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**Assessment of the Labor Markets Integration
and the Higher Education Services Market:
Using the Example of Kazakhstan**

**Teodor Sedlarski
Oxana Bezler**

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ASSESSMENT OF THE LABOR MARKETS INTEGRATION AND THE HIGHER EDUCATION SERVICES MARKET (USING THE EXAMPLE OF KAZAKHSTAN)

Teodor Sedlarski¹ and Oxana Bezler²

Abstract. Supply of the country's economy with highly qualified personnel has the crucial role in effective interaction of the labor market and the higher professional education institutions, integration of their main goals and objectives. Mistakes in the market coordination of these most important market subsystems lead to nonreversible economic losses and negative social consequences since within the market conditions the economy development and the country's competitiveness are largely determined by a high-quality human capital and its employment. In modern science, lots of scientific works are devoted to the interaction of the labor market and the higher education services market, while the analysis of scientific articles has shown this interaction is considered by scientists depending on the study direction, and only individual works – by the issues of integration between domestic markets. In this regard, the authors aim to assess the integration of the labor markets and the higher education services. However, for today, there is no clear methodology for integration the processes assessment, and the authors have attempted to adapt the assessment method proposed by Russian scientists of labor markets and professional education. The used method is based on economic-statistical analysis of the labor market development dynamics and the higher education services with defining integration type under the influence of individual factor of these markets and the use of system and structural-group data analysis. The assessment has revealed an unstable relationship between universities and potential employers which leads to personnel shortage in certain specialties.

Keywords: labor market; higher education services market; integration; integration factor.

JEL: A10, I2, J6

¹ Sofia University «St. Kliment Ohridski», Sofia, Bulgaria, sedlarski@feb.uni-sofia.bg

² Karaganda Economic University of Kazpotreboyuz, Karaganda, Kazakhstan bezleroxana@mail.ru

Introduction

Integration processes occurring in the world community in all spheres of human activities have affected such basic institutions as the labor market and the higher education services market. Modern “results of functioning of these two market institutions do not meet the reproduction requirements domestically. It was reflected in the fact that the restructuring processes in lots of key sectors of the national economy and industry were faced with a lack of skilled workforce, lack or inadequacy of the specialists’ preparation level, requirements for ensuring competitiveness of enterprises and entire industries. Acuteness of the problem of imbalance in the labor market and the higher education market gains crucial significance in the context of increasing rates of industrial modernization and digital economy development. Under these conditions, the economic development should be accompanied not only by creating an efficiently functioning labor market reforming and developing the educational services market, but also by ensuring their integration with the use of certain mechanisms, development of partnerships between entities of these markets (Nekrestyanova, 2009).

1. Literature review

The labor market and the educational services market are the subject of serious scientific research in the modern economy; the search for ways to ensure their mutually profitable functioning has collapsed. In international practice, a sufficient number of modern scientific works is devoted to interaction of the educational services market and the labor market, however, absence of an effective modern interaction is recognized by all authors without exception.

D.G. Filippova (Filippova, 2003) in her work investigated the market interaction mechanism through investments in human capital which, in her opinion, allows balancing the demand for skilled specialists with supply of qualified personnel from the education market. In our opinion, investing in human capital is not enough to solve this problem.

T. Avdeyenko, M. Bakayev (Avdeyenko, Bakayev, 2014) study interaction of the labor market and the higher education market using automated data collecting systems related to the labor market and its saturation with certain specialists at the regional level determining a regional feature of the investigated markets interaction.

Ye.Yu. Kostina, N.A. Orlova (Kostina, Orlova, 2016) do research based on an expert opinion analysis, career expectations and college students' intentions according to which the authors link further development prospects of labor markets and educational services with the fact that employers and other consumers of college services will participate in development of requirements for a future graduate that, in general, will have a qualitative impact on both markets.

Ye. Gushchina (Gushchina, 2017) considers current problems of the higher education system highlighting the problems in absence of connection between the labor market and the educational services market, in decrease of intellectual potential of young people and commercialization of higher education.

The work of M.V. Borisenko (Borisenko, 2017) is of particular interest where he holds the view and we support concerning this view, that, unfortunately, most often when providing a student with a full educational services package the educational services market completes his mission. And, with the acquired competencies, such a student moves to the labor market and there occurs interaction of the educational services market product with a subject of the labor market. At the same time, the assessment of student's competencies received shall be carried out by an educational institution which, according to the university, provided one a high level. Such a situation excludes an objective assessment of acquired competencies quality of an applicant. In the result, the labor market receives a specialist who does not meet the requirements and expectations of an employer.

N.A. Perevozchikova, T.D. Vasilenko (Perevozchikova, Vasilenko, 2018) define in their work the conceptual foundations of the labor market and the higher education services market at the current stage of their interaction.

Given that there is considerable competition in the educational services market, so, unfortunately, it leads not to an increase in the educational service quality, but to overproduction of specialists in certain areas. The problem is that such data should be provided by macroeconomic forecasts of the country's economic development. Partly, they have to be corrected by employers' applications on short and long term period, for this purpose the company shall have a developed planning system which is not entirely possible in economic realities, which generally indicates the need in development of certain mechanisms for integrating the labor markets and educational services. Thus, increasing of an employment

guarantee after obtaining an educational service is an important competitive advantage of a HEI in the higher education services market which problems we have considered in previous studies (Sedlarski, Bezler, 2017; Borbasova, Bezler, 2018; Borbasova, Sedlarski, Bezler, 2019).

Integration processes have become a special form of society formation and in the scientific community there is no clear understanding of integration which generally complicates perception of the investigated subject. This concept interpretation is extremely broad and is considered depending on the field of its application, at the same time, having a close interdisciplinary connection (Bosovskaya 2013).

Digital technologies are intensively fallen within the scope of human economic activity, under their influence employment is transformed, workforce mobility and innovation increase which, in general, leads to change of an employer's requirements to specialist competencies. It poses new challenges for universities to meet the urgent needs of business – specialist training whose competencies are characterized by the digital literacy, the ability to learn independently, the virtual interaction, and the ability to produce innovations.

