, an alternative measure was considered: whether a country uses external examination such as standardised national test. While this information is available in the PISA data, it is a variable that takes only two values: either the country makes use of national assessment tests or it does not. Therefore, this variable does not guarantee variability between countries at a given point in time, nor within countries over time — and as such, it is not adequate for the quantitative JAF methodology.

([115]) See, for example, PISA in Focus No 9 (http://www.oecd.org/pisa/pisaproducts/pisainfocus/48910490.pdf) and Volume IV of the PISA 2012 Results (http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-iv.htm).

([116]) For comprehensive reviews on school accountability see Figlio and Loeb (2011); and EENEE (2012).

([117]) The original OCDE indices can be found in Table IV.3.13 for 2009 (http://dx.doi.org/10.1787/888932382216) and Table IV.4.13 for 2012 (http://dx.doi.org/10.1787/888932957346).

([118]) Refer to the main indicator for details on data coverage.

Sub-indicator 4: Autonomy

Definition: Country average of degree of school responsibility for curriculum and assessment: teachers' and principals' responsibility for establishing student assessment policies, choice of textbooks and determining course content and deciding which courses are offered.

School autonomy, and in particular curriculum autonomy, is often discussed as an important factor to increase student performance ([119]) and in Europe there is substantial evidence showing a positive impact of school autonomy on learning outcomes (Eurydice, 2008; EENEE 2012). A recent study by Hanushek et all. (2013), using a panel dataset from the four waves of international PISA tests spanning 2000–09, demonstrates that in countries with well-developed systems increased school autonomy leads to higher achievement. However, accountability seems a pre-requisite for successful autonomy reforms. It is therefore meaningful to interpret the results for both sub-indicators together.

Source and coverage

This sub-indicator is one of the OECD indices ([120]) and it is built with the PISA data ([121]). More precisely, the index of responsibility of school staff in issues relating to curriculum and assessment was computed from four items taken from the school principal's report. These items enquired whose responsibility it is to *(1)* establish student assessment policies, *(2)* choose which textbooks are used, *(3)* determine course content, and *(4)* decide which courses are offered. The index was calculated by looking at how often the response was 'principal or teachers' as opposed to 'regional/local education authority or national educational authority' ([122]). The index is a built-in variable in the school dataset, which we average at the country level. A higher index means more autonomy.

Table 4.5. Descriptive statistics on the sub-indicator.

Data source and release date	OECD, PISA. Variables used RESPCURR in 2009 RESPCUR in 2012	
Coverage (time, countries)	Release: every three years Latest data: 2012 Missing: 2003: BG, RO, EE, HR, LT, SI, UK, MT, CY 2006: MT CY 2009: CY 2012: MT This sub-indicator is missing for FR in 2009.	
Sample size problems	-	
Variation over countries for year X	**Min**	-1.145 (EL)
	Max	0.965 (NL)
	Mean(weighted)	0.097
	Stdv	0.560

([119]) See, for example, PISA in Focus No 9 (http://www.oecd.org/pisa/pisaproducts/pisainfocus/48910490.pdf) and Volume IV of the PISA 2012 Results (http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-iv.htm).

([120]) The OECD standardised values can be found in Table IV.3.6 for 2009 (http://dx.doi.org/10.1787/888932382216) and Data_Figure IV.4.3 for 2012 (http://dx.doi.org/10.1787/888932957346).

([121]) Refer to the main indicator for details on data coverage.

([122]) OECD 2012, PISA 2009 TECHNICAL REPORT, p. 284.

Sub-indicator 5: Inequality ([123])

Definition: the relationship between student performance and socioeconomic background, in particular using the 'Slope of gradient' index, which is the score point difference in reading associated with one unit increase in the PISA index of economic, social and cultural status (How much a student's performance changes if he/she has a one unit higher socioeconomic status).

This indicator is used to understand whether there are equity issues in the students' performance in the different countries. In particular, the sub-indicator relates students' socioeconomic background to the reading performance (in 2009) and to mathematic performance (in 2012). Thereby, one can detect for example whether in some countries performance is strongly determined by socioeconomic background. In less equal countries we expect socioeconomic background to be among the main determinants on performances and the index will be higher; while in more equal countries the index is lower, meaning that socioeconomic background is not that important in determining students' achievement.

Box 1. The **PISA 2009** index of economic, social and cultural status (ESCS).

'This index captures a range of aspects of a student's family and home background that combines information on parents' education and occupations and home possessions. The index was derived from the following variables: the international socio-economic index of occupational status of the father or mother, whichever is higher; the level of education of the father or mother, whichever is higher, converted into years of schooling; and the *index of home possessions*, obtained by asking students whether they had a desk at which they studied at home, a room of their own, a quiet place to study, educational software, a link to the Internet, their own calculator, classic literature, books of poetry, works of art (e.g. paintings), books to help them with their school work, a dictionary, a dishwasher, a DVD player or VCR, three other country-specific items and the number of cellular phones, televisions, computers, cars and books at home. The rationale for choosing these variables is that socio-economic background is usually seen as being determined by occupational status, education and wealth. As no direct measure of parental income or wealth was available from PISA (except for those countries that undertook the PISA Parent Questionnaire), access to relevant household items was used as a proxy.'

OECD (2010), *PISA 2009 Results: Overcoming Social Background – Equity in Learning Opportunities and Outcomes (Volume II),* p. 29

Sources and coverage

This sub-indicator resembles one of the OECD indices [(124)] and it is built with the PISA data ([125]). The sub-indicator varies between around 25 and around 60. Country with lowest values is EE and country with highest value is FR.

([123]) For sub-indicator 5 we considered three alternatives: (1) Indicators of equity, such as the total variation of performance between schools or the variation of student performance divided in between and within-school variation are less meaningful when aggregated on the country level. Hence, these indicators were not pursued further. (2) Ordinal measures of school autonomy in categories human resources, financial resources, teaching and learning cannot be easily quantified and hence are not included here. (3) Strength of gradient: percentage of variance in student performance in reading explained by student socioeconomic background (To what extent does socioeconomic status explain/predict student performance?).

([124]) http://dx.doi.org/10.1787/888932381418, file T.II.3.2 for 2009; http://dx.doi.org/10.1787/888932964908, file II.2.1 for 2012. We didn't use directly these indices because we re-calculated the 2009 slope using the 2012 re-scaled values of the socioeconomic status and we calculated the index also for the non focus-years subjects.

([125]) Refer to the main indicator for details on data coverage.

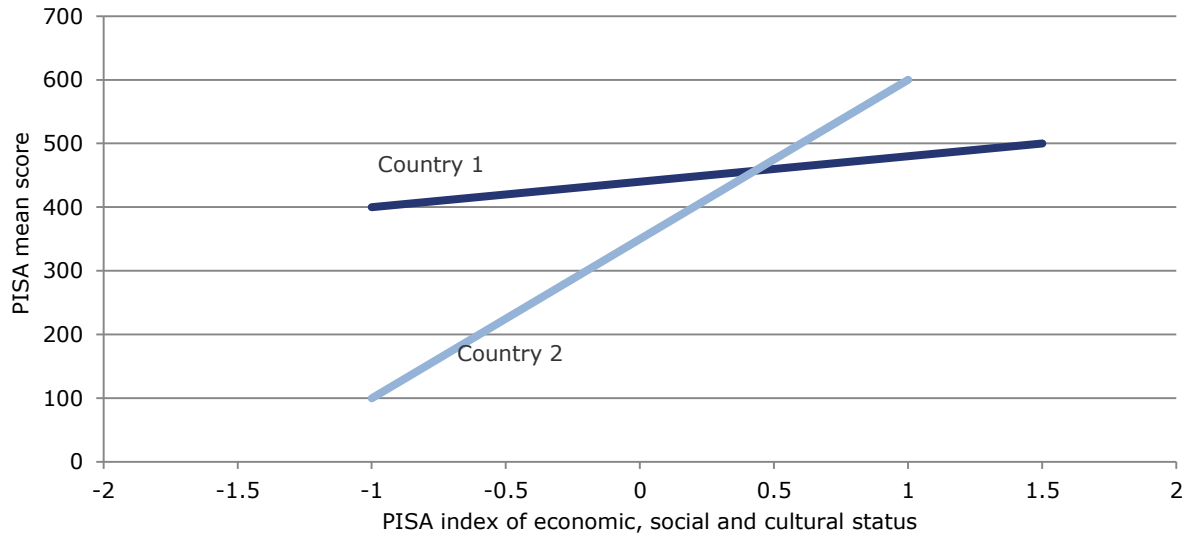
Table 4.6. Descriptive statistics on the sub-indicator.

Data source and release date	OECD, PISA. Variables used: PV1-5MATH, PV1-5SCIE and PV1-5READ and ESCS. For the 2009 we use the 2012 rescaled ESCS (see Box 1).			
Coverage (time, countries)	Release: every three years Latest data: 2012 Missing: 2003: BG, RO, EE, HR, LT, SI, UK, MT, CY 2006: MT CY 2009: CY 2012: MT			
Sample size problems				
Variation over countries for year 2012		**Mathematics**	**Reading**	**Science**
	Min	29.25 (EE)	25.76 (EE)	26.68 (EE)
	Max	57.23 (FR)	58.25 (FR)	57.53 (FR)
	Mean(weighted)	39.99	39.01	39.45
	Stdv	7.00	7.73	8.11

Box 2. The PISA slope of the gradient.

