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Data Analysis of the Motivation and Factors for a Shorter Duration of Study

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Abstract. *The duration of study is of interest to all stakeholders in education. This paper analyses the influence of motivation and other factors on the duration of study of students at professional studies in the field of economics at the Faculty of Tourism and Rural Development in Požega. In order to find out what former students considered important for finishing their studies, a survey was initially undertaken. In the second part of this research, real and objective data from the student information system called ISVU was analysed to find the correlations between the duration of study and selected data set variables that were extracted from ISVU.*

Keywords. Data analysis, data exploration, prediction, duration of study, motivation of students, correlation analysis, multiple linear regression

1 Introduction

Analysis of the motivational factors that influence duration of study is a point of interest of all stakeholders in the educational process: universities, students and employers. The duration of study affects both students and parents due to associated costs of studying, reflects the motivation of students and the quality of study, influences the employability and living standard, and directly impacts the satisfaction of all entities included in the educational process.

According to research conducted on a sample of 1,840 participants, some of the major weaknesses of the Croatian higher education system are the low percentage of study completion and significantly longer duration of study (Rimac, 2021). As stated in the mentioned research, there are many problems that affect the success of students or that influence the duration of studies. For instance, there are issues with adaptation to student life, difficulties with transitioning to a new and challenging level of education, and there are troubles that are related to personal circumstances.

Motivation is one of the very important factors that affects the success of students in terms of completing courses and studies on time. An important determinant

of academic success is the motivation that energizes and directs behavior towards academic achievements (Wigfield et al., 2016).

Despite motivation being a subjective experience of students, many researchers in the field of education use EDM (Educational Data Mining) to explore the aspects of motivation and various factors, such as demographics, socioeconomics, and success in the study. This is done by applying statistical methods and machine learning algorithms for predicting the success or failure of students during their studies.

It is important to investigate and explain the different factors that affect the duration of study and the motivation of students. Factors can be perceived as subjective if they reflect the opinions of students collected through surveys. However, some other factors can also be perceived as objective, such as average grades, information on high school graduation success etc.

This paper is structured in the following way. After the Introduction section, a Literature review section presents relevant recent work, which is followed by a larger section that describes the conducted research methodology along with research results. Limitations and ideas for future work are shown in the fourth section, after which conclusions are drawn.

2 Literature review

A lot of research related to the success of students during their studies has been conducted with regard to different aspects, such as psychological (González et al., 2020), social and predictive elements (Xie et al., 2023), oftentimes based on the use of different statistical methods and machine learning algorithms.

Student motivation that is related to academic success and student well-being was recently explored by analysing a set of factors, such as self-efficacy, ability to self-regulate, engagement in learning, perceived learning value, reasons for studying, achievement motives, goals and adaptability (Kotera et al., 2022).

A research paper highlighted the importance of historical data in predicting student performance, as well as the relevance of background information such as numerical skills, family and motivation (Cavazos & Garza, 2018).

Another study analysed the influence of several factors on overall student performance. Factors that influenced student achievement were gender, application results and homework results (Liufu et al., 2020). All factors had a strong impact on students' final grades. The authors also concluded that promoting technological innovation at the university and strengthening the network of technology application opportunities with employers might help students to improve their learning outcomes.

A multiple linear regression model was used on data obtained from surveys conducted among engineering students in order to predict student performance (Kumar et al., 2020). The results showed that there were four independent variables that were significant for modelling academic performance of students: gender, relationship with their parents, secondary school success and first semester grades.

Research on a sample of 395 students concluded that the success of students is greatly influenced by specific factors, such as past failures with a negative correlation, implying that students are more likely to fail when they have a past failure class record (Beckham et al., 2023). Also, a negative correlation is observed in the case of age, which means that older students fail exams more often than their younger colleagues. However, positive correlations were also noticed, e.g. the mother's education and the student's motivation to continue their higher education.

On the other hand, there are also research papers that deal with the prediction of student dropouts, and thus provide an opportunity for educational institutions to identify students who are at risk of dropping out, and to take necessary countermeasures. For instance, according to an article that is based on a set of data collected from students, there are several factors that might eventually lead to the failure of a student in a course (Hegde & Prageeth, 2018), e.g. four previous course failures, more than three absences from classes, health problems, and the inability to adjust to student lifestyle.

