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PARTICIPATION OF THE POPULATION IN EDUCATION. ROMANIA WHERE?

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Abstract:
The degree of participation of the population in education is an indicator that provides an image of the chance of sustainable development, both at the level of local communities and at the regional and national level. In Romania, over time, the education system has undergone numerous transformations that tried to harmonize this sector with the characteristics of technological, economic and social developments, as a member state of the European Union. The analysis carried out and presented in this paper highlights the fact that, unfortunately, between Romania and the other EU member states there are significant differences regarding the participation of the population in education, as well as its level of education, discrepancies that are accentuated at the level of the development regions. Moreover, in many cases the developments are divergent, compared to the developments at the EU level.

Key words: *education, sustainability, education level of the population, school dropout, employees*

JEL classification: C19, I21, I25, O15

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1. INTRODUCTION

Education is a fundamental factor of sustainable development, not only by promoting the understanding of the need for sustainability by training students, graduates, teachers, researchers and businessmen aware of the alarming situation facing the planet (Adler, 2023), but also by the major impact it has on the standard of living of each individual, as well as on the level of local and regional communities (Andrusca and Negura, 2014).

In the current pace of technological development, the quality and adaptability of education is a primary concern of sustainable development (Guskova et.al., 2016), economic and social dynamics requiring the continuous improvement and development of the level of education (Naoş and Simionescu, 2018), with positive effects on the labor force (Bækgaard and Helsø, 2023) and not only that.

The education level of the population, the relationship between education and the labor market are strategic aspects in a sustainable society. The economic-social dynamics imposes a corresponding dynamic of the educational system, the connection between them being reciprocal. At the level of Romania, this link is analyzed and confirmed in the work A Century of Education in Romania (Caragea and Alexandru, 2018)

In The National Strategy for the Sustainable Development of Romania 2030 (NSSDR, 2018), under Objective 4, Quality education, it is emphasized that "access and participation in quality education are essential for the proper functioning of a sustainable society". In practice, it depends on several aspects (Zamfir and Mocanu, 2017), among which, the rural-urban disparities, the rural environment being disadvantaged from this point of view (Chiriţescu et.al., 2017), the economic and cultural disparities between certain social groups, in disadvantaged ones increasing the risk of school dropout (Ioana, 2012; Olah, 2019), disparities between development regions in Romania (Chilian, 2012), the relationship between entrepreneurship and education (Avran and Sabou, 2016; Mocanu, 2020), as well as, last but not least, disparity between Romania and the other member states of the European Union (Zaharia et.al., 2022; Coman, 2022).

Although the education system in Romania has gone through, and continues to go through, numerous reforms (Urean, 2017), the results obtained are still weak, the adaptation to changes being rather slow (Stroe, 2022) and sometimes turbulent, with an alternation of results positive and negative, a fact underlined by the results obtained in the simulations and national evaluations.

In this context, the paper analyzes, based on a large number of indicators, the level and participation of the Romanian population in education at all educational levels, both at the national level and at the level of the development regions, compared to the other member states of the European Union.

2. DATA SERIES AND METHODOLOGY

Starting from the objectives of the research carried out, the analysis was based both on the series of data available at the level of Romania, available in the database of the National Institute of Statistics (NISDB, 2024) and in the databases available at the level of the European Union.

Among these, the main data series were: Usually resident population by age group and ages, sex, urban/ rural area, macro regions, development regions and counties, at July 1st (URPAG, 2024), Enrolled population, by level of education, urban/ rural area, macro regions, development regions and counties (EPBLE, 2024), Pupils and students in education by age groups - as % of corresponding age population (PSEAGP, 2024), Out-of-school rate in population of lower secondary school age, by sex (OSRLSE, 2024), Out-of-school rate in population of upper secondary school age, by sex (OSRUSE, 2024), Early leavers from education and training by sex and NUTS 1 regions (ELETR, 2024), Pupils from age 3 to the starting age of compulsory education at primary level by NUTS2 regions - % of the population of the corresponding age (P3APLR, 2024), Employees by educational attainment level, sex, age and NACE Rev. 2 activity (EELTA, 2024), Participation rates of selected age groups in education at regional level (PRERL, 2024), Population by educational attainment level, sex and NUTS 2 regions (PEALR, 2024), and The degree of inclusion in education of the school-age population, by gender (DIEPG, 2024). The identifiers and meanings of the variables included in the analyses are presented in table 1.

Table 1. The identifiers and meanings of the variables used in the analysis

ELPLE	The share of employees with less than primary, primary and lower secondary education
EWSNT	The share of employees with upper secondary and post-secondary, non-tertiary education (levels 3 and 4)
EWTE	The share of employees (aged 15-64) with tertiary education (levels 5-8)
PE1519	The share of pupils and students in education by 15-19 age groups of corresponding age population
PE2529	The share of pupils and students in education by 25-29 age groups of corresponding age population
OSRN2	Out-of-school rate in population of lower secondary school age
OSRN3	Out-of-school rate in population of upper secondary school age
SP3PL	Pupils from age 3 to the starting age of compulsory education at primary level, by regions
PR1524R	Participation rates of 15-24 age groups in education at regional level
PRLPE	Population rate with less than primary, primary and lower secondary education, by regions
PRUSE	Population rate with upper secondary and post-secondary non-tertiary education, by regions
PRTE	Population rate with with tertiary education, by regions
PRUN1	The share of the school-age population, from the urban environment, included in primary education
PRRN1	The share of the school-age population, from the rural environment, included in primary education
PRUN1	The share of the school-age population, from the urban environment, included in primary education
PRRN1	The share of the school-age population, from the rural environment, included in primary education

In order to highlight the characteristics of the degree of participation of the population in education (by categories and levels), of the level of education of employees, as well as of the population aged 25-64, both descriptive and inferential statistical analysis methods were used , mainly focused on cluster analyses. In accordance with the objectives of the study, they aimed to identify Romania's place among the member states of the European Union, as well as the evolution

of similarities and disparities at the level of development regions in Romania from the point of view of the population's participation in education.

The application of the hierarchical cluster methodology started from shape matrices

$Y = \left\| y_{ij} \right\|_{i=\overline{1,n},\ j=\overline{1,r}}$, where, at EU27 level, $n = 27$ and $r = 7$, and at regional level, $n = 8$ and $r = 5$.

Starting from these, squared Euclidian distance was used to generate the proximity matrix (García-Escudero et al., 2010): and Ward's method was used to generate the clusters (Murtagh & Legendre, 2014).

To test the statistical significance of the variables belonging to the clusters, as well as their averages, the Welch test (Robust Tests of Equality of Means) was used with the hypotheses:

H_0: there is no significant difference between the means.

$$\exists\, m_i = m_j, \quad i = \overline{1,r},\ j = \overline{1,r},\ i \neq j \tag{3}$$

H_1: there is a significant difference between the means.

$$m_i \neq m_j, \quad \forall\, i = \overline{1,r},\ j = \overline{1,r},\ i \neq j \tag{4}$$

The condition for accepting the null hypothesis (H_0) is: Sig.> α., where for the analyses carried out at the EU27 level, α=0.05 (95% confidence level), and for those at the regional level α=0.10 (confidence level of 90%). Data processing was performed using SPSS.

3. RESULTS AND DISCUSSION

In the last 35 years, the educational process in Romania has gone through numerous transformations that have left their mark on the education level of the population both at national and regional level.

