CENTRAL ASIAN JOURNAL OF INNOVATIONS ON TOURISM MANAGEMENT AND FINANCE

https://cajitmf.centralasianstudies.org/index.php/CAJITMF

Volume: 05 Issue: 06 | October 2024 ISSN: 2660-454X

Article

Multivariate Econometric Analysis of Employment of the Population of the Republic of Karakalpakstan

Rahimboev Mukhtorbek[1*]

1. Teacher of Tashkent International University of Financial Management and Technology, Uzbekistan
* Correspondence: m.rahimboyev@tift.uz

Abstract: This study addresses the asymmetric behavior of the labor force participation rate in the Republic of Karakalpakstan, highlighting the need for nonlinear econometric analysis. The research focuses on the employment challenges, labor market creation, and unemployment prevention in Karakalpakstan, analyzing labor resources and monitoring labor market dynamics. A statistical and economic analysis of labor market development is conducted to understand the current state and economic activity trends. The research aims to assess the nonlinear dynamics of economic activity using econometric methods. Findings reveal significant nonlinearity in the labor market, offering insights for policy recommendations to improve employment outcomes.

Keywords: Labor market, Labor resources, Regression analysis, Correlation coefficient, Non-linear models, Autocorrelation.

1. Introduction

In the modern conditions of the transformation economy, special attention is paid to the problem of employment of the population of the Republic of Karakalpakstan, creation of the labor market, prevention of unemployment. The labor market occupies one of the main places among other markets. The market situation is formed under the influence of the state of the economy, the method of management and structural changes, the technical and organizational level of the enterprise, the quantitative and qualitative ratio of the means of production and labor force. In the conditions of development of economic relations, integration of the Republic of Karakalpakstan into the world community, the problem of formation and use of labor potential acquires special significance, since it reflects the state of society, industry, territory, enterprises, their viability.

In the "Resolution of the President of the Republic of Uzbekistan dated April 28, 2021 No. PP-5094 "On comprehensive assistance to increasing employment and income of the population, employment of the unemployed, especially youth and women, graduates of educational institutions entering the labor market for the first time" on "the introduction of new effective mechanisms for ensuring, creating favorable conditions for attracting the needy population to labor activity, as well as further stimulation of the activities of business entities that have created new jobs": the Ministry of Economic Development and Poverty Reduction, the Ministry of Investment and Foreign Trade, the Ministry of Finance, the State Tax Committee, the Council of Ministers of the Republic of Karakalpakstan, khokimiyats of regions and the city of Tashkent have developed employment and labor relations programs, including for the next 2021 - the State Program for the Creation of New

Citation: Rahimboev Mukhtorbek. Multivariate Econometric Analysis of Employment of the Population of the Republic of Karakalpakstan. Central Asian Journal of Innovations on Tourism Management and Finance 2024, 5(6), 296-305.

Received: 2th Sept 2024
Revised: 2th Oct 2024
Accepted: 9th Oct 2024
Published: 16th Oct 2024

Copyright: © 2024 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/)

Jobs and Promotion of Employment of the Population was approved. [1] Such an approach, first of all, is necessary as a means of promptly solving urgent employment problems by government bodies.

At the same time, such an approach narrows the problem of employment in its national sense, since it ignores other aspects besides employment, in particular, stability of the workplace and achieving maximum compliance of work with qualities. The processes of socio-economic transformation of the labor market are inextricably linked with the formation and development of social institutions serving the labor market, and their existence is a necessary attribute of a developed labor market. Such social institutions include:

a) Formation of a system of remuneration;
b) Creation of an organizational system for regulating the labor market;
c) Creation of a system for the reproduction and training of personnel;
d) Improvement of the activities of the social insurance system.

Literature review

In scientific literature, much attention is paid to the problems of the labor market; there is no unity among specialists on this matter, and there are even many different opinions on the conceptual apparatus of this area of research. In particular, this concerns such basic concepts as "labor market" and "labor market" [2]. This means that an objective assessment and analysis of the efficiency of using labor potential to address issues of forming research stages, identifying and taking into account its existing and potential capabilities are extremely relevant today. In this regard, many expert scientists, including N. G. Menkev [3], Stephen D. Williamson [4], Hansjörg Herp [5], D. P. Boginya, O. A. Grshnova [6], V. I. Vidyapina, A. I. Dobrynina, G. P. Zhuravleva, L. S. Tarasevich [7] and others, conducted scientific research.

