



The Dynamics of Migrants and the Demographic Process in Azerbaijan

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THE DYNAMICS OF MIGRANTS AND THE DEMOGRAPHIC PROCESS IN AZERBAIJAN

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Abstract. The purpose of the article is to clarify the relationship between the dynamics of migrants and demographic processes. To account for the components of demographic change (births, deaths, net domestic and international migration) individual cointegrated equations are created. The net migration equations are more difficult to model because economic conditions, particularly labor market conditions, affect this process over time. Methods of analysis and synthesis, comparison, induction and deduction, etc. were used for demographic analysis. When developing regression models between the number of migrants and the groups directly influencing it, an econometric model was applied. When solving the problem, independent variables were combined in groups and based on the data, a correlation model of the relationship between the number of migrants and demographic factors was built. The model was tested at $\alpha=0.01$, $\alpha=0.05$ for the absence of autocorrelation. The results of the study can be applied in regulating the flow of migrants and maintaining its pace at an optimal level. The research contributes to the regulation of international migration, thanks to the theoretical and practical results obtained. The relevance and value of the study is confirmed by the influence of migration and demographic processes on the standard of living of the population.

Keywords: Demography, Demographic factors, Migration, Econometric Model

1. Introduction

In practical terms, the field of demographic research includes a description of the demographic situation, an analysis of trends and factors of demographic processes in the country in different periods. Based on the study of the characteristics of fertility and mortality in different generations, social groups, etc., demography evaluates their change in the future, developing demographic forecasts. The demographic and economic contribution of migrants to the lives of their countries of origin and host countries is a controversial issue and a typical example of a discussion in which logical or scientific arguments are not enough to convince public opinion. The relative increase in the working-age population is still ongoing and opens up opportunities for accelerated economic growth. The economic growth of demography in the economic sense is called a demographic dividend [12]. In this context, efforts to achieve the Sustainable Development Goals, such as ending hunger, ensuring healthy lives, promoting education and lifelong learning, creating jobs, improving social protection, and reducing inequality, can reinforce these trends and open up even more opportunities.

The main indicators of the demographic situation include: the number and composition of the population, the number of births and deaths, the number of officially registered marriages and divorces, the number of citizens who arrived and left the country, as well as the number of arrivals and departures within the country and its regions. Based on these indicators, indicators are formed that make it possible to comprehensively characterize the structure and movement of the population, socio-demographic processes [4]. The most important source of data on the size and composition of the population at a certain point in time is the census. The basic principles of conducting population censuses are universality, simultaneous conduct, the existence of a single census program, naming, self-determination, confidentiality, centralization of management and disregard for the interests of the state [1, 2].

The migration process is one of the three main demographic processes. Over time, migration has an even greater impact on population change than fertility or mortality. This reflects that migration is becoming the most dynamic of the three processes at the international level. In migrant families of different genders, the decision to return also depends on gender roles and dynamics. In sociocultural contexts where the division of labor in the family and household depends on gender, women are more likely than men to return when family members in their country of origin need care. Research shows that people migrate at a young age, which is also the reason why some studies show that immigrants make a positive financial contribution during their lifetime [8]. According to the author, in order to achieve a net financial effect, the ability of immigrants must integrate into the labor market and offer in-demand skills. However, immigrants have a real potential to improve the financial balance of the host country.

2. Materials and Methods

The theory and methodology of the study are based on the research of local and foreign researchers on the demographic process. The following methods were used in the study. The dialectical method was used to identify common approaches for studying a complex population. Methods of analysis and synthesis, comparison, induction and deduction, etc. were also used for demographic analysis. When developing econometric models between the number of migrants and groups of factors, a multifactorial correlation model was applied. Also, using the analysis method, the current state of the number of migrants, natural growth, birth rate and death rate of the population, the number of valid marriages and divorces, the number of international migrants in Azerbaijan were considered. Using

data on these indicators in the period 2000-2023, an econometric model of the relationship between the dynamics of migrants and the factors of the demographic process in the country was built.

To determine the adequacy of the econometric model, this indicator was tested on the basis of the Darbin-Watson criterion. At the end of the article, based on an analysis of the number of immigrants accepted by the countries, relevant suggestions and recommendations will be given.

