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Oxana Bezler[1]
Teodor Sedlarski[2]

QUANTITATIVE ANALYSIS OF THE INTERACTION OF THE LABOUR MARKET AND THE HIGHER EDUCATION MARKET (ON THE EXAMPLE OF KAZAKHSTAN)[3]

The importance of the interaction of the labour market and the higher education market is beyond doubt. The analysis of scientific articles has shown that this type of interaction is considered by scientists depending on the direction of research. Only a few works are devoted to the quantitative analysis of the interaction of these domestic markets. The task is complicated by the fact that today there is no clear methodology for quantitative analysis of the interaction of subjects of different markets. The authors made an attempt to adapt the analysis methodology proposed by Russian scientists. The methodology used is based on an economic and statistical analysis of the interaction of the labour market and the higher education market, with the determination of the type of interaction under the influence of individual factor indicators of these markets and the use of systematic and structural group data. As a result of quantitative analysis, the lack of elasticity between the supply of universities and the needs of the labour market was revealed. The imbalance has led to the fact that in the sectors of the economy of Kazakhstan, there is a shortage in one industry and a surplus of personnel with higher education in another. The results of this study are important for stakeholders, such as politicians, universities, to solve the problems of unemployment among recent graduates.
Keywords: labour market; demand of labour market, higher education market; proposals from university graduates; interaction; types of interaction of different markets
JEL: A10; I2; J6

Introduction

The labour market and the higher education market are characterized by internal factors and socio-economic indicators. The employment of the population is one of the key indicators of the development of the socio-economic policy of the state. The mandatory employment rate of university graduates in the first year of its completion in Kazakhstan should be 80%. An important role in the growth of employment and recruitment is played by the quantitative

[1] *Oxana Bezler, Karaganda University of Kazpotrebsoyuz, e-mail: bezleroxana@mail.ru.*
[2] *Teodor Sedlarski, Sofia University "St. Kliment Ohridski", e-mail: sedlarski@feb.uni-sofia.bg.*
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interaction of the subjects of the labour market and the subjects of the higher education market. A university graduate is a participant in this interaction. Entering the university, a student decides to master certain competencies, at best, in accordance with their inclinations, ideas about the expected level of wages, income and demand in the labour market. The university strives to sell educational services of already open educational programs to as many potential applicants as possible. The more students enter the university, the higher the level of financial condition of the university. The state order for training specialists for most universities is minimal. The largest share of students in Kazakhstan receives higher education on a fee-based basis. According to official data[4] for the 2020-2021 academic year, the number of students studying at universities amounted to 576.6 thousand students. And only 29.8% (171.8 thousand students) study at the expense of state educational grants. The state does not regulate the quantitative influx of specialists of the highest category. In Kazakhstan, neither the university nor the state studies the quantitative sectoral needs of the labour market. The analysis of personnel needs is carried out only according to the documents of statistical reporting. This situation leads to a violation of the balance between the quantitative demand of the labour market for young professionals with higher education and the quantitative supply of the higher education market. In this case, it is not necessary to talk about the equilibrium price. The economic opportunities of the employer and the desires of the university graduate do not coincide. If the labour market is not able to offer enough jobs that graduates expect, then many graduates will receive limited profits from their education (Lauder, Mayhew, 2020).

The work on making projections, in developed countries, enjoys state support; however, not everywhere state institutions are producers of forecast works. Only in the USA and Canada, government agencies are responsible for this direction. In European countries, professional structure projection is carried out by non-profit organizations, for example, the English Institute for Employment Research at Warwick University or the German Institute for Employment and Occupational Research at the Federal Institute of Labour in Nuremberg. Many researchers explain the non-participation of the state in forecasting activities by the fact that the authorities are afraid to take responsibility for the quality of forecast estimates. In addition to forecasts that are developed by specialists of individual countries, there are forecasts for groups of countries of the European Union. This work is performed by CEDEFOP (Vishnevskaya, Zudina, 2017).

This imbalance, in our opinion, arises as a result of the lack of a clear organizational and economic mechanism between the interaction of the labour market and the higher education market. And also, as a result of the lack of a methodology for analyzing this interaction, the results of which can be considered in the system of planning, forecasting and state regulation.

[4] Official website of the Bureau of National Statistics Agencies for Strategic Planning and Reforms of the Republic of Kazakhstan - https://stat.gov.kz/for_users/dynamic.

Literature Review

In the international practice, a sufficient number of modern scientific works is devoted to the interaction of the higher educational market and the labour market. The absence of effective modern interaction is recognized by all authors without any exception. The authors reveal and investigate this problem from their own scientific point of view.

Kostina and Orlova (2016) conducted an empirical study of the interaction of the labour market and educational services. The authors came to the conclusion that the optimal employment structure can be achieved as a result of the employers' participation in the development of requirements for future graduates and the development of educational material.

With the objective interaction of the labour market and educational services, according to Borisenko (2017), a labour market emerges. The labour market provides a qualitative assessment of the professional competencies of its participants. The quantitative regulation is imposed on the state. Only with such a model of interaction, in his opinion, it is possible to maintain a balance of labour resources.

In the works of Perevozchikova and Vasilenko (2018), the conceptual foundations of the labour market and the higher education market services at the current stage of their interaction are defined.

Digital technologies are intensively included in all spheres of human economic activity. Their influence transforms employment, increases the mobility and innovation of the labour force. In general, this causes a change in the employer's requirements not only for the digital competencies of university graduates but also for their quantity.

