Paradigm

Territorial Inequalities in Participation in the National Assessment Exam and Baccalaureate: Implications for School Dropout in Romania

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Abstract. *With regard to regional inequalities in education, these remain a persistent problem, particularly when it comes to the risk of dropping out of school and non-participation in national exams at key stages of the educational journey. The aim of this paper was to analyze the differences existing at the county level across Romania, with an emphasis on both participation and performance in the National Examination (NE) and the Baccalaureate, thereby assessing the relevance of these indicators for understanding the risk of school dropout. Thus, the study supports findings in the literature highlighting the role of territorial and socio-economic factors in explaining these phenomena. The research uses administrative data aggregated at the county level, based on which a coherent set of indicators is formed that captures exam participation, academic performance, absenteeism, and the socio-territorial context. This analysis addresses research questions regarding the existence of regional differences, participation, or even the value of participation as an indicator of educational risk, and their association with the residential environment. Correlation analyses, descriptive statistics, and linear regression models were conducted, revealing that participation in NE and participation in the baccalaureate exam follow a cumulative pattern throughout students' educational trajectory. In contrast, academic performance reveals strong continuity, with results at the end of middle school being significantly associated with absenteeism during the high school graduation exam. Although rural areas are associated with educational vulnerability, they do not act as an independent determinant after controlling for performance. The study contributes to the literature by providing an analytical framework that is easily replicable by other researchers for monitoring educational inequalities at the regional level.*

Keywords: educational vulnerability, school dropout, academic performance, territorial inequalities, rural context.

Introduction

On a broad scale, education can be viewed as a tool that can contribute to economic growth and poverty reduction. It is an important tool that helps people acquire skills, increases their earning

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potential, and promotes a balanced lifestyle, while also serving as a key factor in democracy and contributing to the creation of a competitive economy (Ananga, 2011).

This paper addresses a topic that has a significant impact today on the development of any society: the school dropout rate. More specifically, it analyzes two major and important stages of the educational journey: the National Examination (NE, taken at the end of elementary school) and the high school graduation exam (taken at the end of high school). These two exams represent key milestones in Romania's education system, and passing them has a major impact on both the educational and professional development of students.

Given that education is not only a right but also an obligation that every child has, the issue of school dropout is viewed as one of the most important and pressing problems in Romania. These issues become all the more relevant when we look at rural areas, where a significant increase has been observed over the years (Grigore & Gavrilescu, 2018)

It is important to note that the significant negative effects of high school dropout rates have major economic and social consequences not only for students, but also for their families and communities. In fact, if educational attainment remains low over the long term, there is a higher probability of unemployment, greater pressure on the social welfare system, reduced financial stability, and even the risk of a higher number of people ending up in prison (Christle, Jolivette, & Nelson, 2007).

This paper will address several issues related to educational performance. The first issue concerns the significant variations observed at the county level in participation rates for NE and high school graduation exams. We will start from the premise that counties with a low participation rate in NE are likely to also see a decline in participation rates for the high school graduation exam. Another issue addressed concerns the extent to which the participation rate in national exams can be used as an indicator of the risk of school dropout. Last but not least, we will consider the situation where the differences found between participation in the two exams are associated with the type of residential environment (rural or urban), as well as with the structure of the school-age population. This situation was identified based on the hypothesis that exam attendance varies from one county to another, thus signaling the existence of territorial inequalities.

Literature review

Over time, school dropout has been defined in various ways in the academic literature because it is a constantly evolving phenomenon and can be approached from numerous perspectives. School dropout has been defined as: "leaving the education system without obtaining a minimum qualification (most often an upper secondary school diploma)" (De Witte, Cabus, Thyssen, Groot, & van den Brink, 2013). A similar concept is early school leaving, which has been defined by the European Agency for Special Needs and Inclusive Education as "leaving school before the end of compulsory education" a point that varies from country to country or "leaving school without the skills, knowledge, or qualifications necessary to cope with adult life and employment" (European Agency for Special Needs and Inclusive Education, 2025) . In fact, there is also discussion regarding school absenteeism, defined over time as "school refusal, truancy, withdrawal from school, and school exclusion" (Heyne, Gren-Landell, Melvin, & Gentle-Genitty, 2019).

