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## Patterns in adult education participation in Europe

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## I Surveys on adult education participation in Europe

In light of the growing importance of lifelong learning and the increased skills demand more and more studies focus on adult education statistics to derive policy recommendations.

In part, the project VoRREFi-WB (“Economic and regional costs, funding structures and benefits of continuing education”) aims to producing a more grounded analysis of perspectives on adult education and to contribute to the discussion of several EU policy objectives, especially with respect to the follow-up indicators of the Lisbon strategy and the new Europe 2020 strategy.

There is an urgent need for a common understanding of adult education statistics to overcome misinterpretations of Europe-wide comparable datasets on adult education. This paper provides an in-depth analysis of issues related to adult learning classifications and statistical concerns as well as an analysis of the development and performance of the adult education sector in Europe.

The main overarching policy objectives to which the VoRREFi-WB project contributes include:

- Analysing trans-European data on the adult education sector to monitor the multiplicity of adult learning and to develop evidence-based policies;
- Achieving better insights about and understanding of the participation of adult learning, its participants, providers and nature.

In the literature, analysts use a variety of concepts of training. Moreover, compared to compulsory education and higher education, data on adult education are limited due to their varied nature and the high dispersion of providers. Since for their surveys analysts must draw on what is available in terms of data, the emphasis is generally placed on simple measures of training participation, for example, whether training has been received during a particular time period. Furthermore, are statistical issues arise from the method of data collection as well as the varied wording of survey questions. Thus far, the literature is less focused on training aspects such as its duration, purpose, funding, location and the number of courses taken. These concepts have, however, often been regarded as important in more general discussions about the provision of training.

To restate, this paper aims to fill the gap in the analysis of statistical data collection of adult education surveys, to provide a holistic analysis of the content and comparability of surveys as well as of current trends with comprehensive data split by contextual factors.

### I.1. Surveys design

The following section provides an analysis and assessment of the outcomes of different adult education surveys, namely the annual Labour Force Survey (LFS), the Continuing Vocational Training Survey conducted every five years (CVTS 2005; CVTS 2010; CVTS 2015) and the three waves of the Adult Education Survey (AES 2007; AES 2011; AES 2016). These surveys constitute the core surveys on adult education and play a key role in the European System of Statistics on Lifelong Learning. In addition, this paper considers the European Working Conditions Survey conducted every five years (EWCS 2005; EWCS 2010; EWCS 2015), the European Skills and Job Survey (ESJS 2014) and the Programme for the International Assessment of Adult Competencies (PIAAC 2011).

These surveys are unique sources to study adult education and provide indicators related to training participation, type of education and training, intensity, costs and financing issues. The coverage of these surveys overlaps and allows for a holistic analysis of the set of indicators on further education.

Nonetheless, when interpreting these surveys attention must be paid to the differences in their methodological approach, their respective period of observation and units of analysis as well as in the form of learning analysed that varies by type of enterprise and individual. Corresponding comparisons of various surveys are available (especially for Germany e.g. Behringer, et al., 2017; Käßlinger, Kulmus, & Haberzeth, 2013). This article now compares the current surveys and survey results at European level. CVTS is considered a well developed survey that constitutes good data on participation, intensity and costs of training. Its core concepts and approaches have remained unchanged between waves which makes for better comparability between different survey cycles (CVTS 5 manual, 2016). In contrast, the AES surveys have seen number of changes in the methods applied which requires particular sensitivity when comparing different survey waves (for details see Eurostat, 2014). Compared to the 2011 AES, the data collection on formal education and training in the 2016 AES is identical. However, some details regarding the collection of data on non-formal education and training have changed, for example, the number of activities was reduced from 10 in 2011 AES to 7 in 2016 AES (Eurostat, 2014). The LFS surveys provide information about participation in formal/non-formal learning activities by field, purpose and length of education and training. In comparison, the AES survey also provides information about participation in formal/non-formal learning activities by provider and field of learning, but also by training setting (during and outside working hours), by reasons for participation (job-related, non-job related), obstacles to participation (reasons for non-participation), volume of participation (time spent in training), type of learning activity (formal, non-formal) and by source of funding (learner, relative, government, employer, etc.). Furthermore, the CVTS survey provides information about company's attitude to training such as CVT strategies, whether courses are designed and managed by the company itself (internal vs external CVT), factors that limit the provision of CVT courses, reasons for the non-provision of CVT activities, costs of CVT and the skills/competences targeted by CVT courses. CVTS data gathers information from persons employed in an enterprise about types of CVT provision. The EWCS survey does not specifically aim at studying adult education. Rather, it focuses on the working environment and in this context provides information on whether individuals had training, who paid for the training, whether training takes place on the job or in other forms, total days in training and outcomes of training activities. The ESJS survey aims at revealing the issues of skills demand and supply, and it contains information about training settings (during or outside working hours, or while regular working), who paid for the training, and these data can be contrasted with the subjective estimation of the skills level of respondents. PIAAC data also aims at providing internationally comparable dataset on adult skills. To this effect the survey gives information about skills levels in literacy, numeracy and problem solving in technology-rich environments and provides information about training settings, who paid for the training, the overall usefulness of training activities, the amount of time devoted to training and about barriers to participation in education.

The surveys described above aim at capturing adult education phenomena from various perspectives and time frames. The harmonization of these surveys is possible to some extent, however, issues arise due to the different methodological approaches which make cross-validation between surveys difficult. The general differences of the surveys are outlined in Table 1 below.

	LFS	AES	CVTS	EWCS	ESJS	PIAAC
Form	Register-based	Survey based	Survey based	Survey based	Survey based	Survey based
Period	Yearly, quarterly	Every five-year period	Every five-year period	Every five-year period	Once only	Defined period
Datasets available	time series are available from 1992	2007, 2011, 2016	1995, 2000, 2005, 2010, 2015	2000, 2005, 2010, 2015	2014	2011, 2016, 2019
Reference period	4 weeks prior to the survey	12 months prior to the survey	one calendar year	12 months prior to the survey	12 months prior to the survey	12 months prior to the survey
Units of analysis	households	households or individuals	Enterprises	Individuals	Individuals	individuals
Individual participation: Age cohorts covered	all groups (for EU LLL-indicators 25-64)	25 to 64 (in some countries also for 18-24 and 65-70)	end of compulsory schooling to statutory retirement age	Aged above 15	25 to 64	16 to 65
Covered economic sectors	EU-LFS covers all economic sectors	All economic sectors.	Some sectors excluded	Sectors are not distinct (only public or private)	All economic sectors.	Sectors are not distinct (only public or private)
Statistical unit	Households and all size classes Enterprises covered Individuals (all statuses)	Individuals living in private households	only employed individuals in small/medium to big companies (firms with less than 10 employees are excluded). only employed individuals (unemployed and inactive are not considered)	Employees	Employees	Individuals
Concepts of learning and types of learning represented	formal education and non-formal education (CLA definition)	formal education, non-formal education, informal learning (CLA definition)	participation in courses (no distinction between formal/non-formal); participation in selected non-formal and informal learning activities ('other forms of training')	Participation in training (no distinction)	Participation in training (no distinction)	Participation in training (no distinction)

Table 1 Differences between surveys - LFS, AES, CVTS, EWCS, ESJS and PIAAC

As Table 1 reveals LFS, AES, CVTS, EWCS, ESJS and PIAAC are survey-based and LFS is a register-based survey. LFS is an annual survey, while AES, CVTS and EWCS are conducted every five years. ESJS has been

conducted once, while PIAAC has already seen the release of data from two survey waves and the 2015 data is expected to be released later this year.

Furthermore, AES and CVTS each have an observation period of 12 months, while LFS takes only 4 weeks prior to the survey. The reference period of CVTS is the calendar year (12 months), whereas AES refers to the previous 12 months. The effect of these differences in the period of observation and reference on access to and intensity of adult learning are analysed by Goglio and Meroni (2014), who examine the impact and comparability of using 12-month and 4-week periods. They find that differences may even arise within the quarters of a year when surveys are conducted which may lead substantial changes in participation rates on the country level, specifically with respect to non-formal education. Furthermore, covering a reference period of 12 months as opposed to four months involves considerably more inconclusion in findings and tends to yield higher values. On the other hand, a 4-week reference period is subject to seasonal effects, however, this approach provides a more recent time frame of reference to the survey participants which facilitates their answering the survey questions. Furthermore, the differences of data collection periods require caution when doing cross-country comparison as well as in comparisons over the years. In turn, differences in the period of observation possibly impact other aspects gathered by the surveys such as hours and costs of education and training.

Moreover, LFS exclusively collects data on people aged 25-64, AES and ESJS also consider individuals aged 25-64 at the time of the interview (Eurostat, 2014), while CVTS, EWCS and PIACC cover all employees including individuals younger than 25 or older than 64 (CVTS 5 manual, 2016). Considering the units of observation, LFS and CVTS cover data on employees as well as employers, while the other surveys consider only employees or individuals in general. By economic sectors, data can be disaggregated only in LFS, AES and ESJS.

Further limitations to the comparability of surveys related to sample size. For instance, the AES sample is smaller compared to the LFS sample, which may lead to variations in the extent of data coverage in terms of participation, types and intensity of training. More details of statistical issues occurred (sampling, measurement and non-response errors, etc.) could be investigated in country Quality Reports. Nonetheless, even if the details of data collection are disclosed, the extent of these issues is difficult to define. Another issue involves translation and cultural interpretation of definitions and concepts among respondents. Again, the extent of this effect on measurement errors is difficult to estimate.

In the following, this analysis attempts to define requirements of learning classifications and to specify types of education and training. The Classification of Learning Activities (CLA) is applied to statistical surveys that collect quantitative information on different aspects of individuals' participation in learning. It was mainly designed to cover and serve the scope of the European Union's adult education survey (AES). However, the 2006 version of the CLA did not include some of the criteria, which then were modified after discussions on the implementation of the 2011 AES and taking into account the updated ISCED 2011. The latest list of criteria is outlined in Table 2. In the 2016 CLA version, there are three main types of learning activities defined as follows:

	Criterion	Formal	Non-formal	Informal
(a)	Intention to learn	X	X	X
(b)	Organization	X	X	
(c)	Institutional framework and location	X	X	
(d)	Hierarchy level-grade structure (“ladder”)	X		
(e)	Admission requirements	X		
(f)	Registration requirements	X	(X)	
(g)	Teaching/learning methods (predetermined/not flexible)	X	X	(X)
(h)	Duration of at least semester (minimum of 30 ECTS)	X		
(i)	Recognition of the programme by the relevant national education or equivalent authorities	X		

*Table 2 Operational criteria for distinguishing broad categories of learning activities according to CLA 2016*

Source: (“Classification of learning activities (CLA) Manual,” 2016)

There are several conflicts in the definitions of the concept of formal education and training between the 2006 version of the CLA and other reference documents on education statistics, including the ISCED 2011 and the operational manual for the UOE data collection on enrolments/entrants (see the Source: (“Classification of learning activities (CLA) Manual,” 2016)). These involve, for example, the recognition and duration of education and training. Currently, according to the 2016 CLA, for formal education the direct reference to the National Qualifications Framework (NQF) is removed and a minimum duration requirement of at least one semester (minimum of 30 ECTS) is added. These changes of definitions in the CLA, in turn, lead to alterations in the LFS and AES collection of target indicators. Therefore, it is important to bear in mind the change of data scope of formal education due to the change in the definition.

### Box 1 The classification of adult education proposed by the CLA 2016

The classification proposed in the CLA is based on three broad categories: formal education and training (FED), non-formal education and training (NFE) and informal learning (INF). The conceptual definitions of these three categories are as follows:

**Formal education** is defined as ‘education that is institutionalised, intentional and planned through public organisations and recognised private bodies, and – in their totality – constitute the formal education system of a country. Formal education programmes are thus recognised as such by the relevant national education or equivalent authorities, e.g. any other institution in cooperation with the national or sub-national education authorities. Formal education consists mostly of initial education [...]. Vocational education, special needs education and some parts of adult education are often recognised as being part of the formal education system. Qualifications from formal education are by definition recognised and, therefore, are within the scope of ISCED. Institutionalised education occurs when an organisation provides structured educational arrangements, such as student-teacher relationships and/or interactions, that are specially designed for education and learning’. There is a clear hierarchy of qualifications granted by ISCED levels up to post-secondary non-tertiary education programmes (level 4). For tertiary education (levels 5 to 8), the pathways can be more complex.

**Non-formal education** is defined as ‘education that is institutionalised, intentional and planned by an education provider. The defining characteristic of non-formal education is that it is an addition, alternative and/or complement to formal education within the process of lifelong learning of individuals. It is often provided in order to guarantee the right of access to education for all. It caters to people of all ages but does not necessarily apply a continuous pathway structure; it may be short in duration and/or low-intensity; and it is typically provided in the form of short courses, workshops or seminars. Non-formal education mostly leads to qualifications that are not recognised as formal or equivalent to formal qualifications by the relevant national or sub-national education authorities or to no qualifications at all. Nevertheless, formal, recognised qualifications may be obtained through exclusive participation in specific non-formal education programmes; this often happens when the non-formal programme completes the competencies obtained in another context’.

**Informal learning** is defined as ‘intentional, but it is less organised and less structured ... and may include for example learning events (activities) that occur in the family, in the workplace, and in the daily life of every person, on a self-directed, family-directed or socially-directed basis’

Source: (“International Standard Classification of Education,” n.d.)

Figure 1 outlines the approach to specifying different types of learning.

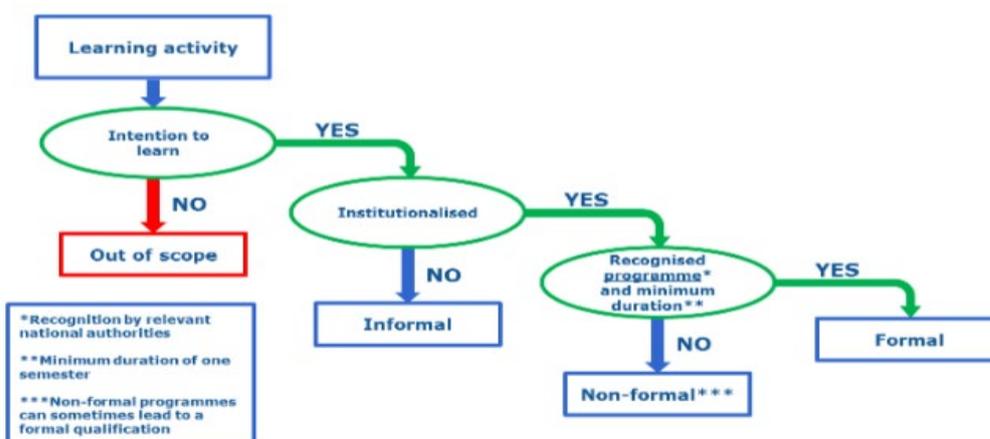


Figure 1 Classification of learning activities based on the three broad categories

Source: (“Classification of learning activities (CLA) Manual,” 2016)

Table 3 presents the list of activities that each type of learning refers to. In the following, this classification is used to analyse the surveys on adult education and to analyse their comparability by types of learning.

<b>Codes</b>	<b>Broad categories / classes / sub-classes</b>
<b>1.</b>	<b>Formal education</b>
<b>2.</b>	<b>Non-formal education</b>
2.1.	Non-formal programmes
2.2.	Courses
2.2.1.	<i>Courses conducted via classroom instruction (including lectures)</i>
2.2.2.	<i>Combined theoretical-practical courses (including workshops)</i>
2.2.3.	<i>Courses conducted through open and distance education</i>
2.2.4.	<i>Private tuition (private lessons)</i>
2.3.	Guided-on-the-job training
2.4.	Other not specified elsewhere
<b>3.</b>	<b>Informal learning</b>
3.1.	Taught learning
3.1.1.	<i>Coaching / Informal tuition</i>
3.1.2.	<i>Guided visits</i>
3.2.	Non-taught learning
3.2.1.	<i>Self-learning</i>
3.2.2.	<i>Learning group</i>
3.2.3.	<i>Practice</i>
3.2.4.	<i>Non-guided visits</i>

*Table 3 Classification of learning activities 2016*

Source: ("Classification of learning activities (CLA) Manual," 2016)

Table 4 compares how formal, non-formal and informal learning is conceptualised in the different surveys on adult education.