In the scientific discussion, there are works devoted to the changes in the content of the labour market, its organization, and the skills of personnel under the influence of computer technology, such as Handel M. J. (2008), Green F. (2012), Seo H. J., Lee Y. S., Hur J.J., Kim J.K. (2012), Frey C. B., Osborne M. A. (2013), Azmuk N. (2015). A number of scientific works is devoted to determining the influence of information technologies on the formation of students' competencies, which in general form a qualitative component (Youssef, Dahmani, 2008; Sampath Kumar, Manjunath, 2013; Castillo-Merino, Serradell- Lopez, 2014). The state, society, and family also have a direct impact on the choice of a future speciality (Barham et al., 2009; Rodriguez – Planas, Benus, 2010; Bacher et al. 2017; Spencer-Oatey et al., 2017). The role of companies and organizations in the development of competencies of their employees with the highlighting of successful strategies and views on performance is of considerable importance in the issue under consideration (Eilström, Kock, 2008; Ronald, 2009; Lai, Teng, 2011; Velasco, 2014; Delaney et al., 2020).

In the research, the authors also focus on the significant role of competition factors in the formation of professional competencies of graduates to meet the needs of the labour market (Ma'dan Marfunizah, Muhamad Takiyuddin Ismail, 2020).

Competition in the higher education market does not lead to an increase in the quality of educational services, but to an oversupply of specialists in certain areas and a shortage in others. In order to maintain a balance, the markets should be provided with data on the

economic and personnel development of the country in the form of macroeconomic forecasts. The data should be partially corrected by employers' expectations in the short and long term. The guarantee of employment after receiving higher education should be an important competitive advantage of the university in the higher education market, the problems of which we considered in previous studies. (Borbasova, Sedlarski, Bezler, 2019).

Having studied the scientific works of domestic and foreign scientists, we can conclude that the interaction of the labour market and higher education is largely investigated through qualitative assessments. Within the framework of this study, the authors tried to give a quantitative analysis of the interaction of the labour market and the higher education market.

Analysis Methodology

The qualitative analysis of university graduates consists of studies of professional competencies. A university graduate must meet the employer's requirements for the professional and qualification composition of staff. The elasticity of the qualitative interaction of markets should be achieved due to the coincidence of the qualitative demand of the labour market with the qualitative supply of the higher education market.

A quantitative analysis of the interaction consists in the balance of the demand for labour resources with higher education (the number of vacancies) in a particular industry and the supply of the higher education market of graduates for certain educational programs. The elasticity of the interaction of quantitative and qualitative characteristics of the markets under research will provide a high level of employment. At the same time, the planning and forecasting system plays an important role in this process.

The process of interaction between the labour market and higher education market reflects the possible balance between labour demand and supply. A market in which demand matches supply reaches equilibrium, but this ideal model is not always supported. The divergence of interests creates an imbalance that requires the participation of all actors in this interaction process.

In this article, we will conduct a quantitative analysis of the interaction of the labour market and the higher education market according to available data from Kazakhstan. For quantitative analysis of interaction, the authors tried to adapt the methodology proposed by Russian scientists Khamalinsky and Zavgorodnya (2010).

The purpose of the methodology used is to identify the type and trends of interaction between the labour market and the higher education market at the current stage of socio-economic development under the influence of various factors with the possibility of planning and forecasting based on the results obtained.

Quantitative analysis of the interaction of labour market demand for personnel in certain industries and the supply of university graduates in certain areas of training is carried out using secondary data analysis. The data of the Ministry of National Economy of the Republic of Kazakhstan Committee on Statistics and the data request of the National Chamber of

Entrepreneurs (NCE) of the Republic of Kazakhstan "Atameken"[5](analyzes the employment of graduates of universities of Kazakhstan according to official data of the State Pension Payment Center and determines whether the graduate has mandatory pension contributions from wages, which confirms the official employment of graduates) were used as sources.

The methodology of quantitative analysis of the interaction of the labour market and the higher education market is implemented using a comprehensive analysis procedure (Table 1).

Table 1

Procedure for analyzing the interaction of the labour market and the higher education market

Analysis and assessment	Indicators
The dynamics of the labour market	The number of economically active people employed, unemployed, including by level of education, by vocational-qualification structure, in industry and regional contexts, allocation of the employable youth level, youth unemployment, and labour replacement rate.
Analysis of the educational services market	The number of universities, the number of universities' graduates, the employment percentage of graduates according their educational programs, the ratio of budget and extra-budgetary financing of universities.
Analysis of factors that determine the formation and functioning of the labour market with the identification of factors that have the greatest impact on the interaction of the studied markets	The total population, graduates gender structure, the number of job opportunities, the number of specialists admitted with higher education during the graduation year, the average annual salary, the cost of educational services
Analysis of the quantitative correspondence of the professional and qualification composition of the labour force to the needs of the labour market (the ratio of supply and demand in the labour market as a whole and by groups of educational programs)	The coefficient of the interaction: $C_i = \frac{S_i}{D_i}$. S_i– graduates supply with a certain of the educational programs; D_i – demand for graduates of the same educational programs. Demand elasticity coefficient (supply) from *i* (factor).
Evaluating interactions based on type and trend identification	Types of interaction with tendencies to increase or decrease the coefficient of interaction: $T_p = C_{i1} / C_{i0}$

Source: Khamalinsky, Zavgorodnaya, 2010.

In our opinion, the choice of a certain speciality for higher education depends on a number of factors:

The supply of graduates of a particular speciality depends on a number of factors:

$$S_i = F(P, P_T, N, K), \quad (1)$$

[5] https://atameken.kz.

P – educational service price;

P_T – average salary;

N – average number of universities;

K – number of working-age population.

The demand for specialists in a particular educational program depends on factors:

$$D_i = F(P_T, E, G), \quad (2)$$

P_T – average salary;

E – workplaces number;

G – number of state orders for specialists in the given educational program (number of allocated grants).

