Journal of Research and Innovation for Sustainable Society (JRISS)
Volume 7, Issue 2, 2025
ISSN: 2668-0416
Thoth Publishing House

DOI: 10.33727/JRISS.2025.2.8:91-106

Aspects of educational performance in Romania through the baccalaureate. Regional and county disparities and similarities

Marian Zaharia[1]
[1]Association for Democracy Education Respect
ORCID: 0000-0002-6580-5913

Abstract. In the last decade, both the participation rate of high school graduates in Romania and the pass rate of the baccalaureate exam have fluctuated from one year to the next. If at the level of Romania, the pass rate of the baccalaureate exam has evolved, in the case of current promotions, around 77%, and in the case of all participating candidates (current promotions plus previous promotions), around 70%, at the level of counties the differences are significantly large. In order to provide an image of the similarities and disparities between counties, from these points of view, the paper presents a cluster analysis of six indicators regarding participation rates, success rates, as well as the ranges of averages obtained. The paper is part of a cycle of papers by the authors dedicated to various aspects of education in Romania in the context of sustainable development.

Keywords: *education, baccalaureate, regional development, cluster analysis*

1. Introduction

For more than two decades, education in Romania has gone through, and continues to go through, numerous reforms (Urean, 2017), with a frequency far too high to allow adaptation to them (Stroe, 2022), which has not led to the expected results. The consequence is the emergence of turbulence, with alternations of positive and negative results, from one year to the next.

In the context of sustainable development, access to and participation of the population in quality education is essential, as highlighted in The National Strategy for the Sustainable Development of Romania 2030 (NSSDR, 2018). This requires a competitive system that is adaptable to the needs of the economy (Chiriac, 2021), under conditions of efficient educational management, which supports the development of young people based on the transfer of knowledge and their motivation to pursue higher education (Spînu, 2023).

Unfortunately, the Romanian education system is not yet at a qualitative level compared to that of most EU countries (Cobzaru & Moraru, 2023; Coman, 2022), with significant differences in the population's participation in education, as well as its level of education (Zaharia & Gogonea, 2024). Among the major challenges of the Romanian education system are the development and modernization of material infrastructure (Tutunaru, 2022), increasing the quality of human resources (Calinoiu & Ana, 2022; Popa, 2021), reducing school dropout (Zaharia, 2024) and last but not least, aligning Romania with current educational trends (Iacob et.al., 2024).

The increasingly high pace of technological development, and not only, entails the need to increase the share of the population with a baccalaureate degree, a mandatory condition in Romania for accessing tertiary education, essential in the process of economic and social development (Brendan

et.al., 2022). In this context, the adaptability of the high school curriculum is imposed, on the one hand, by the socio-economic and ecological requirements of sustainable development (Núñez-Sánchez & Valente, 2023), and on the other hand, by the need to increase the professional opportunities of those with a baccalaureate degree at the beginning of their careers (Herbaut et.al., 2022), with positive effects on the workforce (Bækgaard and Helsø, 2023; Obioma & Nonye, 2024).

In practice, the results obtained by high school graduates in the baccalaureate exam depend on several aspects, among which the lack of performance of some high schools, as well as vulnerable groups of students, are some of the most important. These, in turn, are determined by the low level of students' knowledge, acquired in primary and secondary education, by their degree of motivation influenced by family and/or belonging to vulnerable groups (Shukla, 2021), by financial availability, by the environment of residence, the rural environment being disadvantaged (Chiriţescu et.al., 2017), both in terms of material infrastructure and teaching staff, as well as by the disparities between the development regions to which they belong (Buza & Enache, 2024; Pop, 2024).

Taking these aspects into account, the paper highlights two aspects. The first refers to the evolution of baccalaureate enrollment rates in the total population of the corresponding age, as well as success rates, in Romania over the last decade. The second consists of highlighting, based on a cluster analysis, the disparities and similarities between the counties in Romania in terms of the results obtained in the baccalaureate exam in 2024, high school graduates from the current year.

2. Research methodology

In accordance with the two objectives of the research carried out, the analysis was based on the statistical data series available in the database of the National Institute of Statistics (NISDB, 2025), as well as the Ministry of Education and Research of Romania (MERR, 2025). The main data series are: Legally resident population, by age group and age, sex, urban/ rural area, macroregions, development regions and counties, at July 1st (LRPA, 2025), Graduates by level of education, type of education, macroregions, development regions and counties (GLDE, 2025), Number of pupils who completed the baccalaureate exam, by gender, macroregions, development regions and counties (NSPB, 2025) and counties and Information on the final results (after resolving appeals), recorded in the second session of the national baccalaureate exam, August 2024 (RFB24, 2025). 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

Variable	Signification	UM
PA18Yi	Population aged 18 in year i	number
NGHSi	Number of pupils graduating from high school in year *i*	number
NPBEi	Number of pupils who completed the baccalaureate exam in year *i*	number
RGHSPi	Rate of pupils graduating from high school in year *i*, in the population aged 18 in year *i*	%
RPBEPi	Rate of pupils who completed the baccalaureate exam in year *i*, in the population aged 18 in year *i*	%
RPAB	Rate of pupils enrolled the baccalaureate	%
RGRDB	Rate of completing the baccalaureate exam	%
R_6_7	Rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99	%
R_7_8	Rate of pupils completed to the baccalaureate with grades between 7.00 and 7.99	%
R_8_9	Rate of pupils completed to the baccalaureate with grades between 8.00 and 8.99	%
R_9_10	Rate of pupils completed to the baccalaureate with grades between 9.00 and 10	%

Taking into account the two objectives of the research undertaken, both descriptive and analytical statistical methods were used on the one hand, to analyze the evolution of the participation rates in the baccalaureate, and on the other hand, clustering methods for the cross-sectional analysis of the

similarities and disparities between counties regarding the results obtained in the baccalaureate exam in the summer of 2024.

For the cluster analysis, the matrix was used:

$$Z = \|z_{ij}\|_{i=\overline{1,n},\, j=\overline{1,r}} \quad (1)$$

In (1) $n = 42$, corresponding to the 41 counties and the municipality of Bucharest, and $r = 6$, corresponding to the number of variables included in the cluster analysis.

Starting from these, for Proximity Matrix generation and clusters generation Chebyechev distance and Squared Euclidian distance ware (García-Escudero et al., 2010).

The variance homoscedasticity of variables was tested with Levene's test with null hypothesis (H_{1_0}) variance does not differ significantly (homoscedasticity), and the statistical significance of obtained results were tested with ANOVA methodology (F test), with null hypothesis (H_{2_0}), the cluster membership of the analyzed regions is not statistically significant.

The condition for accepting the null hypotheses H_{1_0} and H_{2_0}, was:

$$F_{stat} < F_{\alpha,k-1,\, N-k} \text{ or Sig } > \alpha \quad (2)$$

Data processing was performed using SPSS, confidence level being of 95% (significance threshold α=0.05)

3. Results and Discussion

In the last decade, although various ways have been tried to increase the quality of pre-university education, and in particular, the structure and organization of the baccalaureate exam, the results obtained have not been and are not up to expectations. Although the percentage of those who completed the baccalaureate exam has increased slightly, significant differences still remain both between development regions and between counties, from this point of view.

