

## NATIONAL EXAMINATION SCORES AS PREDICTORS OF UNIVERSITY STUDENTS' PERFORMANCE IN ESTONIA

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**Abstract.** The current article gives an overview of the academic performance of economics and public administration students at Estonian universities and colleges who enrolled in 1998 and 1999. The academic performance is analysed in the context of the length of study time. The aim of the study was to test the impact of academic skills (national examination scores upon leaving secondary school were taken as the basis) on the success of further studies. The hypothesis was that students with lower national examination scores either study longer or interrupt their studies more frequently than students with higher examination scores. The analysis showed that the main factor of progress at the university was not the students' pre-university academic capability. The study suggests that the students' progress is largely influenced by the type of funding and by the kind of university or college attended.

**Keywords:** Higher education, length of study time, national examination scores, public universities, private universities

### 1. Introduction

The efficiency of teaching at universities and colleges is a frequent topic of public discussion in Estonia and other countries. The question of why student drop-out rates vary across different higher educational institutions is an important issue from the perspective of educational policy coordinators as well as for every student. For example, six year graduation rates are commonly used in U.S. to measure efficiency in different types of universities. The studies show that public universities have lower completion rates than private institutions there. Scott et al. (2006) criticise this approach and argue that public colleges are able to do more with less. They show that with equivalent resources and student populations, the percentage of graduating students in public schools would be slightly larger than in private schools.

The completion rates of private and public universities in Estonia do not show the same pattern as seen in the U.S. Completion rates in Estonia are lower in

private universities than in public universities. So the results of the studies in the U.S. are not directly applicable to Estonian conditions. But still the question remains: if the financing and the abilities of the students were held constant in Estonia, would the completion rates of private schools still remain lower?

Most students start their studies with the aim to graduate successfully. But during the time of study they become subject to risks that can hinder the completion of their studies. The most notable of these risks are changing the major, interrupting the studies and (final) exams (Meulemann 1995:174). These risks occur in different periods of the study time. The current article concentrates on the risks of interrupting and lengthening the studies.

Extension and interruption of studies can be examined on the level of the individual or on the level of the institution and society. The reasons for interrupting or extending the studies can be individual or institutional. Individual reasons include academic abilities, motivation and life course. Institutional reasons are connected with the university or college the student attends and educational policies. According to Meulemann (1995), the main reasons behind the interruption of studies are individual and not institutional. However, passing or failing exams does depend on the conditions at the particular higher education institution.

### *1.1. Institutional reasons of incomplete studies*

A number of institutional reasons of incomplete studies can be mentioned. Research has particularly focused on the quality of teaching, the regulation of studies and resources needed for teaching and learning (Desjardins et al. 2002, Hall and Harper 1981, Schröder-Gronostay 1999). Other possible factors are the unclear structure of the organization, the insufficient preparation of the academic personnel and bad organization of exams (Lewin 1995, Selzer 1985). Examination of these factors has suggested that students from bigger and state-financed universities should have a lower risk of interrupting or prolonging their studies. The admission and student funding policy of the university can play also an important role. For instance, self-funding students are less likely to drop out (Smith and Naylor 2001).

### *1.2. Individual reasons for incomplete studies*

While analysing the students' progress at a higher education institution, pre-university variables should be considered. Many researchers focus on the students' results and academic abilities as factors of interruption and prolongation of the studies (Aitken 1982, Giesen 1981, Gold 1988). The research shows that the higher the university student's average high school grade in mathematics or sciences, the more likely the student is to graduate in time (Baron-Boldt 1989, Giesen 1981, Meulemann 1995). In addition, low academic abilities are considered to be one of the most important factors that could result in prolongation and interruption of studies. The links between students' academic abilities and drop-

out rates were thoroughly documented in the USA (Bean and Kuh 1984, Cohn et al. 2001, DesJardins et al. 2002, Francis and Kelly 1990, Kuncel et al. 2001, Smith and Naylor 2001).

### *1.3. National examination scores and the type of university as drop-out factors*

Since the school marks are widely seen as an unreliable criterion for predicting the long-term success at the university, national examination scores are used as the basis for university admission in Estonia. Admission criteria vary between universities and can also be seen as a factor connected with study outcomes of students. A number of studies have demonstrated that drop-out rates are higher at universities and in the fields where the admission threshold is lower (DiPietro 2004, Reissert and Birk 1982, Reissert and Marciszewski 1987).

