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FEATURES OF ASSESSMENT OF THE INFLUENCE OF PROCESSES OF FORCED MIGRATION ON SOCIO-ECONOMIC DEVELOPMENT OF REGIONS

Forced migration processes, which started in Ukraine with the collapse of the Soviet Union, have taken new forms and reached their peak with the aggression of the Russian Federation in 2014. Since then, the problem of determining the impact of these processes on the development and security of the country's regions has been particularly relevant.

In this regard, the article considers existing methods and international experience of a quantitative assessment of the impact of migration phenomena on the socio-economic development of regions. In addition, the author pays special attention to the identification and justification of the features inherent in internal migration processes, which directly impose restrictions on the quantitative assessment of the impact of these phenomena on the socio-economic development of regions and the obstacles researchers face in this field.

Several critical features are determining the requirements for the choice of quantitative methods for assessing the impact of migration processes on regional

socio-economic development, i.e., the complexity of establishing a direct relationship resulting from displacement is completely separated from the general societal changes; the impact of displacement will vary depending on several key factors; a high level of subjective judgements and estimations; the research results are sensitive to the level of initial data aggregation, their homogeneity and comparability; the lack of statistical information must be taken into account.

A retrospective analysis of existing domestic and foreign approaches to overcome these problems has been carried out. Moreover, their advantages and disadvantages are pointed out.

Based on the obtained results, it has been proved that the linear paradigm, which is superior to the classical economic and mathematical methods, is not always applicable. At the same time, the possibility of using modern non-linear approaches such as the theory of open systems, the theory of chaos has been proposed and justified. Furthermore, relevant conclusions have been made, and prospects for further research have been outlined.

***Key words**: forced migration, socio-economic development, region, impact, numerical assessment.*

Problem statement. Studying the effects of forced migration processes on regional development is an essential component of the State and Regional Programme for the Integration of Migrants in Local Communities development because analysing and assessing the impact of migration phenomena is an integral part of ensuring a modern state.

Recognition of the economic aspects of forced migration creates positive research and policy opportunities. Forced migration processes affect almost all areas of society, including the demographic, social, economic, labour, and financial markets.

According to the McKinsey Institute [1] research, the contribution of migrants to the global gross domestic product in 2015 was 6.4 trillion-6.9 trillion USD, i.e., about 9.4%. This effect is explained by key characteristics inherent to migrants, such as personal ambition and enthusiasm. On the other hand, cities offer more opportunities

and better income, fill skill gaps and in some cases provide an alternative to cheap labour. Also, cities provide a broad client base for migrant entrepreneurs to market products and services. In cities, labour and talent shortages also contribute to healthy competition for skilled individuals in these communities.

Today, however, relatively little research directly addresses the relationship between forced migration and its impact on the economic aspects of regional development.

Actual scientific researches and issues analysis. In recent years, the number of studies devoted to the relationship between migration processes and economic development has increased significantly [2], focusing on the positive contribution of migration remittances to development programmes [3].

A significant number of studies by Ukrainian scientists, including O. Hladun, T. Hnatyuk, O. Ivankova-Stetsyuk, E. Libanova, I. Maydanyk, I. Mostova, O. Ovchynnikova, I. Prybytkova, M. Romanuk, are devoted to a comprehensive analysis of the contemporary migration situation in Ukraine and an assessment of the impact of migration on demographic and socio-economic development.

Among foreign scientists, P. Pedersen, M. Pytlikova, N. Smith made a significant contribution to the study of the regional migration processes theory. The work of M. Fertig and C. Schmidt is devoted to economic research issues into the determinants of immigration.

The World Bank should be singled out among the world organisations which have conducted the most significant number of researches in this direction [4].

Research objective. This study aims to:

- identify the features inherent in internal migration processes that directly impose limitations on the process of numerical assessment of the impact of these phenomena on the regional socio-economic development.

- determine the range of economic and mathematical methods, which can form the instrumental base for the best approximation of impact on forced migration processes on regional socio-economic development.