The works devoted to the labor content changes, its organization, and personnel skills under the influence of informatics and computer technologies are made by Handel M. J. (2008), Green F. (2012), Seo H. J., Lee Y. S., Hur J.J., Kim J.K. belong to. (2012), Frey C. B., Osborne M. A. (2013). Changes occurring in the labor market are closely interrelated and determine transformation of the higher education system were studied in the works of such scientists as Youssef AB, Dahmani M. (2008), Sampath Kumar BT and Manjunath G. (2013), Castillo-Merino D., Serradell- Lopez E. (2014). However, relationship between the digital segments of labor markets and higher education, as well as their mutual influence, is poorly studied and requires a profound research – Barham C., Walling A., Clancy G. (2009), Rodríguez-Planas N., Jacob B. (2010), Bacher J., Koblbauer C., Leitgöb H. et al. (2017), Spencer-Oatey H., Dauber D., Jing J. (2017). Professional competency issues are widely discussed by the international scientific community – Eilström P.-E., Kock H. (2008), Ronald G. S. (2009), Velasco M.S. (2014), Lai N.M. and Teng C.L. (2011), Scarpetta S. (2017).

Having studied a certain vast literature in science we can conclude that “integration” is integration of individual parts as a whole; it is a form of subjects' association; mechanisms and methods of combination; coordinated development; deepening of interaction, cooperation, and partnership. Therefore, “integration of the labor market and the higher education services

market” is such an interaction of the organizational and economic mechanisms of the studied markets when the supply of vocational and qualification structure of personnel coincides with the demand thereof, despite the multifactorial impact, to achieve a positive socio-economic effect through the state regulators’ interaction system.

2. Materials and method

It should be noted that currently, there is no generally recognized assessment methodology for integration processes taking place in world practice. Integration process of the labor markets and educational services reflects possible correlation of demand for workforce and its supply, as well as the market entities actions to coordinate supply and demand. A market where demand coincides with supply reaches equilibrium, but this ideal model is not always maintained. The entity interests’ divergence and quality reduction of the object creates an imbalance for elimination of which there is required participation of all subjects of this integration process.

To assess integrations of the labor market and the education market, the authors have adapted a method for interaction assessment of the educational services and labor market proposed by Russian scientists I.V. Khamalinsky and V.V. Zavgorodnaya in their scientific works (Khamalinsky, Zavgorodnaya, 2010).

The method purpose. Integration assessment of the studied markets involves identification of the type and trends of interaction of these markets at the current stage of socio-economic development and the possibility of results forecasting.

Information sources. Assessment of the current situation and identification of trends in the educational services market and the labor market are based on a secondary analysis of documents. As sources can be used data from state statistics agencies and employment services. Methods of interviewing experts (foresight method) can also be used, it can be employers, representatives of state agencies and universities.

Method. The method of assessment and analysis of integration of the labor markets and educational services shall be implemented through a combination of analysis (Table 1).

Table 1. Analysis and assessment of the labor markets and educational services

No.	Analysis and assessment	Indicators
1.	Dynamic of analysis of the labor 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 labor replacement rate.
2.	Analysis of the educational services market	The number of universities, the number of HEIs' graduates, the employment percentage of graduates according their specialties, the ratio of budget and extra-budgetary financing of HEIs.
3.	Analysis of factors determining formation and functioning of the labor market with identification of factors that influence the most the studied markets integration	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
4.	Analysis of compliance of the qualified workforce with the labor market requirements (balance of supply and demand on the labor market as a whole in the republic and in groups of specialties)	Integration coefficient: $C_i = \frac{S_i}{D_i}.$ <i>S_i</i> – graduates supply with a certain specialty; <i>D_i</i> – demand for graduates of the same specialty. Demand elasticity coefficient (supply) from <i>i</i> factor.
5.	Integration assessment based on highlighting the type of integration and its trends	Three types of interaction with trends to strength and lack of markets integration.

Source: Khamalinsky, Zavgorodnaya, 2010.

Results interpretation. In our opinion, supply for university graduates with a certain specialty depends on the number of factors:

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

P – educational service price;

P_T – average salary;

N – average HEIs number;

K – number of working population (Khamalinsky, Zavgorodnaya, 2010)

Demand for specialists with a certain specialty also depends on the number of factors:

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

P_T – average salary;

E – workplaces number;

G – number of state order for specialists in the given specialty (number of allocated grants) (Khamalinsky, Zavgorodnaya, 2010).

The impact of a particular factor on the resulting indicator can be estimated using the elasticity coefficient. The elasticity coefficient 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 factorial 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 multifactor model can be formulated using a linear function:

$$y_{x_1, x_2, \dots, x_n} = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n, \quad (4)$$

b_1, b_2, \dots, b_n – regression coefficients 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 labor market capacity indicator characterizes the possible volume of demand for workforce with a certain specialty at a given wage level and in a given time interval. Since the integration of the educational services market and the labor market occurs under various conditions of workforce demand and supply, as a result of the study four types of integration will be given based on the ratio of prepared workforce and workplaces (Table 2).

Table 2. Combination matrix of integration types and trends in the labor market and the educational services market

Market integration trends	Market integration types			
	I	II	III	IV
Integration straightening	$C_i=1$ $T_p C_i > 0$	$C_i < 1$ $T_p C_i > 0$	$C_i > 1$ $T_p C_i \leq 0$	$C_i=1$ $T_p C_i \geq 0$
Integration weakening	$C_i < 1, T_p C_i \leq 0$ $C_i > 1, T_p C_i \geq 0$	$C_i < 1$ $T_p C_i \leq 0$	$C_i > 1$ $T_p C_i > 0$	$C_i < 1, T_p C_i < 0$ $C_i > 1, T_p C_i > 0$

Source: Khamalinsky, Zavgorodnaya, 2010.

To assess the integration trends of the studied markets there is used the growth rate indicator of the market integration coefficient –

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

T – growth rate of the markets integration coefficient;

C – markets integration coefficient.

Type I – low intensity of markets integration associated with low intensity of job creation and low intensity of specialists training who meet the requirements of workplaces.

Type II – markets integration is weakened by the educational services market, in such a situation, the labor market is able to move towards a new employment structure under the influence of changing institutional conditions. Moreover, the evolution of the labor market situation is an impetus for changing in the educational services market situation. At the same time, the educational services market hinders the labor market development whilst not meeting its requirements.

Type III – market integration is weakened by the labor market due to the low intensity of job creation and workplaces movement. In this case, the workforce supply with a certain specialty exceeds the demand for it.

