

Dinmuhammed Shaikin<sup>1</sup>

**ECONOMETRIC MODELING OF YOUTH  
EMPLOYMENT AT AGRARIAN LABOR MARKET  
(REPUBLIC OF KAZAKHSTAN CASE STUDY)**

*The establishment and formation of the youth labor market in Kazakhstan have special features. The insufficient attention to the solution of youth problems can be the reason of different social problems connected with antisocial behavior of youth (entering the criminal circles, drug addiction etc.). Therefore, the solution of youth problems (especially youth employment) has to be a national priority, realized on the basis of various state programs.*

*Keywords: youth, labor market, employment, unemployment, statistical data, Furje's row, dynamics.*

Динмухаммед Шайкин

**ЕКОНОМЕТРИЧНЕ МОДЕЛЮВАННЯ МОЛОДІЖНОЇ  
ЗАЙНЯТОСТІ НА АГРАРНОМУ РИНКУ ПРАЦІ  
(НА ПРИКЛАДІ РЕСПУБЛІКИ КАЗАХСТАН)**

*У статті обгрунтовано, що становлення і формування молодіжного ринку праці в Казахстані має специфічні особливості. Зроблено висновок, що недостатня увага до вирішення проблем молоді може стати причиною різних соціальних проблем, пов'язаних з асоціальними проявами молоді (входження в кримінальні кола, наркоманія, алкоголізм тощо). Тому вирішення проблем молоді (особливо зайнятості) повинно бути національним пріоритетом, реалізованим на основі різноманітних державних програм.*

*Ключові слова: молодь, ринок праці, зайнятість, безробіття, статистичні дані, ряд Фур'є, динаміка.*

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Динмухаммед Шайкин

**ЭКОНОМЕТРИЧЕСКОЕ МОДЕЛИРОВАНИЕ МОЛОДЕЖНОЙ  
ЗАНЯТОСТИ НА АГРАРНОМ РЫНКЕ ТРУДА  
(НА ПРИМЕРЕ РЕСПУБЛИКИ КАЗАХСТАН)**

*В статье обосновано, что становление и формирование молодежного рынка труда в Казахстане имеет специфические особенности. Сделан вывод, что недостаточное внимание к решению проблем молодежи может стать причиной различных социальных проблем, связанных с асоциальными проявлениями молодежи (вхождение в криминальные круги, наркоманья, алкоголизм и т.д.). Поэтому решение проблем молодежи (в особенности занятости) должно быть национальным приоритетом, реализуемым на основе разработки и внедрения различных государственных программ.*

*Ключевые слова: молодежь, рынок труда, занятость, безработица, статистические данные, ряд Фурье, динамика.*

**Introduction.** Studying the questions of youth status in the life of modern society, level of its education, political weight is very important for solving of many social and economic problems of this category of population. One of the aspects that need-

<sup>1</sup> Candidate of Economic Sciences, Associate Professor, North Kazakhstan State University of M. Kozybaev, Petropavlovsk, Republic of Kazakhstan.

ed to be analyzed and considered, in our opinion, is the research of the youth labor market development tendencies. It determines the necessity of theoretical and practical research of youth labor resources, such indicators and values as youth employment and unemployment levels', dynamics of migration etc.

The youth is a special social group of the population and labor resources. In our opinion, the researches for the solution of different socioeconomical problems of this category are important and actual tasks under the performance of youth policy measures in any country. These problems are the professional orientation, labor adaptability, employment, unemployment etc.

**Literature review.** There are several approaches to the definition of labor market. For example, A.A. Nikiforova (1991: 10) considers the labor market as a system of social relations which reflects the development level and achieved interests' balance between participating market forces (factors): entrepreneurs, employees and state. On the one hand, the organization form, expressing these interests, is the associations of entrepreneurs, and, on the other hand, they are trade-unions. The state is an employer at state enterprises and it also can be an investor, financing huge projects and development programs.

A.V. Kashenov (1998: 13) considers labor market as a system of social relations and norms which provide price change due to the level of work force supply and demand basing on human rights and freedoms.

The experts of the International Labor Organization (1987: 85) mention that at the labor market employers (entrepreneurs) and potential employees negotiate about salaries and labor conditions.

In accordance with the Kazakhstan Law "About state and youth policy in the Republic of Kazakhstan" (7.07.2004), the "youth" is the citizens of the Republic of Kazakhstan, foreign countries and not having the citizenship, constantly living on the territory of the Republic of Kazakhstan. Their age is from 14 to 29. For labor market, the starting age is 16. This age is determined by legislative documents in Kazakhstan. As a rule, to this moment young men can perform job duties. The upper age limit of youth is 29. So, the age period of youth labor resources is 16–29.

The insufficient attention to the solution of youth problems can be the reason of different social problems of negative nature connected with antisocial behavior of youth (entering the criminal circles, addictions etc.). Therefore, the decision of youth employment problems at the national and regional labor markets has a special meaning.

