



## LIFELONG LEARNING DEVELOPMENT LEVEL IN SELECTED EUROPEAN COUNTRIES: A PERSPECTIVE FOR IMPROVING STATISTICAL LITERACY

Ksenija Dumičić and Berislav Žmuk

Faculty of Economics and Business, University of Zagreb, Croatia

Trg J. F. Kennedyja 6, HR-10000 Zagreb, Croatia

[kdumicic@efzg.hr](mailto:kdumicic@efzg.hr)

[bzmuk@efzg.hr](mailto:bzmuk@efzg.hr)

*The higher the lifelong learning development level, or the higher the participation rate of adults in education and training in a country, the higher is the chance that the employment rate will be higher, since the more persons are competitive on the labour market and the greater the chance for a national economy to be more competitive. The aim of the paper is to inspect whether European countries with higher average lifelong learning development level have also higher average economic development level. The main variable under study is the Participation rate in education and training of people aged from 25 to 64 years for 2014, based on Eurostat data. The descriptive statistics analysis had shown significant differences in the participation rates in education and training between the observed European countries in 2014. An increasing lifelong learning of adults' development level performs a great chance for improving statistical knowledge in all the European countries studied.*

**Keywords:** cluster analysis, economic development level, descriptive statistics, European countries, adult participation in lifelong learning

**JEL classification:** C38, D83

### INTRODUCTION

Involvement in education and training is a measure of lifelong learning, which includes all learning activities started throughout life with the goal of improving knowledge, competences and skills, regarding personal, civic, social or employment-associated views. The goal to learn is the basic point that differentiates these activities from non-learning activities.

The research hypothesis of the paper is that the European countries with higher average lifelong learning development level have also higher average economic development level. Also, the higher level the lifelong learning of adults, the higher opportunity for statistical education to be included into it and statistical literacy and knowledge of adults to be improved.

Recently, issues as statistical literacy, knowledge and thinking are discussed widely. Statistical literacy is a key ability expected of citizens in informed societies, and is often taken as an expected outcome of educating and as a necessary component of adults' literacy. In Gal (2002) statistical literacy is portrayed as the ability to interpret, critically evaluate, and communicate about statistical information and messages. It is argued that statistically literate performance is predicated on the joint activation of five areas: literacy, statistical, mathematical, context, and critical thinking, together with a collection of supporting natures and enabling beliefs. Educational and research implications are discussed, and responsibilities facing educators, statisticians, and other stakeholders are outlined. Gould (2017) promotes statistical literacy as necessary because the role and nature of data have changed, so the definition includes prerequisite for "algorithmic culture", which stands in contrast to the traditional inference culture. Schield (2017) explains the 2016 revision of Guidelines for Assessment and Instruction in Statistics Education (GAISE), which eliminated pure statistical literacy as a stated goal by including multivariate thinking and promoting statistical thinking being part of statistical literacy.

According to Eurostat, adult participation in lifelong learning is defined as the share of population aged 25-64 who take part in education and lifelong learning. Statistics about adult participation in lifelong learning can be drawn from four main datasets. Detailed comparison among the Labour Force Survey (LFS), Adult Education Survey (AES), Continuing Vocational Training Survey (CVTS) and OECD Programme for the International Assessment of Adult Competencies (PIAAC) is given in the report of the European Commission (2014). This technical

briefing deals with adult participation in lifelong learning. In particular, it focuses on the implications associated to the use of different statistical sources (LFS, AES, CVTS and PIAAC), characterized by different reference periods and different definitions of lifelong learning.

According to Dumičić (2017), where statistical literacy is treated as a unique language for a better world, meaning that the enhancing of the statistical literacy may improve knowledge needed for better citizenship, and according to the analysis shown in this paper, lifelong learning may be considered as an opportunity for improving statistical literacy and knowledge, and all this is related to the development level in considered countries.

## LIFELONG LEARNING DATA, METHODS AND ANALYSIS RESULTS

In the paper the lifelong learning as participation rate in education and training of people aged from 25 to 64 years is observed. In order to better understand the participation rate in education and trainings, it is inspected by observing it from different angles: by sex (male, female), by employment status (employed, unemployed), by educational attainment level (primary, secondary, tertiary), and by degree of urbanisation (city, rural areas). The full list of 10 lifelong learning variables is listed in Table 1.