	Formal (courses/ programmes)	Non-formal			Informal
		Courses	Guided-on- the job training	Other not specified elsewhere	
LFS	Individual CVT and employer-provided programmes; taught programmes within national education or equivalent authorities and one semester/6 months length	Individual CVT and employer-provided programmes; taught courses, private tutoring		Some differences in various countries, including e.g. attendance at workshops, or on-the-job learning	Not included
AES	Courses/programmes within national education or equivalent authorities and one semester/6 months length	Individual CVT and employer-provided programmes; taught courses; private lessons	Guided on the job training	Attendance at workshops or seminars	Not included
CVTS	Courses not differentiated into formal/non-formal; internal/external courses only;		guided-on-the-job training;	job rotation, exchanges, secondments or study visits; conferences, workshops, trade fairs and lectures;	learning or quality circles; self-directed learning/e-learning
EWCS	Generally defined – any training		Defined as On-the-job training (co-workers, supervisors)		Other training
PIAAC	Generally defined – training and courses		on-the-job training	seminars or workshops; courses or private lessons training by supervisors or co-workers;	Learning from doing Learning from colleagues
ESJS	Generally defined and types are work-based, classroom based and online		On-the-job training		interacting with colleagues at work; learned at work through trial and error; learned by yourself (e.g. with the aid of manuals, books, videos or on-line materials)

*Table 4 Defining the types of adult education in different surveys - Formal, non-formal and informal learning (own work)*

The 2016 versions of LFS and AES define these types of adult education according to CLA 2016, while previous survey waves were in accordance with CLA 2006. Despite the common definition of CLA, definition of non-formal education is varied by country in LFS (“EU Labour Force Survey Database User Guide,” 2018). LFS data on non-formal education does not cover guided on-the-job training while AES data does so. Moreover, AES and LFS involve different surveys designs: while LFS makes of proxies in the collection of data, AES hardly does so.

CVTS, EWCS, PIAAC and ESJS do not separate by formal and non-formal education. According to CLA as outlined in Table 3, non-formal education refers to a variety of courses and guided-on-the job trainings as well as other non-specified forms of education. In light of the different types of courses covered by non-formal training making comparisons between these surveys is not possible. CVTS, EWCS, PIAAC and ESJS include information on informal learning defined as purposeful learning from colleagues, learning from doing, etc. Nonetheless, due to differences the understanding of informal learning, comparisons between surveys are not possible.

To conclude, this part of the paper has provided a general comparison of the surveys on adult education by form, reference periods, units of analysis, age of respondents, as well as concepts and types of learning. This analysis revealed significant differences to be considered both in comparing different surveys as well as different waves of the same survey.

## 1.2. Cross-validation of indicators in different statistics on adult education (LFS, CVTS, PIAAC and AES)

The following section of the paper examines the comparability of the different surveys as well as trends within the same survey across different years. There are several strategies to assess the coherence of statistical survey results. These trends are compared with respect to LFS, AES, CVTS, ECWS and PIAAC. While ESJS also provides data on participation, it is not selected for analysis as it has only been conducted once and, more importantly, its set of survey questions is not comparable to those of the other surveys. In a first step, the results between different waves of the same survey are assessed. In a second step, differences in participation rates between the different surveys are assessed.

In Table 5 and Table 6 participation rates in lifelong learning for the employed according to LFS (4-weeks reference period) are compared to the participation rates according to AES (12-months reference period), CVTS (calendar year as reference period), EWCS (12 months reference period), and PIAAC data (12-months reference period). The country rates are presented in both time series and cross-sectional form to analyse the time trend and to allow for comparison with other surveys. The analysis is focused on the extent of changes over the years of the surveys and compares whether these trends are reflected in other surveys. To make a comparison between different surveys “the trend sign” is of importance. It is defined as slow at changes of +/- 10%, moderate at changes of +/- 25% and high at changes of more than 25%.

Regarding AES data, given the status of AES1 as a pilot, cross-period comparability should be not far-reaching. For the AES1 deviations from common standards have been more numerous and severe than for other waves, the analysis is limited to the last two survey waves AES2 (2011) and AES3 (2016). The observed effect is particularly strong in Hungary, where data for AES1 are not comparable with the results of the other countries and the results for AES2 for Hungary. Comparing the last two waves (2011 and 2016) reveals low changes in a number of countries (BG, FI, LT, MT, NL, NO, PL, PT, CH), moderate changes in others (AT, BE, CY, CZ, IT, SI, SK, UK), a decreasing trend in some counties (EE, RO, SE) high increases in training participation in EL, FR, LV and a high decrease is in LU.

In terms of LFS data, the years 2006, 2011, and 2016 are considered in the analysis. It shows that from LFS 2006 to LFS 2011, slow changes are found in participation rates for AT, CY, DE, DK, ES, FI, MT, NL, NO, SI, SK, while moderate increases are observed in LT and RO, moderate decreases in BE, FR, IE, IT, LV and PL, high increases for CZ, EE, EL, LU, PT, SE and CH, and high decreases for BG, HU, UK and HR. Comparing the LFS waves of 2011 and 2016, countries that record slow changes are AT, BE, DE, FI, MT, NL, NO, CH, while moderate increases are observed in LU, LV and SE, moderate decreases in CY, DK, ES, IE, PL, PT, RO

and UK, high increases in BG, EE, EL, FR, HU, IT and HR, and high decreases in CZ, SI and SK. Considering an entire decade of observation by comparing the LFS waves of 2006 and 2016, countries may be grouped by those that show a stable and sharp increase in participation (AT, DE, FI, MT, NL, NO, SE, CH, EE, EL, LU) and those that show a gradual decrease (BE, CY, ES, IE, PL, SK, UK) and fluctuations, i.e. sharp increases followed by sharp decreases (BG, CZ, FR, HU, IT, PT, RO, SI, HR).

With regard to CVTS data, comparing CVTS3 (2005) and CVTS4 (2010) reveals slow changes in countries AT, CZ, DK, FI, FR, LU, RO, SE and UK, moderate positive changes in CY, EE, EL, HU, IT, MT, NL and SK, and moderate decreases in SI, while high increases are observed in BE, BG, DE, ES, LT, LV, NO, PL and PT. None of the surveyed countries record a high decrease in participation throughout the two survey waves. In the comparison of CVTS4 (2010) and CVTS5 (2015) slow changes are observed in BE, CY, DE, DK, EE, FI, FR, HU, MT, NL and UK, moderate increases in BG, EL, ES, LU, LV, NO, PL and PT, while moderate and sharp decreases in participation rates are not observed in the two survey waves. Analysing the last three waves of CVTS (2005, 2010 and 2015) reveals an overall increase in participation across countries; only the UK records decreases. Fluctuations between the survey waves are observed in CY, DE and SI, and high increases over time in BG, CZ, ES, IT, LT, LV, NO, PT and SK.

Regarding EWCS data, comparing the survey waves of 2005 and 2010 reveals slow changes in participation in AT, BE, EL, FI, FR, LT, LU, MT, NO, SE, SK and HR, moderate increases in DK, EE, IE, PL and UK, and high increases in BG, CY, CZ, DE, ES, HU, IT, LV, NL, PT, RO and SI. None of the countries record any decreases in participation. In terms of changes between EWCS 2010 to EWCS 2015, slow changes are observed in AT, ES, FI, HU, NL, NO, PL, PT, SE and SI, moderate increases in CZ, DE, IT, LV and RO, moderate decreases in CY and DK, and high increases in BE, BG, EE, FR, IE, LT, LU, MT, SK and HR, while no country records a high decrease in participation. Between the waves of 2005 and 2015, BE, CY, DK, EL, HU, LU, MT, SI and HR show fluctuations in participation, i.e. both increases and decreases, while only Sweden records a decrease in participation, and BG, CZ, DE, EE, ES, FR, IE, IT, LT, LV, NL, NO, PL, RO and SK record steadily increasing participation.

Thus far, PIAAC data are available for only wave; therefore, the analysis is limited to a descriptive assessment, while no trend analysis is possible. Overall, participation rate are high among the surveyed countries (between 35% and 67%) with the exception of Italy (25%). The highest scoring countries are Nordic countries and the Netherland, recording participation rates of 65-67%.

In comparing the AES and LFS surveys, this paper is focused on the changes between AES2 and AES3 (since AES1 is not representative as explained above) as well as changes between the LFS waves of 2011 and 2016. Both AES and LFS data reveal high positive increases in a number of countries: Greece (43% and 74% increases in AES and LFS data respectively), Hungary (36% and 169% respectively), Italy (17% and 65% respectively), Latvia (47% and 23% respectively) while other countries show stable positive changes of 1-10% in both surveys (Malta, the Netherlands, Norway and Switzerland), while negative trends in both surveys are found in Romania (-13% and -28% respectively) and Lithuania (-2% and -7% respectively). Furthermore, for some countries, AES and LFS data report differences in trends of participation rates: Cyprus (14% increase in AES data; 20% decrease in LFS data), Czech Republic (24% increase in AES data; 27% decrease in LFS data), Estonia (12% decrease in AES data; 28% increase in LFS data), Spain (15% increase in AES data; 15% decrease in LFS data), Luxemburg (31% decrease in AES data; 23% increase in LFS data), Poland (5% increase in AES data; 22% decrease in LFS data), Portugal (4% increase in AES data; 15% decrease in LFS data), Sweden (11% decrease in AES data; 18% increase in LFS data), Slovenia (27% increase in AES data; 32% increase in LFS data) and the United Kingdom (46% increase in AES data; 11% decrease in LFS data).

This section compares changes between the data of AES2 (2011) and AES3 (2016) and CTVS4 (2010) and CVTS5 (2015). The reference period of these surveys is twelve months respectively. Hence, more data on participation are included and, consequently, similar tendencies are expected. Most countries showed similar trends in participation rates: Austria (24% and 37% increase in AES and CVTS data respectively), Czech Republic (24% and 38% increase respectively), Greece (43% and 13% increase respectively), Spain (15% increase in both surveys), Italy (17% and 28% increase respectively), Malta (1% and 0% increase respectively), the Netherlands (7% and 8% increase respectively) and Slovenia (27% and 35% increase respectively). A number of other countries show positive trends in both surveys but at a different pace: Belgium (20% and 4% increase in AES and CVTS data respectively), Hungary (36% and 2% increase respectively), Latvia (47% and 12% respectively), Norway (0% and 19% increase respectively), Poland (5% and 22% increase respectively), Portugal (4% and 16% respectively). Furthermore, for some countries, AES and LFS data show contradicting trends: Bulgaria (5 decrease in AES data; 20% increase in CVTS data), Cyprus (14% increase in AES data; 10% decrease in CVTS data), Germany (4% increase in AES data; 4% decrease in CVTS data), Estonia (12% decrease in AES data; 4% increase in CVTS data), Finland (3% decrease in AES data; 9% increase in CVTS data), Lithuania (2% decrease in AES data; 38% increase in CVTS data), Luxemburg (31% decrease in AES data; 21% increase in CVTS data), Romania (13% decrease in AES data; 20% increase in CVTS data), Sweden (11% decrease in AES data; 11% increase in CVTS data) and the United Kingdom (46% increase in AES data; 1% decrease in CVTS data).

Next, the changes between the AES waves of 2011 and 2016 are compared to those between the EWCS waves of 2010 and 2015. Again, the reference period covers twelve months. The data show similar trends in participation rates for a number of countries: Belgium (20% and 34% increase in AES and EWCS data respectively), Czech Republic (24% and 14% increase respectively), Spain (15% and 10% increase respectively), Italy (17% and 18% increase respectively), Luxemburg (31% and 46% increase respectively), the Netherlands (8% and 7% increase respectively), Poland (5% and 9% increase respectively), Portugal (4% and 0% increase respectively) and Sweden (11% and 4% decrease respectively). For other countries, the data of the two surveys show trends in the same direction but at a different pace: Austria (24% and 4% increase in AES and EWCS data respectively), Germany (4% and 13% increase respectively), Latvia (47% and 16% increase respectively), Malta (1% and 27% increase respectively), Slovakia (11% and 35% increase respectively), while yet other countries show contradicting trends: Bulgaria (5% decrease in AES data; 79% increase in EWCS data), Cyprus (14% increase in AES data; 21% decrease in EWCS data), Estonia (12% decrease in AES data; 38% increase in EWCS data), Greece (43% increase in AES data; 32% decrease in EWCS data), Finland (3% decrease in AES data; 10% increase in EWCS data), Hungary (36% increase in AES data; 9% decrease in EWCS data), Lithuania (2% decrease in AES data; 53% increase in EWCS), Norway (no change in AES data; 10% increase in EWCS data), Romania (13% decrease in AES data; 18% increase in EWCS data) and Slovenia (27% increase in AES data; 6% decrease in EWCS data).

Overall, different waves of the same surveys show different variations in the rates of participation in adult education. Generally, LFS reports lower participation rates, while other datasets show relatively higher scores. Furthermore, drawing comparisons between the different surveys reveals that, overall, CVTS and EWCS data show mainly increases in participation rates for most countries, while other surveys such as LFS and AES) show fluctuations over time.

In this context, it must be kept in mind that the different surveys involve different sampling methodologies and participating countries. LFS is a registry-based survey, while other surveys take a survey-based form, of which there are various types. For example, EWCS uses a quota sampling approach. In PIAAC, the sampling frames used by participating countries include three broad types: population

registers, master samples and area frames. Additionally, these surveys use different modes of data collection. AES, ESJS use mixed modes with varying degrees of usage of CAPI, PAPI, CAWI or others, while EWCS and PIAAC only use the face-to-face mode of surveying. There is also a gap of fieldwork periods – between and within surveyed countries alike. Based on these differences it is not possible to determine the extent to which the differences in participation rates are due to the factors of sampling, mode, fieldwork period and possible translation issues and general quality assurance during the surveys. The following part of this papers provides a more detailed analysis of the AES survey methodology.

GEO/TIME		AES-1	AES-2	AES-3	AES1 to AES2		AES2 to AES3		LFS-2006	LFS-2011	LFS-2016	LFS-2006 to LFS-2011		LFS-2011 to LFS-2016	
		2007	2011	2016	Change 2007 to 2011		Change 2011 to 2016		2006	2011	2016	Change 2006 to 2011		Change 2011 to 2016	
AT	Austria	41.9	48.2	59.9	15%	↑	24%	↑	14.7	14.5	15.8	-1%	↔	9%	↔
BE	Belgium	40.5	37.7	45.2	-7%	↔	20%	↑	8.5	7.5	6.8	-12%	↓	-9%	↔
BG	Bulgaria	36.4	26	24.6	-29%	↓↓	-5%	↔	1.5	1.1	1.7	-27%	↓↓	55%	↑↑
CY	Cyprus	40.6	42.3	48.1	4%	↔	14%	↑	9.5	9	7.2	-5%	↔	-20%	↓
CZ	Czech Republic	37.6	37.1	46.1	-1%	↔	24%	↑	6.6	14.1	10.3	114%	↑↑	-27%	↓↓
DE	Germany	45.4	50.2	52	11%	↑	4%	↔	7.6	7.8	8.2	3%	↔	5%	↔
DK	Denmark	44.5	58.5	:	31%	↑↑			30.6	33.6	27.8	10%	↔	-17%	↓
EE	Estonia	42.1	49.9	44	19%	↑	-12%	↓	7.2	13.7	17.5	90%	↑↑	28%	↑↑
EL	Greece	14.5	11.7	16.7	-19%	↓	43%	↑↑	2	2.7	4.7	35%	↑↑	74%	↑↑
ES	Spain	30.9	37.7	43.4	22%	↑	15%	↑	11.7	12	10.2	3%	↔	-15%	↓
FI	Finland	55	55.7	54.1	1%	↔	-3%	↔	26.7	27	29.2	1%	↔	8%	↔
FR	France	34.9	50.5	:	45%	↑↑			7.1	6.1	21.5	-14%	↓	252%	↑↑
HU	Hungary	9	41.1	55.7	357%	↑↑	36%	↑↑	4.3	2.9	7.8	-33%	↓↓	169%	↑↑
IE	Ireland	:	24.4	:					8.2	6.8	5.5	-17%	↓	-19%	↓
IT	Italy	22.2	35.6	41.5	60%	↑↑	17%	↑	6.2	5.5	9.1	-11%	↓	65%	↑↑
LT	Lithuania	33.9	28.5	27.9	-16%	↓	-2%	↔	6.1	7.4	6.9	21%	↑	-7%	↔
LU	Luxembourg	:	70.1	48.1			-31%	↓↓	9	15.1	18.6	68%	↑↑	23%	↑
LV	Latvia	32.7	32.3	47.5	-1%	↔	47%	↑↑	8.2	6.4	7.9	-22%	↓	23%	↑
MT	Malta	33.7	35.9	36.3	7%	↔	1%	↔	8	8.8	9.5	10%	↔	8%	↔
NL	Netherlands	44.6	59.3	64.1	33%	↑↑	8%	↔	18.3	19.7	21.6	8%	↔	10%	↔
NO	Norway	54.6	60	60	10%	↔	0%	↔	20.3	19.5	20.6	-4%	↔	6%	↔
PL	Poland	21.8	24.2	25.5	11%	↑	5%	↔	6.9	5.9	4.6	-14%	↓	-22%	↓
PT	Portugal	26.4	44.4	46.1	68%	↑↑	4%	↔	3.8	12.3	10.4	224%	↑↑	-15%	↓
RO	Romania	7.4	8	7	8%	↔	-13%	↓	1.6	1.8	1.3	13%	↑	-28%	↓
SE	Sweden	73.4	71.8	63.8	-2%	↔	-11%	↓	18.3	25	29.6	37%	↑↑	18%	↑
SI	Slovenia	40.6	36.2	46.1	-11%	↓	27%	↑	17.5	19.2	13.5	10%	↔	-30%	↓↓
SK	Slovakia	44	41.6	46.1	-5%	↔	11%	↑	5.2	4.7	3.2	-10%	↔	-32%	↓↓