The slope of the gradient line measures the steepness of the average relationship between reading\mathematics\science performance and socio-economic background. The slope shows how much students' performance changes, on average, with a change of one unit on the index of socio-economic status, and it is calculated with a single-level bivariate regression of performance on the ESCS: the slope is the regression coefficient for ESCS. In the figure, the slope of the gradient of two hypothetical countries is shown. The sharper the inclination, or the closer it is to a vertical line, the greater the impact of economic, social and cultural status on student performance, suggesting greater inequity (EX: country 2); while gentler gradients indicate a lower impact of socio-economic background on student performance, i.e. more equity (EX: country 1)

Figure 1. Slope of the gradient.



4.3 Further considerations

Additional sub-indicators were considered in the process of selecting the quantitative sub-indicators mentioned here. Firstly, low achievement at other age levels using TIMMS and PIRLS was discussed but dropped in favour of more value-added sub-indicators ([126]). Secondly, the *allocation* of the annual expenditure on public and private educational institutions could be investigated further. Whereas the sub-indicator *Investment* can be seen as the value that countries put upon their education and training systems, it is likely a component of this investment, e.g. teacher salary, that yields the strongest association with learning outcomes. Robust, comparable measurements of this narrower definition were not found, but a future revision of the quantitative sub-indicators should reinvestigate the issue.

Finally, a note on teaching practice. It has to be acknowledged that the teaching profession is insufficiently captured by the quantitative sub-indicators selected. New data from the OECD's Teaching and Learning International Survey (TALIS) 2013 might remedy this in a future revision of the selection. More importantly, the qualitative checklists that are to accompany this quantitative methodology are likely to incorporate factors that deal with aspects of assessment and teacher development. In the process of selecting the quantitative sub-indicators mentioned here, it was agreed that these factors are not easily quantified into rates or indices, and that they would be more appropriate as nominal or ordinal indicators in a more qualitative checklist.

4.4 Note on the reliability of PISA data and general guidelines followed in the analysis

- **Reliability thresholds**

The data source of the ET2020 benchmarks on low achievers and of four out of five sub-indicators is PISA. In the PISA Technical report it is explained that all the released data accomplished reliabilities threshold and sampling standards in terms of schools' and students' response rates. All the information considered under this chapter take into account the PISA standard in terms of reliability thresholds, which says that information should be based on at least 30 students in five schools.

- **Plausible values**

Competences in PISA are measured through five plausible values for each subject. All the calculations implying test scores are carried out using all the five plausible values (e.g. definition of the benchmark, calculation of the slope of the gradient.)

- **Weighting**

Pisa data has a peculiar sampling structure and when calculating country averages from individual level data, student weights or school weights must be taken into account. In building the benchmark, sub-groups and sub-indicator we start from student level data or school level data and calculate countries average values taking into account weights. In particular, for information coming from student level data we weight using student weights (variable W_FSTUWT) and for information coming from school level data we weight using school weights (variable W_FSCHWT).

[126] Achievement in reading, maths and science in the fourth grade does, however, provide a meaningful comparison. See PIRLS 2011: International Results in Reading (http://timssandpirls.bc.edu/pirls2011/international-results-pirls.html), TIMSS 2011: International Results in Mathematics (http://timssandpirls.bc.edu/timss2011/international-results-mathematics.html) and TIMSS 2011: International Results in Science. (http://timssandpirls.bc.edu/timss2011/international-results-science.html).

- **Missing values**

When working with microdata, it can happen that some individuals do not answer or do not provide valid answers to all of the questions in the survey. Therefore, in PISA sample there will be some units (students or schools) that have some missing values for some variables. The general approach we follow when dealing with missing data is that the observation (either student or school) is not used in the country average calculation of sub-indicator A if it has a missing value for the variable used to calculate that particular sub-indicator, but it is used for all the others sub-indicators for which it doesn't not have a missing value.

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5. Employment rate of recent graduates

ET 2020 benchmark: The share of employed graduates (20-34 year olds) having left education and training no more than three years before the reference year should be at least 82 %.

5.1. Main indicator and standard JAF sub-groups

Description of the main indicator

The severe economic crisis that has affected European countries in the last years has prioritised the focus on the transition from education to work. Certain problems like unemployment spells or a slow, difficult transition from education to work are affecting today's youth in Europe. These problems may in the long-term cause negative effects in terms of labour market success, earnings and family formation. This will eventually result in lower returns to public and private investment in education and training, and an adverse effect for society. Especially in the current economic context, it is fundamental to ensure that young people have the best support possible in getting their first job. This is emphasised even more considering the process of demographic ageing, which requires that Europe's increasingly scarce youth generation integrates quickly and effectively into the labour market.

Education and training's support for employability can be seen in three distinct phases ([127]):

1. 'Preparation for employment' within the continuum of formal education and training. Irrespective of the educational pathway chosen and the level of qualification attained, all young people should leave their initial education equipped with key competences and the necessary motivation and understanding of the labour market to allow them to progress in their future careers, all the while bearing in mind that preparation for employment is not the only purpose of formal education.

2. 'Transition from education to employment': this refers to the end of the 'preparation for employment' phase. During this phase, the contribution of education and training systems could, for instance, occur through career guidance and counselling; and through the development of qualification frameworks which are transparent, comparable and understandable to potential employers.

3. 'Stay in employment and progress in career': this phase refers to the capacity of education and training systems to update and upgrade continuously the knowledge and skills of workers. It implies an openness and accessibility of education and training systems to all adult learners.

The employability benchmark is primarily aimed at covering the second phase, but also opens up the discussion on the relevance of skills and qualifications — the first phase — and on the need for continued, adult learning — the third phase. The benchmark was adopted in 2012 with a view to highlighting what education and training policies can do to boost employment success and to increasing the employability of graduates who are not currently enrolled in any further education and training activity ([128]). The objective of the benchmark is to monitor the success rate in the labour market of young people with different levels of educational attainment in the first years after graduation, in particular in order to understand the role of education and training in raising people's employability.

Employability is a complex, multi-faceted concept, which can be defined from a number of different perspectives, alternatively focusing on individual characteristics only, or taking into account also external factors, as those that De Grip et al. (2004) call 'effectuation conditions', i.e. the conditions under which workers can effectuate their employability. The concept of employability considered as a reference by the European Commission is the one provided by Cedefop (2008), which defines employability as 'the combination of factors which enable individuals to progress towards or enter employment, to stay in employment and to progress during their career'. Employability is a

([127]) Taken from SEC(2011) 670 final.
([128]) OJ 2012/C 169/04.

complex concept, involving not only each individual's characteristics, skills, attitudes and motivation, but also other external factors which lie beyond the scope of education and training policy, such as labour market regulations, demography, the structure of the economy and the overall economic situation ([129]).

The employment rate of recent graduates is defined as the share of the employed population aged between 20 and 34 years old who graduated 1 to 3 years before the reference year and who are not currently enrolled in any further education or training activity. The term 'graduate' refers to any person aged 20-34 who has left education and training with at least upper-secondary or post-secondary, non-tertiary qualifications (ISCED 3 to ISCED 4, excluding ISCED 3C short), or with tertiary qualifications (ISCED 5 and 6). Individuals currently engaged in any form of education or training are excluded to ensure that the employability of that cohort may not be altered by the fact that the individual is currently engaged in an updating/upgrading of his/her skills.

The choice to include only those graduating one to three years before the reference year is based on two different observations. From one side, the minimum of one year is devised to avoid the possible impact of short unemployment periods that are common in the early months of job search after graduation. On the other hand, the choice of three years as a maximum is due to the fact that this period is reckoned to be the time frame in which educational attainment contributes the most to the probability of finding a job. Finally, it should be noted that the indicator represents an average over the three year-end points following graduation. This choice is partly due to the lack of longitudinal data to measure precisely the flow of graduates into employment, but this approach also helps to smooth out the possible impact of short unemployment periods which are common in the early years of employment (see also Garrouste and Rodrigues, 2012).

Sources, coverage and descriptive statistics

Data for monitoring country performances in graduate employability are provided by Eurostat based on LFS microdata, and they cover all EU28 countries ([130]). The latest data available refer to 2013.

Table 5.1. Descriptive statistics on the main indicator: Employment rate of recent graduates

Data source and release date	Eurostat (*edat_lfse_24*)	
Coverage (time, countries)	Release: every year Latest data: 2013	
Sample size problems	**-**	
Variation over countries for year 2013	**Min**	39.8 (EL)
	Max	91.8 (MT)
	Mean	73.7 (unweighted), 75.4 (weighted)
	Stdv	12.49

The latest data available show that in 2013, the EU average employment rate of recent graduates was 75.4 %, 0.5 percentage points down from the previous year and 6.6 p.p. lower than in 2008, as a consequence of the economic crisis which hit very hard young people in particular. The highest employment rates are found in MT (91.8 %) and AT (90.2 %), while the lowest value is registered in EL (39.8 %), followed by IT (48.3 %). For a more comprehensive descriptive analysis of country performance for 2012, see Section 5.2 of the Education and Training Monitor 2013 ([131]).

([129]) OJ 2012/C 169/04.
([130]) Online data code *edat_lfse_24*. The online data codes mentioned in this chapter refer to the Eurostat online data base. The respective data can easily be found by using the online data code as a search term when using the search function on the Eurostat webpage (http://ec.europa.eu/eurostat).
([131]) Available at: http://ec.europa.eu/education/monitor.

