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UNIVERSITY ADMISSION IN RUSSIA: DO THE WEALTHIER BENEFIT FROM STANDARDIZED EXAMS?

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This paper examines the impact of family income on the results of the Unified State Examination (the USE) and university choice in Russia. We argue that, even under the USE, which was introduced instead of high school exit exams and university-specific entrance exams, entrants from wealthy households still have an advantage in terms of access to higher education, since income positively affects USE scores through the channel of a higher level of investment in pre-entry coaching. Moreover, richer households make more effective decisions about university. We have found positive and significant relationships between the level of income and USE results for high school graduates, with an equal achievement before coaching. We subsequently propose that students from the most affluent households do invest more in additional types of preparation (pre-entry courses and individual lessons with tutors), and those extra classes provide a higher return for children from this particular income group. Finally, we show that holding the result of the USE equal, students with good and fair marks from wealthy families are admitted to universities with higher average USE score than those from poorer families. As a result, we can observe that income status is a factor that significantly influences enrollment to university.

Keywords: students' achievement; standardized entry exams; equity in higher education; university choice.
JEL Codes: I21, I24, I28.

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Introduction

While for many decades in Soviet Union, and then in post-Soviet Russia, university-specific exams were at the core of the university admission system, they have been recently replaced by an admission system based on the results of national exams (Unified State Examinations, USE) which are obligatory for all high school graduates in Russia. This reform had at least 3 consequences: first of all, under a new system high school students sit the national exams in the city or regional center in which they live, so there is no need to pay for a trip to go and sit examinations in their potential place of learning. Secondly, there is no need to prepare for any particular requirements set by the universities or to make university-specific investments which would be fulfilled in the local exams. Finally, while under former systems applicants had to choose one university to apply to well before exams, they now can make their final choice with a whole range of offers at their fingertips.

One of the aims of such a reform was to increase the accessibility and equality of higher education. It was assumed that under the new institutional settings, students from disadvantaged backgrounds would have more opportunities to be enrolled in universities due to a reduction in expenditures on general and specific investments related to admission (university pre-entry courses, corruption payments etc.), as well as the minimization of transaction costs concerning the application process. However, high school graduates from wealthier households still could have some significant advantages, since they have more resources to invest in the general preparation process during their last year at high school. That, in turn, may improve their final USE scores and hence chances for better placement.

The main objective of this paper is to analyze the differences in USE results for students from different income groups, in order to see how income status (family income level) influences the educational strategies of students (in particular, their choice of type of pre-entry coaching, as well as the level of time and financial investment in the process of preparation), their actual USE scores, and to confirm whether or not it is true that a higher level of income provides more opportunities for admission.

Income may affect the university admission results of an individual in at least two ways. Firstly, via USE scores: additional investments in pre-entry coaching and a wider choice of preparation programs can improve the final result. Secondly, even with their USE scores being equal, students from different income groups may make different decisions about where to apply. Indeed, the level of income is related to revealed risk aversion. Richer households feel more secure about the final outcome (the result of applying to university), and in case of failing to be admitted to a state-subsidized place (when the student's total score is not high enough to study on a tuition-free basis) richer students have sufficient financial resources to

cover the tuition fees, whereas poorer students do not and are forced to choose an institution of a lower quality, but with a higher probability of enrollment, with a lower level of competition between applicants. We will analyze both channels of the influence of income on educational trajectories.

The rest of the paper is organized as follows. In section I we discuss the findings and empirical evidence on the effects of income on achievement and college choice which are presented in contemporary literature. Section II is devoted to the empirical analysis of the relationship between a household's level of income and the student's achievement, measured by the USE scores of the core subjects (such as Mathematics and Russian). In section III we show how the results of the USE differ for students from low, medium, and high income groups, when given the same level of achievement at the end of 9th grade. We demonstrate that even with a fixed achievement level before starting the preparation process, more affluent students show a higher achievement level by the end of high school, earning higher USE scores. One possible explanation for this may be that wealthier parents spend more on pre-entry coaching, which, in turn, affects the student's final result. In Section IV we analyze the results of university-students matching. We demonstrate that holding the result of the USE equal, students with good and fair marks from wealthy families are admitted to universities with a higher average USE score than those from poorer families. As a result, we can conclude that income status is a factor which significantly influences enrollment to university. Section V contains our concluding remarks and discussions.

I.   The impact of income on students' achievements and university choices: results of empirical studies

The problems with the accessibility of higher education and issues concerning the equal opportunities for students from different socio-economic status (such as parental education and level of income) have attracted the attention of many researchers in different countries, and there is a significant amount of papers devoted to the analysis of the effect of income on future educational opportunities. With respect to our goals, it is interesting to consider those works which, initially assess the impact of income on a student's achievement, and then analyze the relationship between income status and college choice.

As a starting point we may consider Coleman report (Coleman et al, 1966), where it was stated that students' achievement is to a large extent defined by the socio-economic status of their families. In subsequent years, researchers several times tested various hypotheses on the significance of the family's SES influence, and in most cases they came to the conclusion that the level of income is an important determinant of a student's academic success, in that

income status positively affects his/her achievement. White (1982) summarized the research on this topic and revealed a positive and significant correlation between the level of parental income and the level of the student's achievement. As a result, differences in school achievement as a result of income inequality can affect one's university choice.

In subsequent decades, research lasted for. For example, Hill and O'Neill (1994) have found a positive non-linear relationship between income and a student's academic performance. Orr (2003) has shown that income is a significant predictor of differences in test results of black and white Americans. Dahl and Lochner (2005), using data from the National Longitudinal Survey of Youth (NLSY), showed that an increase in total family income by US$1000 (after tax) improves the Mathematics results by 2.1%, and in literacy by 3.6% of the standard deviation. The positive effects of income have been proven not only by educational statistics, but by information gathered during the series of experiments (Morris et al, 2004).