UK	United Kingdom	49.3	35.8	52.1	-27%	↓↓	46%	↑	29.9	18.9	16.8	-37%	↓↓	-11%	↓
CH	Switzerland	48.7	65.5	69.1	34%	↑↑	5%	↔	25	32.6	34.7	30%	↑↑	6%	↔
HR	Croatia	21.2	:	31.8					3.5	2.2	2.9	-37%	↓↓	32%	↑↑

*Table 5 Overall comparison between surveys and within survey years (LFS, AES, CVTS, EWCS, PIAAC) - 1*

Trends: ↔ +/- less than 10%; ↑ +10% to below 25%; ↑↑ more than 25%; ↓ -10% below -25%; ↓↓ -25% and more

Source: Participation rate in education and training by sex [trng\_aes\_100]; Participation rate in education and training (last 4 weeks) by sex, age and occupation [trng\_lfs\_04] for age - From 25 to 64 years; Participants in CVT courses by sex and size class - % of persons employed in all enterprises [trng\_cvt\_12s]

\*Not sufficient information for countries: Former Yugoslav Republic of Macedonia, Bosnia and Herzegovina, Serbia

GEO/TIME		CVTS-3	CVTS-4	CVTS-5	CVTS-3 to CVTS-4		CVTS-4 to CVTS-5		EWCS-2005	EWCS-2010	EWCS-2015	EWCS-2005 to EWCS-2010		EWCS-2010 to EWCS-2015		PIAAC 2012
		2005	2010	2015	Change 2005 to 2010	Change 2010 to 2015	2005	2010	2015	Change 2007 to 2011		Change 2011 to 2016				
AT	Austria	33.3	33.2	45.4	0%	↔	37%	↑↑	37%	41%	44%	9%	↔	8%	↔	49%
BE	Belgium	39.9	51.8	53.9	30%	↑↑	4%	↔	40%	37%	49%	-10%	↔	34%	↑↑	48%
BG	Bulgaria	14.8	22	26.5	49%	↑↑	20%	↑	8%	9%	17%	26%	↑↑	79%	↑↑	
CY	Cyprus	30.4	36.7	33.2	21%	↑	-10%	↔	19%	28%	22%	47%	↑↑	-21%	↓	38%
CZ	Czech Republic	58.7	60.8	83.7	4%	↔	38%	↑↑	27%	46%	53%	73%	↑↑	14%	↑	49%
DE	Germany	30.3	39.5	38.1	30%	↑↑	-4%	↔	25%	37%	41%	45%	↑↑	13%	↑	54%
DK	Denmark	34.6	37.1	34.6	7%	↔	-7%	↔	36%	44%	38%	21%	↑	-14%	↓	67%
EE	Estonia	24.4	30.6	31.9	25%	↑	4%	↔	30%	37%	51%	23%	↑	38%	↑↑	53%
EL	Greece	13.6	16.3	18.5	20%	↑	13%	↑	13%	14%	9%	6%	↔	-32%	↓↓	
ES	Spain	33.3	48.3	55.4	45%	↑↑	15%	↑	19%	31%	34%	64%	↑↑	10%	↔	47%
FI	Finland	39.2	40.2	43.8	3%	↔	9%	↔	53%	51%	56%	-3%	↔	10%	↔	66%
FR	France	45.5	45.4	48.3	0%	↔	6%	↔	24%	25%	42%	3%	↔	69%	↑↑	36%
HU	Hungary	16	19	19.4	19%	↑	2%	↔	16%	27%	24%	69%	↑↑	-9%	↔	
IE	Ireland	48.7	:	49.7					37%	42%	54%	12%	↑	29%	↑↑	
IT	Italy	28.8	36	45.9	25%	↑	28%	↑↑	17%	26%	31%	54%	↑↑	18%	↑	24%
LT	Lithuania	14.6	18.6	25.6	27%	↑↑	38%	↑↑	23%	24%	36%	4%	↔	53%	↑↑	
LU	Luxembourg	49.1	51.1	61.8	4%	↔	21%	↑	38%	34%	50%	-9%	↔	46%	↑↑	
LV	Latvia	14.7	24.2	27.2	65%	↑↑	12%	↑	22%	29%	34%	31%	↑↑	16%	↑	
MT	Malta	31.8	35.8	35.8	13%	↑	0%	↔	33%	32%	41%	-4%	↔	27%	↑↑	
NL	Netherlands	34.1	38.6	41.4	13%	↑	7%	↔	32%	49%	52%	55%	↑↑	7%	↔	65%
NO	Norway	29	45.8	54.3	58%	↑↑	19%	↑	43%	47%	52%	10%	↔	10%	↔	65%
PL	Poland	20.6	30.5	37.1	48%	↑↑	22%	↑	26%	33%	36%	25%	↑	9%	↔	35%
PT	Portugal	28.1	39.8	46.3	42%	↑↑	16%	↑	15%	28%	28%	87%	↑↑	0%	↔	
RO	Romania	17.4	17.8	21.3	2%	↔	20%	↑	11%	18%	21%	66%	↑↑	18%	↑	
SE	Sweden	46.1	47.1	52.2	2%	↔	11%	↑	51%	49%	47%	-5%	↔	-4%	↔	65%
SI	Slovenia	49.5	43.1	58.3	-13%	↓	35%	↑↑	38%	48%	45%	28%	↑↑	-6%	↔	
SK	Slovakia	38	43.6	56.8	15%	↑	30%	↑↑	34%	36%	49%	6%	↔	35%	↑↑	

UK	United Kingdom	32.6	30.6	30.4	-6%	↔	-1%	↔	39%	45%		16%	↑		□	56%
CH	Switzerland					□		□	45%		35%				□	
HR	Croatia		22.5	28.7			28%	↑↑	23%	21%	27%	-9%	↔	30%	↑↑	

*Table 6 Overall comparison between surveys and within survey years (LFS, AES, CVTS, EWCS, PIAAC) – 2*

Trends: ↔ +/- less than 10%; ↑ +10% to below 25%; ↑↑ more than 25%; ↓ -10% below -25%; ↓↓ -25% and more

Source: Eurostat - Participants in CVT courses by sex and size class - % of persons employed in all enterprises [trng\_cvt\_12s]; EWCS – data from survey – Q28a\_1 for 2005, Q61a for 2010, Q65a for 2015; PIAAC data - % of people aged 16 to 65 who participated in adult education programs and courses in the 12 months preceding the survey (youth 16-24 in initial cycle of formal studies excluded). - analysis from (Desjardins & Richard, 2015). \*Not sufficient information for countries: Former Yugoslav Republic of Macedonia, Bosnia and Herzegovina, Serbia

The cross-survey analysis of the given surveys presents a challenge to combine, and the above analysis of trends in the rates of participation in adult education shows considerable discrepancies with respect to some countries. Furthermore, differences in the methodological approach taken by the different surveys must be taken into consideration. Nonetheless, taking a holistic look at the state of adult education in Europe by means of the different surveys may provide further insights about various aspects of further education and help to make evidence-based recommendations.

Figure 3 presents the results of the surveys by comparison and draws a very heterogeneous picture. Starting with AES data, the only country that reaches a share of more than 70% (the blue bars) is Switzerland, followed by Netherlands and Sweden with participation rates of around 65% and Norway and Austria with rates of slightly less than 60%. At the bottom end are Romania with 8% and Greece with slightly more than 15%. The orange bars in the middle present the data on employee participation of the CVTS survey, indicating that the participation rates of employees in company training is in most cases very similar according to EWCS and AES results ( $\pm 5\%$ ). Czech Republic had around 50% participation rates in AES against almost 85% in CVTS, Luxembourg and Slovenia with around 10% differences for CVTS and for countries - Netherlands and Austria, where around 10% difference is for AES data. The results from PIAAC vary across countries, showing high participation rates for the Nordic countries - Denmark, Finland, Norway, Sweden - as well as the Netherlands (around 65%), while Italy shows the lowest rate of participation at around 25%. Overall, the PIAAC data show generally higher participation rates for all countries. Yet, the participation rates across the five indicators vary substantially for all of the countries included in the survey, while the overall pattern remains largely stable, i.e. the higher performing groups according to AES have commonly higher participation rates than the low performing groups. In contrast, the participation rates of the middle group show non-uniform results. Furthermore, countries belonging to the low-performing group display lower participation rates than countries belonging to the medium and high-participation groups. Yet, certain countries such as, for example, Slovakia and Poland show higher participation compared to the medium-level participation group in surveys other than the LFS.

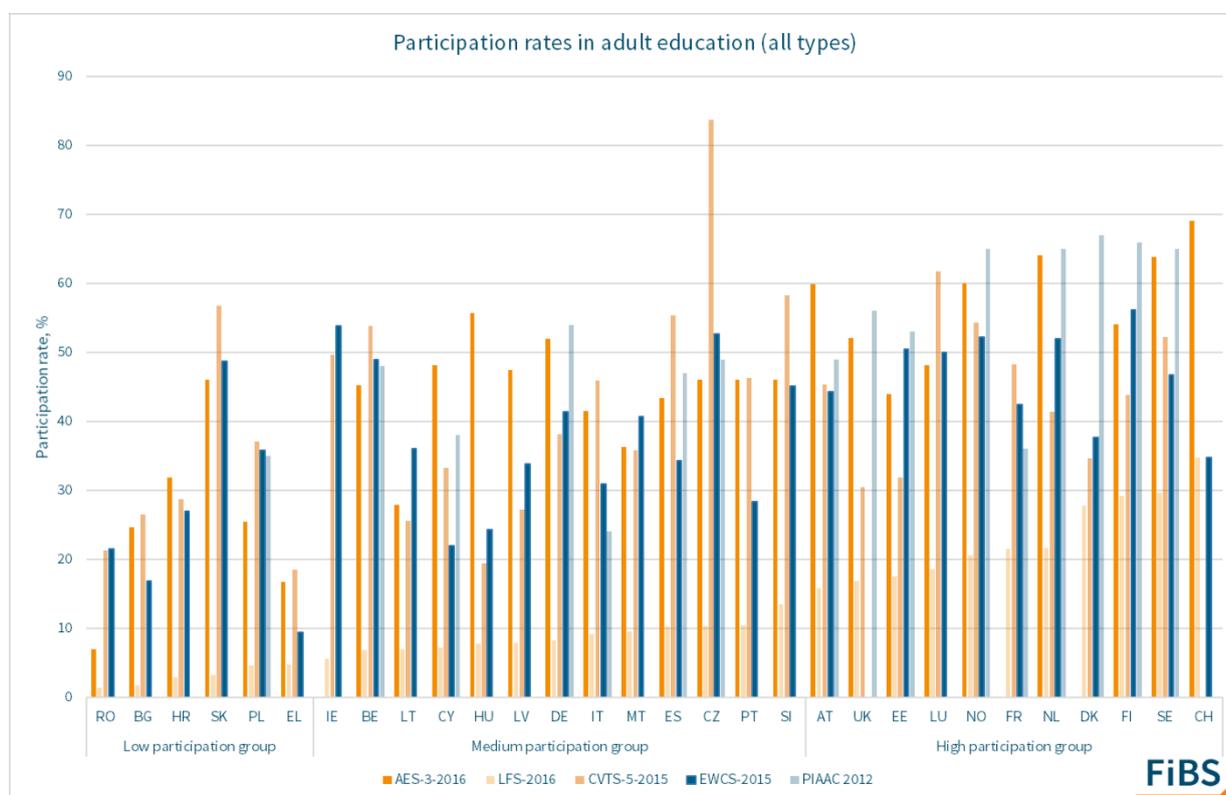


Figure 2 Comparison between participation rates in different surveys

Source: Eurostat, AES-2016, LFS-2016, CVTS 5 -2015; EWCS – 2015, OECD, PIAAC -2012.

### 1.3. Comparability of rankings of the surveys

For more detailed insights about the variation of participation rates and subsequent rankings of countries, in this part of the paper a statistical correlation analysis is conducted. Following the methodology of Goglio and Meroni, the countries included in the surveys are ranked from the highest rate of adult participation to the lowest to allow for the calculation of Kendall ranks correlations (Goglio & Meroni, 2014). The Kendall ranks correlation coefficient is a non-parametric measure of the agreement between two ranks. It takes a value ranging between -1 and 1, where values close to -1 indicate that two measures show no consistency in their ranks, whereas values close to 1 mean that rankings are concordant.

Table 7 presents the results of the rank correlation of the four measures (AES-2, LFS-2011, CVTS-4 and EWCS-2010), which are calculated between countries participating and show the correlations of their position in these surveys. The name of the surveys and number (N) of countries included are given, the pair of the same measures show perfect correlations of 1. Other surveys' correlation shows that there is a positive correlation, meaning that the different surveys seem to rank the countries similarly. If looking at AES-2011 and LFS-2011 country rankings, the correlation is positive and significant at a correlation coefficient of 0,53. The AES-2 country ranking also shows a positive and statistically significant correlation with the rankings of CVTS-4 and EWCS-2010. The correlations coefficients are 0,47 and 0,397 respectively, which indicates lower levels of correlation as compared to AES-2 and LFS-2011. The correlation of CVTS-4 rankings and LFS-2011 and EWCS-2010 rankings are also positive and statistically significant at values of 0,376 and 0,423 respectively. The EWCS-2010 ranking is also strongly and significantly correlated with the LFS-2010 ranking with a coefficient of 0,67.

	AES-2	LFS-2011	CVTS-4	EWCS-2010
AES-2	1	0.532**	0.470**	0.397**
N		29	27	28
LFS-2011		1	0.376**	0.670**
N			28	29
CVTS-4			1	0.423**
N				28

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 7 Kendall's tau Correlations for AES-2, LFS-2011, CVTS-4, EWCS-2010

In Table 8 the correlation coefficients are reported for the next cohort of data. Here we analyse the rankings of AES-3, LFS-2016, CVTS-5, EWCS-2015 and PIAAC-2012. The correlations are more dispersed and show different values across the different set of surveys. The AES-3 survey ranking is strongly correlated with LFS-2016 and PIAAC-2012 at coefficient values of 0,601 and 0,626 respectively, while to a lesser extent with EWCS-2015 at a coefficient value of 0,288. The AES-3 ranks show no significant correlation with CVTS-5. The LFS-2016 survey ranks show a positive and significant correlation with other surveys. The strongest correlation is observed with the AES-3 ranks, followed by the PIAAC ranks (0,55), the EWCS-2015 ranks (0,315) and, finally, with the CVTS-5 ranks (0,276). The CVTS-5 ranks show a strong positive correlation with the EWCS ranks (0,507), and no correlation to the PIAAC ranks. The EWCS-2015 ranks show a positive and statistically significant correlation with the PIAAC ranks at a coefficient value of 0,383. It must be kept in mind, however, that the small sample size of the PIAAC survey may distort the analysis: it covers only 16 or 14 countries depending on pair cases. Consequently, correlations between the PIAAC ranks and those of other surveys are to be treated with caution.

	AES-3	LFS-2016	CVTS-5	EWCS-2015	PIAAC 2012
AES-3		0.601**	0.268	0.288*	0.626**
N		27	26	27	14
LFS-2016			0.276*	0.315*	0.550**
N			29	30	16
CVTS-5				0.507**	-0.083
N				29	16
EWCS-2015					0.383*
N					16

\*\* Correlation is significant at the 0.01 level (2-tailed).  
\* Correlation is significant at the 0.05 level (2-tailed).

Table 8 Kendall's tau Correlations for AES-3, LFS-2016, CVTS-5, EWCS-2015, PIAAC-2012

Table 9 provides an overview of the correlation coefficients by type of training the rankings of AES and LFS waves of 2007, 2011 and 2016. In order to make the datasets more comparable, the AES data is corrected for guided-on-the-job training. With respect to formal education and training, the AES and LFS 2007 waves show a positive and statistically significant correlation of 0,507. Regarding the 2011 and 2016 waves, the correlation coefficients are also statistically significant and take a value of 0,549 and 0,598 respectively. This means over the years the coherence of the surveys show convergence in their country rankings.

Regarding non-formal education and training, the rankings of the AES and LFS 2007 waves show the highest statistically significant correlation and at a value of 0,606. The respective coefficient for 2016 is also positive and statistically significant at 0,587. In 2011 data for non-formal education and training show a negative statistically significant correlation of -0,572, which means that the country rankings of the two surveys diverge.

