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Higher Education Expansion in Russia: What Stands Behind?

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Since the reforms started about ten years ago higher education in Russia has experienced deep changes which may appear contradicting. On one hand, state financing has been cut almost by half in real terms, graduates can not find a job corresponding to their University specialization and the returns to education in Russia are found very low in Russia. On the other hand, no state University has been closed; more than three hundred private Universities have been opened, the number of students has increased considerably and the entry competition is becoming more and more tough.

The paper analyzes the on-going higher education expansion in Russia and its relation to labor market trends. The first level of analysis is regional: we find what regional characteristics are responsible for changes in student numbers. The results show that wealth of a region and unemployment rate are not significant.

The main part of the paper investigates the reaction of the number of students applied and actually admitted to wage and employment in the corresponding labor market. The data are available by regions and by 15 sectors of economy (such as industry, agriculture, services, science etc.) for at least four years 1995-1998. Both OLS in relative change form and panel regressions are used but the results are mostly the same. A number of conclusions is obtained: first, the employment coefficient is positive and significant while the wage one is not usually significant. Second, the regressions for the number of people applied (as proxy for the demand for education) and the number of people admitted (i.e. outcome in equilibrium) are almost identical which might indicate the demand-driven character of higher education in Russia. Third, there are strong regional effects mainly similar to those found in the regional analysis. And finally, using the educational data for 1999 some effect of August 1998 crisis is discovered.

The findings of the paper have a lot of important policy implications, first, for regional authorities and, second, for federal policy in the area of connecting higher education and labor market.

Другов М.А. Что стоит за ростом высшего образования в России? Препринт BSP/01/048E.- М., Российская экономическая школа, 2001.- 35 с.(Англ.)

За последние 10 лет реформ высшее образование в России претерпело значительные изменения, которые могут показаться противоречивыми. С одной стороны, бюджетное финансирование сократилось почти в два раза в реальном выражении, большинство выпускников не могут найти работу, соответствующую их диплому, отдача от образования оценивается на крайне низком уровне. С другой стороны, ни один государственный вуз не был закрыт за эти годы, было создано более 300 негосударственных вузов, численность студентов значительно выросла и растет, конкурс в вузы также увеличивается.

В работе анализируется рост в высшем образовании и его связь с ситуацией на рынке труда. Сначала проводится исследование на региональном уровне: мы находим, какие региональные характеристики объясняют рост числа студентов. Результаты показывают, что величина доходов в регионе, а также уровень безработицы не являются значимыми.

Основная часть работы исследует зависимость числа заявлений в вузы и численности принятых на первый курс от заработной платы и занятости на соответствующем рынке труда. Используются данные по регионам и 15 секторам экономики (промышленность, сельское хозяйство, услуги, наука и т.д.) за несколько лет, в основном 1995-1998. Оцениваются как модели МНК, где берутся относительные изменения переменных, так и в панельной форме; при этом результаты главным образом совпадают. Получен ряд выводов: во-первых, коэффициент при занятости положителен и значим, в то время как при заработной плате - обычно незначим. Во-вторых, модель для числа заявлений (как приближения для спроса на образование) практически совпадает с моделью для численности принятых на первый курс (т.е. результата равновесия), что может свидетельствовать о незначительности стороны предложения в росте высшего образования в России. В-третьих, существуют значительные региональные эффекты, похожие на те, которые были найдены в региональном анализе. Наконец, данные по образовательным переменным за 1999 указывают на некоторое влияние кризиса августа 1998 года.

Выводы работы могут служить для получения важных рекомендаций как региональным властям в области общего роста высшего образования, так и федеральным на стыке политики занятости и реформирования системы высшего образования.

ISBN

I. Introduction

Higher education in Russia has experienced deep changes since the reforms started about ten years ago. State financing has been cut almost by half in real terms and quality of higher education has fallen considerably in most fields. On the labor market side there is an enormous dismatch between graduates professions and their actual occupations. The returns to education in Russia are found low compared to other countries and very low compared to market interest rate as reported by a number of studies, for example, Nesterova & Sabirianova (1999) and Scheidvasser & Benitez-Silva (2000). However, no state University has been closed; more than three hundred private institutions[1] have been opened, the number of students has increased considerably and the entry competition is becoming more and more tough.

The aim of this paper is to analyze the linkage between the on-going higher education expansion and labor market in Russia. As the first step, we seek for the factors that explain the number of students in higher education in Russia's regions. Understanding the complexity of the phenomenon we suppose that there is no one single theory which could explain it; thus, it has *a multidimensional character.* The main part of the paper is devoted to the analysis of the entrance to Universities. This is made on the level of sectors of economy by regions. We want to find how the number of people applied to Universities and the number of students admitted have reacted to the situation on the corresponding labor markets controlling for the regional characteristics found to be significant at the first step.

The findings of the paper might have a lot of important policy implications for the policy makers in education at both federal and regional levels. The main conclusion is made on the adjustment of the higher education system to the needs of

[1] For the sake of style we use the terms "University" and "institution" as synonyms in this paper.

economy: changes in entrance to Universities are found to be mostly due to the demand side of the market and labor market trends seem to have rather limited influence on the process.

The paper is empirical and it is based on the Goskomstat regional data and Ministry of Education data on Universities.

The paper is organized as follows. In section 2 we give a survey of literature; in section 3 regional analysis is presented; section 4 contains the core analysis of entrance adjustment; and conclusions are drawn in section 5.

II. Literature survey

Education has been extensively investigated by economists for at least forty years. Seminal papers of Mincer (1958) and Becker (1964) are usually mentioned as first attempts to study education by the tools of economic theory and econometrics. Literature on economics of education could be divided into two main directions: one studies why education is important for economy while the other investigates the market for education.

The basic questions posed by economists in the framework of the first direction is how education influences some variables of interest like wages or national output and economic growth. Among several possible answers one could undoubtedly indicate the two main explanations: human capital and signaling theories.

