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METHODOLOGICAL ISSUES IN ECONOMETRIC RESEARCH ON REGIONAL SOCIO-ECONOMIC DEVELOPMENT IMBALANCES

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Abstract. Regional differences are visible not only in gross regional product, employment and income, but also in education, health services, level of digitization and inclusion in innovation chains. Therefore, the concept of "regional disparities" is broader than "economic inequality" and covers both institutional and spatial dimensions. According to the author's approach, the analysis of disparities can be seen in four directions: economic - differences in income and productivity; social - standard of living and opportunities; institutional and political-economic — quality of management and effectiveness of institutions; complex — a joint analysis of economic, social and spatial aspects as a multifactorial phenomenon. In this study, factors affecting regional disparities were evaluated based on panel data.

Key words: econometrics, region, socio-economic development of regions, disparities in development, panel data, factors.

1.Introduction

In the world, scientific research is being conducted to identify the factors influencing the territorial location of industries, the priority development of new promising sectors of priority industries, the study of the socio-economic development of regions, social protection of the population, small business and entrepreneurship, and the development process of integrated regional development based on an active investment policy. In particular, important scientific research is being carried out on various aspects of the general behavior of socio-economic development, geographical location, sources of innovation, common suppliers and production factors, the interconnectedness of industry and regional development, the optimization of interregional economic relations, and the use of econometric models to establish mutually beneficial activities of various economic entities.

In the context of socio-economic reforms [1] implemented in Uzbekistan in recent years,

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the issues of improving regional economic policy and econometric analysis of socio-economic development of regions play an important role. Based on "growth points" in the regions, it is possible to further improve the added value chain, optimize costs, ensure product competitiveness, and increase people's living standards and incomes as a result of achieving synergy effects.

2.Literature review

The study of regional economic problems and their elimination have been the focus of constant attention of economists. Among foreign scientists, A. Venables, H. Glenn, P. Krugman, M. Fujita [2], B. Shaun [4], M. Enright [3] and others made an important contribution to the theory of regional competitiveness and development. A. G. Granberg [5], Yu. A. Gadzhiev [6], N. Zubarevich, S. V. Kazantsev, A. N. Nosov [7], D. Sepik [8] and others from CIS scientists have deeply studied the issues of regional growth, economic potential and competitiveness.

In Uzbekistan, the areas of regional economic development, location of productive forces, regional competitiveness, and modeling have been widely covered in the scientific research of scientists S.S. Gulomov [9], T.M. Akhmedov [12], A.M. Sodikov [10], B. Ruzmetov [11], 25. Yuldashev, N. K.[25], Sh.H. Nazarov, P.Z. Khashimov, F.T. Egamberdiev, and others.

3. Methodology

Modern research emphasizes that regional disparities should be considered as a systemic phenomenon that simultaneously affects economic, social, institutional and spatial aspects [13,14,15]. Thus, regional differences are manifested not only in indicators of gross regional product, employment or income, but also in the level of access to education and health services, the level of digitalization and the integration of regions into innovation chains [16,17]. Thus, the concept of "regional disparities" is broader than the concept of "economic inequality", since it includes institutional and spatial dimensions. In order to generalize the approaches of various authors, several main directions in interpreting the essence of regional differences can be distinguished. First, this is the economic interpretation, which focuses on interregional differences in income and productivity [17,18]. Second, a social approach that looks at inequalities in terms of living standards, social mobility and access to social benefits [12,19]. Third, the institutional and political-economic approach, which focuses on differences in the

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quality of governance, the effectiveness of institutions, and political practices [20, 21,22]. And finally, a comprehensive approach, within the framework of which inequalities are understood as a multifactorial phenomenon, requires analysis in the unity of economic, social and spatial dimensions=.[22,23,24]

In our study, we made an econometric assessment of the factors affecting the disparities in the socio-economic development of the regions based on panel data.