	AES-Formal 2007			AES-Formal 2011			AES-Formal 2016
LFS -Formal 2007	0.507**		LFS -Formal 2011	0.549**		LFS -Formal 2016	0.598**
N	29		N	30		N	28
	AES -Non- formal - 2007			AES -Non- formal - 2011			AES -Non- formal - 2016
LFS -Non- formal 2007	0.606**		LFS -Non- formal 2011	-0.572**		LFS -Non- formal 2016	0.587**
N	29		N	30		N	28

\*\* Correlation is significant at the 0.01 level (2-tailed).  
\* Correlation is significant at the 0.05 level (2-tailed).

Table 9 Kendall's tau Correlations for formal and non-formal education and training for AES and LFS

To conclude, the method of statistical correlation analysis offers a way of studying the coherence of positioning of countries in different surveys and provides some useful implications for further analysis. According to the results, there a strong positive and statistically significant correlations between AES and LFS data, and - albeit to lesser extend - between AES data and CVTS, EWCS and PIAAC data.

## 2 Patterns of participation in adult learning

To facilitate the presentation of results and to allow for the identification of inherent systematic relationships between indicators and participation rates, countries are grouped into five categories according to their level of participation rates on the basis of AES data for all available years (very low, low, medium, high, very high) (see Figure 3). Clustering is based on k-means clustering, which aims to partition  $n$  observations into  $k$  clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster.

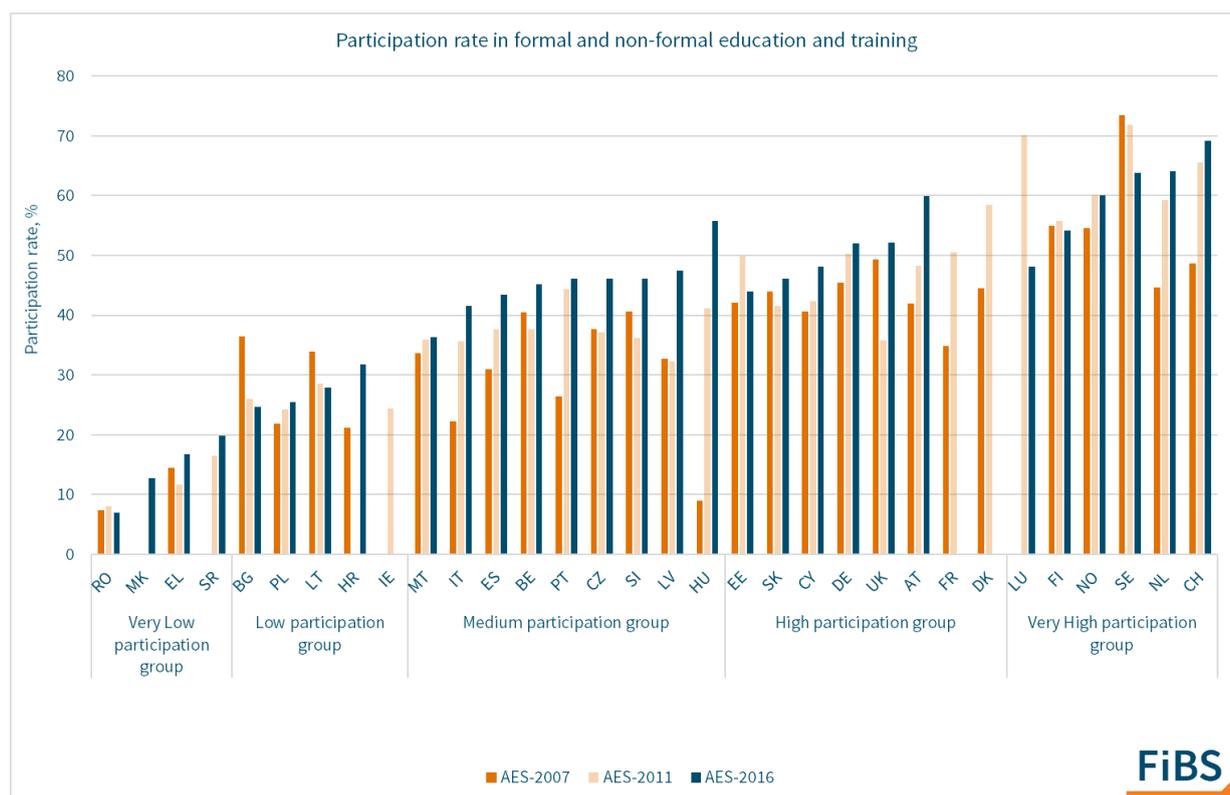
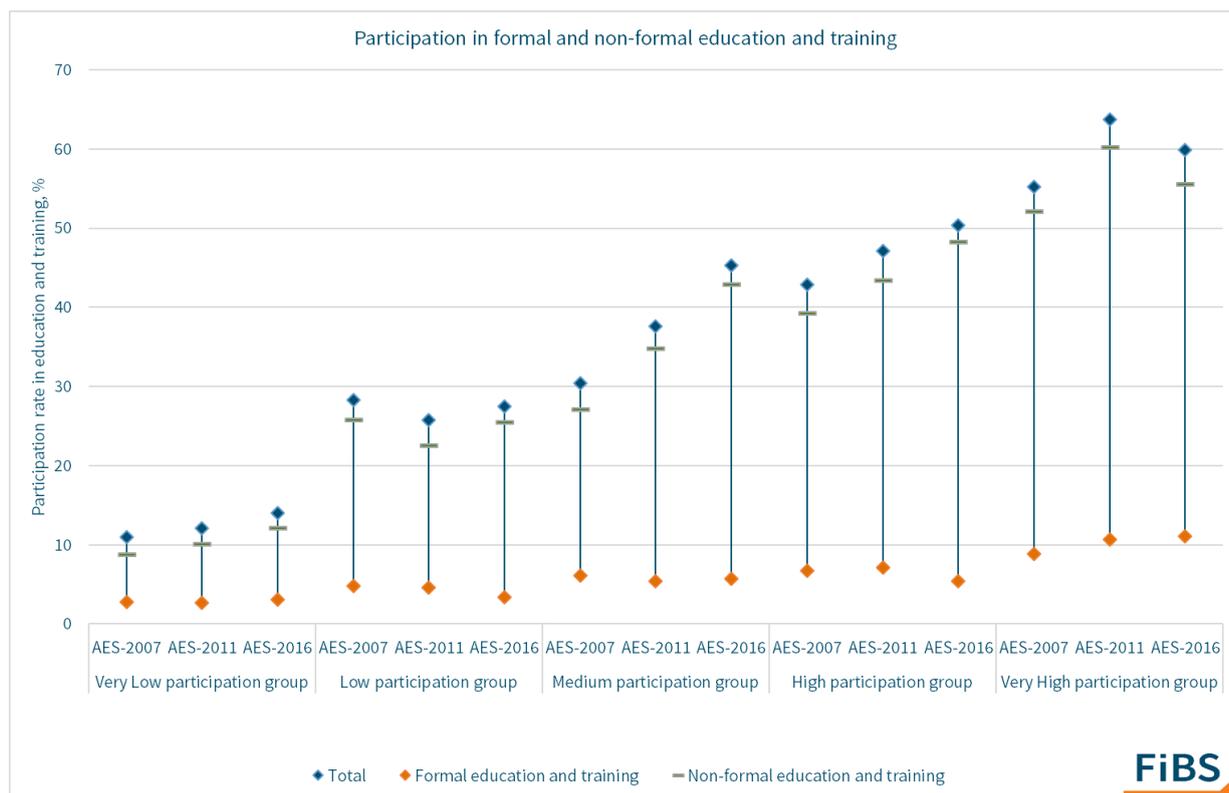


Figure 3 Groups of very low, low, medium, high and very high performing countries for participation in adult learning

Source: Eurostat, Participation rate in Formal and non-formal education and training [trng\_aes\_100]

The group of the top-performing countries in terms of the AES rate of participation in adult learning includes LU, FI, NO, SE, NL and CH. These countries each report participation rates exceeding 50% and are referred to as very high participation group. The high participation group refers to countries with participation rates exceeding 40%, which include EE, SK, CY, DE, UK, AT, FR and DK. The medium participation group includes countries with participation rates between 30-40% such as MT, IT, ES, BE, PT, CZ, SI, LV and HU. Low participation group countries are BG, PL, LT, HR and IE, they have rates around 25%. The very Low participation group includes countries with participation rates of less than 20% such as RO, MK, EL, SR.



*Figure 4 Groups of very low, low, medium, high and very high performing countries for participation in adult learning by type of adult education and its changes over the years*

Source: Eurostat, Participation rate in Formal and non-formal education and training [trng\_aes\_100]

Considering changes in the country composition of the clusters across survey waves, the average value of participation in adult education remains high in the very high participation group, amounting to five to six times that of the very low participation group. The very low, medium, and high participation groups show stable increases in total participation and in non-formal participation rates, while the low participation group shows an increase after the decline in AES-2011, and the very high participation group shows a decrease in the last wave as compared to the previous ones. Participation rates in formal education and training are stable across the three survey waves in both the very low, medium and the very high groups, while there is a decrease in the low and high participation groups.

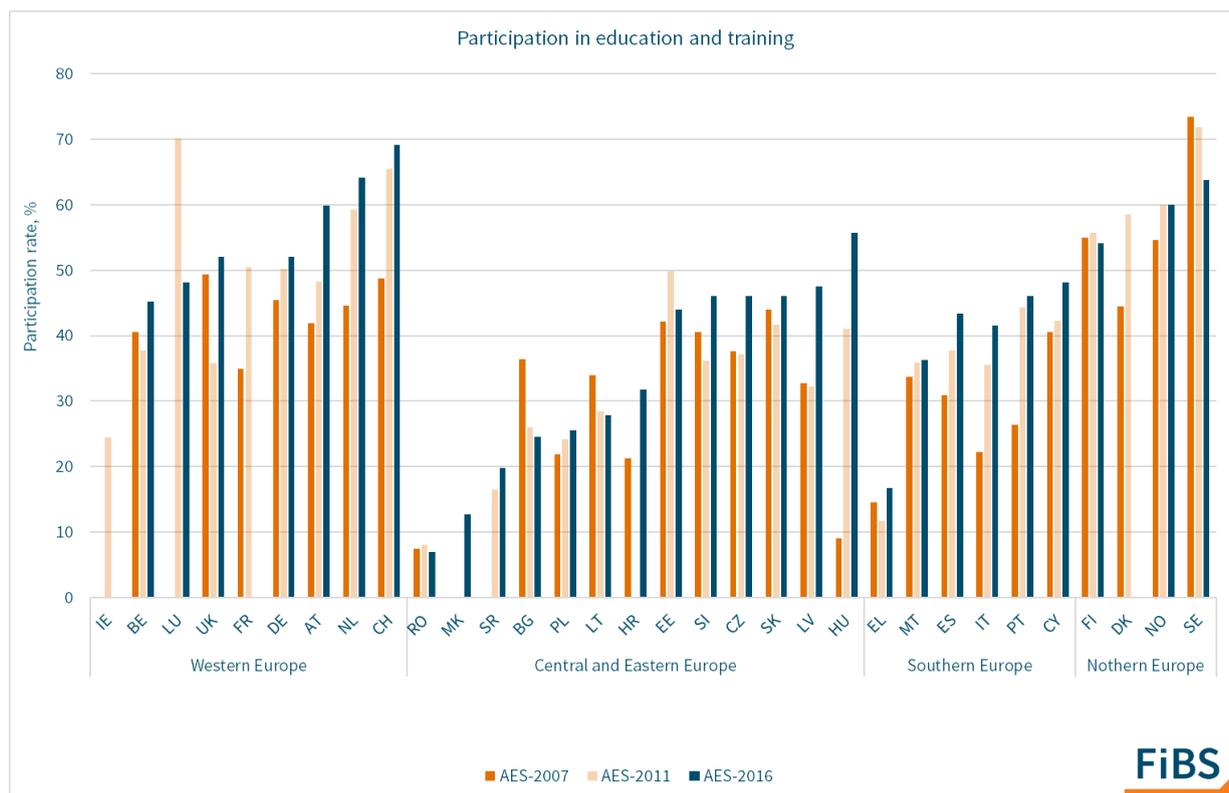


Figure 5 Participation rates in education and training on the basis of data AES-2007, AES-2011, AES-2016.

Source: Eurostat, Participation rate in Formal and non-formal education and training [trng\_aes\_100]

Clustering the surveyed countries by regions shows that the regional disparity seems largely stable across the different survey waves with only some variations within the country groups. Western and Northern European countries score high in participation rates, while Central and Eastern European countries demonstrate lower rates. Southern European countries show lower rates in comparison with the first two groups, but on average perform similarly to the higher performing group in Central and Eastern Europe. Regarding variations within groups, Western and Southern European countries show consistent improvements in participation with the only exception of UK, BE and EL in AES-2011 and LU in AES-2016. With respect to the Northern European countries, FI and NO report stable participation rates, while SE shows a decreasing and DK an increasing participation rate. Central and Eastern Europe countries show increases in their participation rates for most countries with the exception of for BG and LT, where rates are decreasing, as well as SK, SI and EE where rates are slightly fluctuating.

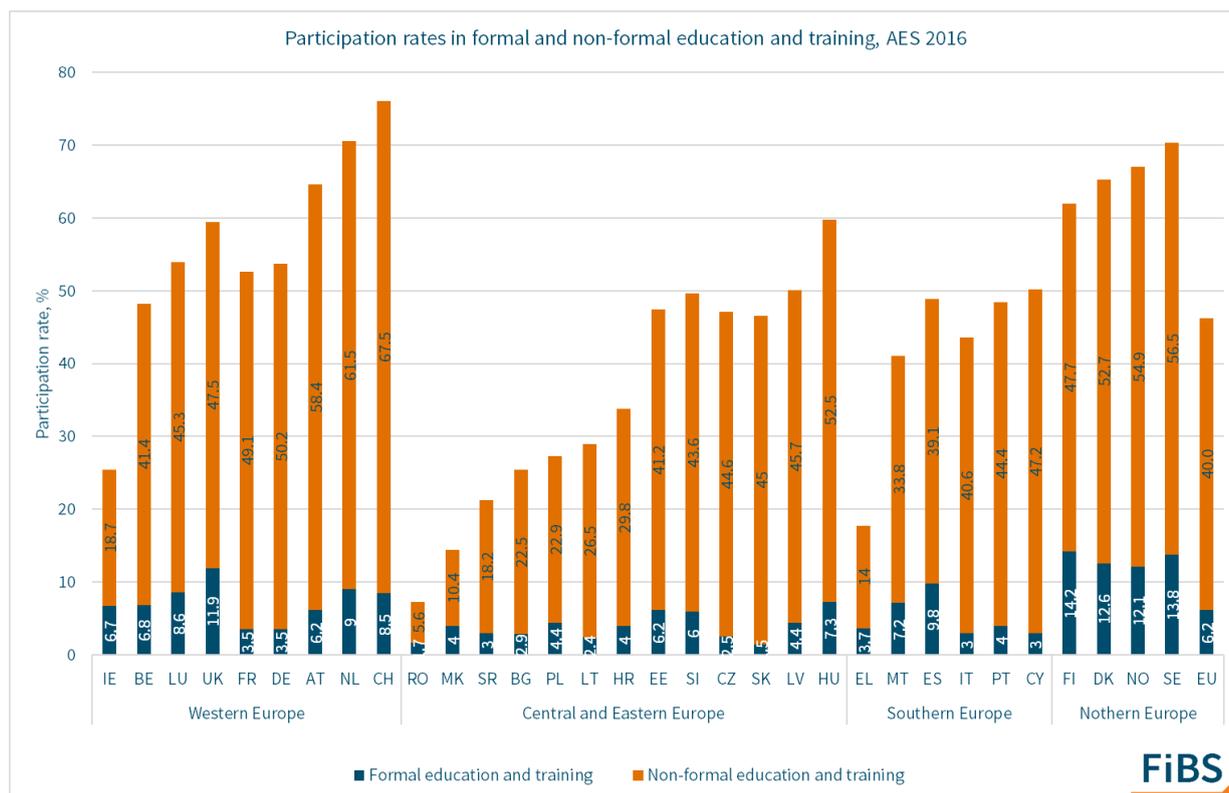


Figure 6 Participation rates in formal and non-formal education and training, AES 2016

Source: Eurostat, Participation rate in Formal and non-formal education and training [trng\_aes\_100]

\*The data on participation on education and training for Denmark, France, and Ireland are taken from AES-2011 data; EU (current composition)

Considering the regional breakdown of the AES 2016 data exclusively shows high participation rates among Western and Northern European countries, while Central and Eastern Europe countries score low in this regard. Northern European countries have the highest participation rates in formal education and training, and similar participation rates as Western Europe with regard to non-formal education and training. Central and Eastern European countries show greater variation among countries included varying between 1.7% and 7.3% with respect to formal education and training and between 5.6% and 52.5% regarding non-formal participation rates. In Southern European countries participation rates range between 40% and 47% with regard to non-formal education, and between 3% and 9,8% regarding formal education.