A study on a sample of 13,696 students who studied at a Latin American university from the first semester of 2008 to the second semester of 2020 analysed various influences on student dropouts (Gutierrez-Pachas et al., 2023). The correlation analysis shows that the number of completed semesters has a strong negative correlation with dropouts in all cases. Furthermore, dropouts have a strong negative correlation with the final grade point average and the proportion of finished courses in relation to the total number of enrolled courses. Also, dropouts and the proportion of the number of absences in relation to the total number of course attendances have a moderate positive correlation.

3 Research methodology and results

This section presents results of two separate studies. Namely, the research is based on:

- i) subjective data based on a survey conducted among former students who already finished their studies;
- ii) objective data that was extracted from the so-called ISVU system (Information System of Higher Education Institutions).

Both studies ought to investigate the various factors affecting study duration.

The first study was conducted as an open-ended survey to examine the subjective factors that influence the duration of studies, according to the answers of students who have completed their studies. It was conducted among former students of the Faculty of Tourism and Rural Development in Požega, Josip Juraj Strossmayer University of Osijek. The survey was sent to 60 email addresses, among which 37 former students responded with answers, out of which 29 of them completed a three-year professional study in the field of economics. A total of 29 former students of economics were analysed in order to reveal the subjective factors that influence the duration of the study.

In the second study, student data from a student information system called ISVU – *Informacijski sustav visokih učilišta* (Information System of Higher Education Institutions) was extracted and examined in order to detect objective factors that affect the duration of study, to establish correlations with the duration of study, and to identify the predictors that mostly influence the duration of study by using multiple linear regression.

3.1 Study one: subjective data analysis

This study analyses the subjective motives that impact the desire to complete studies, and as such represent the personal perception of individual students. Motives highlighted by students who completed their studies within four years are examined in detail. The regular duration of study for professional studies is three years, however, in this research the authors additionally consider four years as regular.

The study was conducted on 29 former students of professional studies of economics. The average duration of study was 5.54 years according to internal Faculty reports. Fig. 1 shows the duration of study for students who participated in the survey.

76% of the surveyed students successfully completed their studies within 4 years, whereas 10% of them studied between five to six years. 7% of the students studied between four to five years, or more than six years.

According to the regulations of the University of Osijek, "a student has the status of a full-time student during the prescribed duration of studies, and at most for a period that is one third longer than the prescribed

duration of studies, i.e. until the end of the academic year in which that period expires”.

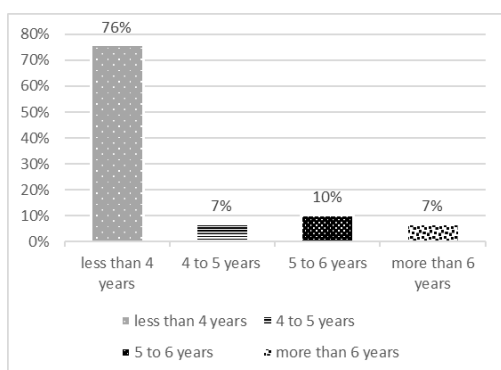


Figure 1. Duration of study

This means that full-time students lose their status after four years of studying, and that if they still want to continue their studies, they must change their status to part-time students.

The following figures in this section refer to students who completed their studies within four years.

Fig. 2 shows the age of the students at study enrolment. It presents only students whose duration of studies was shorter than four years. Most of the surveyed students (50%) were older than 30 years. Also, 41% were students under the age of 20. There were no students between 20 and 25 years old. It should also be noted that the study program is mostly enrolled by students after finishing high school in order to continue their education or by employees who have been employed for more than ten years.

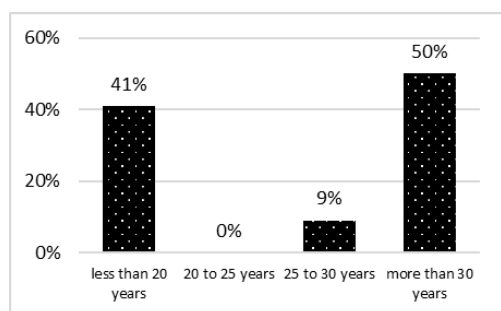


Figure 2. Age of students at study enrolment

Fig. 3 shows the ratio of full-time and part-time students who participated in the survey. Part-time students were a total of 55%, while full-time students made up 45% of all participants.

