External Part of School Leaving Examination and its Statistical Analysis in Selected Region

Roman Vavrek[a]*

[a]University of Presov in Presov, Faculty of Management, Department of Management, 17. Novembra 1, 08001 Presov, Slovakia

Abstract

School leaving exam represents one of possibilities how to finish upbringing and education at high schools. School leaving exam (including its external part) is a form of graduation at high school and presents the basis for further studies at universities. Quality of education determines the competitiveness of graduates from primary, secondary school and universities on domestic as well as foreign labor market.Paper focuses on statistical evaluation of External part of school leaving exam on the set of 112 high schools of Presov Region in 2015.We evaluate an average percentage of school in External part of school leaving examination, an average grade of Slovak language and a number of tested students. To identify a district´s correlations and differences Moran´s Index, Kruskal-Wallis test or Kendal coefficient were used. The differences between the individual results in districts and its comparison are described by a few statistical methods (box plot, maps, moment characteristics) too.

1. Introduction

National Institute for Certified Educational Measurements (NUCEM) as one of organizations is engaged in improving the quality of education in primary and secondary schools.The organization is implementing a project aimed at the introduction of electronic testing (including creating tasks and tests).This is mainly funded by the European Social Fund.

————

* Roman Vavrek. Tel.: 00421-51-7570807.
  *E-mail address:*roman.vavrek@yahoo.com

Several authors deal with the partial areas of education.Some point to the level of financial literacy in education (Vravec, 2013), some deal with an environmental aspects of education (Adamisin, 2010; Adamisin, Chovancova, 2013) and another authors deal with an aspect of education in the field of tourism in relation to the practical needs (Senkova, 2013). Another group of authors puts emphasis on lifelong learning (Coculova, 2010).

The Act no. 245/2008 Coll. characterizes leaving examination as a form, how education and training in secondary schools can be finished. This act is supplemented by Decree no. 318/2008 Coll., which specifies the study finished by leaving exam. The aim of leaving exam is to verify knowledge and skills of pupils in the range of subject matter specified in Catalog of targetrequirements and verification of the ability to use acquired competence in further study or professional and specialist activities for which they are prepared. (Act no. 245/2008 Coll., § 74)

The content of the external part of school leaving examination is defined by law.According to NUCEM (2015) three basic objectives are defined in the academic year 2014/2015:

- provide schools and students nationwide comparison of their education (percentage),
- objectivelyassess skills, knowledge and competencies of pupils (ISCED 3), for example reading and listening comprehension, linking knowledge from different thematic units,etc.
- contribute to improving the quality of education process, ~~to~~ the development of higher cognitive functions and competencies of pupils.

According to NUCEM (2015) is the average percentage of the testis 52,3 %. Grammar school pupils achieved a higher percentage (66,1 %) compared to pupils of secondary vocational schools and conservatories (44,8 %). Analysis of selected groups of schools are discussed in the next part of this contribution.

2. Methodology

School leavingexamination in secondary schools was held on 17th-20th March2015. The total number of secondary schools was 726. At these schools 46 489 pupilsunderwent external part of school living (NUCEM, 2015). This paper focuses on 112 secondary schools in Presov Region ("PSK") in 13 districts:
- district Bardejov,
- district Humenne,
- district Kezmarok,
- district Levoca,
- district Medzilaborce,
- district Poprad,
- district Presov,
- district Sabinov,
- district Snina,
- district Stara Lubovna,
- district Stropkov,
- district Svidnik,
- district Vranov.

The subject of evaluation is average percentage of schools in external part of the school leaving examination in subject Slovak language (%), average grade of this subject and number of students tested in each school.Obtainedresults are summarized at district level and we monitor their spatial autocorrelation (mutual influence of results in space), relationship between monitored variables and differences among PSK districts.

In estimating of spatial autocorrelation we firstlydefine spatial weights which are fundamental element of spatial statistics to measure spatial connections. After identification of spatial scales (type Rook) is a spatial autocorrelation testedby local coefficients MORAN. This coefficient assesses whether there is spatial autocorrelation for a given set of territorial units.

$$I_i(d) = \frac{x_i - \bar{x}}{\frac{\sum_{j=1; i \neq 1}^{n} w_{ij}(d)}{n-1} - \bar{x}^2} \sum_{j=1; i \neq 1}^{n} w_{ij}(d)(x_j - \bar{x}) \tag{1}$$

where:
           d - critical distance
           n - number of spatial units
           x_i - value in spatial unit i
           x̄ - average value
           w_ij (d) - weight for unit i, j and critical distance d

The relationship between monitored variables is tested by Kendall's coefficient:

$$r_K = \frac{n_c - n_d}{n(n-1)/2} \tag{2}$$

where:
           n - number of observations pairs of variables
           n_c - number of concordant couple pairs
           n_d - number of discordant couple pairs
           n_d - number of discordant couples pairs

Differences between PSK districts are tested by K-W test:

$$Q = \frac{12}{n(n-1)} \sum_{i=1}^{I} \frac{T_i^2}{n_i} - 3(n+1) \tag{3}$$

where:
           n - total number of observations across all groups
           n_i - number of observations in group i
           T_i^2 - rank (among all observations) of observation in group i

Analysis and results are processed in MS Office Excel, Statistica 12and Statgraphics.

