

Determinants of access to higher education in  
Ukraine: the case of National University of  
“Kyiv-Mohyla Academy”

by

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Abstract

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This thesis paper defines and examines different socioeconomic, personal other factors which influence the applicant’s access to higher education establishments in Ukraine. From the data of the Entrance Examination Committee of the National University of “Kyiv-Mohyla Academy”, I have distinguished the list of determinants that have the most significant impact on the probability of the applicant to be enrolled into the university and win the state financed place. Also, the existence of the “Fan-spread” effect and the absence of the “Matthew” effect in Ukrainian educational market were proved. For empirical estimation, I have used the binomial logit regression model. The received results are mostly consistent with earlier findings, economic and sociologic intuition and logic.

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## GLOSSARY

**Gymnasium** - (private or public) secondary education establishment which provide students with extended learning of (mainly humanitarian) subjects.

**Lyceum** - (private or public) secondary education establishments which has an extended and often individual educational plan according to the subject concentration (mainly technical).

**Specialized school** – (private or public) secondary education establishment which reflects the mix of gymnasium and lyceum characteristics.

**Simple public school** – public secondary education establishment which function only under full control of Ministry of Education and Science of Ukraine.

**“Fan-spread” effect** – arises when the rate of future gain is relative and proportional to initial endowment.

**“Matthew” effect** – arises in the case when the rich get richer and the poor get poorer.

## *Chapter 1*

### INTRODUCTION

From the very beginning of transition from planned-oriented to market economy, the Ukrainian educational system has faced drastic changes in the educational market. These changes were concerned with moving from soviet-type system of education to a western-type one. Alongside with tremendous fall in the rate of economic growth, hyperinflation and huge unemployment, destructing of the stated owned educational industry was very complex and sometimes very painful process.

In the past soviet times educational system had the goal to prepare specialists for plan-oriented economy and required little understanding by graduates of how market and business work, how competition determines the prices etc.

The soviet youth did not faced the vital problem of deciding where to go to study, what degree to pursue, what wage to receive because the state provided people with enough means to live. The Soviet ideology tried to make people think in narrow way and live in equal conditions (in socialistic society) with the brightest thoughts about the future. But since soviet republics gained their independency, all sectors of economy took the direction of substantial reforms and the process of total restructuring. This process of transition touched the

whole educational system as well. Market economy required more and more well-trained specialists in all sectors of economy but higher education institutions were not ready to satisfy this correspondingly increased demand. The reason was the decreased budget financing of secondary education, no attention to any school innovations, low salaries of teachers, narrowing school programs etc. Such situation created the possibility for other secondary education establishments to appear. The quality of schooling began to differ throughout the country. Therefore, the university applicants began to represent a very heterogeneous group of graduates from secondary educational institutions. Moreover, the inequality in possibilities to enter the university began to rise due to different social, economic and educational backgrounds of young people.

From the very beginning of the transition the quality of secondary education hardly corresponded to the western standards. The curriculum of the secondary schools on the post soviet space continued to be much different from western ones.

Another important issue is about the early specialization of the western secondary schools that gives the possibility for young people and their parents to choose the proper direction of educational development in advance due to variety of current factors, preferences and rational expectations. In Ukraine the process of secondary education is overburdened by the variety of different subjects with compulsory and often not very relevant studies that makes the problem of choice more difficult. Besides, young people often meet the problems to continue their education at higher educational institutions according to employment uncertainty,



family financial state, lack of necessary knowledge and high competition for state-financed places at the Ukrainian universities. Therefore, the average Ukrainian applicant from the ordinary public school has reduced chances and opportunities to win state-financed place at a university holding all other applicant's characteristics equal.

Discussing the educational background and its influence on the success of the applicant to be admitted to the university, we also have to mention such important issue as financial side of our question of interest. Nowadays in Ukraine any Acceptance Examination Committee doesn't take into consideration income level of the applicant due to difficulty of checking it precisely. This issue is out of any discussion and only a negligible part of the applicants from low income families (very often these people are the representatives of socially unprotected such as orphans and physically disabled) get the subsidies from the government to pursue the higher education.<sup>1</sup> As a result "The Matthew effect" might arise what will be discussed later in this paper.

With this diploma paper I would like to determine the factors which influence the probability to be enrolled into the university in Ukraine and win the most demanded state-financed place. The peculiarity of Ukrainian higher educational system is that it offers the state-financed places and self-financed places for all the applicants. State-financed places can be offered on the general and highly competitive entry examination base. Self-financed places can be

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<sup>1</sup> <http://www.me.gov.ua/>

offered to applicants on the much lower competitive entry examination base according to the educational abilities of the applicant and possibility to cover the tuition fee for the whole period of education. In short: when the applicant really did demonstrated very high score during the entrance exams – he or she is offered to be enrolled for free, otherwise applicant has to pay full tuition fee.

Another purpose of this study is to test an existence of the so called “Matthew” effect in Ukraine conditionally on one specific university. More precisely I will check whether the children of relatively rich parents get state-financed places at university but relatively poor parents have to pay for the education of their children.

My paper proceeds as follows: in the second chapter I give the brief description of main studies related to the topic, summarize the results and conclusions of these papers. In my third chapter, the discussion on the necessary data is presented, providing the reader with the all characteristics and peculiarities of the dependent and independent variables. Also, based on the literature review here I give my brief and preliminary expectations about the explanation power of my variables. During the fourth chapter, I introduce and discuss methodology that will be used in the process of my result’s estimation. Fifth chapter presents detailed discussion about received results alongside with their socioeconomic interpretation. Chapter six delivers to the reader the main outcomes of this paper, importance of this research and its further possible implication. Other interesting and important outcomes are reflected in the appendices.

## *Chapter 2*

### LITERATURE REVIEW

In the literature review, I would like to give a brief description of current situation on the Ukrainian educational market and point out the most crucial factors which determine the applicant's success during the acceptance campaign at the universities. Then I provide the description of the most interesting for me and relevant to my topic studies. In addition, I briefly present the meaning of "Matthew" effect and "Fan-spread" effect and investigate the most relevant papers on this topic as well. I use the results and conclusions of these papers for further consideration of my structural model and evaluation of my received results.

Before starting the discussion about determinants of success during the entrance campaign to the universities, I want to discuss some preliminary and basic stages that precede the applicant's decision about applying to higher educational establishment.

Ukraine's education system suffered greatly from the country's years of economic collapse. "A drop in funding and salaries for education, along with deteriorating schools, brought about a decline in the quality of education", (Derkatch, 2005). Such situation on educational market in Ukraine is not unexpected due to many economic problems and political instability which our

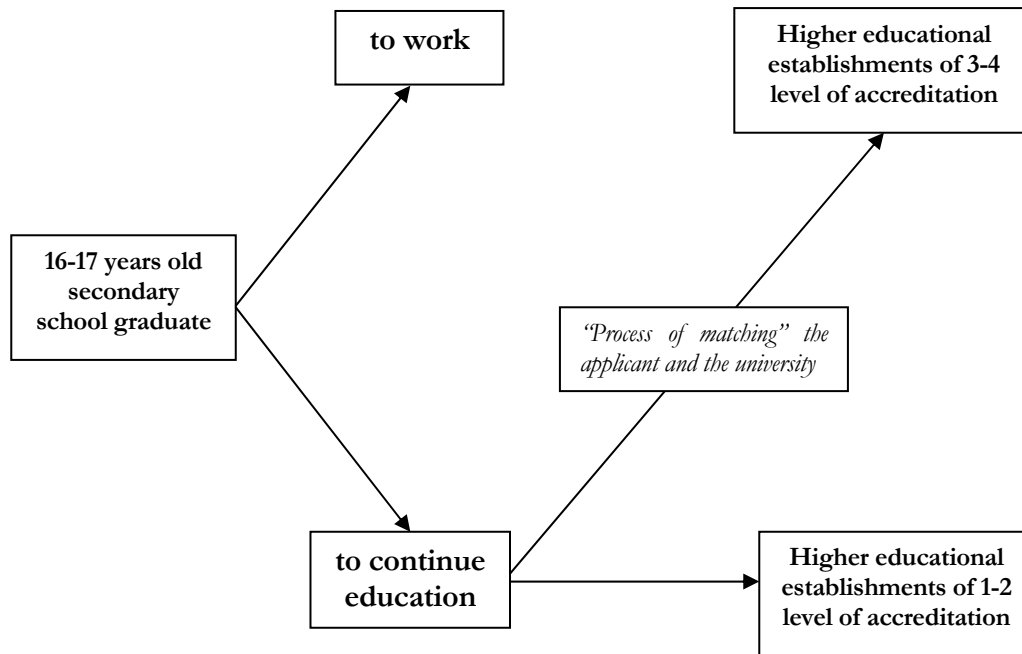
country faced during its independence. Educational endowment into the productivity country's was explored by Medvedev in 2005 where the author showed the existence of the relation between such economic indicator as GDP growth and years of schooling for transition countries.