**Table 1** List of selected lifelong learning variables, for population 25 to 64 years (last 4 weeks)

No.	Code	Variable brief description	Source
1.	LLTotal	Participation rate in education and training, percentage of total population	Eurostat (2015a)
2.	LLMale	Participation rate in education and training, percentage of males	
3.	LLFemale	Participation rate in education and training, percentage of females	
4.	LLEmp	Participation rate in education and training, percentage of employed persons	Eurostat (2015d)
5.	LLUnemp	Participation rate in education and training, percentage of unemployed persons	
6.	LLEduc1	Participation rate in education and training, percentage of persons with less than from 25 to 64 years.	Eurostat (2015c)
7.	LLEduc2	Participation rate in education and training, percentage of persons with upper secondary and post-secondary non-tertiary education (levels 3 and 4)	
8.	LLEduc3	Participation rate in education and training, percentage of persons with tertiary education (levels 5-8)	
9.	LLCity	Participation rate in education and training, percentage of persons living in cities	Eurostat (2015b)
10.	LLRural	Participation rate in education and training, percentage of persons living in rural areas	

In the analysis data for overall 33 European countries are used. So, the lifelong learning data are included for all 28 European Union member states, plus the Former Yugoslav Republic of Macedonia (FYROM), Iceland, Norway, Switzerland, and Turkey. Furthermore, the lifelong learning variables are observed in the period from 2005 to 2014. Still, in the descriptive statistics and outlier analysis more emphasis is given to the most recent data (the year 2014). Unfortunately, data for all countries for the whole observed period are not available.

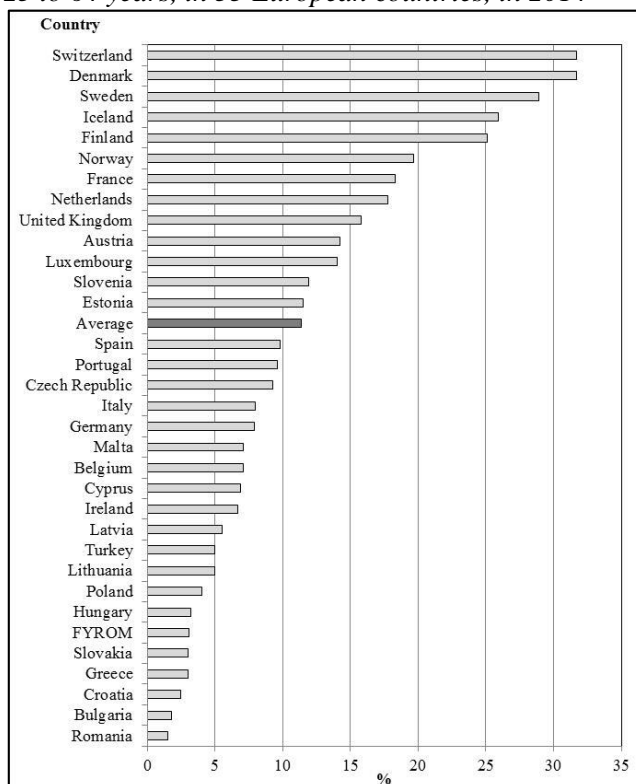
After conducted descriptive statistics and outlier analysis, using the selected lifelong learning variables, a cluster analysis is performed. The cluster analysis will enable recognizing of European countries groups which have similar lifelong learning development level. In the cluster analysis the non-hierarchical approach is used.

In order to observe the strength of impacts of lifelong learning change on the economic development, the correlation and regression modelling is conducted. In the analysis as a measure of the economic development level variable Gross domestic product (GDP) per capita in purchasing power parity (PPP) (World Bank, 2015) was used. Lifelong learning development level or participation rate in education and training of adults should be as high as possible.

The higher the participation rate is, the more persons have got new, relevant and specific knowledge. Consequently, these persons became more competitive on the labour market and they are more valued than before. Furthermore, the competitiveness level of the national economy also becomes higher. All these lead to higher development level in a country and to higher well-being level of its citizens. In Figure 1 the lifelong learning (variable LLTotal) in the observed 33 European countries for the most recent year for which data are available is shown.

Figure 1 revealed great disproportion in the participation rates in education and training between the observed European countries. In the 33 European countries together in average 11.4% of total population aged from 25 to 64 years participated in education and training in 2014.