The first one is proposed by Becker (1964) which introduces the notion of human capital. Education serves as an investment tool increasing productivity of human capital. Thus, a higher level of education results in a higher wage on the individual level and a higher output on the national level. The second approach pioneered by Spence (1973) is based on asymmetric information problem typical

for labor market. Level of education is supposed to signal to an employer about abilities of potential employee. In its extreme form this approach assumes that education adds nothing to abilities and skills of students. Therefore, from social welfare point of view education is a wasteful activity. On individual level, however, a higher educational attainment leads to a higher wage.

There exist other theories that are less popular in the literature. One of them is bottle-neck theory (see Freeman (1986) for a detailed discussion of this approach). It assumes that there is a low substitutability among different types of labor and shortage of some types of labor causes significant bottle-neck problems. A low elasticity of substitution between more and less educated workers explains higher earnings of more educated. Another approach proposed by Schultz (1975) is to assume that through education individuals acquire some skills that allow them to deal better with situations of disequilibrium by increasing their mobility. Therefore, education positively affects average life-time earnings reducing the probability of being unemployed. This reasoning is also applied when it is said that education is an insurance against risk and uncertainty (Kodde (1986)).

Some institutional economists and sociologists discuss an ideological dimension of education. Besides obvious positive externalities education is said to set values and to form ideology. Therefore, a common educational background creates social stability and cohesion. This is the main answer to the question "Why education is publicly provided, not only publicly funded?". In models a common ideology usually means lower transaction costs and consequently a more efficient economy. It sometimes noted, however, that competition among different ideologies might be useful for the society.

The basic question "How does education influence wage (output)?" might have two interpretations. First, the sign of this relationship - positive, negative or

neutral; second, the exact mechanism through which this influence is realized. In practice there is little doubt that education has a positive effect on individual and national performance. So, the main problem is to establish the mechanism of this influence.

After this short description of the existing and often competing theories it is clear that it is a challenge to distinguish among them. Almost any study that relates a performance variable to educational proxies sheds little light on the nature of this relation. At the same time, the finding of relation between education and performance is not a simple curiosity. The importance of its policy implications can hardly be overestimated. The optimal size, shape and quality of educational system are subject to every-day political debates in many countries. Different approaches offer different suggestions not only in terms of the exact figure but in some cases in terms of their meaning also. For example, a high dropout rate is bad from human capital theory point view and good in terms of signaling theory. Or, an ideological view of education demands rather homogenous educational system while bottle-neck approach claims for the opposite. Some features of the different theories are presented in Table 1.

Table 1

How different are different theories?

Theory *Unit* *of analysis*	**Signaling**	**Human capital,** bottle-neck, disequilibria	**Ideology**	
Individual	Higher wages	Higher wages	Higher utility	*Benefits*
Country (region)	No	Higher output and growth	Stability, low transaction costs	
Educational system	Heterogeneous	Heterogeneous and growing	Homogeneous	*Implications*
Educational institution	Conservative	Innovative	Conservative	

While benefits assumed by different theories are often discussed their implications for the educational system as a whole and educational institutions are rarely analyzed. From the signaling point of view educational system should be quite heterogeneous so that the fact of studying in a particular institution (or in an institution of a particular type) is a revealing signal. Educational institutions should not change much so that their relative position remains the same. Theories which suppose that individual acquire some skills through education imply that educational system should be heterogeneous and growing to meet the needs of growing and changing economy; for the same reason educational institutions should be innovative. Theory of ideology effect of education implies that students should be treated as equally as possible for the best acquisition of common values;

consequently, educational system and institutions should be stable and homogenous.

Study of educational market in most cases is limited to the investigation of the demand for education. It is mainly individual demand that is investigated but societal demand is also studied. The multiplicity of theories is reflected in these studies: any of the above discussed approaches might explain the demand for education.

Decision on the education has been modeled in a number of ways. Models in which education performs only investment function seem to be unrealistic. So education with a consumption component is modeled. Usually it is a normal good but Lazear (1977) finds that it is "bad" in some sense. Schultz (1963) divides benefits from education into three parts: higher future wealth due to investment component of education; higher current utility due to present consumption component; and a higher future utility due to an increased ability to consume (future consumption component).

As typically for empirical work, definition of the demand for education is strongly influenced by the available information. Since few studies have direct information on intentions and willingness to pay for education (see Hu & Hossler (2000) for such a study) it is usually considered that "an individual has demanded (higher) education if s/he has obtained a (higher) education degree or is undertaking such education in the reference week" (Albert (2000) p. 151). So these studies investigate the simultaneous outcome of demand and supply of education; if changes in time are considered then it is implicitly assumed that supply has been stable and perfectly elastic.

Theoretical models mainly analyze the influence of monetary costs and returns on the educational demand while all sociological interrogations convincingly report

that there are a lot of non-economic motives such as self-esteem or social status which influence the decision on education. Tradition and environment are also very important in educational choice. As a result family and parental characteristics explain most of variance in many studies.

The demand-centered view of educational market is dominant in the analysis of higher education expansion which is typical for most developed and many developing and transitional economies. In most cases this expansion has been characterized by a deteriorating quality of education and "diploma inflation" which is difficult to explain by signaling and human capital theories. One of the bright examples of such a phenomenon is Israel in 90-s as described in Mehrez & Mizrahi (2000). Besides "abstract" quality of education the question of the correspondence between the educational expansion and the needs of the economy has also been addressed. The common finding is the inertia of the demand for education and consequently overproduction of some professions while the demand for some others is not fully satisfied.

Supply side, i.e. educational institution as a unit of analysis has received less attention than the two above discussed topics of importance of education and demand for education. While this is partly explained by the fact that the economics of educational institutions is not an area of interest for main stream economics this also reflects the neoclassical "black box" approach to organizations. Another reason that there are great conceptual problems in defining performance of schools and Universities, quality of education and outputs. Finally, data limitations play a significant role in narrowing empirical work.