Kenneth Arrow has developed another approach to the relationship between national examination scores and later success in his filter theory (1973). Arrow states that the results of the final or national examinations are important only at the moment of university enrolment. He argues that the higher educational institution serves as a screening device, which sorts individuals according to their abilities thereby giving information about students to their future employers. His model is designed to support the view that the diploma serves primarily as a measure of performance ability rather than an evidence of acquired skills. This implies that higher education contributes in no way to economic well-being, neither does it increase cognition or socialization. However, Arrow does not intend to state that education is only a screening tool. Professional schools definitely provide students with real skills that are valued in the job market and so do undergraduate studies in sciences. But the case is less clear in the field of humanities.

### *1.4. Other factors*

The findings on the gender difference in student performance are controversial. Meulemann (1995) argues for Germany that women tend to interrupt their studies more frequently than men. At the same time men are more likely to extend their studies above the nominal time. DiPietro (2004) did not find an important difference between male and female student drop-out risks in Italy. DesJardins et al. (2002) again found that graduates are more likely to be female and dropouts male. In Estonia the educational level of women has been higher than that of men for decades (see Kenkmann 1990). As research has shown that women's return to higher education have risen faster than those for men in last years (DiPrete and Buchmann 2006), it can be expected that the risk of interrupting or lengthening the studies is higher for men in Estonia.

Gary Becker's human capital theory (1964) might clarify the impact of another factor, taking up a job during the study time, on the university performance of students. According to Becker, education and training are the most important investments in human capital. College and university education usually raises the

person's future income. But there is also a price to pay for higher education: students are not on the labour market for longer periods and incur opportunity cost in terms of forgone income. So studying in a college or university is beneficial provided that the future income of the student is higher than the income of those who have not studied plus the earnings they have made during the study period (Becker 1993). Therefore, the study period should be as short as possible and the interruption or lengthening of studies should be avoided because it would hold the person away from the labour market and thereby decrease lifetime earnings. Taking up a job while studying would make the students concentrate less on the studies and as a result of that prolong the study period. Therefore it has been identified that taking up a job during the study period frequently does not maximize people's lifetime earnings (Franzen and Hecken, 2002).

At the same time, taking up a job while studying might be an economic necessity. In this case, working is a necessary prerequisite that enables a person to graduate. Here, taking up a job is seen as an investment in human capital. Taking up a job during one's studies certainly has positive sides. It gives students knowledge about the labour market and social contacts that can facilitate their further careers.

### *1.5. The research problem*

This study examines whether national examination scores predict the success of studies in higher education institutions (measured as completing the studies in nominal time, lengthening the studies or interrupting the studies). Thus, our research question is whether the students with lower national examination scores lengthen or interrupt their studies more frequently compared with the students with higher national examination scores. Another research question is whether the factors that influence the study time and success are rather individual (students' academic skills should be in accordance with national examination scores) or institutional (the standards set for advancement at higher educational institution, tuition). The influence of other variables (gender, language, type of educational institution and funding) on the success of studies is also considered.

## **2. Data and methods**

The current analysis is based on the data of student registry of the Estonian Ministry of Education and Research. The students who entered the economics and administration areas of different Estonian colleges and universities in 1998 and 1999 make up the set under consideration. It includes 5726 students from 14 colleges/universities and 51 study programmes. The data, current as of July 7, 2004, report whether and when the student has graduated; whether and when the student has interrupted the studies; whether the student is continuing the studies. The maximum nominal study time in these study programmes was 5 years.

In addition to the above-mentioned information, the data about post-graduate studies in Estonian universities were examined.

Descriptive statistics and regression models were used for data analysis. Four sub-groups were compared in the category of students:

- 1) Students who completed their studies in nominal time.
- 2) Students who did not complete their studies in nominal time but did it a year later.
- 3) Students who did not complete their studies in nominal time or during the year after the nominal time but have not terminated their studies.
- 4) Students who have terminated their studies.

Two sub-groups were compared in the category of graduates:

- 1) Students who started Master's studies.
- 2) Students who did not start Master's studies but graduated from the diploma or bachelor programme.

On the basis of these classifications, logistic regression models were constructed in order to predict the relative probability of graduating and entering the Master's level. The dependent variables are constructed on the basis of the above mentioned graduation categories and coded so that the reference categories were respectively students who completed their studies in nominal time and students who did not enter the Master's level.