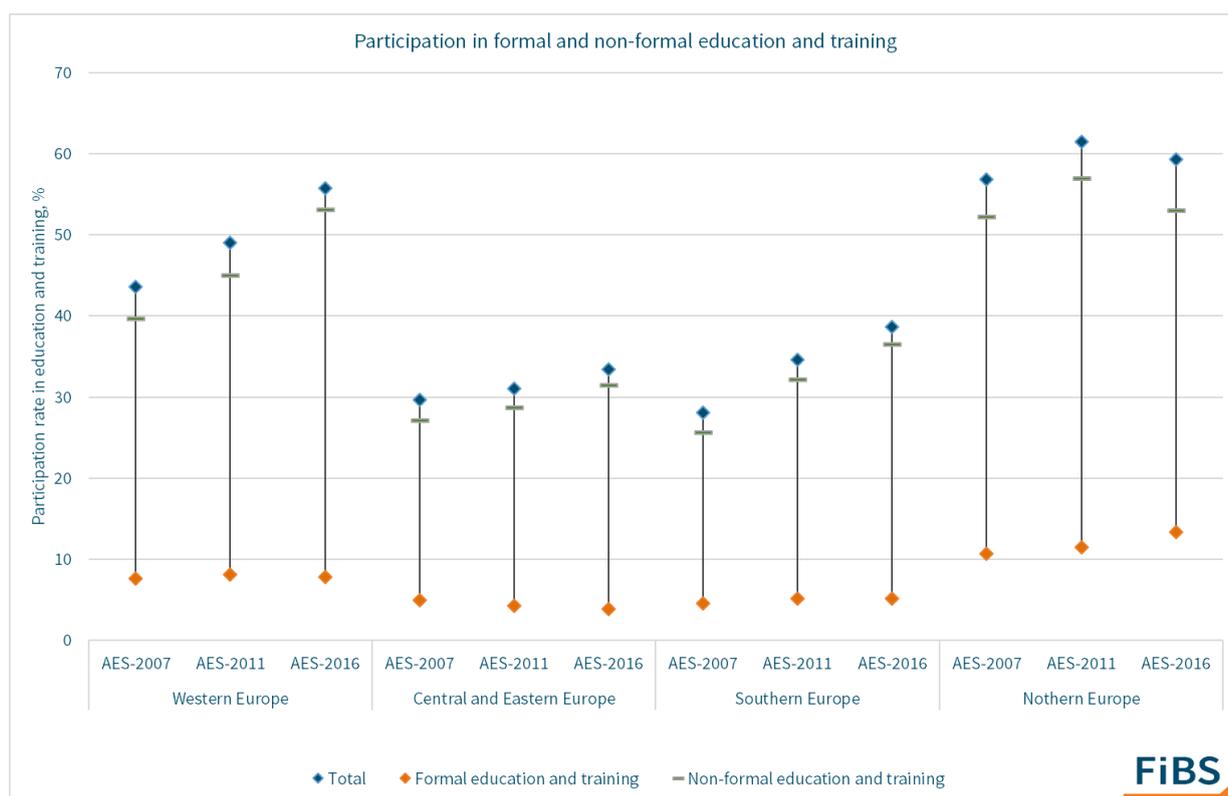


Figure 7 Participation rates in formal and non-formal education and training over the years by regional breakdown

Source: Eurostat, Participation rate in formal and non-formal education and training [trng\_aes\_100]

The regional breakdown of country data across the different survey waves reveals a constant increase in the participation rates regarding overall participation (from 43% to 55%) and participation in non-formal education (from 40% to 53%), while the rate of participation in formal education and training remains stable at around 7.5%. In Central and Eastern Europe countries, the increase in the rate of participation in total and non-formal education appear less steady at increases from 30% to 34% and from 27% to 31% respectively, while the rate of participation in formal education shows a decrease from 5% in AES-2007 to 4% in AES-2016. Southern European countries also show an increase in overall participation less than 30% in AES-2007 to 40% in AES-2016, while the rate of participation in formal education remains stable at around 5%. Northern European countries report a decrease in the rate of overall participation from 62% in AES-2011 to 59% in AES-2016 in non-formal participation from 57% in AES-2011 to 53% in AES-2016, while the rate of participation in formal education and training shows an increase from 10.7% to 13.4%.

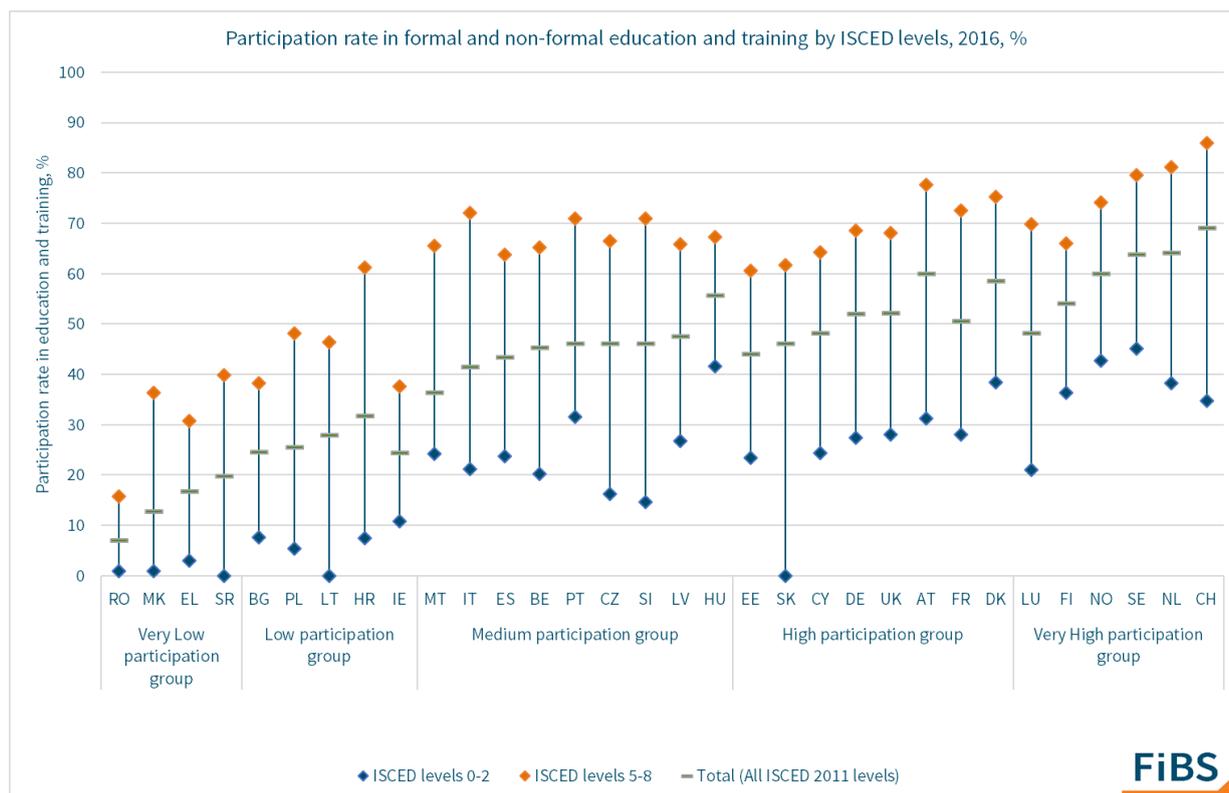


Figure 8 Participation rate in Formal and non-formal education and training by ISCED levels, AES -2016

Source: Eurostat, Participation rate in education and training by educational attainment level [trng\_aes\_102]

Looking at participation rates by educational attainment level, lower educated people show rates of participation that are three times lower compared to higher educated people. In the very low participation group, the participation rates of lower educated people are almost equal to zero, whereas in the low participation group, participation rates for lower educated people are below 10%. In the medium participation group, HU and PT show higher participation rates among lower educated people (40% and 30% respectively). In the high participation group, only SK reports non-participation for lower educated people, while the other countries show rates around 25% to 30% and DK even reports a rate of 40%. The very high participation group shows participation rates among lower educated people to those among higher educated people in the very low and low participation groups. The only exception is LU which shows lower rates of participation among lower educated people. Lower educated people are to be proxied as vulnerable groups and even more likely not to benefit from further education provisions. The reasons for non-participation vary from other groups of educational attainment (Dohmen, 2016).

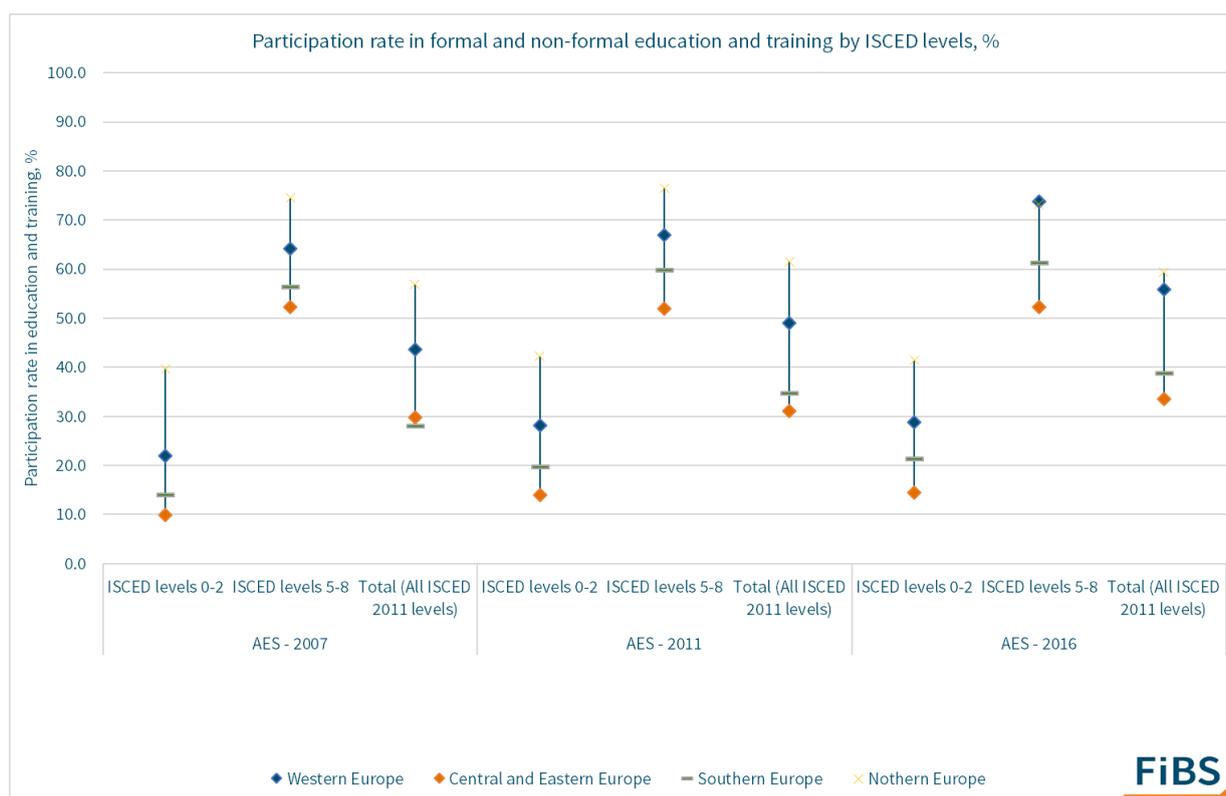


Figure 9 Participation rates in formal and non-formal education and training over the years by regional breakdown

Source: Eurostat, Participation rate in education and training by educational attainment level [trng\_aes\_102]

Across the different survey waves, averages by European regions show stable variations for certain educational attainment groups. Overall, participation in further education among the lower educational attainment group is slightly improving, however, in Central and Eastern Europe countries, these rates are four times lower than in Northern European countries. People with lower education have increased their participation in Central and Eastern Europe (from 10% to 15%), Southern Europe (from 12% to 21%) and Western Europe (from 21% to 29%), while the participation rates in Northern Europe fluctuate around 40% - the highest rate among all regions.

For individuals with tertiary education, Central and Eastern Europe show the lowest participation rates which, on average, did not change between survey waves and remain around 52%. Other regions show increases in participation rates, namely Southern European countries from 55% to 62% and Western European countries from 65% to 75% which is comparable to the rate observed in the Northern European region.

With regard to overall participation, the survey data show a general increase across countries. The rate in Southern Europe was initially slightly lower than in the Central and Eastern European region, and then outperformed the latter, moving gradually from 28% to 38%. Central and Eastern Europe showed a less steep increase from 30% to 34%, while the participation rate in Western European countries increased from 45% in 2007 to 57% in 2016, and Northern European countries showed an increase from 58% to around 60%.

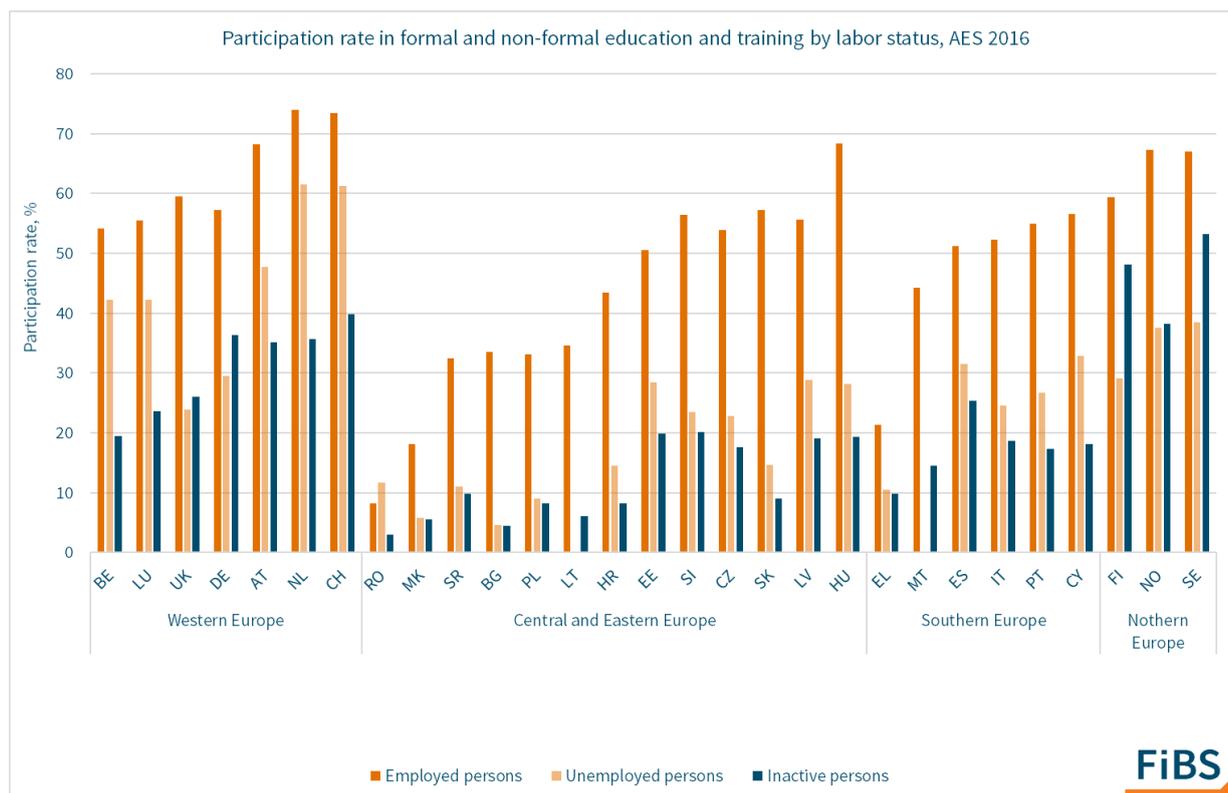


Figure 10 Participation rates in education and training by regional breakdown, AES 2016

Source: Eurostat, Participation rate in education and training by labour status [trng\_aes\_103]