Standard JAF sub-groups

Employment rates of recent graduates are monitored for male/female and native-born/foreign-born sub-populations ([132]). Firstly, employment rates are generally higher for males than for females, although the difference between the two has been narrowing over the last decade in Europe. In 2013, the average EU28 employment rate of graduates was 4.2 percentage points higher among men than among women (77.5 vs. 73.3 %), but down from 5.6 p.p. in 2007. At the country level, consistent differences can however emerge, with countries having larger gaps (e.g. 14.4 p.p. in the Czech Republic in 2013), some with similar levels (e.g. Belgium, with a gap of only -0.1 p.p.), and even cases of employment advantage in favour of female graduates (e.g. 2.7 p.p. in Lithuania).

Secondly, native-born recent graduates generally tend to have a higher employment rate than their foreign-born counterparts. Immigrants are more likely to lose their jobs than the native-born, and generally experience lower levels of job security. Migrants are also shown to be one of the subgroups worst affected by the economic recession in terms of retaining employment or finding employment. As such, being a migrant likely has a negative impact on graduate employability; this is consistent with the significantly lower level of the indicator for the foreign-born than for the native-born at the EU level (69.8 % vs. 75.5 % in 2013), although again with relevant country differences.

5.2. Sub-indicators

The dimensions considered for the sub-indicators

Decreasing unemployment rates of graduates is one of the most relevant challenges to most European governments. The factors most commonly cited as having an impact on graduate employability are skills mismatch, the increasing abundance of graduates, and the greater prominence of temporary contracts particularly since the start of the financial crisis of 2008. Youth unemployment as a whole is identified as a growing and key policy priority. This has placed an emphasis on implementing policies that will improve the education-to-work transition and encourage education systems to better equip graduates with skills deemed relevant in the labour market and by future employers. On the other hand, the literature also points to the increasing instability of job contracts as impacting negatively on graduate employment rates, with not only unemployment being an issue but also graduate underemployment ([133]). It is also indicated that the specific subject of their studies might affect the employability of graduates.

The determinants of graduate employability generally identified in the literature can be divided into two categories: the first category relates to the characteristics and skills of the graduates themselves and how this impacts on their ability to gain employment; the other relates to characteristics of the labour market, i.e. inherent structures of the market and demand for graduates at a given point in time. Both aspects were taken into account in selecting the sub-indicators for the employability benchmark.

([132]) For the annual Education and Training Monitor, additional sub-groups are considered. These are employment rates by regions (NUTS2), employment rates by level of education (ISCED 3-4 versus ISCED 5-6) and employment rates by field of study. It is worth mentioning that starting from 2014 (first publication in 2015), the EU-LFS is collecting data on education attainment by orientation (vocational versus general), which will allow adding a further sub-group to the main indicator.

([133]) 'Underemployment' can be understood as economically inadequate employment, including low-wage or low-hour employment (Prause and Dooley, 2011).

Sub-indicator 1: GDP growth ([134])

Definition: GDP growth in percentage terms.

As mentioned above, the employability of recent graduates has been severely affected by the economic crisis, with the employment rate decreasing by more than six percentage points between 2008 and 2012. It is widely acknowledged that youth employability in general very much depends on the economic cycle, also because young workers are more likely to have temporary jobs than older workers, at least in some European countries. Furthermore, when the economic conditions worsen, the transition time from education to employment tends to increase, as well as the incidence of temporary contracts and underemployment. For this reason, the first sub-indicator is aimed at capturing the overall economic performance of the country. The selected indicator for this purpose was the GDP growth rate, defined as the percentage change on previous period of the gross domestic product at market prices ([135]).

Sources, coverage and descriptive statistics

Data for the first sub-indicator is drawn from Eurostat. Yearly figures are currently available up to 2013 for all countries.

Table 5.2. Descriptive statistics on the sub-indicator 'GDP growth'

Data source and release date	Eurostat (online data code *nama_gdp_k*)	
Coverage (time, countries)	Release: Every year Latest data: 2013	
Sample size problems	**-**	
Variation over countries for year 2013	**Min**	-5.4 (CY)
	Max	4.1 (LV)
	Mean	0.2 (unweighted), 0.1 (weighted)
	Stdv	2.09

According to the latest data available, referring to 2013, the lowest level of GDP growth is registered in CY (-5.4 %), followed by EL (-3.9 %). The highest GDP growth rate was found in LV (4.1 %), followed by RO (3.5 %) and LT (3.3 %). The EU average GDP was almost stable in 2013, with a growth rate of 0.1 %, higher than the -0.4 % registered in 2012, but lower than the rates found in 2010-11 (2.0 and 1.6 % respectively).

([134]) For this sub-indicator, the unemployment rate was considered as an alternative solution. It was however discarded as it was considered to be conceptually too close to the benchmark.

([135]) Given the nature of the sub-indicator, which is already expressed as a percentage change on the previous period, the change shown in the JAF charts is not expressed in percentage terms but in percentage points difference between year *t* and year *t-3*.

Sub-indicator 2: Newly employed ([136])

Definition: Percentage of individuals (older than 15 years) that were employed in the last three months divided by total number of persons employed.

The second sub-indicator was selected with the purpose to provide information about the extent of turn-over in the national labour market.
Labour turnover is important especially when evaluating the dynamics of youth employment rates (and thus employability) because it can hint at challenges such as skill mismatches and overeducation, which might particularly affect young graduates. In a flexible labour market with high turnover rates, these challenges are more likely to be temporary when compared to a more rigid labour market. Overall, the efficiency of the matching process depends on the design and characteristics of other labour market policies and institutions (e.g. firing and hiring costs, employment contractual arrangements, and so on), but high turnover rates might help mitigating some of the problems.
The sub-indicator is defined as the share of employed people who started their job in the last three months in total employment, for the age group 15 and above.

Sources, coverage and descriptive statistics

Data for the sub-indicator on newly employed is drawn from Eurostat. Yearly figures are currently available up to 2013 for all EU28 countries (the only exception being NL for which 2012 is not available).

Table 5.3. Descriptive statistics on the sub-indicator 'Newly employed'.

Data source and release date	Eurostat *lfsa_egdn2, lfsa_egan*	
Coverage (time, countries)	Release: Every year Latest data: 2013 Missing: NL (2012) Breaks in time series: BG, CZ, PT, SK (2011); AT, FR (2013).	
Sample size problems	-	
Variation over countries for year 2013	**Min**	0.0164 (RO)
	Max	0.0800 (SE)
	Mean	0.0412 (unweighted), 0.0389 (weighted)
	Stdv	0.0147

In 2013, the share of employed people who started their job in the last three months in total employment (for the age group 15+) was around 4 % in the EU28 on average. The lowest share was registered in RO (1.6 %), followed by EL (2.1 %) and SK (2.3 %), while the highest share was found in SE (8 %), followed by FI (6.9 %) and DK (6.7 %).

([136]) A number of different alternatives were taken into account for this domain. An analogous indicator is used by the EMCO, but considers people who started their job in the last 12 months. However, the corresponding series are not yet available on Eurostat, so the choice was to take into account individuals starting their current job in the last 3 months. Different age groups were considered, e.g. 20-34 and 20-64; the former was discarded as the objective is to take into account the overall labour market; the latter was dropped in favour of 15+ in order to be consistent with the EMCO indicator. Different domains were taken into account for this sub-indicator as well; one was the job vacancy rate for industry, construction and services, which was discarded because of unsatisfactory correlation with the employability benchmark. Another alternative sub-indicator was the percentage of manufacturing firms listing labour shortage as a factor limiting production; however, this variable would measure shortage of low-skills and given that the benchmark relates to graduate employability also in higher levels of education, this indicator was deemed inferior to the other alternatives.

Sub-indicator 3: Mismatch ([137])

Definition: Percentage of individuals aged 25-34 with tertiary education, i.e. ISCED 5-6, that work in ISCO 4-9, i.e. not as legislators, senior officials, managers and professionals (ISCO 1-2) and not as technicians and associated professionals (ISCO 3).

The third sub-indicator is aimed at capturing the mismatch between occupations and educational level of young people, and in particular vertical mismatch. Cedefop (2010) defines vertical mismatch as the condition in which there is a discrepancy between the acquired and required level of education or skills. The sub-indicator focuses on tertiary education graduates, and analyses the incidence of over-qualification, i.e. the situation in which an individual has a higher qualification than the job requires (Cedefop, 2010). As pointed out by Eurydice (2012), over-qualification can also be only formal, meaning that while formal qualifications appear to be too high, the individual's actual competences do match the job requirements. Nevertheless, an analysis of the incidence of over-qualification can be a useful starting point when trying to evaluate the employability of tertiary graduates.

The third sub-indicator is based on one of the indicators of the Bologna Process (see Eurydice, 2012). It captures the over-qualification rate: the share of young individuals (aged 25-34) with tertiary education (i.e. with ISCED 5-6) employed in occupations that fall under ISCO categories 4-9, that is not working as legislators, senior officials, managers and professionals (ISCO 1-2) or as technicians and associated professionals (ISCO 3).

