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MULTIVARIATE ECONOMETRIC ANALYSIS OF FACTORS AFFECTING HOUSEHOLD INCOME IN SURXONDARYO REGION

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Abstract: This article analyzes the main socio-economic factors affecting household income in Surxondaryo region based on a multivariate econometric model. The study uses survey data collected from 610 households across 14 districts of Surxondaryo region to examine the determinants of household income formation. In particular, the effects of education level, size of cultivated land, number of working-age household members, income from household plots and livestock, migration, and spatial remoteness are assessed. Using a regression model, the impact of these factors on household income is estimated, and the economic characteristics of regional income disparities are identified. The results of the study provide scientific and practical recommendations aimed at increasing household incomes, supporting agricultural activities, and reducing socio-economic inequalities across regions.

Key words: household income, regional differentiation, multiple regression, household, human capital, migration, agriculture, income determinants.

Аннотация: В данной статье на основе многофакторной эконометрической модели проанализированы основные социально-экономические факторы, влияющие на доходы домашних хозяйств в Сурхандарьинской области. В исследовании использованы данные опроса 610 домашних хозяйств, отобранных из 14 районов Сурхандарьинской области. В частности, оценено влияние уровня образования, размера посевных площадей, количества трудоспособных членов семьи, доходов от приусадебного хозяйства и животноводства, миграции, а также территориальной удалённости на формирование доходов домашних хозяйств. С использованием регрессионной модели определено влияние данных факторов на доходы домашних хозяйств и выявлены экономические особенности региональных различий в доходах. Результаты исследования содержат научно-практические рекомендации, направленные на повышение доходов домашних хозяйств, поддержку сельскохозяйственной деятельности и сокращение социально-экономического неравенства между регионами.

Ключевые слова: доходы домашних хозяйств; региональная дифференциация; множественная регрессия; домашнее хозяйство; человеческий капитал; миграция; сельское хозяйство; детерминанты доходов.

INTRODUCTION

Today, the formation of household income and its regional differentiation is considered one of the key issues of socio-economic development. The level of income not only determines the welfare of the population but also reflects the economic activity of regions, the state of the labor market, and the efficiency of resource utilization. In this regard, identifying the factors influencing income formation and quantitatively assessing them is of both scientific and practical importance.

The issue of regional economic disparities and income inequality has been widely studied in the global economic literature as well. The famous economist Simon Kuznets argued that income inequality may initially increase and later decrease during the process of economic development, explaining this phenomenon through the “Kuznets curve” [2] (Kuznets, 1955). This approach serves as an important theoretical basis for analyzing regional income differences.

Therefore, this study focuses on the econometric assessment of socio-economic factors affecting household income formation. The results of the research contribute to identifying the main determinants of regional income disparities and revealing their economic interpretation.

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REVIEW OF LITERATURE ON THE SUBJECT

Household income and its regional differentiation are among the most widely studied and relevant areas in economic research. In this field, representatives of various economic schools have analyzed both theoretically and empirically the factors influencing income formation and distribution.

Kuznets (1955) studied the relationship between income inequality and economic growth and proposed the “Kuznets curve” concept. According to this hypothesis, income inequality initially increases in the early stages of economic development and then tends to decline. This approach serves as an important theoretical foundation for explaining regional income disparities [2].

Becker (1964), developing the theory of human capital, substantiated that education, skills, and knowledge are key determinants of income formation. According to this approach, investment in human capital increases income levels and determines economic well-being [1].

Mincer (1974) analyzed the relationship between income and the labor market through econometric modeling and demonstrated that years of education and work experience have a direct positive impact on income. His model is still widely used in empirical research today [3].

World Bank (2020) reports emphasize that infrastructure development, labor migration, and economic opportunities play a significant role in reducing regional inequality. In particular, income diversification in rural areas is identified as one of the key strategies for poverty reduction [7].

OECD (2019) studies highlight that income inequality is associated not only with economic but also with social factors. Education quality, employment opportunities, and regional infrastructure are identified as major determinants that intensify income disparities [8].

Todaro and Smith (2015), within the framework of development economics, emphasize that migration, urbanization, and agricultural activity significantly influence income distribution. According to their view, the interregional movement of labor resources may either increase or reduce income disparities [4].

In conclusion, the literature review shows that household income formation is influenced by a wide range of socio-economic factors, and econometric approaches play a crucial role in their assessment.

RESEARCH METHODOLOGY

This study analyzes the factors affecting household income based on survey data collected from 610 households across 14 districts of Surxondaryo region. The econometric analysis was conducted using Stata software. The main objective of the study is to identify socio-economic factors influencing household income formation and to estimate their magnitude of impact.