Panel data models are theoretically expressed as follows: first, the specific characteristics of panel data and their types are defined. Second, the types of variables to be investigated are determined, i.e., common variables, within-section variability, and between-section variability are distinguished. Third, the main models are used: Pooled OLS estimator (POLSE) — a simple pooled method, First Differences estimator (FDE) — a difference method, Fixed Effects estimator (FEE) — a model that takes into account individual effects, and Random Effects estimator (REE) — a model that takes into account random effects. [26]

Panel data provide information about individual actions, which have both cross-sectional and time series measurements. Panel data contain a regular time interval T, N observations. It is used together in panel data equations.

The Pooled OLS estimator model looks like this.

$y_{it}=\beta_0 + \beta_1 x_{1it}+ \beta_2 x_{2it} +u_{it}$ (1), i=1…N, t=1…T, NT – кузатувлар сони.

Fixed effects estimator :

$$y_{it} - \overline{y} = \beta_1(x_{1it} - \overline{x}_{1i}) + \beta_2(x_{2it} + \overline{x}_{2i}) + (u_{it} + \overline{u}_i) \quad (6)$$

In the random effects estimator, the independent variables are not correlated with the random errors, i.e. there is no heterogeneity problem, so the Pooled OLS model can achieve stable but inefficient estimates. With OLS, it is necessary to correct for standard errors, because they are correlated over time. The need to modify the model increases so that the new errors are not correlated. Accordingly, the model is expressed as follows:

$$y_{it} - \theta\overline{y} = \beta_0 + \beta_1(x_{1it} - \theta\overline{x}_{1i}) + \beta_2(x_{2it} + \theta\overline{x}_{2i}) + (a_i + \theta\overline{a}_i) + (u_{it} + \theta\overline{u}_i) \quad (9)$$

The θ- parameter is an estimator in the Random effects estimator. According to it: $\theta = 1 - \sqrt{\frac{\sigma_u^z}{\sigma_u^z + T\sigma_u^z}}$ (10) θ=0, When θ=0, Pooled OLS is suitable (ai is not important here).

θ=1 corresponds to Fixed effects within the estimator (ai is not important here).

Here, Random effects is the weighted average of Pooled OLS and Fixed effects within the estimator.

ISSN: 2053-3578 I.F. 12.34

4.Analysis and results

In our study, we examined the correlations between the outcome variable and each factor variable using the Stata 14 program.

Table 1

Regression matrix of factors affecting disparities in the socio-economic development of regions

Source	SS	df	MS	Number of obs	=	126
				F(5, 120)	=	33.42
Model	28.3379429	5	5.66758857	Prob > F	=	0.0000
Residual	20.3482861	120	.169569051	R-squared	=	0.5821
				Adj R-squared	=	0.5646
Total	48.686229	125	.389489832	Root MSE	=	.41179

lnyper_cap~a	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnx1	-.3412335	.1725254	-1.98	0.050	-.6828218	.0003549
lnx3	-.1887582	.0863427	-2.19	0.031	-.3597107	-.0178058
lnx5	.1233856	.029949	4.12	0.000	.0640887	.1826826
lnx6	.4669707	.0908005	5.14	0.000	.287192	.6467495
lnx10	-.2936068	.1802224	-1.63	0.106	-.6504347	.063221
_cons	6.488936	1.118688	5.80	0.000	4.274012	8.703861

Since there was multicollinearity between most of the influencing factors, a regression matrix was constructed based on the selection.

In our study, the main indicators of econometric models Pooled OLS estimator (POLSE), First differences estimator (FDE), Fixed effects estimator (FEE), Random effects estimator (REE), Gauss Markov critical conditions (Breusch Pagan, Durbin Watson, Shapiro Wilk) tests and Hausman tests were generated based on panel data.

However, the selected model was also found to be statistically insignificant when tested using the VIF test.