**Figure 1** Lifelong learning as participation rate in education and training, percentage of total population aged from 25 to 64 years, in 33 European countries, in 2014



Source: Authors' creation, Eurostat.

**Table 2** Basic descriptive statistics results of Participation rate in education and training, percentage of total population aged from 25 to 64 years, in 33 European countries, in period from 2005 to 2014

Statistics	Year									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
N	31	33	33	33	33	33	33	33	33	33
Mean	10.48	9.95	9.92	10.22	10.20	10.55	10.87	11.08	11.45	11.41
Std. dev.	8.23	8.27	8.07	8.21	8.05	8.75	8.57	8.68	8.74	8.93
Coef. var.	78.55	83.06	81.38	80.34	78.85	82.92	78.81	78.35	76.28	78.27
Skewness	1.03	1.12	1.11	1.06	1.01	1.11	1.06	1.06	0.98	1.05
Kurtosis	-0.16	0.09	0.13	0.00	0.03	0.28	0.28	0.15	-0.06	0.10
Minimum	1.3	1.3	1.3	1.4	1.4	1.2	1.3	1.3	1.7	1.5
1st quartile	5.1	4.2	4.4	4.7	4.4	3.9	4.4	4.5	4.3	5.0
Median	7.4	6.8	7.0	6.9	6.8	7.2	7.5	7.4	7.8	8.0
3rd quartile	15.6	15.0	14.8	13.9	14.6	16.2	15.7	14.1	16.1	15.8
Maximum	27.6	29.2	29.0	29.9	31.2	32.5	32.3	31.6	31.4	31.7

Source: Authors' calculation, Eurostat.

From Table 2 it could be concluded that the average of percentage of total population aged from 25 to 64 years which participated in education and training steadily increase from 9.95% in 2006 and 9.92% in 2007 to 11.45% in 2013 and 11.41% in 2014. The average participation rate increased from about 10%, at the beginning of the observed period, to the about 11.5% in the recent years. However, the coefficients of variation are higher than 75% in all observed periods. According to median, in 50% of the observed countries 8.0% or less of total population aged from 25 to 64 years participated in education and training in 2014 whereas in 50% of the countries more

than 8.0% of total population aged from 25 to 64 years participated in education and training in 2014. The lowest values of variable LLTotal convincingly had Bulgaria and Romania in the observed period. In all 10 observed years the value of variable LLTotal was not higher than 1.8%. Denmark and Switzerland have not the value of variable LLTotal lower than 22.5% in all periods.

**Table 3** Basic descriptive statistics results of selected lifelong learning variables, percentages, in 33 European countries, in 2014

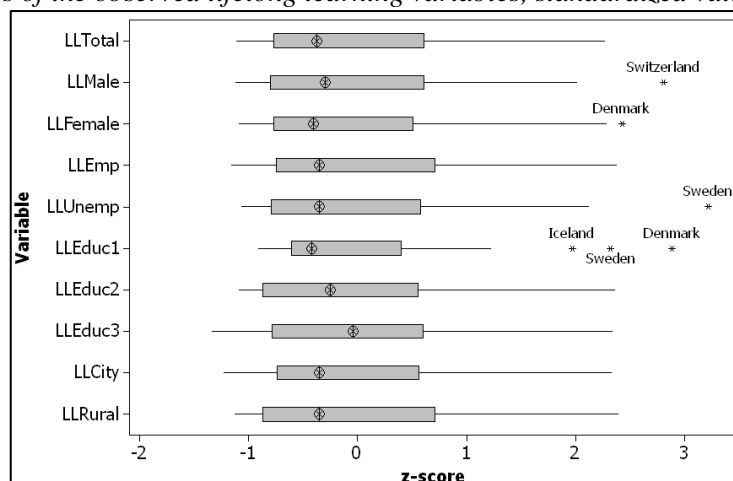
Statistics	Variable								
	LLMale	LLFemale	LLEmp	LLUnemp	LLEduc1	LLEduc2	LLEduc3	LLCity	LLRural
N	33	33	33	33	30	33	33	31	31
Mean	10.30	12.53	11.99	11.29	5.72	10.01	18.00	14.09	9.94
Std. dev.	7.79	10.28	9.28	9.82	5.97	7.74	11.23	9.74	8.27
Coef. var.	75.62	82.05	77.39	86.99	104.32	77.37	62.40	69.12	83.28
Skewness	1.10	1.14	0.96	1.40	1.56	0.98	0.72	0.99	0.94
Kurtosis	0.62	0.33	-0.02	2.11	1.86	0.02	-0.24	0.01	-0.06
Minimum	1.6	1.3	1.2	0.8	0.3	1.6	3.0	2.1	0.6
1st quartile	4.5	4.9	5.5	3.7	2.1	3.3	9.4	7.1	2.9
Median	8.0	8.3	8.7	7.9	3.2	8.1	17.5	10.7	7.0
3rd quartile	14.2	17.4	17.4	16.2	7.8	13.1	24.6	19.5	15.3
Maximum	32.2	37.5	34.1	42.9	23.0	28.3	44.3	36.8	29.7