This indicator can have a few drawbacks and limitations. First of all, it only covers educational mismatch, ignoring the individual skills (and as a consequence, the potential skill mismatch), which as mentioned could be different. Also, it represents only one possible approach to capture educational mismatch; as a matter of fact, it is one of the possible objective methods that can be used (namely, a case of normative/job analysis approach, as opposed to the statistical approach/realised match), a further alternative being subjective methods based on a self-assessment (see CRELL, 2014, for a review of the methods). One of the limitations of this approach is that it somewhat rigidly assigns a fixed educational level to each given occupational category, despite the constant changes that take place in the world of work. It is also based on rather broad occupational categories (ISCO 1 digit), while in many cases a more detailed occupational disaggregation would be more informative.

Nevertheless, this sub-indicator represents a useful starting point for the analysis; the literature on mismatch makes use of a number of possible indicators, and no agreement has been reached on which one is preferable as each one has pros and cons. Furthermore, for the purpose of the monitoring exercise, the selected measure of mismatch needs to be comparable across countries and available for a number of years. As a consequence, this sub-indicator represents the most reliable choice within this framework.

Sources, coverage and descriptive statistics

The source for data on the mismatch indicator is Eurostat, which provides figures covering all EU28 countries. The last year currently available is 2013.

([137]) For the mismatch indicator, two main alternatives were considered. The first one was the same indicator but with a different age group, i.e. 20-34; this would have made the sub-indicator more closely aligned with the benchmark, but in the end this age group was discarded since the age group 25-34 years covers the age group where most tertiary students have graduated, and is coherent with the Bologna approach. The second alternative was the construction of a different over-education indicator, comparing the individual's level of education with the most predominant education level in the same ISCO occupation (i.e. a statistical/realised match objective approach to educational mismatch; see CRELL, 2014). This alternative was however discarded due to low approval rate by the SGIB members.

Table 5.4. Descriptive statistics on the sub-indicator 'Mismatch'

Data source and release date	Eurostat	
Coverage (time, countries)	Release: every year Latest data: 2013	
Sample size problems	Data for LU (2011) and HR (2010) lack reliability due to small sample size.	
Variation over countries for year 2013	**Min**	5.6 (LU)
	Max	39.4 (ES)
	Mean	22.9 (unweighted), 25 (weighted)
	Stdv	8.0

According to the latest data available, referring to 2013, the lowest level of mismatch as defined by this sub-indicator is found in LU, where the share of over-education was 5.6 % (+ 1.8 percentage points when compared to 2012), followed by MT (12.6 %, +2 p.p. on the previous year). The highest level was registered in ES (39.4 %), followed by CY (39.1 %) and IE (36.8 %). The EU average over-education rate was 25 %, up 1.2 percentage points from 2010.

Sub-indicator 4: VET ([138])

Definition: Sum of students in ISCED 3 and 4 in the vocational track divided by the total number of students in ISCED 3 and 4.

For young individuals not wishing to continue their studies into tertiary education ([139]), vocational education potentially provides better prospects for their employability than general, more academically oriented upper secondary education. According to OECD (2013), during the years of the economic recession, countries with relatively high numbers of 25-34 year-old graduates from vocationally oriented programmes succeeded in reducing the risk of unemployment among young people with upper secondary education as their highest level of attainment. Cedefop (2012) finds that VET makes the transition from education to work smoother: the speed of transition is generally faster for VET graduates, who find an occupation more quickly than graduates from general education; furthermore, the first job lasts longer, and also the cumulative spells in work are longer ([140]).

Vocational education and training can also play a fundamental role in improving the ability of a country to deal with rapidly changing labour-market conditions, providing young people with skills that better match the needs of the labour market.

VET systems vary greatly from country to country (see OECD, 2010; and Piopiunik and Ryan, 2012), as does the popularity of VET. Hence, the aim of the fourth sub-indicator is to include a measure of the relevance of vocational education in each country. The current indicator covers ISCED 3 and 4, since vocational education systems in some countries stretch over the two ISCED levels.

The indicator is computed as the share of students in ISCED 3 and 4 in the vocational track on the total number of students in ISCED 3 and 4 in the country.

Sources, coverage and descriptive statistics

Data for monitoring the share of students in vocational education is available on Eurostat ([141]) based on data provided by the UOE database on education statistics, compiled on the basis of national administrative sources, reported by Ministries of Education or National Statistical offices according to international standards, definitions and classifications.

The data available at the time of drafting this report covers the period up to 2012. EU28 average is missing, as is the EU27 one from 2010 onwards. Some years are also missing for some countries.

([138]) The main alternative considered for this sub-indicator was the use of ISCED 3 only; this option was discarded in favour of the inclusion of ISCED 4 as well, since vocational education systems in some countries cover both ISCED levels.

([139]) As mentioned in Cedefop (2012), individuals with a general education are more likely to continue studying at the tertiary level, whereas VET graduates are more likely to seek employment after completing medium-level education; among those aged 18-24, the report found that around three in four of those with a general education orientation are still in formal education, while one in four has stopped studying; the ratios are inverted for those with VET orientation.

([140]) It should however be pointed out that despite having more short- and medium-term benefits, VET graduates — who as mentioned are more likely to work rather than continuing studying — might be giving up the longer-term benefits associated with further education.

([141]) Online data code: *educ_enrl1at.*

Table 5.5. Descriptive statistics on the sub-indicator 'VET'

Data source and release date	Eurostat UOE [*educ_enrl1at*]	
Coverage (time, countries)	Release: every year Latest data: 2012 Missing: EU28; EU27 (2010-12); MT (2012); LU (2010-11); EL (2009); some missing figures for PT and UK.	
Sample size problems	-	
Variation over countries for year 2012	**Min**	0.1316 (CY)
	Max	0.7486 (BE)
	Mean	0.5132 (unweighted), 0.5245 (weighted — our computation from data available)
	Stdv	0.1721

In 2012, the highest share of students in the vocational track among students in ISCED 3-4 was registered in BE (75 %) and AT (74 %), while the lowest share is found in CY (13 %), followed by MT (20 %) and HU and IE (28-29 %). Eurostat does not provide a recent EU average, but our computations on the data concerning the countries available show that at the EU level around 52 % of students in ISCED levels 3 and 4 were enrolled in a vocational track.

Sub-indicator 5: ALMP ([142])

Definition: Active labour market policies (ALMP) expenditure, categories 2-7 divided by number of persons wanting to work in Purchasing Power Standards (PPS).

The aim of the last sub-indicator was to include a measure of the government support for graduates to find a job. The current indicator reflects this as it measures expenditure on active labour market policies in the categories that are designed to support job creation and employment. More precisely, it is defined as the ALMP expenditure in PPS in categories 2-7 per person wanting to work.

Within the broader context of LMP *interventions*, the indicator covers in particular LMP *measures*, i.e. interventions that provide temporary support for groups that are disadvantaged in the labour market and which aim at activating the unemployed, helping people move from involuntary inactivity into employment, or maintaining the jobs of persons threatened by unemployment. These are public interventions in the labour market that are aimed at reaching its efficient functioning and correcting disequilibria and which can be distinguished from other general employment policy interventions in that they act selectively to favour particular groups in the labour market.

In particular, this covers categories 2-7, which include: Training, Job rotation and job sharing (which is currently not used anymore, and is now included under the following category), Employment incentives, Supported employment and rehabilitation, Direct job creation, and Start-up incentives ([143]).
Persons wanting to work are defined as the unemployed plus the labour reserve. The unemployed according to the ILO definition are persons without work, currently available for work and actively seeking work. The labour reserve denotes inactive persons wanting to work, i.e. it is a subset of all inactive persons (persons neither employed nor unemployed) ([144]).

Sources, coverage and descriptive statistics

Data for this sub-indicator is drawn from Eurostat's labour market policy (LMP) database ([145]), which is based on administrative sources. The latest figures refer to 2012, but for many countries the last year available at the time of writing this report is still 2011.

([142]) For the ALMP sub-indicator, the main alternative considered was the same indicator but divided by total population instead of people wanting to work. This was dropped for two reasons; first, ALMP expenditure by persons wanting to work was considered a more meaningful sub-indicator as it focuses on the part of the population who want to work but are currently out of work; secondly, bivariate correlations between the alternative indicator and the employability benchmark were not satisfactory (i.e. negative and significant).
([143]) See http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/lmp_esms.htm.
([144]) It should be noted that the indicator refers to all person wanting to work, with no distinction by age group. Although ideally it would be more meaningful to consider the same age group as in the benchmark, this disaggregation is not available on Eurostat.
([145]) Online data code: *lmp_ind_exp*.

Table 5.6. The sub-indicator 'ALMP'

Data source and release date	Eurostat's labour market policy (LMP) database [*lmp_ind_exp*].	
Coverage (time, countries)	Release: every year Latest data: 2012 (but for many countries the latest year available is 2011, 2010 for EL and UK). Missing: HR (until 2011); EU27; EU28 (2012). For many countries, figures are estimates. Break in series for PT (2011). Changes in definitions over time for BE, so data might be not strictly comparable over time.	
Sample size problems	-	
Variation over countries for year 2011	**Min**	33 (RO)
	Max	7 086 (BE)
	Mean	1 985 (unweighted), 1 543 (weighted)
	Stdv	2 065

In 2011, the lowest level of ALMP expenditure in PPS per person wanting to work for the categories described above was registered in RO (33), followed by MT with 154. On the other hand, the highest expenditure was found in BE (7 086), followed by DK (6 575). The unweighted EU average was 1 985, the weighted average was 1 543.