In the empirical analysis, a multiple linear regression model (OLS) was applied. The dependent variable is the logarithm of monthly household income (ln income of the household head). This specification helps to normalize income distribution and improve the reliability of the estimation results.

The model includes the following independent variables: education level, size of cultivated land, number of working-age household members, income from household plots and livestock, migration, and spatial remoteness factors.

$$LnY_i=\beta_0+\beta_1 Education+\beta_2 Land\_area_i+\beta_3 Labor\_capasity_i+\beta_4 Household\_plot\_income_i+\beta_5 Livestock\_income_i+\beta_6 Migrant\_household\_member_i+\beta_7 Distance\_to\_regional_i+\varepsilon_i$$

Here:

Y_i - household income;

β_0 - intercept term;

$\beta_1 \dots . \beta_7$ - regression coefficients;

ε_i - random error term.

The Ordinary Least Squares (OLS) method was used for estimation, and the reliability of the results was assessed using the F-statistic and diagnostic tests.

ANALYSIS AND RESULTS

This section presents the results of the econometric model developed within the framework of the study. Based on the estimated regression coefficients, the significance and direction of the main socio-economic factors affecting household income are identified. In addition, the statistical reliability of the model and its economic interpretation are provided. Table 1 presents the main factors influencing household income (Table 1).

Table 1. Description of factors affecting household income [1]

Type of variable	Variable	Description
Dependent variable	Ln_income	Monthly income of the household head
Independent variable	Education	Level of education
Independent variable	Cultivated_land	Size of cultivated land
Independent variable	Working_age_members	Number of working-age household members
Independent variable	Household_plot_income	Income from household plot
Independent variable	Livestock_income	Income from livestock
Independent variable	Migration_status	Migration status of household members
Independent variable	Regional_distance	Spatial (regional) factor

Table 2 presents the descriptive statistics of the dependent and independent variables included in the model (Table 2).

Table 2. Descriptive statistics of the variables used in the model [2]

Variable	Obs	Mean	Std. Dev.	Min	Max
Household head monthly income	609	1.615	.414	.85	2.8
Education level	609	1.378	.495	1	3
Cultivated land	609	7.297	2.341	3	15
Working-age members	609	2.76	.689	1	4
Household plot income	609	10.965	3.983	3.3	23.9
Livestock income	609	5.606	3.305	0	15.4
Migration status of household members	609	.087	.282	0	1
Regional distance	609	42.069	26.894	1	95

According to the table data, the descriptive statistics results show that based on 609 observations used in the study, the average monthly income of the household head is 1.615 units, with a minimum value of 0.85 and a maximum value of 2.8. This indicates a significant variation in income levels.

Among the independent variables, the average cultivated land is 7.297 units, while the average number of working-age household members is 2.76 persons. Household plot income (10.965) and livestock income (5.606) indicate that households generate a considerable share of income from agricultural activities.

The migration status variable has an average value of 0.087, showing that participation in migration is relatively low. The regional distance (distance to the regional center) averages 42 km and ranges from 1 km to 95 km, indicating significant infrastructural and geographical disparities across areas.

Overall, the data reveal substantial heterogeneity among households in terms of income and resources, which provides a sufficient basis for econometric analysis (Table 3).

1 Based on survey data; author's compilation.
2 Author's calculations using Stata/MP 17.0 software.

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Table 3. Results of the Multivariate Econometric Analysis of Factors Affecting Household Income [3]

ln_income	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Education	.374	.014	26.84	0	.346	.401	***
Cultivated_land	-.009	.004	-2.63	.009	-.016	-.002	***
Working_age_members	-.012	.009	-1.22	.221	-.03	.007	
Household_plot_income	0	.003	-0.02	.981	-.005	.005	
Livestock_income	0	.003	0.16	.872	-.005	.006	
Migration_status	.056	.023	2.44	.015	.011	.101	**
Regional_distance	0	0	-0.40	.691	-.001	0	
Constant	.03	.043	0.70	.482	-.054	.114	

Mean dependent var	0.448	SD dependent var	0.250
R-squared	0.601	Number of obs	609
F-test	129.105	Prob > F	0.000
Akaike crit. (AIC)	-504.833	Bayesian crit. (BIC)	-469.539
*** p<.01, ** p<.05, * p<.1			

The results of the multiple regression model indicate that socio-economic factors play a significant role in the formation of household income across regions of Surxondaryo. The model demonstrates a relatively high explanatory power, with R^2= 0.601, meaning that the independent variables explain 60.1% of the variation in income differences. The F-test result (129.105; p = 0.000) confirms that the model is statistically significant overall.

From a regional differentiation perspective, education is identified as one of the most important factors (β = 0.374, p < 0.01). This suggests that households with higher levels of human capital tend to have higher incomes, indicating that education plays a key role in reducing regional income disparities.