3.1. An overview at the national level

At the national level, in the last ten years, the number of graduates of pre-university high school education (NGHS), as well as those who succeed in obtaining the baccalaureate degree (NPBE), in the total population aged 18 in the corresponding year (PA18Y), continues to be quite low.

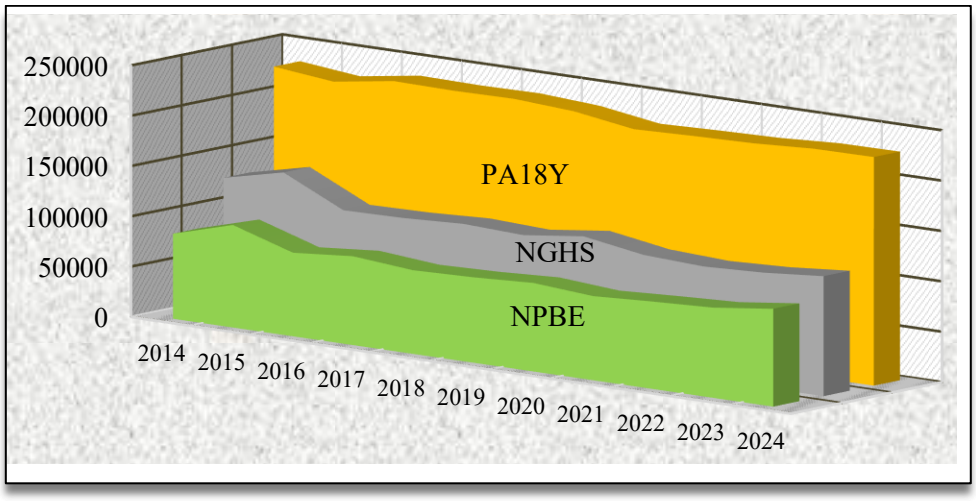

Figure 1 Evolution of the number of pupils registered for the baccalaureate exam (NGHS), and of those who succeed in obtaining the baccalaureate degree (NPBE) compared to the 18-year-old population (PA18Y) corresponding to the respective years. Source: prepared by the authors

During the period 2014-2024, the population aged 18, residing in Romania, on July 1 of each year (PA18Y), evolved from 230,091 people in 2014, to 226,951 people in 2024 (a reduction of 3,140 people), passing through a maximum of 233,005 people in 2016, and a minimum of 219,933 people in 2020. Compared to this (Figure 1), the number of high school graduates corresponding to each year, registered for the baccalaureate exam (NGHS), decreased from 129,759 people in 2014 to 119,052 people in 2024, registering a reduction of 10,707 people (3.41 times more than the reduction in the 18-year-old population in the respective years), the maximum being recorded in 2015 (143,895 people), and the minimum value in 2022 (111,327 people). As a result, the rate of high school graduates registered for the baccalaureate exam in the total population aged 18 (RGHSP) decreased from 56.39% in 2014 to 52.46% in 2024 (a reduction of 3.94 percentage points), a consequence of school dropout and early leaving of education.

On the other hand, the number of high school graduates from the current promotions who completed the baccalaureate exam (NPBE) increased from 84,622 people in 2014 to 97,066 people in 2024 (an increase of 12,444 people), reaching a maximum of 101,966 people in 2015 and a minimum of 83,091 people in 2016. This led to an increase in the rate of 18-year-olds who completed the baccalaureate exam in the total population of the same age (RPBEP), from 36.78% in 2014 to 42.77% in 2024 (an increase of 5.99 percentage points).

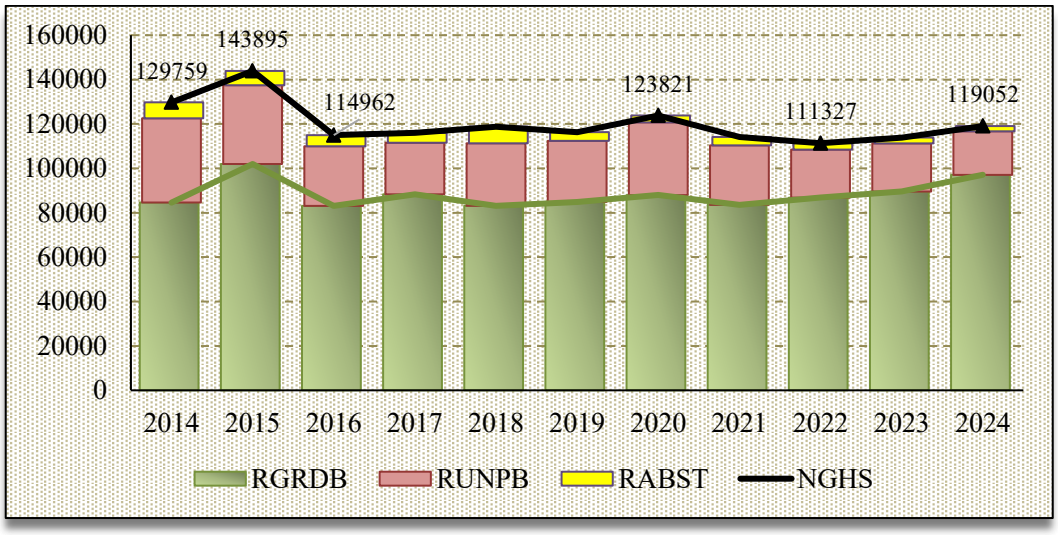

Figure 2 Evolution of the structure of pupils registered for the baccalaureate exam (NGHS), from the point of view of participation and passing the exam (RGRDB), in the period 2014 – 2024
Source: prepared by the authors

From the point of view of the qualitative structure of pupils registered for the baccalaureate exam (NGHS), in the period 2014 – 2024 (figure 2), several aspects are highlighted regarding the absenteeism rate (RABST), the promotion rate (RGRDB) and the failure rate (RUNPB) of the exam.

During the period analyzed, the absenteeism rate in the baccalaureate exam (RABST) decreased from 5.55% in 2014 to 1.98% in 2024. Consequently, the effective participation rate in the baccalaureate exam (RPAB) evolved from 94.45% in 2014 to 98.02% in 2024, an increase of 3.57 percentage points. However, the increase was not continuous, with a minimum of 93.67% recorded in 2018, determined by the highest absenteeism rate of 6.33% and the highest number of absentees (7518 pupils). It is worth noting that in 2023 and 2024 the lowest absenteeism rates were recorded, of 2.31% and 1.98%, the number of absentees from the baccalaureate exam being 3.05 times lower than in 2014, and 3.19 times lower than in 2018.

Regarding the baccalaureate exam pass rate (RGRDB), it increased from 65.21% in 2014 to 81.53% in 2024, an increase of 16.32 percentage points. With small fluctuations, the RGRDB evolved

on an upward trend, with an average annual increase of 1.63 percentage points. This increase in the RGRDB was determined on the one hand by the reduction in the absenteeism rate (RABST), and on the other hand by the substantial reduction in the baccalaureate exam failure rate (RUNPB), which decreased from 29.23% in 2014 to 16.49% in 2024, a reduction of 12.74 percentage points. Consequently, At the level of Romania, in 2024 the best results were obtained in the baccalaureate exam in the entire period analyzed.