The nature of this relationship between income and achievement is discussed in several studies. Lebowitz (1977) gives the following explanation:

On the one hand, families with a higher level of income can afford to buy more goods than less advantaged households. If the consumption of these goods positively affects a student's performance, then there is a direct link between income and results. Moreover, in wealthier families, where the father has a high salary, his wife (the student's mother) may stay at home and spend more time with their child, which will in turn improve his/her results.

Davis-Kean (2005) in her conceptual model concluded that family income (as well as parental education) significantly and positively influences children's school achievement. She considered the following link:

Income → Parental expectations and beliefs → Parental behavior → Child's achievement.

Hence, an indirectly positive relationship between income and achievement was empirically proven.

A separate group of works is related to the impact of income status on *educational choice*. Baird (1967) was one of the first researchers who noticed the differences between students from richer families and those from less advantaged backgrounds. In particular, he has shown that poorer students more often than others choose colleges with lower tuition fees closer to their home, prefer living with their parents during their college years[2] and less frequently decide to continue their studies after receiving their bachelor's degree. In one of his

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[2] This is not always a choice made by a student himself, but sometimes by his/her parents, who consider their child to be a source of help in the household.

subsequent studies, Baird (1984) has concluded that the level of income slightly affects the type of college chosen: SAT results constitute the main predictors of this kind of choice. However, income can also positively affect the result of this exam.

Chapman (1981) proposed a multi-step model of college choice. Based on the results of previous research, he argued that family and its characteristics significantly affect the choice of educational institution. Income, says Chapman, has a direct influence on educational decisions, as it determines the ability to cover tuition fees at college or university. That is why richer students apply and are admitted to private universities (which are usually more prestigious and set higher tuition fees), while lower income students tend to choose between public universities and municipal two-year colleges. Litten (1982) has extended the previous model. While Chapman described outcomes (*final choice*) as a function of different factors, Litten concentrated on the *decision-making process* of college choice. He showed that socio-economic factors (in particular, income) are significant determinants in the process of choice of institution to study at.

Datcher (1982) has shown that the difference in income between black and white students determines the divergence in their educational trajectories: the level of income positively influences the duration of studying (in years). Delaney (1988) argued that students from less advantaged and more advantaged families consider different criteria when making their college choice. For example, the prestige of a university is more important for richer students, while tuition fees are crucial for poorer ones. Hearn (1991) showed that students from low income families tend to apply to less selective universities than richer students, irrespective of their achievement. Cabrera and La Nasa (2001) conducted research on the process of college choice by splitting it into 3 stages: acquiring the minimal level of qualification (skills and knowledge which are required for university studies), graduation from high school, and application to college or university. As a result, the differences in trajectories of richer and poorer students were analyzed.

There are two features of the Russian higher education system that are important for our analysis. The first one is the existence of the dual-track tuition system. It implies that there are both state-subsidized and commercial places for the students, and students that pay tuition and those who do not are enrolled in the same programs and study together. Each public university is assigned a number of state-subsidized places each year and prospective students compete for them. If the applicant is not successful in this competition, he/she has the opportunity to be admitted either to a private university (and pay the full tuition), or to a public one (and cover tuition costs themselves as well). With a few exceptions, there is no competition for commercial places at public universities in general. There are no grants or

subsidies from the government or charity organizations for those who study on commercial places, and student loans are quite expensive and hence not popular among students (Prakhov, Androushchak, 2009).

Secondly, students are admitted for tuition-free places on the assessment of applicants' quality, regardless of their financial needs. This is a significant fact, since this system affects the incentives of low income students to study for free, due to the limited nature of financial aid, and these students lack the resources to cover all the costs of higher education. So it is important to understand how income affects achievement and college choice for students from different income backgrounds, as poorer students have a greater risk of being excluded from higher education.

The Unified State Examination was introduced nationwide in 2009. It was created in order to facilitate the admission procedures for the students, making them more transparent and reducing the costs concerned with preparation for university. Instead of school-based exit exams and specific examination entry procedures at universities (this was before the USE), students only sit the USE (standardized sets of exams) which serves both as the final high school exams and as the basis for enrollment decisions. Only two subjects are obligatory: Russian and Mathematics. Students who want to apply to a program in a certain discipline must also sit exams in some other disciplines (with the same unified format) that correspond to the chosen field of study, regardless of a particular set of universities they are about to apply to. Despite the unification of the exam format and the irrelevance of specific courses and individual lessons with the faculty, richer students have more opportunities for additional preparation even under standardized procedures, which can lead to an improvement of the final result, whilst poorer students have limited resources for investing in pre-entry coaching.

Universities collect students' applications and rank applicants on the basis of the total score of the required subjects. Hence, the total USE score is the main mechanism of selection, irrespective of income and other socio-demographic characteristics[3]. The ranking of students and the names of those recommended for admission are published online by universities, which are freely accessible on universities' web pages in mid-summer. Those students who are on this list can present the scripts of their certificates and be admitted to university during this 'first wave' of admission. Those who do not have enough points can either apply for a commercial place or take a chance at waiting for the results of the next 'wave' of admissions. Students can send their USE results to up to 5 universities, and in many cases they receive

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[3] Aside from the USE, there are still a few opportunities of admission. One of them is taking part in Olympiads for pupils. However, not more than 4% of students are admitted on this basis. The main channel of admission remains the Unified State Examination.

offers from several institutions. As a result of this, by the end of the 'first wave' there are still vacant places in many universities. These educational institutions add up their rankings again and recommend additional students for admission. This situation can affect students' choice, particularly the decisions of high school graduates from low income families. Wealthy applicants, if not successful in competition for a state-subsidized place during the 'first wave', can afford to pay tuition fees at the same university without any decrease in quality of their higher education. Low income students, however, can take a risk and wait for the 'second wave', or, more likely, can choose a less selective university along with the lower quality of higher education provided there. In this case, educational opportunities are not equal, and our goal is to examine how students from different backgrounds manage their USE results.

