The predictive value of the 10th grade and Matura examination achievements for higher education admission

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Abstract. Academic institutions are seeking to attract the most capable and prospective students. Many research studies seek to identify factors determining a successful transition from secondary to tertiary education. One of the important issues is the predictive value of national testing/Matura examination results in relation to higher education institutions admission. The aim of our study is to quantify the odds to study at university and the results of centralised student assessments (the 10th grade and Matura) of mathematics and the Lithuanian language and literature for the period of five years (Matura examinations for the period 2014–2018), taking into account the student's gender, the location of the school attended, social support, and special needs indicators. We estimate that the Matura grade in mathematics is almost double more important when compared to the 10th grade test results for odds of studying at higher education institutions. Grades of the Lithuanian language and literature obtained to be twice more import for males than females. From 2023 or 2024, we may observe the downward trend of people with tertiary educational attainment in Lithuania.

1 Introduction

Academic institutions are seeking to attract the most capable and prospective students. Many research studies seek to identify factors determining a successful transition from secondary to tertiary education. In particular, a number of publications are focused on revealing to what extent grade point average (GPA) by the end of schooling or results of national testing/Matura examination allow one to predict the success of studies at higher education institutions (HEIs) [1, 3, 5, 11, 12, 16].

One of the key questions is how high should the academic standards be set for HEIs applicants. Mayer-Foulkes (2002) pointed out that there are at least three strands of opinionscite [10]. A conservative opinion inclines to impose high academic standards. This point of view is based on the belief that raising the academic level is the best instrument to achieve excellence. A liberal point of view inclines to adapt the academic level to the average students' capacity. Finally, a more radical attitude implies social optimization criteria leading to an open acceptance policy with less stringent academic standards. Which decision best serves the long-term goals of HEIs? Mayer-Foulkes (2002) assumes that institutions should tailor their academic objectives and set their academic standards so as to maximize the achievement of their current students. This means that institutions with a lower reputation attracting a lower student quality will find it optimal to set a lower academic level than those at the higher end of the spectrum. The conservative position is optimal for institutions with a higher reputation. The radical position has more to do with issues in resource allocation that are usually not decided by the institutions themselves. In countries where minimal entrance standards are set by the govern-ment or by common agreement between HEIs, one can speak about the implementation of HEIs admission policy on a central level. For example, Belgium represents a radical HE policy approach: all high school graduates are entitled to start almost all higher education programs, regardless of their specific high school degree. On the other hand, there is very strong ex post selection, especially after the first year of higher education [2]. In Lithuania, minimal entrance standards for state-funded places are set by the Minister of Education, Science and Sports of the Republic of Lithuania [9]. For those applying for non-state funded places, the only requirement is to pass at least one state Matura examination, but HEIs can establish higher requirements of their own. Some high reputation universities, e.g. Vilnius University, apply the same minimal entrance standards both for state-funded and non-state funded study places [15]. Therefore, in Lithuania, we observe a mixed admission policy approach: requirements for the state funded places are adapted to the average students' capacity while non-state funded places are available for almost all school graduates, with the exception of some high reputation universities and study programs. The main research question of our study: what is the predictive value of national examination results in relation to HEIs admission in Lithuania?

This article considers, arguably, the most important centralised student assessments in Lithuanian general education – the 10th grade (full name – test of basic education achievement) tests and the Matura exams. Our research focuses on two subjects: mathematics and the Lithuanian language and literature (detailed analysis of achievements is presented in [8] and [17]).

The 10th grade test is designed to provide students and schools with information on learning outcomes and help in deciding further student learning prospects. The

10th grade Lithuanian language and literature test is intended to assess students' knowledge, understanding and skills in Lithuanian language, literature and culture achieved during implemen-tation of the general program of lower secondary education. Similarly, the aim of the 10th grade mathematics test is to assess students' knowledge, understanding and skills in mathematics. One must note that the tasks of the 10th grade test are prepared centrally, but are assessed by local teachers.