3.2. Characteristics and evolutions at regional level

At the regional level, between 2010 and 2022, the rates of pupils graduating from high school in current year, in the population aged 18 in year (RGHSPi) had different evolutions both from one year to another and from one development region to another (Figure 3).

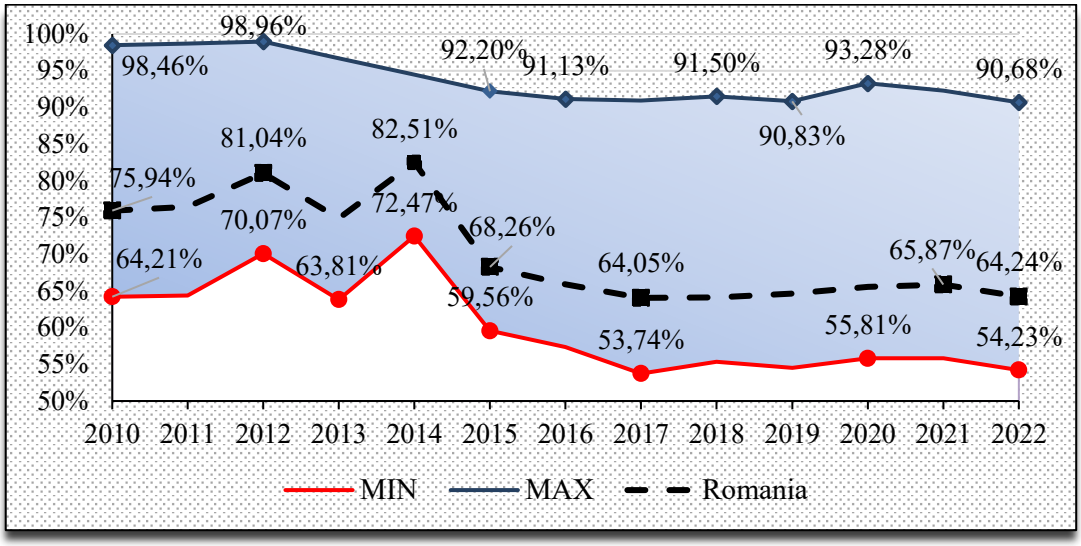

Figure 3 Evolution of the amplitude of the rates of pupils graduating from high school in the current year, in the population aged 18 in year (RGHSP), in Romania, at regional level, in the period 2010-2022 Source: prepared by the authors

Throughout the analyzed period, the limits of the variation interval of the RGHSP values were given, in the upper limit, by the Bucharest-Ilfov development region, with values between 98.96% (recorded in 2012) and 90.68% (recorded in 2022), and in the lower limit, by the North_East region, with values between 72.47% (recorded in 2014) and 54.23% (recorded in 2022). At the level of Romania, the RGHSP values were between 82.51% (recorded in 2014) and 64.05% (recorded in 2017).

In terms of average annual RGHSP rates, throughout the analyzed period, they were negative in all eight development regions of Romania. The highest negative values were recorded in the Center region (-1.65% annually), followed by the North_West region (-1.55% annually) and North_East (-1.33% annually), and the lowest reductions in the South_West Oltenia region (-0.03% annually) and Bucharest-Ilfov (-0.24% annually). However, it is worth highlighting that, during the period 2010-2014, a series of turbulences were recorded, characterized by increases in the RGHSP values recorded during the period 2010-2012, with values ranging between 5.89 percentage points (in the Center region) and 0.50 percentage points (in Bucharest-Ilfov), followed by significant decreases in 2013, with values ranging between -8.45 percentage points (in the Center and South-Muntenia regions) and -2.25 percentage points (in Bucharest-Ilfov), as well as new increases in 2014, with values ranging between 12.13 percentage points (in the South_West Oltenia region) and 3.93 percentage points (in the Center region).

After 2014, the RGHSP values are on a downward trajectory with very small fluctuations from one year to the next, so that, rates of pupils graduating from high school in 2022 in the population aged 18, at regional level were lower than in 2010, with values ranging from -18.81 percentage points in the West region, and -7.20 percentage points, in the South-Muntenia development region.

From the point of view of the convergence and divergence of the RGHSP trajectories, it is worth mentioning that, if in 2010 the difference between the maximum and minimum values of the RGHSP was 34.26 percentage points, at the end of the analyzed period, in 2022, it was 36.46 percentage points (an increase of 2.20 percentage points), which indicates a divergent process, although in the first part of the period (2010-2014) a convergence trend had been recorded.

Between 2010 and 2022, the rate of pupils who completed the baccalaureate exam in the current year, in the population aged 18 in year (RPBEP) is characterized by a general growth trend, highlighting a positive evolution in terms of the results of the baccalaureate exam (Figure 4).

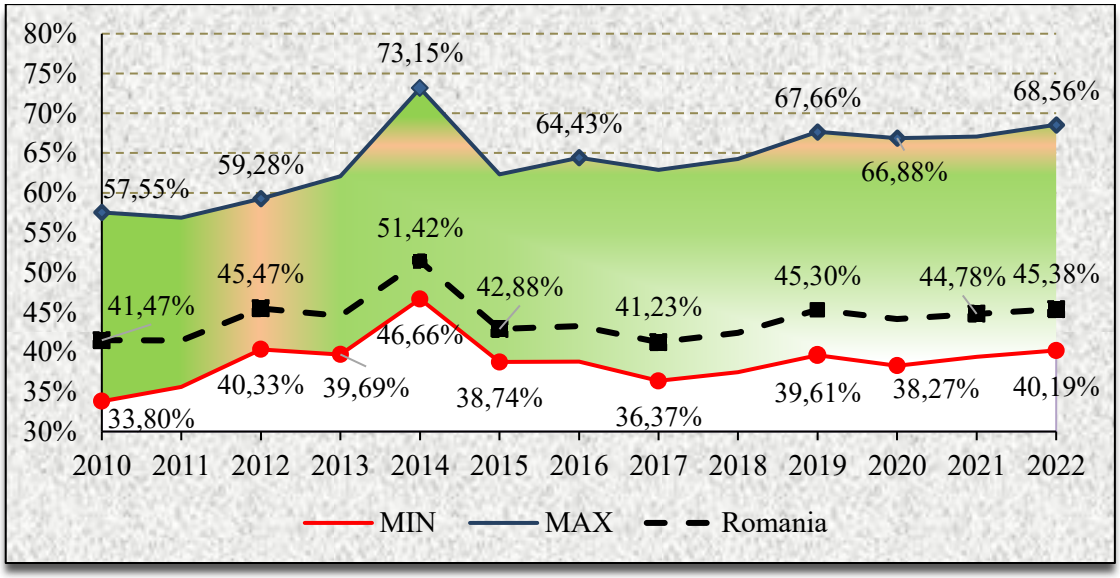

Figure 3 The evolution of the amplitude rates of pupils who completed the baccalaureate exam in current year, in the population aged 18 in year (RPBEP), in Romania, at regional level, during 2010-2022

Source: prepared by the authors

In the case of RPBEP, the limits of the variation interval of its values were given, in the upper limit, also by the Bucharest-Ilfov development region, with values between 73.15% (recorded in 2014) and 68.56% (recorded in 2022), and in the lower limit, except for the years 2010 and 2013, when it is given by the West region (33.80% and 39.69% respectively), it was also given by the North_East region, with values between 46.66% (recorded in 2014) and 36.37% (recorded in 2027). At the level of Romania, the RPBEP values were between 41.47% (recorded in 2010) and 51.42% (recorded in 2014).