The degree of influence of one or another factor on the resulting indicator can be estimated using the elasticity coefficient. The coefficient of elasticity of demand (supply) from the *i*-factor allows you to determine the percentage change in the effective feature (supply, demand) with an increase in the factor feature by 1%:

$$E_i = y'(x_i / y_x) \quad (3)$$

E_i – elasticity coefficient from the *i* factorial feature;

y' – first derived function;

x_i – *i*-factorial feature;

y_x – aligned value of effective feature.

A multivariate model can be constructed using a linear function:

$$y_{x1,x2\ldots xn} = a + b_1 * x_1 + b_2 * x_{2+} \ldots b_n * x_n \quad (4)$$

$b_1, b_2 \ldots b_n$ – regression coefficients are showing the intensity of factors influence on the effective feature, that is, for how many units will be increased the accepted Y value, if the variable X changes by one (Khamalinsky, Zavgorodnaya, 2010).

The interaction of the higher education market takes place with a different state of demand for specialists and their supply. In the methodology used, the authors propose to determine 4 types of interaction depending on the ratio of specialists trained by the higher education market and the need for specialists with higher education in the labour market (Table 2).

Table 2

Combined matrix of types and trends of interaction between the labour market and the higher education market

Trends of market interaction	Types of market interaction			
	I	II	III	IV
The strengthening of interaction	$C_i=1,\ T_pC_i>0$	$C_i<1, T_pC_i>0$	$C_i>1,\ T_pC_i\leq 0$	$C_i=1,\ T_pC_i\geq 0$
The weakening of the interaction	$C_i>1,\ T_pC_i\geq 0$	$C_i<1, T_pC_i\leq 0$	$C_i>1, TpCi>0$	$C_i=1,\ T_pC_i<0$ $C_i>1,\ T_pC_i>0$

Source: Khamalinsky, Zavgorodnaya, 2010.

To assess trends in the interaction of the studied markets, the indicator of the growth rate of the interaction coefficient is used:

$$T_p = C_{i1} / C_{i0}, \quad (5)$$

T – growth rate of the coefficient of the interaction of market;

C – coefficient of the interaction of markets.

The I type is a weak level of market interaction, characterized by a low degree of job creation and training to meet the requirements.

The II type – the analyzed interaction is weakened by universities. In this situation, the labour market is able to move towards a new employment structure, under the influence of changed institutional conditions. Changing demand in the labour market is the impetus for changes in universities. The offer of universities hinders the development of the labour market, not satisfying its quantitative needs.

The III type of interaction, shown by a low intensity of job creation and relocation. In this case, the supply of labour for a particular educational program exceeds the demand for it.

The IV type is high interaction intensity (Khamalinsky, Zavgorodnaya, 2010).

Results

In the quantitative analysis, the factors influencing the supply and demand for graduates were determined. The primary data of the state statistics bodies, the employment service and the legal system of regulatory acts of the Republic of Kazakhstan "Adilet" and the data of NCE "Atameken" were used to conduct a secondary analysis for 2011-2019 and forecasting on 2020-2024.

Initially, with the help of correlation analysis, the influence of various factors on the graduates' supply in all educational programs was determined. The following factors were used:

S – graduates supply (persons);

P – educational services price (EUR);

P_T – cost of studying at a Universities (EUR);

N – average number of Universities (units);

K – population over the age of 15 and above (thousand people).

The results show that the average monthly salary has the greatest impact on the supply of graduates, where the relationship between this factor and the supply is opposite. This can be explained by the fact that with an increase in wages, parents have more opportunities to provide their children with the opportunity to study abroad. This has been a trend in recent years. The average number of universities has the least impact on the supply of graduates. Based on the available data, we will create a regression model of the dependence of the graduates' supply on these factors. The multiple regression equation in general looks like this:

$$S = a + b_1 P + b_2 P_T + b_3 N + b_4 K, \quad (6)$$

We will evaluate the multiple regression equation parameters using the "Regression" tool. As a result of data approximation, we've got a protocol for performing regression analysis (Table 3).

Table 3

The regression analysis protocol (graduates supply)

Regression statistics				
Multiple R	0,933955			
R-square	0,872272			
Standard R- square	0,616816			
Standard error	12012,46			
Observations	7			
Variance analysis				
	df	*SS*	*MS*	*F*
Regression	4	1970876023	4,93E+08	19,34566
Balance	2	288598304	1,44E+08	
Total	6	2259474327		
	Coefficients	*Standard error*	*t-statistic*	
a	500972,143	234274,905	2,138394	
b_1	-0,10953	0,25605646	-4,42777	
b_2	-1,31017	0,55907076	-5,34348	
b_3	-1680,38	1050,24062	-1,59999	
b_4	6,034636	9,2121187	5,655076	

Source: compiled by authors

As a result, we have the following equation of multiple linear regression:

$$S = 500972{,}14 - 0{,}11P - 1{,}31P_T - 1680{,}38N + 6{,}03K \quad (7)$$

The multiple correlation coefficient is equal to $R = 0{,}93$, which indicates a close relationship of the resulting feature with four factorial features simultaneously. The

determination coefficient is equal to $R^2 = 0{,}87$, i.e. 87% of the dependent variable variation is explained by the regression obtained. Check the statistical significance and reliability of the obtained regression equation and its coefficients. The data of regression analysis execution protocol provide that the observed value of the F-test is equal to $F_{obser} = 19{,}35$. The critical value of the F-test at the level $\alpha = 0{,}05$ and the degrees of freedom number $k_1 = m = 4$, $k_2 = n - m - 1 = 2$ (where n – number of observations, m – factors number) is equal to $F_{crit.}(0{,}05\,;\,4\,;\,2) = 19{,}25$.