5.3. Further considerations

New alternatives concerning some of the sub-indicators might arise in the near future thanks to new data availability. In particular, as far as the third sub-indicator on mismatch is concerned, possible alternatives based on the use of the recently released OECD's Survey of Adult Skills (PIAAC), or on Cedefop's EU Skills Mismatch Survey, might be considered for future improvement.

As for the fourth sub-indicator, regarding the share of students in vocational education, it is worth mentioning that starting from 2014 (first publication in 2015), the EU-LFS is collecting data on educational attainment by orientation (vocational vs. general); this will allow adding a sub-group of the main indicator to complement this sub-indicator. The implementation of ISCED 2011 in both the UOE data collection and the LFS in a consistent manner will also improve the coherence of the data from 2015.

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6. Adult participation in lifelong learning

Definition: 'An average of at least 15 % of adults (in the age group 25-64) should participate in lifelong learning' (Council Conclusions 12 May 2009, OJ C 119/2 28.5.2009).

6.1. Main indicator and sub-groups

Description of the main indicator and its sub-groups

The policy importance of encouraging a culture of lifelong learning has been highlighted in recent years, culminating in the adoption of the EU2020 benchmark of increasing participation in lifelong learning to an average of at least 15 % across EU Member States.

More specifically, the indicator on lifelong learning refers to persons aged 25 to 64 who stated that they received education or training in the four weeks preceding the survey ([146]).

Adult participation in lifelong learning features as a key discussion and focus point in policy agendas, and empirical evidence shows that lifelong learning processes contribute to positive individual social and economic outcomes and improve employability of the work force and economic productivity. However, progress has been slow in this area with only a minority of Member States attaining a level of adult participation in lifelong learning in 2012 that is equal to or greater than this target ([147]) (see DG EAC, 2013).

Adult Lifelong Learning is generally shown in the literature to have two main aims: increasing skills and competences which have positive personal and social outcomes and generating positive employment effects (Buiskool et al., 2010).

In reason of the challenges posed by an ageing population and by changes on the economy and the society which claim for quick and regular update of skills, a lifelong learning approach becomes a pivotal feature for competitiveness of Member States and for the more general well-being of citizens.

Sources and coverage

Data about participation in lifelong learning are made available by Eurostat, based on the European Union Labour Force Survey (EU LFS). The Eurostat dataset ([148]) indicates the percentage of people aged 25 to 64 who stated that they received education or training in the four weeks preceding the survey (numerator). The denominator consists of the total population of the same age group, excluding those who did not answer to the question 'participation in education and training'. The information collected relates to all education or training whether or not relevant to the respondent's current or possible future job.

Data are available on yearly basis for all European countries since 1992 to 2013, European averages (EU27 and EU28) are included.

([146]) As far as future improvements are concerned, we may take into consideration the request to prefer data with a reference period of 12 months rather than data with a reference period of 4 weeks. This may lead to redefine the benchmark in the future.
([147]) DK, FI, SE, NL and the UK reached or exceeded the benchmark in 2012.
([148]) Online data code: 'tsdsc440'.

Table 6.1. Descriptive statistics on the main indicator: Adult Lifelong Learning

Data source and release date		European Union Labour Force Survey (EU LFS) 'tsdsc440'
Coverage (time, countries)		Release: every year Latest data: 2013 Missing: No Mean: EU27 and EU28 available Break in time series for: FR (2013), NL (2010)
Sample size problems		
Variation over countries for year 2013	**Min**	1.7 (BG)
	Max	31.4 (DK)
	Mean	EU28 (weighted): 10.4
	Stdv	EU28 (unweighted): 7.7

Sub-groups

The indicator for adult lifelong learning is analysed for the following subgroups:

Gender: male/female

Some gender differences in participation in lifelong learning were identified in the literature: Jenkins et al. (2003) noted that generally women were more likely to participate in adult learning than men. They also noted that mathematical attainment at an early age was an important determinant of participation in lifelong learning for women: their research demonstrated that those in the top quartile for mathematical attainment at age 7 were more likely to participate in adult learning at later stages in their lives. Boeren (2011) further identifies differences in types of lifelong learning undertaken, illustrating that men were more likely to be involved in formal learning processes and women more likely to participate in informal learning processes.

Migrant status: native-born/foreign-born

The literature is consistent in noting that migrants are less likely to participate in ALL than non-migrants (see DG EAC, 2002 and OECD, 2005 for example). This is perhaps also because migrants more often experienced multiple disadvantages in comparison to natives which may affect their ability to participate in ALL, e.g. lower socioeconomic status, lower educational qualifications, etc. The OECD (2005) also notes that first generation migrants often participate in training/courses related to their integration in host societies (e.g. language or citizenship courses); in some EU countries, these courses are either compulsory or strongly encouraged. Moreover, the OECD (2005) highlights that immigrants are less likely to be the recipients of employer-sponsored training, although they are no less likely than non-immigrants to seek it out.

Additional subgroups are:

- Educational level

Jenkins et al. (2003) identified social background as a significant variable as those from more advantageous backgrounds were more likely to pursue ALL (although this result was found to be true only for women). The same study uncovers strong evidence supporting the claim that one initial count of learning frequently leads to further additional learning. This indicates that those with existing educational qualifications and/or those who have previously undertaken training activities are more likely to pursue ALL than others. In sum, those with existing qualifications are more likely to pursue lifelong learning than those who are considered to have previously 'failed' at education/training. As regards to the willingness to focus on the disadvantaged groups for whom training is a more important issue, this sub-group provides a better insight of their specific situation.

— Age

Age appears to be another important factor as older persons are shown to participate less in ALL (OECD, 2005). The literature also emphasises that in the context of an ageing population, as experienced by many developed countries, there should be greater effort focused on providing training to older persons (Burke, 2002).

— Employment status: employed/unemployed

Being employed or unemployed can make a difference in the attitude toward lifelong learning. As highlighted by literature, a status of unemployment can affect the willingness to participate to further education, presumably in favour it in order to enhance employability opportunities. Yet, it has been observed that in some cases the employment status is associated to a risky paradox (the so-called 'Matthew effect', Gazier 2007): those more in need (e.g. unemployed) are also those less able and willing to undertake training due to lack of affordability and low expectations about paybacks.

— Type of learning: formal/non-formal

It is also important to know which kind of training is chosen by adults. This sub-group distinguishes formal and non-formal training. The former is training acquired through attendance to courses in the regular system of schools, universities and colleges. The latter includes all taught learning activities which are not part of a formal education programme. Non formal learning can function as a second chance for individuals, especially for low skilled workers or for those who left early formal education).Besides, a third option is also considered (but not included in Eurostat dataset): informal learning, which corresponds to self-learning through the use of printed material, computer-based learning/training, online Internet-based web education, visiting libraries, etc. (Eurostat Glossary).

6.2. Sub-indicators

The dimensions considered for the sub-indicators

The literature identifies three main levels of analysis which may affect decisions of participation to lifelong learning:

—Background of Individuals: several individual level characteristics, as age, social class, educational level, gender are related to the decisions to whether participate to ALL or not.
—Institutional Factors: certain institutional factors impact on ALL participation, such as government-led initiatives or other external factors which facilitate or incentivise participation to ALL. Certain policies are more effective in one country than another, according to different political or social framework.
—Demand-side perception: there may be demand-side reasons inhibiting participation in ALL, as persons may choose not to pursue lifelong learning for reasons including: a perception of lacking the time, the lack of availability of funding, they lack flexible working hours and so on (OECD 2005).

Due to the different level of analysis of the above mentioned characteristics, we decided to refer to the most relevant individual characteristics as the criteria for establish subgroups. Sub-indicators have been defined starting from the observation of aggregate level characteristics, as institutional factors and on the basis of demand-side perception (measured as percentage over the total population).

Sub-indicator 1: ALMP participants

Definition: Active labour market policy (ALMP) participants per 100 persons wanting to work, category training ([149])

We selected Active labour market policies participants (in the category training) as a sub-indicator of ALL participation, as it covers (at least partially) the supply side for training and measures how many individuals who want to work participate in training paid by the government (through active labour market policies).

Sources and coverage

Data about public spending on active labour market policies involving training are made available by Eurostat. The Eurostat dataset is included in Eurostat database on labour market policies ([150]). The variable indicates the number of participants to active labour market policies related to the category training (number of participants per 100 persons wanting to work).

Data are available on yearly basis for all European countries since 2003 to 2011, with the exceptions highlighted in the table below. European averages (EU27 and EU28) are not available.

Descriptive statistics on the sub-indicator

Table 6.2. Descriptive statistics on the sub-indicator 'ALMP participants'

Data source and release date		Eurostat's labour market policy (LMP) database. 'lmp_ind_actsup' (LMP_TYPE: training)
Coverage (time, countries)		Release: every year Latest data: 2011 Missing: CZ, EL, HR, IT, UK, EU27-EU28 Exceptions: Estimated values for: BE, DK, NL, PO, RO Low reliability for: IE, ES, FR, LU, PT
Sample size problems		
Variation over countries for year 2011	**Min**	0.0 (SK)
	Max	21.9 (DE)
	Mean	EU27 (unweighted): 8.4
	Stdv	EU27 (unweighted): 7.9

([149]) Note that a concern was raised by Cedefop during the last consultation phase before the SGIB meeting in November 2013 that the ALMP indicator should not double count participants who participate in more than one training. Indeed, Eurostat has quality checks against double-counting (see (Eurostat, 2013c, Point 20.6). The total public expenditure on all educational levels as a percentage of GDP was first considered. However, this indicator was criticised for being too broad. Hence, it was decided to choose a more focused indicator, namely ALMP participants on training.