As in the case of RGHSP values, the difference between the RPBEP values recorded in the Bucharest-Ilfov development region and the evolutions recorded in the other development regions is very large. Thus, the difference between the values recorded in the Bucharest-Ilfov region and the North_West region, the best ranked among the other seven development regions, ranged between 9.62 percentage points (recorded in 2012) and 23.95 percentage points (recorded in 2022).

On the other hand, unlike the evolution of the RGHSP values, in the case of the RPBEP there were no turbulent developments, however, two periods with distinct characteristics stand out.

A first period, the one between 2010 and 2014, is characterized by an intense increase in the RPBEP values, the most significant values being recorded in the Bucharest-Ilfov region (15.59 percentage points), followed by the West region (15.53 percentage points) and the South-Muntenia

region (11.82 percentage points). Smaller increases were recorded in the Center (6.22 percentage points) and South_West Oltenia (6.20 percentage points) regions. The upward evolutions were interrupted, however, in 2015, a year in which regressions of RPBEP values were recorded, the highest being in the Bucharest-Ilfov region (-10.82 percentage points) and in the North_West region (-10.77 percentage points), and the lowest in the South_East region (-7.64 percentage points).

The second period, 2015-2022, is characterized by a resumption of the increase in RPBEP values, but of much lower intensity than in the previous period, in seven of the eight development regions in Romania, the highest increase being recorded in the Bucharest-Ilfov region (6.23 percentage points), and the lowest in the North_West region (1.02 percentage points). In contrast, in the Center region, RPBEP values decreased by 1.26 percentage points (from 42.94 percentage points in 2015 to 41.68 percentage points in 2022).

In terms of disparities between development regions in terms of RPBEP values, the difference between its maximum and minimum values increased from 23.75 percentage points in 2010 to 28.36 percentage points in 2022, which also indicates, in the case of RPBEP, a divergent process.

3.3. Similarities and disparities between counties regarding the results of the baccalaureate exam

The analyses carried out in the previous paragraph have highlighted the existence of significant disparities between the development regions of Romania, both in terms of rates of pupils graduating from high school in a year, in the population aged 18 of the respective year (RGHSP), and rates of pupils who completed the baccalaureate exam in a year, in the population aged 18 of the respective year (RPBEP). These hide (level out) the disparities between the counties included in each development region.

Table 2 Structure of the clusters

Cluster	Counties
A	Alba (AB), Arges (AG), Bucuresti (B), Bacau (BC), Bihor (BH), Bistrita-Nasaud (BN), Braila (BR), Botosani (BT), Brasov (BV), Buzau (BZ), Cluj (CJ), Constanta (CT), Dambovita (DB), Galați (GL), Iasi (IS), Neamt (NT), Prahova (PH), Sibiu (SB), Suceava (SV), Valcea (VL), Vrancea (VR)
B	Arad (AR), Calarasi (CL), Gorj (GJ), Hunedoara (HD), Maramures (MM), Olt (OT)
C	Ialomita (IL), Salaj (SJ), Tulcea (TL), Timis (TM), Vaslui (VS)
D	Covasna (CV), Harghita (HR)
E	Mehedinti (MH), Teleorman (TR)
F	Mures (MS), Satu Mare (SM)
G	Caras Severin (CS)
H	Dolj (DJ)
K	Giurgiu (GR)
L	Ilfov (IF)

Source: Elaborated by the authors using SPSS

In order to provide a clearer and more eloquent image of the educational efficiency in Romania through the results obtained in the baccalaureate exam at the level of the 42 territorial entities (41 counties and the Municipality of Bucharest), a cluster analysis of the performances obtained in the baccalaureate in 2024, of the current promotion, was carried out, based on six indicators: rate of pupils enrolled the baccalaureate (RPAB), rate of completing the baccalaureate exam (RGRDB), rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7), rate of pupils completed to the baccalaureate with grades between 7.00 and 7.99 (R_7_8), rate of pupils completed

to the baccalaureate with grades between 8.00 and 8.99 (R_8_9) and rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10).

The tests and analyses carried out led to a structuring of the 42 territorial entities into 10 clusters (Table 2), the dendogram of their generation being illustrated in figure 5. Of the ten clusters, six include at least two territorial entities, the most numerous being cluster A which includes 20 counties and the Municipality of Bucharest, while four clusters (G, H, K, L) include only one county each.