Most econometric work is done on schools for several reasons. First, in any country the number of schools is sufficient for an econometric study. Second, they are much more similar than colleges or Universities. Third, standardized test scores

existing in many countries serve as a good proxy for school performance. The main goals of these studies is to construct production functions for schools, to assess their performance and to measure the influence of some factors important for policy makers such as regional and district characteristics. An overview of approaches and techniques used for these aims is given in Hanushek (1986) and Hanushek & Taylor (1989).

There are some econometric papers on the functioning of Universities like Toutkoushian (1999) who estimates cost functions for US postsecondary institutions. However, because of relatively small number of higher education institutions in most countries a lot of work is done in case-study manner highlighting organizational changes to a great extent. One of the widely discussed problems is the transition from the traditional collegial decision making to more centralized management in American style as discussed, for example, in Askling (2001) for the case of Sweden.

Empirical work on Russia is not extensive due to data limitations. Besides already mentioned RLMS-based studies there were also sociological interrogations (see e.g. Effendiev (1996)) which asked young people and sometimes parents on the professional and educational plans. However, these studies are not much revealing as the samples are usually small and only aggregated statistics is reported.

While case studies are rather numerous as far as I know there has been no econometric study which investigated the performance of Universities. The available regional data seem to have inspired nobody for a research.

III. Regional analysis

In this section we analyses the regional aspect of higher education expansion in Russia during second half of 90-s. The underlying assumption is that interregional student (and labor force) mobility is relatively low. This means that we can regard regional systems of higher education as closed, i.e. responding mainly to the changes in the corresponding regions. There are some exceptions - Moscow is definitely being one and probably Saint-Petersburg, Novosibirsk and several other big cities - where the share of students from other regions is quite high but this is not a common phenomenon.

Considering the number of students, graduates and some other characteristics of regional educational systems we must take into account that they are the joint outcome of two forces: demand and supply of education, therefore we can not attribute all the changes to the demand side as it is done in many papers: we must also consider factors that influence the supply of higher education such as federal budget expenditures on education.

Investigating changes in education one should realize the inertia of educational sphere: people demand and Universities react in response to the facts and tendencies that happened some time ago. In our case we expect that situation in regions in the first half and mid 90-s has been reflected in the changes in education in the second half of the 90-s.

We mainly use the Goskomstat data sources such as "Regiony Rossii" and "Sotsialno-economitcheskoye polozheniye Rossii". In some cases we will use indices constructed by other agencies like Renaissance Capital (to characterize regional authorities, social and political stability).

The two basic indicators of the size of higher education system - the number of students in higher education and the number of higher education institutions (HEI) - are presented in Fig.1 and 2. We see that in the beginning of the transition the number of students had been falling reaching the lowest point of 2.61 mln in 1993/1994 academic year. After that time the system has been recovering. In the year 1996/1997 the number of students was approximately equal to that of mid and late 80-s and it reached 4.7 mln in 2000 of which only 0.47 mln were in private Universities. Since 1993 the annual increase has been about 0.26 mln, i.e. 9%[2].

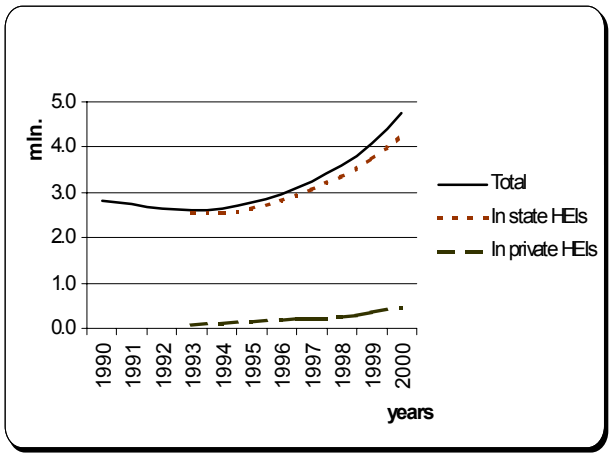

Fig. 1. Number of students in higher education

Source: Goskomstat

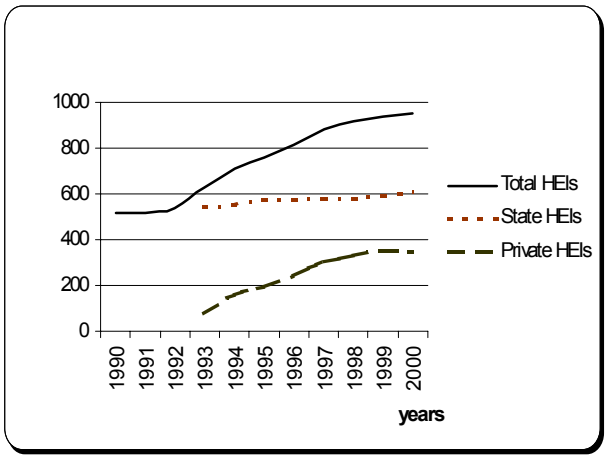

Fig. 2. Number of higher education institutions (HEI)

Source: Goskomstat

The number of state HEIs has been steadily increasing during all years of reforms (by 9 HEIs per year on average). The number of private institutions shows an impressive pattern: from virtually zero in the 1990 to 347 in 2000. The growth was always monotonic with the only exception of 1999-2000 when number of private Universities decreased by two[3].

[2] 0.22 mln and 6% if only state institutions are considered.

[3] This is unlikely to be a sign of educational market saturation as the number of students in these institutions is growing and the number of state institutions as well as their branches is also increasing.

Whereas regional differences in the rates of expansion may be substantial in some cases, the overall situation has not changed much as can by judged by comparing Tables 2 and 3. The statistics is given with Moscow and Saint-Petersburg excluded as the two regions are clear outlyers: the number of students in the two cities was 27.5% of the total number in 1990 and 25.6% - in 1998.