Coming back to the usual for young question about decision whether to apply to the university or not is rather complicated (Stafford and Lundstedt, 1984). After graduating from the secondary school, person has two general alternatives: to continue his or her education or to go to work. In Ukraine, situation with employment is rather difficult and the minimal salary of the worker is rather small to live without any external support.<sup>2</sup> Therefore, very often youth in Ukraine decide to continue their education to target higher salaries in the future and increase their expected income. Nowadays statistics show that more than 70% of school graduates continue their education at the institutes and universities (Igortseva, 2004). Moving further, the problem where to go to study arises. Here, any applicant has the variety of alternatives: colleges, institutions, academies, universities, various specialized programs, business schools etc. On this stage, the decision "where to go to study" influences greatly the future career of the person. Such university choice is very important. The "process of matching" the person and university according to different personal and institutional characteristics starts (DesJardins, Ahlburg and McCall, 2003). On this

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<sup>2</sup> The minimal wage of 237 UAH (45\$) was set for 2004 according to Ukrainian Parliament's resolution in 2003. [www.rada.gov.ua](http://www.rada.gov.ua)

stage set of factors which influence the admission process is one of the points of this thesis interest. Shortly and schematically the process of decision-making is reflected in the following scheme:



To point out the possible determinants of applicant's successful admission I investigate the papers concerned with this subject.

Let me start from the one of the most interesting papers by Botelho, Pinto, Portela and Silva (2001). This study determines the success factors in university entrance in Portugal. The authors use questionnaire data (2356 observations) to define how much social and economic characteristics of the admitted students differ from those who were not enrolled into the higher

educational establishments. Using the binary data estimation method (probit) they found:

- one unit increase of applicant's grades from previous education increases the probability to enter the university by 6%;
- applicants who got the general secondary education were less likely to enter (-11.2%) in comparison with those who graduated from schools with taking technical, art or vocational specific courses;
- being a female decreases the probability of successful admission by 5.7%;
- applicants' residence matters little ( 3 out of 5 regional dummies were insignificant);
- the age of applicant has no explanation power;
- no influence of parental education;

The authors states that success of Portuguese applicants is determined by the ability (grades from secondary school), secondary school choice and personal characteristic such as gender. This interesting outcome is considered during the interpretation of my results later.

One more study by Maton (1966) discusses the factors which influence the rates of participation in secondary and higher education. Author assumes that income per head (I), distance to school or university (R), demand for technically trained personnel (D) matters in the education participations. Looking at the factors that influence the participation in general (not technical) university

education he shows that income per head (I) has significant explanation power. On the other hand the demand for technically trained personnel (D) increases the rate of participation in higher technical educational institutions. The distance coefficient (R) for university turned out to be insignificant. Therefore, such characteristic as “where the applicant came from” does not influence the rate of higher education participation in Belgium.

Actually, we can consider many other factors and impediments which influence the participation in the higher education worldwide. The paper by Lopez-Valkarel and Quintana (1998) reveals the most significant obstacles that prevent Spanish youth to continue their education in the higher educational establishments. For empirical estimations authors use the model which combines human capital theory and discreet choice models to determine the influence of different economic and social factors on the probability to be admitted into the Spanish university. Having 8651 of observations and using the logit for discrete dependent variable (enrolled or not enrolled) in their estimations Lopez-Valkarel and Quintana (1998) concluded that income of the family is to be the highly important determinant which influences the decision of the applicant to continue the education. The probability of the applicant to be enrolled increases by 9% in case his family faces an increase in income by one unit (in the paper this unit of income is equivalent to 100.000 pesetas). Authors note that children from high-income families have the higher probability to be admitted into the university rather than their peers from low-income families. This issue supports the idea of the presence of “Matthew effect” (will be discussed later) in Spain and thus

becomes an important point of interest in Ukraine and in my paper as well. Another important factor considered in the paper is educational background of the parents. It was shown that university educational achievement of the household head gives 23 times higher probability the applicant is being pursuing the higher education.

Also the authors found rather interesting effect about the origin of the applicants: people from rural towns and villages were less likely to be admitted to the university rather than youth from provincial (regional) capitals. However, authors state that the accuracy of these coefficients according to the confidence interval is not very high and these coefficients are only marginally significant.

According to gender characteristic, women in Spain are more likely to be enrolled into the university than men.

Looking at the regional level of unemployment the authors showed that local labor demand has no influence on the probability of specific regional group of youth to pursue the higher education in the universities. The explanation power of this coefficient turned out to be insignificant.

Discussing the educational level of the student's parents, in their paper Burnhill, Garner, McPherson (1988) stated that in Scotland from the 1976 to 1986 the level of parental education has been raising. It is evident that parental occupation and educational background is highly correlated. In this paper authors estimate the net effect of parental education and parental social position on the child's achievements in the attaining the higher education. First descriptive results showed that parental education of school-leaver (with high grades) increases.



“Among the leavers in 1976, 69% reported that both their parents had been schooled only to the minimum age (15 years or less). This percentage fell steadily to 52% in 1986” (Burnhill, Garner, McPherson, 1988). Alongside with the increase of parental educational background, authors state that the share of parents in blue-collar occupation decreased from 60% in 1976 to 47% in 1986. Introducing the logit analysis for the model estimation, they proved that parental education influences entry to higher educational establishments. The results show that among the students enrolled into the higher education, the category of parental education (up to 16 years or less of schooling) increased from 9% in 1976 to 20% in 1986.

Also it is necessary to mention paper by Battle (1997) that discusses the relative effect of married versus divorced family configuration and socioeconomic status on the educational achievements of their children. Happy marriage is considered to be a very strong social factor for children in such family and expected to have positive and significant effect on the children’s future activity. Author states that percentage of families in divorce increases over time and it leads to decline in social and economic background of children from such families. Social and economic background of children was constructed according to different personal and family characteristics. The estimated results actually show that children from families in divorce and with low social and economic background have lower rate of achievements to universities and lower rate of participation in pursuing the higher education. Therefore, we can assume that this fact also holds in Ukraine and in my further estimation I will include the variable

of family status into my final model. The significance of this estimator will show me the importance of this issue discussed above.

Discussing the “**Matthew effect**” and relying on the most interesting papers I have to mention that this effect was discovered in the late 60’s of the last century. The concept of the “Matthew effect” was developed by sociologist Robert K. Merton in 1968. He described this effect in his scientific works. The main idea of one of his papers “The Matthew Effect in Science” by Merton in 1968, was the following: very famous scientists often received more credibility than relatively less known researcher even if their research papers were quiet similar in the quality and context. As a final conclusion Merton stated that more famous people get more credibility from the human society. Now the common definition of this effect states that in the world the poor get poorer alongside with the rich get richer.

Also Matthew effect was tested by Tang (1996) in the area of pay differentials and by Bast and Reitsma (1998) who explored this effect on the personal reading skills in Dutch.

Thus in the light of higher education I assume that children from poor families have less probability to be admitted to the higher education establishment rather the children from the rich families because of different wealth endowments (Gregorio and Lee, 2002).