II.   Students' achievement on the basis of their USE scores and level of income

In our empirical analysis, we use the results of a household survey which was conducted in the fall of 2010 in 16 of the largest cities in Russia[4]. This survey includes data provided by first year students who study at universities, and by their parents. The initial sample consisted of 1600 households (100 households in each city with one parent and one student interviewed per household), but due to data correction the sample was restricted to 1165 observations. The sample was subsequently weighted according to the number of school graduates in the cities above. The data includes information on the socio-economic characteristics of households, the student's achievement (USE scores and high school grades) and their application strategies which covers time and financial investments, sets of universities and disciplines under consideration and the availability of information).

Initially, households were divided into three groups according to their level of income:

- Low income: a monthly income per person of less than 10,000 rubles[5], the proportion of this type of households totaling 34.8%;

- Medium income: a monthly income per person which varies from 10,000 – 20,000 rubles; 47.6%;

- High income: the monthly income per person is higher than 20,000 rubles; 17.6%.

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[4] The survey was conducted as a part of the project "Empirical methods in comparative institutional analysis", run by the Centre for Institutional Studies (CInSt) at the National Research University Higher School of Economics (HSE) in 2011 with the financial support of the Basic Research Program. For further information on CInSt projects see Androushchak, Prakhov, Yudkevich (2008, 2010), and http://cinst.hse.ru/en.

[5] 10,000 rubles equal approximately US$333. Compare to GDP per capita in 2010, which is US$11,861 (US$988 per month), and an average monthly income per capita, which equals 18881 rubles (US$629 per month).

The level of income is linked to the USE scores for Russian, and Mathematics (two obligatory subjects), the average score in obligatory subjects, as well as the overall results[6]. The distribution of students according to their USE scores for different income groups is shown in Table 1.

Table 1. Income level and USE scores

	Subject					
	Russian			Mathematics		
Level of income USE scores	Low	Medium	High	Low	Medium	High
1 - 40 points	1.2%	2.0%	2.4%	12.5%	9.2%	10.7%
41 - 60 points	30.9%	28.2%	9.3%	49.1%	39.5%	16.6%
61 - 80 points	59.8%	58.5%	63.4%	33.2%	41.9%	51.2%
81 - 100 points	8.1%	11.4%	24.9%	5.2%	9.4%	21.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mean	**65.6**	**66.6**	**71.5**	**57.4**	**61.4**	**68.0**
	Average results					
	Russian and Mathematics (obligatory subjects)			Overall average result		
Level of income USE scores	Low	Medium	High	Low	Medium	High
1 - 40 points	3.2%	2.9%	2.9%	4.0%	4.5%	0.7%
41 - 60 points	46.9%	34.2%	15.5%	59.5%	40.5%	16.4%
61 - 80 points	44.9%	55.3%	60.2%	35.4%	48.8%	65.1%
81 - 100 points	4.9%	7.6%	21.4%	1.2%	6.2%	17.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mean	**61.5**	**64.0**	**69.7**	**57.8**	**62.8**	**69.7**

One can see that with an increase in the level of income, USE results in Russian, Mathematics, as well as in average results, improve. Amongst students from low income families only 5.2% are high achievers in Mathematics (those who have achieved more than 80 points). The percentage of excellent USE results in Russian is higher, at 8.1%. Amongst most wealthy students, the proportion of high achievers is substantially higher and equals 21.5% for USE results in Mathematics and 24.9% in Russian. This tendency takes place in dynamics of means as well: when the level of income rises, the mean score of USE results in Russian increases from 56 to 71 points, and in Mathematics from 57 to 68 points. An increase is also seen in the average score for obligatory subjects (from 61 to 70 points), and for the average overall result (from 58 to 70 points).

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[6] The overall average result is obtained as a quotient by dividing the total score (sum of scores) by the number of exams/subjects taken.

The Pearson correlation between monthly income (per person, in rubles) and USE scores is positive. The coefficient of the correlation for USE results in Russian is 0.154; for USE result in Mathematics it is 0.265; 0.235 for obligatory subjects, and 0.333 for all USE exams taken. In all cases this correlation is significant at 1%.

Evidently, the differences between students from low, medium and high income families on the basis of their USE results are statistically significant. However, in order to understand why richer students are better off, it is necessary to address two questions: (1) how USE results are different under fixed achievement before the beginning of the preparation process; and (2) how educational trajectories (choice of the type of pre-entry coaching and investment in the coaching process) vary for students from low, medium and high income groups.

III.   Differences in USE results under fixed achievement

Now let us consider how the average USE results differ in Russian and Mathematics, as well as the average results of all obligatory and chosen subjects for students from different families, but under fixed achievement at the end of 9th grade. For this purpose, we split the sample into several categories according to the marks in the certificates of graduation obtained after 9th grade.

