



THE DECISIVE ROLE OF HUMAN CAPITAL AND REGIONAL INFRASTRUCTURE IN POVERTY REDUCTION

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ABSTRACT

This paper analyzes the role of human capital and regional infrastructure in reducing poverty from both theoretical and empirical perspectives. Based on a sociological survey of 160 respondents and an econometric model covering 2010–2025, correlational relationships among education, infrastructure, and economic growth were identified. The results demonstrate that investment in human capital, particularly in education, has the highest marginal effect on poverty reduction. The study concludes that an integrated approach combining human capital development and regional infrastructure improvement is essential for sustainable poverty reduction in Uzbekistan.

Introduction: Lifting the population out of poverty and improving living standards constitute a central task of any state's socio-economic policy. As a result of the comprehensive economic reforms implemented in the Republic of Uzbekistan since 2017, the poverty rate has declined significantly: while the poverty level stood at 11 percent in 2023, the target is to reduce it to 7 percent by 2030. However, the multidimensional nature of poverty and persistent regional disparities require that this process be managed through a comprehensive approach rather than through income growth alone.

In modern economic theory, the development of human capital is recognized as the most effective means of reducing poverty. According to the human capital theory developed by Nobel laureates Gary Becker and Theodore Schultz, investment in education and health increases an individual's labor productivity and expands their income-earning opportunities. Amartya Sen's capability approach, in turn, interprets poverty not merely as a lack of income but as a limitation of an individual's real capabilities. These theoretical perspectives reveal a profound relationship between human capital and poverty.

Despite these theoretical foundations, empirical studies quantifying the relationship between human capital, regional infrastructure, and poverty in the context of Uzbekistan remain limited. The purpose of this study is to identify and quantitatively assess the role of human capital and regional infrastructure in reducing poverty, and to substantiate the priority importance of investment in human capital. The central hypothesis of the study posits that education and regional infrastructure exert a strong positive influence on poverty reduction through their effect on economic growth.

Materials and Methods: The study employed a mixed-methods approach combining sociological and econometric methods. To determine the role of human capital and regional infrastructure in poverty reduction, a sociological survey covering 160 respondents was conducted. The survey was administered through the Google Forms platform, and the results were processed using STATA and Microsoft Excel software.

The survey questionnaire consisted of 23 Likert-scale items divided into five blocks: income and employment factors, education and human capital, government policy and social protection, infrastructure and regional development, and the relationship between economic growth and poverty. Each item was rated by respondents on a scale from 1 to 5. The reliability of the survey was confirmed through the Kaiser-Meyer-Olkin (KMO) test and Cronbach's Alpha coefficient.

To quantitatively assess the impact of human capital on poverty, a log-log OLS regression model was constructed based on data for the period 2010–2025. The dependent variable was the number of poor people (Y), while the independent variables included per capita real income (X1), employment rate (X2), real education expenditure (X3), and real social protection expenditure (X4). The model took the following form: $\ln(Y) = 21.259 + 0.546 \cdot \ln(X1) - 0.1045 \cdot X2 - 0.785 \cdot \ln(X3) - 0.404 \cdot \ln(X4) + \epsilon$. Additionally, correlation analysis was applied to identify the relationships among the factors.

Results: The reliability tests yielded strong results. The overall KMO value was 0.9011, indicating that the data were highly suitable for factor analysis. Cronbach's Alpha values ranged from 0.72 to 0.90 across all five factor blocks, confirming the high internal consistency and reliability of the survey items. The education and human capital block recorded the highest reliability coefficient (0.8965).

The correlation analysis revealed strong positive relationships among human capital, regional infrastructure, and economic growth. Specifically, the correlation coefficient between education and economic growth was $r=0.6575$, between infrastructure and economic growth $r=0.6922$, and between education and infrastructure $r=0.6516$. The correlation between employment and education was $r=0.5707$. Among the five factor groups analyzed, the education and human capital factor received the highest average index (3.47). In the gender cross-section, female respondents rated the education factor higher than male respondents (3.65 and 3.36, respectively).