3. Results

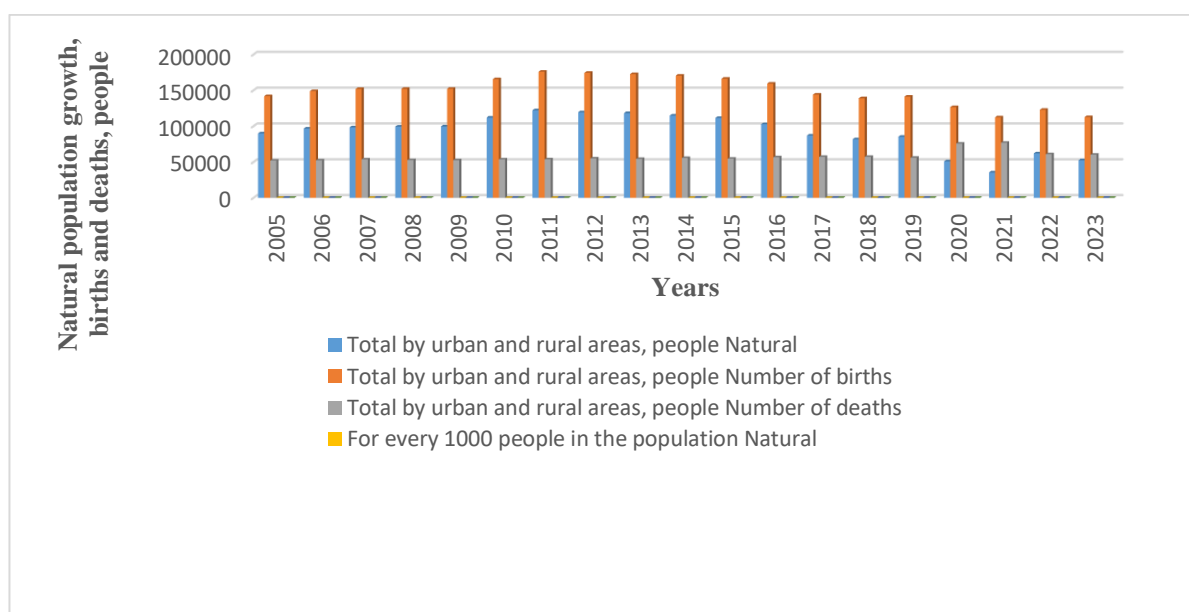
3.1. Analysis of demographic and migration data

Some researchers are considering factors contributing to migration. Based on the results they obtained, we can note that the effects of migration affect the demographic process for both sending and receiving countries. Based on the results of the conducted research, we assume that a change in the trend of the demographic process structure depends on the migration process and vice versa [10, 11].

In some regions of the world, young people (aged 15 to 25) It makes up a significant and rapidly growing population group. In sub-Saharan Africa, where the total population is projected to double by 2050, the number of people of working age (25 to 65 years old) is increasing faster than in any other age group. Most countries in Asia and Latin America and the Caribbean are already experiencing a similar increase in the number of young people, followed by an increase in the number of people of working age.

Calculations of the demographic situation in the world show that in 2024-2050, about 50% of global population growth will be accounted for by nine countries: India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia, Tanzania, Indonesia, Egypt and the United States of America. And the population of Europe will decrease [17]. A number of researchers dealt with the problems of the labor market, the impact of the influx of immigrants, etc., and certain scientific results were obtained [10]. The World Migration Report 2024 recognized the IOM's ongoing duty to protect fundamental human rights and its mission to support those migrants who need help the most. It should be noted that such support is especially needed in three areas to which IOM provides special attention, as indicated in its strategic plan for 2024-2028: -saving lives and protecting people in motion; -finding solutions to the problem of risk in the movement of people; -facilitating ways for legal migration. According to the UN, the world had 281 million international migrants (3.6% of the world's population) in 2024. Many factors contribute to the acceleration of migration: conflicts between countries, violence, political and economic instability, climate change, natural disasters, etc. In 2022, there were 117 million displaced persons in the world, 71.2 million of them internally displaced. The number of people forced to seek asylum due to the war between Russia and Ukraine, Israel and Palestine, etc., increased by 31.7% in 2022 compared to 2020 [9, 16].

The acceleration of migration is influenced by many factors. Demographic factors play an important role among these factors: natural population growth, fertility and mortality; gender composition of the population; composition of urban and rural populations; deaths from common causes, etc. The natural growth, fertility and mortality of the population are presented below (Chart 1).



Graph 1. Natural population growth, births and deaths

A comparative analysis showed that the natural population growth in the period under review decreased by 41.7% and amounted to 52470 people in 2023, there was also a decrease in the birth rate by 20.6%, and in mortality, on the contrary, there was an increase of 15.8%. The reason for the increase in mortality may be the pandemic years, which have claimed many lives in all population groups. According to the Statistical Committee of Azerbaijan, the

natural increase by gender among men decreased by 45.2%, and among women by 41.6% [13]. The decrease in natural growth ultimately has a negative impact on the number of migrants. Thus, the attempt of migrants to move to another country for permanent residence in search of higher wages will be reduced for the aforementioned demographic reason.