Type IV – high intensity of market integration associated with the rapid renewal of workplaces structure in the labor market and high intensity of workforce training by the educational services market in the relevant areas (Khamalinsky, Zavgorodnaya, 2010).

3. Results

The analysis of staff needs dynamics for 2013-2017 has showed the largest demand for workers is in industrial enterprises, on average for the analyzed year their need was 6350 people (26.5% of the total need for personnel), while annually reducing the demand for labor by 7.21% (Table 3).

Table 3. Dynamics of employers' needs for personnel of large and medium enterprises by types of economic activity in Kazakhstan

Type of economic activity	Demand for personnel , K people				
	2013	2014	2015	2016	2017
Total	25,85	27,75	22,34	21,89	22,12
Agriculture, Forestry and Fishery	0,58	0,54	0,69	0,40	0,54
Industry	7,07	7,35	6,21	5,88	5,24
Construction	1,52	1,56	1,27	0,78	1,13
Trade	2,32	1,91	1,73	1,23	1,15
Transportation and warehousing	1,88	3,27	2,89	2,55	4,10
Accommodation and food services	0,76	0,46	0,35	0,42	0,42
Information and communication	0,76	0,56	0,49	0,54	0,78
Real estate operations	0,79	1,12	0,30	0,54	0,24
Professional, scientific and technical activities	1,32	1,97	1,25	1,08	0,72
Administrative and support services activities	2,19	1,97	1,89	2,22	2,25
Education	1,31	1,28	1,13	1,56	0,76
Health and social services	4,37	4,13	3,28	3,96	4,04
Arts, entertainment and leisure activity	0,90	1,64	0,88	0,73	0,76

Source: compiled by authors according of the official website of the Committee on Statistic, <http://stat.gov.kz>

The table shows that the need for personnel in the health sector is 3955 people (16.5%) with an annual decrease of 1.92%. In such industries as transportation and warehousing there is not only a positive growth in staff demand – 2,937 people, but also an annual increase in demand by 21.49%. Most industries tend to decrease workforce demand during the analyzed period.

Table 4 shows dynamics of the labor market needs in personnel in terms of Kazakhstan regions for 2013-2017.

Table 4. The dynamics of the labor market needs in personnel in terms of Kazakhstan regions

Regions	2013		2014		2015		2016		2017.	
	Number of job opportunities, units	Expected demand for personnel, persons	Number of job opportunities, units	Expected demand for personnel, persons	Number of job opportunities, units	Expected demand for personnel, persons	Number of job opportunities, units	Expected demand for personnel, persons	Number of job opportunities, units	Expected demand for personnel, persons
The Republic of Kazakhstan	25748	30 405	27750	23 410	22341	24 422	21894	15 671	22122	14 337
Akmola	1 171	291	980	345	762	141	1 062	434	1 316	161
Aktobe	101	479	773	603	379	222	388	54	311	29
Almaty	1 387	1 557	1 048	1 919	1 378	3 042	1 404	3 305	963	1 598
Atyrau	1 062	608	1 440	753	1 510	852	1 638	467	1 796	1 408
West Kazakhstan	655	602	886	652	922	576	994	378	967	245
Zhambyl	148	739	412	486	335	401	360	388	558	318
Karaganda	2 331	4 697	2 576	3 518	1 973	2 734	1 818	1 665	1 919	1 360
Kostanay	858	4 138	781	370	987	3 500	636	285	1 049	148
Kyzylorda	206	216	258	600	204	168	259	372	281	211
Mangistau	1 767	892	1 487	1 274	962	566	1 024	469	606	420
South Kazakhstan	452	1 221	611	412	460	736	506	500	628	284
Pavlodar	1 823	1 917	1 922	564	1 558	547	1 332	167	1 831	119
North Kazakhstan	506	1 098	514	572	679	547	915	584	649	374
East Kazakhstan	3 039	2 966	2 280	797	1 548	136	1 433	471	1 398	406
Astana city	5 044	4 408	5 198	6 095	3 804	5 069	4 446	2 688	3 975	2 376
Almaty city	4 964	4 576	5 526	4 450	4 872	5 185	3 620	3 444	3 875	4 880

Source: compiled by authors according of the official website of the Committee on Statistic, <http://stat.gov.kz>

The table shows the manpower-surplus and manpower-deficient regions of Kazakhstan. Nevertheless, in the republic there is an annual decrease in the need for personnel by 34.8%. Kostanay (by 76.0%), East Kazakhstan (by 70.0%), Mangistau (by 61.4%) and Karaganda (by 53.3%) regions significantly have reduced regional demand for workforce for the analyzed period, while the Atyrau region has increased the demand for personnel with almost 100% growth.

In general, in Kazakhstan, there is an imbalance of the existing organizational and economic mechanisms of the labor market. Over the analyzed period of Kazakhstan's labor market development, the employment rate was 100.7%, that is over a five-year period it has increased by 0.7% with a demographic growth of 6%, while the need for personnel of all qualification

levels has decreased by 15%, but with wages growth by 37.2%, with its annual increase of 8.8% upon inflation annual increase by 9.8% (Table 5).

Table 5. The dynamics of the labor market major indices for 2013-2017

Types of economic activity	Growth rate,%			
	employed population	demand for personnel	average salary	K labor substitution
Total	100,7	85,0	137,2	98,1
Agriculture, Forestry, and Fishery	63,6	92,3	155,7	105,2
Industry	104,9	74,1	152,3	100,1
Construction	93,0	74,7	159,8	85,0
Wholesale and retail trade; auto service	106,2	49,6	138,8	93,3
Transportation and warehousing	106,8	217,8	135,7	110,5
Accommodation and food services	138,1	55,2	147,2	119,4
Information and communication	117,5	102,4	140,8	80,9
Financial and insurance activities	126,5	-	144,6	89,4
Real estate operations	154,5	30,1	146,7	101,2
Professional, scientific and technical activities	131,2	54,4	126,5	93,4
Public administration and defense; compulsory social security	119,1	-	120,5	90,3
Administrative and support services activities	160,3	102,9	149,3	102,4
Education	114,4	58,1	139,7	98,4
Health and social services	113,6	92,6	134,7	98,2
Arts, entertainment and leisure activity	124,6	84,2	142,1	91,6
Other services provision	108,5	-	135,3	105,9

Source: compiled by authors

In 2017, 27.4% (33.25 thousand people) of graduates obtained diplomas majoring in “education” and has a stable number of graduations for each analyzed year regardless a decrease in total graduates number in the republic; 21.1% - majoring in “technical sciences and technologies” (25.74 thousand people), while there is a downtrend of graduates in 2017 compared with 2013 and 2014 by 1% or 6.43 graduates; 16.9% (20.56 thousand graduates) – majoring in social sciences, economics, and business, having a negative tendency of graduates compared with 2015 in absolute amount, it is 5.32 thousand graduates. Such specialties as “veterinary medicine” – 0.8% (0.86 thousand graduates), “military affairs and security” – 0.6% (0.73 thousand graduates), and “agricultural sciences” – 2 (2.42 thousand graduates), “art” - 2.1 are not in demand. These data indicate that not all specialties are in demand among young

people. In our opinion, the priority choice of specialties directly depends on the amount of state educational order for training specialists with higher education in specific specialties, the wish to study at the expense funded by the state.