The Matura exam is designed to assess students' competencies and help higher education institutions transparently select prospective students. The Lithuanian language and literature Matura exam must be passed by all students in order to complete the secondary education program (students choose either the State Matura examination or the School Matura examination) and receive the Matura certificate. Since 2015–2016, entrants to state-funded places in Lithuanian higher education institutions (except for specialties in the field of arts) must pass the state Matura examination in mathematics. The State Matura Examination is conducted and assessed centrally. Over the analysed period the assessment of both exams was criterion-based.

To our knowledge, there are no studies that quantify the importance of the results of the 10th grade and Matura exam for admission to HEIs. That is, if the student's grade for the respective exam were higher by one point, how much this improvement would increase the opportunity to study at university? Thus, the aim of our study is to quantify the odds to study at university using the results of centralised student assessments in two subjects for a period of five years, taking into account the student's gender, the location of the school attended, social support and special needs indicators.

2 Methodology

In our study, we have used individual level data for the entire Lithuanian secondary school student population (except vocational schools), who took Matura examinations in the period 2014–2018. The data was provided by the Education Management Information System (EMIS, Lith. ŠVIS) of the Ministry of Education, Science and Sports of the Republic of Lithuania. In the analysis, we use the assessment of all students who participated in mathematics and the Lithuanian language and literature state Matura examinations, as well as the respective the 10th grade test. We also had access to the data on the further course of studies immediately after secondary school, i.e. whether the student continued his/her studies at a university, college, vocational school or elsewhere. The latter indicator is the main variable in the study. In addition to exam scores and the indicator of further continuation of the study, we used gender, location of the school attended, social support, and special needs indicators as other explanatory variables in the study. The school location indicator is grouped into five subgroups: Vilnius (the capital of Lithuania), large cities (Kaunas, Klaipėda, Šiauliai, Panevėžys), cities (15–100 thous. inhabitants), small cities (3–15 thous. inhabitants), rural area (<3 thous. in-habitants). Social support and special needs indicators are binary indicators indicating that support has been provided or required. The social support indicator according to the Law on Social Assistance to Students of the Republic of Lithuania distinguishes two forms of social support for learners: the provision of free school meals (breakfast, lunch, dinner, and meals in summer camps organised by schools); and the provision of basic school supplies. Students

have the right to free school meals and support to purchase basic school supplies if the average income for family members is less than 1.5 of the state-supported income. Other cases (related to illness, accident, loss of breadwinner, provision of assistance to a student of disabled parents or from a family with three or more children, etc.) are subject to the decision of the council of a municipality [13]. We had no ability to discern between these two forms of social support. Special needs indicator represents students with special needs that are provided with complete or partial integration (in regular classes or special classes of mainstream municipal schools).

As indicated in the Introduction, the 10th grade is marked by local teachers as the Matura examinations, outputs are assessed through a centralized system. Beyond this, different assessment scales are used for the 10th grade tests and Matura exams. The 10th grade test is evaluated on a 10-point scale, while the Matura exam is assessed, first, on a 60-point scale, then – converted to a 100-point scale. Therefore, for better comparability, we have divided the results of Matura exam by 10.

We have employed binomial multiple logistic regression to assess the chances of studying at HEI. The dependent vari-able of the regression model is the main study variable converted to a binary variable, where a value of 1 means that the student is continuing his or her studies at HEI after graduating the high school, and 0 – in other cases. All the other variables described above served as independent variables in the model. We calculated Generalized Variance Inflation Factor (GVIF) for the assessment of multicollinearity. We have applied the latter factor, as all independent variables except assessment of the exams are binary variables. We can apply the usual VIF rule of thumb if we squared the $\text{GVIF}^{(1/(2*\text{Df}))}$ value, where Df stands for degrees of freedom [4]. In our analysis, $\text{GVIF}^{(1/(2*\text{Df}))}$ was below 1.5, indicating no collinearity. For goodness-of-fit of logistic regression models, we present coefficient of pseudo determi-nation, namely Nagelkerke. All statistical analyses were performed using R version 4.1.0 and RStudio version 2021.09.0-351.