Source: Authors' calculation, Eurostat.

Table 3 shows basic descriptive statistics results of the other 9 selected lifelong learning variables when all selected European countries are observed together in 2014. Unfortunately, there are some missing data. So, there are no available data for the variables LLCity and LLRural for the FYROM and Turkey. Considering variable LLEduc1 there are no available data for Bulgaria, Lithuania and Slovakia whereas for Croatia it was used the most recent available data from 2009. Similar, at the variable LLUnemp for Lithuania data from 2013 was used as an estimate for 2014.

According to the coefficients of variation values, which are presented in Table 3 and which are considerably higher than 30%, it can be concluded that data variation level at each variable is high. Consequently, the median should be consulted instead of the average.

**Figure 2** Box plots of the observed lifelong learning variables, standardized values, in 2014

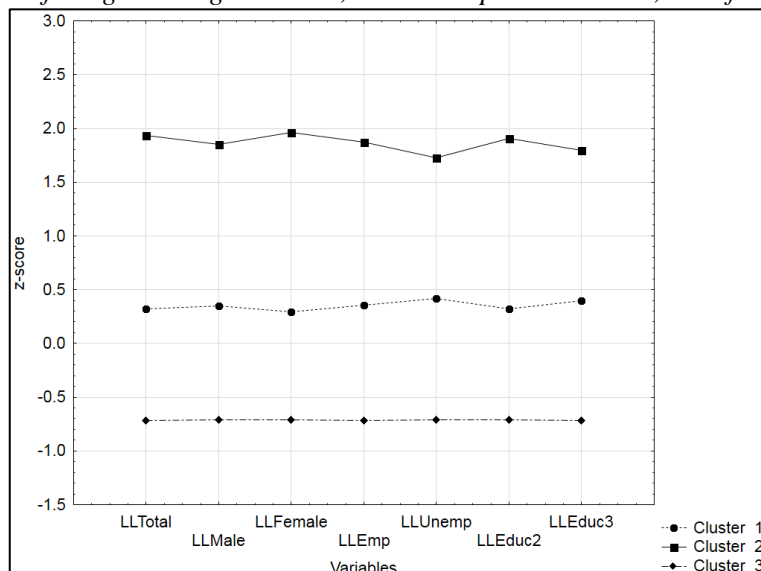


Source: Authors' calculation, Eurostat.

The box plots of the observed lifelong learning variables, which are shown in Figure 2, suggest that there are six outliers. However, only one of emphasized data can be defined as serious outlier. Namely, the LLUnemp variable value for Sweden deviates more than three standard deviations from the variable average ( $z=3.22$ ). In Sweden 42.9% of unemployed aged from 25 to 64 years participated in education and training in 2014. It has been estimated that this data should not have significant impact on the analyses which, so, Sweden was not omitted from the further analysis. Whereas the outliers are not a problem here, the missing data are. Namely, the question

here is to omit from the further analysis countries for which data is missing (five countries) or to omit variables with missing data (three variables). It has been decided to conduct non-hierarchical cluster analysis by using both approaches and then to compare results to see if some significant differences exist.

**Figure 3** Plot of means for each cluster, non-hierarchical cluster analysis, K-means clustering method, 7 selected lifelong learning variables, in 33 European countries, data from 2014



Source: Authors' creation, Eurostat.

**Table 4** Classification of countries in the clusters, non-hierarchical cluster analysis, K-means clustering method, 7 selected lifelong learning variables, in 33 European countries, data from 2014

Cluster 1 10 countries	Cluster 2 5 countries	Cluster 3 18 countries
Austria, Estonia, France, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, United Kingdom	Denmark, Finland, Iceland, Sweden, Switzerland	Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, FYROM, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Turkey

Source: Authors' creation, Eurostat.