([150]) Online data code: 'lmp_ind_actsup', selecting LMP_TYPE: training.

Sub-indicator 2: CVT

Definition: Percentage of employees participating in continuous vocational training (CVT) courses ([151])

The literature on this topic is consistent and there is a general agreement that employer funding is an important factor in encouraging adult training. It should be noted that large firms are more likely to sponsor training opportunities than small firms. It should also be noted that firms are more likely to sponsor training opportunities if there is a direct benefit to the firm itself.

The main factors influencing company decisions to fund training are incentive-based, i.e. cost of training and potential for return on investment; availability of external funds or subsidies (at state or EU level). Burke (2002) discusses various forms of government sponsored training in his analysis of the impact of government policy and found that government legislation requiring firms to provide training to their staff was particularly effective (e.g. in France — the most successful example of where this policy increased ALL participation). Mytzek-Zuhlke (2005) found that at the firm decision-making level, the availability of subsidies or refunds granted for training purposes at the state or EU level were found to have a significant impact, especially in combination with the 'cost of training' factor.

Since investments by firms in employee training should then result in a higher number of employees that participate in training, we propose 'percentage of employees participating in CVT' as a sub-indicator of ALL.

The indicator provides information of the supply of training by enterprises. While in the first sub-indicator we cover the public funded training for individuals who want to work, this indicator covers enterprise funded training for employees.

It should be noted that percentage of enterprises overall providing training to their employees, and the number of hours of training provided, are important elements as well which, however, are not reflected in this indicator.

Sources and coverage

Data about participation in continuous vocational training are made available by Eurostat in the based on CVTS (Continuing vocational training survey-CVTS). The Eurostat dataset indicates the percentage of employees participating in CVT courses ([152]). Data are available for all European countries for the two waves of 2005 and 2010. Missing data for HR in 2005 and IE in 2010. Estimated values for European average (EU28) in 2010.

([151]) The cost of CVT (continuous vocational training) courses as percentage of total labour cost (for all enterprises) was considered as an alternative. However, correlations were very weak for this indicator.
([152]) Online data code: 'trng_cvts42'.

Descriptive statistics on the sub-indicator

Table 6.3. Descriptive statistics on the sub-indicator 'CVT'

Data source and release date		Eurostat, Continuing Vocational Training Survey (CVTS). 'trng_cvts42'
Coverage (time, countries)		Release: 2005 and 2010. Latest data: 2010 Missing: HR in 2005; IE in 2010 Mean: EU28 (estimated values in 2010)
Sample size problems		
Variation over countries for year 2010	**Min**	16 (EL)
	Max	61 (CZ)
	Mean	EU28 (weighted): 38
	Stdv	EU28 (unweighted): 11.4

Sub-indicator 3: Unaffordability

Definition: Share of respondents who wanted but could not participate/participate more in education and training (both formal and non-formal education activities) in the past 12 months, who answered the main reason for non-participation is affordability (training was too expensive or respondent could not afford it) ([153]).

There is considerable evidence in the literature that cost of training is a major consideration for firms (while considerations about training costs in the public sector are less investigated). There is also evidence in the literature that reasons for not participating in ALL include perceptions that time is lacking, that there is no funding available, that individuals/employees don't see the need, or the lack of flexible working hours.

We therefore select two sub-indicators for the two types of obstacles which have the most relevance to policy-making: affordability of training and work-related obstacles.

The former provides indication on the obstacles to participation in formal or non-formal education due to participation costs and is measured as the percentage of respondents who could not participate to education and training due to the fact that could not afford the costs of training.

The choice of this specific variable related to affordability of training was done on purpose, in order to understand what the main obstacle was ([154]). We only include information on obstacles, which have clear policy implications, i.e. are either work related or related to affordability. Other reasons, such as family obligations, health, distance, no need for job, not needed for personal reasons, are considered to be of less relevance for policy purposes.

Sources and coverage

Data about obstacles to participation to education and training due to lack of affordability are made available by Eurostat, based on Adult Education Survey (AES). The dataset indicates the percentage of respondents who found that training was too expensive or respondent could not afford it, as an obstacle for participation ([155]). Data are available for the two waves ([156]) of the survey (2007 and 2011), for all European countries, with the following exceptions: in 2011 data are missing for UK and HR; in 2007 missing data for DK, FR, IE, IT, LU, HU and MT. Low reliability of data for BE, DE, NL, FI and SE in 2007. Finally, EU28 values are estimated in both waves.
Note that almost all countries experience important break in series between 2007 and 2011, affecting the comparability between waves: BE, BG, CZ, DE, EE, ES, CY, LV, LT, NL, AT, PL, PT, RO, SI, SK, FI, SE (in practice all countries but DK, IE, EL, FR, IT, LU, HU, MT). The issue is due to some changes in the 2011 questionnaire: new items have been introduced and old items have been reformulated, thus changing the multiple choices available to respondents. In order to cope with this problem of comparability, when computing the recent change (2011-2007), we selected only items which are common to both waves (both in 2007 and 2011) and rescaled the relative percentage of each item over the sub-total of the common items ([157]). The recent change is thus computed as a difference between rescaled values of 2007 and 2011.

([153]) The total share of respondents who answered reason for non-participation is affordability was considered as an alternative. Total share relates to persons who wanted to participate, wanted to participate more and those who did not want to participate. However, correlations were not satisfactory, i.e. positive insignificant. Another reason for not choosing this indicator is that it relates also to people who did not even want to participate in education and training. Hence, including this part of the population in the sub-indicator is difficult since these people were not motivated to participate in education and training in the first place and hence the reasons they give for not participation might be less indicative of bottlenecks in education and training systems than for the motivated part of the population.

([154]) Note that during the SGIB meeting in November 2013, the question was raised why we use the 'most important reason´ for non-participation and not data on all reasons. In fact, data on 'most important reasons' are used to ensure that the variable relates to real bottlenecks and hence shed light on the most important obstacles to participation.

([155]) Online data code: 'trng_aes_179', selecting PAROBS: OBSPRIC.

([156]) The next wave should be organised in 2016.

([157]) In 2007 there was a total number of 9 items available, in 2011 the items were 10, but some of the items available in 2007 were no longer available in 2011 and some new ones were added. Thus we rescaled the percentages of OBSPRIC (and then OBSSUPP+OBSWRSC) taking into consideration ONLY items which were COMMON to both waves (both in 2007 and in 2011). We thus turned to 100 the total sum of responses for these common items (even if maybe in reality it accounts for 80 % only) and the new

On the contrary, when computing standardized values within the same year, against the EU average, are considered the absolute values provided by Eurostat.

Descriptive statistics on the sub-indicator

Table 6.4. Descriptive statistics on the sub-indicator 'Unaffordability' (***)

Data source and release date		Eurostat, Adult Education Survey (AES). 'trng_aes_179' (PAROBS: OBSPRIC)
Coverage (time, countries)		Release: 2007 and 2011 Latest data: 2011 Missing: HR, UK missing for 2011; DK, FR, IE, IT, LU, HU, MT missing for 2007 Mean: EU28 (estimated values). Break in series for all countries but DK, IE, EL, FR, IT, LU, HU, MT in 2011.
Sample size problems		Yes. Sample sizes need to comply with Eurostat reliability thresholds (see https://circabc.europa.eu/sd/d/d3bbb686-e9fe-4448-a74a-a35aeec43703/LLL_Metadata_Section1_AES.htm)
Variation over countries for year 2011	**Min**	2.8 (BE)
	Max	37.7 (RO)
	Mean	EU28 (weighted): 8.4
	Stdv	EU28 (unweighted): 8.6

(rescaled) percentage of respondents saying that OBSPRIC is the main reason for not participating in training has been computed over this new total.

Sub-indicator 4: Work obstacles

Definition: share of respondents who wanted but could not participate/participate more in education and training (both formal and non-formal) who answered main reason for non-participation is work-related. Work-related reasons are 'Lack of employer's support' and 'conflict work schedule'.

As mentioned before, this indicator takes into consideration the other type of obstacle to participation to education and training which has the most relevance to policy-making.

This measure provides indication on the obstacles to participation in formal or non-formal education due to a lack of employer's support or public services support and due to the fact that training conflicted with the work schedule.

Sources and coverage

As for the previous sub-indicator, data about work-related obstacles to participation are available from Eurostat dataset on Adult Education Survey ([158]) (AES). The dataset used is the same as for the previous indicator, but only the variable codes OBSSUPP and OBSWRSC are considered here (in Table 6.5 descriptive statistics are provided for the sum of the two variables). Data are available for the two waves (2007 and 2011), for all European countries with the following exceptions: missing data for IE, HR and UK in 2011; missing data for HR, FR, MT, DK, HU, BG, EL, EE, IT, IE, LT, LU, LV, DE in 2007; estimated values for EU28 for both waves. Further, data with low reliability for BE, BG, IE, CY, LI, MT, RO, SI, SK in 2011 and for BE, ES, CY, NL, AT, SI, SK, SE, UK in 2007.
As for the previous sub-indicator, almost all countries experience important break in series between 2007 and 2011, affecting the comparability between waves: BE, BG, CZ, DE, EE, ES, CY, LV, LT, NL, AT, PL, PT, RO, SI, SK, FI, SE (in practice all countries but DK, IE, EL, FR, IT, LU, HU, MT). The same procedure of rescaling of percentage described for sub-indicator 3 has been followed for the two items used to build sub-indicator 4 (lack of employer's support and conflict with work schedule).