As $F_{obser.} > F_{crit.}$ $(19{,}35 > 19{,}25)$, then we can conclude concerning the statistical significance and reliability of the obtained regression equation. The statistical significance of the equation certain coefficients shall be determined using a t-student statistic. The observed values of this statistic for the certain coefficients are respectively equal to:

$$t_a = 2{,}14, \quad |t_{b_1}| = 4{,}42, \quad |t_{b_2}| = 5{,}34, |t_{b_3}| = 1{,}6, \quad t_{b_4} = 5{,}7.$$

The critical value of the student criteria at the significance level $\alpha = 0{,}05$ and the number of degrees of freedom $k = n - m - 1 = 2$ is equal to $t_{crit.}(0{,}05\,;\,2) = 4{,}3$.

Comparing the observed values of t-statistics with critical ones, we can conclude about the statistical significance and reliability of only coefficients that take into account such variables as university tuition fees, the average monthly nominal salary and the population aged 15 years and older.

Let's analyze statistically significant coefficients of the obtained regression equation: with an increase in the cost of training by 10 euros, the graduates supply decreases by 110 people; with an increase in the average monthly nominal salary of 10 euros, the graduates supply decreases by 1,310 people; with an increase in the population aged 15 years and older by 1,000 people, the number of graduates increases by 6 people. Let's determine the average value of the elasticity coefficients:

$$\overline{E}_{SP} = b_1 \cdot \frac{\overline{P}}{\overline{S}} = -0{,}11 \cdot \frac{402018}{156485} = -0{,}281\ \%\ ,$$

$$\overline{E}_{SP_T} = b_2 \cdot \frac{\overline{P_T}}{\overline{S}} = -1{,}31 \cdot \frac{120005}{156485} = -1{,}005\ \%\ ,$$

$$\overline{E}_{SK} = b_4 \cdot \frac{\overline{K}}{\overline{S}} = 6{,}04 \cdot \frac{121147}{156485} = 0{,}468\ \%\ .$$

Elasticity coefficients indicate the following: with an increase in the cost of studying by 1% of the average level, the graduates supply decreases by 0.281% of its average level with the unchanged values of the remaining factors; with an increase in the average monthly nominal wage by 1% from the average level, the graduates supply decreases by 1.005% from its average level with the unchanged values of the remaining factors; with population growth aged 15 and older by 1% of the average level, the graduates supply increases by 0.468% of its average level with the unchanged values of the remaining factors.

Thus, we can conclude the average monthly nominal wage has the greatest impact on graduates' supply, and this effect is the opposite, and the possible reasons for this were indicated therein. Further, using the correlation analysis, the influence of various factors on the graduates' demand in all educational programs was determined.

The following indications were used:

D – graduates' demand (persons);

P_T – average monthly nominal wage (EUR);

E – workplaces number (units);

G – state order size for specialists (number of grants allocated, units).

The obtained results show the average monthly wage has the greatest impact on graduates' demand. The least impact on graduates' demand has a number of state orders. Based on the available data, we will create a regression model of the graduates' supply dependence from these factors. The multiple regression equation in a general way is the following:

$$D = a + b_1 P_T + b_2 E + b_3 G, \quad (8)$$

As a result of data approximation, we've got a protocol for performing regression analysis (Table 4).

Table 4

The regression analysis protocol (graduates' demand)

Regression statistics				
Multiple R	0,933955			
R-square	0,872272			
Standard R- square	0,616816			
Standard error	12012,46			
Observations	7			
	Variance analysis			
	df	*SS*	*MS*	*F*
Regression	4	1970876023	4,93E+08	19,34566
Balance	2	288598304	1,44E+08	
Total	6	2259474327		
	Coefficients	*Standard error*	*t-statistic*	
a	500972,143	234274,905	2,138394	
b_1	-0,10953	0,25605646	-4,42777	
b_2	-1,31017	0,55907076	-5,34348	
b_3	-1680,38	1050,24062	-1,59999	
b_4	6,034636	9,2121187	5,655076	

As a result, we have the following equation of multiple linear regression:

$$y = -23683{,}91 + 0{,}43P_T - 0.04E + 1{,}45G, \quad (9)$$

The multiple correlation coefficient is equal to $R = 0{,}94$, which indicates a close relationship of the resulting feature with four factorial features simultaneously. The determination coefficient is equal to $R^2 = 0{,}88$, i.e. 88% of the dependent variable variation is explained by the regression obtained. Let us check the statistical significance and reliability of the obtained regression equation and its coefficients. The data of regression analysis execution protocol provide that the observed value of the F-test is equal to $F_{obser} = 9{,}61$. The critical value of the F-test at the level $\alpha = 0{,}05$ and the degrees of freedom number $k_1 = m = 3$, $k_2 = n - m - 1 = 3$ (where n – number of observations, m – factors number) is equal to $F_{crit.}(0{,}05\,;\,4\,;\,2) = 9{,}28$.

As $F_{obser.} > F_{crit.}$ ($9{,}61 > 9{,}28$), then we can conclude concerning the statistical significance and reliability of the obtained regression equation.

The statistical significance of the equation certain coefficients shall be determined using a t-student statistic. The observed values of these statistics for the certain coefficients are respectively equal to: $|t_a| = 0{,}43$, $t_{b_1} = 5{,}55$, $|t_{b_2}| = 4{,}75$, $t_{b_3} = 3{,}41$.

The critical value of the student criteria at the significance level $\alpha = 0{,}05$ and the number of degrees of freedom $k = n - m - 1 = 3$ is equal to $t_{crit.}(0{,}05\,;\,3) = 3{,}18$.

Comparing the observed values of the t-statistic with a critical one, we can conclude the statistical significance and reliability of only coefficients proceeding all variables, except for an intercept term.