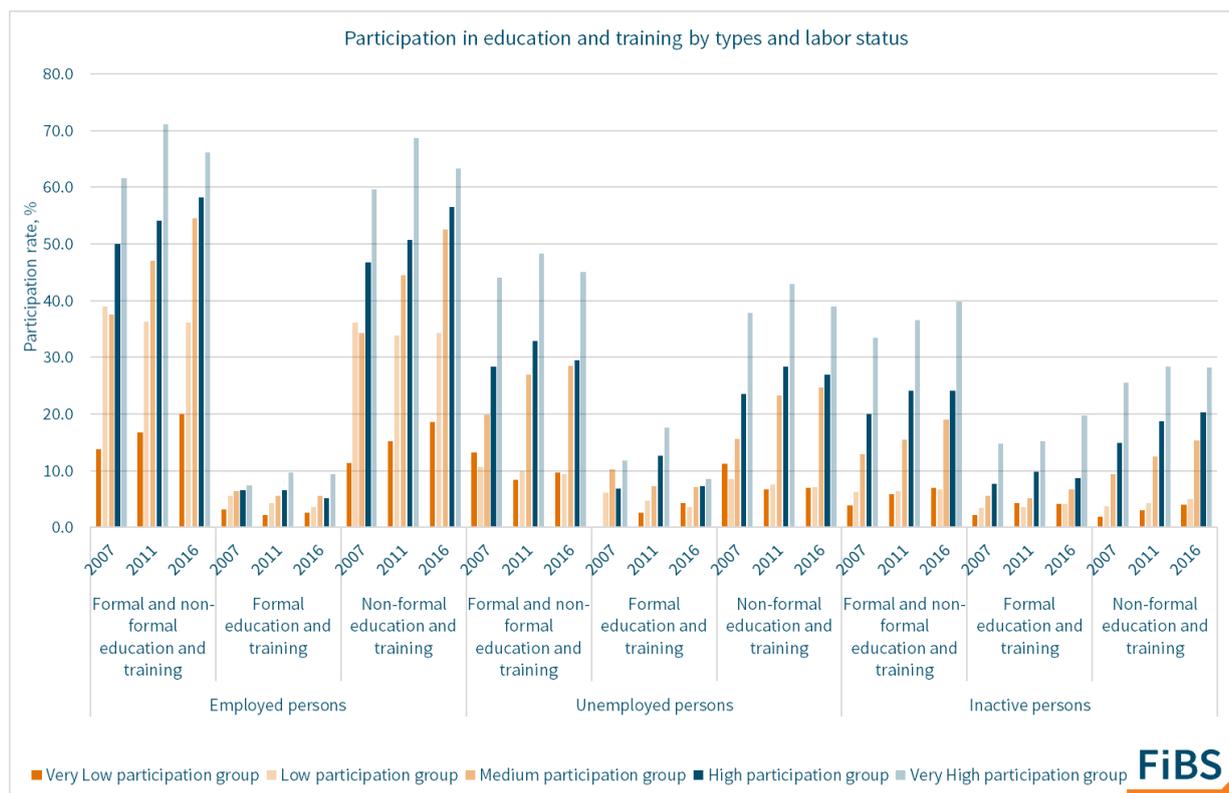
Analysing the survey data by the participants' labour status according AES 2016, as well as by regions on the country level the shows that participation in further education among employed individuals is considerably higher than among unemployed and inactive individuals. However, the ratio of participation of employed over unemployed individuals varies. In Western European countries such as BE, LU, AT, NL and CH the ratio is about 1.2 to 1.3, which shows that the share of employed individuals participating in further education is about 20-30% higher. In Southern and Northern European countries, employed individuals participate in further education 1.5 times more than unemployed people. This ratio is even higher in Central and Eastern European countries at 2.5 to 3. Compared to the unemployed, inactive individuals participate even less in further education in Central and Eastern Europe, Southern Europe and in Western Europe (with the exception of the UK), while the opposite is the case in Northern Europe.



Figure 11 Participation rates in formal and non-formal education and training over the years by regional breakdown and labor status

Source: Eurostat, Participation rate in education and training by labour status [trng\_aes\_103]

Analysing the data across survey waves by regional breakdown and type of training shows that the higher rates among employed people by non-formal type of training. Looking at participation rates by regions, Northern Europe reports the highest rates, followed by Western Europe and then, interchangeably, by Southern Europe and Central and Eastern Europe. Participation rates in formal education and training are almost under the same threshold of less than 10%, with exceptionally high rates among the unemployed and inactive in Northern European countries over the years (around 20% in AES 2007-2011, 9% and 31% respectively in AES-2016).



*Figure 12 Participation rates in formal and non-formal education and training over the years by participation groups breakdown and labor status*

Source: Eurostat, Participation rate in education and training by labour status [trng\_aes\_103]

Looking at the data by labour status breakdown over the years reveals that employed individuals participate, on average, three times more than the unemployed and four times more than the inactive. Within the employed group, there are greater differences in participation rates by participation groups: the very low participation group participates three times less than the very high participation group which applies both in the context of formal and non-formal education. Countries in the medium and high participation groups even show increases in participation among the employed for both types of education, while the low participation group shows a slight decrease in participation. The same trend is observed among the unemployed and the inactive.

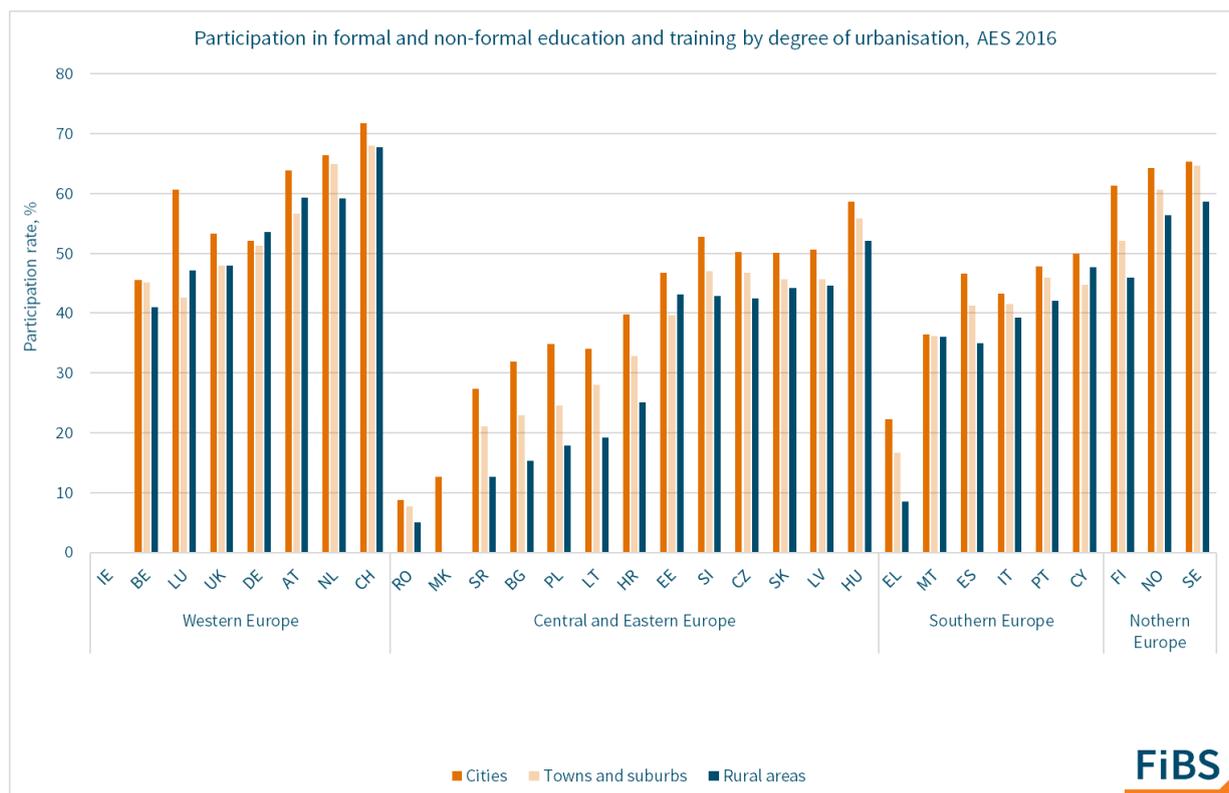
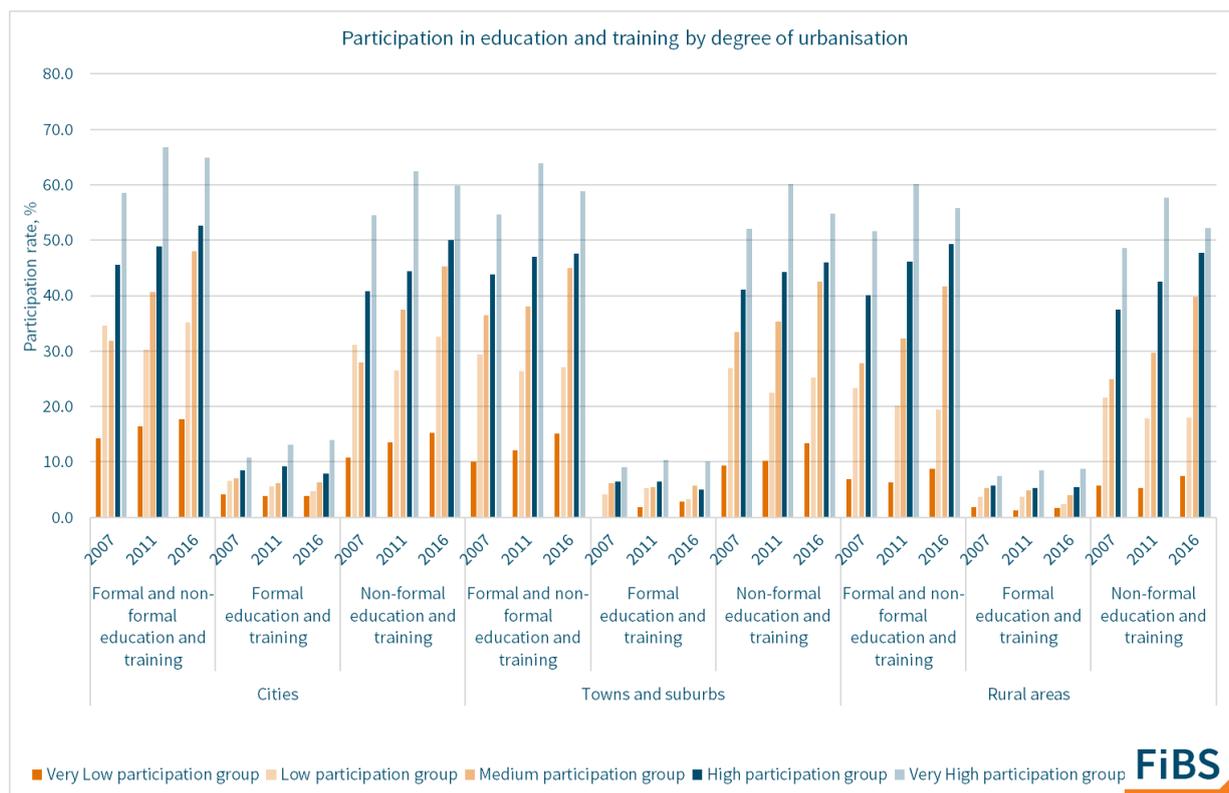


Figure 13 Participation rates in education and training by degree of urbanisation by regional breakdown, AES 2016

Source: Eurostat, Participation rate in education and training by degree of urbanisation [trng\_aes\_105]

Analysing the survey data by degree of urbanization according to the AES-2016 as well as by regions, participation rates in cities are 5% higher than in towns and suburbs, and 5% to 10% higher than in rural areas. Overall, Western Europe (except LU) and Southern Europe (except EL) show lower variations in participation rates, while the Central and Eastern Europe countries show greater discrepancies. In Germany, rural areas report, in fact, slightly higher participation rates than cities.



*Figure 14 Participation rates in education and training by degree of urbanisation by participation groups breakdown, AES data*

Source: Eurostat, Participation rate in education and training by degree of urbanisation [trng\_aes\_105]

By degree of urbanization and type of training among participation groups, it appears that the rate of participation in non-formal education and training is high in all three types of urbanisation (cities, towns and suburbs, rural areas). In cities, more overall participation took place, while differences in the rate of participation in formal education and training amount to less than 10% between types of area. However, by type of training – formal and non-formal – there is a high variation within the groups.

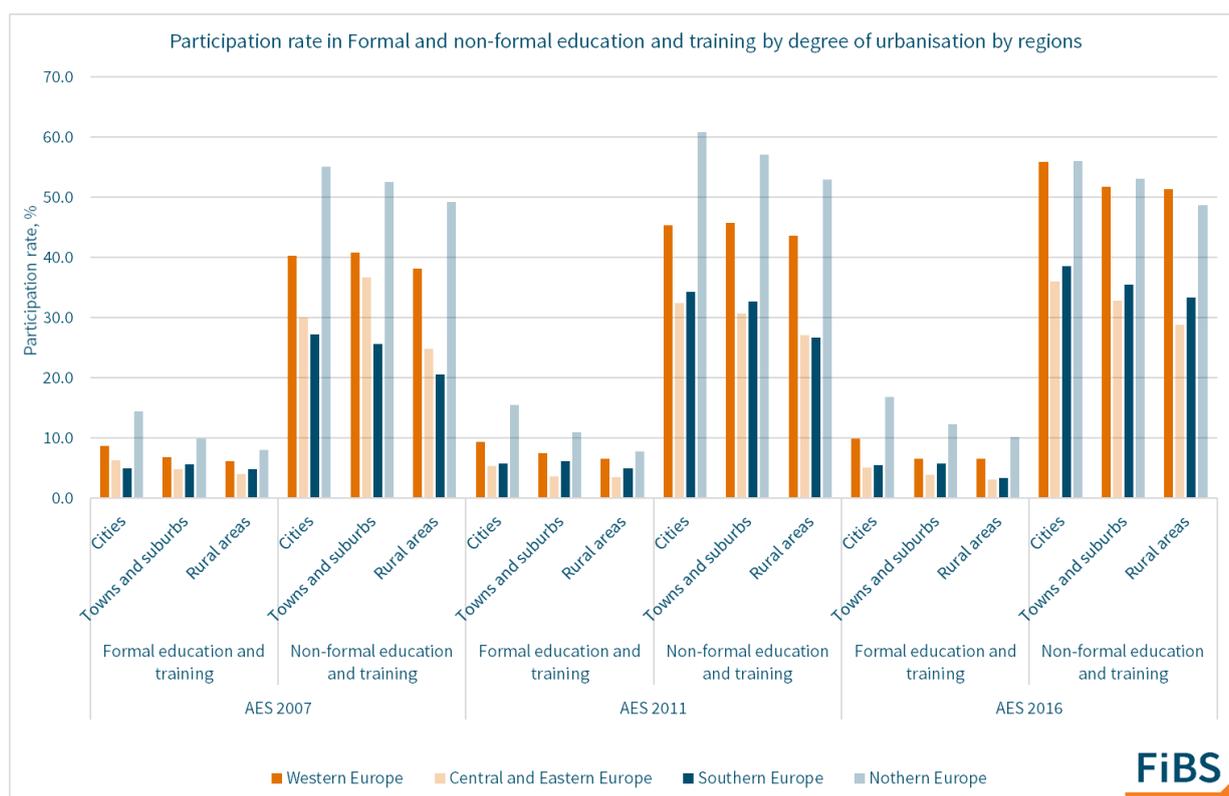


Figure 15 Participation rates in education and training by degree of urbanisation by regional breakdown, AES data

Source: Eurostat, Participation rate in education and training by degree of urbanisation [trng\_aes\_105]

Looking at participation in further education by regions, Northern Europe shows the highest rate of participation in AES 2007-2011 across all three urbanisation areas for both types of training. In the AES 2016 survey, the rate of participation in non-formal education and training is similar in Western Europe and Northern Europe with a slight variation of 3% in towns and suburbs and rural areas. Central and Eastern Europe countries in AES 2007 show higher rates of participation in non-formal education and training compared to Southern European countries. Yet, in the AES 2011-2016, Southern European countries outperform Central and Eastern Europe across all three types of urbanisation areas.

Moreover, the statistical analysis by hours spent on education reveals further insights. To this effect, the statistical data provided in hours is transformed into full time equivalent days of eight working hours. With regard to days spent in further education, Northern European countries report higher values than other regions: FI and DK report around 20 days each, SE reports 16 days, while NO is an exception reporting around 10 days on average. In Southern European countries, participants spend, on average, 16 days on further education: ES and EL report a higher number of days (17 days respectively), while IT and CY report a lower number of days (14 and 7 days respectively). According to AES 2016, participants in Western European countries spend, on average, 15 days on further education; the lowest number of days is reported by the NL (around 11 days). The number of days spent on further education in Central and Eastern Europe varies: SI scoring the highest at 23 days, while CZ, LT and SK report the lowest values at around seven days. Differentiating by educational attainment level, Western Europe, Central and Eastern Europe, and Southern Europe report a higher number of days spent by individuals with tertiary education compared to less educated individuals, with exception for the following countries: BE, DE, PL, LV, EL. In Northern Europe, less educated individuals generally spend more days on further education compared

to other regions. FI is an exception reporting less educated people spending on average 20 days more in further education.

