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Disparities in School Performance in Romania. A Geostatistical Analysis of Baccalaureate Results between 2015-2022

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Abstract: *This study analyses the evolution of the main indicators of students' high school performance at the high school graduation exams (Romanian Baccalaureate) from a geographical perspective. Both participation and pass rates fluctuate depending on the type of high school, gender and place of residence. Behind these quantifiable characteristics there are significant disparities in (in)equality of educational opportunities influenced by the questionable efficiency of the education system in providing quality education to every student, regardless of their parents' financial background. Although the upper cycle of secondary school (11-12th grades) is not legally compulsory, successful graduation is essential for the economic, social and cultural insertion of the future adults in a functioning society. The lack of performance of some high schools and vulnerable groups of students, who face problems of accessibility, motivation, opportunity, and financial support, as well as the worrying numbers of exam absentees, must be brought baccalaureate to the permanent agenda of the policy makers, not exclusively during the exam period. The complexity of the official data from 2015-2022 has allowed the geostatistical analysis of school performance, highlighting the deep discrepancies within the system, specifically between urban and rural students, the administrative and economic hierarchy of the locality and the prestige of the high school attended. The insights of this analysis can be used to identify optimal solutions to enhance the research about educational disparities.*

Keywords: *baccalaureate exams, high school, inequality of opportunities, school performance achievement, urban-rural disparities.*

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Introduction

The Baccalaureate exams are the high school graduation exams in Romania (12th grade) and represent one of the the most important stage of the students' educational pathway as their results have a decisive influence on future career trajectories and the range of options for those who will continue their higher education studies.

The Baccalaureate is structured as follows:

a) *Competence examinations*: Romanian and native language (only for students whose native language is not Romanian) (oral), modern language (English, French, German) (oral and written, with grades from A1 to B2) and digital competences.

b) *Written examinations*: Romanian language and literature, native language (for students whose native language is different from Romanian, e.g. Hungarian, Ukrainian, Turkish), profile subject (mathematics or history) and a chosen subject from those included in the profile of study (geography, economics, philosophy, chemistry, physics, etc.), marked from 1 to 10.

The minimum graduation criteria include, cumulatively, the following conditions: passing all the competency-based exams, obtaining a final average of at least 6.00 for written exams, under the condition that the score, after the appeals, for each exam is higher than 5.00. For graduated candidates, the final exam average will be the main criterion for most university entrance exams. Geographically, the majority of high schools are located in towns and cities (1219 high schools) (Figure 1) and the ones in rural areas, 246 in total, which constitute about 16.7% of the total high school network, are usually technological or theoretical high schools with both courses (theoretical and technological).

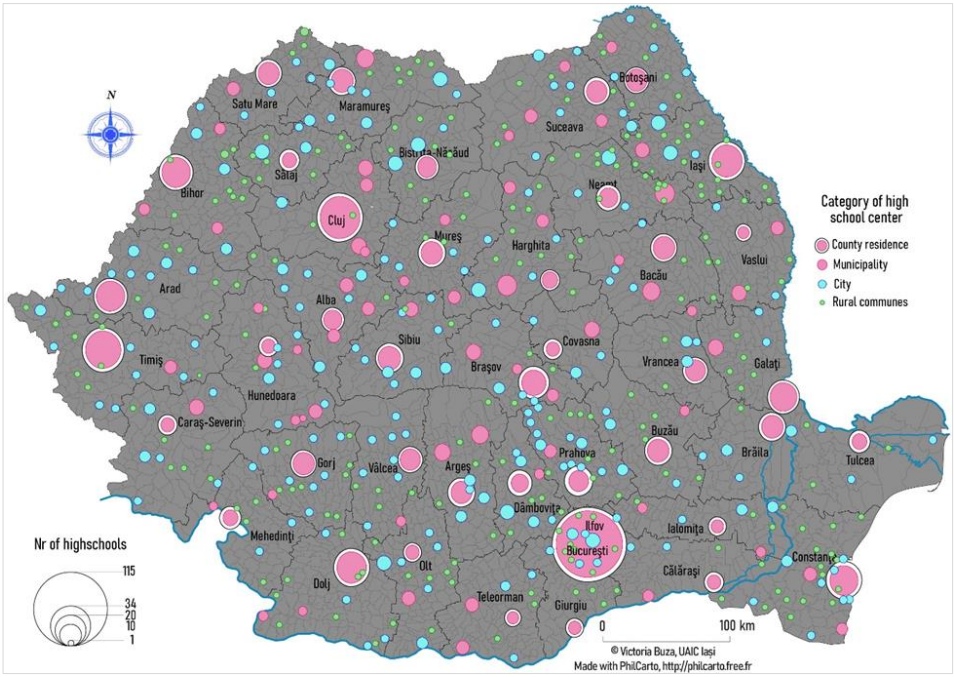


Figure 1. Territorial distribution of high schools by categories of communes

Based on the spatial distribution, the categories of localities (municipalities, towns, cities and rural communes) and the typology of high schools (theoretical, vocational, technological), the aim of this study is to analyse the territorial inequalities that manifest in significant discrepancies in school performance in the Baccalaureate exams. In fact, the classic understanding of territorial inequalities in education correlates the differentiated provision of education in various spatial units with the geography of the place of residence, income and family connections, gender or ethnicity (Micklewright, 1999; Collins et al., 2008), although the fundamental principle on which the whole construction of the concept of educational equity is based should be strictly on criteria of intellectual endowment, talent and learning persistence. From a structural point of view, the construction and territorial hierarchy of the school network creates sharp differences of high schools categories (and therefore of the attending students) that are influenced by geographical position, local administrative hierarchy and prestige within the territory. Originally, national colleges are a category of theoretical high schools considered to be elite (with local or county influence), where the administrative hierarchy of the high school centre is less important, followed, in a descending order, by theoretical,

vocational and technological (where the emphasis lies on learning a qualification rather than theoretical knowledge). Thus, from the outset, admission to a particular type of secondary school may be a strong predictor of the likelihood of (in-) success or academic excellence, based on the historical performance of previous generations. While ranking students according to intellectual ability (as measured by grades) at the upper secondary level is a normal process, the huge discrepancies of graduation, dropout and absenteeism rates between cities and rural areas, as well as between high schools within the same city are a major problem for the whole system. Promotion rates of over 80% are widely commended by the society, and yet in the same generations there are high schools for which this percentage represents the absentees or the underachievers, bringing into question the true extent of the policies that intend to comply with the principles of equity and equal opportunities in education.

In Romania, in terms of geographical location, school performance is associated with attending a high school in an urban area, especially in large cities with important administrative and economic functions, where there are more exigent teachers, better equipped institutions with teaching materials and, in general, a stronger spirit of competition and parental expectations, which manifest as indirect catalysts of motivation. The level of socio-economic and cultural complexity of an urban high school centre is directly proportional to the number of high schools and the proportions of high-achieving students as well as inversely proportional to the percentage of absentees or dropouts. Therefore, strong educational disparities are interdependent with the level of economic development, found especially in rural areas, where the high schools, attended mostly by local students, encounter much higher than average percentages of candidates with low performance or high risk of academic failure (Bonea, 2019; Cismaru, 2019). Their vulnerability is caused by a significantly increased incidence of poverty (Tomuletiu et al., 2010, Gyuris, 2014), a higher proportion of parents having a low educational attainment level (Țoc, 2016; Zamfir, 2020), which influences the instability of income sources, as well as the likelihood for a student to continue the full preuniversity school education. From a systematic point of view, as regards the categories of students with the greatest risk of social exclusion and dropping out of school, attending a high school that does not have an *elite* or *reputable* status should not be a sentence of academic failure, but rather a challenge to overcome their own learning gaps. The entire process of exam preparation should be aimed at building their own techniques for academic success. Nevertheless, statistics show that this is often an extremely difficult task and such students are exceptional

outliers. The collective mindset perceives failure to graduate the Baccalaureate as a form of personal and institutional lack of efficiency, both educationally and socially, related to the lack of financial resources, the questionable quality of the high schools or the poor accessibility and teaching infrastructure (Tomuletiu et al., 2010). An important role is played by personal motivation and commitment, with or without the constant support and involvement of parents in the relationship with teachers and school.

Although an exhaustive statistical analysis of the amplification of educational disparities due to affordability of extra tutoring is quite impossible, it is well known that the quantity and quality of information taught formally at school seems to be insufficient to ensure high grades on exams: a large percentage of students do not feel firmly convinced of the quality of knowledge assimilated during conventional school lessons. Families with average and above average incomes allocate a substantial budget for boosting both cognitive and emotional intelligence of their children by private tutoring, for which the demand has been growing in recent years. Their effectiveness can be explained by the frequent repetition of patterns, methods of solving the exercises and mentally structuring the information that is needed to be memorized for the exams, significantly increasing students' confidence (Ionescu, 2018). The informal paralel education morally nullifies the principle of equity of the official system, primarily because it is not financially accessible to everyone, representig one of the factors that contribute to academic inequality among students. Its pervasiveness questions the fairness of the formal system towards the students for whom private tutoring is not a viable option as additional exam preparation. Hence, the place of residence, the high school attended and family income can be considered as the defining variables of school performance.

In the light of these structural dichotomies, what could be the recipe for school success? How realistic and adaptable are the educational policies that come to implement strategies aiming at reducing unequal access to education and increasing the balance of opportunities for a high-quality education?

Under these circumstances, this study is focused on debating the following hypotheses:

H1: *territorial disparities in Baccalaurete performance emerge along three axes: the hierarchy of the locality, the size of the locality and the typology of the high school.*

H2*: in addition to the structural architecture of the school network, students' performance in Baccalaureate exams is dependent on the socio-economic status of the family.*

Research Methodology

Statistical data on educational parameters and indicators are made available by the Ministry of Education and the results of the Baccalaureate exams, disaggregated at student, school, locality and county level, are provided on the official public data platform data.gov.ro. In this analysis, three datasets were considered, relevant to understand the disparities in school performance: the Baccalaureate results (first session only) between 2015-2022, the database of enrolled students between 2015-2022 and the school network of educational units. Regarding the number of enrolled students the 2015-2022 period, the databases were needed in order to calculate the school dropouts, reflected by the percentual difference between the number enrolled in September in the 12th grade and the number registered for the exams in June. The school network, subdivided by education cycle (primary, secondary, high school), was used to identify the corresponding locality for each school. Although the secondary cycle does not, theoretically, disappear in a particular year from a given high school and subsequently reappear in a following year, the variations, which are mostly found in rural technological secondary schools, can be explained by the fact that during some years there may be few high schools do not have any students registered for the exams. In other cases, there are high schools that have graduates only in the first years included in the analysis but afterwards they do not have any data (e.g. between 2015-2018 the high school in Nicolae Bălcescu commune, Constanţa, has had registered students, but from 2019 onwards it was no longer listed in the databases).