3.1. CHARACTERISTICS AT THE NATIONAL LEVEL

At the national level, taking into account the data available from the databases of the National Institute of Statistics of Romania (NISDB, 2024) and according to the Education Law no. 1/2011 (LEN, 2023), the degree of inclusion in education of the school- age population, by gender (DIEGP, 2024), of the population aged 3-23 years and over, in the period 2010-2015 (Figure 1), was on a downward trend, from 88.3%, in 2010, to 72.4 % in 2015, after which it stabilized around 72.2%.

By gender, throughout the entire period, the participation in education of the female population of school age was significantly higher than that of the male population, the biggest difference, of 6.2 percentage points, being registered in 2010, the year in which the share of the female population included in education was 91.5%, and of the male population, only 85.3%. Although over the analyzed period the difference decreased, it remained significant, in 2019 being 4.2 percentage points (74.5% for the female population and 70.3% for the male population).

The relatively low level of participation of the school-age population in education results also in comparison with the other member states of the European Union. Thus, at the level of 2021 (Table 2) the weighting of pupils and students in education, by age group from the corresponding age population, highlights the fact that, after the age of 15, when education is no longer compulsory, in Romania the population's participation in education it decreases very quickly, as its age increases.

For the 15-19 age group, corresponding to the 3rd level of education (upper secondary education), at the level of the European Union, the share was between a maximum of 96% in

Lithuania, 8.6 points above the EU average, and a minimum of 71.1% In Cyprus. In this age group, Romania is in the penultimate place, with a weight of 71.1%, 16.3 percentage points below the EU average.

For the upper age groups, namely the 20-22-year-olds, as well as the 25-29-year-old age group, although there are decreases in all EU member states, the top places are maintained by almost the same states, with values that exceed the EU average with about 15 percentage points (Slovenia and Netherlands), for the 20-year-old generation, with 13.9 percentage points (Denmark), for the 22-year-old age group, and about 14 percentage points (Finland and Greece), for the 25-29-year-old age group

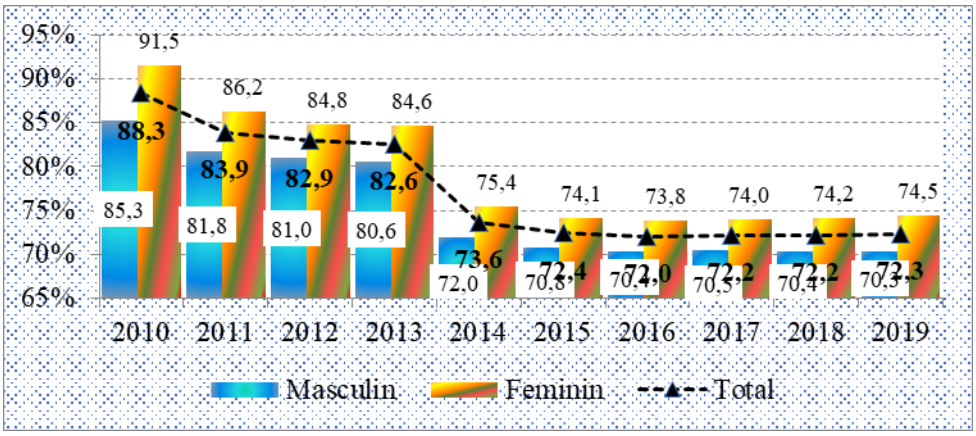

Figure 1. Degree of inclusion in education of the school-age population at the level of Romania in the period 2010 – 2019.

Source: Elaborated by the authors based on the DIEGP data series

Table 2. Pupils and students in education by age groups - as % of corresponding age population

Poz.	15-19 years		20 years		22 years		25-29 years	
EU27	87.4*		58.7		45.3		15.0*	
1	Lithuania	96.0	Slovenia	74.6	Denmark	59.2	Finland	29.2
2	Slovenia	94.5	Netherlands	73.6	Slovenia	57.4	Greece	28.7
3	Belgium	94.1	Greece	72.3	Netherlands	56.6	Denmark	28.5
4	Ireland	93.7	Belgium	72.1	Greece	54.8	Sweden	27.8
5	Netherlands	92.9	Ireland	69.3	Finland	53.4	Germany	22.1
21	Austria	81.5	Romania	46.2	Italy	37.0	Hungary	10.0
22	Hungary	81.2	Austria	45.9	Romania	36.1	Bulgaria	8.2
23	Luxembourg	77.6	Slovakia	44.7	Hungary	35.8	Romania	8.2
24	Malta	75.8	Finland	44.5	Slovakia	33.9	France	7.9
25	Bulgaria	75.0	Denmark	43.7	Cyprus	30.0	Slovakia	6.5
26	Romania	71.6	Cyprus	38.4	Malta	26.5	Malta	5.9
27	Cyprus	71.1	Luxembourg	33.1	Luxembourg	18.2	Luxembourg	5.6

* Values recorded at the level of 2020

Source: Elaborated by the authors based on the PSEAPG data series

At the opposite pole, in last place and with the lowest weights, is Luxembourg, in all three age categories. Romania, for the 20-year-old population, ranks 21st with a weight of 46.2% (12.5 percentage points below the EU average), for the 22-year-old population, it ranks 22nd with a weight of 36.1% (with 9.2 percentage points below the EU average), and for the population aged 25-29, it is in 23rd place with a weight of 8.2% (with 6.8 percentage points below the EU average).

Unfortunately, regarding Out-of-school rate in population of lower secondary and upper secondary school age, in the period 2015 – 2021, Romania recorded the highest values, and the trend is maintained (Figure 2), the gap compared to the EU average being on the rise.

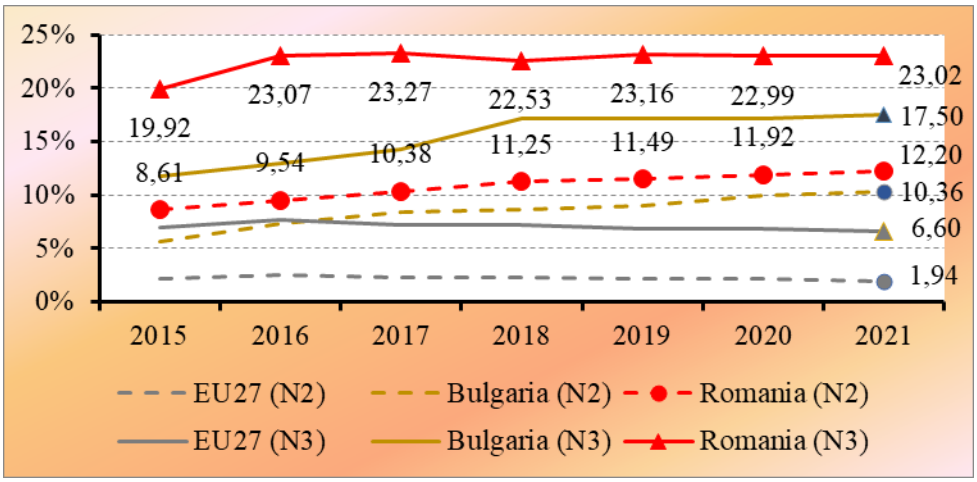

Figure 2. Evolutions of Out-of-school rates in the population of lower secondary and upper secondary school age, in Romania, Bulgaria and EU27.

Source: Elaborated by the authors based on the OSRLSE and OSRUSE data series

Thus (Table 3), if in 2015 the out-of-school rate in the population of lower secondary school age (OSRN2) was 8.61% (with 6.41 percentage points above the EU average), in 2021 it will reach 12.20% (with 10.26 percentage points above the EU average), increasing by an annual average of 0.60 percentage points, while the EU average, decreased by an annual average of 0.04 percentage points.