**Purpose of the research.** To evaluate the youth employment at agrarian labor market on the base of statistic and econometric methods, using the statistic data on 3 regions of the Republic of Kazakhstan (North Kazakhstan, Pavlodar and Kostanai).

**Key results of the research.** In accordance with the statistical data, the amount of population in the Republic of Kazakhstan grew during 2008–2010 (Table 1).

This circumstance actualizes the researches, definition of the problems of youth and their decision. One of them is employment. Discussing it, we would like to acknowledge that practically any young man having high education, coming to the labor market for the first time, meets the severe competition with high-qualified workers. Even the "red diploma" is not the guarantee of employment.

**Table 1. The dynamics of population in the Republic of Kazakhstan in 2008–2010, at the beginning of the year**

Age groups	2008		2009		2010	
	people	% to total	people	% to total	people	% to total
0–14	3729940	24,0	3810073	24,2	3894887	24,3
15–29	4326657	27,8	4338936	27,5	4358183	27,2
30 and more	7514909	48,3	7627483	48,3	7745696	48,4
<b>Total</b>	<b>15571506</b>		<b>15776492</b>		<b>15998766</b>	

Source: Statistical databases and reviews of the Agency for Statistics of the Republic of Kazakhstan (2008–2010).

The regional statistical authorities of Kazakhstan each quarter perform selective observations of population. These data are accumulated by the Agency for Statistics of the Republic of Kazakhstan. In accordance with these data, the population of youth during 2008–2010 was 25016 people. They were the people of different professions and ages, having different incomes and work experience.

In our article we analyze the employed youth, living in the northern part of Kazakhstan (North Kazakhstan, Pavlodar and Kostanai regions).

In Table 2 we present the data of the selective observations performed by these regional statistical authorities during 2007–2010.

**Table 2. Statistical data for the calculation of parameters of (1), which characterizes the dynamics of employed youth amount at the agrarian labor market in the northern regions of Kazakhstan, 2007–2010**

years	x	y	x*	cos(x)	sin(x)	cos <sup>2</sup> (x)	sin <sup>2</sup> (x)	y·sin(x)	y·cos(x)	trend	MAPE
2007	1	4445	0,52	0,87	0,50	0,75	0,25	2222,42	3849,34	4359,72	0,04
	2	4599	1,05	0,50	0,87	0,25	0,75	3982,59	2299,35	4431,51	0,08
	3	4785	1,57	0,00	1,00	0,00	1,00	4785,00	0,00	4627,15	0,07
	...	...	...	...	...	...	...	...	...	...	...
2008	10	4932	5,24	0,50	-0,87	0,25	0,75	-4271,05	2465,89	4893,29	0,02
	11	4601	5,76	0,87	-0,50	0,75	0,25	-2300,33	3984,29	4626,34	0,01
	19	5354	9,95	-0,87	-0,50	0,75	0,25	-2676,91	-4636,54	5427,81	0,03
...	...	...	...	...	...	...	...	...	...	...	
2010	46	4628	24,09	0,50	-0,87	0,25	0,75	-4007,97	2314,00	4893,29	0,12
	47	4652	24,61	0,87	-0,50	0,75	0,25	-2325,83	4028,45	4626,34	0,01
	48	4421	25,13	1,00	0,00	1,00	0,00	0,00	4421,04	4431,04	0,00
<b>total</b>	<b>1176</b>	<b>234901</b>	<b>615,75</b>	<b>0,0</b>	<b>0,0</b>	<b>24,0</b>	<b>24,0</b>	<b>-6398,7</b>	<b>-11105,53</b>	<b>234901</b>	<b>2,13</b>

Statistical data were calculated in accordance with the results of the selective observations of population, performed by the statistical authorities of North Kazakhstan, Pavlodar and Kostanai regions in 2007–2010.

x\* – this column was converted into radians (minimal period of sin(x) or cos(x) is 2π). For example, to calculate, first x\*, it is necessary 2π x 1/48 and etc.

At the beginning of each year the amount of the employed youth is not high. Eventually, this value grows (approximately till September – the 9<sup>th</sup> month of the year) and then goes down. So, during the spring-autumn period we can see the growth of the employed youth. It is connected with the sowing campaign and field works in the agrarian sector of the economy. But during winter the amount of the employed youth is not high and, as a rule, goes down.

Under these fluctuations the periodic functions are usually used to carry out the statistical analysis and modeling. One of them is the following statistical Furje's row:

$$y_x = a_0 + a_1 \times \cos(x) + b_1 \times \sin(x), \quad (1)$$

where  $x$  is period (minimal meaning of  $x$  is in the followi]ng limits  $- \left[ 0; \frac{2\pi}{n} \right)$ ;  $n$  is the amount of months per year. The system of normal equations for the calculations of  $a_0$ ,  $a_1$  and  $b_1$  is the following:

$$\begin{cases} n \times a_0 + a_1 \times \sum \cos(x) + b_1 \times \sum \sin(x) = \sum y \\ a_0 \times \sum \cos(x) + a_1 \times \sum \cos^2(x) + b_1 \times \sum \sin(x) \times \cos(x) = \sum y \times \cos(x). \\ a_0 \times \sum \sin(x) + a_1 \times \sum \sin(x) \times \cos(x) + b_1 \times \sum \sin^2(x) = \sum y \times \sin(x) \end{cases} \quad (2)$$