The importance of their contribution to this area cannot be denied, but changes in the development of our socio-economic system, the transition to public relations characteristic of a market economy, the increasing role of the human factor, the effective formation of labor potential and for an accurate assessment of its use require grouping of indicators and justification, especially in rural areas. It is known that in the political and economic sense, the market is a process of relationships between sellers and buyers based on the establishment of prices and quantities of goods for sale and purchase.

It is a means of distributing economic resources - labor and means of production in various areas of their application, carried out in accordance with the needs and demands of consumers. In the context of market relations, social reproduction is served by the market system, that is, the market of specific goods, services and labor. The labor market is one of the subsystems of the national economy. In this regard, a number of methodological issues arise, the solution of which is important for the theoretical understanding of socio-economic changes in the labor market. In the scientific literature, much attention is paid to the problems of the labor market, there is no unity among specialists in this area.

2. Materials and Methods

This study employs a nonlinear econometric approach to analyze the asymmetric behavior of the labor force participation rate in the Republic of Karakalpakstan. The focus is on understanding employment dynamics, labor market creation, and unemployment prevention. The study utilizes statistical time series data on labor force participation, employment rates, and economic activity from the Republic of Karakalpakstan. The period

of analysis spans from [time period], which includes key economic transitions and policy shifts relevant to the labor market.

Data Collection

The data for this research were sourced from official national databases, including the Ministry of Economic Development, the Ministry of Labor, and relevant government bodies. This includes both primary and secondary data, such as labor force participation rates, employment and unemployment rates, and demographic information. These variables were analyzed for trends, fluctuations, and structural breaks.

Econometric Models

To capture the nonlinear dynamics of labor market behavior, regression analysis and autoregressive distributed lag (ARDL) models were employed. Nonlinear time series models, including threshold autoregressive (TAR) and smooth transition autoregressive (STAR) models, were also applied to account for asymmetric responses in the labor force participation rate. These models were used to identify the impact of economic shocks, structural changes, and policy interventions on labor market outcomes.

Statistical Analysis

Correlation coefficients were calculated to assess the relationships between variables such as employment, labor force participation, and economic activity. Autocorrelation functions were employed to test for the presence of serial correlation in the time series data. Diagnostic tests, including unit root tests (ADF and KPSS), were performed to ensure the stationarity of the data before applying econometric methods.

Model Estimation and Validation

The models were estimated using statistical software (e.g., Stata, EViews), and their performance was validated through residual diagnostics and goodness-of-fit measures. The results were compared with linear models to highlight the advantages of the nonlinear approach in capturing the complexities of labor market dynamics. The results from this analysis offer a comprehensive understanding of labor market behavior in the Republic of Karakalpakstan and provide insights into policy recommendations for improving labor market conditions.

3. Results and Discussion

Changes in the global labor market are one of the important forms of globalization, which requires an analysis of the relevant demographic, migration and other transformation conditions in conjunction with other processes of economic development. Monitoring and analysis of processes occurring in the global labor market serves as a basis for assessing the development prospects of countries in the context of internationalization of economic activity and expansion of international relations between entities of the world economy. Although the development of the global labor market creates prospects of a global economic nature, it is necessary to take into account the aspect of demographic development - the population size, labor force and its composition, which directly affect the volume of migration.

Thus, for countries with high demographic indicators, migration can have positive consequences due to the reduction of tension in the labor market, and for countries suffering from problems of demographic development (aging, high risk of mortality, low birth rate), migration of the influx of labor or vice versa means primarily the outflow of skilled labor. Accordingly, insufficient attention to the analysis of the demographic situation can lead to negative consequences of various political, economic, social and cultural nature.

Thus, according to UN estimates, by 2050 the world population will be 9.7 billion people according to the average forecast, that is, compared to 7.7 billion in 2019, it will

increase by 2.5%. Similarly, significant regional differences are observed in the regional context. In this sense, it is advisable to conduct a statistical and economic analysis of the dynamics of the labor market development in the Republic of Karakalpakstan in the research work (Fig. 1).