Table 3. Out-of-school rate in population of lower secondary and upper secondary school age

Poz.	OSRN2 (level 2)				OSRN3 (level 3)			
Year	2015		2021		2015		2021	
EU27	2.20		1.94		6.97		6.60	
1	Romania	8.61	Romania	12.20	Romania	19.92	Romania	23.02
2	Bulgaria	5.69	Bulgaria	10.36	Luxembourg	16.27	Bulgaria	17.50
3	Poland	4.33	Hungary	5.37	Malta	12.16	Luxembourg	14.66
4	Luxembourg	4.23	Slovakia	4.20	Bulgaria	11.79	Hungary	13.36
5	Slovakia	4.07	Poland	3.97	Hungary	10.20	Germany	10.56
23	Netherlands	0.26	Cyprus	0.00	Belgium	2.20	Netherlands	1.57
24	Portugal	0.26	Portugal	0.00	Sweden	2.20	Belgium	1.01
25	Ireland	0.00	Ireland	0.00	Netherlands	1.14	Lithuania	0.18
26	Croatia	0.00	Croatia	0.00	Portugal	0.65	Portugal	0.00
27	Lithuania	0.00	Lithuania	0.00	Ireland	0.00	Ireland	0.00

Source: Elaborated by the authors based on the OSRLSE and OSRUSE data series

Regarding the out-of-school rate in the population of upper secondary school age (OSRN3), in the period 2015 – 2021, Romania's situation is much worse, registering an increase from 19.92%, in 2015, with 12.95 percentage points above the EU average, at 23.02%, in 2021, with 16.42 percentage points above the EU average. Romania's evolution is also in this case divergent from the EU average. While, in Romania, OSRN3 increased with an annual average of 0.52 percentage points, at EU level, there was a decrease, with an annual average of 0.06 percentage points

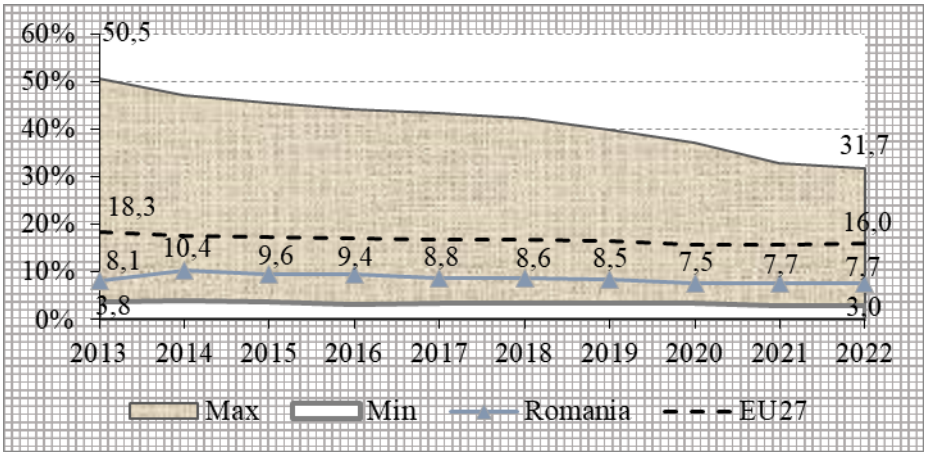

Figure 3. the place of Romania in the evolutions of the share of employees (aged 15-64) with less than primary, primary and lower secondary education (levels 0-2).

Source: Elaborated by the authors based on the EELTA data series

In the period 2013 -2022, after the share of employees with less than primary, primary and lower secondary education (ELPLE), at the Romanian level, reached a maximum of 10.4%, in 2014 (Figure 3), it continuously decreased reaching 2022 to 7.7%, which corresponds to an average annual reduction of 0.34 percentage points. In the same period, at the EU27 level, ELPLE decreased from 18.3% to 16.0%, with an annual average of 0.26 percentage points. In the entire period, among the EU member states, the highest values of ELPLE were recorded in Portugal, from 50.5% in 2013, to 31.7%, in 2022, and the lowest in Lithuania, in the period 2013-2020, from 3.8%, to 3.4%, as well as in Slovakia, in 2021 (2.8%) and in 2022 (3.0%). It should be noted that, during the entire period, in all former communist EU member states, ELPLE recorded values below the European Union average, which highlights the positive performance of their education systems regarding primary and lower secondary education.

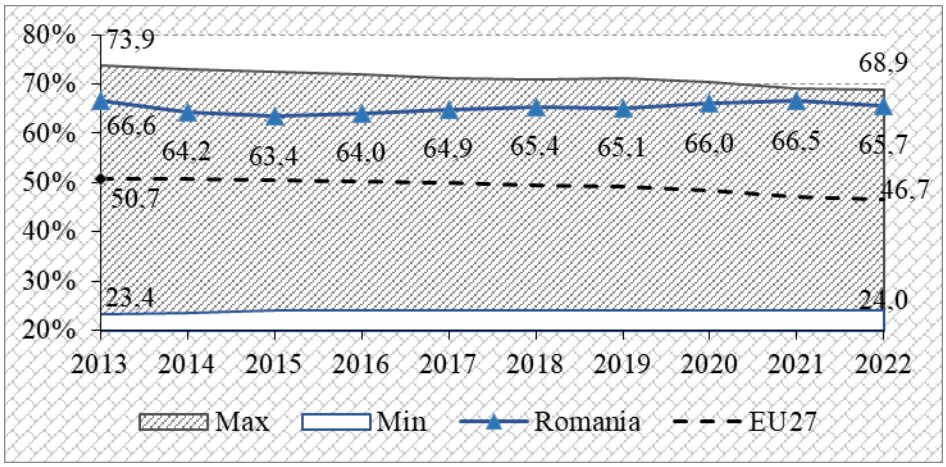

Figure 4. The place of Romania in the evolutions of the share of employees (aged 15-64) with upper secondary and post-secondary, non-tertiary education.

Source: Elaborated by the authors based on the EELTA data series

The highest shares of employees' training level, both in Romania and at the EU27 level, are recorded for employees (aged 15-64) with upper secondary and post-secondary, non-tertiary education (EWSNT). Among the member states, the highest weights were recorded in the Czech Republic, with values between 73.9% in 2013 and 68.9% in 2022, and the lowest in Spain, from 23.4% in 2013 to 24.0% in 2022.

In Romania, the evolution of the EWSNT was slightly fluctuating (Figure 4), from 66.6% in 2013, decreasing to 63.4% in 2015, increasing slightly to 66.5% in 2021 and decreasing to 65.7% in 2022. Compared to the evolution recorded at the EU27 level, where the EWSNT decreased from

50.7% in 2013 to 46.7% in 2022, which corresponds to an average annual reduction of 0.44 percentage points, in Romania the recorded fluctuations were on an approximately constant trend, of about 66%. Consequently, in Romania there is a divergent trend compared to the EU average regarding EWSNT.