Let us analyze the statistically significant coefficients of the obtained regression equation: with an increase in the average monthly nominal wage by 1000 EUR, the graduates demand decreases by 430 people; with an increase in the number of workplaces by 100 units, the graduates demand decreases by 4 persons, it can be explained by the fact that employers prefer to hire specialists with work experience; with the increase in the size of state order for specialists by 100 units, the graduates demand increases by 145 people, i.e. the state order does not completely cover the need for specialists.

Let us define the grand mean of elasticity coefficients:

$$\overline{E}_{DT_T} = b_1 \cdot \frac{\overline{P_T}}{\overline{D}} = 0{,}43 \cdot \frac{120005}{23923{,}71} = 2{,}146\ \%\ ,$$

$$\overline{E}_{DE} = b_2 \cdot \frac{\overline{E}}{\overline{D}} = -0{,}04 \cdot \frac{1043091}{23923{,}71} = -1{,}787\ \%\ ,$$

$$\overline{E}_{DG} = b_3 \cdot \frac{\overline{G}}{\overline{D}} = 1{,}45 \cdot \frac{26971}{23923{,}71} = 1{,}630\ \%\ .$$

Elasticity coefficients indicate the following: with an increase in the average monthly nominal wage by 1% of the average level, the graduates demand increases by 2.146% of its average level with the unchanged values of the remaining factors; with an increase in the

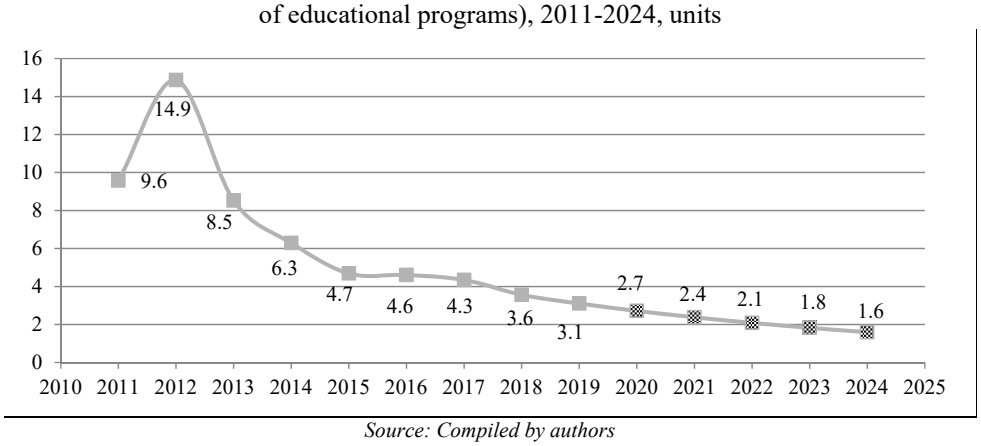
number of workplaces by 1% from the average level, the graduates demand decreases by 1.787% from its average level with the unchanged values of the remaining factors; with an increase in the size of state orders for specialists by 1% of the average level, the graduates' demand increases by 1.630% of its average level with the unchanged values of the remaining factors. Thus, we can conclude the graduates' demand is most affected by the average monthly nominal wage.

Further quantitative analysis of the interaction between the labour market demand for specialists and the supply of university graduates was as follows:

1) all educational programs were combined into 8 enlarged groups of educational programs: education; law; art; agriculture sciences; services; technical sciences and technologies; social sciences, economics, and business; healthcare and social security (medicine) using the Classifier for higher and postgraduate education educational programs of the Republic of Kazakhstan. Such groups of educational programs as the natural sciences and humanities, military affairs, and security were not included in this assessment since it is not possible to define the exact type of professional activity for these groups of educational programs;
2) building of similar regression dependence models of graduates supply and demand for each group of educational programs;
3) defining of projected values of graduates supply and demand for 2020-2024, both in general for all educational programs and for selected groups of educational programs;
4) defining the coefficient of the interaction of the higher education market and the labour market. The coefficient was calculated both according to the available data from 2011 to 2019 and according to the projected values of 2020-2024 (the 2020 data was included in the analysis as a forecast indicator, due to the lack of data during the study);
5) calculation of the coefficient of the interaction growth rate coefficient of the interaction.

Figure 1

Dynamics and forecast of the coefficient of interaction (according to the considered groups of educational programs), 2011-2024, units



Source: Compiled by authors

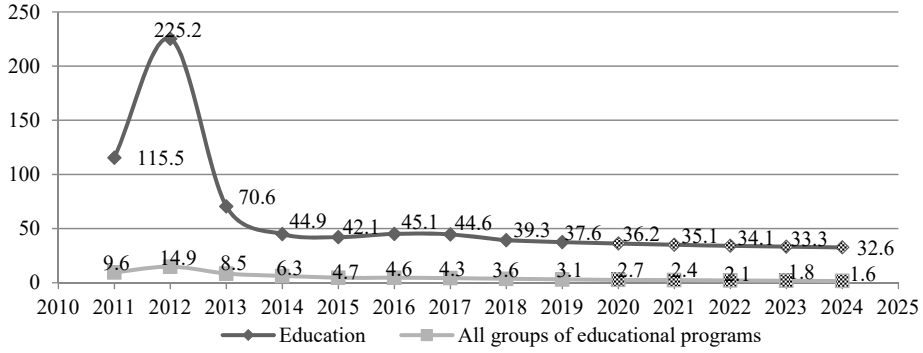
Over the period being evaluated, the interaction coefficient has an annual positive trend from 14.9 in 2012 to 3.1 in 2019. While maintaining annual economic conditions, the interaction coefficient may approach the best value of 1 (in 2024, it will be 1.6).