3   Results

In this paper, we analyse the odds to study at HEIs using the results of centralised student assessments in two subjects (mathematics and the Lithuanian language and literature) for a period of five years, i.e., students who took the 10th grade test from the academic years 2011–2012 to 2015–2016, and the results of the same cohort participating in the Matura examination two years later. In Tables 1 and 2, we provide the distribution of students according to the continuation of their studies after high school graduation together with basic descriptive statistics. Examining both the mathematics exam and the Lithuanian language exam, we have observed that the share of students who continued their studies at the university immediately after secondary school is gradually decreasing. The share of students who continued their studies at the college is somewhat stable in the range of 23–24 per cent. The smallest share (below 5 per cent) decided to continue their studies in vocational school. Interestingly, the proportion of students for whom we do not have information about further studies (i.e., students either took a break from studying or continue their studies abroad) is observed to be notable and increasing. Among students, who took the mathematics exam, this proportion increased from 16.2 per cent to 26.4 per cent, and, respectively, for the Lithuanian language and literature exam it expanded from

19.8 per cent to 28.4 per cent. This latter trend definitely needs additional analysis to understand the causality of the observed positive trend. It would be interesting to know how many students take a study break and after how many years they return to continue their studies.

The declining share of students who continue their studies at universities may be the opposite trend for the reader compared to the fact that a larger share of Lithuanian population has obtained higher education degree in comparison to the EU average. In fact, the share of 25–34 year-olds with tertiary educational attainment is steadily increasing in Lithuania (from 48.2 per cent in 2011 to 56.2 per cent in 2020).[1] The latter indicator is one of seven EU-level targets, which the European Commission is using for monitoring progress in education and training. According to the Council Resolution On a Strategic Framework for European Cooperation in Education and Training Towards the European Education Area and Beyond,[2] EU average of this indicator should be at least 45 per cent by 2030. Students who took the final exams in the year 2014 will be 25 years old in 2020 or 2021. Consequently, based on the results of this study, the upward trend observed so far for people with tertiary educational attainment may change its direction from 2023 or 2024. Of course, by 2030, the share of 25–34 year-olds with tertiary educational attainment will be not less than 45 per cent in Lithuania, but if this growth will be replaced by a decline, this might be a new issue for education policy makers.

The average and median score of the 10th grade test is always higher than the average score of the Matura exam for the mathematics and the Lithuanian language and literature examinations (Table 1 and Table 2). In some cycles, the Matura average and median exam grade is half that of the 10th grade test. We have observed a greater spread for the Matura results. IQR is double for Matura compared to the 10th grade test for the Lithuanian language and literature exam. The higher scatter of the Matura exam results can be explained by the fact that the initial assessment scale is 100 points instead of 10 points, as is the case for the 10th grade achievements.

Analysing the differences in exam results from the perspective of further studies, we observe that students with the highest average achievements continue their studies at universities. The average and median achievement of these students is higher than the national average for both Matura exams in all cycles examined. Colleges and vocational schools attracted students who obtained less favourable results. As described above, the Matura examination is originally assessed on a 100-point scale. According to the National Agency for Education, the knowledge of the Matura exam is divided into four categories: advanced level (86–100 points), basic level (36–85 points), satisfactory level (16–35 points), and if a student collects less than 16 points, it is considered that he or she fails the exam. From the latter classification we can interpret that on average assessment of students who continue their studies at colleges and vocational schools are satisfactory or they fail the exam (especially notable for math examination).

The subgroup of students about whom we have no information of their further studies seems very interesting. Their averages and medians are quite close to the national average, or else we can define them as an intermediate group between those

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[1] Eurostat: https://ec.europa.eu/eurostat/web/education-and-training/policy-context.
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021G0226%2801%29&qid=1617706323424.