Table 2

Summary statistics for the number of HEI students in 1990*

	Percentiles	Smallest		
1%	0	0		
5%	2.8	0.4		
10%	4.1	2.7	Obs	76
25%	11.9	2.8	Sum of wgt.	76
50%	18.7		Mean	27.0
		Largest	Std. Dev.	22.4
75%	42.3	74.9		
90%	60.3	78.8	Variance	500.6
95%	74.9	85.2	Skewness	1.1
99%	89.6	89.6	Kurtosis	3.2

* Without Moscow and Saint-Petersburg

Source: Goskomstat

Table 3

Summary statistics for the number of HEI students in 1998*

	Percentiles	Smallest		
1%	1.1	1.1		
5%	4.1	2.5		
10%	6.54	3.9	Obs	76
25%	14.7	4.1	Sum of wgt.	76
50%	23.0		Mean	35.2
		Largest	Std. Dev.	28.7
75%	51.7	96.9		
90%	79.2	108	Variance	825.0
95%	96.9	113.2	Skewness	1.1
99%	113.4	113.4	Kurtosis	3.3

* Without Moscow and Saint-Petersburg

Source: Goskomstat

From 1990 to 1998 the number of students in Russia increased by 30%. Almost all the statistics (mean, standard deviation, distribution by percentiles) also

increased by the same magnitude while the form of the distribution (skewness and kurtosis) rests unchanged.

Our hypothesis is that the higher education expansion in Russia in the second half of the 90-s had a multidimensional character. This means that the growth in higher education can not be attributed to one single cause, say, a greater unemployment rate. At both sides of the educational market several factors have led to the expansion.

On the demand side we expect the following: First, variables that reflect situation on the labor market during several previous years, such as unemployment rate and some its characteristics (average age of unemployed and distribution of unemployed by education level). This group of variables will stand for the most popular theory of the demand for education as investment. Second, there should be some variables to account for political and social stability like number of crimes or some complex indices which will reflect the insurance view of educational demand. Third, we have to include variables for the wealth of regions such as gross regional product per capita, per capita money income or expenditures and probably variables which measure inequality. These variables will stand for the view of education as a consumption good. Fourth, we should measure somehow cultural level of a region which reflects such gains from education as self-esteem and common values. This could be proxied by average educational level of population or by the percentage of urban population.

On the supply side the most important factor is perhaps the previous development of higher educational system which accounts for a considerable inertia of the educational system. This could be proxied by the proportion of students at some date in the past. Then current tendencies should be taken into account like

regional budget expenditures on education[4] which will show whether education is a priority for regional authorities or relations with the federal center as higher education in Russia is financed from the federal budget. This will proxy the demand for education of the region as a whole (of regional authorities) which have the power to shift the supply curve downwards.

In rather arbitrarily setup the expected signs could be a priori attributed as shown in Table 4.

Table 4

Expected signs in explaining number of HEI students

Group of variables	Demand side				Supply side	
	Unemployment	Stability	Wealth	Cultural level	Previous development	Policy of regional authorities
Expected sign	+	+	+	+	+	+

The first problem to be solved is in what form the dependent variable - number of students in higher education - should be used. After careful consideration we decided to take the growth in number of HEI students for the period from1994 (the lowest point) to 1998 (we prefer to use the last year before crisis as it has some effect as discussed in section 4). We normalized it by the number of HEI students in 1994[5].

[4] In Russia higher education and to a great extent secondary professional education is financed from federal budget (there only 6 regional Universities, all in Moscow). The rest of educational system is on regional (or municipal) budgets.

[5] Sometimes we normalize by the number of HEI students in 1985. This year is the last available before the beginning of decline in the late 80-s. Since a very important variable is the fall in HEI students from 1985 to 1994 normalized by the level of 1985 it makes regression results easier to interpret. In no regression the results in terms of significance and sign have been different.

Looking at Fig. 1 one can think that in the beginning of the 90-s higher education in Russia contracted and the expansion afterwards is merely a return to the pre-reform level due to better economic and social conditions. Thus, we might expect that in regions with a higher fall in the number of students in early 90-s there will be a higher growth in late 90-s. Surprisingly, we observe the opposite result as shown in Table 5.

Table 5

```
Regression with robust standard errors
      Number of obs =     75
      F(  1,    73) =  44.47
      Prob > F      =  0.00
      R-squared     =  0.40
      Root MSE      =  20.70
------------------------------------------------------------
        |             Robust
sth9894 | Coef.  Std. Err.  t     P>|t|     [95% Conf. Interv.]
---------+--------------------------------------------------
sthr9485|  0.70   0.10     6.67   0.00          0.49   0.91
   _cons| 38.99   2.28    17.12   0.00         34.45  43.53
------------------------------------------------------------
```

sth9894 - change in the number of HEI students from 1994 to 1998 normalized by its level in 1985

sthr9485 - change in the number of HEI students from 1985 to 1994 normalized by its level in 1985

We see that the sign of independent variable is significantly positive. So on average the development of higher education in a region in 1985-94 has a positive influence on its subsequent development in 1994-98.

While trying to take into account all the factors that have probably had influence on higher education expansion we made a lot of regressions and two comments have to be made here. First, the fact that some variables a priori considered important are insignificant might be due to the poor data quality rather

than to their real unimportance. Second, unavailability of some variables or poor data quality has led to attempts to find proxies which sometimes could look ambiguous or strange[6].

