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DEMOGRAPHIC AND MIGRATION PROCESSES OF LABOR POTENTIAL: A CASE STUDY THE AGRICULTURAL SECTOR OF THE REPUBLIC OF KAZAKHSTAN

Gulmira Nurzhanova¹, Galym Mussirov², Shakizada Niyazbekova³, Akilbek Ilyas⁴, Yuliya Tyurina⁵,
Leila Maisigova⁶, Marija Troyanskaya⁷, Kymbat Kunanbayeva⁸

¹ Financial Academy, 25 Esenberlin street, 010000, Nur-Sultan, Kazakhstan

² Baishev University, st. Zhubanov Brothers 302A, 030000, Aktobe, Kazakhstan

³ Moscow Witte University, 2 Kozhuhovski proezd 12 stroenie 1, 115432, Moscow, Russia

⁴ Financial Academy, 25 Esenberlin street, 010000, Nur-Sultan, Kazakhstan

⁵ Financial University under the Government of the Russian Federation, 49, Leningradsky Prospekt, 125167, Moscow, Russian Federation

⁶ Ingush State University, pr. Zyazikova, 7, 386001, Magas city, Russian Federation,

⁷ Orenburg State University, Avenue Victory, d. 13, 460018, Orenburg city, Russian Federation

⁸ Financial University under the Government of the Russian Federation, 49, Leningradsky Prospekt, 125993, Moscow, Russian Federation

E-mails: ¹ gulislam@mail.ru; ² mysiroy@mail.ru; ³ shakizada.niyazbekova@gmail.com; ⁴ akilbeki.ilias@mail.ru,
⁵ u_turina@mail.ru, ⁶ maisigova@yahoo.com, ⁷ m_troyanskaya@mail.ru, ⁸ kunanbaeva_kymbat@mail.ru

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Abstract. It is very important to study the demographic and migration processes in the country when forming the labor potential of rural areas. Using these indicators affecting the labor potential, we calculated the parameters of linear trend models, checking their adequacy of the constructed models, calculated the determination coefficients, and built confidential intervals for the forecasts. In order to present a quantitative model expressing the general tendency of the time series change over time, we used the analytical alignment of the time series. In this case, the actual levels were replaced by levels calculated on the basis of certain data. As a result, we got the result of a change in time of the studied indicators in a positive direction. Obtained results: outflow of external and internal migration is the reason for the decline of labor potential in the country, but in general does not affect the efficiency of labor potential of the village; indicators of the population in general, i.e., the population of cities and villages, internal and external migration with natural population growth are quite close to one, what means that their forecast changes are insignificant and do not undergo significant changes in the future. Finally, with a 95% probability, we can expect that in 2020 - 2021, the indicators under consideration will not take values less than the lower limits of confidence forecast intervals and not greater than their upper limits. Obtain results are very important for development of a strategy for the effective use of labor potential.

Keywords: demography; migration; labor potential; agriculture; urban population; rural population; birth rate; labor market

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1. Introduction

Agriculture plays an important role in the economic and social life of any country (Baltgailis, 2019; Vigliarolo, 2020), (Issayeva, 2019). The level of agricultural development largely determines the economic security of the country.

Since the climate and geographical location of Kazakhstan is favorable for agriculture, the country has all the opportunities for the development of a competitive agricultural sector in the world market. In addition, the social situation of almost half of the country's population is in close contact with the countryside. As the village is an important factor in the economic development of the Republic, then the rural population is an important factor in the socio-political stability of the country,

We believe that demographic and migration policy is a multifaceted integrated process that develops in close contact with all socio-political, economic processes in society. Today, demography and migration is not only an economic concept, but also a socially significant concept.

For the continuous reproduction of labor resources, an important prerequisite is the demographic situation in the country. The demographic situation is a complex and integrated process that is directly related to the socio-political, economic development of society.

The country's transition to a market system has also created many favorable conditions for the development of migration. Migration processes effect on the labor supply of the regions, and, as a consequence, on their economic development. Structural transformations of the economy of several regions of Kazakhstan towards the preferential development of the agro-industrial complex raise the value of the reproductive process of the labor potential of a village to a new level.

Taking into account the proportion of Kazakhs living abroad, which make up almost a third of the population of Kazakhstan, the diaspora is a significant social resource of an independent state. Note that presumably more than half of ethnic migrants have agricultural education and skills, and every fourth repatriate is employed in agriculture (Bodaukhan, 2017).

Studies of the quantitative and qualitative characteristics of modern migration movements oriented to the countryside are of great interest, the influence of migrants on the labor market, which is forming in the agricultural sector, as well as the processes of adaptation of migrants in rural areas. In this regard, the study of modern migration processes, the analysis of the extent, directions and factors that determine them, as well as the identification of various aspects of the migration impact on the state of agriculture is very relevant.

The quantitative basis of labor potential, in our opinion, is not labor resources, but the population. As part of the population, labor resources characterize the demographic and migration situation in the country through qualitative and quantitative indicators. Therefore, quantitative changes in labor potential will depend on the general demographic and migration situation.

2. Literature review

The demography has a set of statistical data on the composition of the population, its size, density, age and gender composition. Among the main concepts of demography, one can name such concepts: fertility, mortality, natural population migration, lifetime, life potential of the population, population migration. Examined a conceptual study of the migration impact on the economy in a more complete and complex state, taking into account not only the genesis and structure, but also the characteristics of activities in a framework of transition economy, and in his dissertation he writes: “We consider population migration as social -economic category, based on the fact that the division of labor relates primarily to the sphere of production, ownership, property ” (Mukhammedov 2007).