Analyses of these databases were performed at county and commune level: on average 529 communes have high schools, of which 301 are located in urban areas. The following filters were applied to the raw databases:

a) grade: *12th grade students,*

b) form of education*: full-time,*

c) generation*: current generations of each year (2015-2022).*

Therefore, those enrolled in part-time and evening courses[1] were excluded, as well as students in the 13th and 14th grades (most of them being graduates of technological high schools with evening courses) and those from previous generations. The next stage of data aggregation was the

[1] Evening and part-time education refers to high school graduates who at the time of enrolment in the high school (9th grade) were 18 years old and from previous classes; the courses usually take place in the afternoon and have a reduced number of hours compared to the regular daytime format.

allocation of locality identification codes (SIRUTA) and counties according to the unique codes of high schools (SIIIR).

Once the final databases were prepared, the following methodological procedures were applied to analyse the size of the variation and the evolution of disparities in school performance indicators between (types of) localities, high schools and gender: school performance is mathematically reflected by the enrollment, participation and graduation rates. Therefore, the classic formulas have been used:

$$G_{r1} = \frac{G_p}{N_p} \cdot 100\%, \text{ where:}$$

G_{r1} = the graduation rate of students who attended the exams,

P_p = the number of students who achieved the final average above 6.00 and at least 5.00 in each exam,

N_p = the number of students who attended all the exams.

$$P_{r2} = \frac{P_p}{R_p} \cdot 100\%, \text{ where:}$$

G_{r2} = the graduation rate of the students who registered for the Baccalaureate exams,

N_p = the number of students who registered for the Baccalaureate.

The most effective methods of graphically displaying large sets of mathematical calculations are boxplots and scatterplots, which facilitate the visualisation of the degree of data dispersion. They methods also highlight 6 important values of the set: minimum value (Q0), maximum value (Q4), median (Q2), first quartile (Q1), third quartile (Q3) and skewness. In addition, the datasets (2015-2022) with the final averages of the attending students ("passed" and "failed") were used to analyse inequalities in school performance based on the relations between gender (male / female) and students' area of residence (urban / rural), according to Cohen's model and represented by histograms.

Research results

Urban – rural disparities

The first stage of the analysis of the Baccalaureate results focuses on representing the numerical evolution of the students who were enrolled in September in 12th grade (full-time course, current generations), those who

registered for the exams, those who attended all the exams, and, finally, those who passed. The number of high school population follows a general downward trend, attributed to the overall population decline after 1990 (Iancu, 2015, Salmi et al., 2015). The only numerical revival recorded during these years takes place in the pandemic year 2020, when are registered the smallest differences between the number of enrolled students at the beginning of the school year and those registered for Baccalaureate (Figure 2). Additionally, 2020 also saw the lowest rates of absenteeism (of 1.63%, or 1962 students) and dropout (of 9.53%, or 12662 students), as well as higher proportions of graduated students compared to the previous years. This is largely due to the legislative changes in the spring of 2020, when the Ministry of Education decided to exclude from the examination curricula the subjects taught in the second semester. Therefore, on the assumption that the exams would be less difficult, a record number of students from other generations (25913 from 12th grade, full-time and 31829 students including from 13th and 14th grades, evening and part-time courses) were motivated to retake the Baccalaureate, whereas in other years the numbers varied between 15000 and 17000. In relative terms, over the 8 years, between 61-65% of the students enrolled in the 12th grade graduate from high school on the first attempt. The second session[2], held in August, which includes those who were absent or did not pass in June, raises the final percentages of the overall promotability by 24-29%. Unsurprisingly, taking both sessions into account, 2020 saw the highest graduation rate of all the period included in the analysis (of 92%). In addition, in 2021 and 2022, the curricula was also simplified by eliminating some subjects, changes intended to help the generations of students who were in 11th and 10th grades during the pandemic year. These would have mitigated the shortcomings caused by the sudden shift to online teaching and the lack of consistency in the act of teaching-learning in the countless cases of students and teachers who had struggled to adapt to digital education. As a result, in the last 3 years, all the statistical indicators of exam performance have recorded an unprecedented increase "forced by circumstances", while not necessarily reflecting in an accurate way the real situation of national academic achievement.

[2] The 2nd session of the Baccalaureate is not included in this study because of the impossibility of correlating the students who failed or were absent from the first session with those who attend the second time.

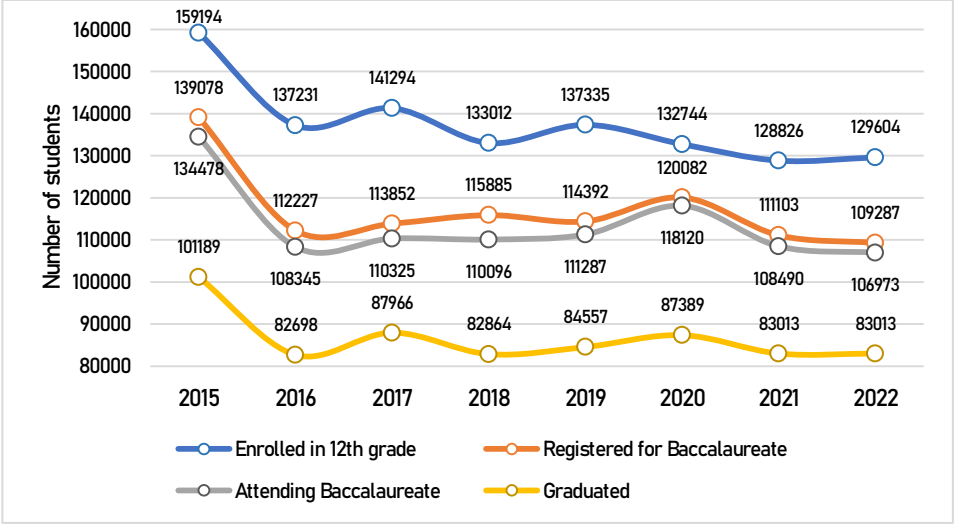
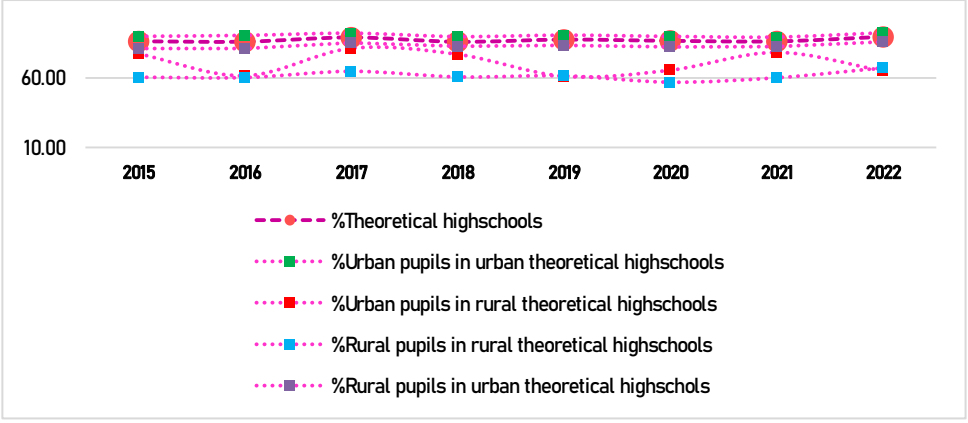


Figure 2. The evolution of enrollment rate, registration rate, attendance rate and graduation rate for high school students (2015-2022)

The major discrepancies between the number of students enrolled at the beginning of the 12th grade and those who pass all the exams are officially attributed to absenteeism, dropouts, incomplete academic records or, generally speacking, to the lack of systematic preparation for the "maturity exam" (Peticilă, 2021). In addition to these factors, unofficially, both in the Baccalaureate exams and in the National Assessment in 8th grade, there is the so-called "Brăila Phenomenon", (Human Catalyst, 2019) which consists in discouraging the students with learning dificulties by their teachers or / and the administration to register for the exams because of the perceived high risk of not graduating. This situation has also been reported among the students who did not manage to prepare well enough to pass all the exams and a possible failure or passing with borderline averages would only jeopardize the reputation and academic expectations of the high school or locality. In practice, "the selection" for exams is done by deliberately failing the students with low grades. This phenomenon returns to the public attention every year, denouncing the inexplicably low participation rate in some localities. In addition, the poor attendance rate in the Baccalaureate exams is also justified by the particularly high percentage of absenteeism and low graduation rates in technological high schools (Figure 3), especially those located in the rural areas: in some years, there were recorded attendance rates of 0%, (e.g. in Poienile de Sub Pădure commune, Maramureş county). Modest results in the school performance of this type of high school are to be expected every year, both because of the low

entrance averages in the 9th grade, and due to a general emphasis on learning a skill at the expense of academic results. The lack of interest in the Baccalaureate exams is influenced by the alternative graduation options: obtaining a level 4 qualification certificate (Ministry of Education, 2022), which gives the official right to practice a skill and enter the labour market as quickly as possible, without having to obtain a diploma. The urgency of learning a skill and poor attendance at exams are linked to the phenomenon of poverty, functional illiteracy and social exclusion, mostly present in the countryside. In these areas, where the population is facing unemployment and financial instability (hence the significant migration of the young adults), few families can afford long-term expenses of attending a good high school, where the students could achieve competitive results. In most of the cases, for students from rural technological high schools, the educational pathway ends long before the exams. At the same time, there are substantial discrepancies between rural students who have chosen to attend the technological course of a rural or an urban high school: although rural students, on average (!), do not outperform their urban peers, their promotion rates are similar. On the other hand, absenteeism rates are much lower for rural students who attended urban high schools, indicating the higher quality of teaching and school infrastructure, as well as the strength of group cohesion and the motivation to learn in an environment with a healthier competition, given the incentive of career prospects. The financial support of the parents is also an important factor, with greater implications, as for rural students who have been studying in urban high schools, or in rural high schools without dormitory facilities, the expenses for accommodation, commuting or school supplies are indispensable and can be very costly.