The largest number of students (59%) who completed their studies within four years achieved an average grade between 3.5 and 4.2, as shown in Fig. 4. An average of less than 3.5 was achieved by 27% of the surveyed students, whereas 14% of them achieved an average grade higher than 4.2.

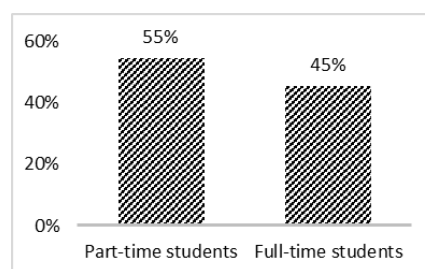


Figure 3. Type of study (enrolment type)

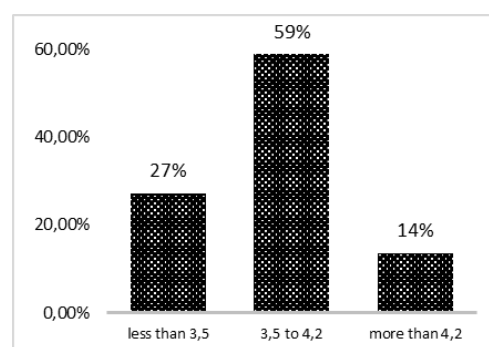


Figure 4. Average grade

Fig. 5 shows the distance from home to the place of study. Most students (64%) live within 30 km from the place of study, while 14% of all students live at a distance of more than 100 km from the place of study.

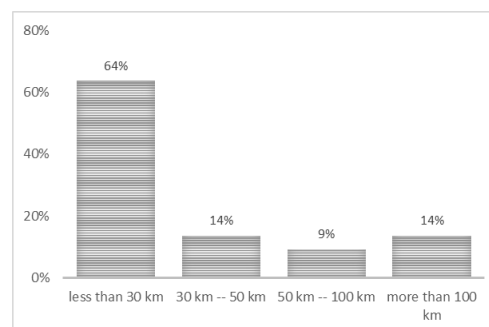


Figure 5. Distance from home

Fig. 6 shows the opinions of surveyed students who completed their studies within four years on what they considered to be important factors that influenced the total duration of their studies.

A total of 91% of the students agree or strongly agree that personal satisfaction/advancement is the most important factor that motivated them to complete their studies.

They also agree or strongly agree that continuing education (82% in total) and desire for employment (73%) are important factors for completing studies. This is to some extent expected, since after finishing high school, students have two choices: continuing their education or looking for a job.

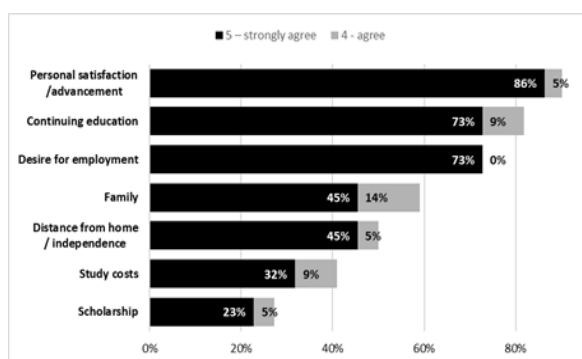


Figure 6. Motives of students for completing their studies

Most of the participants agree or strongly agree that family (59%) and distance from home (50%) are important factors that influence the successful completion of studies. Also, 50% of students who lived independently agree or strongly agree that distance from home is an important factor. The least number of respondents agree that the success of completing studies is influenced by study costs (41%) and scholarships (28%).

According to the observed data, students who finished their studies on time are mostly part-time students over 30 years old with an average grade between 3.5 and 4.2, and that study in a place less than 30 km from home. Motives that affect students to complete their professional studies of economics on time are: personal satisfaction/advancement (91%), need for continuing education (82%) and desire for employment (73%), family (59%) and distance from home (50%). All these are important factors that influence the successful completion of studies.

3.2 Study two: objective data analysis

According to the data extracted from the student information system called ISVU – *Informacijski sustav visokih učilišta* (Information System of Higher Education Institutions), 1,059 students enrolled the professional study in the field of economics at the Faculty of Tourism and Rural Development in Požega in the period from 2013 to 2018. The data was processed using two approaches: descriptive statistics and multiple linear regression.