The theoretical study of the role of international population migration in demographic development is particularly important. At the same time, we emphasize that there is no clear definition of the concept of “demographic development” both in the Kazakh and foreign scientific literature. In our opinion, development in general and demographic development in particular are multifaceted concepts that imply development with a plus sign (progress) and development with a minus sign (regression). Thus, in our understanding, demographic development is both positive and negative changes in the quantitative and qualitative characteristics of the population of a country (Iontsev, Prokhorova, 2014).

An example is a duplicitous demographic situation prevailing in Europe. On the one part, there is an increase in lifetime, infant mortality decreases - progress is obvious. On the other part, fundamental changes in the family — the preference for free relations instead of traditional marriage, the conscious refusal of having children, the spread of marriages of people with a non-traditional orientation — can be considered as indicators of regression. But all this is a demographic development in all its diversity (Iontsev, Prokhorova, 2014).

If we talk about rural-urban migration, it can be assumed that a reduction in land inheritance predicts a significantly greater tendency to migrate to urban areas and find jobs in the non-agricultural sector, i.e. in the city (Holden et al., 2014).

In some scientific studies, it is indicated that intentions to stay in agriculture increase when the inherited land among young people is existing (Bezu, Holden, 2014). They do not find a connection between themselves. However, land inheritance and migration may be due to the broad definition of migration, that they are applicable. Presumably, the expected return to migration will be conditional on the likelihood of employment and the expected wage gap between origin and destination (Harris, Todaro, 1970), both are likely to be more pronounced in case of rural origin and urban direction. This motivates our use of the demographic and migration factor.

Since we consider the influence of demographic and migration processes on labor potential in the article, we consider it necessary to take into account the views of scientists on the concept of “labor potential“. Kostakov V. and Popov A. believe that “the labor potential of a country and its regions is the labor resources considered from the point of view of the unity of quantitative and qualitative indicators“ (Kostakov, Popov, 1982). Some authors began to include many factors characterizing the totality of socio-economic and organizational-managerial capabilities that allow working in the number of socio-economic criteria. Such a characteristic of labor potential is presented in the article by Vigliarolo (Vigliarolo, 2020). The concept of “labor potential” includes labor resources, working conditions, population and employment, the level of education, the totality of the technical infrastructure of labor, which have been used by employees of planning and statistics bodies for a long time (Fedorov, 2005).

Demography (Greek demos - population, grapho - I write): 1) scientific discipline on the laws of population growth and its socio-historical substantiated processes;

2) socio - economic demography - a scientific field that studies the population, its geography, structure and composition, quantitative and spatial - periodic dynamics, birth rate, mortality, lifetime with their socio - historical characteristics;

3) biological demography - a set of statistical data on the density, youth and sexual composition of the population (Dal, 2018). Further, De Brauw, A Mueller and Woldehanna wrote on the relationship between migration and land. Employment opportunities in rural areas are limited outside agriculture (De Brauw et al. 2013). Education was the strongest motivation for migrating from the countryside to the city (De Brauw, 2014).

3. Overview of socio-demographic trends

Today, for the Republic of Kazakhstan, the most important is the methods of forming the labor market, the methods of economic growth, the creation and implementation of employment policies through the methods of efficient use of man power using statistics data.

Labor potential is determined by the average age and gender structure of the population, lifetime, level of education and training, the reserve of man power, which is carried out under certain circumstances, etc.

As of January 1, 2019, the total number of the Republic of Kazakhstan amounted to 18 395.6 thousand people. In 2019, the population was increased by 2 192 300 thousand people compared to 2010 or by 13.53%. Of these, the urban population is 10 509 798 thousand. people, the rural population - 7 647 539 thousand people (Table 1, Figure 1).

Table 1. Dynamics of socio - demographic indicators of the Republic of Kazakhstan for 2010-2019

	Population at the end of the period, thousand people	Urban population, person	Rural population, person	Natural increase (decrease) of population, person	Were born, person	Deceased, person
1	2	3	4	5	6	7
2010	16203,274	8 662919	7 319451	213 378	356261	142 883
2011	16440,47	8 819620	7 383654	221 680	367707	146 027
2012	16673,933	8 973922	7 466548	228 367	372690	144 323
2013	16910,246	9 127543	7 546390	237 742	381153	143 411
2014	17160,855	9 277871	7 632375	250 888	387256	136 368
2015	17415,715	9 433575	7 727280	267 022	399309	132 287
2016	17669,896	9 837025	7 578690	267 647	398458	130 811
2017	17918,2	10 035577	7 634319	269 463	400694	131 231
2018	18157,3	10 250102	7 668112	261 253	390262	129 009
2019	18395,6	10 509798	7 647 539	267 351	397799	130 448
	2019 2010, %	2019 2010, %	2019 2010, %	2019 2010, %	2019 2010, %	2019 2010, %
	113,53 %	121,32%	104,48 %	125,3 %	116,6 %	-8,7

Source: Compiled by the author according to the source (Ministry of National Economy of the Republic of Kazakhstan, year of 2019)