The independent variables included the type of university (public or private), the type of funding, national examination scores, gender of the student and language of studies. For a number of students the information about the language of studies was not available and these students are left out of the models of graduation from the bachelor level.

Regrettably, many substantial individual level factors of graduation or termination of university studies (like the economic and family situation of an individual) cannot be included to the models in the current analysis due to the lack of such data in the registry. But in case e.g. longitudinal data is available, the inclusion of such variables in the analysis of university students' performance should be certainly advocated.

### *2.1. National examinations in Estonia*

In order to graduate from the gymnasium (secondary school) in Estonia, one has to take final examinations in the 12<sup>th</sup> grade. The exams are school exams and national exams. The national examinations are composed and graded outside the school and are identical all over the country. They are supposed to give an objective picture of the mastery of the national secondary school curriculum. The examination scores are valid during the whole lifetime of the examinee.

If young people want to study at a public university and get free state-funded higher education, they have to take and pass one or more national examinations. At the same time, many private universities do not necessarily have passing national examinations among their admission requirements.

The first national examinations in Estonia were administered in foreign languages: in 1995 in English and in 1996 in German. Essay and mathematics were first introduced as national examinations in 1997.

### 3. Results

Data about more than 5700 entrants in the fields of business and administration in the years 1998 and 1999 were available for our analysis. 63% of the students studied in private and 37% in public universities. More than 5000 students paid for their studies themselves, 11% of students did not have to pay for their studies. Students' distribution by the type of university and funding is shown in Table 1.

**Table 1. Distribution of students by the type of university and funding**

	N	Percentage
Private university, tuition fee	3629	63.4%
Public university, tuition fee	1446	25.3%
Public university, no tuition fee	651	11.4%

As to the completion of studies, the situation was the following:

- 1) Completed studies in nominal time – 34.6%
- 2) Did not complete studies in nominal time but did it a year later –8.0%
- 3) Did not complete studies in nominal time or a year later– 24.9%
- 4) Terminated the studies – 32.5%

By the summer of 2004, 291 people (5% of graduates) had started their Master's programme.

#### *3.1. Factors influencing the completion of studies and starting the Master's programme*

Three main factors influencing the completion of studies are analysed in this article. These include the type of university (public or private) and the type of financing as institutional indicators and national examination scores as an individual indicator.

The state-funded students of public universities showed better progress in their studies (Table 2). The students paying tuition fee in public universities followed. Three out of four students of private universities did not complete their studies within the nominal time.

The graduates of public universities were more likely to continue to Master's programmes than the graduates of private universities. While only 3% of private university graduates continued their studies at the master's level, 9–10% of students from public universities did.

**Table 2. Length of studies by the type of university and financing**

	Private university, tuition fee	Public university, tuition fee	Public university, no tuition fee
Nominal time	27.8%	46.4%	46.3%
Nominal time + 1 year	6.9%	7.6%	14.5%
Not finished in nominal time + 1 year	26.8%	21.5%	22.5%
Studies terminated	38.5%	24.5%	16.8%

National examination scores were not available for all students under study. The reason is that not all university study programmes required passing national examinations in the years 1998 and 1999. The essay results of 2760 students, the foreign language results of 2467 students and mathematics results of 1802 students were available. Since students were free to choose which national exams to take (except the essay that all students had to write), the samples of students choosing foreign language and mathematics are not identical. Possibly students with lower academic abilities did not dare to take the mathematics examination.

Table 3 presents the average national examination scores and the length of studies.

**Table 3. Average national examination scores, the length of studies and starting Master's level (students who have finished their studies), maximum 100 points.**

	Essay	Foreign language	Mathematics
Nominal time	63.6	67.4	46.3
Nominal time + 1 year	66.1	71.7	50.4
Not finished with nominal time + 1 year	59.7	66.0	44.2
Studies terminated	57.7	61.1	35.4
Continues studies on Master's level	69.6	71.4	50.5
Does not continue studies on Master's level	63.2	67.9	46.3

When comparing the averages, it appears that students extending their studies up to one year beyond nominal study time have had the best national examination scores in all 3 subjects. Students who completed their studies in nominal time followed. Students who did not finish their studies in nominal time plus one year or terminated their studies had the lowest national examination scores. Thus, it seems that the national examination scores indeed differ between those who complete their studies from those who do not.

Comparing the average national examination scores of those who continued their studies in a Master's programme and those who did not, it can be seen that the former had significantly higher scores.