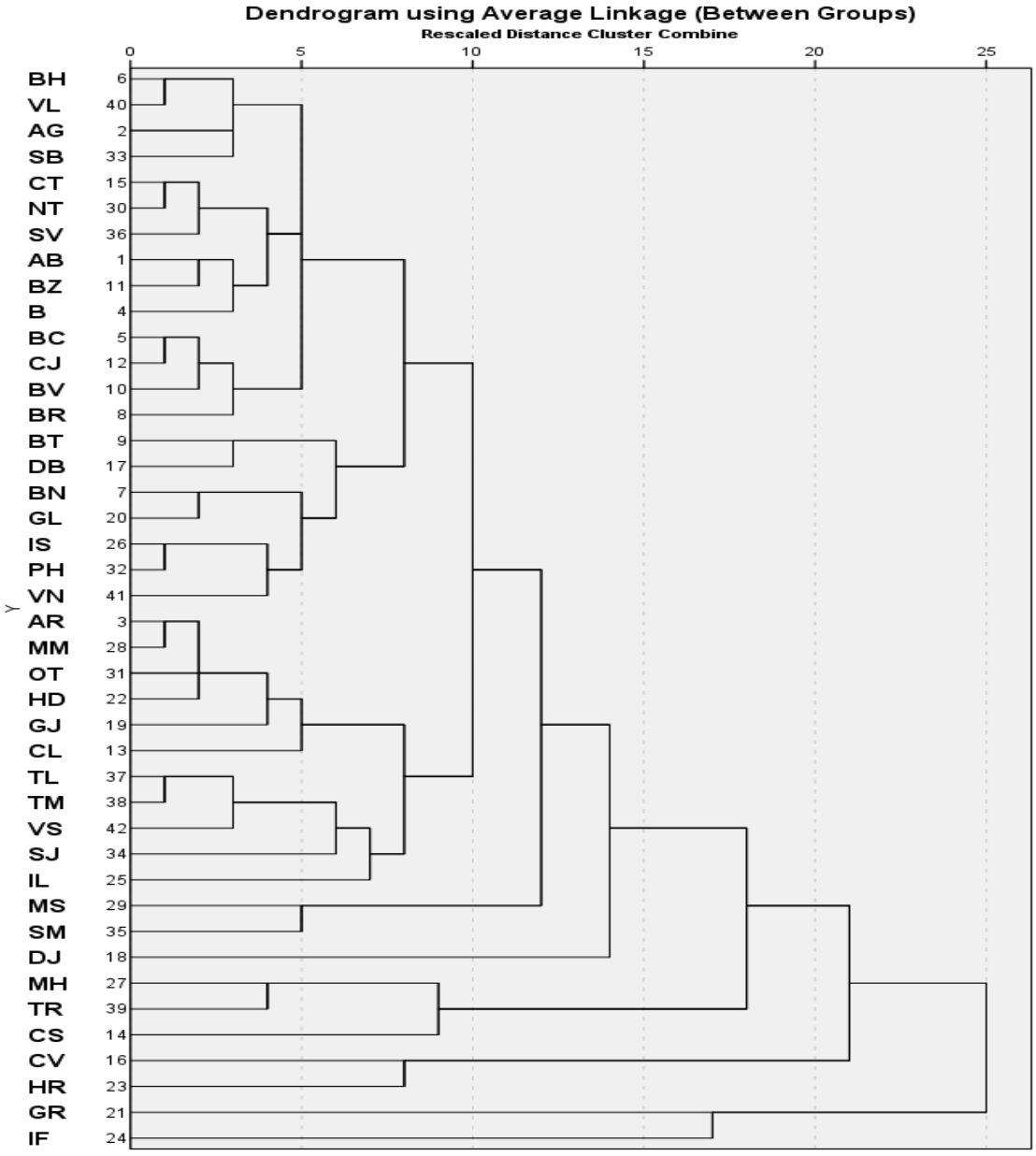

Figure 5 Dendogram of cluster generation

The variance homoscedasticity of variables was tested with Levene's test. The results obtained (Table 3) lead to the conclusion of accepting the null hypothesis (H_{1_0}), variance does not differ significantly (homoscedasticity).

Table 3 The results of Tests of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
RPAB	1.658	5	32	0.173
RGRDB	1.362	5	32	0.264
R_6_7	1.509	5	32	0.215
R_7_8	1.963	5	32	0.111
R_8_9	1.179	5	32	0.341
R_9_10	0.619	5	32	0.686

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 ANOVA methodology (F test). According to the results obtained (Table 4), all values Sig.<α=0.05 which leads to the conclusion that the hypothesis (H_{2_0}) is rejected and, consequently, all the averages recorded at the cluster level are statistically significant.

Table 4. The results of ANOVA methodology

		Sum of Squares	df	Mean Square	F	Sig.
RPAB	Between Groups	88.315	9	9.813	24.989	0.000
	Within Groups	12.566	32	0.393		
	Total	100.881	41			
RRGRDB	Between Groups	1587.929	9	176.437	16.752	0.000
	Within Groups	337.042	32	10.533		
	Total	1924.971	41			
R_6_7	Between Groups	674.511	9	74.946	34.063	0.000
	Within Groups	70.407	32	2.200		
	Total	744.918	41			
R_7_8	Between Groups	431.691	9	47.966	23.625	0.000
	Within Groups	64.968	32	2.030		
	Total	496.659	41			
R_8_9	Between Groups	117.364	9	13.040	11.147	0.000
	Within Groups	37.437	32	1.170		
	Total	154.801	41			
R_9_10	Between Groups	1665.774	9	185.086	27.241	0.000
	Within Groups	217.421	32	6.794		
	Total	1883.195	41			

Source: Elaborated by the authors using SPSS

Analyzing the characteristics of the clusters (Table 5), respectively the average values of the six variables, it results that the best performing results are recorded in the cluster A. It is characterized by the highest average values of the rate of completed the baccalaureate exam (RGRDB), of 81.0%, and the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), of 31.58%, as well as by the lowest average value of the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7), of 16.77%.

This is followed by cluster H (Gorj county) with values of 77.60% of the RGRDB, and 29.73% of the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), as well as very low values of the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7), of 17.61%, and of the rate of pupils completed to the baccalaureate with grades between 7.00 and 7.99 (R_7_8), 19.71%.

. Table 5. The main characteristics of the clusters

Cluster	RPAB	RGRDB	R_6_7	R_7_8	R_8_9	R_9_10
A	97.28	81.00	16.77	21.63	30.02	31.58
B	95.85	72.85	22.51	25.64	29.29	22.56
C	95.08	74.86	19.85	22.96	30.46	26.73
D	97.60	65.30	21.72	32.77	33.49	12.03
E	93.48	65.40	24.88	23.65	30.10	21.38
F	97.90	75.55	20.17	26.51	32.72	20.61
G	91.63	72.80	25.58	27.14	28.40	18.87
H	94.11	77.60	17.61	19.71	32.95	29.73
K	97.42	63.40	33.38	28.35	24.46	13.81
L	93.55	56.70	32.28	33.03	24.32	10.36

Source: Elaborated by the authors using SPSS

At the opposite pole, with the weakest performances in the baccalaureate exam, is Ilfov County (cluster L) where the lowest values of the rate of completing the baccalaureate exam (RGRDB), of 56.70%, and of the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), of 10.36%, were recorded. Also, absenteeism was significant, with the rate of pupils enrolled the baccalaureate (RPAB) being only 93.55%.

Also, poor performance in the baccalaureate exam was recorded in the counties in cluster D (Covasna and Harghita), cluster E (Mehedinți and Teleorman), as well as cluster K (Giurgiu). They are characterized by low average values of the rate of completing the baccalaureate exam (RGRDB), ranging between 63.40% (cluster K) and 65.40% (cluster E). However, regarding the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), while in clusters D and K values of 12.03% and 13.81% were recorded, respectively, in cluster E the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10) was 21.38%, differing significantly from this point of view.

In terms of the rate of completing the baccalaureate exam (RGRDB), clusters B (Arad, Calarasi, Gorj, Hunedoara, Maramures and Olt), C (Ialomita, Salaj, Tulcea, Timis and Vaslui), F (Mures and Satu Mare) and G (Caras Severin) are characterized by average values ranging between 72.80% (cluster G) and 74.86% (cluster C). On the other hand, they differ in terms of the distribution of the baccalaureate completion grades. Thus, while in cluster C the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10) was 26.73% (the third value after clusters A and H), in cluster G it was only 18.87%, and in clusters B and F values of 22.56% and 20.61% were recorded, respectively. Also, in cluster C the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7) was only 19.85%, in cluster G it was 25.58% (5.74 percentage points more), in cluster F it was 20.17%, and in cluster B it was 22.51%, (2.66 percentage points more than in cluster C and 3.07 percentage points than in cluster G).

Given that of the 42 territorial entities (41 counties and the Municipality of Bucharest) analyzed above, 21 were included in cluster A, the cluster with the best performance in terms of the six indicators used, in order to obtain additional information, a new cluster analysis was carried out, based on the same indicators, referring only to these entities.

