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Econometric Analysis of Population Income Formation in Uzbekistan

Iskandarova Dilafruz Ikrom kizi
PhD student of TSUE, Assistant teacher of the department "Labor economy"

Abstract: In this article, indicators determining the quality of life of the population in Uzbekistan, increasing the income of the population and the factors affecting it are analyzed. Factors such as expected years of education, number of employed population and expenses allocated to the social sector from the state budget were selected as factors affecting the income of the population, and their influence and importance studied by correlation coefficient and regression equation. Conclusions and suggestions are given based on the results of the econometric model.

Keywords: Population income, real income, nominal income, expected years of education, employed population.

Introduction

One of the important indicators of the level of well-being of the population of the country is the income of the population. For most people, income is wages and bonuses, returns on investments, pensions and other types of transfer income. Today, the economic analysis of the living standard of the population based on objective statistical data, the study of monetary income and expenses of the population, the level of participation of households in the economy and the analysis of the classification of expenses are considered urgent issues. In turn, it plays an important role in increasing the income of the population, increasing its purchasing power, expanding the volume of production and ensuring stable economic development in the country.

In the conditions of the market economy, the income of economic entities is not guaranteed and is not distributed among different layers of the population. Because one of the positive aspects of the market economy is the growth of property income and business income (even if they correspond to a small part of the population). Differences in per capita incomes are income stratification.

Separation of the population into social classes in terms of income is a characteristic of the market economy, and the stratification of the population by income reflects the uneven distribution of income among different socio-demographic groups. Also, the analysis of income inequality among the population of the country also leads to conclusions about the standard of living of the population. After all, the high percentage of the population in which of the four categories of the standard of living of the population (welfare, standard level, poverty, destitution) is considered one of the indicators reflecting the socio-economic situation in the country.

Depending on the amount measured, there are different conditions of income. Total income of the population - represents the gross income before making mandatory payments and other

deductions. The total income of the population includes monetary incomes and incomes in kind and consists of incomes received by the household or its individual members on a permanent basis, with a recurring nature, in the period of an annual or less time interval. Real income represents the real purchasing power of nominal income, taking into account changes in retail prices and tariffs.

An increase in the real and nominal income of the population has a positive effect on people, communities and the country's economy as a whole. Therefore, the study and analysis of the factors affecting the increase in the income of the population remains an urgent issue today.

Research methodology

The research methods of scientific abstraction, empirical, descriptive statistics, grouping, econometric-statistical analysis, comparative and dynamic analysis are used in the article. As a database for the research, the open sources reflected in the annual statistical publications of the Agency of Statistics under the President of the Republic of Uzbekistan, the annual reports of relevant ministries and agencies were consulted.

Literature review

Many foreign, CIS countries and local scientists have been covering the issues of population well-being, income growth and analysis of factors affecting it based on different approaches in their scientific work.

Research in this direction first began to appear in the works of the English scientist William Petty (1623-1687). He considers the economic development of the population in society to be dependent on objective laws.

Also, in the works of J.Keynes[1], A.Marshall[2], J.Mill[3], D.Ricardo[4], A.Smith[5], M.Friedman[6], F.Hayek[7] and other scientists, the famous manifestations of the science of economics include regulation of employment, improvement of population welfare, people's livelihood the theoretical foundations of the formation of favorable financial conditions for improving the level have been expressed.

Among the scientists of the CIS countries, issues related to population income are expressed in the works of Yu.G.Odegov[8], G.G.Rudenko[9], A.I.Rofe[10], V.N.Bobkov[11], R.M.Nureev[12], V.G.Bilkov[13], A.Ya.Kibanov[14] and others.

From local scientists to research the issues of employment, income and well-being of the population in Uzbekistan in the conditions of the market economy: K.Kh.Abdurakhmanov[15],

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B.Kh.Umurzakov[16], N.K.Zakirova[17], N.Kh.Rakhimova[18], Z.Ya.Khudayberdiev[19], G.K.Abdurakhmanova[20], S.B.Goyipnazarov[21], A.B.Irmatova[22], N.U.Arabov[23], D.A.Nasimov[24], Sh.D.Kudbiev[25] and other scientists made great contributions.