Statement of basic materials. Among the main reasons that significantly complicate the study of the impact of migration processes and, in particular, forced migration on the economic development of regions, the following should be highlighted:

1. All socio-economic contexts of the individual territories and regions development, regardless of whether the influence of forced displacement processes characterises them or not, constantly undergo various forms of socio-economic and political changes. Therefore, it is objectively challenging to establish a direct and complete causal link resulting from displacement per se, completely separate from general societal changes, as indicated, for example, in [5]. This limitation particularly applies to processes of internal displacement significantly distributed over time, making it impossible to isolate and assess the impact of migration processes on socio-economic development. One approach developed to overcome this problem is presented in a few studies and is based on determining the effect of displacement on internally displaced populations by comparing the characteristics, experiences and outcomes of displaced and indigenous populations. Such studies include:

- Attanasio and Ibanez's work done during the 2000s, drawing on data on Colombian internally displaced people and those remaining in the country [6-8];

- Lehrer's paper, which presents the results of an IDP impact assessment based on a comparison of Uganda's IDP datasets and those remaining in the country [9];

- long-term effects of migration described by Sarvimaki et al. using historical data to compare the displaced and non-displaced Finnish population, at a time when Finland ceded part of its territory to the Soviet Union [10];

- the work of Singh, Karunakara and others who used the results of the study "Demography of Forced Migration" to examine the impact of displacement on population structure, household composition and fertility among the remaining Sudanese refugees, Sudanese residents and Ugandan nationals [11-12].

It ought to be taken into account that the main drawback of this method of assessing and analysing the impact of internally displaced persons on socio-economic development is the assumption that there is no impact of the displacement process on

the remaining societies. Therefore, this comparison methodology is not sufficiently valid.

2. The impact of displacement will vary depending on a number of critical factors, including the time frame, the duration since displacement occurred, and whether short-term or long-term effects should be identified and assessed. Moreover, the immediate impact of displacement may be amplified or offset differently depending on the period of displacement and the policies introduced. Similarly, the longer-term effects of even short periods of displacement may be difficult to trace directly to the displacement itself rather than to overall social change. This makes particular demands on quantitative analysis methodology.

3. A high level of subjective judgements and estimates in the analysis. In addition to the limited availability of pre-displacement baseline data and the extent to which available data cannot be disaggregated by level (e.g., different skills, income or health levels) and type (e.g. gender, demographics), a number of implicit and explicit value judgements will also prevail during any analysis of the impact of IDPs on socio-economic development in the region [13]. In order to reduce the influence of subjective judgements on the results of the study, it is necessary, prior to starting the research, to identify a set of characteristics that are quantifiable independent (in order to avoid estimation errors associated with the problem of collinearity); a group of impact variables that can be neglected; if necessary, a list of qualitative indicators to be included in the estimation system; develop an information system (for example, index method) to summarise in one coordinate system the selected characteristics [14].

4. The results of studies on the impact of internal migration processes on the region's socio-economic development are sensitive to the level of aggregation of initial data, homogeneity, and comparability. The researcher has to be sufficiently knowledgeable in the study subject matter to exclude the possibility of errors of this kind at the stage of data collection and preparation.

5. Limited statistical information is available, especially in real-time when internal displacement occurs. This limitation leads to the fact that available research

towards assessing and analysing the impact of displacement processes is predominantly post-analysis.

The reasons mentioned above hamper analysis and quantification of the impact of migration phenomena on socio-economic development of regions and constitute a list of economic-mathematical approaches most commonly used to study the mentioned problem. They include, in particular, the following:

- statistical theory;
- probability theory;
- indicative analysis.

The first approach includes the construction of absolute and relative indicators, which in the dynamics allow performing a comparative analysis of the changes taking place, for example, in the structure of the population. As a result, it is possible to identify the main trends emerging from displacement processes and make projections, provided these phenomena are long term.

The application of probability theory tools makes it possible to reinforce the results obtained at the statistical analysis stage and construct different scenarios of the impact of internal migration processes on individual territories.

The latter approach is mainly used to assess socio-economic security. To use the indicative method at the regional level in order to determine the dynamics of socio-economic security of the regions under the influence of migration processes, it is essential to develop a system of economic indicators that provides a quantitative assessment of the socio-economic development of individual territories, which has to be reflected in the current statistics.