The factors influencing school dropout are, in fact, a combination of various variables, ranging from an individual's personal characteristics to aspects related to their family background, or even external factors linked to the institutions where children are educated. In fact, the specific socio-economic context of the communities in which they are educated or even cultural characteristics can also be taken into account (Lee & Burkam, 2003; Lim, 2008).

This paper analyzes the two final exams, which correspond to key stages within the Romanian education system. These were described by Merce et al. (2015) as: level 2 of lower secondary education (based on at least four years of schooling (grades 5 and 8), comprising students aged 11 to 14, part of compulsory education and operating in both full-time and part-time formats); and level 3 of upper secondary education in high school (lasting four or five years (grades 9–12/13), specifically for students aged 15 to 18).

From a deeper perspective, among the factors influencing school dropout and admission to national exams, the school environment is identified, whether in urban or rural settings. Regarding the influence of this factor on the dropout rate, the literature has observed mixed results. Dropout is only partially influenced by this aspect and is more heavily influenced by variables such as the school, the community, or the family (Miron & Mistrean, 2024).

Methodology

The data was taken from the official site of the Romanian Government (2025). **Table 1** was created to provide a clear overview of the indicators analyzed, their types, what they represent, and how they were calculated.

Table 1. Indicators used in the analysis, classified by type

Indicator	Indicator type	Description of the indicator	Measurement / calculation
I1 – National Evaluation participation rate	Participation / educational vulnerability	The percentage of students participating in the National Examination at the county level.	The ratio of the number of students who took the National Evaluation to the total number of eligible students in the county.
I2 – Baccalaureate participation rate	Participation / educational vulnerability	The percentage of students participating in the Baccalaureate examination at the county level.	The ratio of the number of students who took the Baccalaureate to the total number of eligible students in the county.
I3 – Baccalaureate non-attendance rate	Participation / educational vulnerability	The percentage of registered or eligible candidates who did not take the Baccalaureate examination.	The percentage of students registered for the Baccalaureate who did not take the exam. who did not take the exam.
I4 – Average score in the National Evaluation	Academic performance	Average test scores on the National Evaluation at county level.	The arithmetic mean of the scores obtained on the National Evaluation calculated at the county level.
I5 – Share of students scoring below the threshold in the National Evaluation	Academic performance	The percentage of students who scored below the passing threshold (below 5) on the National Evaluation.	The percentage of students who scored below a 5 on the National Evaluation, by county.
I6 – Average score in the Baccalaureate examination	Academic performance	Average scores on the Baccalaureate examination by county.	The arithmetic mean of Baccalaureate scores, calculated at county level.
I7 – Share of students from rural areas	Socio-territorial context	The ratio of students in rural areas to the total number of students in the county.	The ratio of the number of students in rural areas to the total number of students in the county.
I8 – Number of National Evaluation candidates	Volume indicator (context)	The size of the group of students taking the National Evaluation in the county.	The total number of students who took the National Evaluation in the county.
I9 – Number of Baccalaureate candidates	Volume indicator (context)	The number of students taking the Baccalaureate examination in the county.	The total number of students who took the Baccalaureate examination in the county.

Source: Authors' own research.

Pearson and Spearman correlations were used in the analysis to investigate the relationships between the indicators used:

1. The direction and intensity of the linear relationship between two continuous quantitative variables were assessed using Pearson's correlation coefficient. This can take values ranging from −1 to +1; values close to +1 indicate a strong positive linear relationship, while values close to −1 indicate a strong negative linear relationship, and values close to 0 suggest the absence of a linear relationship (Field, 2024; Pearson, 1895);

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} \quad (1)$$

Where: n represents the number of (x, y) pairs in the dataset or the number of data points; Σxy is the sum of the products of the x and y values calculated for each observation in the dataset; Σx is the sum of the x-values in the data set; Σy is the sum of the y-values in the data set; Σx^2 represents the sum of the squares of the x values in the dataset and Σy^2 represents the sum of the squares of the y values in the dataset

2. To calculate the association between two variables based on the ranks of their values, a nonparametric measure namely, Spearman's correlation (ρ) was applied. This measure takes values between −1 and +1 and indicates the strength and direction of a monotonic relationship, whether linear or nonlinear (Spearman, 1904).

$$\rho = 1 - \frac{6\sum D^2}{N^3 - N} \quad (2)$$

Where: ρ represents Spearman's rank correlation coefficient; D is the difference between the ranks of the corresponding values for each observation; $\sum D^2$ is the sum of the squares of the differences between ranks and N represents the number of observations.