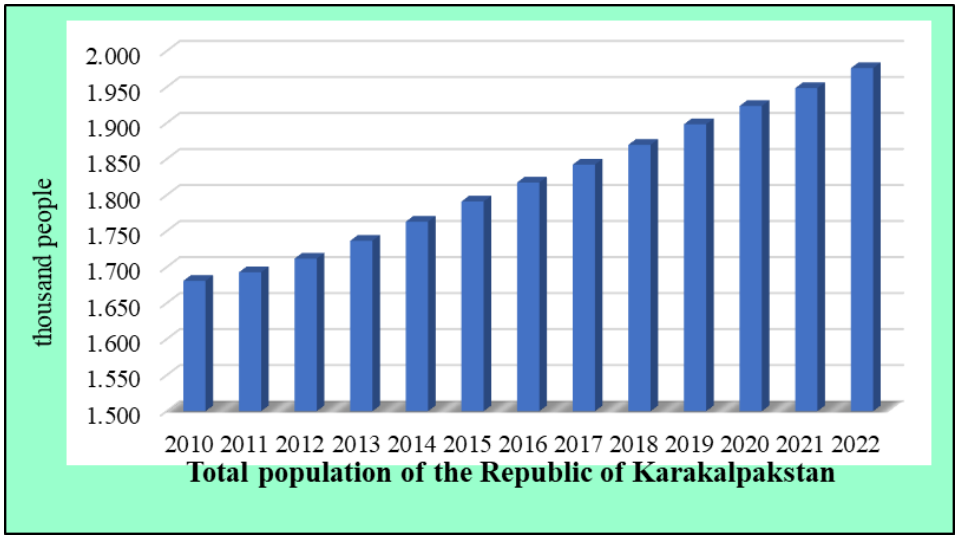


Figure 1: Population dynamics of the Republic of Karakalpakstan in 2010-2020. Author's calculation based on data obtained from the website https://stat.uz/uz.

Based on the data presented in the figure, the population of the Republic of Karakalpakstan increased by 17.6% compared to 2010 and reached 1976.2 thousand people in 2022. If we consider the population growth by year, the largest increase was in 2018 compared to 2017, according to which this figure was 28.5 thousand people. The lowest figure was in 2011, compared to 2010, it was 11.9 thousand people. At the moment, given that the Republic of Karakalpakstan is in a difficult situation of social, political and economic instability and upheaval, there is an increasing need to provide all interested parties with information on the analysis of the state of this market segment. Labor statistics occupies an important place in the system of statistical indicators of economic development, demographic and social processes.

It studies quantitative patterns of mass phenomena and processes in the sphere of reproduction of human capital, labor resources, efficiency of their use. Monitoring the situation on the labor market and the efficiency of employment policy implementation, as well as taking into account national conditions, it is advisable to include in the complex of statistical data individual indicators for assessing the level of employment and employment of the population. In particular, the number of people employed in the economy, the unemployment rate, etc. In this sense, we will conduct an analysis of the labor resources of the population of the Republic of Karakalpakstan (table 1).

Table 1. Labor resources of the population of the Republic of Karakalpakstan.
Author's calculation based on data obtained from the website https://stat.uz/uz

Indicators	2010	2015	2020	2021	2022	Change in 2022 compared to 2010, (-,+)
Total number of labor resources, thousand people.	936,0	1026,6	1074,6	1066,1	1067,6	131,6
City, thousand people	480,6	518,9	542,7	526,3	527,8	47,2
As a percentage of the total	51,3	50,5	50,5	49,4	49,4	-1,9
Village, thousand people	455,4	507,7	531,9	539,8	539,8	84,4
As a percentage of the total	48,7	49,5	49,5	50,6	50,6	1,9

According to the table, the total labor force of the population of the Republic of Karakalpakstan was 936 thousand people in 2010, and in 2022 this figure will increase to 131.6 thousand people with the growth of the population. It reached 1067.6 thousand people. If we pay attention to the placement of this labor force, then in 2022, 49.4% of the total number, that is, 527.8 thousand people, will live in the city. This, in turn, means that compared to 2010, the labor force increased by 1.9 thousand people in the city and among the rural population in the period up to 2022. By 2022, the number of births of the urban population will decrease compared to the rural population. Thus, the researchers argue that due to the two effects of the flow of laid-off workers and the flow of additional workers, economic activity is a more effective indicator of the labor market than employment and unemployment during periods of decline. In this regard, given the complex demographic and economic situation in our country, it is relevant and necessary to study the dynamics of economic activity of the population for a deep analysis of the current state of the labor market in the Republic of Karakalpakstan.