In the republic in general, there is a decrease in HEIs graduates' rate by 45.73 thousand people (26.5%) (Table 6).

Table 6. The dynamics of HEIs graduates in terms of Kazakhstan regions

Regions	Graduation of HEIs students									
	2013		2014		2015		2016		2017	
	total, per.	%	total, per.	%	total, per.	total, per.	%	total, per.	%	total, per.
The Republic of Kazakhstan	172 810	100	177 678	100	147 184	172 810	100	177 678	100	147 184
Akmola	7 221	4,2	7 197	4,1	3 444	7 221	4,2	7 197	4,1	3 444
Aktobe	7 113	4,1	7 155	4,0	6 356	7 113	4,1	7 155	4,0	6 356
Almaty	2 784	1,6	3 079	1,7	2 970	2 784	1,6	3 079	1,7	2 970
Atyrau	3 776	2,2	4 049	2,3	2 874	3 776	2,2	4 049	2,3	2 874
West Kazakhstan	8 622	4,9	10 008	5,6	8 774	8 622	4,9	10 008	5,6	8 774
Zhambyl	10 810	6,3	11 451	6,4	7 634	10 810	6,3	11 451	6,4	7 634
Karaganda	16 364	9,5	16 623	9,4	12 001	16 364	9,5	16 623	9,4	12 001
Kostanay	6 844	4,0	7 087	4,0	5 378	6 844	4,0	7 087	4,0	5 378
Kyzylorda	5 347	3,0	5 745	3,2	3 733	5 347	3,0	5 745	3,2	3 733
Mangistau	2 371	1,4	2 027	1,1	1 417	2 371	1,4	2 027	1,1	1 417
South Kazakhstan	19 863	11,5	22 270	12,6	23 217	19 863	11,5	22 270	12,6	23 217
Pavlodar	6 083	3,5	4 890	2,8	4 249	6 083	3,5	4 890	2,8	4 249
North Kazakhstan	2 223	1,3	2 019	1,1	1 603	2 223	1,3	2 019	1,1	1 603
Turkestan	3 493	2,0	2 916	1,6	2 539	3 493	2,0	2 916	1,6	2 539
East Kazakhstan	13 156	7,6	12 426	7,0	8 002	13 156	7,6	12 426	7,0	8 002
Astana city	9 977	5,8	11 366	6,4	13 625	9 977	5,8	11 366	6,4	13 625
Almaty city	46 763	27,1	47 370	26,7	39 368	46 763	27,1	47 370	26,7	39 368

Source: compiled by authors according of the official website of the Committee on Statistic, <http://stat.gov.kz>

For the past 5 years, Almaty has the leading positions in graduating students, it is 24.68% (31.36 thousand people) of graduates from the state indicator, while in 2017 the number of graduates in this city decreased by 32.9% comparing with 2013. The South Kazakhstan region, Karaganda region, Astana, the West Kazakhstan region are also the regions with the largest number of graduates in the republic - 23.30 thousand people, 12.79 thousand people, 10.17 thousand people, 8.27 thousand people accordingly based on the results of graduation for 2017, since

these regions have the largest number of universities, and nevertheless, the share of graduating students in these regions has the highest negative indicators in dynamics, except for the South Kazakhstan region, where the increase of graduates was 17, 3% in 2017 compared to 2013. In general, the republic has an uneven regional distribution of graduates.

When assessing the studied markets integration there have been defined impact factors to supply and demand of graduates. Assessment of the current situation and identification of trends were based on a secondary analysis of documents. As sources of information, we used the data from state statistics agencies, employment service and informational-legal system of regulatory acts of the Republic of Kazakhstan “Adilet” (<http://adilet.zan.kz>), as well as the request for data from “Atameken” NCE (<http://atameken.kz/>). The data used in assessment of the markets integration in all specialties was determined from 2011 to 2017.

Initially, using the correlation analysis, the influence of various factors on graduates supply in all specialties was determined. The following references were used:

S – graduates supply (persons);

P – educational services price (tenge);

P_T – average monthly nominal wage (tenge);

N – average number of HEIs (units);

K – population from 15 y.o. and above (thousand people).

Using the “Correlation” tool of the Stata “Data Analysis” add-in there was formulated a matrix of correlation matching coefficient (Table 7).

Table 7. Correlation matrix

	P	P_T	N	K	S
P	1				
P_T	0,6854	1			
N	-0,5534	-0,6803	1		
K	0,4179	0,7026	-0,7389	1	
S	-0,6482	-0,7677	0,3054	-0,4419	1

The obtained results show the average monthly wage has the greatest impact on graduates’ supply, where the link between this factor and supply is the opposite. This can be explained by the fact that with wages increase parents have more changes to give their children opportunities studying abroad Kazakhstan; this trend is observed in recent years. The least impact on graduates’ supply has an average number of HEIs.

Based on the available data, we will create a regression model of the graduates' supply dependence from these factors. The multiple regression equation in general way is the following:

$$S = a + b_1P + b_2P_T + b_3N + b_4K \quad (6)$$

We will evaluate the multiple regression equation parameters using the “Regression” tool (“Data Analysis” in Stata). As a result of data approximation, we’ve got a protocol of performing regression analysis (Table 8).