According to the group of educational programs "Education", the worst value of the interaction coefficient was observed in 2012, for this period, supply exceeded demand by 225.2 times, which is significantly higher than the same indicator for all educational programs (14.9).

Since 2017, the coefficient has shown a positive trend, which indicates a decrease in the imbalance between the supply and demand of graduates. The forecast values do not indicate a decrease in this gap (Figure 2).

Figure 2

Dynamics and forecast of the coefficient of the interaction for the "Education" group of educational programs, 2011-2024, units



Source: Compiled by authors

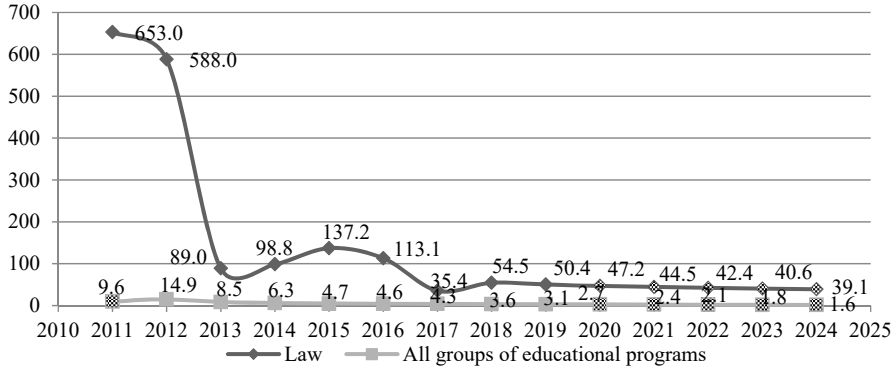
In general, the results obtained reflect the existing problems in the interaction of supply and demand for graduates in the group of educational programs "Education". There is a shortage of teachers in the republic. At a time when the state annually increases the volume of the state order for the training of pedagogical personnel at the expense of the republican budget. Educational grants are being mastered, but work in a school or college among Kazakh youth is not in demand.

For the group of the "Law" educational programs, the coefficient of the interaction has an irregular change (C>1). The greatest oversaturation of the labour market by lawyers with higher education was observed from 2011 to 2016. Over the same period, there is a significant difference with the same indicator for all educational programs (9.6 and 14.9, respectively).

In 2017, the disparity between the supply and demand of law graduates is the smallest. The forecast values for the next four years show that the interaction coefficient will be in the range from 47.2 to 39.1 and is far from an optimistic value (Figure 3).

Figure 3

Dynamics and forecast of the coefficient of the interaction for the "Law" group of educational programs, 2011-2024, units

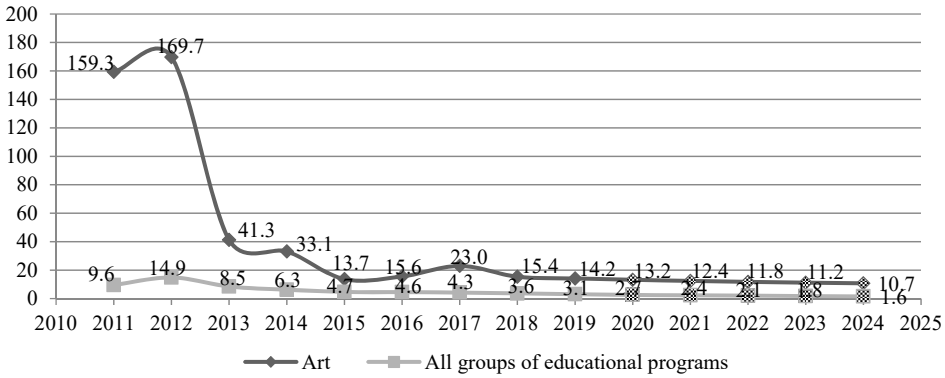


Source: Compiled by authors

For the group of educational programs "Art", the coefficient of interaction has the greatest negative effect in 2012 by 169.7 times. In general, a moderate irregular change is observed in the group of educational programs "Art" (Figure 4).

Figure 4

Dynamics and forecast of the coefficient of the interaction for the "Art" group of educational programs, 2011-2024, units

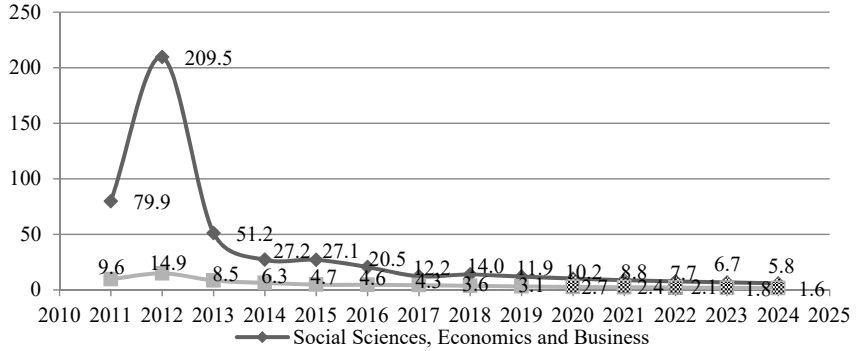


Source: Compiled by authors

For the group of educational programs "Social Sciences, Economics and Business", the worst value of the interaction coefficient was observed in 2012, during this period, supply exceeded demand by 209.5 times, which is significantly higher than the same indicator for all educational programs (14.9) (Figure 5).