Table 1. Distribution of students according to the continuation of their studies after high school graduation together with basic descriptive statistics. Results of the 10th grade test and Matura mathematics examination.

Cycle	Exam type and continuation	Academic year	Mean	SD	Median	IQR	Participated N (%)	Absence N
1 cycle	**10th grade**	**2011–2012**	**7.8**	**1.8**	**8.0**	**2.0**	**15397**	**45**
	Matura	**2013–2014**	**3.9**	**2.7**	**3.0**	**3.5**	**14808**	**634**
	University		4.8	2.7	4.4	4.4	7983 (53.9)	147
	College		2.5	1.5	2.4	1.3	3935 (26.6)	135
	Vocational school		1.4	1.4	1.7	2.2	489 (3.3)	67
	No information		3.7	2.9	2.7	3.6	2401 (16.2)	285
2 cycle	**10th grade**	**2012–2013**	**6.7**	**1.9**	**7.0**	**3.0**	**14261**	**41**
	Matura	**2014–2015**	**4.4**	**2.7**	**3.6**	**3.9**	**13696**	**606**
	University		5.3	2.6	5.1	4.4	7092 (51.8)	186
	College		2.8	1.6	2.6	1.4	3306 (24.1)	121
	Vocational school		1.8	1.6	1.8	2.5	399 (2.9)	47
	No information		4.2	2.9	3.3	4.2	2899 (21.2)	252
3 cycle	**10th grade**	**2013–2014**	**7.3**	**2.0**	**7.0**	**3.0**	**17527**	**48**
	Matura	**2015–2016**	**3.9**	**2.6**	**3.2**	**3.4**	**16727**	**848**
	University		4.9	2.6	4.5	4.2	8672 (51.8)	139
	College		2.7	1.5	2.6	1.4	4168 (24.9)	147
	Vocational school		1.6	1.6	1.7	2.4	689 (4.1)	107
	No information		3.4	2.7	2.7	3.0	3198 (19.1)	455
4 cycle	**10th grade**	**2014–2015**	**7.1**	**2.1**	**7.0**	**3.0**	**17156**	**43**
	Matura	**2016–2017**	**4.9**	**2.8**	**4.2**	**4.4**	**16408**	**791**
	University		6.1	2.6	6.1	4.8	7796 (47.5)	93
	College		3.3	1.7	3.0	2.0	4040 (24.6)	123
	Vocational school		2.3	2.0	2.2	3.0	586 (3.6)	96
	No information		4.3	2.8	3.4	4.1	3986 (24.3)	479
5 cycle	**10th grade**	**2015–2016**	**7.0**	**1.9**	**7.0**	**3.0**	**16895**	**45**
	Matura	**2017–2018**	**3.6**	**2.5**	**2.8**	**2.9**	**16135**	**805**
	University		4.7	2.5	4.2	3.9	7286 (45.2)	77
	College		2.4	1.5	2.3	1.3	3895 (24.1)	121
	Vocational school		1.4	1.3	1.7	2.1	700 (4.3)	91
	No information		3.0	2.5	2.3	2.1	4254 (26.4)	516

studying at universities and those who choose colleges or vocational schools. It seems that here we have students with at least basic knowledge, and they decided to take a break from study or chose to study abroad. Unfortunately, the available data do not allow any deeper analysis, but it would be interesting to understand which part of the students take a break and when (if ever) and to which higher education institutions they return. Also, it would be interesting to understand how many students who have chosen to study in foreign higher education institutions return to Lithuania for second- or third-cycle studies.

After we have described that about half of the students who have taken the Matura exams continue their studies at universities, we can move on to the main goal of the article, i.e., to assess the importance of the 10th grade and the Matura exam assessments for the chances of studying at university. In other words, is there much need to make an effort to improve the results of school exams in order to be admitted to a university?

For the estimation of odds for studying at HEIs, we have employed binary multiple logistic regression model. We know that the gender gap is persistent for the Lithua-

Table 2. Distribution of students according to the continuation of their studies after high school graduation together with basic descriptive statistics. Results of the 10th grade test and Matura Lithuanian language and literature examination.