It should be noted that the social aspects of employment and the approaches aimed at increasing the labor income of the employed population are widely covered in the researches of academician K.Kh.Abdurakhmanov, one of the Uzbek scientists.

One of the ultimate goals of socio-economic reforms, the problems of increasing the population's income and reducing poverty, the fact that the effective and productive employment of the population has not been systematically researched, and that the methodological and conceptual approaches are not sufficiently scientifically based require theoretical, methodological and practical study of these problems.

Analysis and results

The standard of living of the population means that the population is provided with the necessary material goods and services, and the level of satisfaction of the population's consumption and needs. The level of meeting the needs of the population depends on the level of their income. Economic, social, demographic and geographical factors influence income stratification.

According to the Statistics Agency under the President of the Republic of Uzbekistan, the total income of the population in our country changed from 126,268.0 billion soums to 634,797.0 billion soums during 2013-2022. So, over the last 10 years, the total income of the population has increased by 508,529 billion soums. Also, the total income per capita in 2022 was 14,769.0 thousand soums[26].

Creating a multifactor econometric model based on the income of the population in Uzbekistan and the factors affecting it, verifying the constructed model through various tests and determining the statistical significance of the model, making forecasts for future periods and making scientifically based decisions on the development of the social sector .

Below, based on the data of the Statistical Agency under the President of the Republic of Uzbekistan, factors affecting the income of the population at the national level are selected, such as the expected years of education (years), the number of employed people (thousands of people) and the expenses allocated to the social sector from the state budget.

In our research, the following factors were selected as independent variables and time series data were used to construct this econometric model:

Y - population income, billion soums;

x1 - Expected years of education;

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x2 - Employed population, thousand people;

x3 - State expenditures on the social sphere, billion soums.

A correlational analysis is necessary for the reasonable selection of factors for the multi-factor econometric model. For this purpose, individual and pair correlation coefficients are calculated between factors.

Table 1. Correlation matrix

	LNY	**LNX_1**	**LNX_2**	**LNX_3**
LNY	1			
LNX_1	0,981922	1		
LNX_2	0,76463	0,759315	1	
LNX_3	0,956681	0,915675	0,700741	1

The correlation coefficient takes values from -1 to +1, and the strength of the connection is determined according to it. Also, a positive sign represents a positive connection, and a negative sign represents an inverse connection. However, the correlation coefficient only measures the degree of connection between economic indicators, so it cannot explain the causes of economic relations. This purpose is served by a special method known as regression analysis, and it provides an opportunity to assess the level of influence of the factors affecting the result.

It can be seen from Table 1 that private correlation coefficients show the density of connections between the resulting factor (lny) and the factors influencing it (except for lnx_i, x1). So, private correlation coefficients show that there is a close connection between the resulting factor (lny) and influencing factors, that is, the values of private correlation coefficients are greater than 0.5 and they can be included in the multifactor model. However, according to the results of the calculation, some of the values of the mutual correlation coefficients ($r_{x,y}$) of the influencing factors described above are higher than 0.7. It can be seen that there is a problem of multicollinearity between the selected factors. The most important thing here is that the influencing factors should not be closely related to each other. That is, there should be no multicollinearity between influencing factors. If the value of the pairwise correlation coefficient between two influencing factors is greater than 0.7, the problem of multicollinearity arises.

For this, we need to eliminate the problem of multicollinearity first, and then move to the next stages of econometric modeling. For this, firstly, we exclude the x1 factor, which has a low degree of correlation with the resulting factor, from the list of influencing factors and do not use it for the model. Secondly, another way to check the absence of multicollinearity between the influencing factors x2, x3 and x4, which created multicollinearity, is to calculate the coefficients of VIF (Variance Inflation Factors - effect of multicollinearity). VIF coefficients are calculated for each factor.

If there is multicollinearity between influencing factors, then VIF > 10. Below, VIF coefficients of all influencing factors are less than 10. Therefore, it shows that there is no multicollinearity between the influencing factors (Table 2).