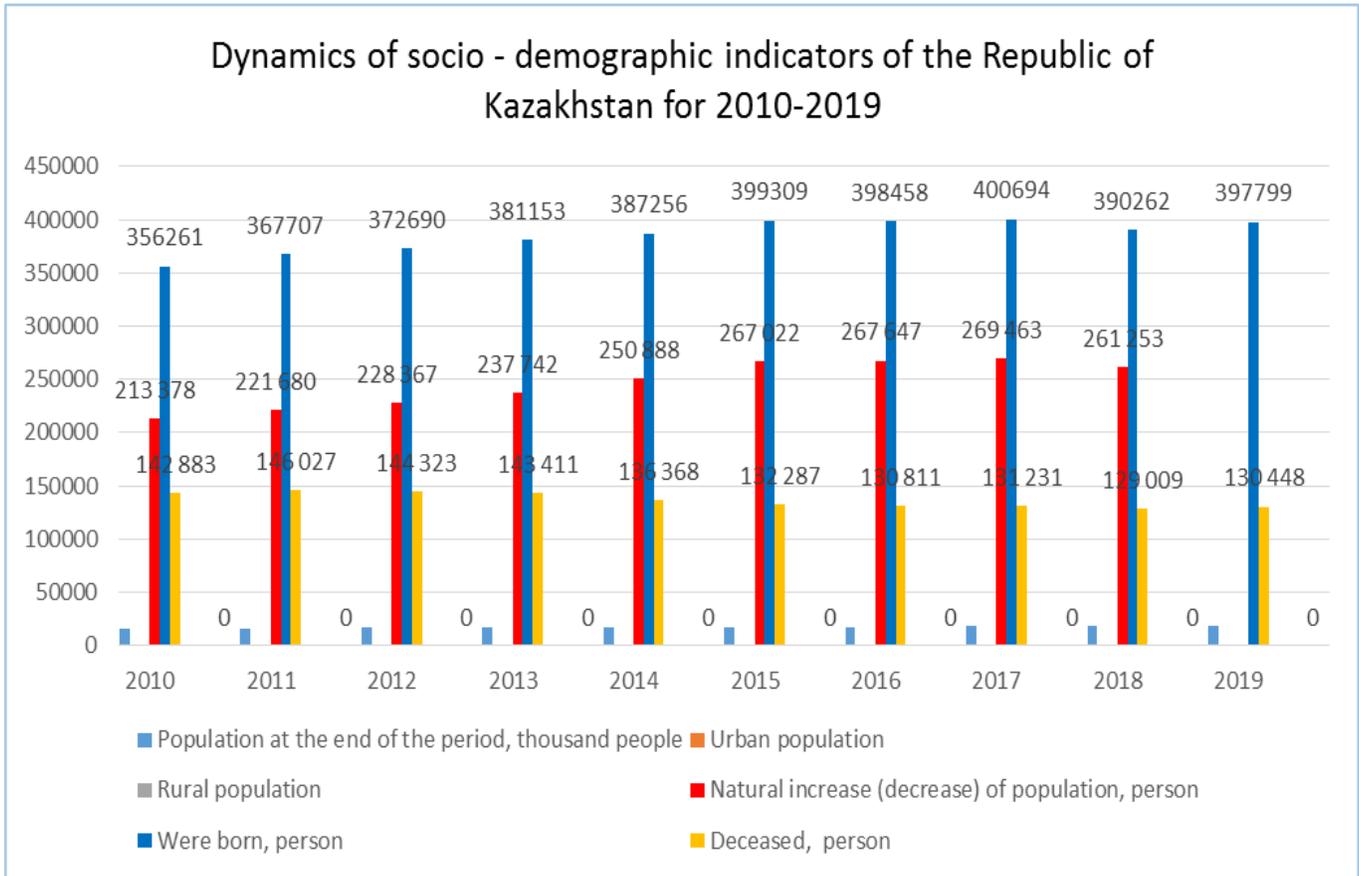


Figure 1. Dynamics of socio - demographic indicators of the Republic of Kazakhstan for 2010-2019

Compared to 2010, the urban population grew by 1,846,879 thousand people, or 21.32%, the rural population by 328,088 thousand people, accordingly, by 4.48 %. We observe an increase in urban population than rural. The natural increase (decrease) in the population in 2010 was 213,378 people, in 2019, was increased up to 267,351 people, or 25.3 %. Meanwhile, we see a decrease in the number of deaths compared to 2010 by 12,435 people at the end of 2019, or -8.7 %. This indicates a significant improvement in the socio-economic situation of the population of Kazakhstan (Ministry of National Economy of the Republic of Kazakhstan in 2019).