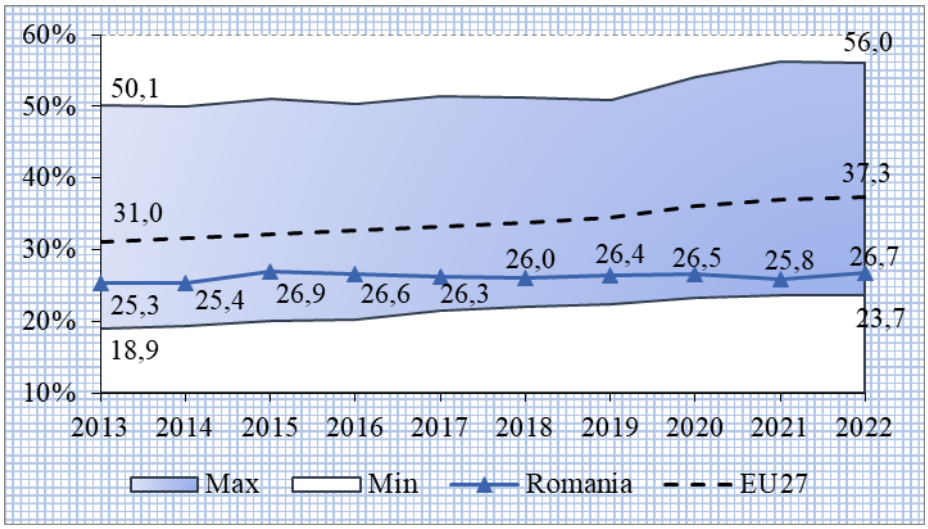

Figure 5. The place of Romania in the evolutions of the share of employees (aged 15-64) with tertiary education (levels 5-8).

Source: Elaborated by the authors based on the EELTA data series

Regarding the share of employees (aged 15-64) with tertiary education (EWTE), Romania is below the EU average (Figure 5), which is a negative fact, especially since a divergent process is also evident here. Thus, while the maximum shares increased from 50.1%, a value recorded in 2013, in Ireland, to 56.0% recorded in 2022, in Luxembourg (an increase of 5.9 percentage points), and the minimum values increased from 18.9%, in 2013, at 23.7%, in 2022, values recorded in Italy (an increase of 4.8 percentage points), in Romania, EWTE evolved between 25.3%, in 2013, and 26.7%, in 2022 (an increase of only 1.4 percentage points).

Consequently, instead of tending to the EU27 average, the evolution of EWTE tends to send Romania towards the tail of the ranking.

Romania's position among the member states of the European Union is also highlighted by the results of the cluster analysis carried out taking into account seven criteria: Share of pupils and students in education by 15-19 age groups of corresponding age population (PE1519), Share of pupils and students in education by 25-29 age groups of corresponding age population (PE2529), Out-of-school rate in population of lower secondary school age (OSRN2), Out-of-school rate in population of upper secondary school age (OSRN3), Employees with less than primary, primary and lower secondary education (ELPLE), Employees with upper secondary and post-secondary non-tertiary education (EWSNT) and Employees with tertiary education (EWTE).

The tests and analyzes carried out led to a structuring of the EU states into five clusters (Table 4).

Table 4. Structure of the clusters according to the values of the indicators PE1519, PE2529, OSRN2, OSRN3, ELPLE, EWSNT and EWTE

Cluster	Countries
C1	Belgium, Estonia, Ireland, France, Latvia, Lithuania, Netherlands, Poland, Slovenia
C2	Bulgaria, Romania
C3	Czechia, Croatia, Hungary, Slovakia, Denmark
C4	Germany, Greece, Italy, Austria, Finland, Sweden
C5	Spain, Cyprus, Luxembourg, Malta, Portugal

Source: Elaborated by the authors using SPSS

The testing of the statistical significance of the average values of the seven indicators, and of their belonging to the clusters, was carried out with the Welch test, Robust Tests of Equality of Means, with the null hypothesis (H_0): the averages of the variables are not statistically significant. According to the results obtained (Table 4), all values Sig.<α=0.05 which leads to the conclusion that the hypothesis H_0 is rejected and, consequently, all the averages recorded at the cluster level are statistically significant.

Table 4. Welch Robust Tests of Equality of Means

	Statistic[a]	df1	df2	Sig.
PE1519	18.140	4	6.208	0.001
PE2529	7.812	4	5.263	0.022
OSRN2	20.577	4	5.255	0.002
OSRN3	7.147	4	5.176	0.025
ELPLE	4.432	4	7.464	0.039
EWSNT	17.050	4	5.616	0.003
EWTE	12.002	4	5.934	0.005

a. Asymptotically F distributed.

Source: Elaborated by the authors using SPSS

Analyzing the characteristics of the clusters (Table 5), respectively the average values of the seven variables, it results that the best performing results are recorded in the states of cluster C1 (Belgium, Estonia, Ireland, France, Latvia, Lithuania, Netherlands, Poland, Slovenia). They are characterized by high values of the population's participation in education for the 15-19 age group (PE1519), low values of the out-of-school rate in the population of school age (OSRN2 and OSRN3), as well as high values of the share of employees with upper secondary, post-secondary and tertiary education (EWSNT and EWTE).

. **Table 5. The main characteristics of the clusters**

Cluster	PE1519	PE2529	OSRN2	OSRN3	ELPLE	EWSNT	EWTE
C1	92.14	13.03	1.15	2.97	9.09	45.04	45.84
C2	73.30	8.20	11.28	20.26	9.20	61.10	29.75
C3	85.23	9.35	2.39	7.36	6.03	64.03	29.93
C4	81.99	25.86	1.18	6.10	15.49	46.29	38.26
C5	80.62	10.84	1.58	6.76	22.56	32.38	45.08

Source: Elaborated by the authors using SPSS

A cluster with similar characteristics is cluster C3 (Czechia, Croatia, Hungary, Slovakia, Denmark), with the difference that, in its case, lower values of population participation in education are recorded for the 25-29 age group and very high shares of employees with upper secondary and post-secondary non-tertiary education (EWSNT).

Clusters C4 (Germany, Greece, Italy, Austria, Finland, Sweden) and C5 (Spain, Cyprus, Luxembourg, Malta, Portugal), although they are characterized by high values of the population's participation in education and low values of the out-of-school rate in population of school age (OSRN2 and OSRN3), register higher shares of employees with less than primary, primary and lower secondary education (ELPLE), in cluster C4 almost a quarter of employees have less than primary, primary and lower secondary education.

The C2 cluster, which includes two states, Romania and Bulgaria, is significantly different from the others by the very high values of the out-of-school rate in the population of school age, more than 9.5 times higher than C1 and C4, at the out-of-school rate in population of lower secondary school age (OSRN2), and 6.82 times higher at out-of-school rate in population of upper

secondary school age (OSRN3), than in cluster C1. Also, although the share of ELPLE is only 9.20%, close to that registered in cluster C1, the very high share of EWSNT (61.10%) highlights a workforce with an average level of education, to the detriment of the share of employees with tertiary education (EWTE).

3.2. PARTICIPATION OF THE POPULATION IN EDUCATION AT THE REGIONAL LEVEL

At the level of development regions in Romania, the share of pupils from the age of 3 to the age of starting compulsory education at primary level in the corresponding age population (SP3PL) highlights both aspects of similarity and significant disparities, especially in comparison with trends in the European Union.