Our best regression looks as presented in Table 6:

Table 6

```
Regression with robust standard errors
      Number of obs =      70
      F(  6,    63) =   47.90
      Prob > F      =    0.00
      R-squared     =    0.45
      Root MSE      =  11.99
------------------------------------------------------------------------
         |             Robust
sthr9894 | Coef.    Std.Err.  t    P>|t|   [95% Conf. Interv.]
---------+--------------------------------------------------------------
sthr9485 | 0.18     0.04     4.17  0.00       0.09    0.26
 young94 | 1.71     0.67     2.53  0.01       0.36    3.05
 unhe_97 |-1.68     0.42    -3.98  0.00      -2.53   -0.83
 unpre_a | 0.007    0.0006  12.09  0.00       0.006   0.008
isedu_97 | 2.27     0.49     4.62  0.00       1.29    3.26
crimpc_a |-0.011    0.003   -3.19  0.00      -0.018  -0.004
   _cons |34.40    13.11     2.63  0.01       8.21   60.59
------------------------------------------------------------------------
```

sth9894 - change in the number of HEI students from 1994 to 1998 normalized by its level in 1985

sthr9485 - change in the number of HEI students from 1985 to 1994 normalized by its level in 1985

young94 - share of young people (15-24 years) in population, %, 1994

unhe_97 - share of unemployed with higher education, %, 1997

[6] For example, share of unprofitable enterprises may be interpreted in two ways: measure of wealth or estimation of current employment perspectives. Number of crimes is said to proxy regional stability while in the next section number of teenagers' crimes is assumed to reflect the attitude towards education through the average number of children and thus cultural level.

unpre_a - share of unprofitable enterprises, %, average for 1992-98

isedu_97 - share of education in investment fixed capital, %, 1997

crimpc_a - number of crime reported, per 100 000 population, average for 1990-98

Here the share of young people in population is a control variable for the demographic situation. The share of unemployed with higher education reflects (negatively) the attractiveness of receiving higher education. The share of unprofitable firms serves as a proxy for regional wealth. The share of education in investment fixed capital reflects to some extent (assuming that educational investment is mainly publicly funded) the policy of regional authorities with respect to education as well as federal component of investment. Finally, the number of crimes is a proxy for regional stability.

The results mostly coincide with our expectations with the exception of the sign of the share of unprofitable enterprises: interpreting this variable as the wealth of a region we have that in poorer regions (higher share) there are more students. However, a different interpretation is possible: this is a proxy for the opportunity costs of studying in University. Thus, a greater share of bad firms (as well as a higher unemployment rate) means a worse alternative to studying.

Finally, it should be noted that we have no variable for the cultural level of regions. We tried different variants like share of population with some level of education but they were insignificant.

IV. Entrance analysis

In this section we use University-level data to study entrance into higher education. Each year every University (state funded) fills in and sends to the Ministry of Education and Goskomstat the statistical form called "3-nk". The form describes Universities as on the 1st of October of the corresponding year. It is designed by Goskomstat and it slightly changes from year to year but the data for different years are comparable. We use two variables: number of students admitted and number of applications[7] both taken from the first bloc of 3-nk "Distribution of students by year and specialization". We have the number of students admitted for 1994-99 and the number of applications for 1995-99.They are aggregated in Fig.3 Sectors are industry, agriculture, education, communications, transport and so on (15 altogether). For such a division Goskomstat provides employment and average wage on the regional level which are used to describe the situation on the labor market. There is no "official" correspondence between University specializations

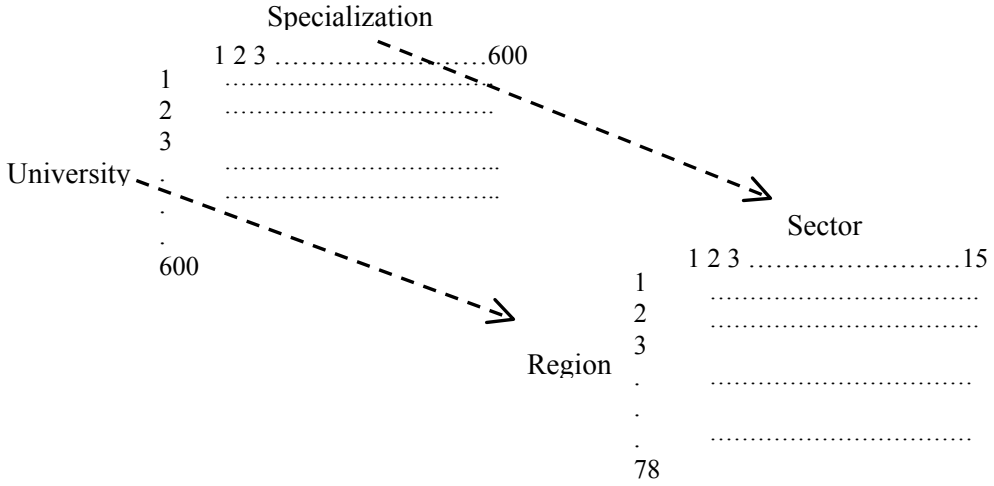

Fig. 3. Data aggregation

[7] Several remarks should be made concerning our data: first, we have data only on state-owned Universities; second, we do not distinguish in our analysis the students who study for free from those who pay for education, and third, we do not take into account different forms of education such as day, evening, by correspondence and external: we simply sum up all the forms. The usual approach in educational statistics is to use a weighted sum. On our level of aggregation the difference is not considerable.

and these Goskomstat sectors so we grouped specializations into sectors by ourselves. These labor market variables are available for 1990 and 1995-98.

The sector-regional matrix is then transformed into a single column so we would have $15 \times 78 = 1170$ observations but given incomplete information for some sectors and regions we typically have 700-900 observations depending on the specification of a regression.

Analyzing the number of students admitted we face the same problem as with the number of students in the previous section: it is also the joint outcome of demand and supply and the influence of the latter might be very strong. The following supply-side effects can be mentioned:

1. Every University has the maximal number of students it can teach written in its license. However, the Ministry of Education establishes every year so-called "control figures of admittance", i.e. number of students for every specialization which should be admitted. In practice, Universities write a proposal about these control figures based on their strategy and capacities which is approved without changes by the Ministry in most cases.
2. In small towns and regions there are a lot of branches of Universities managed from the head University and their strategy might be different from that of other Universities in a region. In many cases branches are created to "pump out" money using the brand name of the head University and provide education of rather poor quality.
3. For a number of reasons (from psychological to financial) Universities increase the number of students much more readily than decrease, so we observe "admittance hysteresis".
4. For several highly demanded fields such as economics, management, law and some others the Law "On education" limits the share of "commercial"

students (those who pay for education) by the 25% of the "budget" students (study for free).