According to the results obtained in the 9th grade, 3.5% of students achieved mostly fair marks (3 out of 5), more than 34% of students have received good marks (4 out of 5), although they did receive some fair marks. Since the first group contains less students, for further analysis we merged the first and second groups and we agreed to mark those students with fair marks as 'low achievers'. More than half of students (53.4%) have graduated from secondary school only with good and excellent (5 out of 5) marks, and we have called this group 'medium achievers'. Those students who have received only excellent marks (8.5%) are considered to be 'high achievers' (Fig. 1).
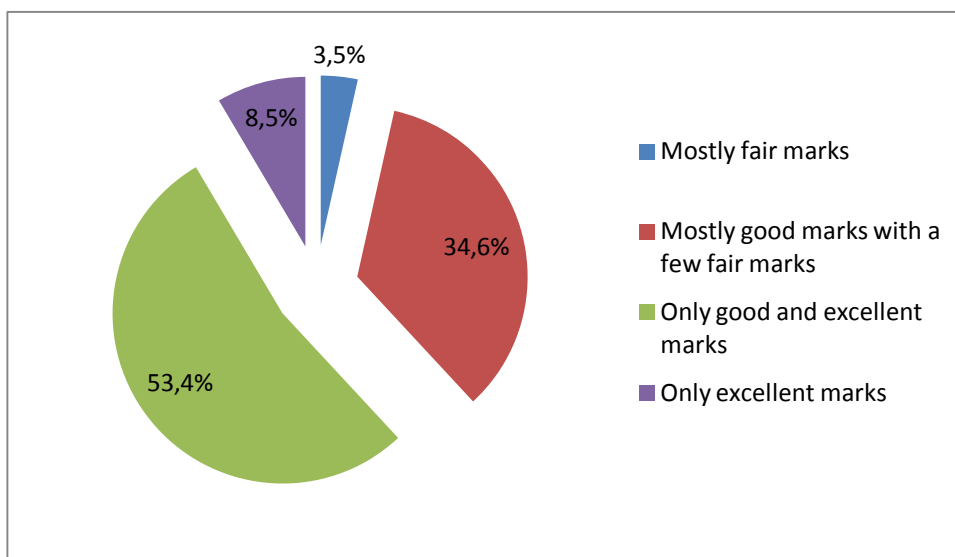
Figure 1. Students' achievement at the end of 9th grade

The relationship between the level of income and USE scores is still positive and significant even under fixed achievement at the end of 9th grade, i.e. for each group of the low achievers, medium achievers and high achievers (see Table 2). However, we should point out that differences between low-income and medium-income groups tend to be smoothed out. Nevertheless, we can argue that, with their prior achievements being equal, students from richer households pass USE exams more successfully than students from lower income families.

Table 2. Mean USE results depending on level of income, with fixed achievement in the 9th grade

Subject / Level of income	Achievement in the 9th grade								
	Low achievers			Medium achievers			High achievers		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Russian	60.0	60.4	64.3	68.6	69.5	72.1	76.4	76.6	86.2
Mathematics	52.1	54.1	60.7	60.2	65.2	68.1	67.5	70.8	85.3
Obligatory subjects	56.0	57.2	62.5	64.4	67.4	70.1	72.0	73.7	85.8
Overall average result	53.7	55.5	65.8	59.7	65.5	68.1	67.0	70.4	83.4

Thus, high achievers from low income families receive on average 68 points at the USE Mathematics exam, the brightest students from middle income families receive 71 points, while excellent students from high income households receive 85 points.

How can those discrepancies in USE results be explained, if by the end of the 9th grade the overall achievement is the same? A possible explanation for this fact is that wealthier families, in principle, can devote more resources to investing in pre-entry coaching. This, in

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turn, can improve the final USE result. To test this hypothesis, we have focused on the relationship between investing in pre-entry coaching and USE results.

IV.   Relationship between the characteristics of pre-entry coaching and the level of income

In spite of the fact that the admission system under the USE doesn't require any university-specific investment in the pre-entry process, we can nevertheless discuss the gap between high school output (knowledge received at high school) and USE requirements. Therefore, the majority of students (more than 60%) state that high school knowledge is insufficient for success in the USE (see Table A1 in Appendix). Such a lack of confidence in the quality of high school teaching forces students (even before the introduction of the USE) to attend additional pre-entry classes, what they actually actively do (see Table 3).

Table 3. Pre-entry coaching activities depending on the level of income

Type of extra-classes	Level of income		
	Low	Medium	High
Pre-entry courses	24.1%	39.2%	38.0%
Individual lessons with tutors	42.2%	46.4%	52.7%
Other types of coaching	35.5%	37.9%	38.0%
Self-coaching	11.6%	7.9%	2.4%
No coaching	19.4%	15.3%	23.9%

Among the richest students, the proportion of those who attend extra classes (besides high school) is higher than among their less wealthy counterparts; among richer students more than 38% visit preparatory courses, while amongst less financially advantaged students this share is only 24%. The situation is the same for individual lessons with tutors; this activity is taken up by 42.2% of low income students, 46.4% of medium income students and 52.7% of high income students. We have subsequently analyzed time and financial expenses on preparation, with a special emphasis on preparatory courses and classes with tutors, as these types of pre-entry coaching are the most popular (Table 4).

Table 4. Temporary expenditures on pre-entry coaching depending on the level of income

Temporary expenditures on pre-entry coaching	Level of income		
	Low	Medium	High
Frequency of pre-entry courses (times per week)	2.0	1.9	2.3
Average number of classes taken within a preparatory program	57.1	66.7	60.1
Frequency of individual lessons with tutors (times per week)	2.4	1.9	2.2
Average number of individual lessons with tutors	72.4	65.5	47.4

Frequencies of classes at pre-entry courses and those with tutors are almost the same; on average, students attend them twice a week. But if we consider the number of classes at pre-entry courses, we can see that longer programs are chosen by students from middle income families, while shorter ones are chosen by less wealthy students. Conversely, students from low income families attend more classes with tutors than other students, while the richest students attend fewer classes.