Cycle	Exam type	Academic year	Mean	SD	Median	IQR	Participated N (%)	Absence N
1 cycle	**10th grade**	**2011–2012**	**7.4**	**1.4**	**7.0**	**1.0**	**20957**	**65**
	Matura	**2013–2014**	**4.3**	**2.7**	**3.6**	**4.0**	**20928**	**94**
	University		5.0	2.8	4.6	4.5	10813 (51.7)	3
	College		3.5	2.3	3.2	3.0	5089 (24.3)	3
	Vocational school		2.2	2.0	2.1	3.2	880 (4.2)	0
	No information		3.8	2.8	3.2	3.9	4146 (19.8)	88
2 cycle	**10th grade**	**2012–2013**	**7.1**	**1.4**	**7.0**	**2.0**	**19930**	**68**
	Matura	**2014–2015**	**4.2**	**2.7**	**3.5**	**4.0**	**19941**	**57**
	University		5.1	2.7	4.8	4.5	9926 (49.8)	3
	College		3.2	2.2	2.9	2.8	4545 (22.8)	1
	Vocational school		2.2	1.9	1.9	3.3	735 (3.7)	2
	No information		3.9	2.8	3.2	3.7	4735 (23.7)	51
3 cycle	**10th grade**	**2013–2014**	**7.4**	**1.4**	**7.0**	**2.0**	**18327**	**52**
	Matura	**2015–2016**	**4.2**	**2.7**	**3.5**	**4.1**	**18291**	**88**
	University		5.1	2.7	4.6	4.5	9357 (51.2)	1
	College		3.2	2.2	2.9	2.9	4243 (23.2)	2
	Vocational school		2.5	2	2.3	1.7	799 (4.4)	0
	No information		3.6	2.7	3.1	3.7	3892 (21.3)	85
4 cycle	**10th grade**	**2014–2015**	**7.4**	**1.4**	**7.0**	**2.0**	**17718**	**44**
	Matura	**2016–2017**	**4.1**	**2.7**	**3.5**	**3.7**	**17690**	**72**
	University		5.1	2.6	4.6	4.5	8193 (46.3)	3
	College		3.1	2.17	2.7	2.5	4055 (22.9)	4
	Vocational school		2.3	1.9	2.1	1.6	662 (3.7)	0
	No information		3.6	2.6	3.1	3.3	4780 (27.0)	65
5 cycle	**10th grade**	**2015–2016**	**7.5**	**1.3**	**8.0**	**2.0**	**17372**	**41**
	Matura	**2017–2018**	**4.7**	**2.6**	**4.3**	**4.0**	**17343**	**70**
	University		5.8	2.4	5.8	4.2	7659 (44.2)	0
	College		3.6	2.2	3.3	2.8	4021 (23.2)	3
	Vocational school		2.8	2.2	2.7	2.5	732 (4.2)	2
	No information		4.1	2.6	3.5	3.7	4931 (28.4)	65

nian language and literature [17], but for the math results it is not prominent [8]. No significant but notable effect was observed in terms of school location for both examinations in [8] and [17]. In the latter papers, we have detected an important association between achievements and social support, and special needs indicators. Therefore, in this study, we continue to use the indicated variables for the quantification of the chances of studying at HEIs.

In Tables 3 and 4 we present estimated odds rations from logistic regression model. We recall that odds ratio above one indicates favourable outcome, that is, an increase in independent variable leads to increasing odds studying at the uni-versities compared to other groups. And opposite holds for odds ratio values below one.

Let us start the reminder of results with discussion of chances estimated using results of the mathematics examination. Thus, for studying at the university, the math Matura grade is almost double more important than the 10th grade. An increase of the 10th grade result by 1 point would increase the chance of studying at university by 8–18 per cent as the corresponding increase in the Matura result would lead to 28–36 per cent increase in odds depending on the cycle. The effect increases

Table 3. Odds ratios with 95% PI from binomial multiple logistic regression using assessments of mathematics.