Descriptive statistics on the sub-indicator

Table 6.5. Descriptive statistics on the sub-indicator 'Work obstacles'

Data source and release date		Eurostat Adult education Survey (AES) 'trng_aes_179' (PAROBS: OBSSUPP + OBSWRSC)
Coverage (time, countries)		Release: 2007 and 2011 Latest data: 2011 Missing: IE, HR, UK missing for 2011; HR, FR, MT, DK, HU, BG, EL, EE, IT, IE, LT, LU, LV, DE missing for 2007; Mean: EU28 (estimated values); Break in series for all countries but all countries but DK, IE, EL, FR, IT, LU, HU, MT in 2011.
Sample size problems		Yes. Sample sizes need to comply with Eurostat reliability thresholds (see https://circabc.europa.eu/sd/d/d3bbb686-e9fe-4448-a74a-a35aeec43703/LLL_Metadata_Section1_AES.htm)
Variation over countries for year 2011	**Min**	3.9 (PT)
	Max	34 (MT)
	Mean	EU28 (weighted) = 15.9
	Stdv	EU28 (unweighted) = 8.3

([158]) Online data code: 'trng_aes_179'

Sub-indicator 5: Demand

Definition: Share of respondents looking for information on learning possibilities in the last 12 months

There are indications that 'learning to learn' skills contribute to increase ALL participation, further, countries who encourage 'learning to learn' value demonstrate higher levels of participation in ALL (DG EAC, 2002). 'Learning to learn' skills are thus defined as 'the ability to learn — maintaining curiosity and interest in new developments and skills — without which lifelong learning cannot exist' (DG EAC, 2002, p. 31).

The literature also highlights the importance of institutions (EU policy recommendations are interpreted and implemented differently at the national level) and thus suggests that there is a role played by culture in shaping ALL policy.

This indicator is used to understand whether there exist country-specific inclinations or attitudes towards learning, which might then eventually affect the participation in adult lifelong learning.

Sources and coverage

Data are made available by Eurostat, based on Adult Education Survey (AES). The dataset considered indicates the percentage of adults seeking information on learning activities in the last 12 months ([159]). Data are available for the two waves of the survey (2007 and 2011), for all European countries (HR is missing in 2011). For the following countries data for the first wave (2007) are missing: CZ, DK, EE, FR, IE, LU, MT. The European average (EU 27) is missing for both 2007 and 2011, estimated values for EU28 are available for both waves.

Descriptive statistics on the sub-indicator

Table 6.6. Descriptive statistics on the sub-indicator 'Demand'

Data source and release date		Eurostat Adult education Survey. 'trng_aes_182'
Coverage (time, countries)		Release: 2007 and 2011 Latest data: 2011 Missing: HR missing for 2011; CZ, DK, EE, IE, FR, LU, MT missing for 2007; Mean: EU28 (estimated values). Break in series for FR, HU in 2011.
Sample size problems		Yes. Sample sizes need to comply with Eurostat reliability thresholds (see https://circabc.europa.eu/sd/d/d3bbb686-e9fe-4448-a74a-a35aeec43703/LLL_Metadata_Section1_AES.htm)
Variation over countries for year 2011	**Min**	2.0 (RO)
	Max	70.7 (UK)
	Mean	EU28 (weighted): 27
	Stdv	EU28 (unweighted): 13.8

([159]) Online data code: 'trng_aes_182'.

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ANNEX

A1. METHODOLOGICAL APPROACH

A1.1. Quality criteria

Data used in the JAF exercise come mainly from three sources: Eurostat, OECD and UOE (Unesco-UIS/OECD/Eurostat) ([160]). The European Statistical System (ESS), which comprises Eurostat and the National Statistical Institutes, is obliged to follow quality criteria before releases of data and the same holds for the OECD and the OUE data.

The concept of quality goes beyond the simple accuracy of the statistical data, and it comprehends a broader set of attributes: relevance, reliability, accuracy, timeliness and punctuality, accessibility and clarity, comparability, coherence and completeness. Quality is then 'the totality of features and characteristics of a product or service that bear on its own ability to satisfy a given need' (ISO 8402 from 1986) ([161]).

Following the 'ESS Quality Glossary' ([162]), the 'Quality in the European Statistical System' ([163]) and the 'Quality framework and guidelines for OECD statistical activities' ([164]) we report the definitions of the various aspects considered under the quality criteria of the main data sources used in the JAF:

- **Relevance**: a statistical product is relevant if it meets users' need.
- **Reliability:** a reliable statistics measure as faithfully, accurately and consistently as possible the reality that it is designed to represent implying that scientific criteria are used for the selection of sources, methods and procedures.
- **Accuracy**: accuracy is the difference between the estimate and the true parameter value, thus it measures the closeness of the estimates to the true value.
- **Timeliness and punctuality** in disseminating results: timeliness is the period between the availability of the information and the event described; while punctuality measure the delay between the date of the release of the data and the target date.
- **Accessibility and clarity** of information: accessibility describes the set of conditions and modalities by which users can obtain the data; while clarity describes the extent to which easily comprehensible metadata are available.
- **Comparability**: comparability measures the extent to which differences between statistics can be attributed to differences between the true values of the statistical characteristics. In general terms, it means that statistics for different populations can be legitimately aggregated, compared and interpreted in relation to each other or against some common standard. Comparability should be granted across space and time, so to allow for harmonised statistics.

([160]) The UOE data collection is administered jointly by the United Nations Educational, Scientific, and Cultural Organisation Institute for Statistics (Unesco-UIS), the Organisation for Economic Co-operation and Development (OECD), and the Statistical Office of the European Union (Eurostat). The goal of the UOE data collection on statistics of education is to provide internationally comparable data on key aspects of the education systems, specifically on the context, participation, and the costs and resources of education.
([161]) 'Assessment of quality in statistics', Eurostat, 2003
([162]) The ESS Quality Glossary is developed by Unit B1 'Quality, Methodology and Research'.
([163]) Quality in the European Statistical Systems, 2002, p. 69.
([164]) Quality Framework for OECD Statistical Activities.

- **Coherence ([165])**: coherence measures the adequacy of the data to be reliably combined in different ways and for various uses. Statistics coming from different sources should be based on common definitions, classifications and methodological standards.
- **Completeness**: completeness refers to the extent to which all statistics that are needed are available. The measurement of the availability of the necessary statistics normally refers to data sets and compares the required data set to the available one.

A1.2. Selection criteria of sub-groups and sub-indicators

As mentioned in the previous sections, the six main ET 2020 benchmarks are integrated by a series of sub-groups and sub-indicators:

a. **Sub-groups** should provide important context information for the assessment of the overall indicator. This mainly includes breakdowns of the overall indicators but can also be information that serves the qualitative assessment. A set of standard sub-groups for immigrant background (native born vs. foreign born) and gender (male vs. female) are associated to each main indicator ([166]). It allows examining whether the four sub-populations perform equally well or if, on the contrary, Member States should make a particular effort to improve the performance of one or more of them.

b. **Sub-indicators** are used to shed light on why the overall indicator behaves as it does: they are generally relevant for explaining the behaviour of the benchmark, and are useful to identify specific country challenges even beyond 2020. These sub-indicators constitute commonly acknowledged underlying determinants of ET performance and are able to explain countries' performance in the medium and long term. Sub-indicators should have an impact on the overall indicator and — ideally — hint at a policy lever for changing the performance of the overall indicator. The types of sub-indicators chosen vary depending on the main indicator.

Each sub-indicator has been selected by taking into consideration the following dimensions:

- Relevance with the main indicator
- Sufficient sample size, including for smaller Member States and sub-groups (*accuracy*).
- Easy interpretation of the indicator (*clarity*).
- Coherence with indicators already selected in other frameworks, with the possibility of some fine-tuning to the specific needs.

> *As an example, the inadequacy sub-indicator for the early childhood education and care (ECEC) indicator (defined as women aged 15-64 who would like to work but are not searching for a job/who work part-time due to their care responsibilities and lack of suitable care services, as a percentage of women with care responsibilities) is consistent with the work of DG EMPL's Employment Committee Indicator Group (EMCO IG); on the other hand, the indicator selected by EMCO adopts a broader labour market perspective than what is required for the purposes of the ET 2020 targets monitoring, so the sub-indicator adopted here is more narrow, since it faces the issue from the perspective of availability of suitable services for children only. On the contrary, in the case of early school leavers (ESL) indicator the standard JAF sub-groups and the sub-indicators are the same as those used by DG EMPL. For the benchmark on the employment rate of recent graduates, the mismatch sub-indicator is based on one of the indicators of the Bologna Process.*

([165]) The concept of coherence is closely related to the concept of comparability between statistical domains. Both coherence and comparability refer to a data set with respect to another. The difference between the two is that comparability refers to comparisons between statistics based on usually unrelated statistical populations and coherence refers to comparisons between statistics for the same or largely similar populations.