To investigate the relationship between a dependent variable and one or more independent variables by estimating a model that describes this relationship as a linear function, linear regression (a statistical method) was used (Field, 2024; Wooldridge, 2009).

$$Y = \beta_0 + \beta_1 X + \varepsilon \quad (3)$$

Where: Y= is the dependent variable, representing the outcome of interest; X is the independent variable, representing the explanatory factor; β_0 is t s the y-intercept, the expected value of $Y$when $X = 0$; β_1 represents the slope coefficient, the expected change in Y associated with a one-unit increase in X; ε is the error term, capturing unexplained variation in Y.

Results

The following section presents the results of statistical analyses conducted to identify regional disparities in participation in national exams, based on county-level aggregate data for the year 2025. The analysis was designed to address research questions regarding variations in student participation in the EN and the Baccalaureate, as well as the role of the residential environment in navigating these educational stages.

Descriptive profile of indicators at county level

Table 2 was created to provide the clearest possible overview of the dataset, which includes a statistical description of the variables.

With regard to participation in NE (I1), values range between 0.15 and 0.25, with an average of 0.20 and a standard deviation of 0.02. The fairly narrow range suggests that at the end of middle school, participation in NE is stable across counties. However, it should be noted that the minimum of 0.15 indicates the existence of counties where participation is lower, which may indicate educational vulnerabilities at the end of secondary school.

Participation in the Baccalaureate (I2) has a fairly similar range of 0.14–0.24, but the average is lower at 0.18 and the standard deviation is 0.02. This indicates that, on average, participation in the exam decreases during the course of education due to various causes (educational selection, repetition, ineligibility, or dropping out before the end of high school).

Absenteeism on the high school graduation exam (I3) had a standard deviation of 0.02, with a mean of 0.03 and values ranging from 0.01 to 0.07. Even though the recorded mean is quite low, the range suggests that absenteeism can reach high values (up to 0.07), from which it can be inferred that there are counties where absenteeism from the baccalaureate exam is becoming a noticeable problem. Furthermore, by comparing the standard deviation with the mean, it is observed that the distribution is more "scattered" than in the case of participation rates, thus supporting the idea that absenteeism is a phenomenon concentrated in certain counties.

The average score for NE (I4) ranges from 6.13 to 7.87, with a mean of 6.88 and a standard deviation of 0.37. The identified difference is nearly 1.7 points between the minimum and maximum values, suggesting significant regional disparities in performance at the end of middle school. The standard deviation of 0.37 further indicates that performance is not uniform but reflects varying educational conditions at the county level.

The ratio of students scoring below a 5 on the National Examination (I5) has a mean of 0.21, with values ranging from 0.07 to 0.33 and a standard deviation of 0.06. On average, about one-fifth of students score below the 5 threshold; in some counties, this proportion can reach as high as one-third. This indicator helps identify educational vulnerability and is important in terms of educational risk, as learning difficulties in middle school can influence future educational outcomes.

The average Baccalaureate (I6) results show less variability compared to the average NE results due to their lower standard deviation of 0.18. This may suggest a selection of the population that actually takes the Baccalaureate (students who remain to take the Baccalaureate tend to be more homogeneous in terms of performance). Even so, regional differences still exist, though they are less pronounced.

The proportion of students in rural areas (I7) varies widely (ranging from 0.00 to 0.60), which indicates that the rural-urban structure differs substantially from one county to another, a factor that is relevant for the interpretation of educational disparities.