The financial aspects of the process of pre-entry coaching were also discussed. To evaluate the amount of money spent on preparation, three variables which reflected financial investment were considered:

1. *Total investment in pre-entry courses = Monthly fee for pre-entry courses (rubles per month) · Duration of pre-entry courses (in months)*

2. *Total investment in individual lessons with tutors = Monthly fee for lessons with tutors (rubles per month) · Duration of preparation with tutors (in months)*

3. *Total investment in pre-entry coaching = Total investment in pre-entry courses + Total investment in individual lessons with tutors.*

Distributions of the variables described above depending on the level of income are shown in Table 5.

Table 5. Money expenditures on pre-entry coaching

Level of income / Level of expenditures	Type of investment								
	Pre-entry courses			Lessons with tutors			Total investment		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
No expenditures	75.9%	61.0%	62.0%	57.8%	54.1%	49.5%	42.4%	34.7%	32.2%
25000 rub. and less	18.0%	17.7%	14.1%	24.9%	21.3%	26.7%	32.3%	24.2%	28.3%
25001 - 50000 rub.	3.7%	9.2%	11.7%	12.3%	9.9%	12.1%	16.0%	13.9%	11.7%
More than 50000 rub.	2.5%	12.1%	12.2%	4.9%	14.8%	11.7%	9.4%	27.3%	27.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average amount of investment (in rubles)[7]	23866	72560	45682	49427	43777	54470	46107	73981	65661

The highest investments in pre-entry coaching were made by medium income families (apart from lessons with tutors), and the smallest investments were made by low income families. Thus, the average total investment for poorer families does not exceed 50,000 rubles, while middle income families spend approximately 80,000 rubles on extra classes.

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[7] This value is calculated only for those students who attended corresponding programs of pre-entry coaching.

The very wealthiest households spend around 66,000 rubles. Therefore, low income families invest fewer financial assets in the preparation than other types of households.

The substantial expenditures on pre-entry courses, the high level of investment amongst medium income families, and the substantial expenditures on lessons with tutors by low income families can be clarified thus:

These households prefer and are able to make *ex ante* investments, meaning investments before admission in order to increase their child's chances of being admitted to a tuition fee free place at university. By doing so, the household will succeed in avoiding *ex post* expenditures, in other words the tuition fee at university. This hypothesis is indirectly confirmed by two facts: firstly, among students from low and medium income groups, the proportion of those who study for free is higher than among the students from high income families (see Table 8 below). Secondly, among those who study at tuition-paid places at universities, the proportion of students who also applied for a state-subsidized position decreases with the rise in the level of income, from 66.0% among the poorest students to 39.6% among the richest ones.

How does an investment in pre-entry coaching affect the USE results, and what is the return to such investment (see Table A2 in Appendix)? In low income families, increasing the investments in the preparation process has a positive effect only for the USE results in Russian. Hence, this investment in pre-entry coaching for poorer families is rather inefficient.

For middle income students the result is moderate, in particular those who spent a considerable amount of money on extra classes will gain from 3 to 8 points (out of 100) compared to those who did not invest in pre-entry coaching at all.

The greatest effect of investment on the student is shown in the wealthiest households. By attending preparatory classes, these students can gain up to 12 points out of 100. Therefore, these families spend more than the poorest households, and so the effect of this strategy is the evidently the most substantial amongst the three income groups. As a result of this, we can maintain that by having more opportunities to spend money on pre-entry classes, and by using this opportunity more intensively, richer students achieve better USE results, which in turn can indirectly indicate the presence of inequality of access to higher education.

We have approximated the relationships described above by assessing the effects of income and investment in pre-entry coaching using the following linear regression model:

$$Y_{ij} = \alpha_j + \beta_j \ln(Income_i) + \gamma_j \ln(1 + Total\ Investment_i) + \eta_{ij},\ \text{where}$$

Y_{ij} – the USE result of a student *i* on the subject *j* (i.e. in Russian, Mathematics, average result on obligatory exams as well as average overall result);

ln($Income_i$) – natural logarithm of monthly income per person in the household i;

ln(1 + $Total\ Investment_i$) – natural logarithm of total investment in pre-entry coaching made by family i, increased by one;

$\alpha_j, \beta_j, \gamma_j$ – regression coefficients;

η_{ij} – error term.

The results of regression analysis are shown in Table 6.

Table 6. Results of regression analysis: impact of income and investment in pre-entry coaching on the USE results

Dependent variable / Coefficients	USE score in Russian	USE score in Mathematics	Average USE score in obligatory subjects	Overall average USE result
α_j (Crossing)	20.648***	-29.466***	-4.409	-32.576***
	(7.755)	(9.657)	(8.026)	(8.566)
β_j (Income)	4.514***	9.371***	6.943***	9.892***
	(0.811)	(1.010)	(0.839)	(0.893)
γ_j (Investment)	0.653***	0.406***	0.530***	0.423***
	(0.070)	(0.087)	(0.073)	(0.075)
R^2	0.100	0.092	0.104	0.154

Significance level: *** - 1%. Standard errors are given in parentheses.

The results of the regression analysis prove the hypothesis that income positively and significantly affects USE results in all cases. The investment in pre-entry coaching is significant and has a positive effect on the scores as well. However, the investment effect is lower than the effect of income.

At the same time, independent variables such as income and investment in pre-entry coaching have a positive correlation; the correlation coefficient is 0.107 and significant at a 1% level, so the estimations of the coefficients may be biased. One way to avoid this is to run regressions of total investment in pre-entry coaching on USE results under a fixed income, i.e. separately for each income group. Therefore, we have estimated the following model:

$$Y_{ij} = \lambda_j + \varphi_j \ln(1 + Total\ Investment_i) + v_{ij}, \text{ where}$$

Y_{ij} – the USE result of a student i on the subject j (i.e. in Russian, Mathematics, average result on obligatory exams, as well as average overall result);

ln(1 + $Total\ Investment_i$) – natural logarithm of total investment in pre-entry coaching made by family i, increased by one;

λ_j, φ_j – regression coefficients;

v_{ij} – error term.