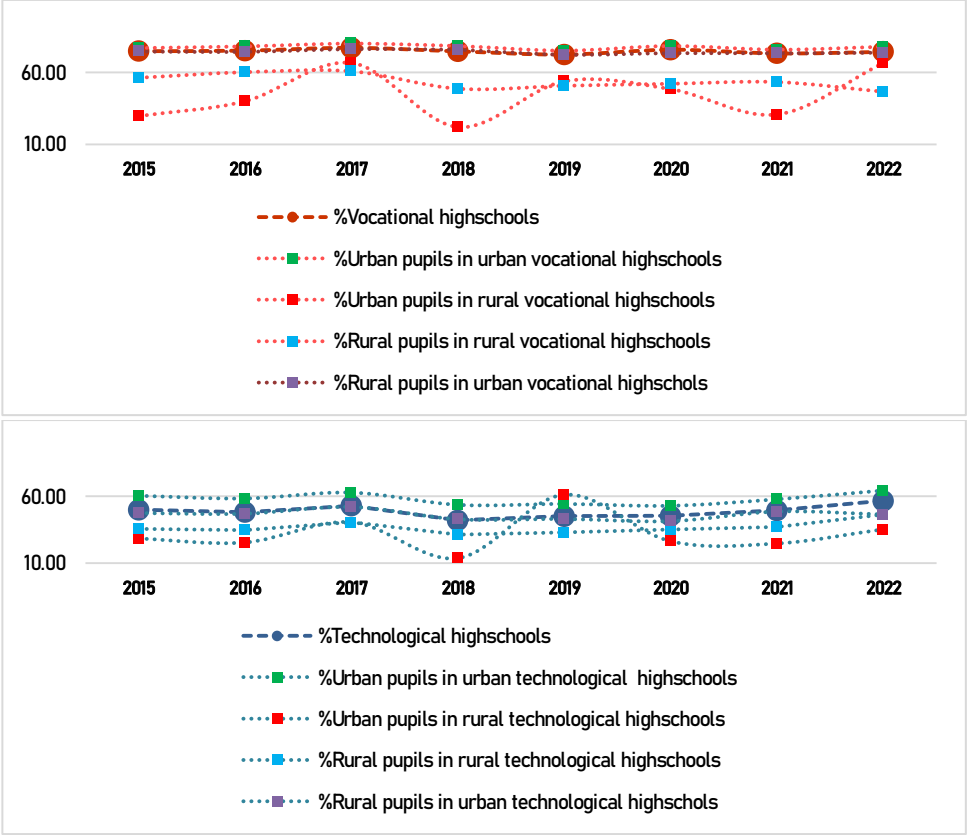


Figure 3. The evolution of graduation rate (%) of students coming from urban and rural areas, in theoretical, vocational, and technological high schools (2015-2022)

Similar to the technological course are also the statistical situations of the theoretical and vocational courses, although the theoretical includes elite high schools, where the promotion rate exceeds 90%. Moreover, the number of urban students also reaches the same percentages, while for rural high schools, attended mainly by students from neighbouring areas, the promotion rates decrease, on average, between 25-29%. Overall, the theoretical course concentrates students with average and above average intellectual abilities, who achieve very good results and show continuous academic perseverance; obviously, there are also discrepancies between the two profiles (sciences vs humanities), where the students from sciences classes usually outperform their peers with at least 4% higher averages.

Regarding the vocational course, which consists of 5 profiles (arts, sports, pedagogical, military and theological), the academic performances of military high schools (with graduation rates of 99.51% and final averages of

8.82) are only comparable with national colleges, considering the rigorous admission process, where only the students with the highest competitive grades are selected. Given the semi-closed accommodation regime and the tougher style of organising the whole architecture of time management and learning style, the differences between the results of urban and rural students of military high schools are quite negligible. In contrast, the lowest results are achieved by sports high schools, followed by theological high schools, where students are more likely to be interested in extracurricular activities specific to the profile. Therefore, from a mathematical perspective, there is a 39% "gap" between the theoretical and the military profile, where the results of the Baccalaureate exams are based on an intense competition, thanks to the higher teachers' qualifications together with the high schools' reputation within the hierarchy of urban centres. On the other side, in technological high schools, which de facto have the worst academic image correlated with a high degree of underachievement (Istrate, 2008), students for who chose not to drop out before the exams will rather prioritize the professional qualifications over studying for theoretical exams.

The statistics on urban-rural differences in graduation rates (Figure 4) are hardly surprising: urban students have always been considerably ahead of their rural peers regarding final graduation grades and the overall educational achievement. Moreover, the data show that temporary migration to the city to attend high school (Figure 3 and Figure 4) or the daily commute from the village to the city are not robust enough factors to help rural students to outperform their peers, one of the reasons being the shortcomings with which they come from rural lower-secondary schools. In terms of the frequency of values within the datasets, the cases of academic excellence of rural students are exceptions rather than a common occurence. In other words, for a rural student, attending an urban high school is not a strong guarantee of graduating with good results, but, nevertheless, it may be a decisive factor in reducing the risk of dropping out by attenuating the inequalities of opportunities for educational achievement. Indeed, one may consider that the recipe for academic (in)success is primarily based on the students' place of residence, the envionment, prestige of the high school, commuting distance, the types and frequency of transport and personal aspirations. Financially, the situation is qualified by family income: it is understandable that those in urban areas will have greater resources for additional investment in private tutoring, which is considered extremely necessary, particularly for the most difficult disciplines, as mathematics, or in certain cases where the teachers have not been teaching consistently and therefore the students do not feel sufficiently prepared to take the exams.

Nevertheless, it is considered a blamed phenomenon, for objective reasons: proving the low efficiency of formal education, its very high costs, the normalisation of double standards of teaching (especially where the tutors are the same ones who teach at school), the dependence of school achievement on money. Yet, it is an imperative because it is perceived as an essential key to get higher exam grades and increase the chances of getting a good ranking in university admissions. Therefore, the payoff is worth the financial effort: tutoring can raise the final grades by 1-2 points (Digital Nation, 2021). According to some studies, about a third of 12th graders take private tutoring, and twice as many urban students as rural ones (Popa, 2006, Bray, 2011). On the other hand, during the secondary school years teachers organise so-called "remedial classes", free of charge, especially for those students whose parents do not have the resources to support their children's parallel education. These extra classes are intended to help students facing a high risk of school drop-out, often due to a lack of adult authority or to difficulties in understanding the subjects.

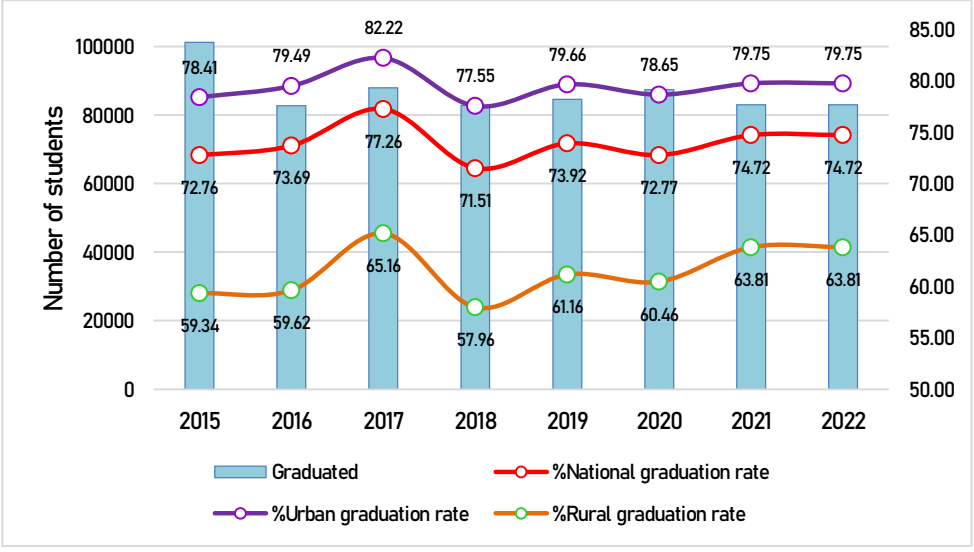


Figure 4. The evolution of the number of graduated students: national, urban and rural graduation rate (%)

The cartographic representation of promotability at county level (Figure 5 and Figure 6) places Cluj county at the top, with an average rate of 87.59%, followed by Braşov and Brăila (85.06% and 85.01%), while Bucharest ranks on the 8th place, with 83.02%. In addition, these counties also recorded the smallest percentual variations between the number of

graduated and failed students (by about 3000). The three counties occupy roughly the same positions in the national ranking each year and the main factors ensuring their school success rate are of social and economic nature (with the exception of Brăila, due to the reasons mentioned above): the highly dynamic economic environment of the last decade has stimulated diversity and competition on the labour market, increasing the general standard of living and the financial power to invest further in children's education. In addition, they have a highly urbanised population, with cities representing important regional economic hubs. On the other hand, the bottom ranked counties are Ilfov (51.01%, 3136 failed students), Giurgiu (57.18%, 3640 failed students) and Teleorman (61.51%, 5676 failed students), the results are correlated with high risk of poverty, social and economic vulnerability (Muntele et al., 2021). The big cities of these counties are not able to stand out in the region in terms of (high) educational standards, being overshadowed by the capital, which is the largest centre of high school polarisation (with 104 high schools). Starting with the 9th grade high school admissions, one can see the earliest significant migratory flows from Giurgiu, Teleorman, Ialomița, Călărași and Ilfov counties to Bucharest: a substantial number of students, especially those with high admission averages, choose to study in the capital. As a result, facing a lack of a real competition and the subsequent educational opportunities, combined with a high degree of rurality, depopulation and demographic ageing, these areas face the most pronounced discrepancies between urban and rural educational outcomes. In addition, over the past decades this region has experienced high illiteracy rates and this phenomenon, although considerably reduced according to the latest population censuses, is still an influential factor on the motivation and educational goals of students coming from less educated background (Stancu, 2020). In the families where at least one parent has a lower level of education than high school, children are more likely to show an increased risk of school failure, as the level of parental education is an indicator of the quality of the inherited human capital (Marks, 2008). It represents the nature of their learning practices and the presence or lack of self-fulfilment motivation, with regard to educational perceptions of the importance of further schooling or stopping the academic path (Stanef, 2013a; Țoc, 2016). In other words, in this region, students who want (and can afford) to achieve a higher level of academic performance and have competitive Baccalaureate results, have as the best option to choose a reputable high school in Bucharest (which has become a generalized phenomenon in recent years in neighboring counties), or to choose among the few prestigious local high schools. On the other hand, in Harghita, a

county populated mainly by ethnic Hungarians, with a graduation rate that places it on the 38th position out of 42, the percentage of 62.92% is largely due to the students' difficulty in passing the Romanian language and literature exam. Over the 8 years, of the 5660 Hungarian students who failed to graduate, 45.05% of them failed to achieve a passing score (5.00) only at Romanian language and literature exam, while the Hungarian language exam grades are in the comparable rages of the other counties. As this is a compulsory exam, these students face a disadvantaged position with regard to the likelihood of continuing their studies (e.g. Hungarian faculties), especially if they do not use Romanian at all on a daily basis. The percentage differences in the graduation rate between the analysed period (Figure 6) are balanced (with a variation of only +3.92%) by the counties that had high values in 2015 and recorded minimal positive changes in 2022 (Cluj, Galaţi, Brăila, Iaşi), or those with median values (Prahova, Alba, Tulcea), counterbalanced by those that managed to have remarkable percentage increases (Covasna, from 69.09% to 80.20% or Teleorman, from 51.98% to 67.06%).