Table 8. The regression analysis protocol (graduates supply)

<i>Regression statistics</i>				
Multiple R		0,933955		
R-square		0,872272		
Standard R- square		0,616816		
Standard error		12012,46		
Observations		7		
<i>Variance analysis</i>				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4	1970876023	4,93E+08	19,34566
Balance	2	288598304	1,44E+08	
Total	6	2259474327		
<i>Coefficients</i>				
	<i>Coefficients</i>	<i>Standard error</i>	<i>t-statistic</i>	
<i>a</i>	500972,143	234274,905	2,138394	
<i>b₁</i>	-0,10953	0,25605646	-4,42777	
<i>b₂</i>	-1,31017	0,55907076	-5,34348	
<i>b₃</i>	-1680,38	1050,24062	-1,59999	
<i>b₄</i>	6,034636	9,2121187	5,655076	

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 $F_{observed} = 19,35$. 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 $F_{observed} > F_{crit.}$ ($19,35 > 19,25$), 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 these statistic for the certain coefficients are respectively equal to:

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

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 the t-statistic with a critical one, we can conclude the statistical significance and reliability of only coefficients proceeding the variables: the educational services price, the average monthly nominal wage and population aged 15 and older.

Let us analyze the statistically significant coefficients of the obtained regression equation:

- with an increase in the educational services cost by 1000 tenge, the graduates supply decreases by 110 people;
- with an increase in the average monthly nominal wage by 1000 tenge, the graduates supply decreases by 1310 people;
- with population growth aged 15 and older per 1000 people, the graduates supply increases by 6 people.

Let us define the grand mean of elasticity coefficients:

$$\begin{aligned} \bar{E}_{sp} &= b_1 \cdot \frac{\bar{P}}{\bar{S}} = -0,11 \cdot \frac{402018}{156485} = -0,281 \% , \\ \bar{E}_{sp_r} &= b_2 \cdot \frac{\bar{P_r}}{\bar{S}} = -1,31 \cdot \frac{120005}{156485} = -1,005 \% , \\ \bar{E}_{sk} &= b_4 \cdot \frac{\bar{K}}{\bar{S}} = 6,04 \cdot \frac{121147}{156485} = 0,468 \% . \end{aligned}$$

Elasticity coefficients indicate the following:

- with an increase in the educational services cost 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 specialties was determined. The following indications were used:

D – graduates' demand (persons);

P_T – average monthly nominal wage (tenge);

E – workplaces number (units);

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

Using the “Correlation” tool of the Stata “Data Analysis” add-in there was formulated a matrix of correlation matching coefficient (Table 9).

Table 9. Correlation matrix

	P_T	E	G	D
P_T	1			
E	-0,5168	1		
G	-0,6902	0,4693	1	
D	0,8311	-0,7219	0,6318	1

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 general way is the following:

$$D = a + b_1P_T + b_2E + b_3G \quad (8)$$

We will evaluate the multiple regression equation parameters using the “Regression” tool (“Data Analysis” in Stata). As a result of data approximation, we’ve got a protocol of performing regression analysis (Table 10).

Table 10. The regression analysis protocol (graduates’ demand)

<i>Regression statistics</i>				
Multiple R			0,940138	
R-square			0,883859	
Standard R- square			0,767719	
Standard error			3710,837	
Observations			7	
<i>Variance analysis</i>				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3	3,14E+08	104795496,1	9,61024752
Balance	3	41310941	13770313,75	
Total	6	3,56E+08		
<i>Coefficients</i>				
	<i>Coefficients</i>	<i>Standard error</i>	<i>t-statistic</i>	
<i>a</i>	-23683,91	54571,54	-0,433997509	
<i>b</i> ₁	0,427975	0,167519	5,554778453	
<i>b</i> ₂	-0,04099	0,023465	-4,74668255	
<i>b</i> ₃	1,446024	1,028331	3,406185115	

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 $F_{observed} = 9,61$. 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 $F_{observed} > F_{crit.}$ ($9,61 > 9,28$), 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 statistic for the certain coefficients are respectively equal to:

$$|t_a| = 0,43, \quad t_{b_1} = 5,55, \quad |t_{b_2}| = 4,75, \quad t_{b_3} = 3,41.$$

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 tenge, 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:

$$\begin{aligned}\bar{E}_{DT_r} &= b_1 \cdot \frac{\bar{P}_r}{\bar{D}} = 0,43 \cdot \frac{120005}{23923,71} = 2,146 \% , \\ \bar{E}_{DE} &= b_2 \cdot \frac{\bar{E}}{\bar{D}} = -0,04 \cdot \frac{1043091}{23923,71} = -1,787 \% , \\ \bar{E}_{DG} &= b_3 \cdot \frac{\bar{G}}{\bar{D}} = 1,45 \cdot \frac{26971}{23923,71} = 1,630 \% .\end{aligned}$$

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 integration analysis of the educational services market and the labor market was as follows:

- 1) all specialties were combined into 8 enlarged groups of specialties: 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 specialties of the Republic of Kazakhstan. Such groups of specialties as the natural sciences and humanities, military affairs and security were not included into this assessment since it is not possible to define the exact type of professional activity for these groups of specialties within the dissertation framework;
- 2) building of similar regression dependence models of graduates supply and demand for each group of specialties;
- 3) defining of projected values of graduates supply and demand for 2018-2021, both in general for all specialties and for selected groups of specialties;
- 4) defining of the integration coefficient of the educational services market and the labor market. The coefficient was calculated both according to the available data from 2011 to 2017, and according to the projected values of 2018-2021 (2018 was included in the analysis as an estimated indicator due to the lack of data for 2018 during the study).
- 5) calculation of the integration coefficient growth rate.

Let us analyze the results obtained. In general, when calculating the integration coefficient of graduates' supply in the educational services market and their demand in the labor market for all specialties were observed in 2012, supply exceeds demand by almost 15 times ($C > 1$) (Fig. 1)

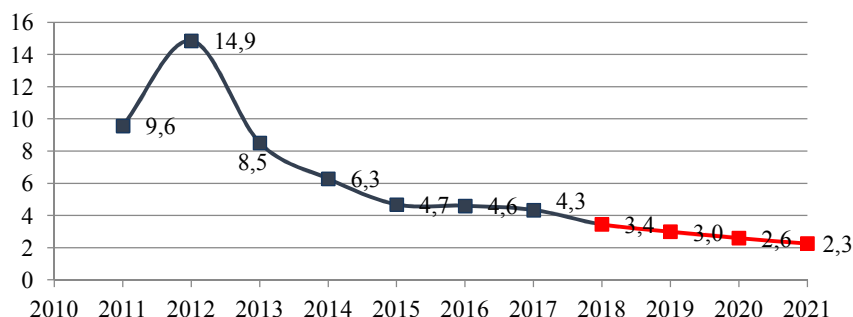


Figure 1. Dynamics and forecast of the coefficient for the labor market integration and the higher education services market, 2011-2021, units

For the evaluated period, the integration coefficient has an annual decreasing trend from 14,9 in 2012 to 2.3 in 2021, which generally says that while maintaining the current economic trend in the future the integration coefficient may achieve effective integration of educational services markets and labor markets.