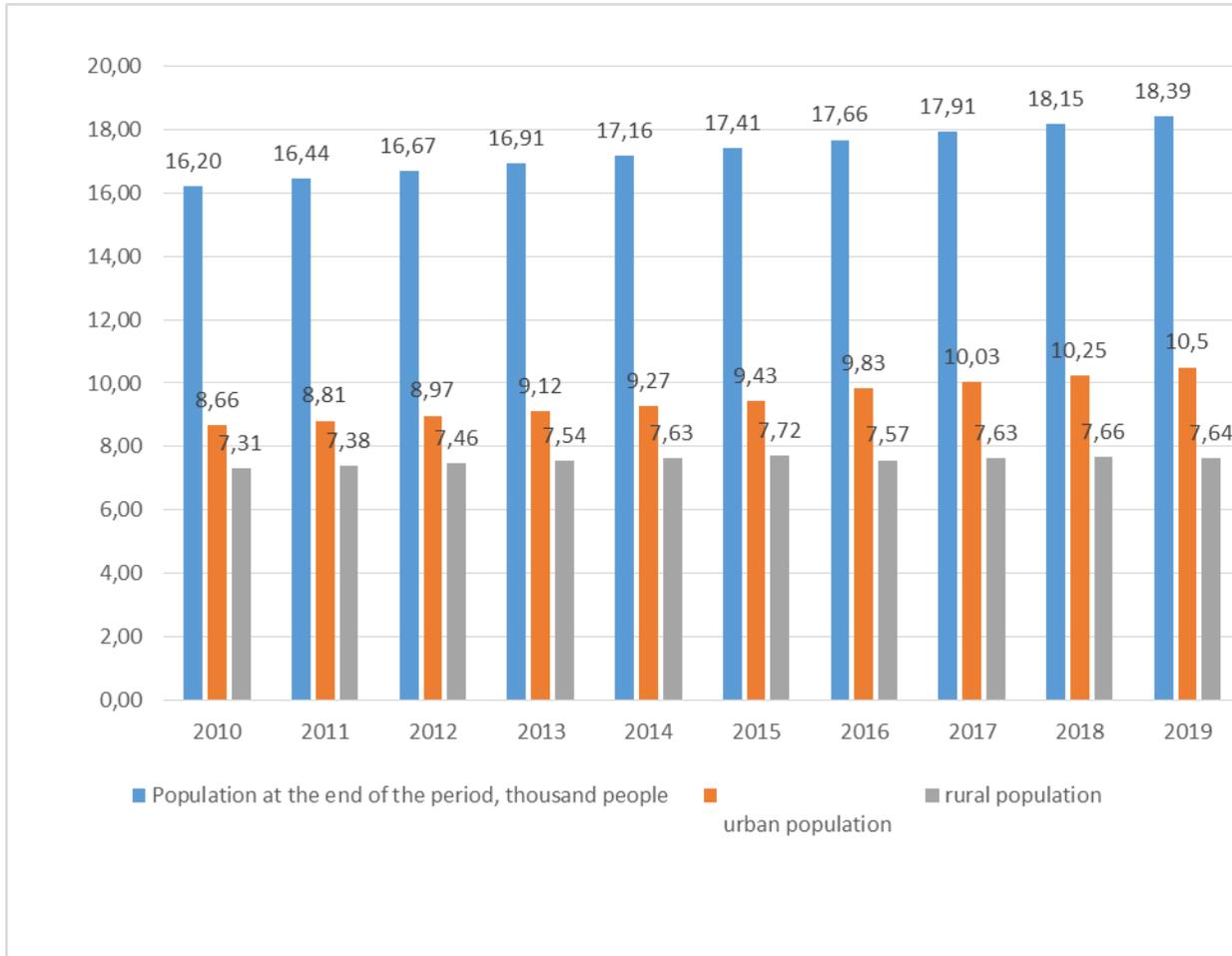


Figure 2. Dynamics of urban and rural population of the Republic of Kazakhstan for 2010 -2019

Labor migration is an important factor in achieving sustainable development of the economic sector (Semenyuk, 2019). Currently, economic and other problems occurring in the world do not reduce the number of labor migrants, but increase the number of people wishing to leave the country.

Table 2. Migration of the population of the Republic of Kazakhstan for 2010-2019, person

Years	Balance of migration (+-)	Arrived, person	Departed, person
Total			
2010	7526	406166	398640
2011	15516	408094	392578
2012	5069	402654	397558
2013	-1426	366137	367563
2014	-279	361372	361651
2015	-12162	422400	434562
2016	-13466	472032	485498
2017	-21145	630649	651794
2018	-22130	946415	968545

2019	-29121	900931	930052
External migration			
Years	Balance of migration (+-)	Immigrant	Emigrant
2010	7 526	41 511	33 985
2011	15 516	42 057	26 541
2012	5 096	38 016	32 920
2013	-1426	28 296	29 722
2014	-279	24 105	24 384
2015	-12 162	16 784	28 946
2016	-13 466	16 581	30 047
2017	-21 145	13 755	34 900
2018	-22 130	15 595	37 725
2019	-29 121	12 747	41 868
Internal migration			
2010		364655	364655
2011		366037	366 037
2012		364638	364638
2013		337841	337841
2014		337267	337267
2015		405616	405616
2016		455451	455451
2017		616894	616894
2018		930820	930820
2019		888184	888184

Source: Compiled by the author according to the source (Ministry of National Economy of the Republic of Kazakhstan, Committee of statistics, information for the year of 2019)