The studies were successfully completed by 460 (43%) enrolled students. A total of 164 (36%) students completed their studies on time, i.e. within four years. The average duration of study was 5.39 years, whereas the median was 4.76 years.

3.2.1 Analysis of data from ISVU and discussion

Fig. 7 shows a comparison of the duration of study of full-time and part-time students.

It is noticeable that **full-time students** completed their studies on average in 4.56 years (median 4.16 years), which is almost two years earlier than part-time

students – their average is 6.64 years (46% longer), with a median of 6.50 (56% longer).

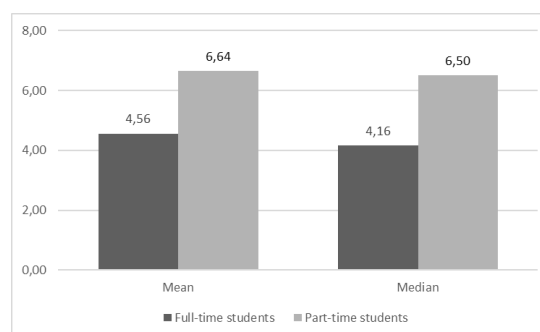


Figure 7. Average duration of study

It is reasonable to infer that full-time students wish to finish their studies earlier because they either plan to get a job and start working, or they plan to continue their education.

These two – continuing education and desire for employment – were also highlighted by the students in the survey as two of the three most important motivational factors for completing their studies.

Additionally, it might be speculated that part-time students are more driven by a desire for personal satisfaction/advancement to complete their studies. Part-time students, by definition, should already be employed, and therefore should be motivated to finish their studies for personal satisfaction or possibly for advancement at work. However, this should be analysed more carefully in future research for more precise results and conclusions.

The following figures in this section refer to students who completed their studies within four years.

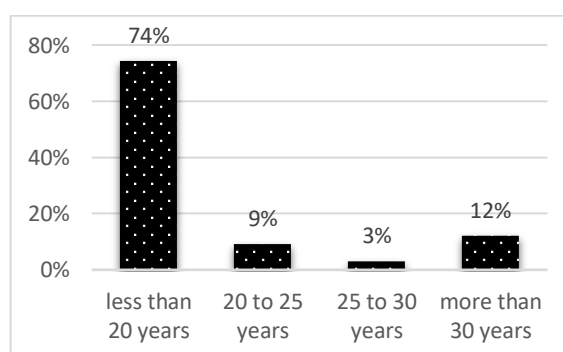


Figure 8. Age of students at study enrolment

Fig. 8 shows the age of the students at study enrolment. Most of the students (74%) were younger than 20 years. According to ISVU data, it should also be noted that this particular study program is mostly enrolled by students after finishing high school in order to continue their education.

Fig. 9 shows the ratio of full-time and part-time students. Part-time students were a total of 18%, while

full-time students made up 72%, according to ISVU data.

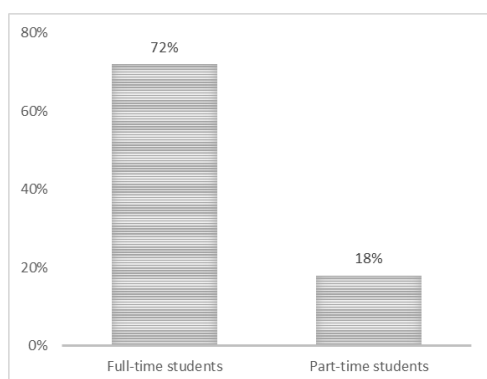


Figure 9. Type of study (enrolment type)

The largest number of students (63%) who completed their studies on time achieved an average grade less than 3.5. An average grade between 3.5 and 4.2 is achieved by 29% of the students, as shown in Fig. 10. In addition, only 8% of them achieved an average grade higher than 4.2.

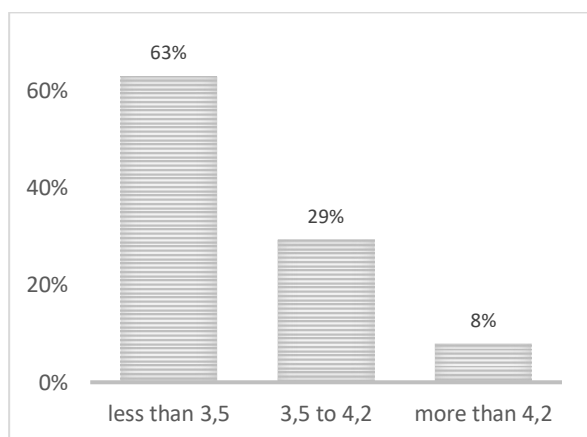


Figure 10. Average grade

Among the students who finished their studies on time, almost 60% of them were students from other counties, whereas 40% were from the Požega-Slavonia County, as shown in Fig. 11.