For the group of “Education” specialties the largest ($C > 1$) value of the integration coefficient was observed in 2012, during this period, supply exceeded demand by the factor of 225.2 times, which significantly exceeds the same indicator for all specialties (14.9). Until 2017, the interaction coefficient decreases, which shows a decrease in imbalance between supply and demand of graduates. The forecast values for the next four years also show a probable decrease in this difference (Fig. 2).

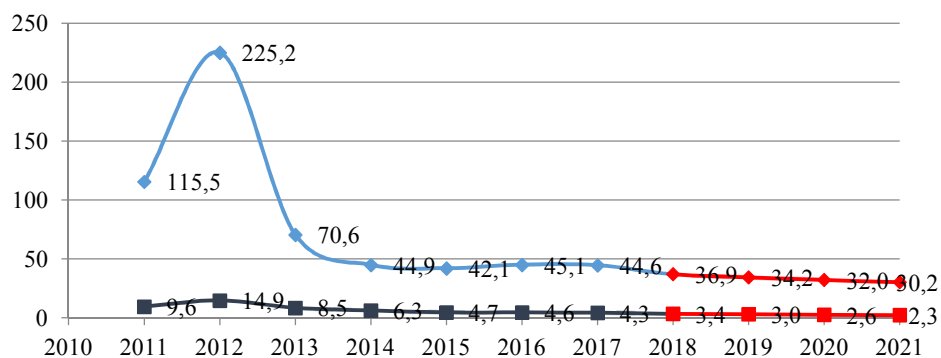


Figure 2. Dynamics and forecast of the integration coefficient for the “Education” group of specialties, 2011-2021, units

For the group of the “Law” specialties the integration coefficient has a wavy change ($C>1$), growth recession (Fig.3).

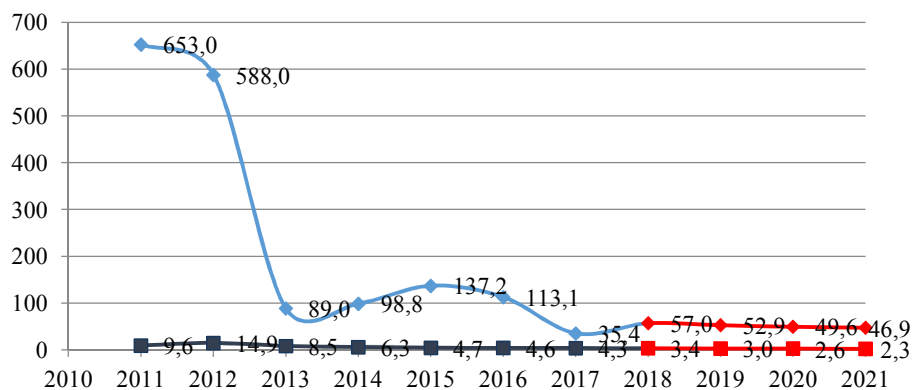


Figure 3. Dynamics and forecast of the integration coefficient for the “Law” group of specialties, 2011-2021, units

The largest labor market glut was observed in 2011 and 2012. In the same period, there is a significant difference with the same indicator for all specialties (9.6 and 14.9, respectively). In 2017, the disproportion between supply and demand of graduates is the smallest. The forecast values for the next four years show that the interaction coefficient will be in the range from 46.9 to 57.0.

For the group of the “Art” specialties the integration coefficient has the largest glut in 2012 by the factor of 169.7 ($C> 1$). In general, for the “Art” group of specialties there is a moderate wavy variation both during the analyzed period and in the forecast indicators. The lowest value of the integration coefficient is observed in 2015 (13.7), but it has even the highest value (2.9 times) in comparison with the general indicator for the republic. In the forecast indicators of the education market and the labor market integration coefficients in 2019 the forecasted value is 30.5, which is 10.2 times larger than the general indicator (Fig. 4).

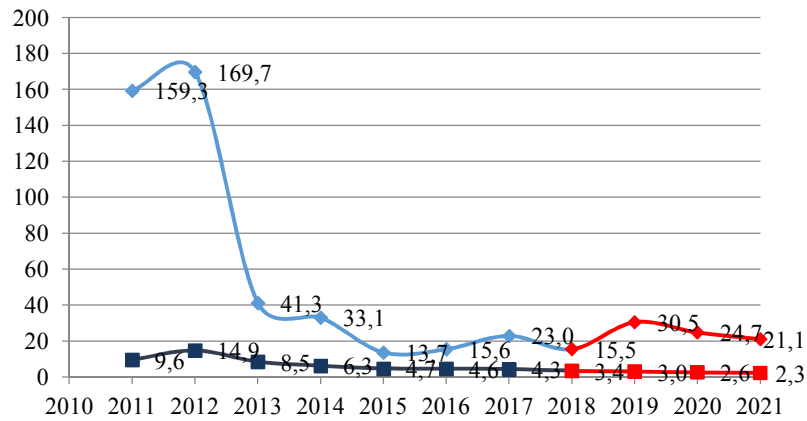


Figure 4. Dynamics and forecast of the integration coefficient for the “Art” group of specialties, 2011-2021, units

For the “Social Sciences, Economics and Business” group of specialties the highest ($C > 1$) value of the integration coefficient was observed in 2012, during this period the supply exceeded the demand by the factor of 209.5 times, which significantly exceeds the same indicator for all specialties (14.9) (Fig. 5).