**Table 5** Classification of countries in the clusters, non-hierarchical cluster analysis, K-means clustering method, 10 selected lifelong learning variables, in 28 European countries, data from 2014

Cluster 1 5 countries	Cluster 2 7 countries	Cluster 3 16 countries
Denmark, Finland, Iceland, Sweden, Switzerland	Austria, France, Luxembourg, Netherlands, Norway, Slovenia, United Kingdom	Belgium, Croatia, Cyprus, Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Italy, Latvia, Malta, Poland, Portugal, Romania, Spain

Source: Authors'.

According to Table 4 and Table 5 there are slight movements of European countries between clusters regarding their economic development.

### CONCLUDING REMARKS

According to the analysis shown in this paper, increasing lifelong learning development level, which is positively related to and all this is related to the development level in considered countries, may be considered as an opportunity for improving statistical literacy and knowledge. The conducted analysis has shown that there are great differences in lifelong learning achieved

level over the observed European countries. The increasing trend in lifelong learning level in the observed European countries overall is noticed. The lifelong learning development level in the 33 observed European countries increased in last 10 years from 10% to 11.5%. The two conducted cluster analyses have shown that three groups of countries according to achieved lifelong learning development level can be recognized. Unfortunately, the same or similar distinction between countries could not be made when economic development level, measured by Gross domestic product (GDP) per capita in purchasing power parity, was taken into account. Consequently, the research hypothesis of the paper could be only partially accepted because strong relationship between achieved lifelong learning development level and achieved economic development level was not found.

The higher the participation rate of adults in education and training in a country, the higher is the chance that the employment rate will be higher, since the more persons are competitive on the labour market and the greater the chance for a national economy to be more competitive. All these lead to higher well-being level of citizens. The statistical education for adults, employed or unemployed, should be improved in the European countries. Since, statistics is considered as a new key competence for lifelong learning enhancing employability and the ability to remain employable throughout life, the role of statistics educators is important, related to government support, ministry of education, etc., and the educators become very responsible, especially for those that design and organize educational programs in statistics for all society segments. In future research lifelong learning perspective for improving statistical knowledge should be investigated and implemented more.

## REFERENCES

- Dumičić, K. (2017). *Enhancing Statistical Literacy as a Unique Language for a Better World*. Plenary Speech. In: Kremić, E., Kozarić, K. (Eds.), *Book of Abstracts ICOS2017- The International Conference on Official Statistics, Sarajevo, B&H, 30.-31.03.2017, School of Economics and Business in Sarajevo, University of Sarajevo, B&H*, pp. 19-21.
- European Commission (2014). *Adult Participation in Lifelong Learning - The impact of using a 12-months or 4-weeks reference period*. <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC92330/lbna26918enn.pdf> (June 1, 2017)
- Eurostat (2015a). *Participation rate in education and training (last 4 weeks) by sex and age*. [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng\\_lfse\\_01&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng_lfse_01&lang=en) (November 4, 2015).
- Eurostat (2015b). *Participation rate in education and training (last 4 weeks) by sex, age and degree of urbanisation*. [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng\\_lfs\\_14&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng_lfs_14&lang=en) (November 4, 2015).
- Eurostat (2015c). *Participation rate in education and training (last 4 weeks) by sex and educational attainment level*. [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng\\_lfse\\_03&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng_lfse_03&lang=en) (November 4, 2015).
- Eurostat (2015d). *Participation rate in education and training (last 4 weeks) by sex and labour status*. [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng\\_lfse\\_02&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng_lfse_02&lang=en) (November 4, 2015).
- Field, A. (2009). *Discovering statistics using SPSS*. Thousand Oaks, CA: SAGE Publications.
- Gal, I. (2002). Adults' Statistical Literacy: Meanings, Components, Responsibilities. *International Statistical Review*, 70(1), 1-5.
- Gould, R. (2017). Data Literacy is Statistical Literacy. *Statistics Education Research Journal*, 16(1), 22-25.
- Schild, M. (2017). GAISE 2016 Promotes Statistical Literacy. *Statistics Education Research Journal*, 6(1), 50-54.
- World Bank (2015). *GDP per capita, PPP (current international \$)*. <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD> (November 5, 2015).