Independent variable	Level	1 cycle			2 cycle			3 cycle			4 cycle			5 cycle		
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
10th grade		1.12	**1.09**	**1.15**	1.09	**1.06**	**1.12**	1.09	**1.06**	**1.12**	1.08	**1.06**	**1.11**	1.18	**1.15**	**1.21**
Matura		1.29	**1.26**	**1.31**	1.28	**1.25**	**1.31**	1.35	**1.32**	**1.38**	1.36	**1.33**	**1.39**	1.36	**1.33**	**1.39**
Gender	Female	Reference category														
	Male	0.90	**0.84**	**0.96**	0.89	**0.83**	**0.96**	0.81	**0.76**	**0.87**	0.88	**0.82**	**0.94**	0.79	**0.74**	**0.85**
School location	Rural area	Reference category														
	Vilnius	1.65	**1.47**	**1.87**	1.32	**1.16**	**1.49**	1.38	**1.22**	**1.55**	1.49	**1.32**	**1.68**	1.49	**1.32**	**1.68**
	Large cities	1.51	**1.35**	**1.69**	1.41	**1.25**	**1.58**	1.39	**1.25**	**1.55**	1.42	**1.27**	**1.59**	1.30	**1.16**	**1.45**
	Cities	1.25	**1.11**	**1.40**	1.00	**0.88**	**1.12**	1.28	**1.14**	**1.43**	1.46	**1.29**	**1.64**	1.07	**0.95**	**1.20**
	Small cities	1.28	**1.15**	**1.44**	1.13	**1.00**	**1.27**	1.25	**1.12**	**1.39**	1.28	**1.14**	**1.44**	1.08	**0.96**	**1.22**
Indicator of social support		0.55	**0.48**	**0.63**	0.57	**0.49**	**0.66**	0.56	**0.49**	**0.65**	0.59	**0.50**	**0.70**	0.59	**0.49**	**0.71**
Indicator of special needs		0.54	**0.29**	**0.95**	0.73	0.35	1.44	0.62	0.33	1.10	0.59	0.33	1.04	0.83	0.47	1.43
Nagelkerke pseudo R^2 (%)		20.22			18.34			22.12			25.03			25.98		

School location: Vilnius (capital of Lithuania), large cities (Kaunas, Klaipėda, Šiauliai, Panevėžys), cities (15–100 thous. inhabitants), small cities (3–15 thous. inhabitants), rural area (<3 thous. inhabitants).

Table 4. Odds ratios with 95% PI from binomial multiple logistic regression using assessments of the Lithuanian.

Independent variable	Level	1 cycle			2 cycle			3 cycle			4 cycle			5 cycle		
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
10th grade		1.22	**1.19**	**1.25**	1.13	**1.10**	**1.16**	1.19	**1.16**	**1.23**	1.25	**1.21**	**1.29**	1.31	**1.27**	**1.36**
Matura		1.19	**1.18**	**1.21**	1.25	**1.23**	**1.27**	1.26	**1.24**	**1.28**	1.29	**1.27**	**1.31**	1.32	**1.29**	**1.34**
Gender	Female	Reference category														
	Male	1.73	**1.62**	**1.84**	1.72	**1.61**	**1.84**	1.93	**1.81**	**2.07**	2.26	**2.10**	**2.42**	2.17	**2.01**	**2.33**
School location	Rural area	Reference category														
	Vilnius	1.69	**1.54**	**1.87**	1.32	**1.19**	**1.46**	1.63	**1.46**	**1.82**	1.59	**1.42**	**1.78**	1.93	**1.72**	**2.17**
	Large cities	1.67	**1.52**	**1.83**	1.58	**1.44**	**1.74**	1.56	**1.41**	**1.73**	1.52	**1.37**	**1.69**	1.29	**1.16**	**1.44**
	Cities	1.29	**1.17**	**1.43**	1.02	0.92	1.12	1.23	**1.10**	**1.37**	1.41	**1.25**	**1.58**	0.96	0.85	1.08
	Small cities	1.20	**1.09**	**1.32**	1.07	0.97	1.18	1.19	**1.07**	**1.32**	1.12	1.00	1.25	0.91	0.81	1.02
Indicator of social support		0.56	**0.51**	**0.63**	0.59	**0.52**	**0.66**	0.58	**0.51**	**0.67**	0.70	**0.60**	**0.82**	0.68	**0.57**	**0.81**
Indicator of special needs		0.57	0.31	1.00	0.69	0.38	1.21	0.91	0.49	1.65	1.24	0.67	2.29	1.24	0.69	2.18
Nagelkerke pseudo R^2 (%)		14.96			15.26			18.25			20.50			23.85		