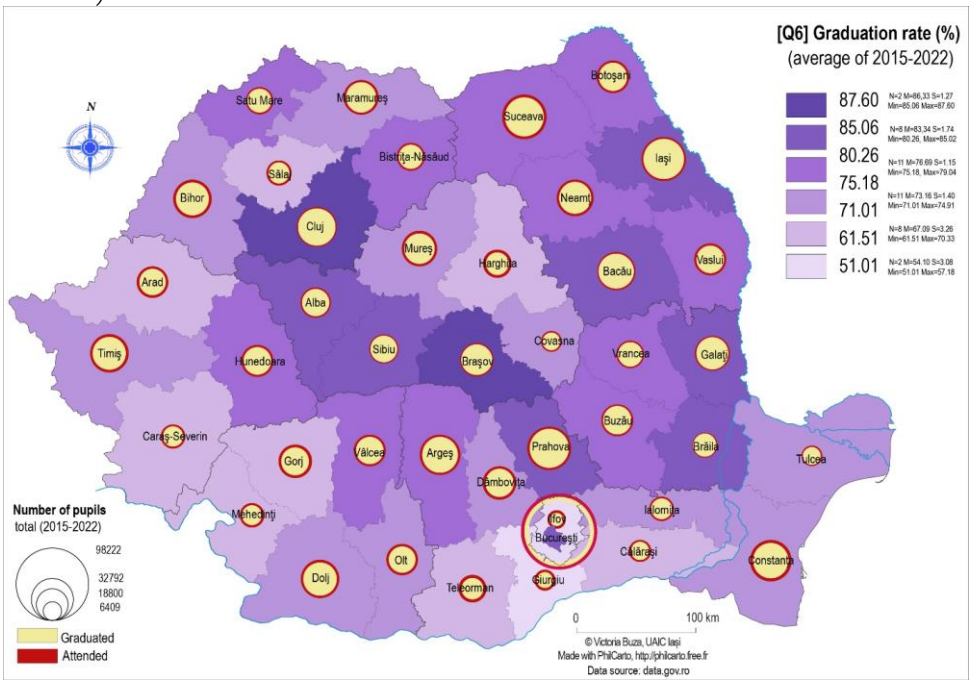


Figure 5. The average of graduation rate (%) (2015-2022), by county

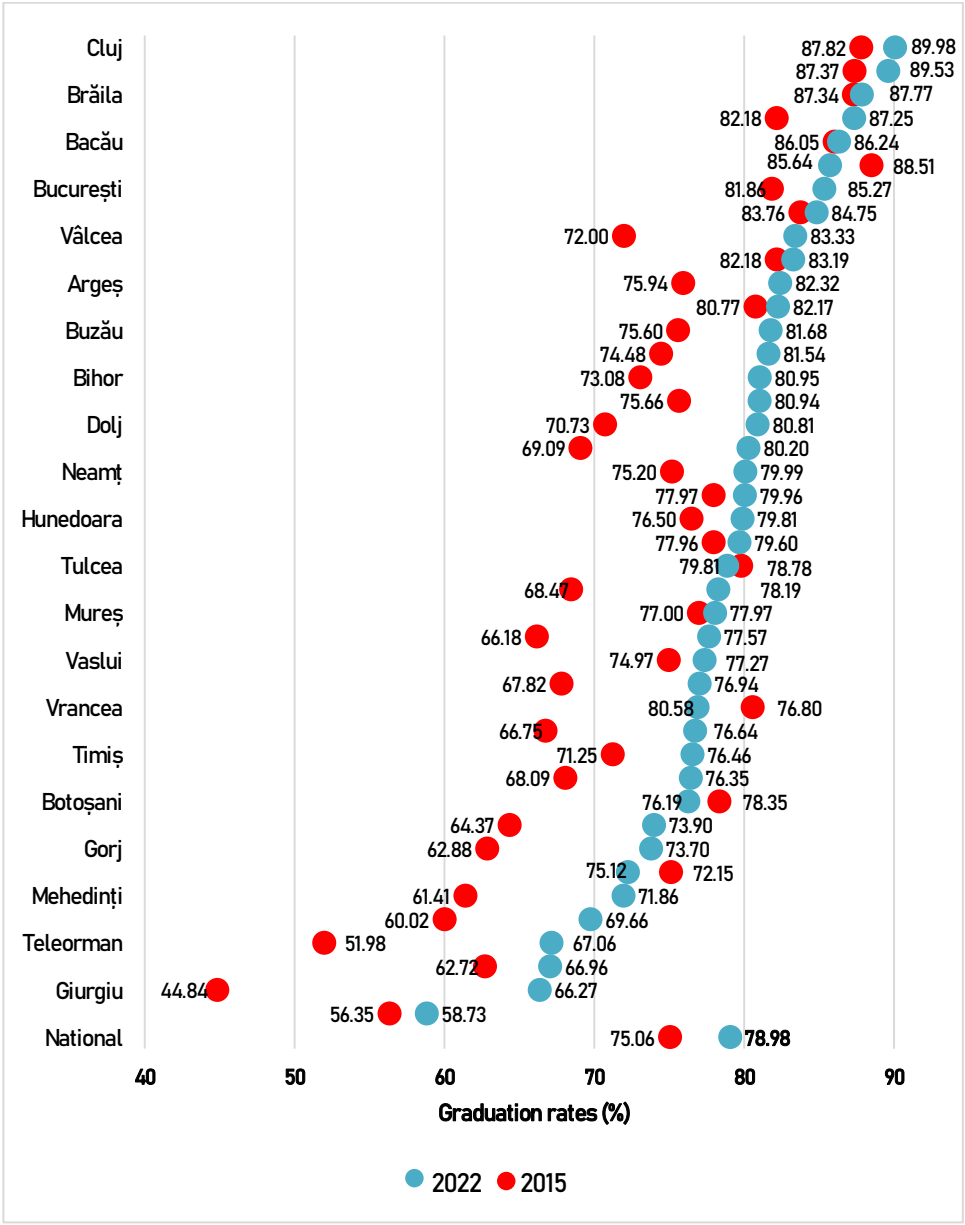


Figure 6. The percentage difference in the promotion rate in 2015 and 2022, by county

The scatterplot and boxplot analyses (Figure 7) compact all the counties into a single graphical representation, distributed on the two dimensions of the same indicator: the gross graduation rate of all the students registered for the Baccalaureate exams (*Gr2*) and the net rate of

students who attended the exams (including promoted, failed and eliminated) (*Grf*), which manages to outline the heterogeneity of the counties through the simple dispersion (1) and the discretization of the values in quantiles (2). The boxplots structure highlights the following outliers: Ilfov county (51.01% net vs. 48.91% gross) and Giurgiu (57.18% net vs. 54.20% gross), while Cluj stands out at the opposite extreme, with negligible differences, due to the fact that it is the county with the lowest average rate of absenteeism (0.89%), followed by Caraş-Severin, with 0.90%. The gross graduation rate disparity (up) includes more than half of the counties (22) between Q1 (67.94%) and Q3 (76.94%), similar to the net rate (down), which includes 20 counties in the same range. At -0.786, the value of the skewness of the net graduation rate indicates that (statistically speaking!), most of the students have a good chance of graduating from high school in the first Baccalaureate session, but, inevitably, at least a quarter of them will ultimalety fail. The dissemination of the same indicator at the locality level balances the asymmetry values, both for the gross graduation rate (-0.416) and for the net values (-0.537) (Figure 8), since it includes of all localities that had at least once between 2015-2022 high school graduates enrolled and passed the Baccalaureate. As a result, it outlines a cluster composed of 16 rural communes with technological high schools that did not have a single graduated student for 8 years and recorded absenteeism rates of over 60%.

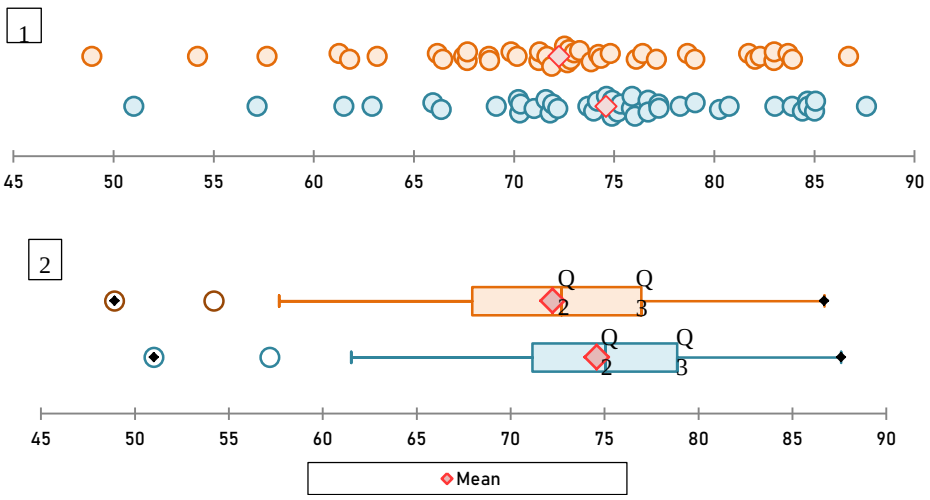


Figure 7. Distribution of graduation rates (%), by county: boxplot (2), scatterplot (1). Up: students who were registered for Baccalaureate; down: students who attended all the exams.

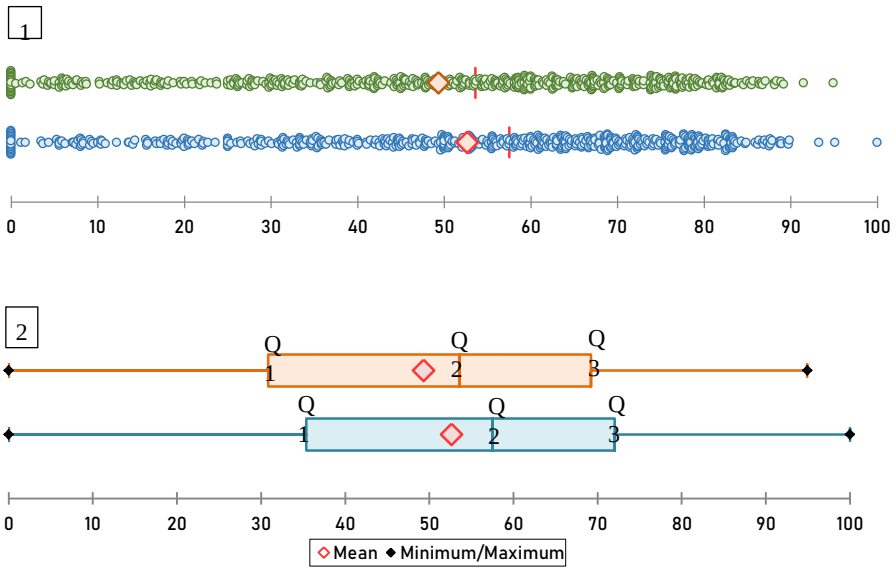


Figure 8. Distribution of graduation rates (%), by locality: boxplot (2), scatterplot (1). Up: students who were registered for Baccalaureate; down: students who attended all the exams.