The revealed asymmetric behavior of the labor force participation rate in the Republic of Karakalpakstan indicates the need for a nonlinear econometric analysis and a full statistical study of the characteristics of the time series. To create an adequate model for describing the share of economic activity of the population of the Republic of Karakalpakstan, the correct use of econometric methods requires a preliminary statistical analysis of the characteristics of the time series of the PURS, in particular, a study of its statsionarity. In different countries, the indicator determining the share of the working-age population in the labor force is characterized by different statistical characteristics. M. Gustavsson and P. Osterholm found that the PURS in Australia, Canada and the USA are not statsionar [12]. Z. Ozdemir and others analyzed the overall PUFS, as well as the separate PUFS for men and women, in their studies and found that statist nature may

hinder structural changes in the economy[13]. The study of the studies of these expert scientists leads to the following conclusions:

a) If the PUFS is statist, then in the long run the unemployment rate will become the employment rate,
b) if the PUFS exhibits a non-statist feature, then the unemployment rate in the labor market is incorrect. Given the non-statist nature of the share of the economically active population, the effectiveness of measuring the unemployment rate using the PUFS indicator is questionable, since the response of labor supply to macroeconomic shocks may vary and depend on employment prospects.

This suggests that the PUFS is non-statist and, therefore, the response of labor supply to macroeconomic shocks may vary depending on employment prospects. Studies show that the first natural logarithms of ΔLnPURS, which determine the growth rate of the share of the economically active population, a series of differences are statsionar, since the LnPURS series is integrated first, the presence of a unit root is checked using the extended Dickey-Fuller test based on the results of the study of the statsionarity of PURS, conducted on the basis of data from the Statistical Office of the Republic of Karakalpakstan for the ΔLnPURS series (table 2).

Table 2. Testing the non-stationarity of the percentage of economic activity of the population. Author's calculation based on data obtained from the website https://stat.uz/uz

Exogenous variables	ADF-statistics	Level of importance	Critical value	p-value
Null hypothesis: LnIKID has a unit root				
Crossing over	-2.315721	0.01	-2.425312	0.0245
Linear		0.05	-3.246723	
Trend		0.10	-2.3462742	
Null hypothesis: ΔLnIKID contains a unit root				
	-13.214572	0.01	-1.234521	0.0000
		0.05	-2.682456	
		0.10	-1.582431	

Based on the data in the table, analysis of the change in the ΔLnPURS series and the Dickey-Fuller test, the necessity of using nonlinear time series models in modeling its asymmetry and economic activity in the labor market is proved. The necessity of using nonlinear models often arises in macroeconomic and financial modeling.

Nonlinear econometric models can be divided into two large categories. The first does not include a linear model as a special case, and the second covers a range of models that generalize linear models and are linear under certain restrictions. Examples of models belonging to this class are switching regression models, various Markov switching models and smooth transition regression models.

As a result of preliminary econometric analysis, as well as taking into account the experience of foreign studies, the smooth transition regression model (STAR) was chosen to model the economic activity of the population of the Republic of Karakalpakstan. These STAR models are nonlinear regression models that can be considered as an extension of permutation regression models. In addition, the univariate autoregressive model with two smooth transition modes (STAR) has advantages over floor autoregressive models or models with Markov switches due to the ability to take into account the smoothness of the

transition between different modes. STAR models allow modeling processes in which a certain structure of the series can dominate over a certain period, which is smoothly replaced by another structure as a result of switching modes under certain conditions. Change in employment of the population in the Republic of Karakalpakstan according to the 2nd scenario, employment of the population in the republic - ZNR, personal income tax - PIT, the number of higher education graduates - NHEG and average wage - AWS factors Let us conduct an econometric analysis of the change in the secret. First, the correlation coefficient of the factors is determined (table 3).

Table 3. The ratio of factors influencing the change in employment of the population of the Republic of Karakalpakstan. The author's calculation based on data obtained from the website https://stat.uz/uz

	ЗНР	*НДФЛ*	*ЧВВО*	*СЗП*
ЗНР	1			
НДФЛ	0,914316	1		
ЧВВО	0,429104	0,625151	1	
СЗП	0,950638	0,743897	0,538094	1

Based on the table values, employment of the population of the Republic of Karakalpakstan - ZNR, personal income tax - PIT (r ЗНР, НДФЛ =0,914316) and average monthly wage - AMS (rЗНР, СЗП =0,950638) are in high density correctly associated. The number of graduates of higher education is correctly associated with the CHVVO (rЗНР, ЧВВО = 0,429104) in average density, and this, in turn, the increase of these selected factors will lead to employment of the population of the Republic of Karakalpakstan. provides swelling.