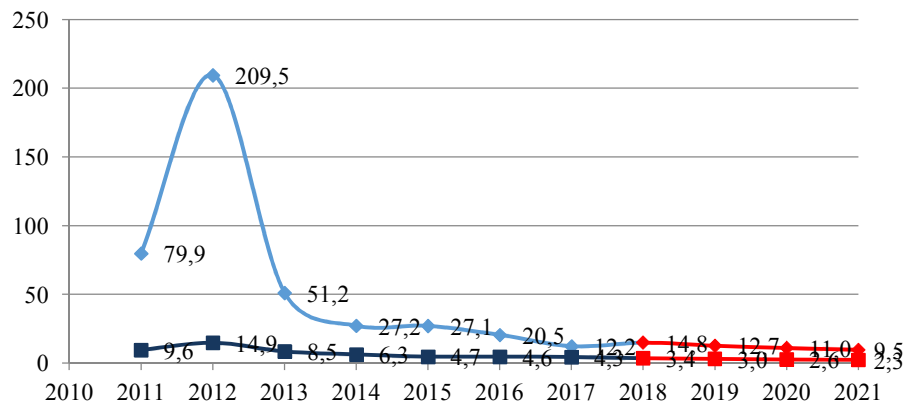


Figure 5. Dynamics and forecast of the integration coefficient for the “Social Sciences, Economics and Business” group of specialties, 2011-2021, units

However, after the peak in 2012, since 2013, the integration coefficient follows a downward trend, the imbalance between supply and demand in the studied markets is decreased. In 2017, the imbalance decreased by the factor of 10.2 times (20.5), compared with the indicator in 2013 (209.5). In the forecast by 2021, this imbalance downward trend between supply and demand of graduates will remain (in 2021 - 9.5), but will not reach republican indicators (2.3).

The integration coefficient for the “Technical Sciences and Technologies” group of specialties, as well as for other specialties has the largest gap between supply and demand of graduates in

2012, and exceeded it by the factor of 67.6 times ($C > 1$), i.e. to 1 vacant place in this specialty applied nearly 68 graduates (Fig. 6).

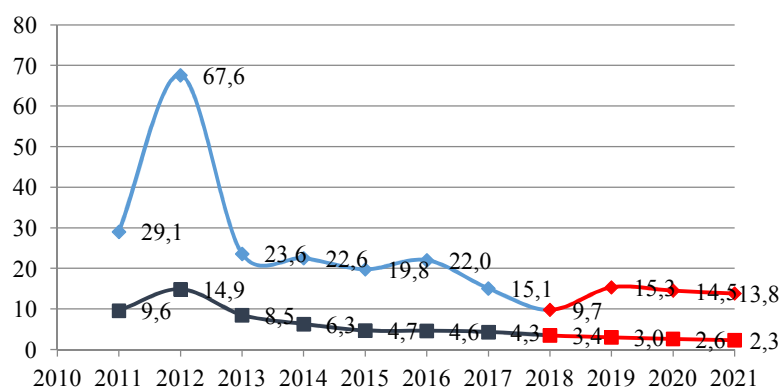


Figure 6. Dynamics and forecast of the integration coefficient for the “Technical Sciences and Technologies” group of specialties, 2011-2021, units

In 2012, for this group of specialties, among all the specialties there was the smallest disproportion between supply and demand of graduates (67.6). Further, we can see a wavy value of the integration coefficient for this group of specialties. The smallest imbalance is observed in 2018 (9.7), in our opinion, this occurred due to implementation of state programs to support technical education. However, by 2021, the integration indicator does not approach the value of the overall coefficient.

Wavy variations of the integration coefficient are observed for the “Agricultural Sciences” group of specialties ($C > 1$). For the investigated period, the smallest disproportion in supply and demand of graduates in this group of specialties was observed in 2011 (13.5) with subsequent intensive growth in 2012 and 2013 - 213.3 and 362.8, respectively. In 2013, the maximum integration gap was observed - 362.8, which is almost 27 times higher than the indicator in 2011. Then, in 2015, the gap between graduating students in the given specialty and specialists with a higher education hired according to their specialty was decreased and amounted 30.4, which is 12 times lower than the indicator in 2013, and with its sharp increase by 6.3 and 6.4 times in 2016 and 2017, respectively. However, forecast indicators follow the trend to reducing this gap in 2021 by the factor of 11.5 times compared to 2017 (Fig. 7).

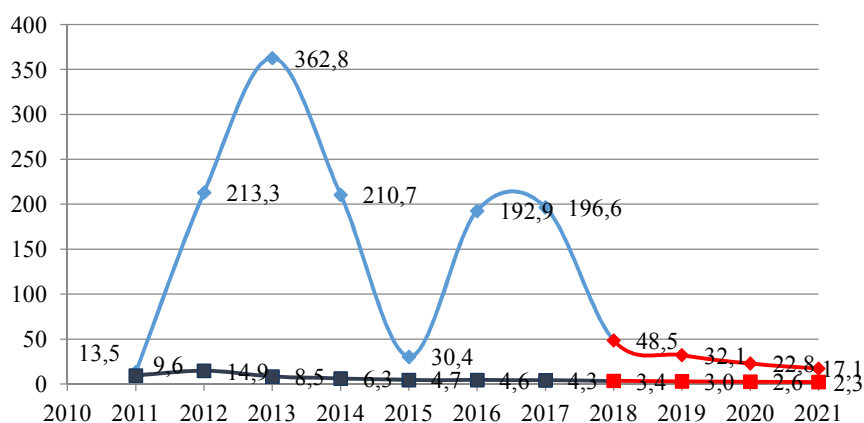


Figure 7. Dynamics and forecast of the integration coefficient for the “Agricultural Science” group of specialties, 2011-2021, units

In the “Services” group of specialties, the highest ($C > 1$) value of the integration coefficient was observed in 2012, during this period supply exceeded demand by the factor of 34.9 times, which significantly exceeds the same indicator for all specialties (14.9) (Fig. 8) .