Out of the 239 localities on the left of the mean, 51 of them are small cities with only one technological high school (Valea lui Mihai, Bihor county, Cehu Silvaniei, Sălaj county) and a few with theoretical high schools (Negru Vodă, Constanţa county, Popeşti Leordeni, Ilfov county). In contrast, the outliers of the scattergram are the city of Breaza, Prahova county, with 3 high schools, one of which is military, with a graduation rate of 94.90%, followed by Prundu Bârgăului, Bistriţa-Năsăud county, with only one theoretical high school, which achieved to register 91.46% and Ceauşu de Câmpie, Mureş county, with 84.93%. In relative values, several urban centres with more than 50.000 inhabitants hold the top positions: Gherla municipality, Cluj-Napoca municipality and Sângeorz-Băi city. As expected, most of the large municipalities and county residences are above the inter-quantile range, with values well above the median of the group (except for Giurgiu, Alexandria and Drobeta-Turnu Severin). Due to the uneven dispersion, only 49.54% of the spatial units are concentrated in the inter-quantile range (Q1=35.39, Q3=72.04).

Drawing the conclusions solely on the analyses at this stage would obscure the much more nuanced and complex realities behind the summarized data at the macro(county) level. Therefore, in order to further explore the discrepancies between rural and urban environments, it was considered relevant to disaggregate the raw data into two categories according to the origin of the students *who attended* all the exams between rural and urban, and further

separated by the final status: graduated or failed, represented cartographically in Figure 9 and Figure 10. Firstly, this type division of the data enables to visualise the school performance of each high school and, secondly, to highlight the (in)efficiency of the educational system regarding the school achievements of the most vulnerable groups, especially the rural students who chose to attend a rural high school. Most of the difficulties of rural high schools, which have a pass rate of less than 50% and above average absenteeism rates (more than 10%) (Tab. 1) are caused by a number of factors that have the effect of "facilitating" the risk of school failure: insufficient investment in school infrastructure (buildings, accommodation, classroom equipment), administrative and geographical limitations, high turnover of teachers, who are often non-tenured and come 1-2 days a week from other towns. Some studies (Stanef et al., 2013b, Muntele et al., 2020) include poorer didactic preparation of teachers working in rural high schools, as well as lack of financial resources and parental lack of involvement as some of the reasons that indirectly contribute to the lower academic achievement. In addition, the early school leaving of the most vulnerable students, who no longer find the purpose of graduating in the context of insufficient preparation, is often influenced by the poor communication between the teacher-parent-student relationship, a more common phenomenon in rural communities (Merce et al., 2014).

Financial difficulties, limited transportation options, commuting schedule constraints (early morning delays and leaving early to catch the last bus) and the complex bureaucratic system for its reimbursement also contribute to the economic pressure on the families of students attending high schools in other localities. As for rural students attending urban high schools, the data show that county residences are generally less accessible because of the instability of income sources of poor families and the higher cost of living that moving would require. High-achieving but more financially vulnerable local elites tend to choose a prestigious high school in other urban centres, usually in other municipalities or cities in the county.

In Figure 9, representing the average graduation rate of rural students and the percentages of students according to their final status, for each high school centre, Bacău (79.30%) and Iaşi (77.96%) stand out, followed by Cluj (77.22%) and Bucharest (74.19%), whose county residences are also university centres of regional and national importance. At the other end of the scale, in 7 counties the ratio of graduates from rural areas failed to exceed at least 50%: Sălaj, Dolj, Giurgiu, Teleorman, Gorj, Ilfov and Harghita. Individually, there are a few isolated examples of cities where rural students register higher graduation rates than (relatively speaking!) their urban colleagues: Motru municipality, Gorj county (rural: 93.82% vs. urban: 68.74%), Drăgăşani municipality, Vâlcea county

(rural: 93.04% vs. urban: 64.90%) and Curtici city, in Arad county (rural: 72.97% vs. urban: 57.05%). Apart from these special cases, statistical data clearly indicate the extent of the inequalities in opportunities, and the challenges of overcoming them may become a frustrating experience for students from poor families. With less time to focus on school, they often tend to end up with lower grades because their families don't encourage or are simply unable to offer financial support due to the economic and social burden. In the most difficult circumstances, these children are actively involved in agricultural work which is their main source of income, may be discouraged from moving to a distant location with a superior high school over a local high school because better exam results would become too expensive.

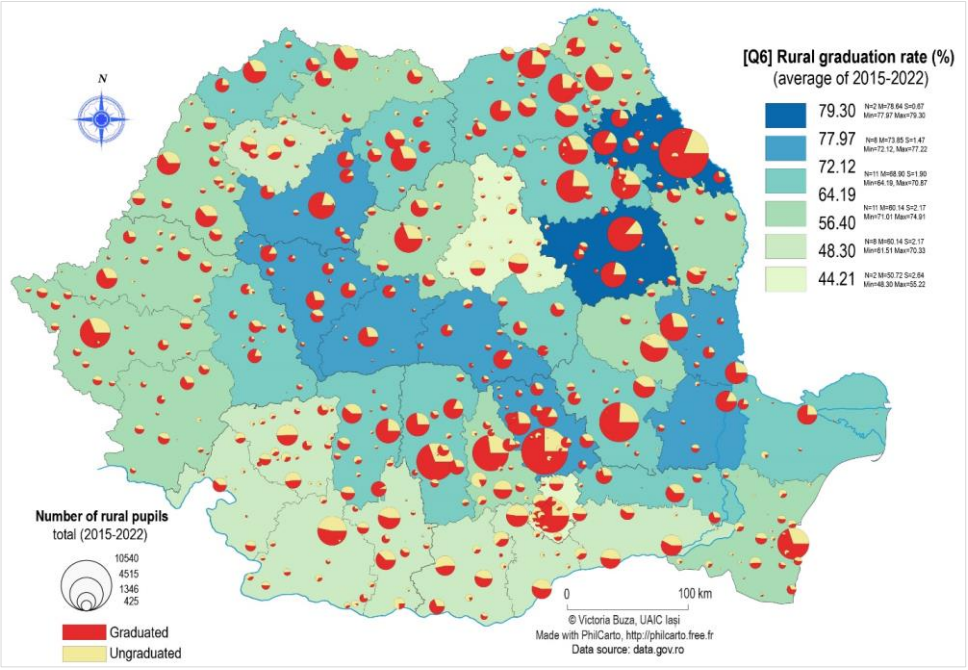


Figure 9. Graduation rate, number of graduated and ungraduated students from rural areas

The analysis of the performance indicators of urban students and the overall urban centres (Figure 10, Table 1) reveals a much more optimistic situation: quite unsurprisingly, the best graduation rates are registered in the county municipalities (Cluj-Napoca municipality, Cluj county, is at the top of the urban centres, according to the percentage of the graduated urban students (91.58%), followed by Gherla municipality, Cluj county with 91.28% and Iaşi, Iaşi county, 90.80%. The exceptional results of this ratio are complemented by

the interrelated indicators (lowest rates of exam absenteeism, highest final averages (both for graduates and failed students)). To a large extent, this is due to the high accessibility, diversity and competition between high schools, the higher level of wealth of the population allows for increased and sustained expenditures on formal and informal education. Typically, the high schools for which there is very tough competition, due to their prestige, and hence higher average admissions, shape the best students for whom school failure is not an option, but rather the exams question is thought of in terms of *how good they can be*. This certainty is based on the solid knowledge acquired in secondary school, which provides an easy path to assimilate information, as well as thanks to the better learning skills, the consistency of studying and the long-term stability of teachers (Vasile, 2011). In addition, a higher degree of parental involvement throughout the student's school trajectory and the financial availability for extra tutoring are the ingredients that make the difference in the process of developing the recipe for educational success.

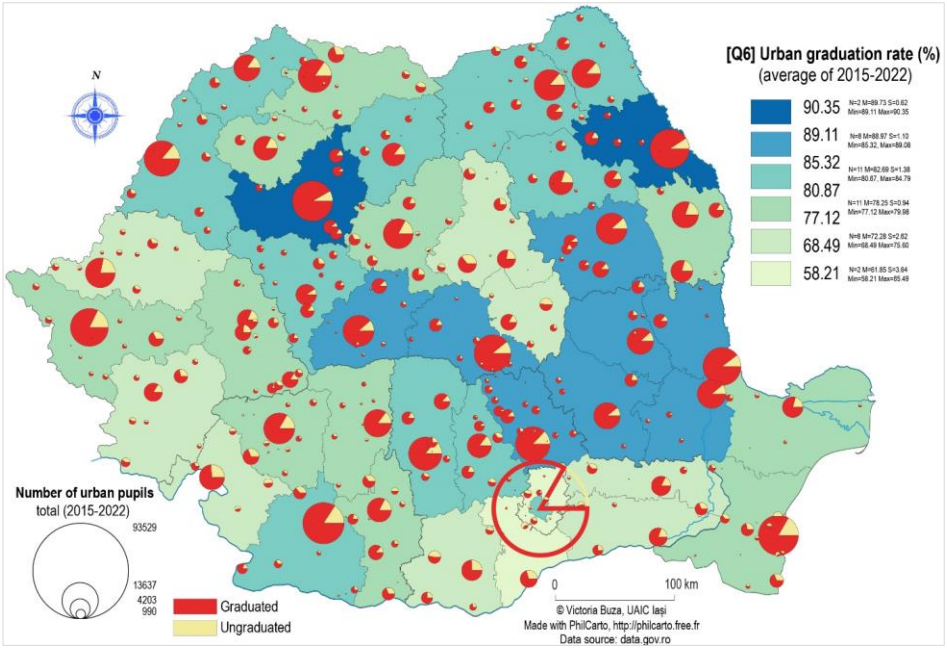


Figure 10. Graduation rate, number of graduated and ungraduated students from urban areas

The evolution of the indicators in Table 1 is slightly fluctuating, and the simplification of the Baccalaureate curricula in the last 3 years seems to have had a considerable good influence on the absenteeism rate, which has had a decreasing trend as more students have been encouraged to take the exams, even though the fees for extra tutoring have increased in recent years (Burnar,

2022). The final averages of both graduated and attended students (including those who failed) show a slight increase in municipalities and cities, but the analysis still points to the overall stability of the variations within the annual values. For example, the graduation rate of high schools in cities ranges between 63% and 71% and the absenteeism rate between 4% and 6%, except for rare conjunctural situations, such as 2020, for the reasons mentioned above.