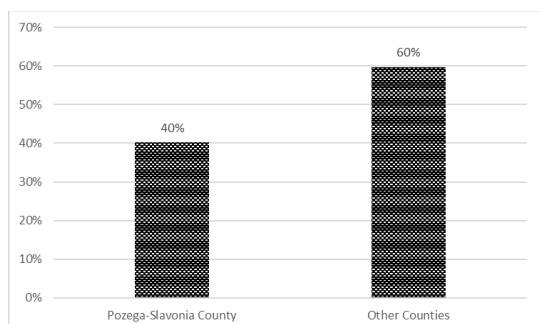


Figure 11. County residence

In comparison, according to the initial survey, most of the students (64%) live within 30 km from the place of study.

According to the data extracted from ISVU, mostly full-time students younger than 20 years old with an average grade less than 3.5 from outside the Požega-Slavonia County are more motivated to complete their studies within four years.

3.2.2 Multiple linear regression and discussion

Fifteen variables were selected from the ISVU database of the Faculty of Tourism and Rural Development in Požega: duration of study, age at the time of enrolment, grade point average (average grade achieved by students during their studies), type of study (part-time or full-time), type of finished high school (such as economy and trade, public transport, electrical engineering, gymnasium, agriculture, mechanical engineering, catering and tourism, musical art, construction, geodesy and building materials, mathematics, physics and computer sciences, woodworking, leather working, maritime, river and port transport, food, textiles), Economics_in_out (finishing a high school of economics or not), counties of Croatia, PSZ_in_out (residence in Požega-Slavonia County or not), gender (male or female), high school score, state exam score, total score (high school score plus state exam score), English language level B score, Croatian language level B score and mathematics level B score. In this case, only data from students who completed their studies were considered (460 of them, i.e. 43% out of all students from ISVU).

Correlations between the duration of study (the dependent variable in this research) and all other mentioned variables (also known as predictors or predictor variables) were calculated with the help of SPSS.

Table 1 shows only variables that have a significant correlation with the duration of study for all graduated students. There is a medium Pearson correlation (Cohen, 1998) at the 0.01 (1%) significance level between the duration of study and the type of study (-0.44), total score (high school score plus state exam score) (-0.44), high school score (-0.44), state exam score (-0.43), English language level B score (-0.40), Croatian language level B score (-0.41) and mathematics level B score (-0.43).

A low Pearson correlation at the 0.01 significance level between the duration of study and gender (-0.22), grade point average (-0.18) and finishing high school of economics or not (-0.15). Also, there is a low Pearson correlation at the 0.05 significance level between the duration of study and the type of finished high school (0.12). The negative values for the variables that reflect high school grades and graduation success, as well as the grade point average during study, show that students with better grades complete their studies earlier.

Table 1. Correlation between the duration of study and other predictors

	Duration of study		
	Pearson Correlation	Sig. (2-tailed)	N
Part-time or full-time students	-.436**	,000	455
Gender	-.219**	,000	455
Grade point average	-.182**	,000	455
Type of finished high school	,120*	,010	455
Finished or not High School of Economics	-.149**	,001	455
High school score	-.435**	,000	455
Croatian language level B score	-.405**	,000	452
English language level B score	-.400**	,000	412
Mathematics level B score	-.425**	,000	452
State Exam score	-.426**	,000	455
Sum of high school score and state exam score	-.439**	,000	455

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

The multiple linear regression model shows the linear relationship between the independent variables and the dependent variable. It considers the effect of multiple independent variables (i.e. predictor variables) on a dependent variable, and determines a quantitative relationship between them (Vinodhini & Chandrasekaran, 2018). The multiple linear regression equation is shown in (1):

$$Y = k_0 + k_1x_1 + k_2x_2 + \dots + k_nx_n \quad (1)$$

where

Y=dependent variable,

x_i =predictors,

k_i =slope coefficient for every predictor,

k_0 =intercept (the value of Y when all predictors are zero).

