GRAGUATES WITH ENGINEERING EDUCATION ON THE RUSSIAN LABOR MARKET: SHORTAGE OF SUPPLY OR LOW QUALITY OF JOBS?

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Abstract

Currently many Russian experts express the opinion about the existence of imbalance between the structure of professional training and labor market needs. One manifestation of this imbalance is the lack of supply of graduates who received diplomas of engineers. The answer to this situation was activities of the state aimed at increasing the number of places for training in engineering area and the reduction of places for training in other areas.

The idea of the study: if there is a shortage of engineering graduates then we should expect a higher rate of employment of graduates with engineering education, both in general and in accordance with the education profile. If the rate of employment is higher for young engineers than other graduates, then the reasons for the declared deficit should be sought in the unattractiveness of the jobs offered to engineers.

Regression analysis showed that engineering education does not increase the likelihood of young people employment. The declared reasons of the engineering personnel shortage are not low volume of training in the universities, but unattractiveness of jobs (especially on wages) offered at industrial enterprises employing engineers.

Key words: education-occupation-mismatch, over education, mismatch skills, Russian labor market.

JEL Code: I23, J24, J44

Introduction

The topic of the nonconformity of the structure of supply and demand on the Russian labor market in recent years is one of the most talked about. There is a common point of view according to which there is a high demand for engineers on the labor market, but despite this, universities are still preparing economists, managers, lawyers and other professionals, the labor market of which is already saturated. This view is usually confirmed by the data of education statistics.

Indeed, over the past 25 years, Russia has significantly changed the occupational structure of university graduates. If earlier training in the field of engineering, technology and technical sciences (hereinafter – engineers) were predominant, then at the present time, every third graduate of a Russian university has a degree in Economics or Management, what is almost 70% higher than for engineers (Education in Russian Federation, 2014).

The state's response to the changing structure of training in universities was the change in policy of financing of education in the universities. In recent years, 45% of the total number of the government-funded places in universities are allocated on programs of engineering training (Ministry of education and science of Russian Federation, 2016).

However, in order to justify the need of expanding the training of engineers it is not enough to analyze only the supply of labor, it is important to assess the demand for labor of engineers.

The idea of the study the following: if there is shortage of engineering graduates we should expect a higher rate of employment of graduates with engineering education, both in general and in accordance with the level and profile of education. In addition, the high demand for the work of engineers can lead to better employment characteristics, including official employment, the availability of indefinite employment contracts, full employment. If indicators of employment of young engineers are not higher than indicators of employment of other graduates, then the existing labor supply is sufficient, and there is no need for additional training of engineers, and the reasons for the declared deficit should be sought in the unattractiveness of the proposed jobs etc.

The objectives of the study are:

- assessment of employment in accordance with the level and profile of education of graduates who received education in engineering, compared with graduates of other specialties and areas of training;
- assessment of factors determining the employment of the graduates, received an engineering education.

The analysis is performed according to the monthly labor force surveys for the period of 2010-2015, conducted by the Federal service of state statistics. The sample included respondents aged up to 29 years inclusive, with higher education who graduated from university no more than three years ago. The total sample amounted to 90374 observations, including graduates from universities with engineering specialties and areas of training – 21.9%. For

comparison, the number of graduates from universities in Economics and Management is equal to 35,0%[1].

1 Literature review

From an economic point of view, the problem of matching the workplace to the obtained knowledge can be attributed to a number of reasons, including the presence of a significant relationship between the index of skills mismatch and structural component of unemployment (Humal, 2013), the reward from the labor market of professional knowledge only in the case that a person works on the profile of attained education (Heijke et al., 2002). According to Russian sources, referring to the entire working population, the largest discrepancy between the level and profile of education and the position is observed for workers with engineering education (Gimpelson et al., 2009).

The results of the research of education-occupation-mismatch problem in other countries give mixed reviews. The prevalence of work of engineers not on a specialty in the United States is estimated as low (Robst, 2007), and in Sweden it exceeds the average values (Nordin, 2010).

Excessive level of education (overeducation), typical for about a quarter of workers also leads to serious problems (Groot, 2000). These problems include higher unemployment among highly skilled workers, increase of its duration, the displacement of the part of employees in the sector of jobs with lower level of education, the additional costs of training in new skills (McGuinness, 2006).