The number of applications reflects mainly the demand side of higher education market. The only supply effect we can think of here is the change in expected probability of being admitted: if places, for instance, in economic departments were held constant we would not observe such an increase in people who want to be economist (they would go to private Universities). So we expect that the number of applications behaves differently and probably more dynamic.

An important issue is the form in which entrance and labor market variables are used[8]. First, what period changes should be taken? The idea was to use rather long periods because education is said to be inertial. We discuss further the effect of crisis of August 1998 on the entrance to Universities; for labor market variables we tried to use changes on 1990 basis but the results are almost the same. Second, how to calculate these changes? In models presented here we use logarithm of the ratio for two years (see explanation after Table 7) and regressions using usual percentage changes are given in Appendix Table A1.

In Table 7 two regressions explaining the number of students admitted and the number of applications are presented:

[8] Here we discuss only OLS estimations with entrance and labor market variables in relative change form. Our data allow for a panel estimation (1995-1998) which is done in Appendix Tables A2-A5. The main results - significance of employment (and the value of coefficient) and insignificance of real wage - are almost the same while some regional variables show a different pattern. We prefer to use and discuss OLS regressions as they are more robust to the quality of data and do not assume rapid year-to-year reaction of educational variables to labor market changes.

Table 7

Regressions with robust standard errors	admi9995	appl9995
E9895	0.298 (2.96)***	0.192 (1.92)*
wr9895	0.178 (1.33)	0.067 (0.48)
large	0.125 (0.89)	0.207 (1.42)
medium	0.252 (2.56)**	0.224 (2.21)**
estasc98	0.003 (1.62)	0.003 (1.98)**
towns_96	0.012 (2.88)***	0.015 (3.62)***
mitosl_a	0.001 (2.29)**	0.001 (2.82)***
aexedu97	0.037 (3.49)***	0.024 (2.13)**
conspc_a	-0.002 (2.38)**	-0.003 (2.78)***
young_a	-0.051 (2.91)***	-0.043 (2.39)**
crteen_a	0.000 (2.26)**	0.000 (1.49)
Constant	0.113 (0.35)	0.117 (0.34)
Observations	754	754
R-squared	0.11	0.10
Robust t statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

admi9995 - changes in admittance, 1995-99

appl9995 - changes in the number of applications, 1995-99

e9895 - changes in employment, 1998-95

wr9895 - changes in real wage, 1998-95

All the changes are in logarithmic form: varXY = ln(varX/varY)

large - dummy for big regions (with population more than 4 mln)

medium - dummy for medium size regions (with population 1 - 4 mln)

estasc98 - electoral stability score (taken from Renaissance Capital), 1998

towns_96 - share of town residents (taken from Renaissance Capital), 1996

mitosl_a - ratio of money income to average subsistence level, average for 1994-97

aexedu97 - share of educational expenditures in regional budget, 1997

conspc_a - general education facilities commissioned per 10,000 population, average for 1990-97

young_a - share of people less than working-age, average for 1991-97

crteen_a - number of crimes committed by teenagers or with their accessory per 100,000 population, average for 1990-97

We see that unlike our expectations the number of students admitted and the number of applications follow similar behavior patterns what may imply that higher education expansion is mostly driven by the demand side. Another explanation is also possible: Universities react to the same variables as people in choosing the fields of growth. This also implies comparable speeds of adjustment of supply and demand.

Employment coefficient is found to be positive and significant while real wage coefficient is not. We tried different forms of estimation and this situation is found in most specifications. This is probably due to the fact that the data on employment are usually better: wages are underreported and disinflation may also worsen the data.

The positive effect of the share of town population and money income is intuitive; the effect of electoral stability (abstracting from the way it is calculated) poses no questions either. The positive influence of regional size deserves some explanation. In our opinion, a bigger region has more Universities which results in a tougher competition among them. So, in bigger regions competitive forces make Universities adapt more rapidly and stimulate demand for their services.

The share of educational expenditures in regional budget which we found to be positive is a proxy for the policy of regional authorities in sphere of education. While there is no direct way to influence higher education on the regional level this could be done indirectly, for example, by postponing or even abolishing utility bill payments.

The three last variables - the number of places in general education, the share of young population and number of teenagers' crimes - seem all to have wrong signs. Our interpretation is that all three variables have higher values for regions with a good demographic situation which are mostly situated in the Russian south. High birth rates demand more places in general education and they also mean higher teenagers' crimes. On the other hand, in these regions the value of higher education has been traditionally low compared to the rest of Russia, thus, the growth in higher education has been smaller in these regions.

Low values of R-square are not surprising as we have only employment[9] to explain intersectional variance.

The crisis of August 1998 is said to cause a considerable growth in the entrance to higher education as current employment perspectives (i.e. opportunity cost of education) have worsened considerably. A further step is to assume that the group which chooses to work or to study differs from other students (applicants) in its responsiveness to labor market tendencies. We have only one year after the crisis[10] so we use one-year changes. The results are in Tables 8 and 9.

[9] And wage but it is insignificant.

[10] Formally, we have two: 1998 and 1999 since information is collected for the 1st of October. However, given the admittance process ending in summer, we treat 1998 data as being before crisis.