Due to excessive multicollinearity, the following predictors were removed from the model: high school score, state exam score, English language level B score, Croatian language level B score and mathematics level B score. Therefore, only the total score (high school score plus state exam score) is considered.

Table 2 shows a comparison of two multiple linear regression models. The R-squared value of both models is ca. 0.32, which indicates that the model explains 32% of the variation in the duration of study.

The adjusted R-squared value of ca. 0.31 is insignificantly lower than the R-squared value. Higher R-squared values can be obtained by simply increasing the number of predictors in the model, so an adjusted R-squared is used to prevent this. Using the adjusted R-squared value can avoid overfitting the value, as it

takes into account the number of predictors and penalizes models with a large number of predictors.

Table 2. Comparison of models

Model Summary ^c			
Model	1	2	
R	,563 ^a	,568 ^b	
R Square	,317	,323	
Adjusted R Square	,309	,309	
Std. Error of the Estimate	1,8458079	1,8455635	
Change Statistics	R Square Change	,317	,006
	F Change	41,620	1,030
	df1	5	4
	df2	449	445
	Sig. F Change	,000	,391

a. Predictors: (Constant), Part-time or full-time students, Type of finished high school, Gender, Age, Sum of high school score and state exam score
b. Predictors: (Constant), Part-time or full-time students, Type of finished high school, Gender, Age, Sum of high school score and state exam score, Croatian Counties, Grade point average, Living or not in Požega Slavonia County, Finished or not High School of Economics
c. Dependent Variable: Duration of study

The first model consists of five predictors: total score (high school score plus state exam score), type of finished high school, gender, age at the time of enrolment, and type of study (part-time or full-time).

The R-squared change score shows the improvement in R-square when a new predictor is added. In this very case, for the second model it is only ca. 0.01 which is almost a negligible improvement over the first model. This allows the remaining predictors to be ignored: counties of Croatia, grade point average, PSZ_in_out (residence in Požega-Slavonia County or not), Economics_in_out (finishing high school of economics or not).

The most effective multiple linear regression model is established between the dependent variable "duration of study" and the predictive variables: total score (high school score plus state exam score), type of finished high school, gender, age at the time of enrolment, type of study (part-time or full-time), as presented in the first model in Table 2. Overall, this means that the duration of study is influenced by age, gender, total score (high school score plus state exam score), type of finished high school, age at the time of enrolment and type of study (part-time or full-time).

Table 3. Correlation between the duration of study and other predictors

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13,019	,798		16,310	,000
	Part-time or full-time students	-1,884	,318	-.410	-5,921	,000
	Age	-.121	,018	-.328	-6,730	,000
	Gender	-.854	,219	-.153	-3,899	,000
	Type of finished high school	,049	,024	,081	2,065	,039
	Sum of high school score and state exam score	-.002	,001	-.254	-3,984	,000

a. Dependent Variable: Duration of study

Table 3 shows the contribution of the five optimal predictors to the duration of study. The beta score in the column of standardized coefficients shows the influence of the predictor on the dependent variable when the variance explained by all other predictors in the model is subtracted.

The highest absolute value is scored by the type of study (part-time or full-time) which has the greatest influence of -0.41. This means that if the predictor that reflects the type of study (part-time or full-time) increases by one standard deviation, and other predictors remain constant, then the duration of study will decrease by 0.41 of standard deviations.

The column "Sig." shows that all five predictors make a statistically significant unique contribution (<0.05) to the final value of the duration of study. Unstandardized coefficients in column B are used to describe the model. The first number represents a constant, whereas other values represent the slope coefficient for each predictor. Using equation (1), the multiple linear regression model in this case is:

$$Y = 13.019 - 1.884 \cdot \text{type of study} - 0.121 \cdot \text{age at the time of enrolment} - 0.854 \cdot \text{gender} + 0.049 \cdot \text{type of finished high school} - 0.002 \cdot \text{total score}.$$

It can be noticed that the type of study, age and total score (high school score plus state exam score) have the greatest influence on the duration of study. The model implies that older full-time female students with better scores in high school and final exams will complete their studies in a shorter period of time.

Table 4 shows only variables that have a significant correlation with the duration of study for students who completed their studies within four years.