Coefficients (φ_j) of corresponding regressions for each income group which can be interpreted as efficiency (the marginal effects) of pre-entry coaching are shown in Table 7.

Table 7. Effects of investment in pre-entry coaching on USE results for students with different levels of income

Dependent variable ⟍ ⟍ Income group	USE score in Russian	USE score in Mathematics	Average USE score in obligatory subjects	Overall average USE result
Low	0.609***	-0.136	0.236**	-0.284***
Medium	0.607***	0.498***	0.552***	0.828***
High	0.999***	0.878***	0.938***	0.404**

Significance level: ** - 5%, *** - 1%.

The marginal effect of investing in pre-entry coaching increases with the rise of the level of income for almost all USE results, aside from the average overall result. This means that the same amount of investments in pre-entry coaching have a higher return and are more effective for high income students. Thus, a total investment of 50,000 rubles according to the model adds 5.1 points out of 200 to the final USE score on obligatory subjects for students from low income families, 11.9 points for those from medium income families, and 20 points for those from high income families.

These data may indirectly explain the reason as to why low and medium income families can spend more on pre-entry coaching than those of a high income.

V.   Relationship between college choice and income status

Differences in students' achievement, expressed through their USE results, show the inequality of opportunities for being successfully admitted to university. We shall now examine how the level of income affects admission, as well as what kind of place (whether tuition-free or not) is achieved by the student, and the total tuition fees at the chosen university.

As previously mentioned, according to the admission rules the process of admission takes place in several waves. The distribution of students according to the moment of admission is shown in Table A3 in the Appendix. There is a relationship between the level of income and admission. The most affluent students are more frequently admitted to universities via Olympiads, and less frequently, as a result of the second wave, when the risk of being not admitted is substantially higher. However, reasons for a student's admission during the first wave are clear. Should the student fail to obtain a tuition free-position, he/she could still be admitted to the same university, since their parents have sufficient financial resources to support them and they would be obliged to cover the tuition fee.

It is not surprising then, that amongst students from high income families the proportion of those who pay tuition fees is the highest (see Table 8). This means that these students whose results were insufficient for a state subsidized position still have an opportunity to attend their chosen university.

Table 8. Type of place depending on family income

Type of place	Level of income		
	Low	**Medium**	**High**
Tuition-free	63.8%	67.9%	53.4%
Tuition-paid	36.0%	32.1%	46.6%
Rather not say	0.2%		
Total	**100.0%**	**100.0%**	**100.0%**

We shall now examine what kind of position (whether tuition-free or not) is open to students with equal USE results, but with different levels of income. We used the average USE results of obligatory subjects as the indicator of achievement. Low achievers are those students whose score varies from 41 – 60 points, medium achievers are students who have received 61 – 80 points, and high achievers are students who have scored more than 80 points out of 100[8].

Among low achievers (students who have a higher risk of not being admitted), the proportion of students who study for free decreases with the rise of income level (see Table A4 in the Appendix). This could be due to the fact that more wealthy students can afford to pay tuition fees if they are unsuccessful in applying for a state-subsidized position. At the same time, less advantaged low achievers will tend to look for less selective universities with a lower level of competition amongst its applicants.

The important indicators which reflect university and quality of higher education are tuition fee and the average USE of the students who were admitted on a tuition-free basis. It is no secret that most popular universities charge higher tuition fees. The distributions of those students at universities with different tuition fees depending on their households' level of income are presented in Table 9.

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[8] We use this scale and do not consider those students who have achieved less than 41 points, since USE scores from 0 to 40 points denote a "fail", and those students who have such results are not allowed to apply to university.

Table 9. Tuition fees at universities attended by students from different income groups

Tuition fee	Level of income		
	Low	Medium	High
50000 rub. per year or less	68.6%	52.9%	36.9%
50001 - 75000 rub. per year	20.5%	16.4%	12.1%
75001 - 150000 rub. per year	7.7%	21.7%	30.1%
More than 150000 rub. per year	3.2%	9.0%	20.9%
Total	**100.0%**	**100.0%**	**100.0%**

Using the distributions above, we can argue that families from the higher income group choose more expensive institutions. At the same time more than 2/3 of students from lower income families study at universities with relatively low tuition fees, some of whom pay for their tuition fees and some of whom are on state subsidized places. The picture is the same if we consider those who study for free, and those who pay for their education separately. Moreover, 71.9% of students from low income families who study for free attend the universities with tuition fees of less than 50,000 rubles per year, while state subsidized students from high income families prefer more expensive universities.

Consequently, students from families with different levels of income not only differ by their USE results and their investment in pre-entry coaching, but also by the amount of tuition fees in the universities they attend. Wealthier students study at more expensive universities (and we may tentatively say that those universities are of a higher quality, but this issue requires a more detailed examination), while students from poorer households end up at lower cost universities.

The second indicator of quality of higher education is the average USE score among students who were admitted for state subsidized positions. This variable reflects the university's selectivity and as well as the general level of freshmen.

Table 10 represents the distributions of the average USE scores of first-year students for each income group. The differences between income groups are statistically significant. We can state that, on average, wealthier families prefer universities with higher average scores; richer students are admitted to universities with a higher level of competition for state subsidized positions. Indeed, only 3.9% of low income students and 6.8% of medium income students attend the most selective universities, while among high income students this proportion increases to 12.1%.