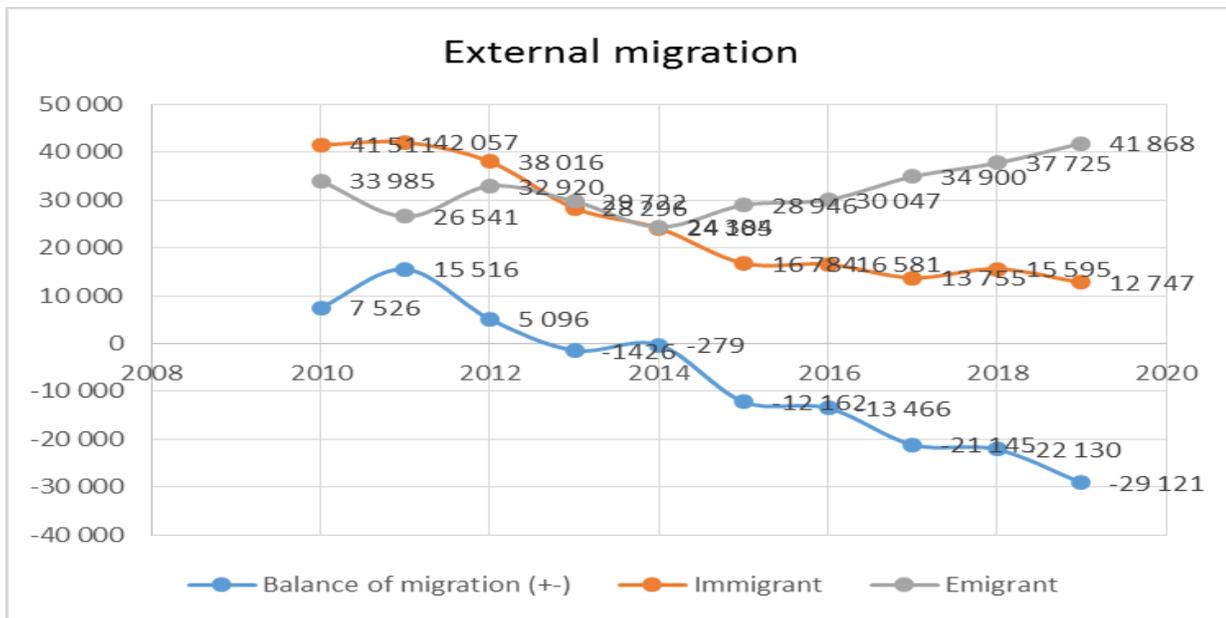


Figure 3. External migration of the Republic of Kazakhstan for 2010-2019, person

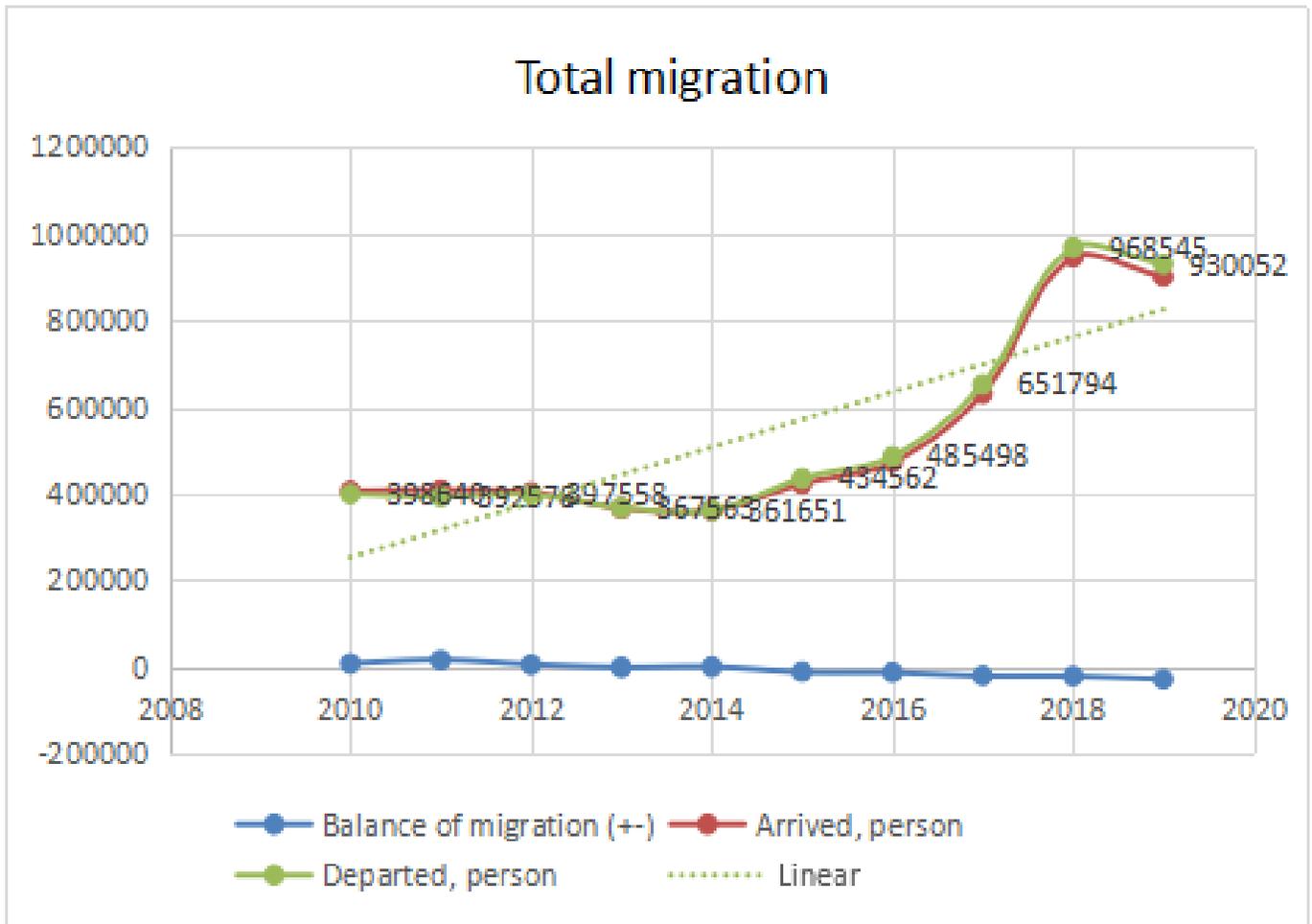


Figure 4. Total migration of the Republic of Kazakhstan for 2010-2019, person

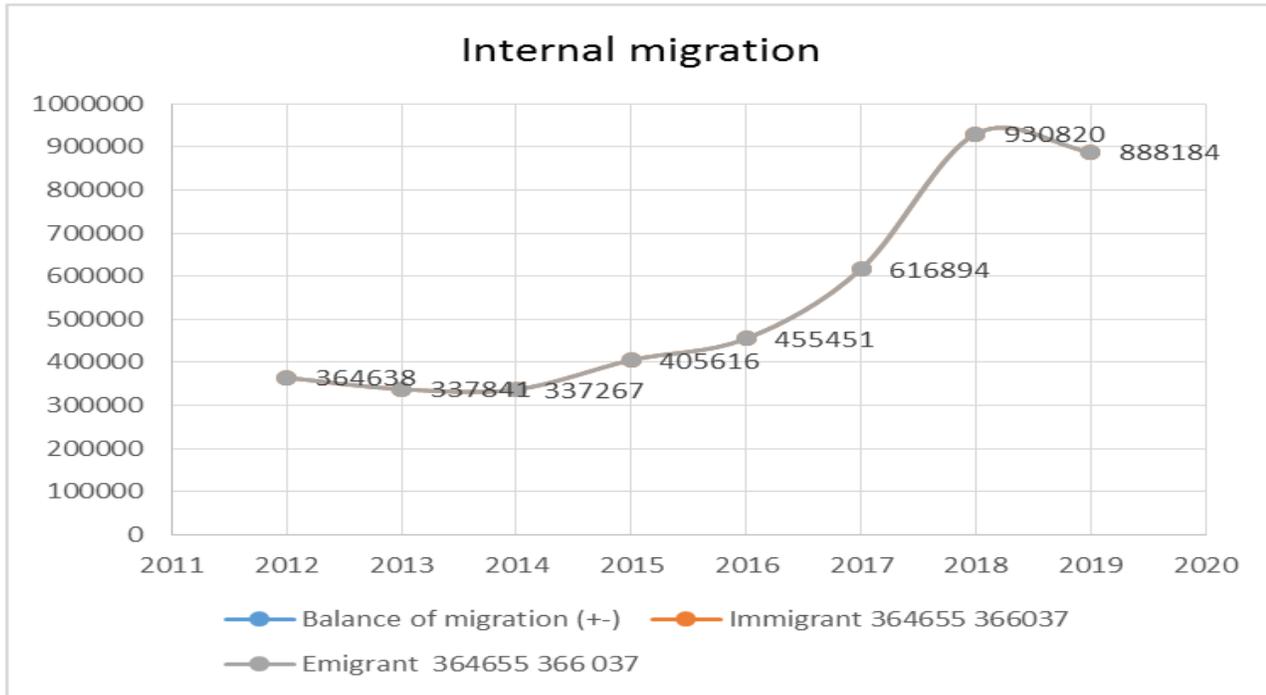


Figure 5. Internal migration of the Republic of Kazakhstan for 2010-2019, person

The data in table 1, figure 2-4 shows that the demographic situation in the Republic is not stable. The migration difference of the republic remains negative due to internal migration in recent years. In accordance with the data of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan 16.4 thousand families moved to Kazakhstan in recent years, which amounted to 34 thousand ethnic Kazakhs. Of these, 66.2 % came from Uzbekistan, 26 % from China. The remaining migrants arrived from countries such as Mongolia (2.68 %), Turkmenistan (1.48 %), Russia (1.42 %), other countries of far abroad (1.5%) and other CIS countries (0.68 %) (Research Report 2017). However, according to the results of the questionnaire and survey conducted by members of the research group among ethnic migrants living in the Akmola region, 65.7% of respondents aggravate the situation with internal migration, moving to cities in search of permanent work and income (Bodaukhan, Djussibaliyeva, 2018).

Now, let's consider the types of trending models with which we will work and calculate the impact of indicators on labor potential. An important task is to study changes in the analyzed indicators over time. These changes can be studied if you have data on a certain range of indicators for a number of points in time or for a number of time intervals following each other.

3. Methodology

A number of statistical indicators located in a chronological sequence is a *time (dynamic) series*. Models based on data characterizing one object for a series of consecutive moments (periods) are called *time series models*.

One of the problems arising in the analysis of the series of dynamics is the establishment of patterns of change in the levels of the studied indicator over time, i.e. development trends. Thus, the *trend* is a function of time that determines the main tendency of time indicator development.