School location: Vilnius (capital of Lithuania), large cities (Kaunas, Klaipėda, Šiauliai, Panevėžys), cities (15–100 thous. inhabitants), small cities (3–15 thous. inhabitants), rural area (<3 thous. inhabitants).

slightly with time. The odds ratio with respect to gender indicates that the grade of mathematics is 10–21 per cent more import for females than for males. What regards location, we observe a clear pattern that students studying in Vilnius and large city schools have larger chances for university admittance comparing to the rural area (from 30 to 65 per cent, depending on cycle). However, the outcome for cities and small cities is mixed – no advantage is estimated for the second and fifth cycles. What regards social support indicator, we have evaluated that they have roughly by 40 per cent smaller chances to enter university. Social support for students, specifically free school meals, could be considered as a proper approximation of low social and eco-

nomic status (SEC) [6]. Some countries, like the USA, have been using eligibility for free lunches as a measure of student SEC background for a long time [14]. However, there are studies which disagree that free school meals as a variable is a good measure of SEC because it is a very narrow focusing on one economic dimension and ignoring the social and cultural ones [7]. Other indicator that reduces the chances of studying at university might be the indicator of special needs. However, we detect a significant association for the first cycle only. Students with special needs accounted for 0.3–0.5 per cent of all students who took the math Matura exam, and from 23.9 to 34.8 per cent were admitted to the universities depending on the cycle.

Let us turn the discussion to the analysis using assessments of the Lithuanian language and literature. Thus, for studying at the university, the Matura grade may boost chances similarly to the 10th test grade. An increase of, irrespectively, the 10th test grade or Matura result by 1 point would increase the chance of studying at university by 13–32 per cent. The odds ratio with respect to gender indicates that the grade of the Lithuanian language and literature could be twice more important for males than for females. The effect increases slightly with time. Similarly to math, we detect positive association for students from Vilnius and large cities schools having better odds for university admittance when com-pared to rural area (from 29 to 93 per cent). The outcome for cities and small cities has no clear pattern; advantage is estimated for the first and third cycles. What regards the social support indicator, we have evaluated that students who need social support have 30–42 per cent smaller chances to enter university depending on the cycle and, on average, it is the indicator that most reduces the chances of studying at university. For the indicator of special needs, we observe an increasing favourable association; however, we were not able to estimate it uniquely, i.e., the 95 per cent confidence interval covers both above and below 1 values, indicating that some students might experience problems as regards university admittance, albeit for others the characteristic of special needs is not an obstacle to study at the university. Students with special needs accounted for 0.3–0.4 per cent of all students who took the Lithuanian language and literature Matura exam, and from 29.9 to 45.1 per cent were admitted to universities depending on the cycle. Our findings might suggest that the climate is becoming more supportive with respect to students with special needs in Lithuanian universities. However, this supportive environment has been detected by us when analysing the results using the Lithuanian language and literature, but not mathematics. Such information could be explained by the fact that perhaps the knowledge of the Lithuanian language and literature is more important when planning to continue studies in the humanities. For justification the latter, we would require more detailed information on the field of study chosen, not just that a student was pursuing a university degree.