Table 2. Summary statistics for the indicators

Indicator	Minimum	Maximum	Average	Standard deviation
I1	0.15	0.25	0.20	0.02
I2	0.14	0.24	0.18	0.02
I3	0.01	0.07	0.03	0.02
I4	6.13	7.87	6.88	0.37
I5	0.07	0.33	0.21	0.06
I6	7.36	8.23	7.90	0.18
I7	0	0.60	0.36	0.10

Source: Authors' own research.

On the whole, the descriptive statistics reveal fairly moderate regional variations in exam participation (I1–I2), but more marked variations in academic vulnerability (I5) and rural structure (I7). There are consistent regional differences in average performance (I4, I6), and the non-attendance indicator (I3) reveals the existence of counties where the level of disengagement from the baccalaureate is significantly greater.

It is also important to mention that indicators I8 and I9 give information on the size of the student groups analyzed. The number of applicants for the NE and Baccalaureate differs considerably from one county to another, which reflects demographic and structure differences. Even so, the values observed are high enough at county level to ensure the stability of the rates used in the analysis.

Analysis of correlations between educational indicators

Within this subsection, the links between participation in EN, school performance, and the socio-territorial environment at the county level are analyzed. Through the bivariate correlation analysis, the aim is to assess the extent to whom the participation and the vulnerability patterns found in different stages of the educational pathway are associated at the county level, as also the way in which the academic performance and the environmental factors correlate with the absence from national exams. To this end, the Pearson and Spearman correlation coefficients are used. The decision to examine these relationships is based directly on the questions posed and the assumptions formulated.

In the following, the Spearman correlation between variables is presented in Table 3, and the Pearson correlation in Figure 1, Figure 2 and Figure 3.

Table 3. Spearman correlations between educational indicators (county level)

Indicator X	Indicator Y	Spearman correlation coefficient (ρ)
I1 – Participation rate in the National Evaluation	I2 – Participation rate in the Baccalaureate examination	−0.199
I7 – Share of students from rural areas	I3 – Baccalaureate non-attendance rate	0.273
I4 – Average score in the National Evaluation	I6 – Average score in the Baccalaureate examination	0.678

Source: Authors' own research.

For the relationship at the county level between the participation rate in the NE program (I1) and the high school graduation rate (I2), the Pearson coefficient of correlation (**Figure 1**) shows a very low and statistically non-significant association ($r = -0.099$; $p = 0.534$), suggesting the absence of a consistent linear relationship between the two indicators. Furthermore, this hypothesis is reinforced by the Spearman correlation ($\rho \approx -0.20$), which indicates that counties with lower NE participation rates are not the same counties with lower baccalaureate participation rates. Consequently, it can be said that the H1 hypothesis is not data-supported, as NE participation can not be directly used as a determinant of future Baccalaureate participation.

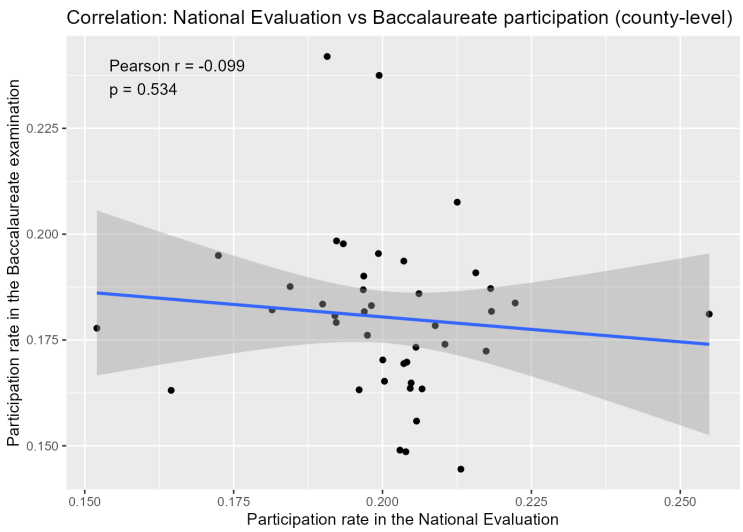


Figure 1. The relationship between participation in NE and participation in the Baccalaureate, at county level

Source: Authors' own research.