Due to the absence of multicollinearity between factors, provided rx1, x2 < 0,8 it is possible to determine the regression equation between the observed relationships. For this, the units of measurement of the initially selected factors are different, to give them homogeneity in mathematics they are logarithmized by the base and continued through the EViews program (table 4).

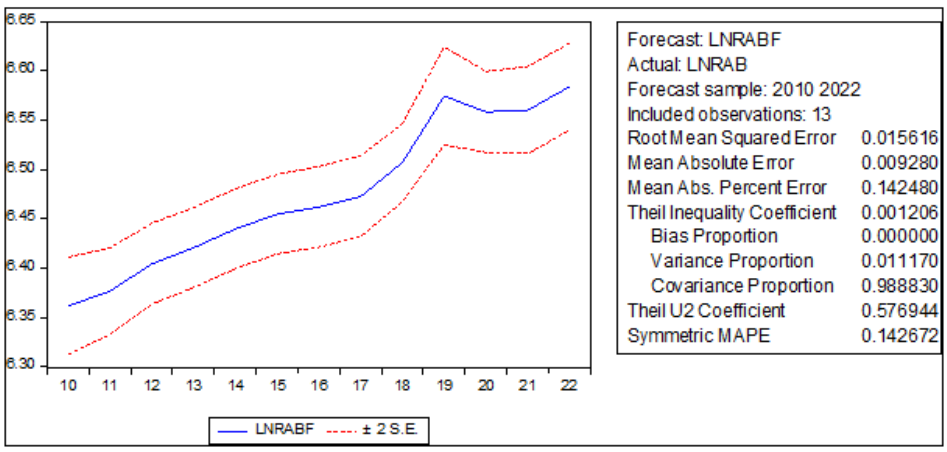
Table 4. Results of the multivariate regression equation for changes in employment in the Republic of Karakalpakstan. Author's calculation based on data obtained from the website https://stat.uz/uz

Dependent Variable: LNRAB				
Method: Least Squares				
Date: 12/20/23 Time: 16:38				
Sample: 2010 2022				
Included observations: 13				
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
Ln НДФЛ	-0.01572	0.029252	-0.537399	0.0001
Ln ЧВВО	0.108328	0.047818	2.265423	0.0471
Ln СЗП	0.090969	0.042345	2.148282	0.0380
C	5.073561	0.382259	13.27257	0.0000
R-squared	0.956525	Mean dependent var		6.475244
Adjusted *R*-squared	0.942033	S.D. dependent var		0.077751
S.E. of regression	0.018719	Akaike info criterion		-4.870843
Sum squared resid	0.003154	Schwarz criterion		-4.697012
Log likelihood	35.66048	Hannan-Quinn criter.		-4.906573
F-statistic	66.00481	Durbin-Watson stat		2.001391
Prob(F-statistic)	0.000002			

LnЗНР=0.11LnЧВВО+0.1LnСЗП-0.01572LnНДФЛ+5.01 (2)

If we pay attention to the significance of the determined parameter of the 2*-regression equation according to the t-Statistic criteria, then in the case of α=0.05 and k=9, the personal income tax is equal to tтаб=2,262157163 (tНДФЛ =-0,537399<tтаб=2,262157163) and average monthly wage - AMS (tСЗП =2,148282<tтаб=2,262157163) tx1>tтаб and tx2>tтаб are insignificant, provided that it is required to check whether these parameters are truly insignificant or significant with the retrospective quality criteria MAPE<10% and TIC<1 (Figure 2).

Table 2. Forecast of Labor Force Participation Rate (LNRABF) with Confidence Intervals for the Period 2010–2022



Based on the data shown in Figure 2, MAPE=0.142, which in turn means that MAPE=0.142<10% has high forecast accuracy, and TIC=0.576<1, since the coefficient is close to zero and the inequality is satisfied, all parameters of the regression equation 2 are significant. To transform this equation into a linear one, it is raised to a power based on the properties of the logarithm, and the following (2*)-equation is created:

$$ЗНР = \frac{ЧВВО^{0.11} * СЗП^{0.1} * e^{5.01}}{НДФЛ^{0.01572}} \qquad (2^*)$$

The generated (2*)-regression equation is statistically significant at α = 0.05 and k1 = 9; At k2 = 3, taking into account that Ftab = 0.258896435, the Fisher value was calculated from the F-coefficient = 66.00481. Since it is about 2, the reliability and adequacy of the equation come from the absence of autocorrelation.