Table 1 Exams performance metrics (only attendees), by type of administrative rank

Category		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
County Residences	*Graduation rate (%)*	81.62	82.12	85.01	80.96	81.21	79.03	81.55	84.70
	Nr. of promoted students	57811	53619	57032	54797	56323	58170	56029	57991
	*Final average**	8.10 / 7.46	8.14 / 7.52	8.23 / 7.70	8.15 / 7.21	8.19 / 7.55	8.33 / 7.54	8.23 / 7.58	8.28 / 7.75
	Absenteeism (%)	2.13	2.32	2.05	3.24	1.84	1.21	1.68	1.44
Municipalities	*Graduation rate (%)*	73.45	74.85	78.32	72.69	73.23	71.91	73.74	78.85
	Nr. of promoted students	15796	15122	16258	15023	15052	15530	14436	15011
	*Final average**	7.93 / 7.05	7.99 / 7.15	8.06 / 7.32	7.96 / 7.07	8.03 / 7.16	8.14 / 7.13	8.01 / 7.13	8.06 / 7.36
	Absenteeism (%)	3.23	3.05	2.47	5.00	2.46	1.45	2.27	2.63
Cities	*Graduation rate (%)*	64.52	65.27	68.61	63.79	65.31	63.32	65.26	71.20
	Nr. of promoted students	14705	11703	12225	10971	11180	11541	10641	11195
	*Final average**	7.86 / 6.68	7.81 / 6.64	7.89 / 6.80	7.83 / 6.63	7.82 / 6.67	8.00 / 6.65	7.84 / 6.67	7.86 / 6.92
	Absenteeism (%)	5.01	5.99	5.24	7.68	4.53	2.50	4.04	3.82
Rural high schools	*Graduation rate (%)*	46.67	45.77	52.50	45.27	46.95	45.68	48.81	56.64
	Nr. of promoted students	2745	2254	2451	2073	2002	2148	1907	2123
	*Final average**	7.58 / 5.79	7.62 / 5.74	7.61 / 5.97	7.56 / 5.72	7.59 / 5.85	7.70 / 5.78	7.62 / 5.95	7.60 / 6.23
	Absenteeism (%)	*10.70*	*10.62*	*11.50*	*15.89*	*9.85*	*5.41*	*6.89*	*6.69*

*Final average: (1) only graduated students / (2) all attended students, including those who did not graduate

The dynamics of the decrease of the final averages and graduation rates (hence the increased number of students who failed the exams) with the lowering of the administrative rank (from county residence to municipality to city) of the urban centres can be explained by the reduction in population size, meaning a less diverse high school offer and often correlated with the declining level of economic development. Accordingly, school performance is directly proportional to city size and its socio-economic importance in the territory. From this point of view, small county residences (such as Alexandria, Călăraşi, Drobeta Turnu-Severin, Slatina), even if they represent the highest administrative position, the performance indicators are similar to those of regular municipalities (graduation rates of 74% and absenteeism of about 3.50%). In contrast, the presence of at least one university seems to have a strong positive impact on performance indicators: the university centres of regional and local importance (Cluj-Napoca, Iaşi, Braşov, Galaţi, Sibiu) record the best results, with more than 7% above their class averages.

In order to capture the territorial realities that may lie behind the administrative status, in the following part of the analysis the high school urban centres have been classified according to the population size considering the 2021 Population Census (Table 2). This type of filtering, unsusceptible to the administrative hierarchy, whose status has been artificially "forced" in a few cases for some localities with too few urban features (Bănică et al., 2013) manages to differentiate the de facto educational functionality of urban centres. Thus, the category of cities with more than 100.000 inhabitants inludes only 18 county residences (the largest cities in the country), 15 of which are university centres (except for Baia Mare, Brăila and Buzău). These county residences hold the monopoly of high school attractiveness in their own regions thanks to their generous school offer (and accommodations) which, in addition to local students, usually also attract the best rural students and the students from the neighbouring counties without universties. In general, the quite numerous national colleges and theoretical high schools manage to "raise" the overall local averages. Technological high schools, although fewer in number, concentrate the poorest academic performers, but they still manage to outperform their peers from other technological high schools in regular municipalities, cities or rural communes. The category of cities with between 50.001 and 100.000 inhabitants includes the other medium-sized county residences (Botoşani, Deva, Vaslui), including three smaller university centres (Suceava, Alba Iulia and Târgovişte), as well as two of the capital's satellite towns, Mihăileşti (Giurgiu county) and Popeşti-Leordeni (Ilfov

county). Most of the residences in this category are located in counties with significant percentages of rural population, with social problems related to demographic ageing, negative migration balance, unemployment and lower level of economic development. The third class consists of medium-sized urban centres with regular municipal status which are less attractive in terms of high school diversity, but which still succeed in maintaining a high status in the county hierarchy, competing with the county residences (such as Roman, Reghin, Lugoj, Tecuci). They are vital for improving equity of access to high school services in terms of reducing the disparities between urban and rural students. Moreover, some of them manage to achieve similar performance rates as the top high schools from the county residences. A couple of very small municipalities (Vatra Dornei, Aiud, Târnăveni) and the majority of the large cities (Buhuşi, Darabani, Pucioasa, Rovinari) can be classified in the fourth category, where performance indicators are slightly lower than in the previous one. These urban centres usually have 1-3 theoretical and / or technological high schools, with modest graduation rates (approx. 70%) and a moderate risk of dropout and school failure. The smallest cities (Bicaz, Făget, Isaccea) from the last category are those with limited urban functions, rather rural architecture and a stagnating economic situation, from where the high achievers tend to leave for bigger cities. They have a very low high school catchment areas (usually only one high school), with a strictly local influence (especially for the students from nearby rural localities), and for these reasons they cannot be competitive in national classifications.

Table 2. Exams performance metrics (only attendees), by type of population size of the urban centers

Population		2015	2016	2017	2018	2019	2020	2021	2022
>100.000 inh.	*Promotion rate (%)*	83.17	83.77	86.65	82.26	82.82	80.43	83.11	85.99
	Nr. of promoted students	44354	36612	39148	37682	39053	40501	39221	40837
	*Final average**	*8.11 / 7.55*	*8.17 / 7.61*	*8.27 / 7.80*	*8.17 / 7.56*	*8.21 / 7.62*	*8.34 / 7.61*	*8.25 / 7.67*	*8.30 / 7.81*
	Absenteeism (%)	*1.80*	*1.89*	*1.84*	*2.86*	*1.59*	*1.09*	*1.53*	*1.33*
50.001-100.000 inh.	*Promotion rate (%)*	76.77	78.87	82.16	78.31	78.02	76.12	78.54	82.02
	Nr. of promoted students	19125	15789	16681	15971	16064	16406	15609	16091
	*Final average**	*8.07 / 7.25*	*8.09 / 7.36*	*8.17 / 7.52*	*8.12 / 7.37*	*8.15 / 7.40*	*8.30 / 7.40*	*8.18 / 7.43*	*8.24 / 7.61*
	Absenteeism (%)	*3.08*	*3.07*	*2.53*	*4.22*	*2.28*	*1.41*	*2.01*	*1.64*
25.001-50.000 inh.	*Promotion rate (%)*	74.96	76.33	79.47	73.84	73.86	72.66	74.78	79.54
	Nr. of promoted students	12308	10020	10566	9819	10060	10256	9697	9988
	*Final average**	*7.93 / 7.11*	*7.97 / 7.20*	*8.08 / 7.38*	*7.98 / 7.12*	*8.08 / 7.22*	*8.15 / 7.17*	*8.01 / 7.17*	*8.07 / 7.41*
	Absenteeism (%)	*3.13*	*2.43*	*2.45*	*4.70*	*2.56*	*1.50*	*2.15*	*2.21*
10.001-25.000 inh.	*Promotion rate (%)*	69.41	70.21	70.74	68.63	69.99	68.31	70.20 %	75.70
	Nr. of promoted students	14806	11814	12657	11497	11446	11920	11006	11531
	*Final average**	*7.91 / 6.88*	*7.93 / 6.90*	*7.99 / 7.04*	*7.94 / 6.87*	*7.93 / 6.93*	*8.09 / 6.92*	*7.96 / 7.17*	*8.00 / 7.18*
	Absenteeism (%)	*3.97*	*4.91*	*3.97*	*6.07*	*3.49*	*2.16*	*3.31*	*2.76*
under 10.000 inh.	*Promotion rate (%)*	62.55	59.86	67.00	57.81	63.70	61.88	62.92	68.99
	Nr. of promoted students	7800	6209	6462	5822	5932	6158	5573	5750
	*Final average**	*7.82 / 6.60*	*7.76 / 6.56*	*7.85 / 6.70*	*7.78 / 6.56*	*7.79 / 6.60*	*7.98 / 6.60*	*7.80 / 6.56*	*7.80 / 6.81*
	Absenteeism (%)	*5.31*	*5.97*	*4.90*	*7.97*	*4.52*	*2.19*	*3.85*	*4.06*

*Final average: (1) only graduated students / (2) all attended students, including those who did not graduate

Gender inequality in educational performance

The statistical analysis of inequalities in educational achievement by gender (male / female) and environment (urban / rural) provides different perspectives on the big data sets that can hide behind the over-generalisations of previous classifications (urban vs. rural), which mix spatial units of different sizes, especially with urban, which is much more heterogeneous than rural, on urban typologies or on the differentiation of urban by population size. These analyses, by nature of the level of data aggregation (small scale), may distort or hamper some features. Therefore, this sub-chapter focuses on disseminating the results by 4 categories of students: a) urban, female, b) rural, female, c) urban, male, and d) rural, male. Firstly, the most important difference of this analysis compared to the previous ones is the change of optics in the urban / rural relationship: whereas in the preceding analyses urban and rural refer to the *administrative location of the high school*, urban and rural correspond to the environment of the locality *where the student comes from*. In a typical high school there will be students from both backgrounds, although generally, in urban high schools there will be more urban and viveversa.

Histogram analysis (Figure 11) is an effective statistical technique that shows the disparities in the final averages by gender and environment between the four categories of students. Thus, the best (and most numerous) results resulting in "passed" status (final average of at least ≥ 6.00 and at least ≥ 5.00 in all exams) are obtained by urban female students, who account for 288431 graduated candidates, representing 85.14% of the total who attended the exams, compared to 80.82% for urban male peers. At the same time, this group also records the lowest absenteeism rate of only 1.62%. The distribution of the final averages, as well as of the averages in the Romanian language and literature (Figure 12) and profile subjects exams (Figure 13), with significant negative asymmetries (of -1.12 and -1.00) shows that the urban females tend to perform much better than their peers from the same environment, even in the subjects considered more difficult, such as mathematics.