In the analytical alignment of a series of dynamics, a regularly changing level of the studied indicator is estimated as a function of time $\hat{y}_t = f(t)$, where \hat{y}_t - the levels of the dynamic series calculated by the corresponding analytical equation at t time. Table 3 shows the various types of trend models that are most often used for analytical alignment.

Table 3. Types of the trend models

Item №	Function name	Function description
1	Lineal	$\hat{y}_t = a + bt$
2	Second-order parabolic curve	$\hat{y}_t = a + b_1t + b_2t^2$
3	Cubic parabola	$\hat{y}_t = a + b_1t + b_2t^2 + b_3t^3$
4	Hyperbolic	$\hat{y}_t = a + b\frac{1}{t}$
5	Indicial	$\hat{y}_t = ab^t$
6	Degree	$\hat{y}_t = at^b$

Thus, a trend model is built - an economic-mathematical dynamic model in which the development of a simulated economic system is reflected through the trend of its main indicators.

The choice of curve shape largely determines the results of trend extrapolation. The basis for choosing the type of curve can be a meaningful analysis of the essence of this phenomenon development. You can also rely on the results of previous studies in this field.

In our research, we will use a linear function, which has the form $\hat{y}_t = a + bt$

A linear dependence is selected in those cases when in the initial time series there are more or less constant absolute chain increments that do not show a tendency to either increase or decrease. In this case, a linear trend is built - a straight line equation expressing the trend of the time series.

To estimate the parameters of the time series of model a and b , the least squares method (LSM) is used, according to which the model parameters are calculated by the following formulas:

$$b = \frac{\overline{yt} - \bar{y} \cdot \bar{t}}{\overline{t^2} - \bar{t}^2}, \quad a = \bar{y} - b\bar{t}. \quad (1)$$

The parameter b is a regression coefficient that determines the direction of development. If $b > 0$, then the dynamics levels increase uniformly, and when $b < 0$, they uniformly decrease. The coefficient b characterizes the average absolute increase. Coefficient a shows the initial level of the time series.