One of the main factors affecting the number of migrants is considered to be the number of deaths due to common causes, which can negatively affect the change in their number. Data analysis shows that this indicator increased by 17.7% in the period under review [13]. Thus, the impact of the increase in the number of people who died for various reasons on the migration process does not allow many families to move to another country. Because families who set themselves the task of moving from their place of residence force them to change their thoughts related to leaving the country to live in other countries with higher secure living standards.

The positive dynamics of migrant labor market indicators in Azerbaijan was observed after the pandemic (2020-2021), then slowed down compared to previous years. This process has had a disproportionately negative impact on the migration rate. However, the employment rate has improved at a faster rate, and in 2022 it is almost equal to the indigenous population. Also, the average employment rates of these population groups in the OECD countries amounted to 71-72% [13]. Data analysis shows that in these countries the number of migrant workers is higher in percentage terms than the local population. One of the important aspects of immigration is the ethnic balance of the population, which is changing rapidly. Therefore, the role of migration in the labor market continues to become more controversial. According to experts, the dynamics of leadership development in countries is determined by the number of highly qualified specialists. The labor market acts as the main mechanisms for assimilation of immigrants, the comprehensive resources of the country's human resources potential and the state strives to develop and implement action plans in this direction.

3.2. Hypotheses for modeling the relationship between the number of migrants and groups of factors

Regression models are the best tool (method) for analyzing, estimating and predicting the change in the number of migrants, including identifying the main factors directly affecting this indicator. Correlation analysis is a method of modeling and studying the properties of measured data. The initial data consists of a combination of values of the dependent variable and independent variables (explanatory variables). The model parameters are set in such a way that the model is as close to the data as possible. The qualitative criterion for approximating quantities (the objective function) usually shows the root-mean-square error. Here it is assumed that the dependent variable is the sum of the values of the given model and a random variable. The model is used for forecasting, time series analysis, hypothesis testing, and identifying hidden relationships in data [5].

The analysis period, the selection of the initial data. To build an econometric model that ensures a minimum number of migrants, we took a period covering the years 2000-2023. The source materials were selected from the statistical collections labor market and population of the State Statistics Committee of Azerbaijan [13] (Table 1). To present the results of the analysis in a comparative form for 2014, all cost indicators fully cover subsequent years. Here: X1-natural population growth, thousand people; X2- number of employed people, thousand people; X3 – nominal monthly salary, manat; X4- number of deaths due to common causes, thousand people.

Table 1. Initial data and calculation results

	y	x1	x2	x3	x4	ŷ
▷	0.8	114.855	4602.9	442.4	55.648	1.0685
	1.6	111.513	4671.6	466.9	54.697	1.3419
	1.7	102.816	4759.9	484.3	56.648	1.5384
	1.9	86.932	4822.1	515.4	57.109	1.7014
	1.6	81.732	4879.3	595.7	57.25	1.8791
	1.6	85.263	4785.6	635.1	55.916	1.6241
	0.6	50.924	4721.2	707.3	75.647	0.4211
	0.6	35.406	4831.1	732.1	76.878	0.713
	1.1	62.036	4901.1	840	60.81	1.7443
◊	2.5	52.47	4963.3	933.9	60.15	1.9683

3.3. Description of the results of the econometric model construction

In the study, based on the selected data, a correlation model of changes in the migrant ring (Y) was postulated depending on many factors (Xi, i= 1,2, ..., 4 factor) and the formula is expressed as:

$$Y = a_0 \cdot X_0 + a_1 \cdot X_1 + a_2 \cdot X_2 + a_3 \cdot X_3 + a_4 \cdot X_4 + u, \quad (1)$$

where: Y is the number of dependent migration observations (number of observations n=10) from independent factors (k=4); u-deviation from the regression function; a is the regression coefficients, a=1,2,...,4; X₀=1.

Based on the calculation, the coefficients (a₁, a₂, ..., a₄), R², and the DW criteria were obtained. The calculation results are: a₀=-12.3353; a₁= 0.0018; a₂= 0.0034; a₃=0.0000; a₄= -0.0466; R²=0.69842, DW=2,2.

$$Y = -12.3353 + 0.0018 X_1 + 0.0034 X_2 + 0.0000 X_3 - 0.0466 X_4 \quad (2)$$

The Darbin-Watson test is used to test the hypothesis that there is no first-order autocorrelation in the remainder vector of the model. The Darbin-Watson criterion (DW), which is an indicator of the adequacy of the model obtained from the calculation. In practice, the hypothesis H_0 about the absence of autocorrelation of residuals is tested by comparing the statistics of DW with the theoretical values of dl and du for a given number of observations $n = 10$, the number of independent variables of the model $k = 4$ and the significance level α .