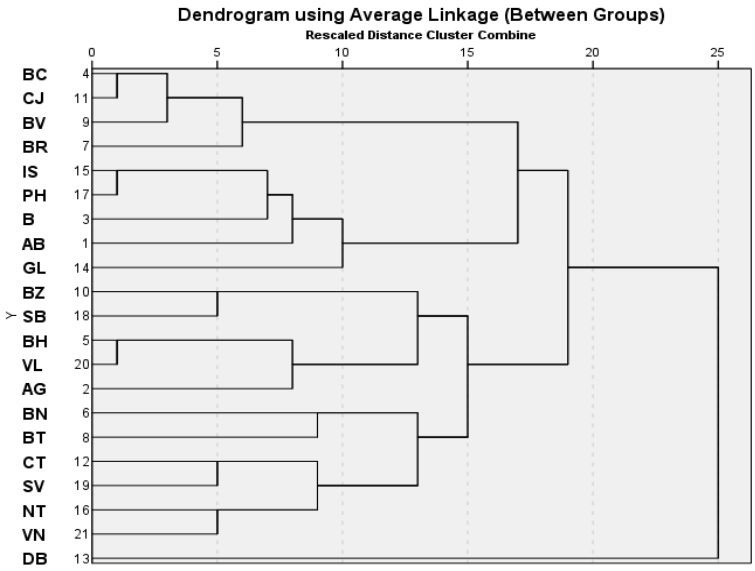

Figure 6 Dendogram of the generation of subclusters of cluster A

A structure (Figure 6) with seven clusters (Table 6) was generated. Of these, A1 includes four counties and the Municipality of Buburesti, A2 includes three counties, A3 and A6 include four counties each, A4 and A5 include two counties each, and A7 includes a single county.

Table 6 Structure of subclusters of cluster A

Cluster	Counties
A1	Alba (AB), Bucuresti (B), Galați (GL), Iasi (IS), Prahova (PH),
A2	Arges (AG), Bihor (BH), Valcea (VL)
A3	Bacau (BC), Braila (BR), Brasov (BV), Cluj (CJ)
A4	Bistrita-Nasaud (BN), Botosani (BT)
A5	Buzau (BZ), Sibiu (SB)
A6	Constanta (CT), Neamt (NT), Suceava (SV), Vrancea (VR)
A7	Dambovita (DB),

Source: Elaborated by the authors using SPSS

As in the case of the cluster analysis performed above for 42 territorial entities, in this case, the variance homoscedasticity of variables was tested with Levene's test. The results obtained (Table 7) lead to the conclusion that the null hypothesis (H_{1_0}) is accepted, variance does not differ significantly (homoscedasticity).

Table 7 The results of Tests of Homogeneity of Variances for 21 territorial entities

Variables	Levene Statistic	df1	df2	Sig.
RPAB	1.609	5	14	0.222
RGRDB	1.481	5	14	0.258
R_6_7	1.769	5	14	0.184
R_7_8	1.464	5	14	0.263
R_8_9	1.309	5	14	0.315
R_9_10	1.693	5	14	0.201

Source: Elaborated by the authors using SPSS

Also, the testing of the statistical significance of the average values of the six indicators, and of their belonging to the subclusters, was carried out with ANOVA methodology (F test). According to the results obtained (Table 8), all values Sig.<α=0.05. It follows that, the null hypothesis (H_{2_0}) is rejected and, consequently, all the averages of the six variables, recorded at the subclusters level, are statistically significant.

Table 8. The results of ANOVA methodology for 21 territorial entities

		Sum of Squares	df	Mean Square	F	Sig.
RPAB	Between Groups	6.927	6	1.155	11.745	0.000
	Within Groups	1.376	14	0.098		
	Total	8.303	20			
RRGRDB	Between Groups	186.603	6	31.100	8.749	0.000
	Within Groups	49.767	14	3.555		
	Total	236.370	20			
R_6_7	Between Groups	30.394	6	5.066	8.800	0.000
	Within Groups	8.059	14	0.576		
	Total	38.453	20			
R_7_8	Between Groups	40.986	6	6.831	8.141	0.001
	Within Groups	11.747	14	0.839		
	Total	52.733	20			
R_8_9	Between Groups	17.465	6	2.911	4.190	0.013
	Within Groups	9.726	14	0.695		
	Total	27.191	20			
R_9_10	Between Groups	125.116	6	20.853	15.600	0.000
	Within Groups	18.714	14	1.337		
	Total	143.829	20			

Source: Elaborated by the authors using SPSS

Analyzing the characteristics of the seven subclusters of cluster A (Table 9), it results that, compared to the average values recorded at the level of cluster A, only subcluster A1 (Alba, Bucharest, Galați, Iasi and Prahova) records superior performances in all six indicators included in the analysis. Thus, the values of the rate of completing the baccalaureate exam (RGRDB) and the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10) are 1.43 and, respectively, 3.71 percentage points above the average values of cluster A, and the values of the rates of grades between 6 and 9 are below the averages of cluster A, by 1.25, 1.68 and, respectively, 0.79 percentage points.

.

Table 5. The main characteristics of the subclusters of cluster A

Cluster	RPAB	RGRDB	R_6_7	R_7_8	R_8_9	R_9_10
A1	97.51	82.52	15.52	19.95	29.23	35.29
A2	97.37	79.40	17.96	23.38	31.02	27.64
A3	98.20	84.93	15.70	22.43	30.69	31.19
A4	97.03	79.40	17.73	22.05	28.64	31.59
A5	96.50	82.50	15.99	23.53	30.84	29.65
A6	96.72	78.68	17.78	20.29	30.38	31.55
A7	96.46	72.30	19.33	22.31	28.04	30.32

Source: Elaborated by the authors using SPSS

Values of the rate of completing the baccalaureate exam (RGRDB) above the average of cluster A, as well as the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7) below the average of cluster A, were also recorded at the level of subclusters A3 (Bacau, Braila, Brașov and Cluj) and A5 (Buzău and Sibiu), but regarding the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), both clusters are below the average of cluster A (-0.39 percentage points for A3 and -1.93 percentage points for A5), subcluster A5 being also characterized by the fact that the majority of the grades obtained in the baccalaureate are between 8.00 and 8.99.

The worst results in terms of the rate of completing the baccalaureate exam (RGRDB) and the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7) were recorded in subcluster A7 (Dambovita), which is characterized by the lowest rate of completing the baccalaureate exam (RGRDB), of only 73.30% (-8.70 percentage points below the cluster A average) and the highest rate of pupils completed to the baccalaureate exam with grades between 6.00 and 6.99 (R_6_7), of 19.33% (2.56 percentage points above the cluster A average).

Also, in terms of the rate of completing the baccalaureate exam (RGRDB) and the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7), poor results were also recorded in subclusters A4 (Bistrita-Nasaud and Botoșani) and A6 (Constanța, Neamț, Suceava and Vrancea), with -1.60 and -2.32 percentage points below the cluster A average regarding the RGRDB and with 0.96 and 1.01 percentage points above the cluster A average regarding the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7). The difference between these and subcluster A7 is that, in the case of subclusters A4 and A6, the values regarding the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10) are approximately equal to the average value recorded at the level of cluster A.