Regarding the relationship that exists between the proportion of students from rural areas (I7) and the absenteeism rate on the high school graduation exam (I3), the Pearson correlation coefficient shows a moderate positive connection, but one with only minor statistical significance ($r = 0.268$; $p = 0.086$). **Figure 2** also shows an increasing trend: counties with a larger rural proportion tend to have higher non-attendance rates. The Spearman coefficient ($\rho \approx 0.27$) suggests that being rural is not a sufficient factor in determining vulnerability in terms of participation in the Baccalaureate. This result provides only partial support for hypothesis H2 and suggests rather a contextual role of the rural environment, which interacts with other factors, such as academic performance.

Figure 3 helps illustrate the relation between the mean grade obtained on the NE (I4) and the mean grade on the high school graduation exam (I6). It shows that the Pearson correlation coefficient has a strong and significant positive association ($r = 0.616$; $p < 0.001$), and Spearman's correlation coefficient ($\rho \approx 0.68$) also confirms that this association holds at the rank level, not being driven solely by the presence of a few outlier counties. Thus, we can say that counties that record good results at the end of middle school tend to achieve high results at the end of high school as well. These findings suggest the persistence of educational disparities and indicate that academic performance tends to increase over the course of a student's educational journey, consistent with hypothesis H3.

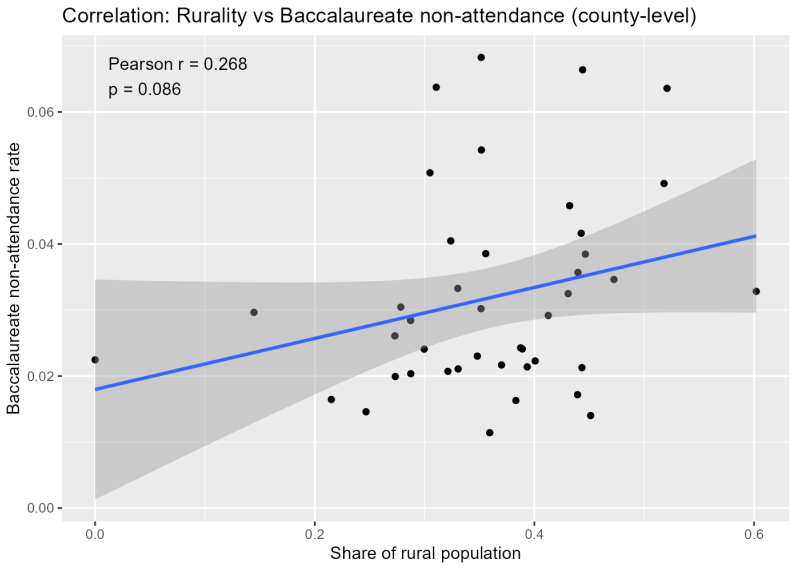


Figure 2. The relationship between the proportion of students from rural areas and the rate of non-attendance at the Baccalaureate, at county level

Source: Authors' own research.