Table 6. Shares of students from the age of 3 to the age of starting compulsory education at primary level, from the corresponding age population

	2013	2014	2015	2016	2017	2018	2019	2020	2021
EU27	89.6	90.8	91.8	92.5	92.4	92.2	92.9	92.9	91.8
Romania	84.1	84.2	84.6	85.2	84.0	80.5	78.6	78.2	75.6
North-West	93.2	92.9	90.9	92.2	92.0	88.7	84.8	84.2	82.4
Center	91.1	91.3	89.8	89.8	88.7	84.5	83.7	82.6	81.4
North-East	81.1	82.0	83.4	82.3	81.0	74.4	71.7	72.2	70.1
South East	82.7	84.1	86.4	85.8	85.1	81.5	78.3	78.3	75.7
South-Muntenia	78.1	77.9	79.5	83.1	82.1	79.9	78.6	78.1	76.1
Bucuresti-Ilfov	74.6	71.3	72.7	74.7	72.1	73.8	73.8	72.6	67.3
South-West Oltenia	88.8	89.9	89.8	90.1	89.1	85.7	85.4	86.9	82.5
West	86.1	88.3	87.3	86.4	83.4	79.3	76.9	75.3	73.0
Range	18.6	21.6	18.2	17.5	19.9	14.9	13.7	14.7	15.2
V	7.7	8.7	7.3	6.5	7.3	6.5	6.4	6.9	7.6

Source: Elaborated by the authors, based on the P3APLR data series

As similarities, in all the eight development regions in Romania, quite high weights are recorded regarding the participation of the population of the appropriate age in preschool education. At the level of Romania (Table 6), they evolved between a maximum of 84.2%, in 2015 and a minimum of 75.6%, in 2021. In terms of development regions, the maximum values were recorded in the North-West region, in the period 2013-2018 (from to 93.2% in 2013, to 88.7% in 2018) and in the South-West Oltenia region, in the period 2019-221 (from 85.4% in 2019 to 82.5% in 2021). At the same time, the minimum values were recorded in the Bucharest-Ilfov development region, in the period 2013-2018 (from 74.6% in 2013, to 73.8% in 2018) and in 2021 (67.3%), as well as in the region North-East, in 2019 (71.7%) and 2020 (71.2%).

On the other hand, analyzing the values of the coefficient of variation (V) and the Range parameter, it results that there are no significant differences between the development regions, the values recorded at the level of the 9 years of the analyzed period being homogeneous, the tendency being towards convergence, the amplitude of the interval of variation decreasing from 18.6 percentage points in 2013 to 15.2 percentage points in 2021.

However, comparing these evolutions with the trend registered at the level of the European Union (Figure 6), a significant discrepancy results. Practically, the two evolutions are moving further and further apart. Thus, if in 2013, the difference between the SP3PL values, recorded at the EU27 level and in Romania, was 5.5 percentage points, in 2021 it had reached 16.2 percentage points.

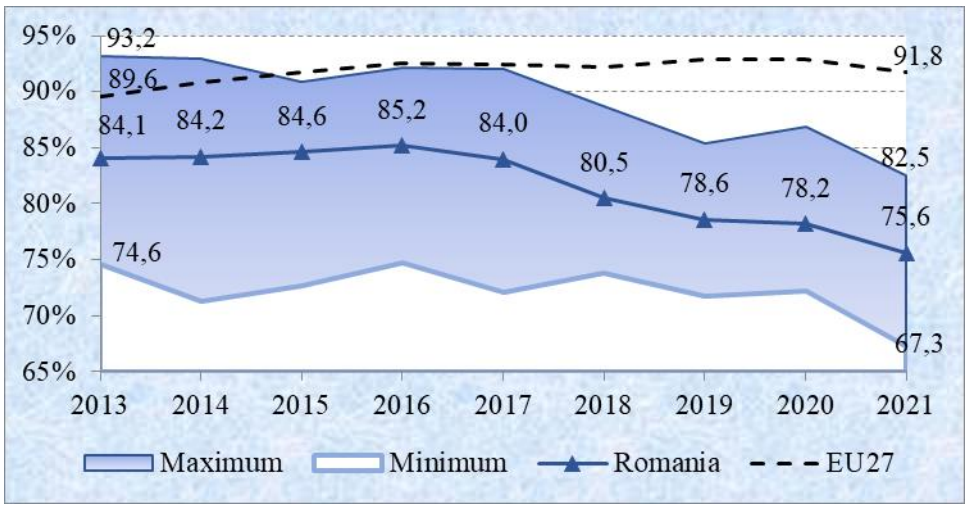

Figure 6. The evolutions of SP3PL, in Romania and EU27

Source: Elaborated by the authors, based on the P3APLR data series

During the period of compulsory education, respectively primary education (level 1) and lower secondary education (level 2), the shares of the school population included in education, from the age groups 6-10 and 11-14 years, in the period 2012-2022, are significantly higher than the SP3PL values, both at the national and regional level, the disparities between the development regions are maintained, especially in the rural environment.

The share of the urban school-age population included in primary education (PRUN1) is characterized by a divergent evolution highlighted by the increase in the difference between regions, from 3.40 percentage points in 2013, the extreme values being recorded in the North- East (97.89%) and South-West Oltenia (94.49%), at 14.19 percentage points, in 2022, between the maximum values of 100% recorded in the North-West, Center and West regions, and the minimum value of 85.5% recorded in the North region - East.

Regarding the directions of PRUN1 evolutions, from the eight development regions of Romania, upward evolutions were recorded in five regions (North-West, Center South-Muntenia, South-West Oltenia and West) with average annual increases between 1.06 points percentage points (North-West) and 0.18 percentage points (South-Muntenia), while, in the other three regions (North-East, South-East and Bucharest-Ilfiv) PRUN1 evolutions were downward with negative annual average increases between - 1.21 percentage points in the North-East, and -0.03 percentage points in the South-East.

In the rural environment, the share of the school-age population included in primary education (PRRN1) highlights a much more unfavorable situation (Figure 7). In 2012, they ranged between a maximum of 84.13%, in the Center region, and a minimum of 71.95% in the Bucharest-Ilfov region, the difference being 12.19 percentage points. Moreover, in the rural area of the Bucharest-Ilfov region, the lowest shares are recorded in the entire analyzed period.

Although after a minimum, recorded in 2016, PRRN1 values register a slight increase until 2020, when PRRN1 registers values between 86.72%, in the South-East region and 69.42% in Bucharest-Ilfov, a gap of 17.30 percentage points, in the 2021-2022 period, there are significant decreasing in PRRN1 values, with a maximum of 77.85%, in the Center region (with 6.29 percentage points less than in 2012), and a minimum of 62.08%, in Bucharest-Ilfov (with 9.87 percentage points less than in 2012). These evolutions not only highlight a decreasing trend of the share of the school-age population included in primary education in rural areas, but also a divergent process of increasing the gaps between the development regions from this point of view.