Table 8

Regressions with robust standard errors	admi9995	admi9895	admi9998
e9895	0.298 (2.96)***	0.217 (3.49)***	0.134 (1.99)**
wr9895	0.178 (1.33)	0.116 (1.33)	0.122 (1.37)
large	0.125 (0.89)	0.041 (0.43)	0.136 (1.46)
medium	0.252 (2.56)**	0.041 (0.75)	0.235 (3.27)***
estasc98	0.003 (1.62)	0.002 (2.89)***	0.001 (0.67)
towns_96	0.012 (2.88)***	0.004 (1.41)	0.013 (4.59)***
mitosl_a	0.001 (2.29)**	0.000 (1.56)	0.001 (2.57)**
aexedu97	0.037 (3.49)***	-0.002 (0.37)	0.045 (5.25)***
conspc_a	-0.002 (2.38)**	-0.001 (1.98)**	-0.001 (1.68)*
young_a	-0.051 (2.91)***	0.001 (0.20)	-0.052 (4.02)***
crteen_a	0.000 (2.26)**	0.000 (1.46)	0.000 (1.91)*
Constant	0.113 (0.35)	-0.055 (0.22)	-0.151 (0.63)
Observations	754	863	802
R-squared	0.11	0.05	0.16
Robust t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

admi9895 and admi9998 are calculated in the same way as before; all other variables were defined above

We know that the consequences of the crisis were much more severe for big cities and we see this in higher education figures: only in 1999 were the size of a

region and the share of urban population significant. The fact that labor market variables are less important for 1998-99 change than before is not surprising: the crisis had structural consequences and previous changes in sectors of economy were not of great value.

The wrong-sign-three-variable group seems to have less influence before the crisis than after it. This coincides with our interpretation: for the poor south regions the crisis had virtually no consequences, so after-crisis adaptation of the rest of Russia has made this difference in higher education expansion.

The same analysis of August 1998 crisis is applied to the number of applications in Table 9.

Table 9

Regressions with robust standard errors	appl9995	appl9895	Appl9998
e9895	0.192 (1.92)*	0.114 (1.75)*	0.121 (1.89)*
wr9895	0.067 (0.48)	0.063 (0.69)	0.089 (0.93)
large	0.207 (1.42)	0.097 (0.93)	0.148 (1.54)
medium	0.224 (2.21)**	0.026 (0.44)	0.213 (2.97)***
estasc98	0.003 (1.98)**	0.004 (4.46)***	0.000 (0.20)
towns_96	0.015 (3.62)***	0.006 (2.12)**	0.014 (4.82)***
mitosl_a	0.001 (2.82)***	0.000 (0.47)	0.001 (3.81)***
aexedu97	0.024 (2.13)**	-0.007 (0.91)	0.039 (4.49)***
conspc_a	-0.003 (2.78)***	-0.001 (1.86)*	-0.001 (1.84)*
young_a	-0.043 (2.39)**	0.002 (0.25)	-0.047 (3.66)***

crteen_a	0.000 (1.49)	0.000 (1.80)*	0.000 (0.71)
Constant	0.117 (0.34)	-0.081 (0.29)	-0.164 (0.65)
Observations	754	863	802
R-squared	0.10	0.05	0.13
Robust t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

appl9895 and appl9998 are calculated in the same way as before; all other variables were defined above

Looking at the 1995-98 regression there is an impression that the number of applications depended on almost no reasonable variables: only regional stability is significant at 1% level and for all periods the influence of labor market is very limited. We may conclude that before the crisis people wanted to have any higher education diploma and the supply was the limiting side of the market. After the crisis people began to think more thoroughly about what education they need and whether they can afford it.

In general we can say that the difference between admittance and application regressions are not so considerable to imply a great importance of the supply side. However, the demand for higher education does not seem to follow labor market trends closely.

V. Conclusion

In the literature review section we have seen that there are several competing theories that propose different mechanisms through which education affects positively individual and national wealth. This multiplicity of approaches has been reflected in a number of theories that explain the demand for education.

Rather poor economic performance of Russia, huge differences among regions and the rapid and stable growth of the higher education indicates undoubtedly in our opinion the presence of several reasons that explain this phenomenon. The non-existence of one dominant theory made us suppose a multidimensional character of the higher education expansion in Russia in the second half of the 90-s.

The presented regional analysis supports our hypothesis. Despite a lot of shortcomings it allows to conclude that there is a number of factors related to different theories that are responsible for the growth in higher education while some most popular factors such as unemployment rate are found to be insignificant. Thus, it is highly doubtful that the higher education expansion in Russia in late 90-s can be explained in the framework of one single theory.

The analysis of entrance to higher education shows that supply side effects are not so considerable as one might expect, or at least, demand and supply in higher education follow the same economic and social trends in the environment.

The core issue of whether higher education has been adapting to the changes in the economy is answered in a rather expected manner: there is some adaptation but not very significant. This creates a ground for more active and pronounced policy in higher education. The Ministry of Education should probably change the "control figures of admittance" and the way they are established. Another possibility is a financial mechanism which stimulates development of some fields of study. Finally, the linkage between higher education and labor market should be

improved. The fact that the majority of graduates do not find the job in the same field as their University degree prevents applicants from seeking direct employment benefits from higher education and this preserves the current inefficient situation.