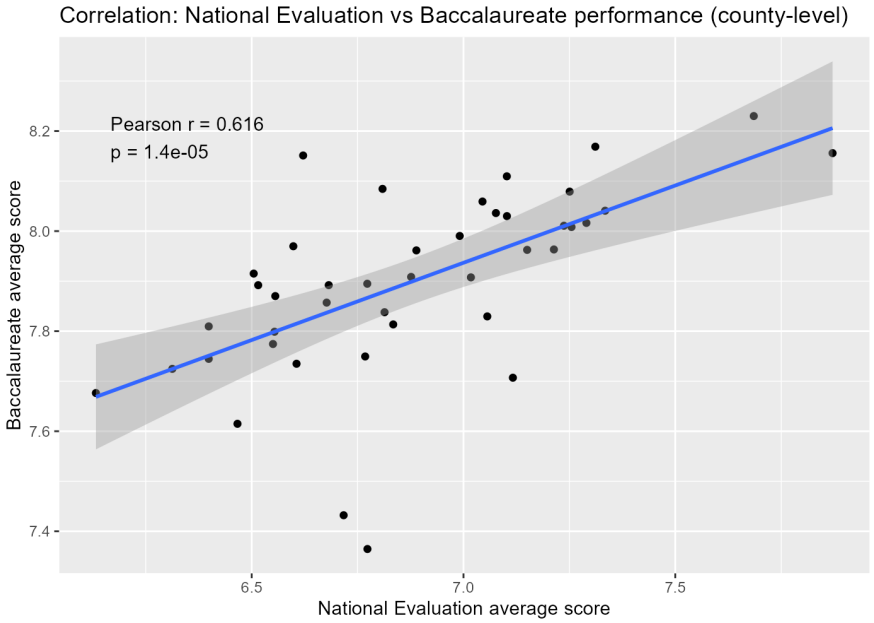


Figure 3. The relationship between performance in the NE and performance in the Baccalaureate, at county level

Source: Authors' own research.

This subsection shows a clear distinction is made between the dynamics of participation and academic performance. Even though participation in NE does not show continuity between educational stages, academic performance has been observed to be strongly correlated throughout the school career. Rurality is associated with vulnerability in participation, but in a moderate manner.

Multivariate analysis: predictors of Baccalaureate participation and non-attendance

The following subsection explains the linear regression models used to simultaneously analyze the relationships among multiple educational indicators. The purpose of this analysis is to identify the mechanisms underlying the observed regional differences and to verify the hypotheses regarding educational continuance and educational vulnerability.

Model A (**Figure 4**) was created to test whether there is continuity between participation in NE (I1) and participation in the Baccalaureate (I2), controlling for the rural context (I7). Applying regression, it can be seen that neither I1 nor I7 are significantly associated with I2, the coefficient for I1 being negative but insignificant ($\beta = -0.087$; $p = 0.688$); and the coefficient for I7 is positive but also insignificant ($\beta = 0.010$; $p = 0.761$). Furthermore, the model explains a very small proportion of the variation in participation in the Baccalaureate ($R^2 = 0.012$, and the adjusted R^2 is negative), and the overall test of the model is not significant ($p = 0.789$).

Thus, we can conclude that at the county level, participation in the Baccalaureate does not seem to be directly influenced by the level of participation in the NE, nor explained by the environment of origin, which suggests that the mechanisms that determine participation in these two exams are different (which was also observed in the correlational result in **Figure 1**).

```
MODEL A: I2 ~ I1 + I7

Call:
lm(formula = I2 ~ I1 + I7, data = df)

Residuals:
      Min        1Q    Median        3Q       Max
-0.034695 -0.011249 -0.000740  0.009112  0.059925

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.19414    0.05010   3.875 0.000397 ***
I1           -0.08711    0.21512  -0.405 0.687748
I7            0.01027    0.03358   0.306 0.761368
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.0198 on 39 degrees of freedom
Multiple R-squared:  0.0121,    Adjusted R-squared:  -0.03856
F-statistic: 0.2389 on 2 and 39 DF,  p-value: 0.7886
```

Figure 4. Model A for Regression

Source: Authors’ own research.

In comparison with the model illustrated above, Model B (**Figure 5**) examines whether failure to take the high school graduation exam (I3) is related to rural residence (I7) and previous academic performance (I4). Based on the results, it can be observed that I4 (the NE average) has a statistically significant negative effect ($\beta = -0.0187$; $p = 0.013$), which indicates that counties performing better on the NE tend to show lower dropout rates for the Baccalaureate. Furthermore, I7 (the proportion of rural areas) is uncorrelated with I3 ($\beta = -0.0006$; $p = 0.983$), which indicates that, when controlling for NE performance, the rurality of counties is not a significant factor in explaining differences in non-attendance rates across counties. Also worth mentioning is that the model is significant at the global level ($p = 0.010$ and accounts for approximately 21% of the variation in the non-attendance rate ($R^2 = 0.209$; adjusted $R^2 = 0.168$).