Summarising, we can conclude that the descriptive power of binary logistic regression models is quite limited (max pseudo R^2 is less than 26 per cent) irrespectively which subject achievements have been used to estimate odds for studying at university.

4 Conclusions

The main question of our research is the predictive value of the results of national exams when entering HEI's in Lithuania. To the best of our knowledge, this is the

first study to quantify the importance of the 10th grade and maturity exam results for admission to higher education. We have calculated the chances of studying at university using the results of centralized assessments of students in mathematics and the Lithuanian language and literature for a period of five years, taking into account the student's gender, the location of the school attended, social support and special needs indicators.

The share of 25–34 year-olds with tertiary educational attainment is steadily increasing in Lithuania. However, our study shows a decrease in the number of students who continue their studies at universities immediately after graduating from high school, which in the future may lead to a decrease in the share of the population with higher education in Lithuania. Consequently, based on the results of this study, the upward trend observed so far for people with tertiary educational attainment may change its direction from 2023 or 2024. We may assume that an increasing number of students are taking a break from studying or go abroad to study. So far there is no available data on the topic, and the tendency of decreasing numbers of HE applicants might require further in-depth research.

In terms of predictive value, Matura exams appear to be more important than the 10th grade test. For studying at university, the Matura grade in mathematics is almost double more important when compared to the 10th grade test results. We have detected positive association for students from Vilnius and large cities schools having better odds for university admittance when compared to rural area. Students who need social support at school have 30–42 per cent less chances to enter university. Data indicates, that, despite the relatively wide access to higher education in Lithuania, regional and social factors still remain important in terms of student admission. We have also observed certain gender differences. The odds ratio with respect to gender indicates that the grade of the Lithuanian language and literature could be twice more import for males than females.

This study could be extended if information was available not only on the fact that the student was continuing his/her studies at the university, but also on the chosen field of bachelor or integrated studies. With the latter information, one could apply the models developed in the article to assess the chances to study in a specific field of study. However, this would require combining information from EMIS with information available to higher education institutions in Lithuania.

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REZIUMĖ

PUPP ir VBE pasiekimų svarba prognozuojant galimybes studijuoti aukštosiose mokyklose

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Aukštojo mokslo įstaigos stengiasi pritraukti studijuoti gabiausią ir perspektyviausią šalies jaunimą. Mokslininkai siekia nustatyti sėkmingą perėjimą nuo bendrojo ugdymo prie aukštojo mokslo studijų lemiančius veiksnius. Viena iš aktualių problemų yra pagrindinio ugdymo pasiekimų patikrinimo (PUPP) ir valstybinių brandos egzaminų (VBE) svarba prognozuojant galimybes studijuoti aukštosiose mokyklose. Tyrime apskaičiuotos įstojimo į aukštąsias mokyklas galimybės žinant matematikos ir lietuvių kalbos ir literatūros PUPP ir VBE rezultatus. Buvo analizuoti penkerių metų (2014–2018 m. brandos egzaminų) rezultatai, atsižvelgiant į lyties, vietovės, kurioje lankyta mokykla, socialinės padėties ir specialiųjų poreikių rodiklius. Iš tyrimo rezultatų matome, kad matematikos brandos egzamino pažymys yra beveik dvigubai svarbesnis nei 10 klasės testo įvertinimas vertinant šansus studijuoti aukštojoje mokykloje. Taip pat nustatyta, jog lietuvių kalbos ir literatūros egzaminų rezultatai yra dvigubai svarbesni vyrams nei moterims. Nuo 2023 ar 2024 m. Lietuvoje galime pradėti matyti asmenų, įgijusių aukštąjį išsilavinimą, dalies mažėjimo tendenciją.

Raktiniai žodžiai: pagrindinio ugdymo pasiekimų patikrinimas (PUPP); valstybiniai brandos egzaminai (VBE); mokinių pasiekimai; prognostinė vertė