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Appendix

Table A1

Regressions with percentage change variables

Regressions with robust standard errors	admi9995	admi9895	admi9998	appl9995	appl9895	appl9998
e9895	0.947 (3.01)***	0.474 (2.83)***	0.305 (2.63)***	0.375 (1.41)	0.603 (1.36)	0.273 (1.83)*
wr9895	0.750 (2.11)**	0.413 (1.55)	0.307 (2.50)**	0.811 (1.81)*	0.259 (0.52)	0.309 (1.83)*
large	107.716 (1.37)	89.166 (1.30)	16.609 (1.28)	153.501 (1.59)	195.217 (1.66)*	27.033 (1.64)
medium	67.586 (2.07)**	36.894 (1.94)*	22.161 (1.95)*	75.486 (1.81)*	83.904 (1.85)*	26.113 (1.96)*
estasc98	0.529 (2.31)**	0.455 (2.71)***	0.137 (1.09)	0.675 (2.47)**	1.001 (3.09)***	0.126 (1.00)
towns_96	2.712 (1.92)*	1.600 (1.80)*	2.043 (3.32)***	3.746 (1.91)*	3.627 (1.95)*	2.451 (3.23)***
mitosl_a	0.113 (1.09)	0.079 (1.16)	0.085 (2.08)**	0.223 (1.58)	-0.016 (0.12)	0.163 (2.97)***
aexedu97	3.926 (1.02)	1.131 (0.35)	4.676 (2.92)***	3.713 (0.80)	-3.236 (0.44)	4.783 (2.01)**
conspc_a	-0.695 (2.01)**	-0.389 (1.53)	-0.081 (1.12)	-0.869 (2.07)**	-0.678 (1.62)	-0.076 (1.00)
young_a	1.840 (0.51)	1.493 (0.97)	-1.924 (1.27)	6.526 (1.47)	0.723 (0.22)	-1.415 (0.71)
crteen_a	-0.008 (1.00)	-0.007 (1.23)	0.000 (0.00)	-0.015 (1.51)	-0.018 (1.62)	-0.003 (1.37)
Constant	-112.054 (0.91)	-58.587 (0.77)	-96.335 (1.88)*	-234.592 (1.46)	5.012 (0.03)	-129.124 (1.83)*
Observations	754	863	802	753	863	802
R-squared	0.04	0.02	0.08	0.03	0.02	0.06
Robust t statistics in parentheses						
* significant at 10%; ** significant at 5%; *** significant at 1%						

All the change variables (admi, appl, e, wr) are in the percentage change form, i.e. varXY = (varX-varY)/varY*100
admi - changes in admittance
appl - changes in the number of applications
e - changes in employment
wr - changes in real wage
large - dummy for big regions (with population more than 4 mln)
medium - dummy for medium size regions (with population 1 - 4 mln)
estasc98 - electoral stability score (taken from Renaissance Capital), 1998
towns_96 - share of town residents (taken from Renaissance Capital), 1996
mitosl_a - ratio of money income to average subsistence level, average for 1994-97
aexedu97 - share of educational expenditures in regional budget, 1997
conspc_a - general education facilities commissioned per 10,000 population, average for 1990-97
young_a - share of people less than working-age, average for 1991-97

crteen_a - number of crimes committed by teenagers or with their accessory per 100,000 population, average for 1990-97

Table A2

Random effects model estimation

Random-effects GLS regression	l_admi	l_appl
l_e	0.196 (12.99)***	0.187 (12.05)***
l_wr	0.015 (0.39)	-0.014 (0.35)
t96	0.058 (3.18)***	0.104 (5.35)***
t97	0.168 (8.38)***	0.213 (10.00)***
t98	0.265 (19.19)***	0.319 (21.52)***
large	0.085 (0.51)	0.131 (0.78)
medium	-0.105 (1.12)	-0.060 (0.63)
estasc98	-0.000 (0.34)	-0.000 (0.08)
towns_96	-0.039 (10.37)***	-0.038 (9.94)***
mitosl_a	0.001 (2.54)**	0.002 (2.81)***
aexedu97	0.005 (0.40)	0.006 (0.54)
conspc_a	0.001 (1.42)	0.002 (2.41)**
young_a	-0.021 (1.88)*	-0.006 (0.55)
crteen_a	0.000 (9.44)***	0.000 (9.80)***
Constant	5.353 (13.46)***	5.307 (13.09)***
Observations	3646	3645
Number of counter	949	949
R-sq within	0.14	0.16
R-sq between	0.43	0.42
R-sq overall	0.41	0.41
Absolute value of z statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

Variables admittance (l_admi), application (l_appl), employment (l_e) and real wage (l_wr) are in logarithms

t96, t97 and t98 are dummies for the corresponding years (this is a four-year panel: 1995-98) all other variables were defined above

Table A3

Random vs. Fixed effects Hausman test

Hausman specification test	l_admi			l_appl		
	Coefficients		Difference	Coefficients		Difference
	Fixed effects	Random effects		Fixed effects	Random effects	
l_e	0.132	0.196	-0.064	0.088	0.187	-0.099
l_wr	0.093	0.015	0.079	0.059	-0.014	0.072
t96	0.032	0.058	-0.026	0.080	0.104	-0.024
t97	0.137	0.168	-0.031	0.183	0.213	-0.030
t98	0.270	0.265	0.005	0.322	0.319	0.003
crteen_a	0.000	0.000	-0.000	-0.003	0.000	-0.003
Chi2(6)	13.80			14.92		
Prob>chi2	0.032			0.021		

Table A4

Fixed effects model estimation

Fixed-effects (within) regression	l_admi	l_appl
l_e	0.144 (4.27)***	0.091 (2.52)**
l_wr	0.076 (1.72)*	0.042 (0.89)
t96	0.037 (1.88)*	0.088 (4.16)***
t97	0.141 (6.41)***	0.185 (7.85)***
t98	0.258 (18.76)***	0.308 (20.90)***
Constant	5.341 (39.91)***	6.059 (42.31)***
Observations	3801	3800
Number of counter	994	994
R-squared	0.13	0.15
Absolute value of t statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

Table A5

Estimation of time-invariant variable coefficients

OLS regression on time-invariant variables after within estimation	Fixed effects u_admi	Fixed effects u_appl
large	0.184 (1.10)	0.266 (1.54)
medium	-0.039 (0.41)	0.030 (0.30)
estasc98	-0.000 (0.21)	0.000 (0.17)
towns_96	-0.034 (8.62)***	-0.032 (8.01)***
mitosl_a	0.002 (2.58)***	0.002 (2.93)***
aexedu97	0.000 (0.01)	0.002 (0.17)
conspc_a	0.002 (1.83)*	0.002 (2.85)***
young_a	-0.030 (2.68)***	-0.018 (1.54)
crteen_a	0.000 (8.64)***	0.000 (9.27)***
Constant	0.492 (1.27)	-0.167 (0.41)
Observations	891	891
R-squared	0.32	0.33
Absolute value of t statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		