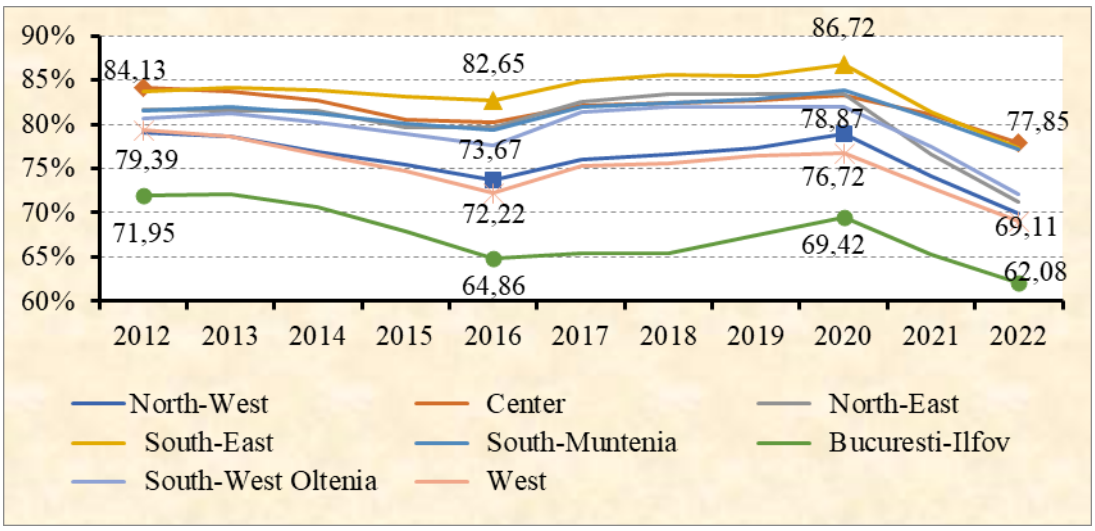

Figure 7. The evolution of the share of the rural school-age population included in primary education (PRRN1) in the period 2012-2022

Source: Elaborated by the authors based on the EPBLE and URPAG data series

The evolution of the share of the school-age population, from the urban environment, included in secondary education (PRUN2) is relatively different from that recorded in primary education (PRUN1), due to the fact that, in the period 2013-2016, PRUN2 tended to 100% in all regions of development. Starting from 2017, however, the gap between regions begins to increase from 1.08 percentage points in 2017 to 8.58 percentage points in 2022. In 2022, three development regions (North-West, Center and West) recorded the maximum values of 100% while, in the other five regions, values between 97.85% in South-Muntenia and 91.42%, in North-East, were recorded.

Regarding the evolutions of the share of the school-age population, from the rural environment, included in secondary education (PRRN2), they are relatively similar to the evolutions of the share of the school-age population, from the rural environment, included in primary education (PRRN1). Thus (Figure 8), if in 2012, they were between a maximum of 84.36%, in the North-East region, and a minimum of 73.11% in the Bucharest-Ilfov region, the difference being 11.42 percentage points, at the end of the analyzed period there are significant reductions in the PRRN2 values, between a maximum of 73.91%, in the South-Muntenia region (with 10.42 percentage points less than in 2012), and a minimum of 57.40%, in the rural environment of the Bucharest-Ilfov region (with 15.71 percentage points less than in 2012), the gap between development regions increasing to 16.51 percentage points.

After the end of the period of compulsory education (level 1 and level 2), with the exception of the Bucharest-Ilfov development region, the participation of the population in education is significantly reduced. At the same time, the discrepancies between the regions are increasing. Thus (Figure 9), if in 2013 between the West development region where a value of participation rates of 15-24 age groups in education (PRE15_24) was recorded, of 62.1% and the minimum value recorded in the South-Muntenia region, of 44.0 %, there was a gap of 18.1 percentage points, in 2021 it had reached 26.0 percentage points, between the value recorded in the North-West region (62.1%) and that recorded in South-Muntenia (36.1%).

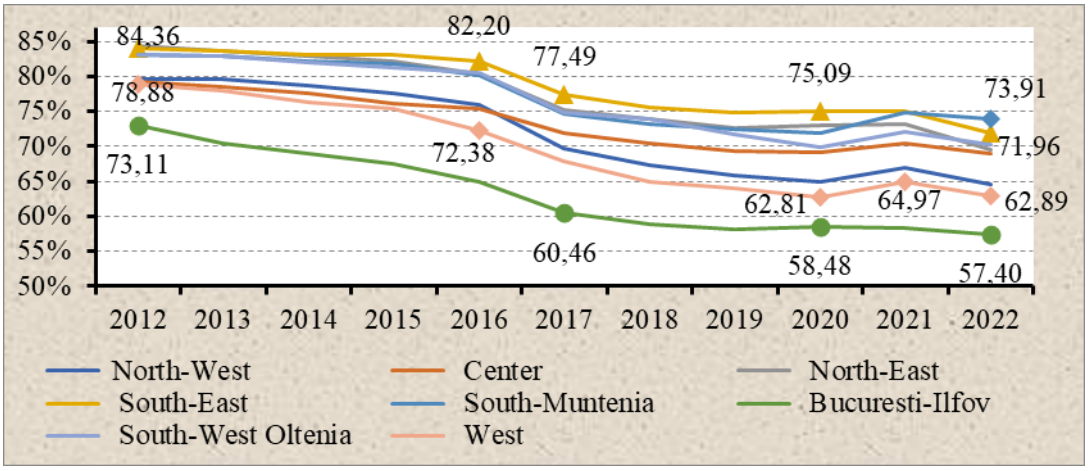

Figure 8. The evolution of the share of the school-age population in the rural environment included in secondary education (PRRN2) in the period 2012-2022.

Source: Elaborated by the authors based on the EPBLE and URPAG data series

Although, during this period, the PRE15_24 value registered in the Bucharest-Ilfov development region tended towards 100%, the impact of PRE15_24 evolutions in the other regions made the PRE15_24 values decrease by 5.5 percentage points, from 58.9%, in 2013, to 53.4%, in 2021. Consequently, the gap with the PRE15_24 evolution recorded at the European Union level increased from 4.4 percentage points, in 2013, to 12.2 percentage points, in 2021.

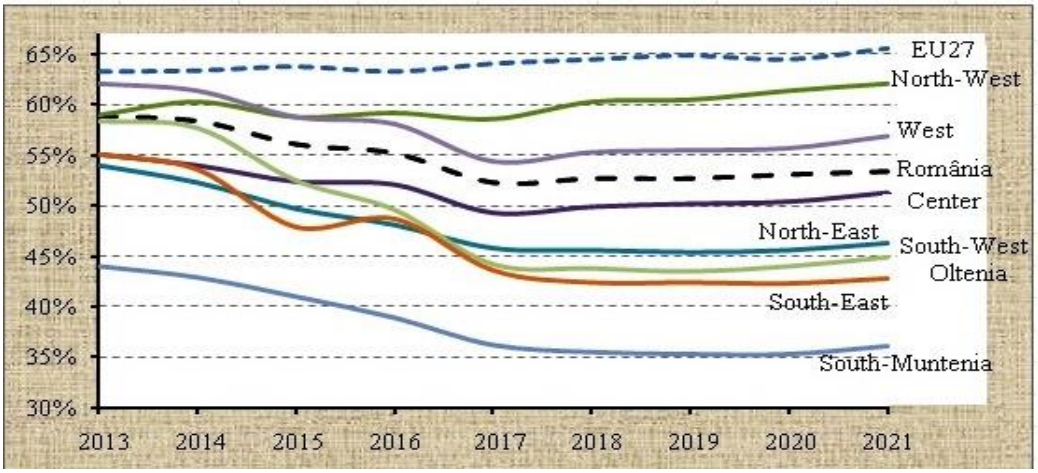

Figure 9. The evolutions of participation rates of 15-24 age groups in education in seven development regions in Romania, compared to the evolutions at the EU27 level.

Source: Elaborated by the authors based on the PRERL data series

The participation rates of the population in education, at the regional level, have an impact over time on the structure of the population aged 25 to 64 years, from the point of view of the level of education acquired. Thus, in the period 2013-2022, population rate with less than primary, primary and lower secondary education (PRLPE), at the regional level, in Romania, in 2014, recorded values between a maximum of 32.8%, in the South-East region, and a minimum of 14.5% in Bucharest-Ilfov (Figure 10), which corresponds to a difference of 18.3 percentage points. In the same year, at the level of Romania, PRLPE was 27.2%.