Other relevant paper concerned this topic is by Walberg and Tsai (1983). The authors broadly discuss the “Matthew effect” and “Fan-spread effect” in the educational process. “Fan-spread” effect states that rate of future gain is relative

and proportional to initial endowment”, (Walberg and Tsai, 1983). Here the authors imply the level of scientifically related activities is correlated with initial educational endowment. In this survey the authors investigate the relationship between the science-achievement score (as a dependent variable) and three different composite independent variables such as motivation, prior education and current educative experience. Motivation in this case implies the amount and intensity to learn current information acquisitions such as news media exposure and different readings, prior educative experience implies the parental socioeconomic status, respondent education, specific scientific trainings, current educative experience implies the level of different educational activities which the respondent is engaged with.

For the empirical estimation the representative sample of 1287 young adults and aging from 26 to 35 was taken using questionnaire survey by National Assessment of Educational Progress (NAEP) in 1977. After the creation of two three-term equations and applying the proper regression analysis the intercorrelation matrix was built. Interpreting the results authors stated that empirical estimations shows that “all these three composite factors contribute significantly and independently to the prediction of achievements”, (Walberg and Tsai, 1983).

Also the “Fan-spread effect” was tested and proved by Aarnoutse and Leeuwe (2000) in the field of elementary school education. Authors tested the presence of this effect comparing the reading skills of the young scholars.

Having overviewed all the above papers on the issue of the determinants of access to higher education, “Matthew effect” and “Fan-spread effect”, I can state that all factors which influence the applicant’s probability to be admitted into the university can not be regarded individually. In my work for estimation of significance of the success factors I check the determinants (or their proxies) which turned out to be powerful in the research papers discussed. The following applicant’s information is the point of my interest: age, gender, origin, previous education, type of school graduated from, ability, parental socioeconomic information (age, occupation, marital status). Also while working with the data I include more applicant’s characteristics which will help me to extend my model and provide the best goodness of its fit.

### *Chapter 3*

#### DATA DESCRIPTION

The goal of this part of work is to prepare the base for the methodology of empirical estimation, determine and describe the factors that are much likely to influence the probability of the applicant to be accepted into the university.

To estimate the potential access factors I have chosen the applicant data base of the National University of “Kyiv-Mohyla Academy”<sup>3</sup>. The data base in electronic form was taken from the Entrance Examination Committee of NaUKMA and other departments with the direct permit of NaUKMA’s rector Vyacheslav Bryuhovetsky. These data are confidential ones and they can be used only internally without any disclosing them to mass media. This university was chosen due to the most transparent entry condition. This advantage is very important because everyone can participate in the entering competition without any fear to be cheated (Igorseva, 2004). One more positive issue is the central location of the NaUKMA. It allows the distance factor to be proxy equal for applicants from the eastern, southern and western regions. Also I have to mention about some disadvantages which make our sample to be not very representative. The point is that NaUKMA is considered to be in the top 5 ([www.univer-sity.com](http://www.univer-sity.com)) of prestigious universities in Ukraine. Here I have to

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<sup>3</sup><http://ukma.kiev.ua>

Speak about self-selection effect which leads to the point that relatively best applicants try to apply. This issue was arisen from firsthand monitoring the applicant's data like 37% of applicants were awarded, 52% of applicants graduated from the relatively best secondary educational establishments such as gymnasiums, lyceums and specialized schools. Thus I can consider about some not quite representative sample as well.

Before introducing the description of my data I would like to stress on some assumption which are imposed in this research. The results which I will get after the model estimation will be based on the following list of assumptions:

- the entrance fee (180 hr.) is affordable sum to each potential applicant;
- the applicants disclose the true information about their background and parents;

As it was mentioned above that mainly the data base was taken from the Entrance Examination Committee of NaUKMA. The applicant's data were given in electronic form and were sorted for statistical estimation properly. The data sample consists of information about the applicants of the university in 2005, their grades and the final three outcomes such as accepted on state financed place, self financed place and not accepted.

I have also to explain one important issue about the regional representativeness of my sample. According to the that fact that Ukrainian is compulsory subject during the examination test at NaUKMA and knowing that

the Russian is more widely used in the east and south regions I can explain the skeweness of my sample toward the central and western regions of Ukraine.

To summarize the above general description of my data I have to say that further analysis will be conducted on the base of already applied applicants and I don't take into account any other potential group of applicants to the university.

These data consist of the four main parts:

- general information about applicants;
- final grades and ranking of the applicants according to the entry test which is held for all applicants during the 3,5 hours on the 2-nd Sunday of July;
- list of state financed students;
- list of self financed students;

Finally I have got 2187 of reliable observations which can be used in my estimation process. Before developing the methodology of my access factors estimation I would like to give a brief description of my dependent and independent variables.

In the Table 1. I present my dependent dummy variables which were split into 3 categories: state financed students, self financed students and not accepted applicants. These dummy variables were created based on the Entrance Examination Committee official order which is announced after all the examination and appellate procedures.

**Table 1.** Distribution of the applicants according to the examination results

(2005). (number/percent)

All Applicants	2187 (100%)
State-financed	441 (20%)
Self-financed	244 (11%)
Not accepted	1502 (69%)

These dummy variables take the only two values: **0** or **1**. The value of one indicates the true meaning (state financed, self financed or not accepted) in each column of dependent variable. Otherwise, the value of the dependent variable is zero. The main statistical characteristics of my explained variables are provided in the Appendix 1.

The other biggest part of my variables is the set of independent variables. These data are compound from the data bases, which concern the general information about the applicants and the final results of examination test. From these sources of information I succeeded to draw out the following explicative variables:

**Gender:** this variable separates the applicants by gender difference. For boys the dummy variable takes the value of **1**, otherwise **0**. Totally, 788 boy and 1399 girls applied and took entry exam tests.



**Age (in years):** this variable represents the age of the applicant up to the moment of applying to the university. Having the year of applying and the year of applicant's birth, I calculated the age of each person. Age of the applicant can be considered as a proxy indicator of experience and accumulated knowledge. The average applicant's age is 17,5. The oldest person is 31 years old and the youngest is 15 years old (see Appendix 1). Thus some positive influence of the age on the successful entrance into the university can be expected.

**Specialty applied:** NaUKMA offers 15 different specialties in 6 different departments. Each applicant can apply for not more than two different specialties in any department. So I created 15 dummy variables, which indicate the specialty the applicant applied for. In stata output these variables can be found with special mark "app" after the specialty applied (f.e. law\_app, finance\_app, physics\_app etc). For example if the person applied for two specialty Chemistry and Finance then at the intersection of applicant's row and the column of Chemistry and Finance one can find 1's in the corresponding columns and 0's in the rest of the columns of specialty applied.

**Table 2.** Distribution of the applicants due to the specialties applied (2005) number/percent).

Law	525 (24%)	History	192 (9%)
Finance	368 (17%)	Philosophy	153 (7%)
Economic theory	350 (16%)	Chemistry	68 (3%)
Computer Science	231 (11%)	Biology	113 (5%)
Political Science	317 (15%)	Ecology	142 (7%)
Sociology	181 (8%)	Physics	79 (4%)
Social work	200 (9%)		
Art	279 (13%)		
Philology	260 (12%)		

Note: the applicant can apply for the two speciality simultaneously, so the sum of all percentage indicators is **not** equal to 100%

**School graduated from:** this set of variables is very important in my research because I expect these variables to have significant power in explaining the success of the applicant. In the Soviet times secondary education does not differ so much in quality extend but nowadays Ukrainian secondary education in the transition period has change dramatically. Many private and public specialized schools appeared recently. These educational establishments began to provide much better quality of education then the most of the simple public schools. Therefore, I split all the Ukrainian schools into 4 main categories and introduce the explicative dummy variable for each of these categories such as: gymnasium, lyceum, specialized school and simple public school (see Glossary for definitions).

In addition, taking into account the possibility of reapplying of the students of other universities, colleges and technical schools I introduced one more dummy variable for this specific category.

Taking into account the variety of secondary education establishments and quality of education, I expect the positive influence of graduation from gymnasium, lyceum and special school. On the other hand I expect the negative influence from being at simple public school on the successful entry of the applicant.