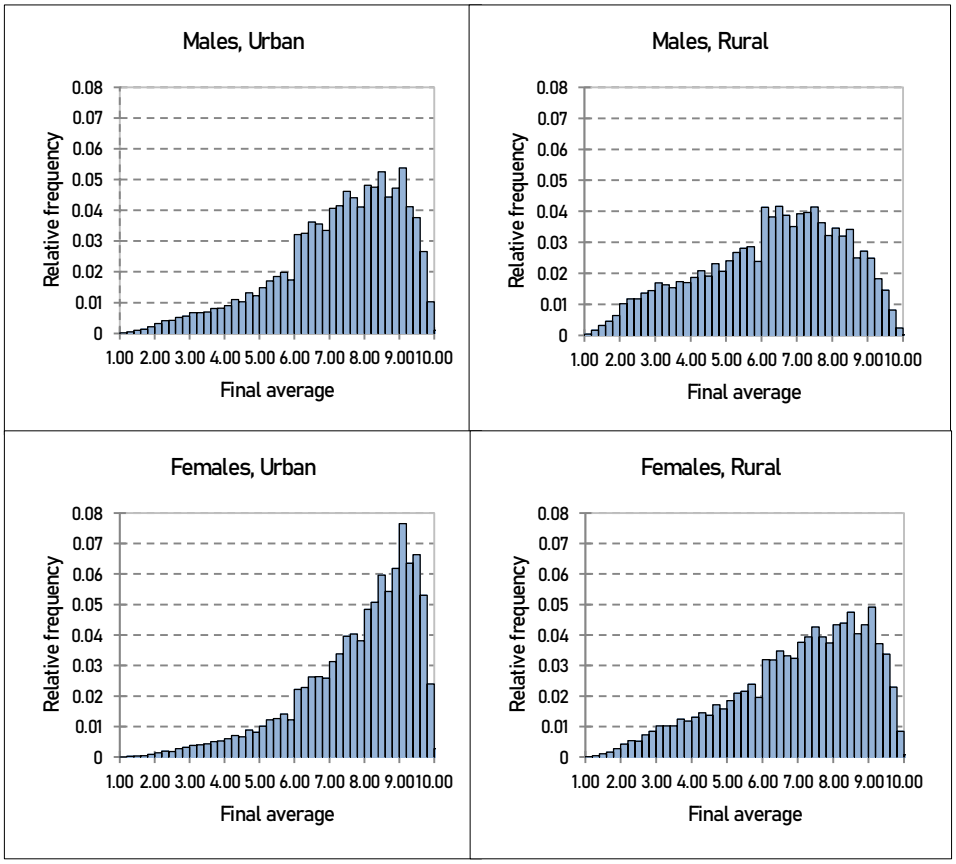


Figure 11. Histograms of the relative frequency distributions of the final averages, by gender and students' environment (average 2015-2022)

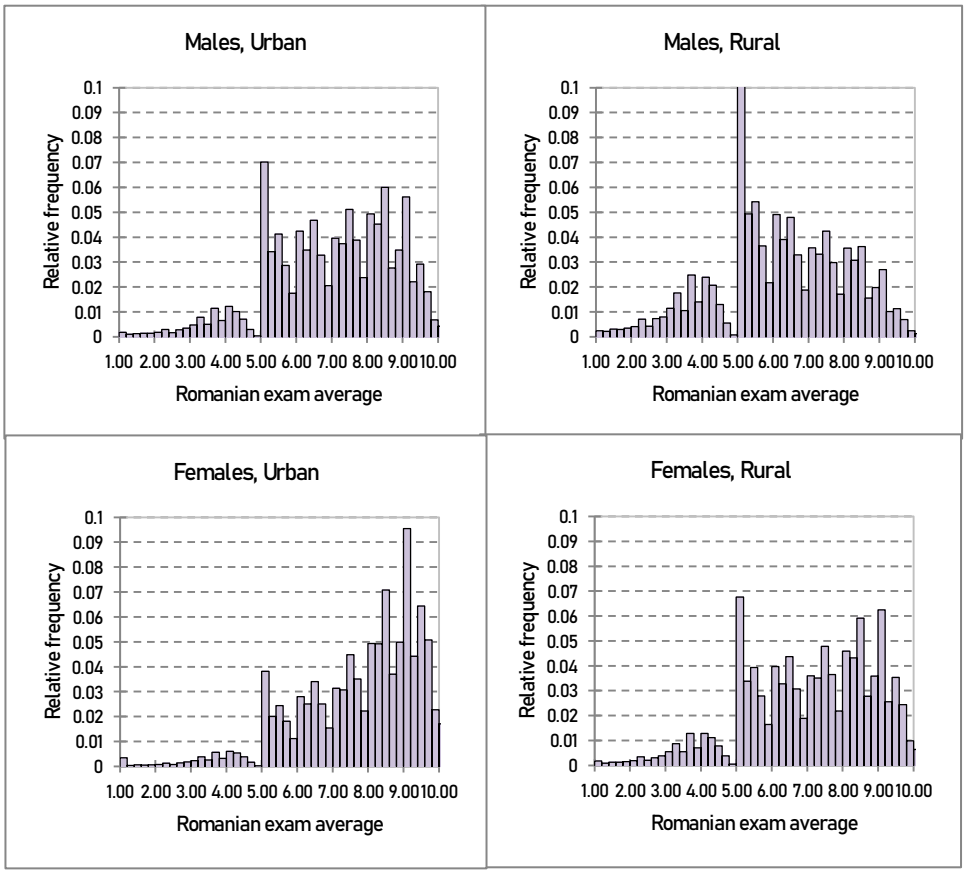


Figure 12. Histograms of the relative frequency distributions of the Romanian language exam averages, by gender and students' environment

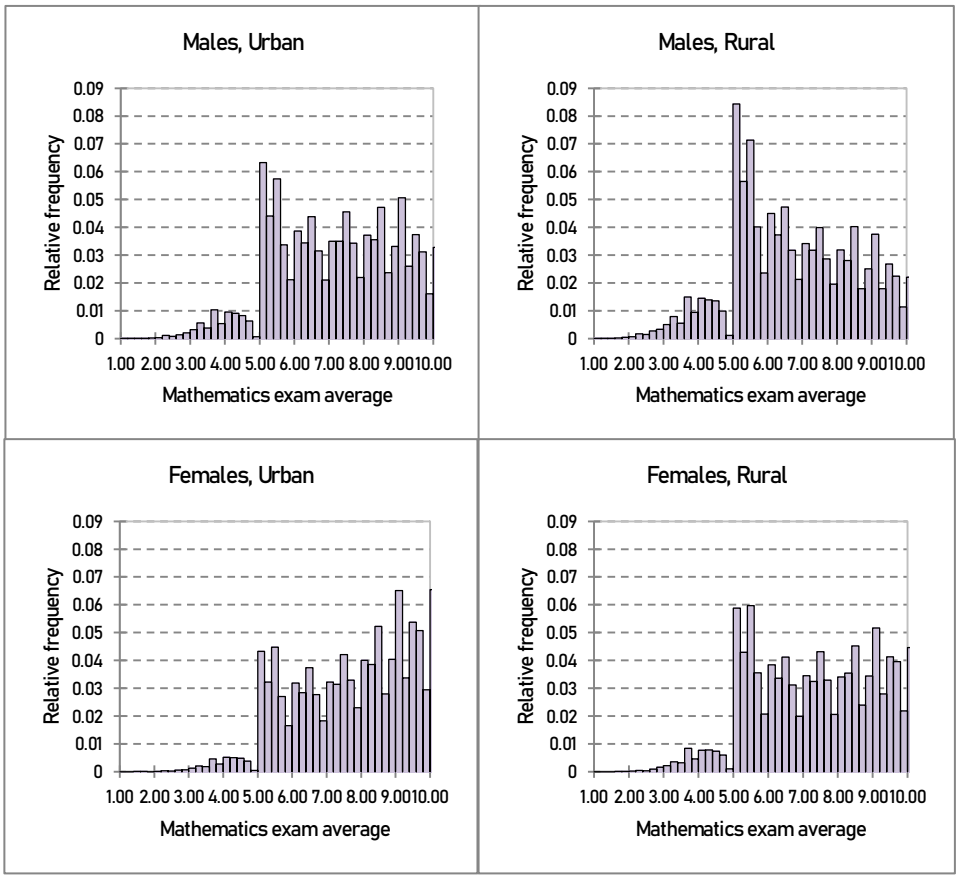


Figure 13. Histograms of the relative frequency distributions of mathematics exam averages, by gender and students' environment.

From a statistical point of view, an effective method of mathematically measuring the strength of the relationship between two groups of students is by calculating the coefficient d (Cohen's *d*) (Cohen, 1988). This is defined as the ratio of the difference between the means of each data set and its standard deviation (formula (1)). Since the data samples do not contain the same number of individuals (e.g. the number of urban female students ≠ the number of urban or rural female students), the standard deviation is calculated according to formula 2:

(1) $d = \frac{a_1 - a_2}{\sigma}$, where $\sigma = \sqrt{\frac{(n_1-1)\sigma_1+(n_2-1)\sigma_2}{n_1+n_2-2}}$ (2), where:

a_1 = 1st sample mean, a_2 = 2nd sample mean;

σ_1 = 1st standard deviation, σ_2 = 2nd standard deviation;

n_1 = number of students in sample 1, n_2 = number of students in sample 2.

The results of this formula can be used to determine the strength of interaction between two different groups of individuals (e.g. rural vs. rural students or rural vs. urban students). The advantage of this statistical calculation is to identify which factors have a stronger or weaker influence on the improvement or lack of performance in the Baccalaureate exams: gender or the environment in which the student grew up? Or both? Although the raw databases do not contain information on the background of graduated secondary school, which is the basis of theoretical knowledge and plays an important decision-making role in determining high school options, the final results highlight a number of interesting findings: one of the easiest ways to understand the meanings of *d* values (Table 3) is by overlaying the results of the two groups. According to the effect size power scale, values close to zero (≤0.2) will indicate an almost perfect degree of similarity in the distribution of results between females and males or between rural and urban, as applicable. In the case of the final averages (Figure 11, Table 3), there are medium differences (≥ 0.5, ≤ 0.8) between the urban female vs. rural female groups (*d*= 0.626, indicating that only 75.7% of their averages overlap. For boys, the discrepancies are even larger, with *d*=0.734 meaning that only 71.5% of the results will overlap. In other words, there is a 69.7% probability that an urban male student will have a higher average than a rural peer. The differences are diminishing between the groups from the same residence areas, but still remain significant; for rural females and males there are slightly larger discrepancies than for urban students, with only a +3.9% difference in the overlap of the final averages distributions. Therefore, these statistics show that the student's background has a stronger influence on school performance than does gender. For urban students, although females outperform males, the differences are quite marginal, while rural females seem to outperform their peers more easily, although it is quite challenging for them to reach the same level as their urban peers (the probability of outperforming is 67.2%). At the same time, females will perform better than males in all categories (final averages, Romanian language and literature or profile subject exams (mathematics and history)).

Table 3. *d* s values for each group of individuals for same area, different gender and different area, same gender

	Final averages		**Romanian language and literature**		**History**		**Mathematics**	
Area / Gender	Females	Males	Females	Males	Females	Males	Females	Males
Urban vs rural	*0.626*	*0.734*	0.449	0.472	0.232	0.244	*0.537*	*0.574*
Rural: females *vs.* males	*0.529*		0.491		0.323		0.309	
Urban: females *vs.* males	0.432		0.488		0.312		0.141	

This division method facilitates the mathematical exploration of the existing stereotypes regarding the possible affinity of girls for the humanities and boys for the exact sciences (Chatard, 2007, Steffens, 2010). Although some studies state that at secondary school level boys tend to outperform girls in mathematics (which is considered as a less feminine science) (Nosek, 2002), an important factor being that boys may be more confident in their analytical skills than girls, who are expected to be excellent in the humanities, in the case of the Baccalaureate exams in Romania.