In the period 2014-2022, the PRLPE values decreased approximately linearly both at regional and national level so that, in 2022, it took the extreme values being recorded in the same regions: 25.7%, in South-East, and 6.2% in Bucharest-Ilfov, (the amplitude of the difference being 21.3 percentage points), this being higher by 3.0 percentage points than in 2014, which highlights an increase in the discrepancy between the development regions.

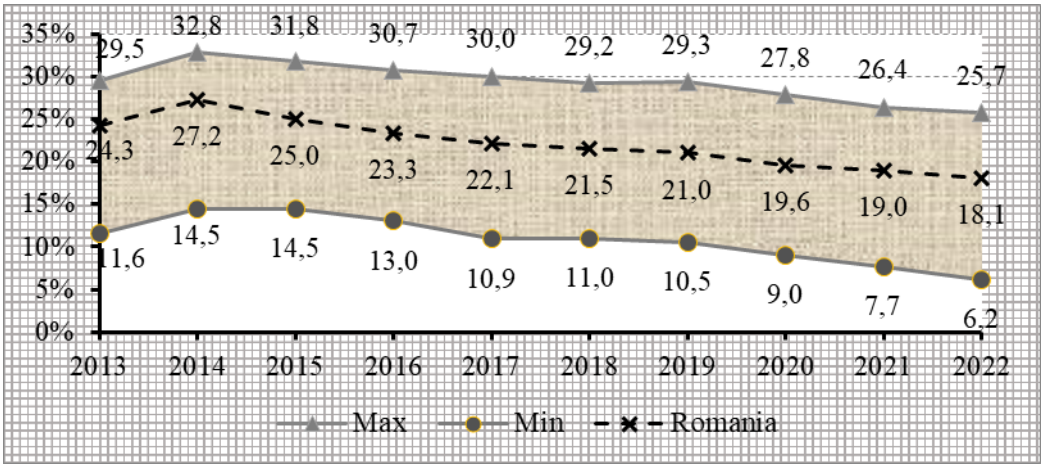

Figure 10. Evolution of PRLPE, at the regional level, in Romania, in the period 2013-2022.
Source: Elaborated by the authors based on the PEARL data series

In the same period, the population rate with upper secondary and post-secondary non-tertiary education (PRUSE), although it had a different evolution (Figure 11), is a consequence of the PRLPE evolution. Thus, in 2014, when PRLPE recorded maximum values, PRUSE recorded the lowest values at the level of development regions, between 62.4% in the West region and 55.2% in the Bucharest-Ilfov region, the amplitude of the difference being 7.2 percentage points.

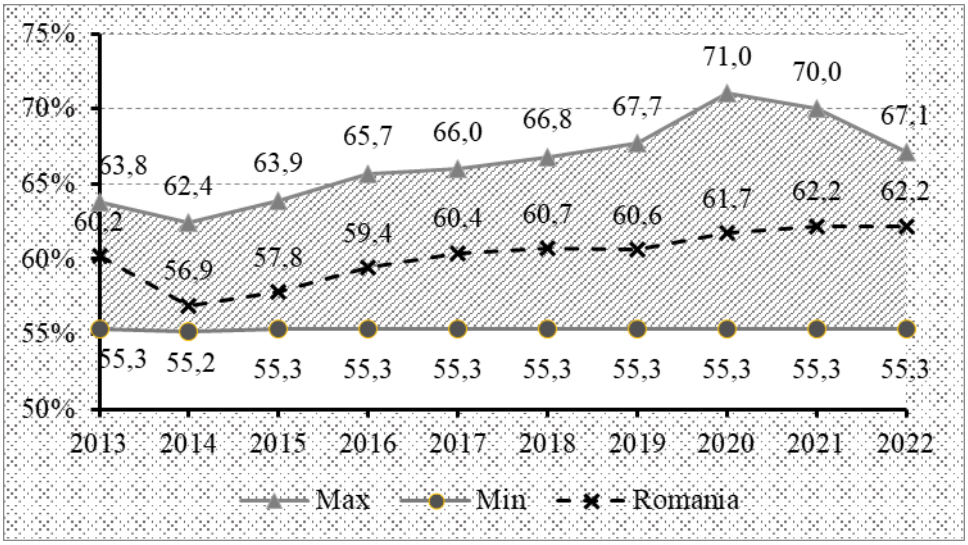

Figure 11. PRUSE evolution, at the regional level, in Romania, in the period 2013-2022.
Source: Elaborated by the authors based on the PEARL data series

In the period 2014-2020, with the exception of the Bucharest-Ilfov development region, where PRUSE remains constant, at 53.3%, in the other regions there are significant increases, up to 71.0%, in 2020, and 67.1% in 2022, both values being registered in the West region. This highlights the fact that, during the analyzed period, there is an increase in the education level of the population, determined by the reduction in the population rate with less than primary, primary and lower secondary education and the increase in the population rate with upper secondary and post-secondary non-tertiary education.

The regional evolutions of the population rate with tertiary education (PRTE) are correlated with the evolutions of PRLPE and PRUSE. Thus (Figure 12), the best performances were recorded in the entire period, in the Bucharest-Ilfov region, and the weakest in the South-Muntenia region, in 2013, 2014 and 2022, as well as in the North-East region, in period 2015-2021.

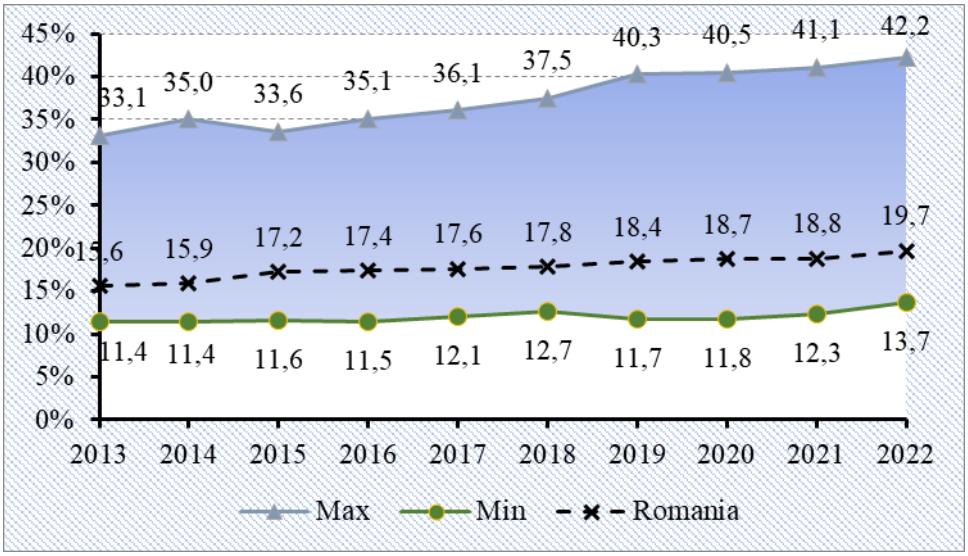

Figure 12. The evolution of PRTE, at the regional level, in Romania, in the period 2013-2022

Source: Elaborated by the authors based on the PEARL data series

It should be noted that, during the analyzed period, at the EU27 level there was an increase in PRTE of 7.2 percentage points, while at the Romanian level the increase was only 4.1 percentage points, the only region with higher increases than in the EU27 being Bucharest-Ilfov (9.1 percentage points). Increases in PRTE values greater than or equal to the increase recorded at the Romanian level were in the Center (4.6 percentage points), North-West and West (4.1 percentage points) regions.