So, here are all my explicative variables concerning the background education prior the applying to the NaUKMA: **gymnasium, lyceum, special\_school, public\_school, university\_college.**

**Table 3.** Distribution of the applicant’s secondary education (2005)  
(number/percent)

Gymnasium	581 (27%)
Lyceum	423 (19%)
Special school	133 (6%)
Simple public school	987 (45%)
University/college	63 (3%)

**Award (for outstanding school educational performance):** as we know that every Ukrainian educational establishment may award their best students for excellent performance while pursuing the educational degree. Gold medals, silver medal, diploma with honor can be considered as good indicators of successful

studying and ability of the student. In my research I can consider the award as one of the proxy for applicant ability. So, these dummy variables help me to identify the importance of this ability factor during the access to the university.

Therefore, considering the award as the proxy for applicant’s ability and the quality of his school knowledge, I expect the presence of any gold or silver medal may lead to positive influence on the probability of successful enrollment. Otherwise, the absence of any award can be considered as negatively related to probability of getting the state-financed place.

Thus, for this purpose I created three dummy variables for each category of applicants with **gold\_medal**, **silver\_medal**, **no\_medal**.

**Table 4.** Distribution of the awards received by applicants (2005)  
(number/percent)

Gold medal	622	(28%)
Silver medal	196	(9%)
No medal	1369	(63%)

**Prior exam preparation courses:** in fact the NaUKMA offers its applicants a variety of different preparation courses which are conducted by the university instructors. Of course these preparation courses are not for free but its influence on final results actually stays unclear for many applicants and their parents. I distinguish between short preparation (3 week of intensive studying) and long preparation (8 months of usual studying) of the applicants. Also many people

don't take any NaUKMA courses and prepare entry subjects themselves. So I expect the positive influence of having any preparation courses versus self preparation. Finally, I introduce the following dummy variables according to the specificity of preparation courses: **short\_preparation**, **long\_preparation**, **self\_preparation**.

**Table 5.** Distribution of the preparatory courses taken by the applicants (2005)  
(number/percent)

Short preparation (3 weeks)	597	(27%)
Long preparation (8 months)	48	(2%)
Self preparation	1542	(71%)

**Military status:** this variable indicates the obligation of the boys to serve at the national army after getting the age of 18. This indicator can serve as a proxy of the health condition for boys who apply to the university. If the coefficient turns out to be significant we may conclude about the influence of health factor as one of the determinant of successful entry to the university. Thus, I created the dummy variable which determines the military obligation of the boy applicant (see Appendix 1).

**Applicant's residence:** these dummy variables are supposed to identify what region the applicant comes from. Actually, Kiev city is situated in the relative central region of Ukraine, therefore the distance factor loses its meaning in this

case. Moreover, the transportation costs while traveling Ukraine is very low. But what peculiarity matters more in this situation?

The point is that Ukrainian (language) is a one out of two or three major exams at NaUKMA. Ukrainian determines about one third of total points which the applicant can get. Looking at the Table 6, we can see that the number of applicants from central and western regions is higher rather than from eastern and southern ones. This skewness to central and western regions might prove the fact that applicants from central and western regions should be more successful in winning the state financed places. To prove this issue I have to look at the significance of regional coefficients and determine their influence on the probability of the applicant to be successfully admitted into state financed place. Therefore, I divided the Ukraine into main four regions and the fifth category was created for Kyiv city.

In order to distinguish the regional belonging 5 dummy variables were created. They indicate the region where the applicant got the secondary education and came from to apply in NaUKMA: **west, center, east, south, Kiev.**

**Table 6.** Distribution of the applicants by regions (2005) (number/percent)

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West	434 (20%)
Center	656 (30%)
East	215 (10%)
South	87 (4%)
Kiev	795 (36%)

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**Big city:** this dummy variable indicates whether the applicants came from big city (capital of the region) or not. Actually, I suspect the quality of secondary educations to be higher in big cities rather than in small towns. Thus, I expect this factor to have positive and significant influence on the probability to get in.

**Parental age (years):** these explicative variables represents the age of the applicant's parents. Having the year of applying and the year of father and mother birth, I calculated the age of each person. The statistical description of these variables can be found in the Appendix 1.

**Parental status:** this variable indicates on the marital status of the applicant parents. This is very important indicator of social condition of the applicant and I expect the negative influence of divorced families on the success during the entering the university. From the original sources I obtained the place of living of both parents and compared them. I assumed that if the parental address is not the same we can conclude that applicant parents are in divorce. Due to the paper by Battle (1997) I expect the negative influence of unhappy families on the probability of being successfully enrolled because of financial and personal problems between the parents. Therefore, I introduce the dummy variable for marital status. Note that dummy variable takes the value one if the parents are in divorce.

**Table 7.** Distribution of the parent marital status of the applicants (2005)  
(number/percent)

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Divorced	482 (22%)
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Not divorced 1705 (78%)

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**Parental occupation:** these dummy variables were created to determine the parental professional status. Firstly I split the parental occupation into father and mother (**f** or **m**). Next I split parental occupation into 10 categories and created 10 dummy variables for each category. I developed the classification of parental occupations according to the salary distribution in different area of activity. Such approximations were made based on the salary statistics on country level by Derzhkomstat. The aim of dividing the parents' occupation into groups is to approximate the income of the family. This indicator of family welfare can be crucial while estimating the probability of being accepted to university. Therefore I have got twenty dummies in my data set. Here is my classification:

- **f\_1** or **m\_1** : top management and high administrative position.
- **f\_2** or **m\_2** : middle management, private entrepreneurs, financier and accounting position.
- **f\_3** or **m\_3** : engineers, teachers, the military, white-collar workers.
- **f\_4** or **m\_4** : lawyers.
- **f\_5** or **m\_5** : physicians.
- **f\_6** or **m\_6** : pensioners.
- **f\_7** or **m\_7** : workers of art, musicians, positions related to religion.
- **f\_8** or **m\_8** : unemployed.
- **f\_9** or **m\_9** : holders of blue-collar jobs



- **f\_10** or **m\_10** : no information

The main characteristics of explicative variables for total sample are provided in the Appendix 1.

**Parental wage:** to show the existence of income effect on access to higher education in Ukraine, I introduce two explicative variables for parental wages. These two variables were taken out of the description of the parental occupation. On the first stage I analyzed the description of the parental occupations and ascribed them to one of seventeen possible economic activities. After that using the Ukrainian Yearly Statistical Report for 2004 and comparing the region and economic activity, I succeeded to get salaries for both parents. In my study I also assume that income of the both parents is the total income of the household. Therefore, watching the influence of these two variables, I would be able to check the existence of the “Matthew” effect. The main characteristics of parental wage distribution can be found in the Appendix 1.

To check all my expectations and conduct the proper econometric estimations I have to develop the methodology, check the possible estimation problems and interpret the results. All these procedures are discussed in the next chapters of this paper.



## Chapter 4

### METHODOLOGY

Summarizing the discussion about the data and taking into consideration their specifics in the previous chapter, in this chapter I introduce the methodology of my estimation process and provide the reader with the formal model. As we can see from the data description I have binary dependent variables which can take only one out of two possible values **0** or **1**. For the estimation of my dependent binary variables I can not use the Linear Probability Model because of the following reasons (Green, 2000):

- distribution of the error terms is not normal
- violation of homoskedasticity
- predicted values might be out of the [0 , 1] interval

Therefore, for the estimation of my probabilities I use Binary Regression Model (BRM), (Long and Freese, 2003). This model can be derived by using the relationship between latent (unobservable) and observed (our real binary outcome) variable.

The structural equation for the latent variable can be presented in the following form:

$$y_i^* = x_i \beta_i + \varepsilon_i$$

, where  $y^*$  - is the latent variable

$x_i$  - set of explicative variables

$\beta$  - set of the parameters to be estimated

$\varepsilon_i$  - error term

The relation between observed and latent (unobserved) variables can be introduced in the following form:

$$y_i = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases}$$

Therefore, for a given values of my explicative variables:

$$\Pr(y = 1 | X) = \Pr(y^* > 0 | X)$$

Knowing the structural equation for the latent variable transforming and rearranging terms, the above equation can be transformed into the following one:

$$\Pr(y=1|X) = \Pr(\varepsilon > -(\alpha + \beta X) | X)$$

From the last equation it can be seen that probability of observing the positive outcome 1 depends on the distribution of the error term.