The factors that determine the level of non-compliance of workplace with level and profile of education, include gender and age differences (Flisi et al., 2014), regional characteristics (Davia et al., 2017, Kupets, 2016), features of local labor markets (Ramos & Sanroma 2013), migration (Villarreal, 2016, Nieto et al., 2015).

2 Research methodology

By using logistic regression models, the authors estimated the contribution of the profile of education and other factors determining the position of graduates on the labor market.

[1] Hereinafter, employment of economists is given with the purpose of comparing two profiles of education, one of which receives additional support from the state, and the second – on the contrary, is deprived of existing funding.

The model has the following form:

$$f(z) = \frac{1}{1+e^{-z}} \quad (1)$$

$$z = b_0 + \sum_{i=1}^{n} b_i x_i + u \quad (2)$$

where z - dependent variable, e - base of natural logarithm, bi - estimated regression parameters, xi - regressors, n - number of regressors, and u - random error. The function f(z) in this model, takes values in the interval from 0 to 1, what allows its use to assess the likelihood of various states of employment.

There were used the following dependent variables:

- presence of a workplace;
- presence a workplace that fits the profile of education (variable is based on estimates of respondents to the question about the relationship of work with the obtained profession and takes the value 1 if the answer was "yes" and "probably yes" and 0 in other cases);
- presence of a workplace that fits the level of education (the variable has a value of 1 if the activity belongs to the groups "Managers" or "Specialists of the highest skill level" and 0 in other cases);
- presence of a workplace with the characteristics of standard employment (formal sector, employment contract for an indefinite term, full-time).

Regressors included characteristics of workers and characteristics of the labor market. The characteristics of workers were classified as gender, marital status, presence of children, educational background (engineering, economic, other), work experience after obtaining a diploma of higher education. The characteristics of the labor market were classified as:

- the type of settlement (city, village);
- Russian Federal district (Central, Northwest, Southern, North-Caucasian, Volga, Ural, Siberian, Far East);
- regional unemployment rate;
- the proportion of the employed population in different economic activities in the region of residence of the Respondent (agriculture, mining and manufacturing, production and distribution of electricity, gas and water, transport and communication, etc.).

In addition, there were separately constructed models for the subsample of respondents with an engineering education to identify the differences in employment of engineers.

To assess the impact of education on the characteristics of employment we also calculated the average marginal effects, showing the change in f(z) with increasing xi by one.

3 Research results

According to available data, engineering education reduces the likelihood of unemployment compared to the average performance of the labor market. The unemployment rate of graduates-engineers is estimated at 7,1% with an average value of 8,6%. The unemployment rate among economists is slightly above average and is equal to 8.7%.

Data from the labor force survey enabled us to assess the conformity of work and obtained field of study based on the evaluations of the respondents (table 1).

Tab. 1: Compliance of the main work and specialization for graduates with higher education (self-assessment, %)

Groups of training areas	Compliance of the work and specialization, training area			
	Yes	Rather yes	Rather no	No
All areas of training	53,2	14,3	7,5	25,1
Engineering, technology, technical sciences	54,0	14,5	7,3	24,2
Economics and management	48,4	18,3	9,2	24,1

Source: our calculations

As can be seen from the table, the presence of engineering education from the standpoint of employment does not give significant advantages. If we summarize the two possible answers ("Yes" and "Rather yes"), then differences in the employment of engineers and economists become very insignificant - 1.8 percentage points.

Information about the correspondence of the level of education obtained and education required in the workplace, can be obtained from the table 2.

Tab. 2: The distribution of graduates with higher education by occupations (in accordance with the classification of occupations, %)

	Executives	Specialists of highest qualification level	Other types of occupations
All areas of training	8,8	55,6	35,6
Engineering, technology, technical sciences	12,2	54,0	33,8
Economics and management	10,0	53,5	36,5

Source: our calculations

As can be seen from table 2, in this case again the presence of engineering diplomas does not give serious advantages. The presence of an excess of education is a characteristic of all of the groups and the variation of the average value is small (see category "other types of occupations").

Slightly larger differences were obtained with the analysis of other employment characteristics of graduates:

- for employed in the formal sector the differences vary in the range from 87,2% to 90,5%;
- among self-employed from 73,4% to 76,7% of young professionals have an employment contract for an indefinite period;
- among self-employed from 76,3% to 81,6% of young professionals work full time.