In essence, failure to take the Baccalaureate is more strongly linked to past academic performance than to rural settings as a systemic component.

```
MODEL B: I3 ~ I7 + I4

Call:
lm(formula = I3 ~ I7 + I4, data = df)

Residuals:
      Min        1Q    Median        3Q       Max
-0.026599 -0.008583 -0.002194  0.003501  0.029764

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)    0.1610219  0.0556504   2.893  0.00621 **
I7            -0.0005595  0.0254851  -0.022  0.98260
I4            -0.0187377  0.0072190  -2.596  0.01324 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.0137 on 39 degrees of freedom
Multiple R-squared:  0.2086,    Adjusted R-squared:  0.168
F-statistic:  5.14 on 2 and 39 DF,  p-value: 0.01044
```

Figure 5. Model B for Regression

Source: Authors’ own research.

The models created confirm that participation in the Baccalaureate (I2) is not well explained by participation in the NE (I1) or rurality (I7), while non-attendance at the Baccalaureate (I3) is significantly associated with performance in the NE (I4).

Discussions

This section will discuss the results obtained in relation to the research questions and hypotheses formulated, with the central objective of presenting the territorial differences observed in participation and performance in national exams, as well as the role of the socio-territorial context in shaping educational vulnerability.

Taking into account the descriptive analysis and the correlation made, several clear differences were observed between counties in terms of participation in the NE and Baccalaureate. Even though the variation in participation rates was relatively moderate compared to other indicators, the minimum and maximum distributions, as well as the counties with extreme values, support the idea that participation in national exams is not uniformly distributed across the country. The results suggest that persistent territorial inequalities in education manifest themselves through other techniques (results or vulnerability) than through simple formal participation in exams.

In fact, it was concluded that there is no significant relationship between participation in the NE and participation in the Baccalaureate. Both the correlational analysis and the regression model show that counties with lower rates of participation in the NE are not systematically the same counties with low rates of participation in the Bac. Thus, transitions between educational cycles seem to represent tense moments, in which mechanisms of dropout or ineligibility intervene. Consequently, NE participation can't be seen as a good predictor of whether students will go on to take the Baccalaureate.

National exam participation is a limited predictor of the risk of dropping out of school. Even so, indicators related to non-attendance at the Baccalaureate and academic in the early years of schooling are far more relevant. Through regression analysis, it was found that poor performance on NE is strongly linked to non-attendance at the Baccalaureate, indicating that the difficulties students face in school over time are likely to increase the probability of them not taking the Baccalaureate exam.

It should also be noted that an analysis of the relationship existing between the proportion of students from rural areas and non-attendance at the Baccalaureate shows a moderate positive association at the bivariate stage. Moreover, rural background is no longer an independent predictor of non-attendance, being instead a contextual factor that exacerbates existing vulnerabilities in education.

Conclusion

The main objective of this study was to examine existing regional inequalities in terms of participation and performance in the education system of northeastern Romania, with the aim of evaluating their relevance to understand educational disadvantage and the risk of dropping out of school. To accomplish this objective, county-level information and a consistent set of schooling indicators were utilized.

Following the analysis, the results showed that participation in NE and participation in the Baccalaureate do no longer follow a territorial cumulative model. The counties that recorded lower completion rates at the end of middle school do not consistently have the same low completion rates at high school graduation. Counties with better NE results tend to perform better in the Baccalaureate as well. With regard to the socio-territorial context, it can be concluded that living in a rural area is not an important factor in itself for not taking the Baccalaureate, as long as school performance is taken into account.

These findings are consistent with previous research, which clearly distinguishes between attendance and achievement as different aspects of educational vulnerabilities. The research demonstrates that participation in NE is insufficient to predict participation in the Baccalaureate whereas the results achieved at the end of the lower secondary cycle are a key factor in explaining non-participation in the Baccalaureate.

It should also be noted that the study had certain limitations. The data were analyzed at the county level; in other words, averages and general statistics were used, rather than information about each individual student. Thus, the exact individual reasons leading to school dropout are more difficult to identify. The indicators used are estimates of educational risk, showing only where there is a higher risk of dropout, but they do not directly measure school dropout itself. Moreover, socioeconomic variables (family income, parents' education level, living conditions, etc.) are missing, making it harder to observe the extent to which the family and social environment influence the phenomenon of school dropout.

To further this analysis in the future, as potential avenues for future research, the analysis might be extended by the use of individual-level or school-level data, by including additional socioeconomic indicators and by taking a longitudinal perspective on student groups.

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