([166]) Except for early childhood education and care (ECEC), where this breakdown is not possible in the source data. Instead, the ECEC main indicator adds a breakdown according to age (4/5+).

- Comparability and availability across countries and time (*comparability, timeliness and completeness*).

  In relation to Low achievement in reading, mathematics and science indicator, some additional sub-indicators were considered at the stage of selection of quantitative sub-indicators. The first one was 'low achievement at other age levels' using TIMMS and PIRLS. However, after consideration it was dropped in favour of more value-added sub-indicators ([167]). The second one was 'teacher salary', a component of investment in education, which yields the strongest association with learning outcomes. However, robust, comparable measurements of this narrower definition were not found, and the sub-indicator was not introduced.

  For the benchmark on ECEC, for the domain of availability/affordability, fees for pre-schooling and household expenditure on ISCED 0 were considered as an alternative sub-indicator. However, data quality and availability for a reasonable number of countries was deemed very poor, so the final choice was for a more reliable sub-indicator.

([167]) Achievement in reading, maths and science in the fourth grade does, however, provide a meaningful comparison. See PIRLS 2011: International Results in Reading (http://timssandpirls.bc.edu/pirls2011/international-results-pirls.html), TIMSS 2011: International Results in Mathematics (http://timssandpirls.bc.edu/timss2011/international-results-mathematics.html) and TIMSS 2011: International Results in Science. (http://timssandpirls.bc.edu/timss2011/international-results-science.html).

A2. OVERVIEW OF SUB-GROUPS AND SUB-INDICATORS

		Label in JAF chart
1. Early leavers from education and training (Eurostat LFS)		
Standard breakdown	▪ Male/Female ▪ Foreign-born/Native-born	▪ Males/Females ▪ Foreign-born/Native-born
Additional sub-groups	▪ Employment status ▪ Age/year of birth ▪ ISCED level ▪ ESL by region	
Quantitative sub-indicators	1. Employment disadvantage: difference in employment rate in percentage points between individuals 20-64 with ISCED 0-2 compared to individuals with ISCED 3-4; 2. Parental E&T (low): proportion of females aged between 45 and 54 with low education attainment (ISCED 0-2); 3. Investment: annual expenditure on public and private educational institutions in EUR PPS at primary and secondary levels (ISCED 1 to 2) divided by the size of the cohort aged 6 to 18 compared to the GDP per capita in EUR PPS; 4. VET: proportion of students at ISCED 3 level in vocational education; 5. ECEC: proportion of students between 4 and starting age of compulsory education participating in early education.	▪ Employment disadvantage ▪ Parental E&T (low) ▪ Investment ▪ VET ▪ ECEC
2. Tertiary education attainment (Eurostat LFS)		
Standard breakdown	▪ Male/Female ▪ Foreign-born/Native-born	▪ Males/Females ▪ Foreign-born/Native-born
Additional sub-groups	▪ ISCED level ▪ Field of study ▪ Region (NUTS2) ▪ Age ▪ Employment status	
Quantitative sub-indicators	1. Completion rate: proportion of those entering a tertiary-type A programme and go on to graduate from at least a first tertiary-type A programme; 2. Upper secondary: percentage of population aged 20-24 having completed at least upper secondary education; 3. Investment: Annual expenditure on tertiary level in EUR PPS (Purchasing Power Standards) divided by the size of the cohort aged 20 to 24 compared to the GDP per capita in EUR PPS; 4. Parental E&T (high): proportion of females aged between 55 and 64 with ISCED 5-6 level; 5. Employment advantage: difference in employment rate in percentage points between individuals 20-64 with ISCED 3-4 compared to individuals with ISCED 5-6.	▪ Completion rate ▪ Upper secondary ▪ Investment ▪ Parental E&T (high) ▪ Employment advantage

		Label in JAF chart
3. Early childhood education and care (Eurostat UOE)		
Standard breakdown	▪ Male/Female ▪ [note that Foreign-born/Native-born is not available from UOE]	▪ Males/Females
Additional sub-groups	▪ Age ▪ ECEC by region	▪ Age group 4/Age group 5+
Quantitative sub-indicators	1. Barcelona target: Number of children aged 0-2 cared for (under formal arrangements other than by the family) as a proportion of all children in the same age group; 2. Investment: Total public expenditure on education at ISCED level 0 in EUR PPS, divided by the size of the cohort aged four to the country-specific starting age of primary schooling, compared to the GDP per capita in EUR PPS; 3. Inadequacy: Women aged 15-64 who would like to work but are not searching for a job/who work part-time due to their care responsibilities and lack of suitable care services, as a percentage of women with care responsibilities; 4. Informal care: Country average of the sum of alternative care, i.e. 'babysitters' and 'grandparents' (=RL050+RL060) for children aged three to country-specific starting age of primary schooling; 5. Inequality: Difference in ECEC rate between the region with lowest ECEC and the national average (in p.p.).	▪ Barcelona target ▪ Investment ▪ Inadequacy ▪ Informal care ▪ Inequality
4. Adult participation in lifelong learning (Eurostat LFS)		
Standard breakdown	▪ Male/Female ▪ Foreign-born/Native-born	▪ Males/Females ▪ Foreign-born/Native-born
Additional sub-groups	▪ Age groups ▪ ISCED level ▪ Employment status ▪ ALL by region (NUTS2) ▪ Type of learning: formal/non-formal	
Quantitative sub-indicators	1. ALMP participants to training: ALMP participants per 100 persons wanting to work, category training 2. CVT: Percentage of employees participating in CVT courses 3. Affordability obstacle: share of respondents who wanted but could not participate/participate more who answered main reason for non-participation is affordability 4. Work obstacle: share of respondents who wanted but could not participate/participate more who answered main reason for non-participation is work-related 5. Demand: Share of respondents looking for information on learning possibilities in the last 12 months looking	▪ ALMP participants ▪ CVT ▪ Unaffordability ▪ Work obstacle ▪ Demand
5. Employment rate of recent graduates (Eurostat LFS)		
Standard breakdown	▪ Male/Female ▪ Foreign-born/Native-born	▪ Males/Females ▪ Foreign-born/Native-born
Additional sub-groups	▪ ISCED level ▪ Field of study (plus orientation of study from mid-2014 onwards)	

		Label in JAF chart
Quantitative sub-indicators	1. GDP growth: GDP growth in percentage terms; 2. Newly employed: Percentage of individuals (older than 15 years) that were employed in the last 3 months divided by total number of persons employed; 3. Mismatch: Percentage of individuals aged 25-34 with tertiary education, i.e. ISCED 5-6, that work in ISCO 4-9, i.e. not as legislators, senior officials, managers and professionals (ISCO 1-2) and not as technicians and associated professionals (ISCO 3); 4. VET: Sum of students in ISCED 3 and 4 in the vocational track divided by the total number of students in ISCED 3 and 4; 5. ALMP (active labor market policies): Active labour market policies (ALMP) expenditure, categories 2-7 divided by number of persons wanting to work in Purchasing Power Standards (PPS).	▪ GDP growth ▪ Newly employed ▪ Mismatch ▪ VET ▪ ALMP
6. Low achievement in reading, mathematics and science (OECD PISA)		
Standard breakdown	▪ Male/Female ▪ Foreign-born/Native-born	▪ Males/Females ▪ Foreign-born/Native-born
Additional sub-groups	▪ ECEC participation	▪
Quantitative sub-indicators	1. Investment: annual expenditure on public and private educational institutions at primary and secondary levels (ISCED 1 to 2) divided by the size of the cohort aged 6 to 18 compared to the GDP per capita in EUR PPS; 2. Learning time: Learning time in reading, mathematics and science per week; 3. School accountability: Percentage of students in schools that post achievement data publicly; 4. Autonomy: Country average of degree of school responsibility for curriculum and assessment: teachers' and principals' responsibility for establishing student assessment policies, choice of textbooks and determining course content and deciding which courses are offered; 5. Inequality: the relationship between student performance and socioeconomic background, in particular using the 'Slope of gradient' index, which is the score point difference in reading associated with one unit increase in the PISA index of economic, social and cultural status (How much a student's performance changes if he/she has a one unit higher socioeconomic status).	▪ Investment ▪ Learning time ▪ Accountability ▪ Autonomy ▪ Inequality
7. Learning mobility		
Standard breakdown	*(t.b.d.)*	
Additional sub-groups	*(t.b.d.)*	
Quantitative sub-indicators	*(t.b.d.)*	

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Abstract

This technical report represents the official guide to DG EAC's Joint Assessment Framework (JAF). The JAF methodology was first introduced by DG EMPL in 2010 to standardise the monitoring of benchmarks and indicators under the Employment Guidelines. Since two of the Employment Guidelines concern education and training, DG EAC was directly involved in developing the methodology and has since introduced it into its own monitoring approach concerning the strategic framework for European cooperation in education and training (ET 2020). The JRC's Centre for Research on Education and Lifelong Learning (CRELL) has helped EAC to adapt the JAF to the context of education and training, developing the quantitative part of the methodology for the ET 2020 benchmarks. This report details the main empirical, theoretical and policy arguments behind the selection of the various sub-groups and sub-indicators for each of the six operational ET 2020 benchmarks; it also lists the methodological criteria adopted throughout the JAF development work. Finally, the report provides explanations on how to interpret the JAF charts that are produced annually by CRELL for the quantitative assessment.

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