As for subcluster A2 (Arges, Bihor and Valcea), it is characterized by the lowest value of the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), of only 27.64% (-3.94 percentage points below the average of cluster A), 54.40% of pupils completed the baccalaureate exam with grades between 7.00 and 8.99. Also, the rate of completing the baccalaureate exam (RGRDB) was 79.4%, with -1.6 percentage points below the average of cluster A.

4. Conclusions

In the last decade, both the participation rate of Romanian high school graduates in the baccalaureate and the exam completion rate have fluctuated from one year to the next. At the Romanian level, although the rate of high school graduates enrolled in the baccalaureate in the total population aged 18 decreased from 56.39% in 2014 to 52.46% in 2024 (a reduction of 3.94 percentage points), the baccalaureate exam pass rate increased from 65.21% in 2014 to 81.53% in 2024, an increase of 16.32 percentage points determined, on the one hand, by the reduction in the absenteeism rate, and on the other hand by the substantial reduction in the baccalaureate exam failure rate.

At regional level, the annual rates of pupils graduating from high school in the population aged 18 in year (RGHP) had different developments both from one year to another and from one development region to another, the limits of the variation interval being, in the upper limit, the Bucharest-Ilfov development region, and in the lower limit, the Northeast region, the general trend being downward, a fact highlighted by the developments of the average annual rates of RGHSP, which throughout the analyzed period, were negative in all eight development regions in Romania, the largest reductions being recorded in the Center, North_West and North_East regions, and the smallest reductions being recorded in South_West Oltenia and Bucharest-Ilfov.

Regarding the annual rates of pupils who completed the baccalaureate exam, in the population aged 18 (RPBEP), it was characterized by a general upward trend, highlighting two periods with distinct characteristics. A first period, between 2010 and 2014, was characterized by an intense increase in RPBEP values, the most significant values being recorded in the Bucharest-Ilfov, West and South-Muntenia regions, smaller increases being recorded in the Center and South_West Oltenia regions. The second period, 2015-2022, is characterized by a resumption of the intensity of the increase in

RPBEP values, in seven of the eight development regions in Romania, the highest increase being recorded in the Bucharest-Ilfov region, and the lowest, in the North_West region, while in the Center region the RPBEP values decreased.

In terms of disparities between development regions in terms of both RGHSP and RPBEP, the difference between its maximum and minimum values increased, in the case of RGHSP, from 34.26 percentage points in 2010, to 36.46 percentage points in 2022 (an increase of 2.20 percentage points), and in the case of PREB, from 23.75 percentage points to 28.36 percentage points, which highlights divergent processes.

On the other hand, cluster analyses conducted in 41 counties and the Municipality of Bucharest, regarding the disparities and similarities between them through the lens of the six performance indicators for the 2024 baccalaureate (RPAB, RGRDB, R_6_7, R_7_8, R_8_9 and R_9_10), highlighted very significant differences between them.

The first cluster analysis, which included all 42 territorial entities, highlighted a grouping in 10 clusters, of which cluster A (Alba Arges, Bucharest, Bacau, Bihor, Bistrita-Nasaud, Braila, Botosani, Brasov, Buzau, Cluj, Constanta, Dambovita, Galați, Iasi, Neamt, Prahova, Sibiu, Suceava, Valcea and Vrancea), and cluster H (Gorj county) are characterized by high values of the rate of completing the baccalaureate exam (RGRDB), and the rate of pupils completed to the baccalaureate with grades between 9.00 and 10 (R_9_10), as well as by low values of the rate of pupils completed to the baccalaureate with grades between 6.00 and 6.99 (R_6_7), of 16.77%**.**

At the opposite pole, with the weakest performances in the baccalaureate exam, is Ilfov County (cluster L) where the lowest values of the rate of completing the baccalaureate exam (RGRDB) were recorded, of 56.70%. Also, weak performances in the baccalaureate exam were recorded in cluster D (Covasna and Harghita), cluster E (Mehedinți and Teleorman), as well as cluster K (Giurgiu).

Among these, from the point of view of the rate of completing the baccalaureate exam (RGRDB), clusters B (Arad, Calarasi, Gorj, Hunedoara, Maramures and Olt), C (Ialomita, Salaj, Tulcea, Timis and Vaslui), F (Mures and Satu Mare) and G (Caras Severin) are characterized by average values between 72.80% (cluster G) and 74.86% (cluster C), but differ in terms of the distribution of baccalaureate completion grades.

The second cluster analysis focused only on the 21 territorial entities included in cluster A. It resulted that, compared to the average values recorded at the level of cluster A, only subcluster A1 (Alba, Bucharest, Galați, Iasi and Prahova) performed better. Similar positive performances were also recorded at the level of subclusters A3 (Bacau, Braila, Brașov and Cluj) and A5 (Buzău and Sibiu).

In conclusion, significant positive similarities are highlighted between the counties in clusters A1, A3 and A5, the disparities between them and the counties included in clusters D (Covasna and Harghita), cluster E (Mehedinți and Teleorman), cluster K (Giurgiu) and L (Ilfov) being particularly large. This underlines once again the conclusion above regarding the divergent trajectories of educational performance at county and regional level in Romania.

5. Bibliography

[1] Bækgaard, Hans and Helsø, Anne-Line Koch, (2023), Labor Force Participation and Education, *Nationaløkonomisk tidsskrift*, **2023**, issue 1, number 1. https://ideas.repec.org/a/hhs/jdaecn/0304.html

[2] Brendan Apfeld, & Coman, Emanuel & Gerring, John & Jessee, Stephen, 2022. "Education and Social Capital", *Journal of Experimental Political Science*, Cambridge University Press, vol. 9(2), pages 162-188, July. https://ideas.repec.org/a/cup/jexpos/v9y2022i2p162-188_2.html

[3] Buza Victoria & Enache Tusa, 2024. "Disparities in School Performance in Romania. A Geostatistical Analysis of Baccalaureate Results between 2015-2022", *Revista romaneasca pentru educatie multidimensionala - Journal for Multidimensional Education*, Editura Lumen, Department of Economics, vol. 16(1), pages 391-428, March. https://ideas.repec.org/a/lum/rev1rl/v16y2024i1p391-428.html

[4] Calinoiu (Ionescu), Cristina-Roxana & Ana (Toma), Ioana-Daniela, 2022. "The Interfering Influence Of Teacher Motivation In Quality Assurance In Romanian Pre-University Education", *Contemporary Economy Journal*, Constantin Brancoveanu University, vol. 7(3), pages 121-125. http://www.revec.ro/images/images_site/articole/article_9583953db238c2e11d981a44c5c731a6.pdf

[5] Chiriac Irina, 2021. "Connection between the Education Strategies and Economic Development," *Ovidius University Annals, Economic Sciences Series*, Ovidius University of Constanta, Faculty of Economic Sciences, vol. 0(1), pages 240-245, August. https://ideas.repec.org/a/ovi/oviste/vxxiy2021i1p240-245.html