Figure 5

Dynamics and forecast of the integration coefficient for the "Social Sciences, Economics and Business" group of educational programs, 2011-2024, units



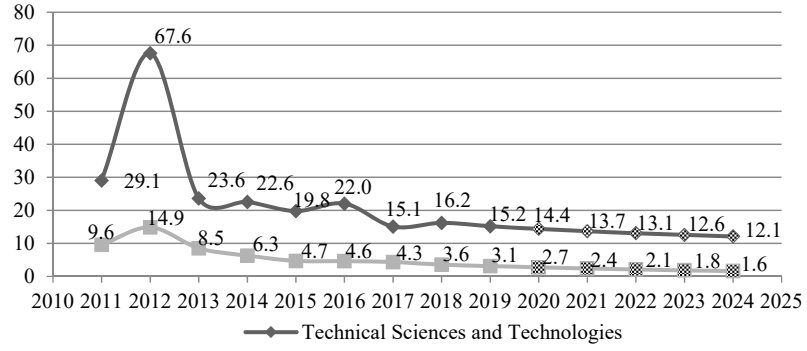
Source: Compiled by authors

However, after reaching a peak in 2012, since 2013, the interaction coefficient follows a downward trend, the imbalance between supply and demand in the studied markets decreases. In 2019, the imbalance decreased by 17.6 times (11.9) compared to 2012 (209.5). In the forecast by 2024, this tendency to reduce the imbalance between the supply and demand of graduates will continue and will strive for an ideal value.

The coefficient of interaction for the group of educational programs "Technical Sciences and Technologies" has the largest gap between the supply and demand of graduates in 2012 and exceeded it by 67.6 times, i.e. almost 68 graduates applied for 1 vacant place in this group of educational programs (Figure 6).

Figure 6

Dynamics and forecast of the integration coefficient for the "Technical Sciences and Technologies" group of educational programs, 2011-2024, units



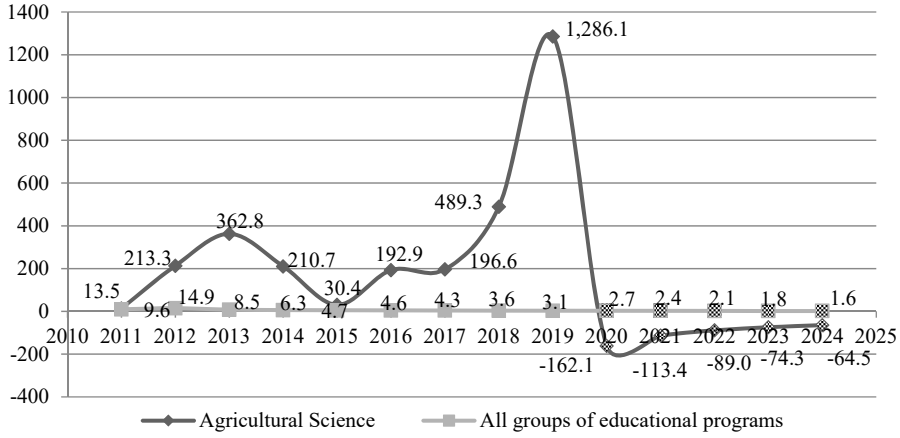
Source: Compiled by authors

Further, we can see a wavy value of the coefficient of interaction for this group of educational programs. The smallest imbalance was observed in 2017 (15.1), in our opinion, this was due to the active phase of the implementation of state programs to support technical education. However, if the current situation persists, the indicators will not be close to the optimal value.

Significant fluctuations in the coefficient of interaction are observed for the group of educational programs "Agricultural Sciences". During the study period, the smallest disproportion in the supply and demand of graduates for this group of educational programs was observed in 2011 (13.5), followed by intensive growth in 2012 and 2013 – 213.3 and 362.8, respectively. The largest oversupply in the agricultural sector was observed in 2019 by 1286.1 times. However, at the moment, the agricultural sector of Kazakhstan is experiencing an acute "personnel shortage", including personnel shortage with higher education. This problem requires a systematic state approach and serious strategic decisions of large agricultural holdings (Figure 7).

Figure 7

Dynamics and forecast of the integration coefficient for the "Agricultural Science" group of educational programs, 2011-2024, units



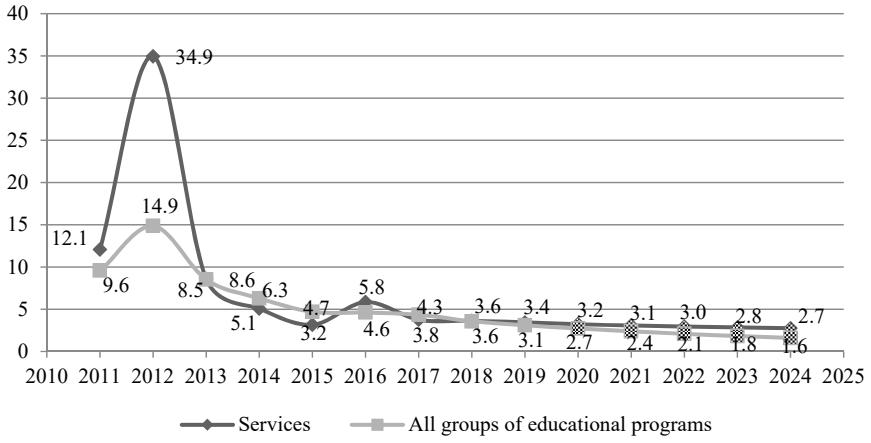
Source: Compiled by authors

In the group of educational programs "Services", the worst value of the coefficient of interaction was observed in 2012, during this period, supply exceeded demand by 34.9 times, which is significantly higher than the same indicator for all educational programs (14.9). In the service sector, the best closeness of the relationship with the general values in the country is observed (Figure 8).