3. Results and discussion

Secondaryschool students in PSK achieved in Slovak language an average 51,85%.This result is comparable to the national average at 52,3%.The best results were achieved in district Medzilaborce (68,5%), the worst one in district Kezmarok (47,4 %). Differences between schools can be seen in the variation range of results (R = 50) and table 1 which is shown in the structure of results of external part of the school leaving examination.

Table 1.Moment characteristics of total results

characteristics	value
Average	51,846
Median	50,55
Standard deviation	12,144
Minimum	30,2
Maximum	80,2
Lower quartile	41,4
Upper quartile	61,7
Skewness	0,318
Kurtosis	-0,906

The average grade at schools in PSK district is 2,63, median grade is 2,7. The worst pupils are evaluated at Technical School in Presov (4). On the contrary, the best pupils are at Grammar school arm. gen. L. Slobodu in Humenne (1,4).

Table 2. Moment characteristics of each district (average grade)

district	Average	Median	Std. dev.	min	max	Q_1	Q_3
Bardejov	2,51	2,75	0,598	1,7	3,3	1,8	2,9
Humenne	2,47	2,6	0,642	1,4	3,2	2	3,1
Kezmarok	2,66	2,9	0,391	2,1	3	2,4	2,9
Levoca	2,95	2,8	0,450	2,5	3,8	2,6	3,2
Medzilaborce	2,55	2,55	0,777	2	3,1	2	3,1
Poprad	2,75	2,85	0,662	1,7	3,8	2,2	3,3
Presov	2,53	2,45	0,616	1,5	4	2,1	2,85
Sabinov	2,62	2,8	0,657	1,7	3,2	2,2	3,2
Snina	2,80	2,8	0,588	2,2	3,4	2,3	3,3
Stara Lubovna	2,52	2,5	0,567	1,7	3,3	2,5	2,6
Stropkov	2,43	2,2	0,585	2	3,1	2	3,1
Svidnik	2,88	2,85	0,438	2,3	3,5	2,55	3,25
Vranov nad Toplou	2,81	2,95	0,685	1,7	3,6	2,4	3,3

Using local Moran index ($I = 0,125$) we conclude randomness, resp. un correlation of results in individual districts. Despite the differences of individual schools these results are not influenced by geographical location of schools in PSK district.

Table 3. Correlations matrix - Kendall coefficient

	Students	Success (%)	Average grade
Students		0,08	-0,11
Success (%)	0,08		-0,53*
Average grade	-0,11	-0,53*	

The only significant relationship confirmed at significance level of 5% is a middle correlation between percentage success of pupils and their grade of this subject.

Table 4. Differences between individual districts

Variables	test	p-value
Student	14,624	0,2626
Success (%)	6,073	0,9124
Average grade (%)	7,942	0,7896

Based on table 4 we conclude homogeneity of PSK districts in all variables (average percentage of schools in external part of the school leaving examination in subject Slovak language (%), average grade of this subject and number of students tested in each school).

4. Conclusion

The external part of school leaving examination presents a tool for national evaluation and comparison of the level of pupils' knowledge of selected subjects.That comparison can also serve as a guide for selection of primary school pupils but also for assessing aquality of schools themselves.In terms of spatial autocorrelation we conclude the randomness of results of the external part of school leaving examination from monitored subject. School results in individual districts are independent of each other. They also did not show differences between schools in different PSK districts.

Based on the correlation matrix we conclude independence between meanaverage successpercentage in school testing, average grade on number of students.It has been confirmedthat schools with better average grade achieved even better results in the external part of school leaving examination.

In the next phase we plan to monitor the differences between schools and using statistical methods to identify schools and districts for further qualitative research.

Acknowledgements

References

Act no. 245/2008 Coll.on upbringing and education (the Education Act)

Adamisin, P. and Chovancova, J., (2013). Environmentalne vzdelavanie na Presovskej univerzite v Presove ako nova vyzva vo vzťahu k realizovanemu Univerzitnemu vedeckemu parku TECHNICOM. In: Stav a perspektivy environmentalneho vzdelavania : zbornik vybranych prispevkov.Univerzita Komenskeho, Bratislava, pp. 16-27.

Coculova, J., (2010). Celozivotne vzdelavanie vo verejnej sprave. In: Slovensko v Európskej unii: zbornik z celostatnej konferencie. Akademia Policajneho zboru v Bratislave, Bratislava, pp. 210-214.

Decreeno. 318/2008 Coll.on completion of study at secondary schools

National Institute for Certified Educational Measurements,2015. Available at: http://www.nucem.sk/documents//25/maturita_2015/vsledky_vyhodnotenia/Zakladne_informacie_o_vysledkoch_EC_MS_2015_final.pdf

National Institute for Certified Educational Measurements,2015. Available at: http://www.nucem.sk/documents//25/maturita_2015/vsledky_vyhodnotenia/Prezentacia_MS_2015_final_040615.pdf

Senkova, A., (2013).Vysokoskolske vzdelavanie v oblasti cestovneho ruchu vo vazbe na potreby praxe. In: Uroven a moznosti skvalitnovania vzdelavania na vysokych skolach :zbornik abstraktov z pracovno-odborneho seminara. Bookman, Bratislava, pp. 33.

Vravec, J., (2013). Financne vzdelavanie a financna gramotnosť v SR. In: Financie, uctovnictvo a controlling v kontexte globalnych a regionalnych zmien: nekonferencny vedecky zbornik. Bookman, Presov, pp. 207-213.