Thus, in my model with dependent binary variable I estimate the probabilities of the applicant to be successfully enrolled by using the logistic (normal) or standard normal distribution functions of the error terms.

Since, the number of observation is relatively big (2187 observations) I expect that logit and probit methods of estimation give me quite similar results (Wooldredge, 2002).

My model with the discrete dependent variables is traditionally estimated with the help of Maximum Likelihood Estimation. By maximizing the log-likelihood function, we get efficient and consistent parameters which actually show the relationship between the explicative variables and the unobservable latent variable. But what are we interested in, is the effect of X's on the probability of observing positive outcome **1**. In other words the effect of x's on  $P(Y=1|X)$ . This effect is called the marginal effect. Thus, to estimate the marginal effect of my explicative variables on the probability of observing **1**'s  $P(Y=1|X)$ , the logit or probit command in stata should be followed by *mfx compute* (Coupe, 2005).

To choose between these two methods of estimation, further I consider that model which goodness of fit and percentage of correctly predicted outcomes are the best.

Talking about problems which both methods can contain, the important issue concerning my model is a goodness of fit statistics. McFadden Pseudo  $R^2$  (index which shows the likelihood ratio of estimated model to a model with only constant ) is different from zero. For the logit McFadden Pseudo  $R^2$  is equal to 0.1749. For the probit this statistics is equal to 0.1761. The McFadden Pseudo  $R^2$  is not very high. The reason for that might be the absence of other important factors and personal characteristic of the applicants.

Another important indicator of the goodness of fit is percent of correctly predicted outcomes by the model in comparison to model with constant only (Coupe, 2005). Looking on the percent of correctly predicted outcome (see

Appendix 3), it can be seen that the difference in predictions for the logit and for the probit is relatively small. This small difference can be explained by cross-sectional data and omitted variables in the model.

Therefore, taking into consideration indicators of goodness of fit for both models, I can accept any of these two methods of estimation. Since the difference between these two methods is quite negligible, in our further estimation I use logit and for double checking probit estimation method is appropriate one.

Another important issue in this model is possible violation of homoscedasticity. The point is that when the variances of disturbance terms in logistic model are not the same. Therefore, my received unbiased ML estimates are considered to be inconsistent. To fix this problem I add the command “rob” in STATA after the main logit command. As a result I received efficient estimates, using heteroskedasticity adjusted error terms (error terms with constant variances).

## *Chapter 5*

### RESULTS

Now let me proceed with the discussion of my results which I received during the empirical part of this research. As it was mentioned above the coefficients of the logit model show the influence of the one unit change in value of the some explicative variable on the unobservable latent variable (Appendix 3). The change in probability of observing true outcome (1) in our model can be presented with the help of marginal effect. These marginal effects of my estimation are presented in the Appendix 4.

The main point of interest of the current research is the determination of access factors which influence the probability of the applicant to win the state-financed education at the university. In the Appendix 4, one can see the results of my logit estimation. During the interpretation of my results I use the conventional 5% level of significance to interpret the marginal effect of our explicative variable. To keep the importance of some explicative variables which are not significant on the conventional 5% level of significance I use the 10% level of significance to show the marginal significance of some relevant coefficients.

As one can notice, my explicative variables are grouped into different and pre-specified area (acceptance, location, schools, preparation courses etc.).

Therefore, perfect multicollinearity is present within one group of variables. So, to clarify and ease the interpretation of my results I dropped some variables and the received marginal effects within one pre-specified group of my explicative variables will be interpreted in comparison to the marginal effects of my dropped variables.

**Age:** from the Appendix 4. one can see that this coefficient is highly significant (p-value=0.001). According to the paper by Botelho, Pinto, Portela and Silva (2001), the age of the applicant was found to have no explanation power in their work. In Ukraine (conditionally NaUKMA) the result is opposed. The interpretation of the age coefficient might be stated as the following: since the age of the applicant in Ukraine might be considered as a good proxy of personal experience, increase in the age of the applicant by one year leads to increase in probability of being enrolled into pursuing the higher education for free by 2.2%.

**Gender:** from the paper by Lopez-Valkarel and Quintana (1998) and Botelho, Pinto, Portela and Silva (2001) the gender characteristics was found to be significant in both cases. During my estimation (see Appendix 4.) the gender coefficient turned out to be insignificant with no further explanatory power. As a result concerning gender characteristic of the applicants I can state that there is no gender discrimination during the entrance campaign in NaUKMA.

**Specialty applied:** having investigated all 15 specialties, which NaUKMA offers for the applicants to choose, I found out the list of specialties applying to which will increase the applicant's probability to win the state financed place



within the university. This set of specialties includes the department of Natural Sciences (physics, chemistry, biology and ecology), Department of Humanitarian Science (philology, art, history and philosophy), Department of Social Science and Technologies (sociology, social work and political science), computer science and economic theory. The coefficients of specialties such as law and finance turned out to be insignificant. This issue can be explained by the fact of high competition that is held on these two specialties. And this explanation can be quite reasonable because it is always more easy to win when the competition is relatively low.

**School graduated from:** Botelho, Pinto, Portela and Silva (2001) in their paper indicated that previous education is significant while attaining the higher education in Portugal. Having the general previous education, the probability of Portuguese applicants to access the higher education falls by 11.2% in comparison to technical, economic or humanitarian specialized secondary education. Discussing my received results about this issue, it can be seen that in comparison with the simple public school the applicants from gymnasiums, lyceums, specialized schools and those who reapplied from other universities have the relative advantage. All the coefficients of the secondary educational establishments the applicants previously graduated from turned out to be significant (only coefficient of specialized schools is marginally significant). As I admitted before, the quality of the secondary education is varying a lot. Therefore, the applicants from these secondary educational establishments are getting the education of better quality and due to transparent entry condition in

NaUKMA their probability increases due to the type of school they graduated from. For those who graduated from gymnasium this increase composes 14.3%, from lyceum – 9%, from specialized schools – 6.6% and for those who reapplied from other universities or colleges – 17.4%. Thus, I can conclude that quality of the previous education which is determined by the secondary educational establishment matters a lot during the entrance campaign at the NaUKMA.

**Award (for outstanding school educational performance):** as it was discussed in the literature review that previous grades matter (while attaining the higher education) and increase the probability of being accepted by 6% (due to increase in previous grades by one unit) Botelho, Pinto, Portela and Silva (2001). Since, these dummy variables for gold and silver medal can be considered as a good indicator of ability of the applicant, the coefficients of both indicators are significant. In comparison with the “no medal” holder, the person, who after graduating the secondary school received the gold or silver medal, increases his probability to win the state financed place at NaUKMA by 22% or 12.5% respectively. This found issue might be a good indicator that proves reliability and credibility of the applicant’s received knowledge while pursuing the secondary school degree.

**Prior exam courses:** the effectiveness of these preparatory courses turned out to be significant (coefficient near long preparatory course is marginally significant) and as my results show such prior exams courses help applicants to acquire new and aggregate already received knowledge before final entrance testing in NaUKMA. These preparatory courses have to be paid by the applicant

but my results proved their magnitude. Taking long (8 months) or short (3 weeks before final entrance testing) preparatory courses increase the probability of the applicant to be enrolled into the university and win state financed place by 15% and 8.5% respectively. These figures support my previous expectations about usefulness of these courses and actually should be taken into applicants' consideration before applying the NaUKMA.