Significant ups and downs are observed in the close relationship in the group of educational programs "Health and social security" ("Medicine") (Figure 9). In 2012, the World Health Organization indicated that there is an acute shortage of medical personnel in the world. The effective provision of the country with medical workers is determined by the ratio of the number of medical workers to the population. Kazakhstan is urgently considering new mechanisms for regulating the personnel issue in the field of medical services.

Figure 8

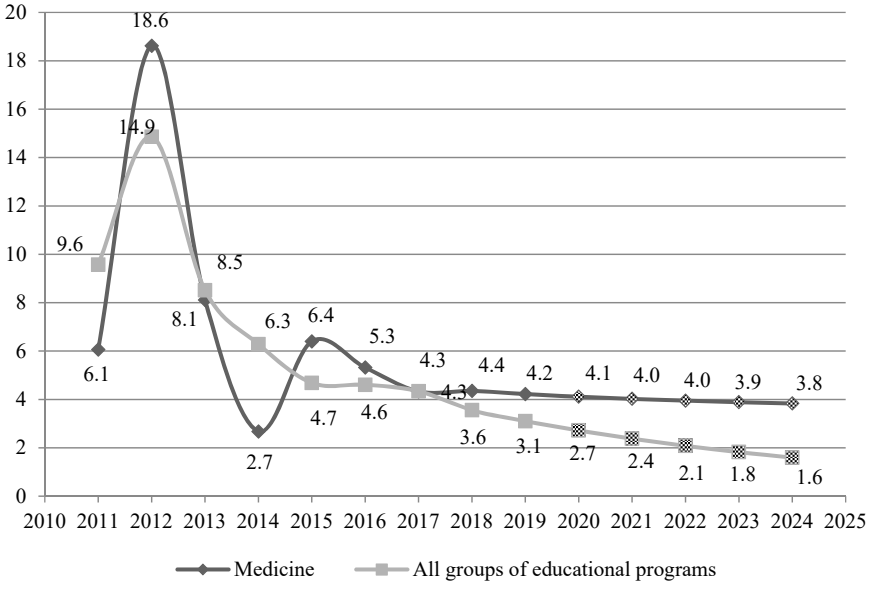
Dynamics and forecast of the integration coefficient for the "Services" group of educational programs, 2011-2024, units



Source: Compiled by authors

Figure 9

Dynamics and forecast of the integration coefficient for the "Medicine" group of educational programs, 2011-2021, units



Source: Compiled by authors

According to the research methodology used, it is now necessary to calculate and analyze the growth rates of the interaction coefficient for groups of educational programs. The type of dynamic and predictive interaction between the labour market and the higher education market is determined (Table 5).

Table 5

Type and trends of quantitative interaction between the labour market and the higher education market

Group of educational programs	The current interaction					The expected interaction				
	Ci_0	C_{i1}	T_pC_i	indicator values	type of interaction	Ci_0	C_{i1}	T_pC_i	indicator values	type of interaction
All groups of educational programs	9.6	3.1	0.32	$C_{i1}>1$ $T_pC_i>0$	III	2.7	1.6	0.59	$C_{i1}>1$ $T_pC_i>0$	III
Education	115.5	37.6	0.33	$C_{i1}>1$ $T_pC_i>0$	III	36.2	32.6	0.9	$C_{i1}>1$ $T_pC_i>0$	III
Law	653.0	50.4	0.08	$C_{i1}>1$ $T_pC_i>0$	III	47.2	39.1	0.83	$C_{i1}>1$ $T_pC_i>0$	III
Art	159.3	14.2	0.09	$C_{i1}>1$ $T_pC_i>0$	III	13.2	10.7	0.81	$C_{i1}>1$ $T_pC_i>0$	III
Social Sciences, Economics and Business	79.9	11.9	0.15	$C_{i1}>1$ $T_pC_i>0$	III	10.2	5.8	0.57	$C_{i1}>1$ $T_pC_i>0$	III
Engineering Science and Technology	29.1	15.2	0.52	$C_{i1}>1$ $T_pC_i>0$	III	14.4	12.1	0.84	$C_{i1}>1$ $T_pC_i>0$	III
Agricultural sciences	13.5	1286.1	95.2	$C_{i1}>1$ $T_pC_i>0$	III	-162.1	-6.45	-226.6	$C_{i1}>1$ $T_pC_i>0$	II
Services	12.1	3.4	0.28	$C_{i1}>1$ $T_pC_i>0$	III	3.2	2.7	0.84	$C_{i1}>1$ $T_pC_i>0$	III
Medicine	6.1	4.2	0.69	$C_{i1}>1$ $T_pC_i>0$	III	4.1	3.8	0.93	$C_{i1}>1$ $T_pC_i>0$	III

Source: compiled by authors

The dynamics of the coefficient of interaction between the higher education market and the labour market in combination with the third type of interaction shows a tendency to weaken interaction. This weakening is associated with a reduction in jobs by type of economic activity and an increase in the number of graduates.

Conclusions

Applying the methodology of quantitative analysis of interaction, the republican features of the interaction of the higher education market and the labour market were identified, in the context of groups of educational programs - “Education”, “Law”, “Art”, “Social Sciences, Economics and Business”, “Engineering Science and Technology”, “Agricultural Sciences”, “Services”, “Medicine”, which revealed that the interaction of the studied markets belongs

to the 3rd type. The labour market is weakened due to the low intensity of job creation and relocation, while the supply of graduates exceeds its demand.

The Kazakhstan Government is taking certain steps to stimulate employment and education among the population, and this cannot be denied. The labour market and the higher education market are in the process of constant development, but as we can see, the measures taken are insufficient. Perhaps the Kazakhstan Government should pay attention to the European experience of organizing a professional structure forecasting, using the services of research institutes, non-profit scientific organizations.

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