The econometric model demonstrated high explanatory power, with a coefficient of determination $R^2=0.9754$ and an F-statistic of 109.21, and all variables were statistically significant at the 5 percent level. According to the model results, a 1 percent increase in education expenditure reduces the number of poor people by 0.785 percent — the highest elasticity coefficient among all factors. A 1 percentage point increase in the employment rate reduces the number of poor people by 0.105 percent, with the employment variable showing the highest statistical reliability (t-statistic absolute value of 6.37). A 1 percent increase in social protection expenditure reduces poverty by 0.404 percent.

The multidimensional poverty analysis showed that infrastructure-related deprivations were among the most severe, with limited access to the internet reaching 37 percent and inadequate clean water supply reaching 20 percent. Regional analysis identified the Republic

of Karakalpakstan, Surkhandarya, and Kashkadarya as the regions with the highest risk of multidimensional poverty.

Discussion: The empirical findings confirm the theoretical propositions of human capital theory in the context of Uzbekistan. The highest elasticity of education expenditure (0.785) demonstrates that investment in human capital, particularly in education, yields the highest marginal effect on poverty reduction. This finding corroborates the education-based development strategy exemplified by the experience of South Korea, which transformed from one of the poorest countries in the 1960s into a developed economy through massive investment in its education system.

The strong correlation between infrastructure and economic growth ($r=0.6922$) confirms the role of transport networks, internet connectivity, and electricity and water supply in enhancing economic activity. The strong relationship identified between human capital and regional infrastructure ($r=0.6516$) indicates that these two factors mutually reinforce one another: in regions with adequate internet, transport, and electricity, both the quality of and access to education are higher. This finding suggests that human capital and regional infrastructure should be developed in an integrated manner within poverty reduction policy.

The impact of human capital on poverty reduction is primarily manifested through the labor market. Individuals with higher levels of education and professional skills possess greater competitiveness in the labor market, expanding their opportunities to secure decent work and earn higher incomes. The positive correlation between employment and education ($r=0.5707$) confirms that employment opportunities improve as the level of education rises. This effect is particularly significant in the context of the digital economy, where individuals with digital skills can access new opportunities such as remote work and e-commerce without geographical constraints — a promising pathway out of poverty especially for rural youth and women.

The finding that higher-income respondents rated education factors more highly than lower-income respondents reveals what may be termed a “human capital paradox”: precisely those individuals who achieved higher incomes through investment in human capital perceive its importance more strongly. This pattern justifies the need for targeted awareness and incentive programs demonstrating the benefits of education for low-income groups, who may otherwise underestimate the long-term economic returns of education. Furthermore, the relationship between social protection and human capital is critical: social protection expenditure enables low-income families to invest in their children's education and health, thereby breaking the intergenerational “poverty trap” in which poverty impedes the formation of human capital, while low human capital perpetuates poverty across generations.

These findings should be interpreted in light of certain limitations. The survey sample was dominated by students and younger respondents, which constrains the representativeness of the results for the entire population. Future research employing a stratified sampling method and a larger sample size, as well as panel household data, would strengthen the causal interpretation of these relationships.

Conclusion: The conducted study substantiates, both theoretically and empirically, the decisive role of human capital and regional infrastructure in poverty reduction. The

correlation and econometric analyses confirmed strong positive relationships among education, infrastructure, and economic growth. The highest elasticity of education expenditure with respect to poverty (0.785) demonstrates the priority importance of investment in human capital.

Accordingly, the policy of lifting the population out of poverty requires an integrated approach oriented not only toward income growth but also toward the development of human capital and the improvement of regional infrastructure. As mutually reinforcing factors, human capital and regional infrastructure ensure economic growth and sustainably reduce poverty. These conclusions carry significant scientific and practical implications for achieving the poverty reduction targets set out in the Uzbekistan-2030 strategy. Future policy should prioritize education expenditure in budget planning, expand digital infrastructure in rural areas, and direct infrastructure investment toward regions with the highest poverty risk.

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