Now, if we interpret the (2*) regression equation determined in the study from an economic point of view, if the personal income tax in the Republic increases by 1.0%, the employment rate of the Republic will decrease by 100 people. It was found that this will cause growth. However, if the number of graduates from higher education institutions and the average monthly salary increase by 1.0%, the number of people employed in the Republic may increase by 800 people and 700 people, respectively. In conclusion, it should be noted that studies show that full employment does not mean that all the working-age labor force is employed in the economy.

Some people do not want to work for the wages offered (voluntary unemployment). In addition, there are always people looking for a better job or preparing for work in a new place. This level of unemployment determines the natural level of unemployment and is manifested as a result of the possibility of freely choosing a job in the labor market and its duration. Increasing the competitiveness of the workforce by addressing the problems of graduates of higher education institutions, training, retraining and advanced training. In addition, when approaching the issue of changing the labor market, it is important to take into account the features of the National Labor Market model.

4. Conclusion

We also believe that these characteristics, which will be the subject of a separate analysis in the future, should be taken into account when developing a system of specific measures to change the labor market. The study found that although the share of formal employment in the Republic of Karakalpakstan is increasing, it is not in full-time positions. This situation, in our opinion, can be explained by the growth of the level of joint work and other types of flexible forms of formal employment. However, the composition of ordinary income makes the population of the Republic of Karakalpakstan consider themselves poor due to the presence of the following trends:

1) Ages cover less than half of family expenses;
2) Various types of social assistance make up more than a third of all income;
3) Even without taking into account the formation of savings, total wages and social assistance do not cover the volume of consumer spending;
4) The share of income from property (received) tends to decrease. It should be noted that the share of income and mixed income (which is typical of self-employment) gradually increased and reached its maximum level in 2020-2021, which maximizes the scale of informal employment. coincided with the period of increase

REFERENCES

[1] Decision PQ-5094 of the President of the Republic of Uzbekistan, "On comprehensive assistance to increasing employment and income of the population," Apr. 28, 2021.

[2] M. Rahimboyev, "Dynamics of the Transformation of the Labor Market in the Conditions of Raising the Standard of Living of the Population," Green Economy and Development, vol. 1, p. 338, Jan. 2024. [Online]. Available: https://green-economy

[3] N. G. Mankiw, Principles of Economics, 6th ed. St. Petersburg: Piter, 2009, pp. 1–672. ISBN: 978-5-91180-321-6.

[4] S. D. Williamson, Macroeconomics, LitRes, 2022. ISBN: 9785041781798, 5041781796.

[5] H. Herr, "The Labor Market in a Keynesian Economic Regime: Theoretical Debate and Empirical Findings," Cambridge Journal of Economics, vol. 33, no. 5, pp. 949-965, Sept. 2009.

[6] D. P. Boginya and O. A. Grshnova, Essentials of Labor Economics: A Beginner's Guide, 3rd ed. Kyiv: Znannya-Press, 2002, pp. 1-313.

[7] V. I. Vidyapina, A. I. Dobrynina, G. P. Zhuravleva, and L. S. Tarasevich, Economic Theory, Moscow: INFRA-M, 2003, pp. 1–714.

[8] L. I. Shevchenko, "Labor Market: Analysis of Economic Concepts," Economics of Ukraine, no. 4, pp. 18, 2006.

[9] I. L. Petrova, Segmentation of the Labor Market: Theory and Practice of Regulation, Kyiv: Avanpost, 2007, pp. 1–240.

[10] G. I. Kupalova, "The Socio-economic Essence, Forms, and Functions of the Labor Market," Employment and Labor Market, no. 2, pp. 12–19, 2006.

[11] L. I. Shevchenko, "Labor Market: Analysis of Economic Concepts," Economics of Ukraine, no. 4, pp. 18, 2006.

[12] E. M. Libanova, Labor Market (Methods of Analysis and Regulation Possibilities), Kyiv: IPK of State Employment Service, 2003, pp. 1–129.

[13] D. Ricardo, On the Principles of Political Economy and Taxation. London: John Murray, 1817.

[14] M. Gustavsson and P. Österholm, "Labor Force Participation Rates and the Informational Value of Unemployment Rates: Evidence from Disaggregated U.S. Data," Economics Letters, vol. 116, no. 3, pp. 408–410, 2012.

[15] Z. A. Ozdemir, M. Balcilar, and A. Tansel, "International Labor Force Participation Rates by Gender: Unit Root or Structural Breaks?" Bulletin of Economic Research, vol. 65, no. 5, pp. s142–s164, 2013.