Table 10. Distributions of average USE scores for first-year students

Average USE score	Level of income			Sample
	Low	Medium	High	
41 - 60 points	27.5%	12.4%	7.6%	16.9%
61 - 80 points	68.7%	80.8%	80.3%	76.5%
81 - 100 points	3.9%	6.8%	12.1%	6.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Since average USE scores among freshmen may reflect popularity and demand for the university, the relationship between the average USE scores and the level of income allows us to conclude that richer students attend more selective institutions. This is true for both tuition-free students and those who pay for their tuition. This statement is confirmed by the results of regression analysis; coefficients of the regression of income on the average USE score are positive and significant at a 1%-level of significance[9].

Can it be claimed that students from different income groups but with the same USE scores choose different universities? Table 11 represents the choice of low, medium and high achievers depending on their level of income.

Table 11. Distributions of students with different average USE scores among universities

	Individual USE scores								
	Fair			Good			Excellent		
Level of income / Average USE score	Low	Medium	High	Low	Medium	High	Low	Medium	High
41 - 60 points	27.1%	15.8%	15.4%	28.7%	11.1%	3.2%	11.1%	8.6%	13.2%
61 - 80 points	69.7%	79.6%	65.4%	67.5%	84.1%	86.3%	77.8%	71.4%	73.7%
81 - 100 points	3.2%	4.6%	19.2%	3.8%	4.8%	10.5%	11.1%	20.0%	13.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Number of observations	155	152	26	157	270	95	18	35	38

Low achievers. Due to the limited number of observations in the high income group, all the data in this group can be considered for reference only. However, when we move from the low income group to the medium income group, we can see significant differences in the distributions; more wealthy students apply and are admitted to universities with higher average USE scores. Hence, for low achievers the relationship between the level of income and the average USE score of the chosen university is positive.

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[9] For students who study for free, the regression equation is: *Average USE score* = 48.668 + 2.217 ·ln (*Income*); for those who cover their own tuition fees: *Average USE score* = 47.129 + 2.121 ·ln (*Income*), where ln(*Income*) – is the natural logarithm of monthly household income per person.

Medium achievers. This group is the largest one and contains students who have achieved 61 – 80 points on average in Russian and Mathematics. The higher the households' income is, the larger is the number of students in the group who tend to choose more selective universities. Hence, income positively affects the choice of higher educational institutions for medium achievers.

High achievers. This group is the smallest, which is why we cannot come to an unambiguous conclusion on the significance of the differences between different income groups. On the one hand, the insignificance of the differences could be due to the small number of observations. On the other hand, it could be because high achievers from richer families tend to have the same chances at successful admission to university as those from poorer households.

Hence, at least for low and medium achievers, we can argue that the relationship between level of income and university choice (where the indicator of choice is the average USE score among students who study for free) is significant and positive. In other words, students from higher income families, even with equal USE scores, manage their results more effectively than applicants from lower income families.

Conclusion

We have studied how income status affects high school students' achievements on the basis of their USE results, as well as pre-entry strategies and university choice. We have addressed the question as to whether richer students still can benefit more from the reformed system of university admission. Before the USE, access to higher education was limited by a high level of university selectivity and specific requirements for applicants, when students were required either to invest in pre-entry courses provided by the university or to have individual consultations with tutors for successful admission. Thus, the university choice for applicants from low income families was initially restricted to less selective universities of a lower quality. After the introduction of the USE, under standard requirements and the same examination program this problem could be solved. However, richer parents still can invest more financial assets, which can result in their children's increased final USE results.

First, we have set a positive relationship between the level of income and USE results in Russian and Mathematics, as well as in the average score on obligatory subjects and the average overall USE result. This tendency is maintained even under fixed prior achievements before the start of the process of pre-entry coaching.

We have subsequently examined how pre-entry coaching affects the achievement of students from different income groups. It was found that students from richer families tend to

choose additional ways of preparation more frequently, specifically pre-entry courses and classes with tutors. Nevertheless, the higher amount of investments in pre-entry coaching is made by medium income families, but if we consider the effectiveness of such preparation, the richest students have greater benefits and the poorest gain significantly less. Therefore we can argue that additional pre-entry coaching is effective for high income students and ineffective for low income ones. In other words, in having more resources for preparation, wealthier students do seem to gain better results in the USE.

We addressed the separate question as to how students with different income backgrounds and with equal USE scores manage their USE results. As an indicator of university choice we have chosen the average USE result of students who were admitted to state subsidized positions. We have revealed a positive relationship between the level of income and the average USE score for low achievers and medium achievers. This means that under these levels of achievement richer students manage their scores more effectively than poorer ones. However, among high achievers (expressed in USE scores) the relationship between the level of income and university choice was ambiguous. On one hand, this could be due to the small number of observations noted. On the other hand, high achievers from richer families may have the same chances for successful admission as those from poorer households, so the institution of access to higher education provides equal opportunities for high achievers regardless of the level of parental income.

Nevertheless, income status is a significant factor which determines achievement (expressed in USE results), characteristics of pre-entry coaching and university choice. Thus, we cannot conclude that the introduction of the USE has provided equal access to higher education for all income groups of students.

While our analysis is restricted to the biggest Russian cities and does not reflect situation in smaller regions, we can claim that as far as small towns and villages are concerned, the problem of equality is even more aggravated.

In this paper we have shown that access to higher education in Russia under the system of standardized exams can be limited for lower income students, as richer families can benefit in at least two ways; by investing in pre-entry coaching which, in turn, increases USE results, and/or by the more effective management of results. Therefore, the equality of higher education can be improved both by the state and by universities themselves. This could be achieved via discounts within pre-entry courses for high school graduates from disadvantaged backgrounds, and also by an improvement in the ease of access to information which would aid affluent students in making a successful choice of university, and facilitate the proper management of their final scores.

References

1. Androushchak G., Prakhov I., Yudkevich M. The Strategies of Pre-entry Training and University Choice under The Unified State Examination: information bulletin. Moscow – Yoshkar-Ola: OOO "Center-Print", 2010 (in Russian).