The classical approach to assessing the vulnerability of the national economy is indicative in nature. The algorithm implies a preliminary calculation of a set of indicators and their comparison with limit values. The economic system is assumed to be vulnerable to internal and external factors beyond these values. It loses the ability to self-development, competitiveness, accumulation of national wealth [15]. Consequently, the optimal regulation of the economy is reduced to the periodic

monitoring of a particular system of indicators and the formation of appropriate corrective actions.

The resulting assessment of a country's economic security can be carried out in two ways:

1. calculation of a comprehensive assessment based on previous sub-indicators in the context of significant social, economic and political processes and its subsequent comparison with the limit norms or a reference value [16-17];

2. calculation of the number of sub-indicators that meet the normative values and assignment of the country's economic security status (optimal, dangerous, critical, etc.) following their share in the total number [18]).

To date, Ukraine has established methodological recommendations for calculating the country's economic security level at the legislative level, which implement an indicative approach in assessing the vulnerability of the national economy and eventually involve the calculation of an integral assessment [19]. Compared to the abolished methodology of 2007, the new development has several advantages, namely:

- definition of the vector of boundary values of integral indicators;

- specifying the weighting coefficients for calculating the contribution of each subindex to the integral index by the principal component method;

- justification of the rotation method for factor axes [20].

This methodology has several known methodological and technical problems in determining the generalising integral indicator of economic security.

Within the framework of this study, the author will identify the possibility and prospects and outline the advantages of using the conceptual framework of the open systems theory to assess the regional socio-economic security level [21].

The justification for changing the analysis and quantification of regional economic security is due to:

- the increasing scale and acceleration of globalisation processes in the world;

- the complex geopolitical situation within the country, when the unforeseen change in the status of certain parts of industrial and recreational regions led to the

actual forced alienation of large enterprises of different functional purposes, the termination of production cycles, noticeable migration of the population.

The openness of the economy at the national and regional level, on the one hand, offers excellent opportunities for economic competition and increased prosperity through international trade. On the other hand, the interdependence that emerges during internal or external financial and economic integration, when there is a sharp deterioration of the economy in one of the partner countries, an economic crisis or a cooling of political relations at the highest level, creates many times worse dangers for the national economy than any indicative value of an integral or sub-indicator of economic security that goes beyond the limits. This is primarily due to the inability of the government or the president to unilaterally prevent the adverse effects of such changes in the shortest possible time and the lack of a methodological basis for a permanent assessment of such risks.

In this regard, the author proposes to proceed to the methodology for assessing the region's economic security using the conceptual apparatus of the open systems theory [22]. According to it, the economy is considered an "open system" that exchanges resources (material, energy and information) with the environment. By exchanging resources with the environment, the system is constantly evolving. Resources coming from outside the system are used to sustain life, order and maintain the system's stability. In contrast, closed systems degrade and collapse. Examples of closed systems are the tribal, collectivist and socialist societies [23].

The application of the developments in the field of modeling open systems allows the assessment of regional security to include the impact of external factors, particularly unexpected shocks, economic and political volatility.

In this case, the economy's trajectory can be described using the non-linear differential equation of Fisher-Kolmogorov-Petrovsky-Piskunov [24], which is a basic equation for the theory of active media and the theory of self-organising systems:

$$\frac{dX(R,t)}{dt} = F[X(R,t)] + \frac{dX}{dR_i}\left[D_{ij}(X)\frac{dX}{dR_i}\right], \qquad (1)$$

where $X(R,t)$ – a set (vector) of functions characterising the economic system;

$F(X)$ – non-linear functions determined by the system's structure under study. For example, for a single-product open economy consisting of bistable parts, it may have the form of a polynomial [25]:

$$F(X) = (a - bX^2)X, \text{ for } b > 0, \quad (2)$$

the corresponding dynamic equation for calculating a single system element will be:

$$\frac{dX}{dT} = (a - bX^2)X, \text{ for } b > 0, \quad (3)$$

where a – defines the bifurcation point of the economic system, with $a < 0$ it has a quiescent state, with $a > 0$ - it is a bistable state of the economic system with $X \pm \sqrt{\frac{a}{b}}$;

D – spatial diffusion coefficient of elements of an open system;

R – radius of vector points of the medium.