Since the admission requirements of the Estonian universities vary, it can be supposed that the impact of national examination scores and types of universities should be analysed together. Logistic regression models of lengthening or terminat-

ing the studies and continuing at Master's level were estimated for this purpose. The reference categories are students who completed their studies in nominal time (Table 4) and students who did not continue at Master's level (Table 5).

**Table 4. Logistic regression models for predicting completion of studies with: nominal time + 1 year (N+1), more than nominal time + 1 year (N+more) and studies terminated (T). Reference category is "Completion of studies with nominal time". Odds ratios (exp(B)) are shown in the table.**

	Model 1			Model 2		
	N+1	N+more	T	N+1	N+more	T
<b>National examination scores</b>						
Foreign language	1.01**	1.003	0.994*			
Mathematics				1.007	1.008**	0.993*
<b>Type of university</b>						
Private university, tuition fee	1.25	1.85**	3.96**	1.25	2.17**	2.77**
Public university, tuition fee	1.14	2.15**	2.70**	1.12	2.95**	2.39**
Public university, no tuition fee	1	1	1	1	1	1
<b>Gender</b>						
Male	1.53**	2.00**	2.16**	1.40	1.96**	1.87**
Female	1	1	1	1	1	1
<b>Language of instruction</b>						
Estonian	1.51	1.67**	1.38*	1.74*	1.63**	0.99
Other	1	1	1	1	1	1
Constant	-2.67	-1.58	-1.21	-2.12	-1.89	-0.82
N	2331			1710		
Nagelkerke R <sup>2</sup>	0.108			0.112		
Chi-square	245.8**			187.7**		
Degrees of freedom	15			15		

\*  $p < 0.05$ ; \*\*  $p < 0.01$

The results from Table 4 show that national examination scores, type of university and funding, gender and language of studies are all important predictors of lengthening or terminating the studies. (Only the results of mathematics and foreign language national exams were analysed because the pattern of essay scores was similar to those.) The higher the score of foreign language examination, the higher the risk of completing the studies later than nominal time compared to completing the studies in nominal time (model 1). The increase in foreign language examination score by one point increases the risk of completing the studies a year later by one per cent. Also, the increase in foreign language examination score by one point decreases the risk of terminating the studies by 0.6%. Higher mathematics examination scores increase the risk of failure to complete the studies in nominal time plus one year (compared to students completing their studies in nominal time) and decrease the risk of terminating the studies (model 2). So it can be seen that students with higher national examination scores have a lower risk of terminating their studies but do not have a lower risk of lengthening the studies.

Students who have to pay for their studies have a significantly higher risk to lengthen the studies by more than one year and to terminate the studies. It is also remarkable that the risk of terminating the studies is almost 4 times higher among private university students than among students of public universities who do not have to pay tuition fee (model 1).

The risk of lengthening the studies is considerably higher among male than female students. Model 1 shows that males are at a 53% higher risk of lengthening the studies by 1 year beyond nominal time, a double risk of lengthening their studies for longer than 1 year and an even higher risk of terminating the studies (compared to completing the studies in nominal time).

Comparing the students studying in Estonian and other languages (mostly Russian), it can be seen that students studying in Estonian have a higher risk of lengthening the studies for more than one year and terminating their studies. But it must be said here that there is a very low proportion of students studying in other languages in public universities (7% compared to 45% by students studying in Estonian). So the issue of multicollinearity can be raised. Models without the variable of study language were constructed for this purpose, but the dimension of the results by school and funding type, examination scores and gender did not change notably.

Models were also built in order to describe the impact of national examination scores and gender on the study performance of different university and funding types separately (not shown here). The results were similar to models 1 and 2. The only differences were that higher mathematics examination scores reduced the risks of terminating the studies and lengthening the studies by more than 1 year in private universities. It could also be seen that the risk of terminating the studies was not different for males and females not paying for their studies in public universities. At the same time, for other universities and funding types males were under a higher risk of not completing their studies in nominal time.

The only significant factors predicting continuation of studies at the Master's level were the type of university and funding on the bachelor/diploma level (Table 5). The odds of entering the Master's level are the lowest for students who studied on the bachelor/diploma level in private schools. It is slightly more than 40% of the odds of public university students who did not pay tuition. When comparing the students who had to pay their tuition, no significant differences could be discovered.

We found no significant gender difference in the odds of entering the Master's level. Females complete their studies earlier than males and terminate their studies less frequently than males but the difference disappears on entering the Master's programme.