**Applicant's residence:** by introducing these dummy variables I expected to find the influence of the regional peculiarities, which possibly determine the access to higher education in Ukraine conditionally NaUKMA. From the descriptive variables' statistics we can see that majority (86%) of the total number of applicants consists of the western, central representatives and inhabitants of Kiev city. In addition to that these regions mostly represent Ukrainian speaking layer of population within the whole country. Knowing that fact that Ukrainian play very important role during the entrance test (33% of the entrance points are determined with this subject), it is quite reasonable to expect that people from these regions are more likely to be enrolled into the university<sup>4</sup>. What we can see is that all the coefficients near the regional explicative variables are turned out to be insignificant except the Kiev city. Therefore, I can state that regional characteristic of the applicant has no influence on the probability to be enrolled into the state financed place at the university. The coefficient near Kiev city is marginally significant (at 10% level) and shows that probability to be enrolled of

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<sup>4</sup> The distribution of the population due to language preferences see [www.ukrcensus.gov.ua](http://www.ukrcensus.gov.ua)

the applicant who resides the capital of Ukraine decreases by 7%. This phenomenon can be explained by the low transportation and accommodation costs for people from Kyiv itself. Thus, many different (poorly and highly educated) applicants from the capital (775 out of 2187) faces low costs during the entrance campaign and as a result just apply to the university without high expectations to be enrolled. Therefore, many of these applicants fail the entrance exam and Kiev city explicative variable has marginally significant and negative influence on the final outcome.

**Big city:** having reviewed the paper by Lopez-Valkarel and Quintana (1998), I expected the positive influence of this coefficient on the probability of successful access to the university because of poorer education in the rural regions. And indeed, this coefficient turned out to be marginally significant. Therefore, applicant's probability to be enrolled into the university increases by 3.1% in case he or she resides the capital of the region. This fact can be supported by the more advanced educational infrastructure, higher salaries of big cities and also higher competition on the secondary educational market in big cities.

**Parental age:** as results show parental age have no influence power because both coefficients turned out to be insignificant. The same thing can be said about the coefficient near the "military status" of the applicant.

**Parental status:** investigating the ukrainian statistics concerning the yearly numbers of marriages and divorces<sup>5</sup>, this issue is also reflected in the family status of the applicants parents (482 couples in divorce out of 2187). As a result this high percent (22%) of families in divorce also played an important role in the higher education access process. As it was mentioned earlier the parents in divorce present a negative social environment during the process of bringing up the children. In addition to that strong reduction of family income might take place. The coefficient near “parental status” explicative variable is appeared to be highly significant with negative influence on the probability of observing true outcome. As a conclusion, being the applicant with the parents in divorce decreases the probability to get state financed place by 6.7%. Received estimate supports the earlier conclusion made by Battle (1997) about negative influence of families in divorce on the educational attainment by the children from such families.

**Parental occupation:** Having introduced the list of both parents’ occupation activities I was eager to define whether parental profession plays the most important role in the process of accessing the higher educational establishment or not. As a result majority of parental occupation turned out to be insignificant except only three ones such as pensioners and father occupied with jurisprudence and law. The potential explanation to the parental status of pensioners is that the old parents were grown up in the former USSR and they

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<sup>5</sup> The statistics about family status throughout Ukraine see [www.ukrcensus.gov.ua](http://www.ukrcensus.gov.ua)

little understand the importance of nowadays education from the market standpoint. Moreover, little understanding of the process of human capital accommodation makes old parents (pensioners) to pay no attention to educational process of their children. So as a result of my estimation, father pensioner and mother pensioner reduce the probability of their son or daughter to be enrolled by 8.1% and 11.1% respectively. Only one drawback appeared during the interpretation of my occupation coefficient which concerns father's occupation in jurisprudence and law. Stata's output states that presence of the father occupied with jurisprudence and law decreases the probability to be enrolled by 13.1%. This unexpected result can be explained by the huge disbalance in this dummy variable (small number of such "fathers" 28 observations in comparison to total sample of 2187 observations).

**Parental wage:** while reviewing the literature, many authors found out the income of the family matters a lot while explaining the possibility of access of the children to higher education in different countries. Lopez-Valkarel and Quintana (1998) in their paper proved that income is highly important issue which influences the access to universities. Also Burnhill, Garner, McPherson (1988) showed that level of participation of the children in the higher education with low educated and poor parents is decreasing over time. Since income of the family might be considered as rough proxy for socioeconomic and educational background of the parents, I decided to include two variables into my main regression.

As the parental salary in levels was created using rough description and aggregated data about regional income according to the specific economic activity of the father or mother, first of all I had to check the correctness of my salary proxies. Working with the data set I succeeded to create the sample of the applicants who did not win the state financed place at the university but according to the general entrance grade were eligible to be enrolled into the university on the self financed base. Such specific sample (1379 observations) of “eligibles to pay” was created and my results show (see Appendix. 6) that my salary proxies turned out to be good because wage of father and wage of mother coefficients are significant. This fact really proves my theory that rich families are more likely to pay for the education of their children versus poor families.

Coming back to the interpretation of the parental wage coefficients, I found that these wage of both parents does not influence the probability of being enrolled even marginally. These interesting result will be considered in the below discussion about “Matthew” effect.

**“Fan-spread” effect:** due to the definition of this effect, the initial educational endowment should positively influence the future gain of the applicant (enrolled into state financed place at the university). These initial educational endowments in my case are: type of school graduated from, developed ability expressed through the holding reward (gold or silver medal) and taken preparatory courses (as a part of educational endowment prior final entrance testing). One can see from Appendix 4. that all these coefficients are

turned out to be highly significant and concluding the above discussion I can state that “Fan-spread” effect holds in Ukraine conditionally NaUKMA.

**“Matthew” effect:** Let me refresh the definition of the “Matthew” effect: the rich get richer and the poor get poorer. Interpreting this definition more precise, I state that rich people invest money into expensive process of the secondary education of their children. As a benefit of such investment has to be the winning of state financed place at the university and this win might be considered as a return on investment in this case. As a conclusion of this theory I expected the positive and significant influence of parental wages on the probability to be enrolled into the state financed place at the university. Surprisingly, parental wage coefficients turned out to be insignificant and without any explanation power at all (see Appendix 4). Therefore, I can conclude that income of the family does not determine the probability of successful access to the university. Moreover, the applicants from rich families are not more likely to get free higher education in comparison with applicants from poor families. And as a final conclusion I can state that “Matthew” effect does not hold in Ukraine conditionally NaUKMA.



## CONCLUSIONS AND DISCUSSIONS

In this diploma I have determined the access factors which influence the probability of successful winning the state financed places at the university in Ukraine. Using the data taken from the Entrance Committee of National University of “Kyiv-Mohyla Academy”, I examined the possibility of pursuing free of tuition fees higher education. As a result, I have the existence of “Fan-spread” effect alongside with the absence of the “Matthew” effect on the Ukrainian educational market (conditionally NaUKMA).

During my estimations I have used the methodology developed for estimation of discrete data. I succeeded to show the influence of some crucial factors which affect the probability to be successful during the entrance campaign. Precisely, I have determined the list of factors which positively related to the applicant’s chance to be accepted. Thus, the older applicants are more likely to be enrolled in comparison with their less experience peers.

Other factor of influence is the type of school the applicants are graduated from. As was shown, the secondary educational establishments with better quality of education (gymnasium, lyceum, specialized schools) increase the chances of the applicant to be successful in comparison with the simple public schools. Then the residence of big cities was noticed to have significant influence on the

probability to be enrolled. This finding supports my assumption that quality of any secondary educational establishments in city is higher in comparison with rural regions. The applicants, who priority were enrolled into any other higher educational institutions, also have much higher chances to be enrolled. These results can be rather useful for Ministry of Education and Science for analyzing the secondary educational market and for implication of different governmental policies to equalize the chances of all secondary school graduates in accessing the higher education in Ukraine.

This issue about residence of the applicant can be summarized in the following statement: overall, the residence of the people has no influence on the educational attainment in Ukraine (conditionally NaUKMA). This outcome coincides with the conclusion in the study by Maton (1966) that place of residence (proxy of the distance) does not matter in the higher education participation. The received results also might be supported by the fact of low transportation and accommodation costs incurred by the entrance campaign.