Let's refer to the results of the regression analysis of the situation of graduates on the labor market (table 3).

Tab. 3: The results of estimating logit models of the situation of university graduates in the Russian labor market

Dependent variable	Engineering education		Economic education	
	Parameter estimation	Average marginal effect	Parameter estimation	Average marginal effect
Presence of a workplace	0,117***	0,024	0,054***	0,011
Compliance of the workplace with obtained level of education	0,278***	0,061	0,144***	0,032
Compliance of the workplace with obtained profile of education	0,342***	0,0712,9	0,188***	0,039
Formal employment	0,248***	0,025	-0,102***	-0,010
Full time employment	0,039	0,012	-0,177	-0,049
Employment contract for an indefinite period	0,178	0,003	0,312***	0,010

*** p<0,01

Source: our calculations

The table shows that engineering education gives certain advantages in the labor market, increasing the chances of getting a job, including job in compliance with the level and profile of education. However, the differences are statistically significant, but nor relevant. They do not allow confirming the thesis that graduates with engineering degree are much higher in demand. So, the differences between engineers and economists for employment in accordance with the received level of education is estimated at 2,9 percentage points, and in accordance with the profile of education is 3,2 percentage points.

Let's consider the main factors affecting employment of graduates with an engineering degree. Since the influence of all examined factors on the likelihood of employment in accordance with the level of education is extremely small, let us consider patterns of employment and employment in accordance with the profile of education.

The effect of gender on the employment of engineering graduates is statistically significant (p<0,01). For men the increase in the probability of employment is slightly higher

(0,008) than for women, however, in the case of employment in accordance with the profile of education increase the probability of women is slightly higher – in the range of 0,003. Similar results were obtained in relation to marital status and presence of children.

The probability of employment is positively related to time elapsed after the end of training ($p<0,01$). The average marginal effect for employment is 0,051. However, for employment in accordance with the received profile of education evaluation is statistically significant, but the differences are minor ($p<0,01$, the average marginal effect is less than 0,01).

Living in the city compared to a village has a positive effect on employment of engineers ($p<0,01$), although the magnitude of marginal effects is small 0,024 (employment) and 0,009 (employment according to profile of education).

The unemployment rate in the region negatively affects the likelihood of employment: -0,005 (employment), -0,012 (employment according to profile of education).

Analysis of regional differences shows that the largest employment chances of young engineers are on the labor market of the North-West Federal district ($p<0,01$, the increase of probability of employment – 0,017). In the same region, along with the Ural Federal district and Far Eastern Federal district, there is the highest increase in the probability of employment according to the profile of educational attainment – from 0,020 to 0,037.

At the same time, labor markets in the Southern Federal district and North Caucasian Federal district the availability of engineering education reduces employment opportunities and on 0,024 and 0,129 respectively ($p<0,01$).

Considering the sectoral structure of employment in the regions, we note that it has little effect on the employment of engineers, but has a positive effect on employment according to profile of education. Employment of engineers according to profile of education is positively associated the proportion of employed in extractive industries, production and distribution of electricity, gas and water. (0,044-0,045, $p<0.01$). The negative effect of the proportion of employed in manufacturing industries in regions according to the profile of education (-0,025, $p<0,01$) requires additional explanation, because the development of the manufacturing industry explains the actions associated with increase of training of engineers. In our opinion, this situation may be due to various reasons, among them are low-paying jobs, and common in this area recruitment policies of prospective employees with subsequent retraining.

Conclusion

The analysis captures the insignificant variation in the employment of graduates of Russian universities both in general and in accordance with the level and profile of education.

The employment of graduates with engineering education is positively associated with period that passed after graduation, presence of family, proportion of employed in industry and in construction, and is negatively associated with unemployment rate in the region and presence of children. Men and urban dwellers, workers living in the Central Federal district and North Caucasus Federal district, are employed in accordance with the level and profile of education less frequently.

In this connection, the current argument of increased admissions quotas for engineering specialities in universities does not seem convincing enough. The reasons of declared shortage of engineers, probably, do not lie in the plane of the education system, but in the plane of the quality of jobs.

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