2. Androushchak G., Prakhov I., Yudkevich M. The Strategies of University Choice and Pre-entry Coaching: information bulletin. Moscow: Vershina, 2008 (in Russian).

3. Baird L.L. Family Income and Characteristics of College-Bound Students. ACT Research Report No. 17, 1967.

4. Baird L.L. Relationships Between Ability, College Attendance, and Family Income // Research in Higher Education, Vol. 21, No. 4, 1984, pp. 373-395.

5. Belley P., Lochner L. The Changing Role of Family Income and Ability in Determining Educational Achievement. NBER Working Paper 13527, 2007.

6. Cabrera A.F., La Nasa S.M. On the Path to College: Three Critical Tasks Facing America's Disadvantaged // Research in Higher Education, Vol. 42, No. 2, 2001, pp. 119-149.

7. Chapman D.W. A Model of College Choice // The Journal of Higher Education, Vol. 52, No. 5, 1981, pp. 490–505.

8. Coleman J., Campbell E., Hobson C., McPartland J., Mood A., Weinfeld F., York R. Equality of Educational Opportunity. U.S. Government Printing Office, Washington D.C., 1966.

9. Dahl G.B., Lochner L. The Impact of Family Income on Child Achievement. NBER Working Paper 11279, 2005.

10. Datcher L. Effects of Community and Family Background on Achievement // The Review of Economics and Statistics, Vol. 64, No. 1, 1982, pp. 32-41.

11. Davis-Kean P.E. The Influence of Parent Education and Family Income on Child Achievement: The Indirect Role of Parental Expectations and the Home Environment // Journal of Family Psychology, Vol. 19, No. 2, 2005, pp. 294–304.

12. Delaney AM. Parental Income and Students' College Choice Process: Research Findings to Guide Recruitment Strategies. Paper presented at: Annual Forum of the Association for Institutional Research; May 17–20, 1988; Minneapolis, Minn.

13. Hearn J.C. Academic and Nonacademic Influences on the College Destinations of 1980 High School Graduates // Sociology of Education, Vol. 64, No. 3, 1991, pp. 158-171.

14. Hill M.A., O'Neil J. Family Endowments and the Achievement of Young Children with Special Reference to the Underclass // The Journal of Human Resources, Vol. 29,

No. 4, Special Issue: The Family and Intergenerational Relations, 1994, pp. 1064-1100.

15. Leibowitz A. Parental Inputs and Children's Achievement // The Journal of Human Resources, Vol. 12, No. 2, 1977, pp. 242-251.

16. Litten L.H. Different Strokes in the Applicant Pool: Some Refinements in a Model of Student College Choice // The Journal of Higher Education, Vol. 53, No. 4, 1982, pp. 383–402.

17. Morris P., Duncan G.J., Rodriguez C. Does Money Really Matter? Estimating Impacts of Family Income on Children's Achievement with Data from Random-Assignment Experiments. Unpublished Manuscript, 2004.

18. Orr A.J. Black-White Differences in Achievement: The Importance of Wealth // Sociology of Education, Vol. 76, No. 4, 2003, pp. 281-304.

19. Prakhov I., Androushchak G. Student Loans: Terms of Provision and Demand for a Loan // Journal of Educational Studies, No. 3, 2009, pp. 76-93 (in Russian).

20. White K.R. The Relation Between Socioeconomic Status and Academic Achievement // Psychological Bulletin, Vol. 91, No. 3, 1982, pp. 461-481.

Appendix

Table A1. Sufficiency of high school knowledge for successful matriculation depending on the level of income

Sufficiency of high school knowledge	Level of income			Sample
	Low	Medium	High	
Yes, high school knowledge is sufficient for successful matriculation	36.9%	34.7%	33.0%	35.2%
No, high school knowledge is insufficient for successful matriculation	58.6%	61.0%	59.7%	59.9%
Rather not say	4.4%	4.3%	7.3%	4.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table A2. The USE results depending on the amount of investment of pre-entry coaching and level of income

	Subject					
	Russian			Mathematics		
Level of income / Total expenditures on pre-entry coaching	Low	Medium	High	Low	Medium	High
No expenditures	63.92	63.89	65.71	58.27	59.63	63.67
25000 rub. and less	65.38	67.48	70.66	55.25	61.77	65.04
25001 - 50000 rub.	67.26	68.36	74.99	58.11	62.30	73.87
More than 50000 rub.	70.59	68.43	77.47	59.13	62.96	73.67

	Subject					
	Obligatory subjects			Overall average result		
Level of income / Total expenditures on pre-entry coaching	Low	Medium	High	Low	Medium	High
No expenditures	61.09	61.76	64.69	57.74	59.27	69.03
25000 rub. and less	60.32	64.62	67.85	57.69	61.59	63.68
25001 - 50000 rub.	62.68	65.33	74.43	58.57	63.98	72.13
More than 50000 rub.	64.86	65.70	75.57	57.36	67.05	75.72

Table A3. Point of admission to the university depending on the level of income

Point of admission to the university	Level of income		
	Low	Medium	High
At the beginning of the admission procedure process as the result of participation in an Olympiad	4.2%	6.0%	6.8%
As a result of the first wave (before 30th of July)	56.5%	64.4%	55.8%
As a result of the second wave (before 10th of August)	34.6%	27.1%	23.8%
Rather not say	4.7%	2.5%	13.6%
Total	**100.0%**	**100.0%**	**100.0%**

Table A4. Proportion of students who study on a tuition-free basis

USE results (Russian and Mathematics)	Level of income		
	Low	Medium	High
Fair	53.2%	42.1%	37.5%
Good	74.2%	84.3%	56.5%
Excellent	95.0%	74.4%	100.0%

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