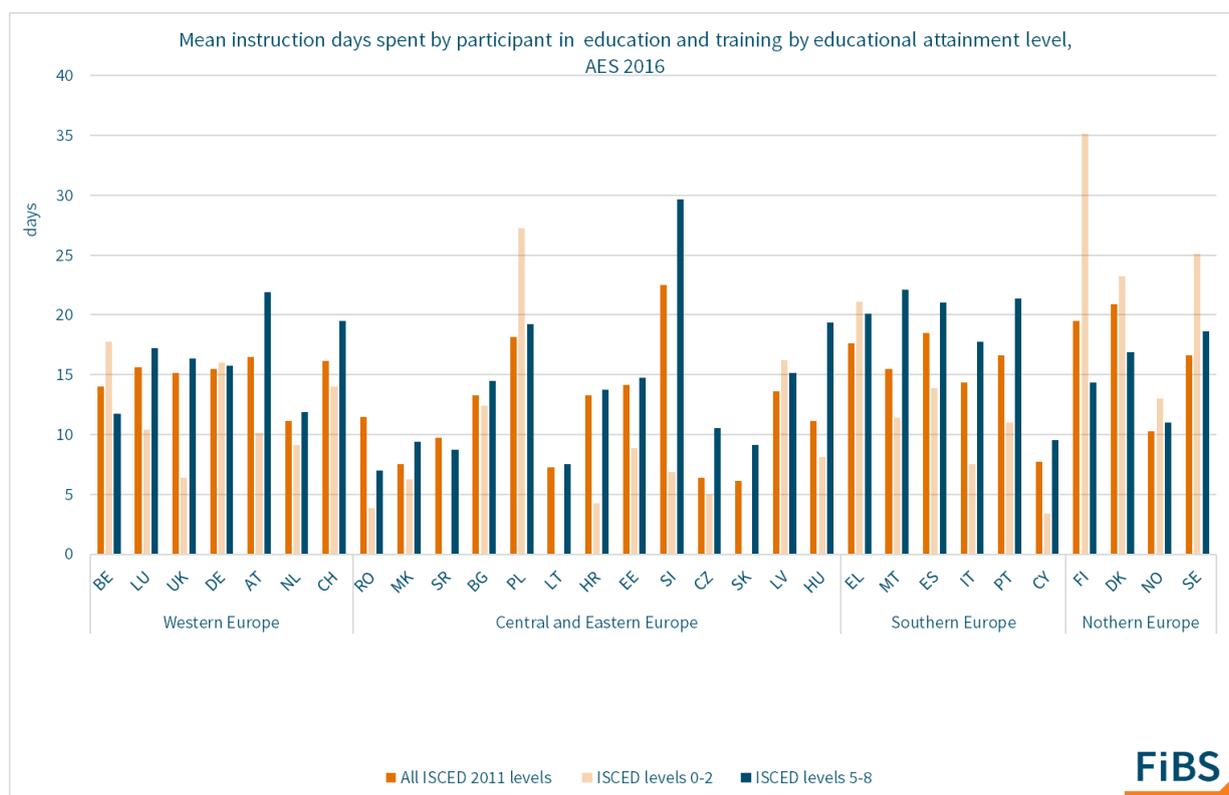
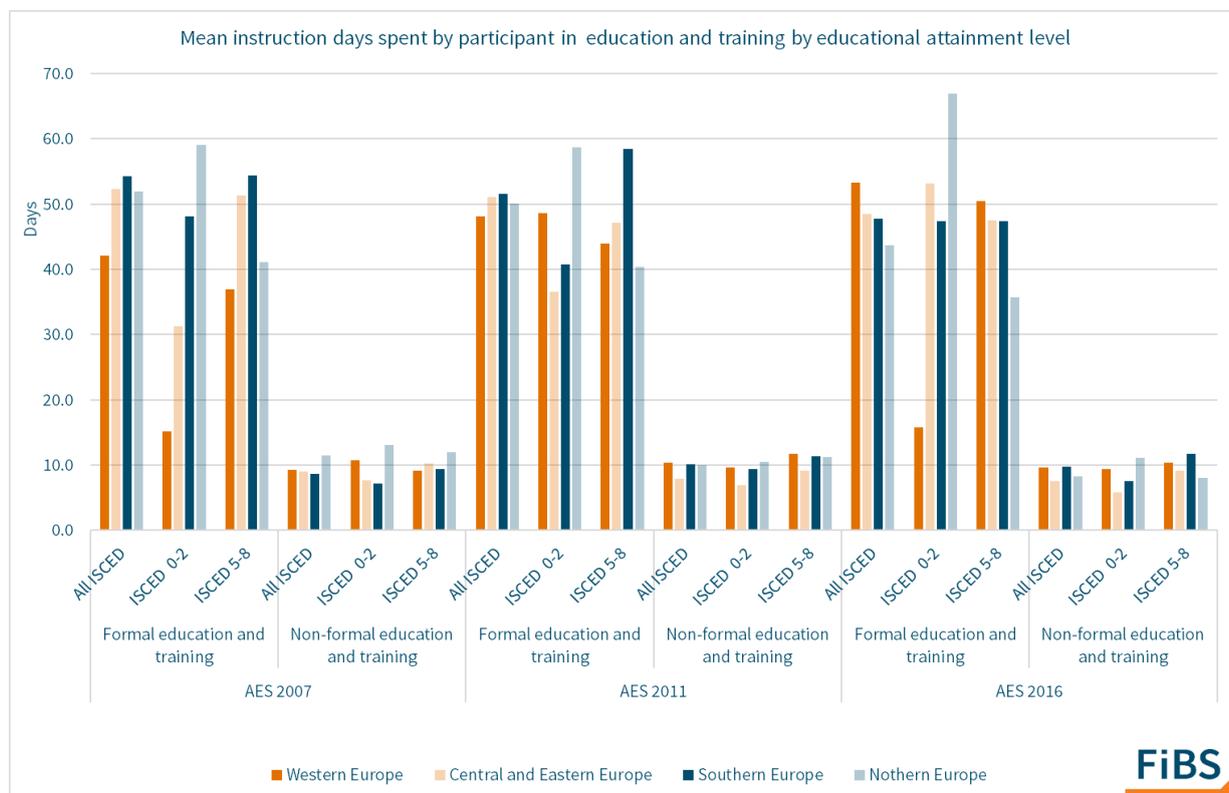


Figure 16 Mean instruction days spent by participant in education and training by educational attainment level, AES 2016

Source: Eurostat, Mean instruction hours spent by participant in education and training by educational attainment level [trng\_aes\_148]

With respect to the number of average days spent on further education across the different survey, it appears that between four to five-times as many days are spent on formal education compared to non-formal education. Across the survey waves, Western Europe shows an increase in the number of days spent in formal education, scoring the highest in AES 2016 with 53 days on average, while other regions report a decrease in the number of days spent in formal education. By educational breakdown, more and more days are spent by lower educated people in formal education – Northern Europe doing particularly well in this regard, followed by Central and Eastern Europe, then by Southern Europe. Western European countries demonstrate fluctuations, where in AES 2011, the number of days spent in formal education range between 15 and 48, before dropping considerably to 17 days in AES 2016. With respect to tertiary educated individuals, the number of days spent on formal education show a reversed pattern, where Western European countries report a consistent increase across the survey waves, scoring the highest with around 50 days on average per participant. Meanwhile, the other regions show a gradual decrease in the number of days spent on formal education; Northern Europe reports a minimum of around 36 days per participant. The average number of days spent on non-formal education is below 10 days with no substantial differences between regions or groups of educational attainment. However, lower educated people report slightly fewer days spent on non-formal education compared to tertiary educated people, although the situation is different with respect to Northern Europe.



*Figure 17 Mean instruction days spent by participant in education and training by educational attainment level by regions*

Source: Eurostat, Mean instruction hours spent by participant in education and training by educational attainment level [trng\_aes\_148]

Breaking down the data by participation groups shows that the order of European regions is reversed with respect to the total number of days spent on education and training according to AES 2007-2011, where the very Low participation group spent the highest number of days per participant. However, in AES 2016, the ranking of participation groups is in accordance with the ranking of days spent per participant, although there is an overall decline in days for all countries. Regarding formal education, the number of days varies between country groups across survey waves, however, the very high participation group reports fewer days than other groups, with the exception of AES 2016, where it scores the second place after the very low participation group by number of days. By non-formal education, the groups spent less than 10 days on average. By educational attainment breakdown, lower educated individuals in formal type of education and training show big differences within participation groups, with the very low participation group reporting zero days and the very high participation group reporting around 55 days in AES 2016. In contrast, according to AES 2011, participants in the high participation group reported a higher number of days, namely, up to 63 days on average. The data reveals that tertiary educated people in Low participation group spent the more days in training then followed by Medium and High participation groups interchangeably over the years. Moreover, the Very high participation group countries (defined by their overall participation rates) spent the lowest number of days in training after the Very low participation group.



### 3 Conclusion

Adult education is receiving an increased level of attention due to the changing nature of the working environment and the growing demand for skills. Therefore, high-quality data on participation in formal and non-formal education and training are required as a basis for effective policy recommendations and actions to promote lifelong learning.

Adult education is highly diversified with respect to the mode and duration of participation, course contents, costs and outcome expectations. The above analysis provides a distinct definition of adult education by analysing and comparing the main surveys on adult education (AES, LFS, EWCS, PIAAC and ESJS) by their approach in defining these aspects. The outcome shows that the surveys vary in reference period, reference category, inclusion of types of adult education, which in certain cases even change between waves of the same survey. These issues reduce the comparability both between countries and across survey waves. The surveys are compared using trend analysis as well as correlation analysis.

This paper provides an in-depth analysis of the AES 2016 to outline the methodological issues that arise during data collection by way of example. Furthermore, the AES data are differentiated by country and region as well as a variety of features in order to provide a comprehensive understanding of the geography of adult education in Europe.

The analysis shows that reliable data are needed in order to monitor the multiplicity of adult learning and to develop evidence-based policies.

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## 5 Annex

### 5.1. Overview of design and methods of AES 2011 and AES 2016

This part of the paper presents the analysis of the AES methodology aiming to reveal some of the complexities regarding the statistical data collection. The AES presents the main dataset on adult education statistics and supports the monitoring of lifelong learning at EU level by providing detailed insights about the participation (participation rates, reasons for participating, characteristics of the learning activities, outcomes, etc.) and the non-participation (obstacles to participation) for the population aged 25-64.

So far, three waves of the survey have been conducted (2007 AES, 2011 AES and 2016 AES). The first AES wave – referred to as AES 2007 – was a pilot exercise carried out on a voluntary basis in 29 countries in the EU, EFTA (European Free Trade Association) and candidate countries between 2005 and 2008. The 2011 AES and 2016 AES were underpinned by a European legal act (Commission Regulation as regards statistics on the participation of adults in lifelong learning<sup>1</sup>) and thus carried out in all member states on a mandatory basis. As AES 2007 is a pilot version, it was subject to many changes and had many recommendations for improving the quality of the information (European Commission, 2010). The later versions (AES 2011 and AES 2016) are considered to have high geographical comparability across countries which was achieved through regulations and the AES manuals that ensures harmonisation of methodology, concepts and definitions for participating countries. However, due to different method of sampling, recording, translation issues, and differences in cultural understanding and common classifications of adult education, perfect comparability of statistical data is still difficult to achieve. In this regard, each country has the responsibility to ensure high comparability and for that reason countries might conduct pre-surveys or pilot surveys and use their own methods of data collection to increase response rate. Regarding comparability over time, it is not perfect as some variables have changed due to deletion or questions and answers having been rephrased or improved.

The AES surveys make use of the following standards and classifications:

- Classification of Learning Activities (CLA): 2006 edition for 2007 and 2011 AES and 2016 edition for 2016 AES;
- International Standard Classification of Education (ISCED): ISCED 1997 for 2007 and 2011 AES and ISCED 2011 for 2016 AES;
- International Standard Classification of Education - Fields of Education and Training (ISCED-F): ISCED-F 1999 for 2007 and 2011 AES and ISCED-F 2013 for 2016 AES;
- Classification of Occupations (ISCO): ISCO-COM 88 for 2007 AES and ISCO 08 for 2011 and 2016 AES;
- Classification of economic activities (NACE): NACE Rev. 1.1 for 2007 AES and NACE Rev. 2 for 2011 and 2016 AES.

Table 10 outlined the coverage area of the AES survey waves.

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<sup>1</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1415896180907&uri=CELEX:32014R1175>  
<https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1415896180907&uri=CELEX:32010R0823>





### 5.1.1 Sampling method

Many participating countries in AES 2011 and AES 2016 use a stratified random sample design. Stratification with random sample consists of several layers or 'strata', and within each stratum random selection is made. Usually it is made up of regions (NUTS2, NUTS3), or 'urban' versus 'rural' area classifications. Some countries used a multi-stage sampling, where highest order sampling is performed by a specific criterion and then further sub-sample is selected by another criterion. Despite this relative simple grouping by methods, sampling design varies by countries, where stratification can be based on proportional to population size and age, or by administrative-territorial districts in the country. The full list of countries' sampling methods is given in Table 11.

Sampling method	AES 2011 countries	AES 2016 countries
Stratified random sampling	Austria, Cyprus, Denmark, Finland, Malta, Norway, Sweden, Switzerland	Austria, Belgium, Cyprus, Denmark, Finland, Spain, Norway, Sweden, Switzerland, Luxembourg, Germany, Croatia, Lithuania, Latvia
Two-stage stratified sampling	Belgium, Bulgaria, Greece, Ireland, Latvia, Netherlands, Poland, Slovenia, Spain	Albania, Greece, Hungary, Netherlands, Poland, Slovenia, Slovakia, Spain, Czech Republic, Republic of Macedonia
Three-stage stratified sampling	Czech Republic, Germany, Serbia, Slovakia	Bosnia and Herzegovina, Serbia
Stratified systematic sampling	Estonia	Malta
Two-stage stratified cluster design	Portugal	Portugal, Romania
		Bulgaria, UK – information is not given in the reports. Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.
Source: AES 2011 Standard National Quality Reports, Adult Education Survey 2011 EU Quality Report, AES 2016 Standard National Quality Reports		

Table 11 Sampling methods by country in AES 2011 and AES 2016

As the AES results are based on a sample of population they are subject to the usual types of errors associated with sampling techniques and interviews. Sampling errors, non-sampling errors, measurement errors, processing errors and non-response are calculated for each country and documented in the quality reports. Further we will give short overview of errors and the state in AES 2011 and AES 2016.

### 5.1.2 Sampling errors

The participating countries provide estimates of the relative standard error of the indicators, which can also be given as its variance, standard error, coefficient of variation or confidence interval (the range of values that in 95% of the cases would capture the true value in the population). The relative standard errors cannot be reduced to a minimum as it was not possible to apply calibration. Each country calculates the estimates and confidence limits and provides the information in quality reports. Table 12

and Table 13 outline these details for the countries included in the survey (95% confidence as reported in the countries' quality reports).

Countries*	Participation rate in formal education and training, age 25-64, total - %			
	Estimated value of the indicator (weighted)	Coefficient of variation	Standard error	95% confidence interval**
Albania	1.69	16.62	0.28	[1.2;2.3]
Austria	6.21	0.06	0.36	5.51 - 6.92
Belgium	6.81	0.05	0.34	[6.14% - 7.49%]
Bosnia and Herzegovina	2.17	10.78	0.23	(1.71;2.63)
Bulgaria	2.9	0.11	0.31	[2.26;3.48]
Cyprus	2.99	14.12	0.42	2.16-3.82
Switzerland	8.45	4.22	0.36	0.70
Czech Republic	2.50	6.40	0.16	2.18 – 2.81
Germany	3.50	7.40	0.26	0.51
Denmark	13.48	4.06	0.55	12.40 - 14.55
Greece	3.71	9.34	0.35	3.02-4.39
Spain	9.84	2.83	0.28	9.3-10.4
Finland	14.2	4.5	0.64	12.95-15.45
Croatia	3.98	9.48	0.38	[3.24, 4.72]
Hungary	7.35	0.04	0.26	(6.83, 7.86)
Lithuania	2.44	0.12	0.28	(1.88; 2.99)
Luxembourg	8.56	5.21	0.45	7.72-9.47
Latvia	4.44	4.62	0.21	0.40
Republic of Macedonia	3.99	7.37	0.29	[3.41,4.56]
Malta	7.20	0.58	0.08	0.16
the Netherlands	9.00	0.07	0.60	2.37
Norway	12.13	0.05	0.66	1.30
Poland	4.39	4.63	0.20	[3.99; 4.79]
Portugal	4.00	5.78	0.23	(3.55; 4.46)
Romania	1.70	9.31	0.16	1.36 - 1.97
Serbia	2.98	12.51	0.37	(2.24, 3.70)
Sweden	13.80	4.41	0.61	12.64 – 15.03
Slovenia	6.00	5.71	0.34	[5.35;6.69]
Slovak Republic	1.52	16.57	0.25	± 0.49
United Kingdom	11.85	4.65	0.55	1.08
*Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.				
**95% confidence intervals are presented in the way are stated in quality reports.				