The cultivated land variable has a negative and statistically significant effect (β = -0.009, p < 0.01). This result implies that although land resources are available in rural areas, their efficiency in generating income is not uniform, reflecting differences in resource utilization efficiency across regions.

The migration variable shows a positive and statistically significant impact (β = 0.056, p < 0.05), indicating that labor migration contributes to reducing income disparities by increasing household income through remittances in some regions.

In contrast, household plot income, livestock income, number of working-age members, and regional distance (Regional_distance) are statistically insignificant, suggesting that these factors are not strong determinants of income differences across regions.

Overall, the results indicate that income differentiation in Surxondaryo region is mainly driven by human capital and migration, while agricultural resources alone do not fully explain regional income disparities.

To examine multicollinearity among independent variables, the Variance Inflation Factor (VIF) test was conducted [5]. The results show that all VIF values are below 10, indicating that there is no serious multicollinearity problem in the model (Table 4).

This ensures the reliability of the regression coefficients and confirms that the model estimates are statistically stable. Thus, the obtained econometric results are considered sufficiently reliable for analyzing regional income disparities (Table 4).

3 Author's calculations using Stata/MP 17.0 software.

Table 4. Multicollinearity test (VIF) results among the independent variables [4]

	VIF	1/VIF
Household_plot_income	2.572	.389
Livestock_income	1.9	.526
Cultivated_land	1.65	.606
Education	1.145	.873
Working_age_members	1.014	.986
Migration_status	1.012	.988
Regional_distance	1.006	.994
Mean VIF	**1.471**	.

According to the VIF test results, all variables have VIF values below 10 (mean VIF = 1.471), indicating that there is no multicollinearity problem in the model and that the regression results are reliable. In addition, to further examine the statistical reliability of the model, the heteroskedasticity issue was tested using the White test (Table 5).

Table 5. Results of heteroskedasticity testing in the multiple regression model based on the White test [5]

White›s test H0: Homoskedasticity Ha: Unrestricted heteroskedasticity chi2(34) = 33.76 Prob > chi2 = 0.4793 Cameron & Trivedi›s decomposition of IM-test chi2	df	p
33.760	34	0.479
22.120	7	0.002
0.540	1	0.461
56.430	42	0.068

To test for the presence of heteroskedasticity in the model, the White test was applied [6]. The White test, developed by H. White, is used to examine heteroskedasticity by testing the constancy of the error term variance (homoskedasticity) in regression models and is widely applied in assessing model reliability.

According to the obtained results, the main test statistic is $\chi^2(34) = 33.76$, and the corresponding probability value (Prob > chi2 = 0.4793) is greater than 0.05. This means that the null hypothesis of homoskedasticity cannot be rejected. In other words, the assumption of constant variance is not violated, and no heteroskedasticity problem is detected in the model. This result increases the reliability of the regression estimates and confirms the statistical stability of the OLS coefficients.

The results of the diagnostic tests confirm the statistical reliability of the model. Based on the White test, no heteroskedasticity problem was identified, indicating that the regression estimates are stable. Therefore, the results obtained from the OLS model are considered sufficiently reliable for economic interpretation. Overall, the model is appropriate for empirical analysis and allows for meaningful practical conclusions.

CONCLUSIONS AND SUGGESTIONS

In this study, factors affecting household income were analyzed using a multivariate econometric model based on data from 610 households across 14 districts of Surxondaryo region. The results indicate that the model is statistically significant and that the independent variables explain a substantial portion of income variation.

According to the empirical results, education is the strongest positive determinant of household income, highlighting the important role of human capital in reducing regional income disparities. Migration also has a positive and statistically significant effect, serving as an additional source of income and improving household welfare.

4 Author's calculations using Stata/MP 17.0 software.
5 Author's calculations using Stata/MP 17.0 software.

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In contrast, cultivated land has a negative effect on income, indicating that the efficiency of agricultural resource utilization is not uniform across regions. Household plot income, livestock income, number of working-age members, and regional distance were found to be statistically insignificant.

In addition, diagnostic tests (VIF and White test) confirm that there are no multicollinearity or heteroskedasticity problems in the model, which increases the reliability of the regression results.

Based on these findings, the following ordered recommendations are proposed:

1. Development of the education system – strengthening investment in human capital is essential for increasing household incomes and reducing regional disparities.
2. Effective management of labor migration – regulating migration processes and improving their economic efficiency can expand additional income sources.
3. Improving agricultural efficiency – introducing technological modernization and innovations in the use of cultivated land, household plots, and livestock resources is necessary.
4. Development of regional infrastructure – improving transport and service systems can help ensure equal economic opportunities across regions.
5. Implementation of comprehensive socio-economic policy – strengthening systematic state policies aimed at reducing income inequality across regions is considered essential.

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