Having built the regression equation, it is necessary to evaluate its adequacy. This is done using the Fisher test (F). The actual level ($F_{act.}$) is compared with the theoretical (tabular) value:

$$F_{act} = \frac{\sigma_{act.}^2 (n - k)}{\sigma_{2rem.}^2 (k - 1)}, \quad (2)$$

where k – number of function parameters that describes the trend; n is a number of series levels

$$\sigma_{rem.}^2 = \frac{\sum (y_t - \hat{y}_t)^2}{n}, \quad (3)$$

$$\sigma_{act}^2 = \frac{\sum (\hat{y}_t - \bar{y}_t)^2}{n}. \quad (4)$$

$F_{act.}$ Is compared with $F_{tab.}$ for $\nu_1=k-1$ and $\nu_2=n-k$ degrees of freedom and significance level α (usually $\alpha=0,05$). If $F_{act.}>F_{tab.}$, then the regression equation is significant, i.e. the constructed model is adequate to the actual time trend.

In order to know how well a linear model approximates our data, the coefficient of determination shall be calculated (R^2). The coefficient of determination characterizes the share of variance, explained by regression, in the total variance of the effective feature y ($0 \leq R^2 \leq 1$).

Forecasting in the economy is the transfer of the laws that operated in the past to the future, i.e. the forecast is based on extrapolation. The possibility of extrapolation is provided by two circumstances:

- 1) the general conditions that determine the development trend in the past do not undergo significant changes in the future;
- 2) the trend in the development of the phenomenon is characterized by one or another analytical equation.

When making forecasts, they do not operate with a point, but with an interval estimation, determining the so-called confidence intervals of forecasts. The value of the confidence interval is determined in general terms as follows:

$$\hat{y}_t \pm t_\alpha \frac{S_{\hat{y}}}{\sqrt{n}}, \quad (5)$$

where $S_{\hat{y}}$ - average deviation from the trend; - tabular value of t-student test at a significance level α .

The value $S_{\hat{y}}$ is determined by the formula:

$$S_{\hat{y}} = \sqrt{\frac{\sum_{t=1}^n (y_t - \hat{y}_t)^2}{n - m}}, \quad (6)$$

where m – a number of function parameters that describes the trend; n is a number of levels in the series.

5. Application functionality. Results and Discussion

Let`s calculate the parameters of linear trend models, check the adequacy of the constructed models, calculate the coefficients of determination and construct confidence intervals for the forecasts for 2020-2021 for the following indicators:

- the population at the end of the period of the Republic of Kazakhstan;
- urban population of the Republic of Kazakhstan;
- rural population of the Republic of Kazakhstan;
- Natural increase (decrease) in the population of the Republic of Kazakhstan;
- External migration;
- Internal migration.

Combined results are provided in table 4, figures 5, 6, 7, 8.

Table 4. The results of analysis of the main demographic, migration indicators

Indicator	Trend model	Coefficient of determination (R^2)	Verification of Fisher's F-criteria	Forecast values for 2020-2021
Population of the RK at the end of the period, thousand people	$\hat{y}_t = 18395,6 + 42,16t$	$R^2=1$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 18589,3$ $\hat{y}_9 = 18877,43$
Urban population of the RK	$\hat{y}_t = 10509798 + 29,05t$	$R^2=0,97$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 1140,41$ $\hat{y}_9 = 1169,46$
Rural population of the RK	$\hat{y}_t = 7647539 + 30,27t$	$R^2=0,98$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 1068,10$ $\hat{y}_9 = 1098,37$
Natural increase (decrease) in the population of the RK	$\hat{y}_t = 9,09 - 0,37t$	$R^2=0,97$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 6,14$ $\hat{y}_9 = 5,78$
External migration	$\hat{y}_t = 399,41 + 8,49t$	$R^2=0,78$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 467,36$ $\hat{y}_9 = 475,85$
Internal migration	$\hat{y}_t = 3642,71 - 210,46t$	$R^2=0,97$	$F_{act.} > F_{tab.}$	$\hat{y}_8 = 949$ $\hat{y}_9 = 739$

Thus, we can draw the following conclusions:

- the coefficients of determination of the constructed models are quite close to unity, which speaks in favor of the models;

- constructed trend models are adequate;

And so: Forecast values for 2020-2021:

Population at the end of the period of the Republic of Kazakhstan: $\hat{y}_8 = 18589,3$, $\hat{y}_9 = 18877,43$

Urban population of the Republic of Kazakhstan: $\hat{y}_8 = 1140,41$, $\hat{y}_9 = 1169,46$

Rural population of the Republic of Kazakhstan: $\hat{y}_8 = 1068,10$, $\hat{y}_9 = 1098,37$

Natural growth (decrease) population of the Republic of Kazakhstan: $\hat{y}_8 = 6,14$, $\hat{y}_9 = 5,78$

External migration: $\hat{y}_8 = 467,36$, $\hat{y}_9 = 475,85$

Internal migration: $\hat{y}_8 = 949$, $\hat{y}_9 = 739$

With a probability of 95%, it can be expected that in 2020 - 2021 the considered indicators will not take values smaller than the lower bounds of the confidence forecast intervals and not greater than their upper bounds.

Conclusions

The migration turnover in the country depends on the openness of state borders, the geopolitical situation in the republic, the stability of interethnic relations, as well as the legal framework for migration, and the level of state regulation. North Kazakhstan region occupies the 5th place in terms of population density of 5.66 people / km², and the regions with low population density include Mangistau and Aktobe regions - population density per 1 sq. km. is 2.3 people. In cities, the leading place in demography and fertility in 2019 is held by Almaty and Nur - Sultan. The process of shredding the rural settlement network, which lasted over 10 years (more than half are small, with a population of less than 500 people, where 9.8% of the rural population lived), complicated the social arrangement of rural areas, which led to a migration outflow of the able-bodied population, especially youth, from village to city and the inevitability of urbanization. In rural areas, socio-economic imbalances between the level and quality of life still persist. Currently, 42 % of the country's population lives in rural areas. The main results of the labor market of urban and rural population are presented in the final table 5, figure 5.