This introduces the control parameter concept (or a set of control parameters) that determines the degree of the orderliness of the states of an open economic system. The control parameter specifies the direction and motion speed of the controlled system in the plane phase (an abstract space with a number of dimensions equal to the number of time-dependent variables that characterise the state of the system under study) [21]. For a random system, this attractor in the plane phase will have the shape of a cloud at any dimensionality of the embedding.

In the correct selection of the plane phase characteristics, there will be a random attractor of a completely different shape.

Under the considered approach, the task of determining the optimal trajectory of economic development corresponding to a sufficient level of socio-economic security of the region is reduced to finding a set of control parameters that will ensure the transition from one equilibrium state of the system to another.

In accordance with the indicative classical approach, the optimal management of economic security involves periodic monitoring and calculation of sub-indices in the context of basic socio-economic processes (production, demographic, energy, foreign trade, investment and innovation, macroeconomic, food, social, financial);

their comparison with the threshold values and development of such management influences that ensure finding the calculated indicators in safe limits.

In addition to the discussed shortcomings and limitations of the existing economic and mathematical methods for analysing and assessing the impact of internal migration processes on individual aspects of regional socio-economic development, it is necessary to consider that the vast majority of approaches and concepts ultimately aim to build an analytical dependence. This will define a linear pattern between the influencing and dependent variables (2.4-2.7) [26]:

1. linear regression:

$$y(t) = \sum_{j=0}^{n} a_j x_j + \varepsilon(t) \quad (4)$$

where n – number of explanatory variables, $\varepsilon(t)$ – random perturbation.

2. regression models with a distributed lag

$$y(t) = \sum_{j=0}^{q} a_j x(t-j) + \varepsilon(t) \quad (5)$$

where q – the value of the most significant lag, $\varepsilon(t)$ – random perturbation; $\sum_{j=0}^{q} a_j x(t-j)$ — lag polynomial as a moving average variable, $x(t)$, a_j - weighting factors that determine the lag structure.

3. autoregression models:

$$y(t) = \sum_{j=0}^{p} a_j y(t-j) + \varepsilon(t), \quad (6)$$

where p – the value of the most significant lag, $\varepsilon(t)$ – random perturbation; $\sum_{j=0}^{p} a_j y(t-j)$ — lag polynomial as a moving average variable; $y(t)$ - autoregressive component of the model, a_j – weighting factors that determine the lag structure.

4. moving average models:

$$y(t) = \mu + \sum_{j=0}^{q} b_i \varepsilon(t-i), \quad (7)$$

where q – moving average order, b_i– weighting coefficients determining the structure of the moving average, μ – constant process average.

Conclusions and directions for future research. Analysing existing research methods of a quantitative assessment of the internal migration processes impact allows for formulating the following features that significantly complicate such analysis.

Among the main reasons that complicate the study of the impact of migration processes and, in particular, forced migration on the economic development of regions, the author determines the following:

- First, all socio-economic contexts of regional development constantly undergo various forms of socio-economic and political changes. Therefore, it is difficult to establish a direct link resulting from displacement entirely separate from general societal changes.

- Secondly, the impact of displacement will vary depending on a number of key factors, including the time frame, the duration since displacement occurred, and whether short-term or long-term effects should be identified and assessed. This places particular demands on quantitative analysis methodology.

- Third, there is a high level of subjective judgement and estimation in the analysis.

- Fourthly, one should bear in mind that the results of surveys on the impact of internal migration processes on socio-economic development in the region are sensitive to the aggregation level of initial data, their homogeneity and comparability.

- Fifth, the researcher needs to consider the limited statistical information available.

The reasons mentioned above, complicating analysis and quantitative assessment of the impact of migration phenomena on socio-economic development of regions, have formed a list of economic-mathematical approaches, most commonly used to study the mentioned problem. They include, in particular, statistical theory, probability theory and indicative analysis.

However, it has to be noted that the vast majority of approaches and concepts ultimately aim to construct an analytical relationship, which will define a linear pattern between the influencing and dependent variables. Furthermore, actual processes in economic systems are non-linear in nature. Therefore, the author considers it promising

to use a non-linear paradigm to analyse and assess the impact of internal migration processes on specific aspects of regional socio-economic development.

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