Table 12 Sampling error indicators for 2016 AES key statistics - participation rate in formal education and training, age 25-64, total %

Countries*	Participation rate in non-formal education and training, age 25-64, total - %			
	Estimated value of the indicator (weighted)	Coefficient of variation	Standard error	95% confidence interval**
Albania	8.20	5.99	0.49	[7.3;9.2]
Austria	58.42	0.01	0.68	57.08 - 59.76
Belgium	41.38	0.02	0.63	[40.14% - 42.63%]
Bosnia and Herzegovina	6.93	6.59	0.46	(6.04;7.83)
Bulgaria	22.47	0.04	0.86	[20.78;24.15]
Cyprus	47.17	2.17	1.02	45.16-49.17
Switzerland	67.52	0.87	0.58	1.15
Czech Republic	44.60	1.14	0.51	43.59 – 45.58
Germany	50.18	1.41	0.71	1.39
Denmark	43.75	2.03	0.89	42.01 - 45.50
Greece	14.04	5.12	0.72	12.62-15.46
Spain	39.12	1.14	0.44	38.25-39.99
Finland	47.70	1.90	0.91	46.92-50.48
Croatia	29.77	2.73	0.81	[28.18, 31.37]
Hungary	52.48	0.01	0.64	(51.23, 53.72)
Lithuania	26.53	0.03	0.78	(25.00; 28.05)
Luxembourg	45.31	1.74	0.79	43.74-46.84
Latvia	45.66	1.18	0.54	1.05
Republic of Macedonia	10.38	4.12	0.43	[9.54,11.22]
Malta	33.80	1.07	0.03	0.06
the Netherlands	61.48	0.02	0.99	3.89
Norway	54.92	0.02	1.02	2.00
Poland	22.91	1.96	0.45	[22.03; 23.79]
Portugal	44.37	1.64	0.73	(42.95; 45.8)
Romania	5.60	7.72	0.43	4.72 - 6.40
Serbia	18.18	4.28	0.78	(16.65, 19.70)
Sweden	56.50	1.51	0.85	54.80 – 58.14
Slovenia	43.60	1.83	0.80	[42.09;45.21]
Slovak Republic	45.00	2.22	1.00	± 1.96
United Kingdom	47.49	1.70	0.80	1.58
*Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.				
**95% confidence intervals are provided as stated in countries' quality reports.				

*Table 13 Sampling error indicators for 2016 AES key statistics - participation rate in non-formal education and training, age 25-64, total %*

The coefficient of variation (CV) is a measure of relative variability, which is the ratio of the standard deviation to the mean (average). The data show that the rate of participation in formal education and training has a higher variability in countries such as Albania, Bosnia and Herzegovina, Cyprus, Serbia, and the Slovak Republic, while the rate of participation in non-formal education and training shows higher variability in Albania, Bosnia and Herzegovina and Romania.

Another indicator is the standard error of the mean, which reflects how the mean varies with different modes of data collection measuring the same quantity. Thus, if the effect of random changes is significant, the standard error of the mean will be higher. If there is no change in the data points as the collection of data is repeated, the mean standard will be close to zero. The AES data show a relatively high value for the standard error of participation rates in non-formal education and training, in countries such as Cyprus, Norway and Slovak Republic, where the values are equal to or above 1.

Furthermore, the countries surveyed use their own methods of weighting (for further details see 2011 EU quality report or AES 2016 country quality reports). Weighting is a mathematical procedure used to generate more representative data of the basic population. In AES surveys, weighting procedures are applied to gross up the results in the net sample to the target population and to adjust for unit non-response. The impact of the use of weighting cannot be identified. When using the weighting (the process of calibration to each stratum to compensate non-response), the assumption used is non-respondents are in every way similar to the respondents with respect to the objectives of the survey.

### 5.1.3 Non-sampling errors

There are four types of commonly reported non-sampling errors. The details of the four types of errors – coverage errors, measurement errors, processing errors, and non-response errors - are described below. Furthermore, extensive information on these errors is provided in the national quality reports.

#### 5.1.3.1 Coverage errors

Coverage errors relate to the problem of over-coverage or under-coverage which may occur due to time-lags of the latest registration details or usage of previous censuses as sampling frames. The over-coverage issue details are provided in Table 14. Again, the exact impact of coverage errors cannot be defined and it is further corrected with weighting.

Countries*	Over-coverage rate (%)	
	Households level	Individual (person) level
Albania	9.12	9.12
Austria	N/A	3.8
Belgium	N/A	1.7
Bosnia and Herzegovina	7.16	7.16
Bulgaria	10.98	N/A
Cyprus	25.5	N/A
Switzerland	N/A	0.7
Czech Republic	33.3%	N/A
Germany	86.20	N/A
Denmark	N/A	2.7
Greece	78.4	N/A
Spain	N/A	12.8
Finland	N/A	1.10
Croatia	14.7	14.7
Hungary	47.48	N/A
Lithuania	N/A	0.54
Luxembourg	N/A	7.3
Latvia	N/A	5.46
Republic of Macedonia	14.1	N/A
Malta	10.78	N/A
Netherlands	N/A	8.5
Norway	N/A	0
Poland	26.78	N/A
Portugal	30.3	N/A
Romania	33.0	N/A
Serbia	12.4	N/A
Sweden	N/A	1.41
Slovenia	N/A	2.1
Slovak Republic	N/A	17.0
United Kingdom	N/A	0.16

\*Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.

*Table 14 Over-coverage rate of AES 2016 survey*

### 5.1.3.2 Measurement errors

Measurement errors cannot be estimated and treated as potential bias, however the subjectivity of understanding the scope of the questions can have impact to the results. Possible sources of measurement errors include survey formulations (design, content and wording), methods of data collection, the selection of interviewers and respondents' personal biases in understanding. To avoid such errors, pilot testing is conducted by some countries enable certain changes and clarifications, such as reformulations, deleting questions and introducing new questions.

Countries that conducted comprehensive pilot tests of the AES 2011 questionnaire include Belgium, Bulgaria, Czech Republic, Denmark, Estonia, France, Italy, Hungary, Malta, Romania, Slovenia, Slovakia, the United Kingdom, Switzerland, and Serbia . Furthermore, partial pilot tests were conducted in Latvia, Lithuania, Austria, Hungary, Finland and Norway. With respect to the AES 2016 questionnaire,

comprehensive pilot tests were conducted in Albania, Bosnia and Herzegovina, Germany, Denmark, Serbia and the United Kingdom, while partial pilot tests were conducted in Austria, Bulgaria, Finland and Slovenia. Belgium, Switzerland, Malta, Netherlands, Macedonia, Cyprus, Greece, Spain, Croatia, Hungary, Lithuania, Luxembourg, Norway, Poland, Portugal, Sweden and Slovakia undertook no pilot testing. Other forms of testing as conducted in Romania and the Czech Republic involved informal tests where the AES questionnaire was tested among social survey experts, selected interviewers and small public samples, while no official pilot testing was conducted on a sub-sample of the population.

Furthermore, in order to reduce the likelihood of biases, a number of countries do not allow proxy answers. Yet, AES 2011, various countries still allowed proxy answers. In the following, the estimated percentage share of questions including proxy answers in all survey questions is provided: Czech Republic (33.0%), Greece (40.6%), Spain (0.3%), Italy (19.5%), Hungary (48.0%) and Romania (16.4%). With respect to AES 2016, these shares were: Czech Republic (12.0%), Greece (28.4%), Spain (2,1%), Hungary (32%), Malta (3,07%) and Romania (11,8%). Slovenia did not allow proxy answers in the CAWI and CATI but allowed proxy answers in the CAPI form (estimated share is not available).

There are several different methods of data collection that are used in the AES data collection process. For the AES 2011, countries used variety of combinations (for more details see European commission (2014), for the AES 2016, methods are presented in Table 15 covering a total of six methods: face-to-face interviews - paper assisted (f-PAPI), face-to-face interview - computer assisted (CAPI), telephone interviews - computer assisted (CATI), self-administered interviews - paper assisted (PAPI), self-administered interview - computer assisted (CAWI) and others. In general, the use of Computer Assisted Personal Interviewing (CAPI) is recommended for interviews as validations of answers and consistency checks are already embedded.

Further, Table 15 includes information about the duration of interviews. It appears that the length of an interview does not necessarily depend on the method of data collection. In the case of computer assisted interviews, respondents in Germany and Spain on average took 20 minutes to respond, while in Bulgaria and Macedonia, participants took 23 and 14 minutes respectively, and participants in the UK, Finland and Lithuania took considerably longer to respond. In the case of paper-based interviews, participants in Albania and Greece took around 30 minutes. Consequently, besides the respective advantages and disadvantages of the different interview methods, there are other sources of measurement errors that refer to the survey's reference period, the burden of responding to the questionnaire and respondent errors like misunderstanding, etc.

Country	Survey type						Duration of interview (all methods taken into consideration) (average time)
	Face-to-face interview - paper assisted (f-PAPI)	Face-to-face interview - computer assisted (CAPI)	Telephone interview - computer assisted (CATI)	Self-administered interview - paper assisted (PAPI, includes electronically submitted PDF version of the questionnaire)	Self-administered interview - computer assisted (CAWI with interactive online questionnaire)	Other	
Albania	X						30 minutes

Austria		X			X		22 minutes
Belgium				X	X		was not measured
Bosnia and Herzegovina		X					15 minutes
Bulgaria	X						23,4 minutes
Cyprus	X	X	X			X	40 minutes
Switzerland			X				26 minutes
Czech Republic	X	X	X	X			14.34 minutes
Germany		X					20 minutes
Denmark			X		X		N/A
Greece	X					X	30 minutes
Spain		X	X		X		18 minutes
Finland		X			X		CAWI 36 minutes and CAPI 48 minutes
Croatia		X					35 minutes
Hungary		X			X		N/A
Lithuania		X			X		40 minutes
Luxembourg				X	X		N/A
Latvia		X	X		X		20,51 minutes
Republic of Macedonia	X						13,58 minutes
Malta		X	X			X	N/A
Netherlands			X		X		N/A
Norway			X		X		16 minutes
Poland	X	X					for the household = 21 minutes; for personal questionnaire = 16 minutes
Portugal		X					N/A
Romania	X						13 minutes - for the household questionnaire; 15 minutes - for the individual questionnaire
Serbia			X				between 15 and 20 minutes
Sweden			X				17 minutes
Slovenia		X	X		X		WEB: 19 minutes;

							CAPI: 14 minutes; CATI: 14 minutes
Slovak Republic	X	X	X			X	29 minutes
United Kingdom			X				27 minutes
Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.							

Table 15 AES 2016 survey methods of data collection

### 5.1.3.3 Processing errors

From the collection of data to statistical analysis, the data undergo a certain processing: coding, data entry, data editing, imputation, etc. There are many approaches to these steps, and the corresponding techniques are outlined in the national quality reports.

In general, processing errors are supposed to be managed and mitigated with the use of CAPI and CAWI, where the data is entered directly in electronic form in the interviewer's computer. Data entry programs can include a full set of predetermined checks and plausibility checks to identify errors in the data flow or values.

### 5.1.3.4 Non-response errors

There are two types of non-response errors (European Commission, 2014):

- unit non-response which occurs when no data is collected on a population unit designated for data collection
- item non-response which occurs when data is collected for only some but not all of the survey variables of a designated population unit.

One of the main reasons for the non-response is that the overall survey and its containing questions are filled in on a voluntary basis and have not been made mandatory (except Luxemburg). Details of non-response errors in the AES 2016 survey are outlined in Table 16. For the following countries, the unit non-response is calculated only at individual (person) level: Albania, Austria, Belgium, Switzerland, Denmark, Spain, Finland, Croatia, Lithuania, Luxembourg, Latvia, Netherlands, Norway, Sweden, Slovenia, Slovak Republic and the United Kingdom. For the following countries the unit non-response is calculated only at the household level: Bosnia and Herzegovina, Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Republic of Macedonia, Malta, Poland, Portugal and Romania.

Germany (83,8%), Belgium (67,8), Sweden (54,9%) and the Netherlands (54,8%) have the highest overall non-response rates. The Czech Republic (16,6) and Cyprus (14,6) stand out as countries with the lowest one.

Item non-response also impacts the quality of the data. Table 16 reports the number of variables with non-response rates of 10% and higher (out of total 254 variables) by country. Here, the actual questions and their non-response rates vary greatly by country, for full information see the national quality reports.

Countries	AES 2011 unit non-response rates (%)	AES 2016 - Unit non-response rate (un-weighted) for Total population aged 25-64 (%)		AES 2016 - Unit non-response rate (weighted) for Total population aged 25-64 (%)		Number of AES 2011 variables with item non-response rates 10% and higher	Number of AES 2016 variables with item non-response rates 10% and higher (out of total 254 variables)
		Households level	Individual (person) level	Households level	Individual (person) level		
Albania	N/A	N/A	21,3	N/A	21,3	N/A	30
Austria	56,6	N/A	48,5	N/A	48,7	1	1
Belgium	57,6	N/A	67,8	N/A	N/A	23	46
Bosnia and Herzegovina	N/A	25,4	N/A	24,5	N/A	N/A	4
Bulgaria	12,1	22,76	N/A	N/A	N/A	2	2
Cyprus	8,8	14,6	N/A	N/A	N/A	N/A	N/A
Switzerland	47,0	N/A	57,1	N/A	N/A	2	27
Czech Republic	31,2	16,6	N/A	N/A	N/A	N/A	N/A
Germany	50,3	N/A	83,8	N/A	N/A	4	7
Denmark	37,3	N/A	56,4	N/A	N/A	1	24
Greece	35,9	39,8	N/A	N/A	N/A	12	8
Spain	13,1	N/A	18,8	N/A	N/A	4	5
Finland	32,0	N/A	43,8	N/A	N/A	2	3
Croatia	N/A	N/A	33,5	N/A	32,7	N/A	1
Hungary	26,5	46,5	N/A	43,3	N/A	N/A	33
Lithuania	23,0	N/A	30,73	N/A	N/A	N/A	6
Luxembourg	58,3	N/A	45	N/A	N/A	6	9
Latvia	44,0	N/A	31,95	N/A	N/A	8	25
Republic of Macedonia	N/A	15,5	N/A	N/A	N/A	N/A	22
Malta	7,4	23,34	N/A	N/A	N/A	3	1
Netherlands	44,1	N/A	54,8	N/A	54,8	N/A	12
Norway	46,6	N/A	45,54	N/A	N/A	4	17
Poland	13,3	45,9	N/A	45,2	N/A	1	4
Portugal	5,5	30,3	N/A	N/A	N/A	N/A	N/A
Romania	13,0	18,6	N/A	N/A	N/A	4	4
Serbia	17,8	19,8	N/A	N/A	N/A	N/A	3
Sweden	34,1	N/A	54,9	N/A	52,6	9	19
Slovenia	41,0	N/A	34,76	N/A	35,25	1	2
Slovak Republic	33,0	N/A	24,08	N/A	24,08	N/A	3
United Kingdom	43,0	N/A	47,48	N/A	N/A	N/A	16
Quality reports for AES 2016 for countries - France, Ireland, Italy, Turkey are not present yet.							
Source: AES 2011 and AES 2016 Standard national quality reports							

Table 16 Non-response rates in AES 2011 and AES 2016 surveys

Non-response can be due to a failure in contacting the individual, a refusal or other reasons (rejected interviews, inability to respond, etc.). The detailed non-response rates, broken down by type of non-response, are given in the quality reports.

In the AES 2016, Greece and Luxemburg attempted to solve the non-response issue by making participation in the survey as mandatory. However, both countries still faced high non-response due to non-contact reasons (no one was at home or the questionnaire was never sent back). Nonetheless, no legal actions were taken against non-respondents.

The method of data collection can also affect the response rate. In the case of unit non-responses, this may be due to rejected questionnaires, where the selected household/person did take part but the survey form cannot be used due to poor quality - e.g. strong inconsistencies, unacceptable item-response or most of the questions being left unanswered.

All countries used a variety of measures to reach the respondents, for example, by making additional visits, taking fieldwork in the evening and on Saturdays to reach persons (e.g. employed persons), flexibility for appointments, and a variety of reminders to encourage participation and to minimize non-response.

To prevent any systematic bias occurring due to unit-non-response rates, countries employ weighting. In order to correct for non-response, calibration is applied to external data relating to the distribution of persons in the target population.

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