Table 5. Key indicators for comparing the labor market of urban and rural population

	2014		2015		2016		2017		2018	
	city	village	city	village	city	village	city	village	city	village
Man power, thousand people	4 973,3	3 988,6	5118,5	3769,1	5 152,3	3 846,6	5187,3	3840,1	5 277,2	3 861,4
Man power share, in percent	69,4	72,4	69,2	70,4	68,8	71,7	68,3	71,7	68,5	72,3
Employed population, thousand people	4 715,3	3 794,8	4858,5	3574,9	4 890,7	3 662,7	4932,0	3653,1	5 017,5	3 3677,5
Employment level, in percent to:										
The population of 15 years old and more	65,8	68,9	65,7	66,8	65,3	68,3	64,9	68,2	65,1	68,9
Number of man power	94,8	95,1	94,9	94,8	94,9	95,2	95,1	95,1	95,1	95,2
Employees, thousand people	3 884,7	2 225,0	4069,0	2225,9	4 102,0	2 240,9	4160,2	2325,7	4226,7	2385,7
Share in employed amount, in percent	82,4	58,6	83,8	62,3	83,9	61,2	84,4	63,7	84,2	64,9
Self-employed, thousand people	830,6	1 569,8	789,5	1349,0	788,7	1 421,8	771,8	1327,4	790,8	1291,8
Share in employed amount, in percent	17,6	41,4	16,2	37,7	16,1	38,8	15,6	36,3	15,8	35,1
Unemployed people, thousand people	258,1	193,8	260,0	194,2	261,6	183,9	255,3	187,0	259,7	183,9
Level of unemployed people, in percent	5,2	4,9	5,1	5,2	5,1	4,8	4,9	4,9	4,9	4,8
Of youth (at the age of 15-28 years old) unemployment, in percent	5,0	3,4	4,8	3,8	4,6	3,5	4,4	3,3	4,4	3,1
Level of long-term unemployment, in percent	2,1	2,6	2,2	2,8	2,2	2,3	1,9	2,5	1,9	2,7
People not related to man power, thousand people	2 193,1	1 522,8	2281,3	1586,1	2 339,3	1 515,7	2410,0	1517,2	2431,2	1476,1
Share of people not related to man power, in percent	30,6	27,6	30,8	29,6	31,2	28,3	31,7	28,3	31,5	27,7

Source: Compiled by the author according to the calculation of lineal-trend model using a source (Ministry of National Economy of the RK, committee of statistics, information for 2019)

Considering the peculiarities of development of the agri-food sector and the growth of income from agricultural activities, the existing surplus of rural population is one of the reasons for restraining the growth of the standard of population living, which complicates the planning of sustainable development of the country (Akimbekova, 2019).

In the long run, urban employment has a steady upward trend. However, in rural areas there has been a steady decline in employment. In addition, significant differences between urban and rural areas persist in the structure of employed population. So, 84 % of the urban population are employees, the remaining 16% are self-employed. In rural areas, the share of employees is only 61%, and the share of self-employed workers is 39% (Nurzhanova et al., 2020).

As a result of the analysis of migration, demographic processes and their impact on the development of the Republic of Kazakhstan economy at the present stage, the following conclusions can be drawn.

The positive result of labor potential development is influenced by many different, as well as interdependent factors such as urban and rural population, natural increase (decrease) in the population, external migration and internal migration.

Knowledge of the mechanisms of interaction of these factors, as well as its impact on labor potential and the entire economy as a whole, is very important for developing a strategy for the demographic and migration situation.

A factor analysis of the population migration causes, the demographic position of the republic allows us to conclude that the development of external migration is the main cause of historical and ethnic factors, and the development of internal migration of socio-economic factors.

An analysis of internal migration flows shows that in recent years there has been a tendency for migration to cities for rural people. Having studied the topic, we can draw the following conclusions:

- the trend model shows that the coefficients of determination of indicators of total population, urban and rural population, internal and external migration with natural population growth are quite close to unity, which speaks in favor of models;

- constructed trend models are error-free, authentic; research limitations related to accuracy of secondary data are typical to such researchers.

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Gulmira NURZHANOVA Doctoral student of Economics and management Department, JSC Financial Academy, Nur-Sultan, Kazakhstan. Research interests: economy, labor potential, labor resources.

ORCID ID: <https://orcid.org/0000-0002-1456-2157>

Galym MUSSIROV Ph.D., Senior Lecturer, Baishev University, Aktobe, Kazakhstan. Research interests: economy, finance, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0003-2853-6504>

Shakizada NIYAZBEKOVA Candidate of Economic Sciences PhD, Moscow Witte University, Moscow, Russian. Research interests: economic, finance, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0002-3433-9841>

Akilbek ILYAS Doctor of Economic Sciences, professor of Financial Academy JSC, Department of Finance and customs, Nur-Sultan, Kazakhstan. Research interests: finance, economics, ecology, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0002-6655-6277>

Yuliya TYURINA Doctor of economic sciences, associate professor, Professor of the Financial University under the Government of the Russian Federation, Moscow, Russian Federation

Research interests: economic, finance, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0002-5279-4901>

Leila MAISIGOVA Candidate of Economic Sciences, Ingush State University, Magas, Russian Federation

Research interests: economic, finance, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0003-2148-4924>

Marija TROYANSKAYA Doctor of Economic Sciences, Associate Professor, Orenburg state university

Research interests: economic, finance, management, labor potential, labor resources

ORCID ID: <https://orcid.org/0000-0003-4545-3786>

Kymbat KUNANBAYEVA is senior teacher, Financial University under the Government of the Russian Federation, Moscow, Russian Federation.

Research interests: management of city-forming organizations, economic of organizations, single-industry town, social controlling.

ORCID ID: <https://orcid.org/0000-0002-5846-855X>

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