When calculating based on data from a certain period, we chose the theoretical values of $dl = 0.230$ and $du = 2.193$ in the case of $\alpha = 0.01$ (1%). Also, it was determined at the significance level of the statistical quantities $dl = 0.69$ and $du = 1.97$ in the case of $\alpha = 0.05$ (5%) [18]. When testing the hypothesis, $DW > du$, or $2.2 > 2.193$, at the level of $\alpha = 0.01$ (1%) of the Darbin-Watson criterion, it was found that the absence of an autocorrelation balance in the real price is accepted.

Thus, the change in the number of migrants in Azerbaijan and its projected value can be solved based on the long-term data of the factors selected for the case under consideration. Note that the model justifies itself in determining the change in the number of migrants in any country from multinational factors. The model allows us to determine the form of impact, reflecting the dependence of changes in quantities in any period on the influence of various factors.

4. Discussion

The first studies of the patterns of demographic phenomena were conducted at the end of the 17th century. The Renaissance brought with it a new philosophy and a new value system. Under these conditions, the attempt to apply the mathematical method to the analysis of social phenomena has become logical. In the book by J. Graunt's "Natural and Political Observations made on Mortality Bulletins" (1662) suggests an approach where it became possible to study society through numbers [15].

In 2003, the International Union for Academic Population Research (IUSSP) organized a special group on the demography of conflict and violence. Here, the first concern of demographers is focused on how and why people die in conflicts (Brunborg and Urdal, 2005; Brunborg and Tabeu, 2005). Therefore, many demographic researchers propose the following reasons for the structure of demographic development: ethnic fragmentation, social inequality, youth growth, migration (Homer Dixon, 1991; Urdal, 2004; Neupert and Prum, 2006; de Walque, 2005; Heuveline, 1998; Vervimp and Bavel, 2005). Both in the past and in the present, epidemiological situations have led researchers on these issues to take an active interest in conflict-related deaths, especially those related to causes of death [8].

Some scientists have found that the structural and demographic transformations in post-conflict societies during the war, the rate of decline in the proportion of children and demographic aging were higher than the European average. The long-term dynamics of the age structure of the population of modern post-conflict countries of the former Yugoslavia does not differ in basic parameters from other European countries [12]. In our opinion, the reason for the decrease in the number of births in these 3 countries was due to large migratory losses of reproductive cohorts in the population.

In research, some authors argue that immigration does not reduce the capital intensity of the economy, but rather allows firms to expand and investments to adjust, as well as promotes innovation and economic growth, especially when highly skilled immigrants are accepted. There is also little evidence that immigration leads to displacement of jobs or lower wages in host countries [17].

There are many economic and non-economic factors involved in solving the migration of the country's citizens. In their own country, migrants are displaced by deteriorating economic conditions or the confrontation of political forces within the country. On the contrary, migrants are drawn to move to other countries that need high-class specialists in their specialties with high salaries, better service in all service sectors of the economy, linguistic proximity, etc. [14].

Practice shows that the arrival of migrants to their destination countries is diverse. This process depends on numerous factors, including the motivations of migration, migration status, integration processes, etc. The migration process sometimes provides some key results for the integration of migrants, depending on different points of view: integration into the labor market, remittances, level of professional training and housing provision, etc. And these results are still closely related to the benefits and privileges granted to migrants depending on the length of their right to stay in the destination country.

Summarizing the opinion of scientists on the conducted research, it should be noted: -the change in the number of labor migrations confirms the fact of dependence of the countries of the world; - the number of international migration depends on numerous factors such as: NTP, free movement of labor, change of residence, etc.; -the migration process is influenced by the development of multinational corporations; -population migration is an important component in modern processes in the global economy; -a decrease in the number of immigrants and a decrease in the growth of local populations does not meet the demand of the labor market.

5. Conclusions

The demographic and economic contribution of migrants to the lives of their countries of origin and host countries is a controversial issue and a typical example of a discussion in which logical or scientific arguments are not

enough to convince public opinion. To determine the relationship between the number of migrants and the selected group of factors, the program “Vizual Studio Code” was used and matrices of coefficients of regression models were compiled. Also, the constructed model justifies itself in determining the change in the number of migrants in any country.

The amount of international migration depends on numerous factors that push them to move to other countries. Immigration does not reduce the capital intensity of the economy, but promotes development when highly qualified immigrants are accepted. Migrants have even a minor impact on job displacement or lower wages in host countries.

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