The above tables cover various factors affecting economic growth and social development across regions, and their theoretical analysis allows for a deeper understanding of the models implemented based on panel data. First, the gross domestic product per capita (LnYper_capita) is adopted as the main structural variable and its role in explaining economic growth is important. This indicator is the main criterion for measuring the level of development of regions, quality of life and production efficiency. Independent variables, on the other hand, cover various sectors and reflect the multifaceted impact on the economic development of

ISSN: 2053-3578 I.F. 12.34

regions. For example, the indicators LNx1 and LNx2 represent the number of graduates of higher education institutions and their level of competitiveness. Theoretically, higher education can have a positive impact on economic development by training high-quality and competitive specialists. Highly qualified personnel in the labor market serve to introduce innovations, increase production efficiency and raise the level of wages. At the same time, the variable LNx3 is based on the results of admission and reflects the balance of supply and demand in the education system. Its importance is that the number of students admitted to higher education institutions determines the quality of the workforce in the future.

The variables LNx4 and LNx5 are related to research and development work and reflect the innovation potential. Research and development and the expenditures directed at them are of decisive importance in the development of high-value-added sectors of the economy. Theoretically, research and development expenditures are the main drivers of innovations, which ensure economic growth in the long term. Therefore, the positive impact of LNx4 and LNx5 has a solid basis in economic development models.

LNx6 and LNx7 reflect trade activity in the regions. Wholesale and retail trade volumes reflect the potential of the domestic market, the purchasing power of the population and the business environment. Theoretically, the growth of trade volume indicates the growth of incomes of the population along with the production potential. In regions with rapidly developing market activity, the quality of life is also higher. Trade volume also determines the flow of investments, since investment in trade infrastructure supports economic growth.

The LNx8 variable reflects the total volume of agricultural products and shows the role of agricultural potential in the economy of the regions. Theoretically, agriculture is one of the main sectors of the economy, ensuring food security for the population, increasing export potential and attracting a wide range of labor resources. Especially if the efficiency in the agricultural sector is high, overall economic growth will accelerate.

The LNx9 indicator covers foreign trade turnover and determines the international economic relations of regions. Theoretically, the volumes of exports and imports indicate the level of integration of the country in foreign markets. While the growth of export volumes has a positive effect on the competitiveness of the national economy, the volume of imports covers the needs related to technologies and consumer goods. Regions with high foreign trade turnover have a greater potential for economic growth.

ISSN: 2053-3578 I.F. 12.34

The LNx10 indicator is related to the number of small businesses and private entrepreneurship entities and indicates the development of the entrepreneurial environment in the regional economy. Theoretically, small business plays a decisive role in the sustainable development of the economy. It creates jobs, strengthens the competitive environment and plays an important role in the implementation of innovations.

5. Conclusions

In studying disparities in socio-economic development, it is important to determine the impact of factors such as education, science, trade, agriculture and entrepreneurship on economic growth. Econometric analyses show that the competitiveness of graduates of higher education institutions and the growth in the number of specialists increase the share of qualified personnel in the labor market and have a positive impact on the growth of gross domestic product. For example, if the competitiveness of graduates increases by 1%, economic growth can increase by 0.12%. This confirms the importance of human capital and innovative potential in the development process.

At the same time, although the results of admission to higher education have a small impact on economic growth, they ensure long-term sustainable development by forming a human resource reserve in the future. Scientific research and spending on them stand out as the main drivers of economic growth. For example, a 1% increase in the volume of scientific research can increase economic growth by 0.20%. This indicates that science and innovation potential are of primary importance in eliminating imbalances.

Domestic market factors also determine the appearance of imbalances. An increase in the volume of total trade increases the purchasing power of the population and market activity, which gives impetus to overall economic growth. At the same time, the volume of agricultural products and foreign trade turnover play an important role in reducing the gap between economic stability and regional development. In particular, a 1% increase in foreign trade can increase economic growth by 0.18%.

In this regard, the increase in small business entities also serves to smooth out imbalances, since entrepreneurship creates new jobs and increases the share of the private sector in the economy.

In short, in order to reduce imbalances in socio-economic development, it is necessary to develop education and science, domestic and foreign markets, agricultural sectors, and entrepreneurship in a harmonious manner. Econometric analyses show that the most effective way to address disparities is to strengthen innovation and external economic ties, as well as invest in human capital.

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