The variable of language was not entered into these models because the number of Master students studying in a language other than Estonian was too small.

National examination scores before entering the university do not affect the entrance to Master's level after the impact of the initial university and funding type is considered. In a model with no other arguments than the national examina-

tion score, the higher foreign language examination score increased the odds of entering the master's level.

**Table 5. Logistic regression model for the odds of starting the Master's programme (reference category: finished the studies but did not enter the Master's level). Odds ratios (exp(B)) are shown in the table.**

	Model 3	Model 4	Model 5	Model 6
<b>National examination scores</b>				
Foreign language	1			1.01*
Mathematics		1		
<b>Type of university</b>				
Private university, tuition fee	0.44**	0.47**	0.43**	
Public university, tuition fee	0.87	1	0.85	
Public university, no tuition fee	1	1	1	
<b>Gender</b>				
Male	0.94	1.01		
Female	1	1		
Constant	-1.66	-1.57	-1.55	-2.69
N	1052	792	1052	1052
Nagelkerke R <sup>2</sup>	0.032	0.027	0.031	0.008
Chi-square	17.9**	11.8*	17.7**	4.3*
Degrees of freedom	4	4	2	1

\*  $p < 0.05$ ; \*\*  $p < 0.01$

#### 4. Discussion

The results show that the students' performance at the university is influenced by both individual and institutional factors, yet the latter are more important. The university or college which students enter on the basis of their national examination scores has a significant impact on their study performance. The students of public universities showed the best performance, students from private universities lengthened or terminated their studies more often.

The results do not support the idea that students with higher academic abilities (measured in national examination scores) complete their studies more often in nominal time than the students with lower academic abilities. As it could be seen, students with the highest national examination scores did not complete their studies very frequently in the nominal study time and tended to exceed the nominal time. At the same time, students with lower national examination scores tended to terminate their studies slightly more often than other students. These results are in compliance with those of Baron-Boldt (1989), Cohn et al. (2004), Giesen (1981), Kuncel et al. (2001) and Meulemann (1995).

A possible explanation for the impact of institutional factors like the type of university and funding is that public universities tend to be stricter in their requirements for the qualification of lecturers, study materials, regulations of examina-

tions and graduation. It means that public universities expect a more serious commitment from their students than private universities. As a result, both public universities and their students value quality.

The other explanation is that competition, especially for state-financed places, in public universities is higher than in private universities. So the public universities can select students with higher academic abilities. The current study reflects this tendency. In this sense the results are in accordance with Arrow's filter theory (1973). In his theory Arrow states that the most important function of higher educational institutions is not creating an added value but selecting students with certain abilities and to give them appropriate certificates. Later on this certificate gives the employer information about the abilities of potential employees. Our results also suggest that after the selection procedure, the individual differences in abilities do not play a big role.

The tendency of students with higher examination scores to exceed the nominal study time (but not terminate their studies) can be explained in light of the economic situation of the current period in Estonia. Since the students analysed here were mostly from the field of economics and administration, possibly many of them, especially people with better social capital, tried to start their own business or started their career already during their studies. Starting a family as a competitive process to studies or spending part of the studies abroad could also explain these differences. Regrettably the data did not allow testing these impacts.

The previous explanation of a parallel career could also be relevant for the gender difference is the duration of studies. Females indeed completed their studies earlier than males and also terminated their studies less frequently. The result is in accordance with the former results of DesJardins et al. (2002) and DiPrete and Buchmann (2006). But the difference vanishes when Master's studies are concerned. So probably the proportion of academically-oriented people is about the same among male and female students.

The lengthening of study time by students studying in Estonian can be explained by the difference in university and funding types between students studying in Estonian and in other languages. But the alternatives to studying (like finding a job or starting a business) are different for those who do and who do not have an adequate command of the Estonian language for the studies in a public university. But these differences are too complex to discuss them here in detail.

## **5. Conclusion**

On the basis of the results of the current study it can be concluded that institutional factors play an important role in predicting the performance of university students. Individual factors measured by national examination scores do not have a major impact after the type of university and funding are considered. But the impact of national examination scores is decisive while selecting the future university students. Public universities, especially with state-funded places, admit

students with higher national examination scores. Private universities, where the admission requirements are less strict, get students with lower academic abilities. After admission, national examination scores do not have a major impact on the performance of students within the same type of university.

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