For considering the ability of the applicant, the reward might be a good proxy of this personal characteristic. Keeping in mind the assumption about absolutely transparent entrance conditions of NaUKMA, the positive influence of reward for outstanding educational performance in the secondary school supports the idea of ability's positive impact on the access to the higher education. This fact also supports the behind idea about the relatively honest secondary educational process when pupils with the higher abilities are properly distinguished among their classmates. Also, prior educational endowment in the

form of preparatory courses favorably affects the educational attainment of higher education in Ukraine (conditionally NaUKMA).

The socioeconomic characteristics of the applicants' parents have different influence on the probability of an applicant to be enrolled. The impact of the families in divorce is unfavorable. Parental occupation mostly turned out to have no influence power. Wages of the parents are also found to be insignificant. This outcome breaks my assumption about the existence of “Matthew” effect in Ukraine. This signal about the absence of “Matthew” effect proves the transparency of the entrance campaign in NaUKMA and emphasizes the well-known policy of the university which provide the possibilities for talented and with outstanding educational performance applicants without paying no attention to their previous socioeconomic background.

The study on factors of success in entering the higher educational institution is conducted for the first time in Ukraine and received results could be favorably used in analyzing the nowadays educational market in Ukraine. This paper could be also interesting for the parents who want to make useful effort in their children's capital accumulation process. With knowing the magnitude and significance of different access factors, parents will be able to develop the basic concepts for their children's educational process. Moreover, this thesis paper gives to young secondary school graduates the directions for becoming more competitive during the entrance campaigns in the higher educational establishments. For the Ministry of Education and Science of Ukraine, this

research could be the first step in analyzing the most important field of their responsibility, such as secondary and higher education in Ukraine is.

The further investigation of this area lies in more narrow approach within the educational field and fuller data set with extended personal characteristics of the applicants and information from other higher educational institutions.

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## APPENDICES

Appendix 1. Variables' descriptive summary.

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std.Dev.</b>	<b>Min</b>	<b>Max</b>
elig_slf_fin	2187	0,6305	0,4828	0	1
state_fin	2187	0,2016	0,4013	0	1
self_fin	2187	0,1116	0,3149	0	1
not_accept	2187	0,6868	0,4639	0	1
age	2187	17,5386	1,1857	15	31
gender	2187	0,3603	0,4802	0	1
law_app	2187	0,2401	0,4272	0	1
econ_app	2187	0,1600	0,3667	0	1
fin_app	2187	0,1683	0,3742	0	1
comp_app	2187	0,1056	0,3074	0	1
polit_app	2187	0,1449	0,3521	0	1
soc_app	2187	0,0828	0,2756	0	1
soc_w_app	2187	0,0914	0,2883	0	1
ukrainian_~p	2187	0,1189	0,3237	0	1
philos_app	2187	0,0700	0,2551	0	1
history_app	2187	0,0878	0,2831	0	1
cult_app	2187	0,1276	0,3337	0	1
physics_app	2187	0,0361	0,1866	0	1
chemist_app	2187	0,0311	0,1736	0	1
ecology_app	2187	0,0649	0,2465	0	1
biology_app	2187	0,0517	0,2214	0	1
gimnas	2187	0,2657	0,4418	0	1
liceum	2187	0,1934	0,3951	0	1
sp_school	2187	0,0608	0,2390	0	1
sim_school	2187	0,4513	0,4977	0	1
univ_college	2187	0,0288	0,1673	0	1
gold_med	2187	0,2844	0,4512	0	1
silver_med	2187	0,0896	0,2857	0	1
no_med	2187	0,6260	0,4840	0	1
sh_prep	2187	0,2730	0,4456	0	1
lg_prep	2187	0,0219	0,1465	0	1
self_prep	2187	0,7051	0,4561	0	1
milit_status	2187	0,3178	0,4657	0	1
west	2187	0,1984	0,3989	0	1
center	2187	0,3000	0,4583	0	1
east	2187	0,0983	0,2978	0	1
south	2187	0,0393	0,1944	0	1

kiev	2187	0,3640	0,4812	0	1
big_city	2187	0,5944	0,4911	0	1
age_f	2187	45,9813	5,2379	33	77
age_m	2187	43,9337	4,8937	34	70
fam_status	2187	0,2204	0,4146	0	1
f_1	2187	0,0983	0,2978	0	1
f_2	2187	0,2222	0,4158	0	1
f_3	2187	0,1975	0,3982	0	1
f_4	2187	0,0128	0,1124	0	1
f_5	2187	0,0366	0,1878	0	1
f_6	2187	0,0402	0,1966	0	1
f_7	2187	0,0114	0,1063	0	1
f_8	2187	0,1148	0,3188	0	1
f_9	2187	0,1381	0,3451	0	1
f_10	2187	0,1280	0,3342	0	1
m_1	2187	0,0133	0,1144	0	1
m_2	2187	0,2222	0,4158	0	1
m_3	2187	0,2753	0,4467	0	1
m_4	2187	0,0133	0,1144	0	1
m_5	2187	0,0677	0,2512	0	1
m_6	2187	0,0197	0,1389	0	1
m_7	2187	0,0091	0,0952	0	1
m_8	2187	0,2259	0,4183	0	1
m_9	2187	0,1358	0,3427	0	1
m_10	2187	0,0178	0,1324	0	1
wage_f	2187	550,9698	345,8564	107	2351
wage_m	2187	526,7471	350,4908	107	2351



Appendix 2. Test for heteroskedasticity

<b>Variable</b>	<b>Coef.</b>	<b>Std. err.</b>	<b>t-stat</b>	<b>p-value</b>
age	0,1019	0,0712	1,43	0.152
gender	-0,1871	0,1445	-1.29	0.195
gimnas	0,0776	0,1638	0.47	0.636
liceum	0,3500	0,1946	1.80	0.072
gold_med	0,1087	0,2003	0.54	0.587
silver_med	0,2731	0,2608	1.05	0.295
sh_prep	0,2982	0,1725	1.73	0.084
lg_prep	3,1045	8,2686	0.38	0.707
west	-0,2964	0,1918	-1.55	0.122
center	-0,4290	0,1756	-2.44	0.015
big_city	-0,5585	0,1773	-3.15	0.002
age_f	0,0196	0,0166	1.18	0.239
age_m	-0,0104	0,0185	-0.56	0.574

Likelihood-ratio test of  $\ln\sigma^2=0$ :  $\chi^2(13) = 26.61$  Prob >  $\chi^2 = 0.0141$   
 Reject  $H_0$ : there is homoskedasticity.

Appendix 3. Test for goodness of fit (percent of correctly predicted)

**Logistic full model** for state\_fin

Classified	True		Total
	D	~D	
+	99	67	166
-	342	1679	2021
Total	441	1746	2187

Classified + if predicted Pr(D) >= .5  
True D defined as state\_fin != 0

Sensitivity	Pr( +   D)	22.45%
Specificity	Pr( -   ~D)	96.16%
Positive predictive value	Pr( D   +)	59.64%
Negative predictive value	Pr( ~D   -)	83.08%
False + rate for true ~D	Pr( +   ~D)	3.84%
False - rate for true D	Pr( -   D)	77.55%
False + rate for classified +	Pr( ~D   +)	40.36%
False - rate for classified -	Pr( D   -)	16.92%

Correctly classified **81.30%**

**Logistic model with constant only** for state\_fin

Classified	True		Total
	D	~D	
+	0	0	0
-	441	1746	2187
Total	441	1746	2187

Classified + if predicted Pr(D) >= .5  
True D defined as state\_fin != 0

Sensitivity	Pr( +   D)	0.00%
Specificity	Pr( -   ~D)	100.00%
Positive predictive value	Pr( D   +)	.%
Negative predictive value	Pr( ~D   -)	79.84%
False + rate for true ~D	Pr( +   ~D)	0.00%
False - rate for true D	Pr( -   D)	100.00%
False + rate for classified +	Pr( ~D   +)	.%
False - rate for classified -	Pr( D   -)	20.16%

Correctly classified **79.84%**

*continue* of Appendix 3.