The statistics show that the contrary is rather true. Hence, the values of *d* and the distribution of the final averages of the Romanian language and literature, mathematics and history exams were also calculated (Figures 12, 13, 14). Similarly to the previous analysis, urban students continue to have the best results, even in the mathematics exam, outscoring their peers with a graduation rate of 86.19% compared to 83.69%. In terms of differences between areas of residence, there are significant discrepancies (of ≥ 0.5), much higher when compared to the other exams, indicating that mathematics is a very difficult exam for rural students (and especially for boys), including those who attended an urban high school. This situation is caused by chronic shortcomings in the quality of consistency and methods of teaching inherited in rural secondary schools, determined by the scarcity of good mathematics teachers, who are expected to build a strong foundation of a subject that can be extremely troublesome to assimilate. Another reason could be the supplementary private mathematics courses, very popular among graduates, which are reported to boost the final results (about 80% of those who take supplementary courses are in need for mathematics because they do not feel confident enough of their knowledge from conventional classes), especially in urban areas, where it is much easier to find very good teachers (IRES, 2021).

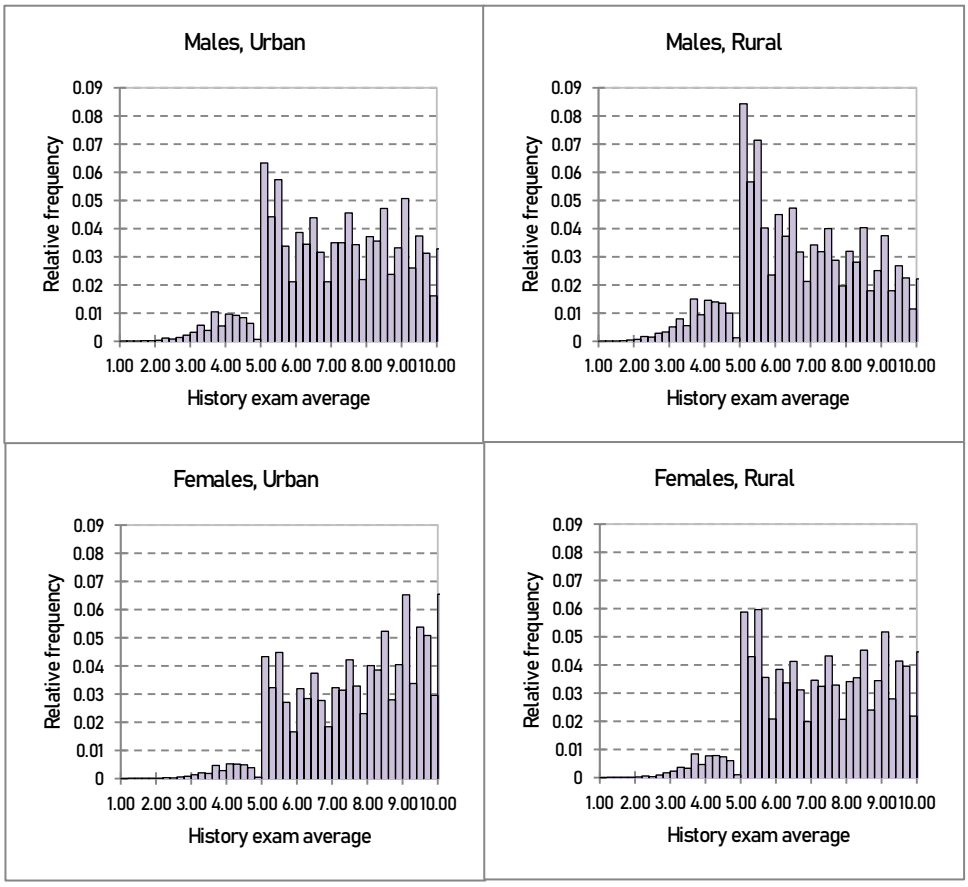


Figure 14. Histograms of the relative frequency distributions of history exam averages, by gender and students' environment.

The effect size calculations for the Romanian language and literature and history exams reveal much more attenuated differences between rural and urban and between females and males: while for the history exam the differences are almost insignificant when considering the same gender, both for urban and rural students, (0.232 and 0.244), the discrepancies increase between the groups from the same environment: urban females have a graduation rate of 96.37%, compared to 93.15% of their male peers. Regarding rural students, the differences are 94.47% vs. 89.35. On the other hand, the degree of (di)similarity between the four groups remains constant in Romanian language and literature exam, while the distribution of the final averages by gender and environment (Figure 12) shows higher levels of negative asimetry for females (-0.41 in urban and -0.18 in rural) and mixed asimetry for males (-0.20 for urban and 0.02 for rural). The (stereotypical?)

bias in favour of girls for much higher achievement in subjects involving communication, artistic and creative intelligence has also been documented by other studies in Germany (Steffens, 2010), Canada (Steele, 2006) and the United States (Kiefer, 2007). These support the idea that the female students *are expected* to be proficient in language and literature, just as the males are expected to be proficient in mathematics, although the opposite or parity situations are increasingly common. In fact, the dihotomic correlation, disproved by the above analysis, is based on socio-cultural preconceptions: girls are less represented in mathematics-related professional fields (but form the majority in communication areas), tending to be discouraged by teacher or family preconceptions from competing in this domain, while boys who demonstrate above-average mathematical ability will be encouraged to pursue it.

Discussion

This study focuses on the geostatistical analysis of territorial educational disparities, as reflected by major disparities in school performance in high school graduation exams. Although the data were analysed as a whole, over a considerable time span (8 years), the value of each percentage and the final results of the mathematical calculus depended on the effort of each student to demonstrate, to their maximum potential, all the competences and knowledge acquired during their school years, in a short period of two weeks, under a substantial amount of pressure from their teachers, family and with regard to their own professional aspirations afterwards. The proposed spatial analysis models had a strong emphasis on identifying distinct spatial structures but also certain categories of high schools with chronic educational problems (persistent poor results every year in certain areas, abnormal percentages of absenteeism during exams, low indicators of academic performance in certain exams, *e.g.* Romanian language exam in Hungarian communities, etc.), in addition to pointing out the regions with a tradition of healthy competition and where academic excellence has become a normality.

Based on the theoretical background and previous research in this field, the results reinforce, altogether, the robust correlation between the living environment, the type of high school graduated (national college, theoretical, vocational or technological high school) and the estimated averages in each exam. Rural high schools, often with an agricultural, forestry or electronics profile, start from the outset with the disadvantage of having the most underprepared students, whose admission averages would not have been able to compete with urban high schools in the first place. In

addition to the fact that these high schools are considered indispensable to maintaining the balance of educational offer in rural areas, far from large urban centres or where access is difficult due to the morphology of the terrain (particularly in mountainous areas), their students are often marginalised by the system itself. A similar situation is common in urban technological and certain vocational high schools. Restrictive economic, social and cultural factors are converging to their disadvantage as socially challenged backgrounds are reflected in high rates of absenteeism, and where students do attend the exams, they usually get very low grades. This vicious circle of educational underachievement and exclusion, which contradicts the concept of "equal opportunities", is often indirectly fuelled by the high schools, either due to the failure to involve human resources, insufficient funding, or simply by a clear unwillingness to take responsibility for getting disadvantaged pupils back, as early as possible, on a promising trajectory that would motivate them not to drop out of school and to provide support to achieve academic success.

Beyond the extremely important role of the family environment, which fundamentally influences the social hierarchy and the possible future options of the students, the collective mindset's perception of poverty and chronic lack of financial resources is the instrisec motivation to overcome it either through seasonal employment (in agriculture or construction) or, quite often, by parental emigration abroad to ensure better educational resources for their children. Obviously, these methods of overcoming economic difficulties cannot be reliable for every family, and, in this context, it is the duty of public policies to intervene, through coherent administrative coordination, to compensate for the socio-cultural shortcomings of the students who inherit an unproductive cultural capital.

The novelty of this study is determined by the scope of the timeframe considered (2015-2022), the detailed level of research (on the statistical parameters of each pupil and on each locality with high schools) and the carto-geographical approach. A geographic analysis of education at such a fine scale can lead the way to further research on high schools with particular circumstances, bypassing trivial statistics, in order to create favourable contexts for targeted analytical inquiry on inequalities of opportunity. Therefore, geography is welcome to provide the foundation for the development of effective long-term public educational policies.

Conclusions and implications

Nowadays, in Romania, there is still no well-defined approach that could guarantee good results in the Baccalaureate exams. The high school institution is far from benefiting from the formal infrastructure that could ensure equity in providing high quality education. Structural inequalities in opportunities for educational success are also present in other developed countries. However, beyond the uneven structure of the whole system, the students are the main subjects on which territorial disparities are projected. The results of the analyses highlight the gaps in school performance in terms of graduation, attendance and absenteeism rates which tend to be proportional to the locality's hierarchy and size. Students who learn in the largest urban centres will have the highest chances of academic success, which declines as the socio-economic complexity (and hence the cross-competition) of the city decreases. Within the keen competitive environment of the large cities, the parameters of competitiveness still indicate an inequitable long-term struggle: learning in an urban centre with an educational tradition, although being the privileged status, is still not necessarily a guarantee of achievement, as typology og the high school and course chosen also do matter.

On the other hand, in rural high schools, on average, only 83.59% of registered students attend all the exams, of which only 36.51% will successfully graduate, confirming the first hypothesis. The high absenteeism values in rural areas are a reflection of the administrative inflexibility, which oftentimes does not adjust to students' general problems: financial vulnerability, poverty, difficulties in commuting, lack of motivation to perform, etc. The level of financial wealth of the family, which generally translates into a higher level of cultural and intellectual capital of the parents and the availability of additional educational investments in addition to the conventional timetable, is expressed in the significant differences in the average grades of urban versus rural students. Those from underprivileged backgrounds are rarely supported by the official mechanisms that could help them overcome their disadvantaged status. However, when they do manage to overcome this condition, the success made possible thanks to the sustained help of their families, confirming the second hypothesis. The unequal distribution of high-quality education derive from students' social, economic and residential backgrounds. Rural areas or urban areas with recent economic contractions are associated with lower access to upper secondary education and quality of teaching. Particularly affecting students from disadvantaged social groups, the problematic aspects of the whole system relate to lack of material resources, poor motivation, dropout and

discrimination. This geostatistical study does not have the ambition to provide definitive answers, but it can highlight educational inequalities in different territories. The analysis can open the path to the integration of targeted actions, adapted to each geographical area, in order to reduce the discrepancies in educational achievement. Distinctive contexts and particular situations may require in-depth research into optimising locally applicable solutions alongside those that are much needed on a national scale.

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