Table 4. Correlation between the duration of study and other predictors (within four years)

Correlations							
	Part-time or full-time students	Age at the time of enrolment	Gender	Grade point average	Finished or not High School of Economics	High school score	Sum of high school score and state exam score
Duration of study	Pearson Correlation	,276**	-,270**	-,171*	-,179*	-,209**	,174*
	Sig. (2-tailed)	,000	,000	,028	,022	,007	,026
	N	164	164	164	164	164	164

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

There is a low Pearson correlation at the 0.01 significance level between the duration of study and type of study (0.28), type of finished high school (-0.21) and age at the time of enrolment (-0.27). There is also a low Pearson correlation at the 0.05 significance level between the duration of study and gender (-0.17), grade point average (-0.18), high school score (0.17), and total score (high school score plus state exam score) (0.16). It can be concluded that the age at the time of enrolment and the type of study can be highlighted as the variables that have the greatest influence on the duration of studies (within four years).

Table 5 shows only variables that have a significant correlation with the duration of study for students who completed studies in more than four years (prolonged study duration).

Table 5. Correlation between the duration of study and other predictors (more than four years)

Correlations							
	Part-time or full-time students	Gender	High school score	Croatian language level B score	English language level B score	Mathematics level B score	State Exam score
Duration of study	Pearson Correlation	-,420**	-,178*	-,427**	-,382**	-,403**	-,401**
	Sig. (2-tailed)	,000	,002	,000	,000	,000	,000
	N	296	296	296	294	275	294

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

There is a low Pearson correlation at the 0.01 significance level between the duration of study and type of study (-0.42), total score (high school score plus state exam score) (-0.42), high school score (-0.43), state exam score (-0.40), English language level B score (-0.40), Croatian language level B score (-0.38) and mathematics level B score (-0.40).

A low Pearson correlation at the 0.01 significance level between the duration of study and gender (-0.18) is also observed. Therefore, it is evident that the high school score, the total score (high school score plus state exam score) and the type of study can be highlighted as the variables that have the greatest influence on the duration of studies in the context of studying for more than four years.

By comparing the previous two tables, some differences and similarities can be observed. The type of study (part-time or full-time) has a positive correlation in the case of students who completed their studies within four years. On the other hand, students who study longer than four years have a negative correlation for the type of study.

It means that full-time students who study longer than four years finish their studies earlier, although not within four years. In both cases, female students finish their studies earlier than their male colleagues, regardless of the duration of study.

4 Limitations and future research

The main limitation of this research is the small number of students who participated in the survey, and especially the small number of students who studied for longer than four years.

Therefore, it was not possible to make a comparison with students who finished their studies earlier. For future research the authors plan to consider the inclusion of students from similar institutions and from other geographical areas so that comparisons on multiple levels can be made.

5 Conclusion

The aim of this research was to analyse data related to the influence of various motivational factors and to predict optimal factors that impact the duration of study in the case of a professional 3-year study program.

The research was conducted on students of professional studies in the field of economics, at the Faculty of Tourism and Rural Development in Požega. It was based on two studies: i) on subjective data (survey) among 29 former students who already finished the three-year professional study in economics, ii) on objective data on 460 students who finished the professional study of economics in the period from 2013-2018 – extracted from ISVU (Information System of Higher Education Institutions).

Results of the first study show that students who finish their studies on time, agree or strongly agree that continuing education (82%), desire for employment (73%) and personal satisfaction/advancement (91%) are very important motivational factors for completing their studies. Also, family (59%) and distance from home (50%) are highlighted as well.

Results of the second study show that full-time students younger than 20 years, with an average grade less than 3.5 from outside of Požega-Slavonia County, are more motivated to complete their studies on time, according to ISVU data.

There is a significant difference between students residing in the Požega-Slavonia County and those outside it, which directly affects the costs of studies and living. This is a clear important motivational factor for students from outside the county to complete studies on time.

When analyzing correlations between the duration of study and fifteen variables, the results show a significant correlation at the 1% significance level for factors that influence the duration of study for the following variables: type of study (part-time or full-time), total score (high school score plus state exam score), English language level B, Croatian language level B and mathematics level B.

The multiple linear regression model discovers five optimal factors for predicting the duration of study. Type of study (full-time or part-time), age and total score (high school score plus state exam score) have the greatest impact, followed by the type of finished high school and gender.

The multiple regression model also predicted that older female full-time students with better grades from high school and final exams will finish their study in a shorter period of time.

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