**Probit full model** for state\_fin

Classified	True		Total
	D	~D	
+	96	65	161
-	345	1681	2026
Total	441	1746	2187

Classified + if predicted Pr(D) >= .5  
True D defined as state\_fin != 0

Sensitivity	Pr( +   D)	21.77%
Specificity	Pr( -   ~D)	96.28%
Positive predictive value	Pr( D   +)	59.63%
Negative predictive value	Pr( ~D   -)	82.97%
False + rate for true ~D	Pr( +   ~D)	3.72%
False - rate for true D	Pr( -   D)	78.23%
False + rate for classified +	Pr( ~D   +)	40.37%
False - rate for classified -	Pr( D   -)	17.03%

Correctly classified **81.25%**

**Probit model with constant only** for state\_fin

Classified	True		Total
	D	~D	
+	0	0	0
-	441	1746	2187
Total	441	1746	2187

Classified + if predicted Pr(D) >= .5  
True D defined as state\_fin != 0

Sensitivity	Pr( +   D)	0.00%
Specificity	Pr( -   ~D)	100.00%
Positive predictive value	Pr( D   +)	.%
Negative predictive value	Pr( ~D   -)	79.84%
False + rate for true ~D	Pr( +   ~D)	0.00%
False - rate for true D	Pr( -   D)	100.00%
False + rate for classified +	Pr( ~D   +)	.%
False - rate for classified -	Pr( D   -)	20.16%

Correctly classified **79.84%**

Appendix 4. Results after the logit estimation

<b>Variable</b>	<b>Coef.</b>	<b>Robust Std. Err.</b>	<b>t-stat</b>	<b>p-value</b>
age	0,1885	0,0521	3.62	0.000
gender	0,1588	0,2889	0.55	0.583
law_app	0,1736	0,2143	0.81	0.418
econ_app	0,5026	0,2109	2.38	0.017
fin_app	0,3489	0,2052	1.70	0.089
comp_app	0,9071	0,2359	3.85	0.000
polit_app	0,4885	0,2084	2.34	0.019
soc_app	0,5662	0,2467	2.29	0.022
soc_w_app	0,7373	0,2452	3.01	0.003
ukrainian_~p	0,8696	0,2376	3.66	0.000
philos_app	0,9294	0,2545	3.65	0.000
history_app	1,2480	0,2335	5.34	0.000
cult_app	0,5425	0,2229	2.43	0.015
physics_app	1,6934	0,2916	5.81	0.000
chemist_app	2,2840	0,3354	6.81	0.000
ecology_app	1,2472	0,2414	5.17	0.000
biology_app	1,2778	0,2794	4.57	0.000
gimnas	0,9580	0,1461	6.56	0.000
liceum	0,6169	0,1676	3.68	0.000
sp_school	0,4520	0,2453	1.84	0.065
univ_college	1,0126	0,3808	2.66	0.008
gold_med	1,4069	0,1358	10.36	0.000
silver_med	0,7933	0,2119	3.74	0.000
sh_prep	0,6078	0,1450	4.19	0.000
lg_prep	0,8949	0,4217	2.12	0.034

*continue* of Appendix 4.

milit_status	0,1563	0,2884	0.54	0.588
west	-0,1625	0,3465	-0.47	0.639
center	-0,1547	0,3373	-0.46	0.647
east	-0,1730	0,3845	-0.45	0.653
kiev	-0,5803	0,3628	-1.60	0.110
big_city	0,2496	0,1558	1.60	0.109
age_f	0,0188	0,0143	1.32	0.187
age_m	0,0054	0,0161	0.33	0.739
fam_status	-0,5895	0,2237	-2.64	0.008
f_1	-0,2546	0,5658	-0.45	0.653
f_2	-0,3750	0,5440	-0.69	0.491
f_3	-0,1161	0,5374	-0.22	0.829
f_4	-2,0728	1,1667	-1.78	0.076
f_5	-0,0585	0,5950	-0.10	0.922
f_6	-0,8419	0,6186	-1.36	0.174
f_8	-0,1436	0,5443	-0.26	0.792
f_9	-0,5226	0,5553	-0.94	0.347
f_10	0,0635	0,5980	0.11	0.915
m_1	-0,7546	0,9051	-0.83	0.404
m_2	-0,0722	0,6682	-0.11	0.914
m_3	0,0829	0,6563	0.13	0.899
m_4	0,9834	0,8290	1.19	0.236
m_5	0,4978	0,6810	0.73	0.465
m_6	-1,4111	0,9855	-1.43	0.152
m_8	-0,0291	0,6579	-0.04	0.965
m_9	0,1328	0,6690	0.20	0.843
m_10	-0,1903	0,9146	-0.21	0.835
wage_f	0,0003	0,0002	1.33	0.183
wage_m	0,0003	0,0002	1.21	0.226
_cons	-8,2058	1,3372	-6.14	0.000

Appendix 5. Marginal effect after the logit estimation

<b>variable</b>	<b>dy/dx</b>	<b>Robust Std. Err.</b>	<b>t-stat</b>	<b>p-value</b>
age	0,0241	0,0066	3.62	0.000
gender	0,0206	0,0380	0.54	0.589
law_app	0,0229	0,0291	0.79	0.432
econ_app	0,0721	0,0338	2.13	0.033
fin_app	0,0482	0,0305	1.58	0.114
comp_app	0,1462	0,0459	3.18	0.001
polit_~p	0,0702	0,0334	2.10	0.036
soc_app	0,0847	0,0425	1.99	0.046
soc_w_~p	0,1149	0,0453	2.54	0.011
ukrain~p	0,1380	0,0451	3.06	0.002
philos~p	0,1534	0,0515	2.98	0.003
histor~p	0,2188	0,0508	4.31	0.000
cult_app	0,0794	0,0370	2.15	0.032
phisc~p	0,3322	0,0706	4.70	0.000
chemis~p	0,4763	0,0772	6.17	0.000
ecolog~p	0,2218	0,0536	4.14	0.000
biolog~p	0,2306	0,0632	3.65	0.000
gimnas	0,1426	0,0246	5.79	0.000
liceum	0,0896	0,0273	3.28	0.001
sp_sch~l	0,0660	0,0404	1.63	0.103
univ_c~e	0,1744	0,0819	2.13	0.033
gold_med	0,2201	0,0238	9.23	0.000
silver~d	0,1254	0,0396	3.17	0.002
sh_prep	0,0854	0,0222	3.85	0.000
lg_prep	0,1501	0,0874	1.72	0.086
milit_~s	0,0203	0,0383	0.53	0.595
west	-0,0200	0,0413	-0.49	0.627
center	-0,0193	0,0413	-0.47	0.640
east	-0,0210	0,0445	-0.47	0.636
kiev	-0,0703	0,0418	-1.68	0.093
big_city	0,0313	0,0192	1.64	0.100

*continue of Appendix 5.*

age_f	0,0024	0,0018	1.32	0.186
age_m	0,0007	0,0021	0.33	0.739
fam_st~s	-0,0671	0,0226	-2.97	0.003
f_1	-0,0302	0,0623	-0.49	0.628
f_2	-0,0445	0,0599	-0.74	0.457
f_3	-0,0145	0,0653	-0.22	0.825
f_4	-0,1313	0,0271	-4.84	0.000
f_5	-0,0073	0,0731	-0.10	0.920
f_6	-0,0815	0,0435	-1.87	0.061
f_8	-0,0176	0,0642	-0.27	0.784
f_9	-0,0584	0,0538	-1.09	0.278
f_10	0,0082	0,0789	0.10	0.917
m_1	-0,0740	0,0653	-1.13	0.257
m_2	-0,0091	0,0829	-0.11	0.913
m_3	0,0107	0,0860	0.12	0.901
m_4	0,1695	0,1788	0.95	0.343
m_5	0,0735	0,1144	0.64	0.521
m_6	-0,1113	0,0416	-2.68	0.007
m_8	-0,0037	0,0830	-0.04	0.965
m_9	0,0175	0,0913	0.19	0.848
m_10	-0,0228	0,1022	-0.22	0.824
wage_f	0,0000	0,0000	1.34	0.182
wage_m	0,0000	0,0000	1.21	0.225