Table 2. Multicollinearity between influencing factors measure the effect

Variable	**VIF**
C	9.16
lnx_2	7.44
lnx_3	2.36
lnx_4	6.19

Also, the multiple correlation coefficient between the resulting and influencing factors is calculated using the following formula:

$$R = \sqrt{(1-(1-r_{yx1}^2)*(1-r_{yx1x2}^2)*...*(1-r_{yx1..x_p}^2)} \quad (2)$$

Based on calculations using this formula, R=0.99, that is, we can know that there is a strong correlation between the resulting factor Y and the factors X2, X3, and X4 that we selected. Also, the R2 coefficient of determination determines how well the expected years of education, the number of employed people, and the impact of the public budget allocated to the social sector on the income of the population are expressed. So, R2 ≈ 0.98, that is, 98 percent of the change in the resulting factor U is the influence of factors X2, X3, and X4 (expected years of education, the number of employed people, and expenditures allocated to the social sector from the state budget) occurring under (Table 3).

Table 3. Multiple correlation coefficient between factors

REGRESSION STATISTICS	
PLURAL R	0,992658207
R-SQUARE	0,985370316
NORMALIZED R-SQUARED	0,978055475
STANDARD ERROR	25258,14757
OBSERVATIONS	10

To perform the analysis, we construct a multivariate regression equation, where we assume that the relationship between y and x is linear ($\ln y=\ln a_0+a_1\ln x_1+a_2\ln x_2+a_3\ln x_3+\varepsilon_i$) and we determine the parameters a0, a1, a2, and a3.

a_0= -2104294,5; a_1= 157127,6; a_2= 18,8; a_3=2,1

Table 4. Calculated parameters of the multifactor econometric model

Variables	**Coefficients**	**Standard error**	**t-statistic**	**p-value**
s	-2104294,463	472474,9339	-4,453769527	0,004311691
lnx_1	157127,581	33803,86851	4,648212997	0,003510244
lnx_2	18,83560991	35,38905928	0,532243871	0,613680275
lnx_3	2,052446746	0,710555997	2,888508092	0,027747565
Number of Observations	**Normalized, R2**	***R-squared***	***F-statistic***	**Probability (F-statistic)**
10	0.978	0.985	134,7	6,81

Thus, the linear equation of the correlational link regression takes the following form:

Y_x = -2104294,5+157127,6x_1+18,8x_2+2,1x_3 (4)

Here, regression coefficients a_1, a_2, and a_3 determine the relationship between the resulting characteristic (Y) and the influencing factor characteristic (x). This answers the question of how many units the resultant sign increases when the factor sign increases by one unit.

According to our analysis, a_1= 157127.6; a_2= 18.8; is equal to a_3=2.1. Therefore, there is a correct relationship between the expected years of education, the number of employed people, the expenses allocated to the social sector from the state budget and the income of the population, and their increase by one unit under the condition of other factors being unchanged is the corresponding result. 157127.6 of the factor; 18.8 and 2.1 leads to an increase.

a_0≈ -2104294.5 is the average influence of other factors on the result sign (except expected years of education, number of employed population, expenses allocated to the social sector from the state budget) as a constant value in our analysis represents, that is, under conditions where the

factor signs are x1, x2, x3→0, the resulting sign will be equal to Y=-2104294.5 due to other factors taken as constant.

Based on the analysis of the mentioned econometric model, it can be said that the most important of the 3 factors selected as influencing the income of the population in Uzbekistan is: expected years of education.

Conclusion

In conclusion, it is known from the results of the above-mentioned analysis that the use of such a method is effective in studying the issues of increasing the income of the population and the factors affecting it. Because by analyzing the income of the population in a statistical method, the stratification of the population in terms of income and the influence of various socio-economic factors on it were analyzed, and the most important influencing factor in increasing the income of the population is the expected years of education, and the annual income of people additional education increases their total annual income to 157,127.6 billion. it was found that it will increase to soums. Therefore, it has been confirmed that the development of human capital is one of the most urgent issues of today's improvement of the population's well-being.

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