The similarities and disparities between the development regions in Romania are also highlighted by the results of the cluster analysis carried out taking into account five criteria: Pupils from age 3 to the starting age of compulsory education at primary level, by regions (SP3PL), Participation rates of 15-24 age groups in education at regional level (PR1524R), Population rate with less than primary, primary and lower secondary education (PRLPE), Population rate with upper secondary and post-secondary non-tertiary education (PRUSE), Population rate with tertiary education (PRTE)

The tests and analyzes carried out, based on the five indicators, led to a structuring of the development regions in Romania, in four clusters (Table 7) of which cluster C4 includes only the Bucharest-Ilfov development region

Table 7. Grouping of the states in clusters according to the values of the indicators SP3PL, PR1524R, PRLPE, PRUSE and PRTE

Cluster	Cluster structure
C1	North-West, Center, South-West Oltenia
C2	North-East, South-East
C3	South-Muntenia, West
C4	Bucureşti-Ilfov

Source: Elaborated by the authors using SPSS

Testing the statistical significance of the average values of the seven indicators and their cluster membership was performed with the Welch test, Robust Tests of Equality of Means with the null hypothesis (H0): the averages of the variables are not statistically significant. Given that the data series are very short, a confidence coefficient of 90% (α=0.10) was used to test the significance of the means.

According to the results obtained (Table 8), for four of the five variables the values Sig.<α=0.10 which leads to the conclusion that, for them, the hypothesis H0 is rejected. In the case of the variable PR1524R, for which Sig=0.530, the hypothesis is accepted, its average values

recorded at the cluster level do not differ significantly. Consequently, in the analysis of the cluster characteristics at the regional level (Table 9) it is conclusive only in terms of the other four variables (SP3PL, PRLPE, PRUSE and PRTE).

Table 8. Welch Robust Tests of Equality of Means

	Statistic[a]	df1	df2	Sig.
PRLPE	15.621	2	1.862	0.069
PRUSE	13.826	2	2.274	0.053
PRTE	44.700	2	1.799	0.029
SP3PL	15.095	2	1.545	0.097
PR1524R	0.894	2	1.949	0.530

a. Asymptotically F distributed.

Source: Elaborated by the authors using SPSS

The average values of the variables that describe the performances recorded regarding participation in education at the regional level highlight that the C1 cluster, which includes the Bucharest-Ilfov development region, is in first place. The lowest value of the population rate with less than primary, primary and lower secondary education (PRLPE), of 6.20%, is recorded here, as well as the highest value of the population rate with tertiary education (PRTE), of 42.20%. On the other hand, the rate of pupils from age 3 to the starting age of compulsory education at primary level (SP3PL) is only 67.30%.

Clusters C1 (North-West, Center and South-West Oltenia) and C3 (South-Muntenia and West) register very close values regarding the population rate with less than primary, primary and lower secondary education (PRLPE) and the population rate with upper secondary and post-secondary non-tertiary education (PRUSE). However, it should be noted that, in the case of the rate of the population with tertiary education (PRTE), C1 is ahead of C1 by 2.23 percentage points, and in the case of the rate of pupils from age 3 to the starting age of compulsory education at primary level (SP3PL) the highest is recorded value, of 82.10%, 7.55 percentage points more than C3 and 14.80 percentage points more than C4.

Table 9. Characteristics of clusters at regional level

Cluster	PRLPE	PRUSE	PRTE	SP3PL
C1	17.60	64.13	18.23	82.10
C2	24.80	61.25	14.00	72.90
C3	17.30	66.70	16.00	74.55
C4	6.20	55.30	42.20	67.30

Source: Elaborated by the authors using SPSS

The most disadvantaged development regions in terms of the population rate with less than primary, primary and lower secondary education (PRLPE) are North-East and South-East, components of cluster C2 in which PRLPE has the value of 28.80%, of approximately 1.4 times higher than in the regions included in clusters C1 and C3, and 4 times higher than in the Bucharest-Ilfov region. Also, the lowest rate of the population with tertiary education is recorded here, of only 14.0%

4. CONCLUSIONS

The economic and social transformations after 1990 also produced significant effects on the education system in Romania, which went through a long period of transition. These had both positive influences, such as the wide access to tertiary education and the facilities offered by the transferable credit system, but also negative influences, especially through the increase in school dropouts, as well as through low shares of the population's participation in education after the end of the compulsory cycles.

At the present time, in Romania, the level of education of the employed population aged 15 to 64, in a proportion of approximately 50% is the result of the educational system before 1990, and the other 50% is the result of the educational system developed after 1990. Under these conditions , taking into account the much stricter system of population participation in compulsory education levels until 1990, the share of employees with less than primary, primary and lower secondary education, for over 40 years, is extremely small. This means that, although after 1990 the educational systems in Romania were and are much more permissive regarding non-participation in compulsory education, in the total number of employees aged 15 to 64, from the point of view of ELPLE, Romania is in a position better than the EU average.

On the other hand, however, regarding the evolutions of the share of employees (aged 15-64) with upper secondary and post-secondary, non-tertiary education, although currently, Romania is in the middle of the EU member states ranking, in relation to the EU average, the trend is divergent. This trend is even more evident in the case of the evolutions of the share of employees (aged 15-64) with tertiary education, which can lead Romania to the bottom of the ranking from this point of view.

At the level of the development regions in Romania, although the population's participation in education falls within the trends recorded at the national level, there are a number of disparities between the development regions, especially in comparison with trends in the European Union.

During the period of compulsory education, respectively primary education (level 1) and lower secondary education (level 2), although the shares of the school population included in education, from the age groups 6-10 and 11-14 years, in the period 2012-2022, are significantly more higher than in preschool education, the disparities between the development regions are maintained, especially in the rural environment. These developments not only highlight a decreasing trend of the share of the school-age population included in primary education in rural areas, but also a divergent process of increasing the gaps between the development regions from this point of view.

After the end of the period of compulsory education, with the exception of the Bucharest-Ilfov development region, the participation of the population in education is significantly reduced. At the same time, the discrepancies between the regions are increasing. The evolutions of participation rates of 15-24 age groups in education at regional highlight the fact that, with the exception of the Bucharest-Ilfov region, among the seven development regions analyzed, only in the North-West development region was there an upward evolution, at the level of the other six regions of development, the participation rates of 15-24 age groups decreased with values between 5.2 percentage points in the West region, and 13.5 percentage points, in the South-Muntenia region.

Regarding the education level of the population aged 25-64 at the regional level, although there were reductions in the rate of the population with less than primary, primary and lower secondary education and an increase in the rate of the population with upper secondary and post-secondary non -tertiary education, as well as the rate of the population with tertiary education, the population with secondary education has the largest share, at the expense of that with tertiary education, significant differences are registered between the development regions in Romania, both in terms of the population's participation in education, as well as regarding the structure of the population from the point of view of the level of education acquired.

These conclusions are also highlighted by the results of the cluster analysis, which highlighted that both the lower level of the population's participation in education and the large and growing shares of the out-of-school rate in the population of lower secondary and upper secondary school age are factors that in the long term lead to unfavorable levels of the share of employees with upper secondary and post-secondary, non-tertiary education (levels 3 and 4) and implicitly with tertiary education (levels 5-8) with implications on sustainable development in Romania.

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