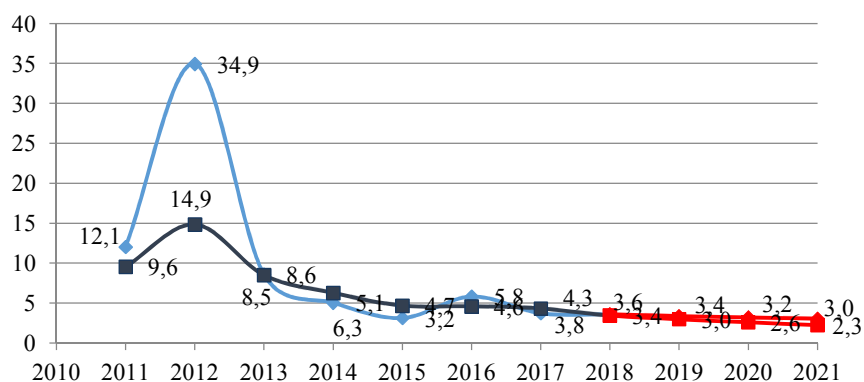


Figure 8. Dynamics and forecast of the integration coefficient for the “Services” group of specialties, 2011-2021, units

Since 2013, the integration coefficient has a positive trend (8.6), and in 2014 and 2015 this indicator (5.1 and 3.2) was even lower than the general value (6.3 and 4.7), respectively. In further forecast periods, the integration coefficient of the educational services market and the labor market is close to general indicators, which generally creates a positive competition among applicants for vacant jobs, three applicants apply for one vacant place.

Significant ups and downs are observed in the integration coefficient in the “Healthcare and Social Security” (“Medicine”) group of specialties starting from the lowest dynamic indicator in 2011, when the interaction indicator between the educational services market and the labor

market was 6.1 ($C > 1$), which is lower than the indicator for all specialties (9.6) and the subsequent jump in 2012 three-fold (18.6) (Fig. 9).

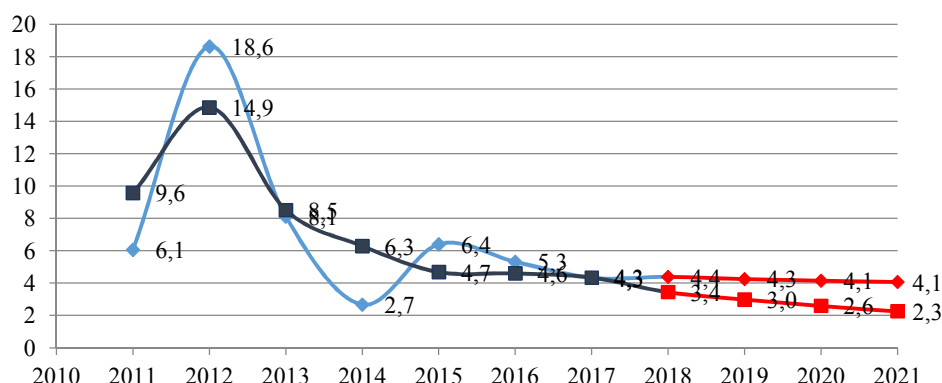


Figure 9. Dynamics and forecast of the integration coefficient for the “Medicine” group of specialties, 2011-2021, units

Further, the indicators of this coefficient continue having a wave-like characteristic with a decrease to 2.7 in 2014, which is lower than the general indicator by the factor of 2.3 times and with values increase occurred in 2015 that is higher than the republican ones. Since 2017, there has been a stable smallest trend in the integration coefficient for this specialty from 4.3 to 4.1 in 2021, with its coincidence with the general indicators in 2017.

We calculate the growth rate of the integration coefficient and by the groups of specialties and determine the type of dynamic and forecasting integration of labor markets and educational services (Table 11).

Table 11. Type and trends of the labor markets and educational services markets integration

Group of specialties	Current integration					Expected integration				
	C_{i0}	C_{i1}	$T_p C_i$	indicator values	integration type	C_{i0}	C_{i1}	$T_p C_i$	indicator values	integration type
All groups of specialties	9,6	4,3	0,45	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type	3,4	2,3	0,68	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type
Education	115,5	44,6	0,38	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type	36,9	30,2	0,82	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type
Law	653,0	35,4	0,05	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type	57,0	46,9	0,82	$C_{i1} > 1$ $T_p C_i > 0$	III weak. type

Art	159,3	23,0	0,14	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	15,5	21,1	1,36	$C_{il} > 1$ $T_p C_i > 0$	III weak. type
Social Sciences, Economics and Business	79,9	12,2	0,15	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	14,8	9,5	0,64	$C_{il} > 1$ $T_p C_i > 0$	III weak. type
Engineering Science and Technology	29,1	15,1	0,52	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	9,7	13,8	1,42	$C_{il} > 1$ $T_p C_i > 0$	III weak. type
Agricultural sciences	13,5	196,6	14,56	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	48,5	17,1	0,35	$C_{il} > 1$ $T_p C_i > 0$	III weak. type
Services	12,1	3,8	0,31	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	3,6	3,0	0,83	$C_{il} > 1$ $T_p C_i > 0$	III weak. type
Medicine	6,1	4,3	0,45	$C_{il} > 1$ $T_p C_i > 0$	III weak. type	4,38	4,06	0,93	$C_{il} > 1$ $T_p C_i > 0$	III weak. type

Source: compiled by authors

As a result of the integration assessment of the labor market and educational services market, there is an inefficient integration, when supply of graduates of the 8 groups of specialties of the educational services market under consideration does not meet the demand for these graduates in the labor market of Kazakhstan.

Conclusions

The labor market and the educational services market in Kazakhstan are the subject of serious scientific research in the domestic economy, the search for ways to ensure their mutually beneficial functioning has not been successful. At the same time, the issues of organizational-economic integration of these two market institutions were not properly considered and could not be the subject for a comprehensive study of Kazakhstani economists. This was due to incomplete use of integration mechanisms at all stages and levels of government.

The listed trends of organizational-economic mechanisms for integration of the vocational education market show some problems in the quality of services provided in the higher education market, and the lack of stable links between universities and potential employers which leads to personnel shortage of certain specialties.

Kazakhstan, at the level of government decisions, makes certain steps to stimulate employment and education among the population, and this cannot be denied. However, the labor markets and the educational services market are in the process of permanent development, and improvement processes are ongoing. The labor market and the educational services market development have a direct impact on improving socio-economic indicators.

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Teodor SEDLARSKI, Assoc. Prof. at the Department of Economics Sofia University «St. Kliment Ohridski», 1504, Bulgaria, Sofia, str."Tsar Osvoboditel",15 ,sedlarski@feb.uni-sofia.bg;

Oxana BEZLER, PhD Candidate (Economics), Karaganda Economic University of Kazpotreboyuz, 9 Akademicheskaya Str., Karaganda,100009, Republic of Kazakhstan. bezleroxana@mail.ru