In this system  $\sum \cos(x) = \sum \sin(x) = 0$  (Table 2). Using mathematical actions, we have the following:

$$\begin{cases} a_0 = \frac{\sum y}{n} \\ a_1 = \frac{\sum y \times \cos(x)}{\sum \cos^2(x)}. \\ a_2 = \frac{\sum y \times \sin(x)}{\sum \sin^2(x)} \end{cases} \quad (3)$$

Using (3) and the data from Table 2, the statistical Furje's row is the following:

$$y_x = 4893.77 - 462.73 \times \cos(x) - 266.61 \times \sin(x). \quad (4)$$

The data of the selective observations of the employed youth, living in the northern regions of Kazakhstan (North Kazakhstan, Pavlodar and Kostanai), together with (4) are shown in Figure 1.

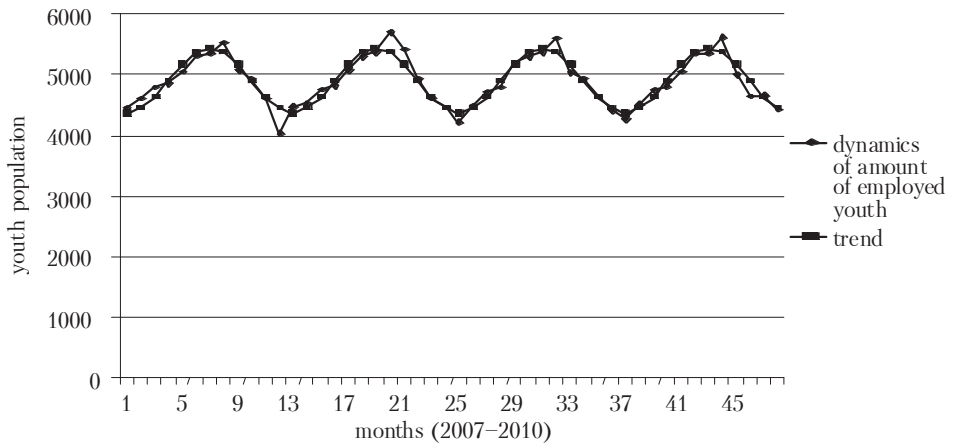


Figure 1. The data of the selective observations of the employed youth, living in the northern regions of Kazakhstan together with (4)

When the model is done, it is advisable to evaluate optimality of its description of the researched process. One of the most widespread statistical values is MAPE (middle approximate estimation).

$$MAPE = \frac{1}{n} \sum \left| \frac{y_x - \hat{y}_x}{y_x} \right| \times 100, \quad (5)$$

where MAPE is the middle approximate estimation;  $y_x$  is the meanings of the researched value;  $\hat{y}$  is the meanings of the Furje's row;  $n$  is the time interval.

**Conclusions.** In accordance with Table 2, MAPE is 2,13. Therefore the usage of trend (4) under researching of the youth employment in the agrarian sector of economy in the North Kazakhstan regions is proved and comprehensible.

The results can be used by state authorities for developing effective youth policy in the labor field.

**Reseferences:**

О государственной молодежной политике в Республике Казахстан: Закон Республики Казахстан от 7.07.2004 №581-ІІ (с изм. и доп. на 05.07.2011) // online.zakon.kz.

*Кашенов А.В.* Экономика и занятость. – М.: Финстатинформ, 1998. – 191 с.

*Никифорова А.А.* Рынок труда: занятость и безработица. – М. Международные отношения, 1991. – 120 с.

*Потуданская В.Ф. Шайкин Д.Н.* Естественное и механическое движение населения и трудовых ресурсов Северного Казахстана: анализ, моделирование и прогнозирование: Монография. – М.: Экономика, 2008. – 168 с.

*Потуданская В.Ф. Шайкин Д.Н.* Трудовые ресурсы молодёжи Северного Казахстана: Монография. – Омск: ОмГТУ, 2006. – 164 с.

Статистика: Учебник / Под. ред. проф. И.И. Елисеевой. – М.: ВИТРЭМ, 2002. – 448 с.

Статистические базы данных и отзывы (2007–2010) // Агентство по статистике Республики Казахстан // www.stat.kz.

*Шайкин Д.Н.* Трудовой потенциал Республики Казахстан. Аспекты формирования и развития (на материалах Северо-Казахстанской области): Монография. – М.: Информ-Знание, 2010. – 341 с.

Эконометрика: Учебник для вузов / Под ред. проф. Н.Ш. Кремера. – М.: ЮНИТИ-ДАНА, 2003. – 311 с.

Экономика труда: Учеб.-метод. пособие / Институт труда Минтруда России (НИИ труда). – М.: Финстатинформ, 2001. – 490 с.

International Labor Organization (1987). World Labor Report 3. Geneva. 312 p.

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