[6] Chirițescu, Vergina, Pădurean, Maria and Kruzslicika, Mihaela, (2017), Education Role in the Sustainable Development of Romanian Rural Communities, *Agricultural Economics and Rural Development*, **14**, issue 1, p. 109-121. https://ideas.repec.org/a/iag/reviea/v14y2017i1p109-121.html

[7] Cobzaru Marinela & Moraru Monica, 2023. "The educational system in Romania, the European Union and the United Kingdom of Great Britain and Northern Ireland. Comparative analysis," *Black Sea Journal of Psychology*, Ovidius University of Constanta, Faculty of Psychology and Educational Sciences, vol. 14(1), pages 22-37, May. https://www.bspsychology.ro/index.php/BSJoP/article/view/218

[8] Coman, Cristiana-Ioana, (2022), Empirical Evidence of Romania's Competitiveness with a Focus on Education and R&D. Evolution and Recommendations, *Revista Economica*, **74**, issue 3, p. 35-49. https://www.researchgate.net/publication/373252688_empirical_evidence_of_romania_s_competitiveness_with_a_focus_on_education_and_rd_evolution_and_recommendations

[9] FRB24, Information on the final results (after resolving appeals), recorded in the second session of the national baccalaureate exam (August 2024) 30_08_2024_Dosar_presa_bacalaureat_august_2024_rezultate_finale_DC.pdf

[10] García-Escudero, L. A., Gordaliza, A., Matrán, C., & Mayo-Iscar, A. (2010). A review of robust clustering methods. *Advances in Data Analysis and Classification*, *4*(2–3), 89–109. https://doi.org/10.1007/s11634-010-0064-5

[11] GLED (2025) Graduates by level of education, type of education, macro regions, development regions and counties, SCL109A, http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table

[12] Herbaut Estelle & Carlo Barone & Louis-André Vallet, 2022. "Baccalaureate Tracks and Employment at the End of Education: Contribution of the Educational Pathway and Analysis of Gender Gaps," *Economie et Statistique / Economics and Statistics*, Institute National de la Statistique et des Etudes Economiques (INSEE), issue 530-31, pages 61-81. https://ideas.repec.org/a/nse/ecosta/ecostat_2022_530_4.html

[13] Iacob Silvia-Elena & Constantin Alexandra & Budu Alexandru Radu, 2024. "Examining the challenges and opportunities of AI integration in the Romanian education system: a case study perspective," *Theoretical and Applied Economics*, Asociatia Generala a Economistilor din Romania / Editura Economica, vol. 0(Special,), pages 9-32. https://ideas.repec.org/a/agr/journl/vxxxiy2024ispecialp9-32.html

[14] LRPA (2025) Legally resident population, by age group and age, sex, urban/ rural area, macro regions, development regions and counties, at July 1st, POP108B, http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table

[15] MERR, (2025) Ministry of Education and Research of Romania, https://edu.ro

[16] NISDB (2025) National Institute of Statistics of Romania, https://insse.ro/cms/en

[17] NSPB (2025) Number of pupils who completed the baccalaureate exam, by gender, macroregions, development regions and counties, SCL109G, http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table

[18] Obioma Ekere Veronica & Nonye Azih, 2024. "Perceived Soft Skills Needed and Possessed by Baccalaureate Accounting Education Graduates for Effective Job Performance" , *International Journal of Research and Scientific Innovation* (IJRSI), vol. 10(12), pages 156-166, January. https://rsisinternational.org/journals/ijrsi/articles/perceived-soft-skills-needed-and-posessed-by-baccalureate-accounting-education-graduates-for-effective-job-performance/

[19] Pop Teodora-Mădălina, 2024. "An Overview of the Recent Evolution of the Socioeconomic Dimension of Inequality. The Case of CEE Countries", *European Review of Applied Sociology*, Sciendo, vol. 17(28), pages 1-11, June. https://sciendo.com/article/10.2478/eras-2024-0001

[20] Popa (Petrescu), Mariana, 2021. "The Teachers Career Evolution in Romanian Pre-University Education", *Ovidius University Annals, Economic Sciences Series*, Ovidius University of Constanta, Faculty of Economic Sciences, vol. 0(2), pages 475-479, December. https://stec.univ-ovidius.ro/html/anale/RO/2021-2/Section%203/40.pdf

[21] Sara Núñez-Sánchez & Maria João Valente, 2023. "Sustainable Development Goals and Climate Change in Spanish Technology Disciplines' Curricula: From LOMCE to LOMLOE", *Sustainability*, MDPI, vol. 15(13), pages 1-16, June. https://www.mdpi.com/2071-1050/15/13/10301/review_report

[22] Shukla Vachaspati, 2021. "Group Disparities in Educational Outcomes: An Age Cohort Perspective", *Indian Journal of Human Development*, , vol. 15(2), pages 334-352, August. https://ideas.repec.org/a/sae/inddev/v15y2021i2p334-352.html

[23] Spînu, Cristinel Sorin 2023. "Performance Management In Educational Institutions In Romania", *Annals of University of Craiova - Economic Sciences Series*, University of Craiova, Faculty of Economics and Business Administration, vol. 1(51), pages 52-58, August. https://ideas.repec.org/a/aio/aucsse/v1y2023i51p52-58.html

[24] Stroe, Andreea-Cristina, (2022), Digitalization of Romanian Education System: Is Romania Ready to Embrace Education 4.0, *Informatica Economica*, **26**, issue 3, p. 16-25. https://revistaie.ase.ro/content/103/02%20-%20stroe.pdf

[25] Tutunaru Tatiana, 2022. "The Challenges of the Education System in Romania," *Ovidius University Annals, Economic Sciences Series*, Ovidius University of Constanta, Faculty of Economic Sciences, vol. 0(2), pages 463-470, Decembre. https://stec.univ-ovidius.ro/html/anale/RO/2022-issue2/Section%203/34.pdf

[26] Urean, Claudia Andreea, (2017), An Overview of the Romanian Education System, *Annals - Economy Series*, **3**, issue , p. 146-153. chrome- https://www.utgjiu.ro/revista/ec/pdf/2017-03/19_CLAUDIA%20ANDREEA%20UREAN.pdf

[27] Zaharia Marian & Gogonea Rodica-Manuela (2024) Participation of the population in education. Romania where? The USV Annals of Economics and Public Administration, Volume 24, Issue 2(40), 2024 http://www.annals.seap.usv.ro/index.php/annals/article/view/1543/1232

[28] Zaharia Marian (2024) The influence of pre-university education resources on school dropout and the unemployment rate in Romania is significant? *Journal of Research and Innovation for Sustainable Society (JRISS) Volume 6, Issue 2, 2024 ISSN: 2668-0416* DOI: 10.33727/JRISS.2024.2.22:202-214 https://jriss.4ader.ro/wp-content/uploads/2024/11/22.-Marian-Zaharia-The-influence-of-pre-university-education-resources-on-school-dropout-and-the-unemployment-rate-in-Romania-is-significant.pdf