

Вплив міжрегіональної економічної диференціації на економічну безпеку регіонів України

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Анотація. Міжрегіональна економічна диференціація властива більшості країн світу. З одного боку економічна диференціація є природнім явищем, з другого показує неефективність бюджетної політики держави. Однак, для формування ефективних механізмів зниження міжрегіональної економічної диференціації першочерговою задачею є об'єктивне її оцінювання. Мета статті полягає у здійсненні аналізу та оцінювання соціально-економічної диференціації регіонального розвитку. У дослідженні розглянуто систематизацію теоретичних положень і методологічних рекомендацій із аналізу та регулювання диференціації соціально-економічного розвитку регіонів у системі їхньої економічної безпеки. Запропоновано метод аналізу для дослідження структури та динаміки диференціації соціально-економічного розвитку регіонів. Доведено необхідність використання комплексу статистичних характеристик і методу кластерного аналізу. Запропоновано методичний підхід розрахунку одномірного відносного показника рангового розкиду, що формує уявлення про розподіл економічної диференціації у середині економічної групи, що досліджується на диференціацію. Проведено аналіз методів, що використовуються у задачах дослідження структури та динаміки диференціації соціально-економічного розвитку регіонів, запропоновано методик оцінки рівня диференціації. Розкрито поняття соціально-економічної диференціації регіонів. Запропоновано напрями регулювання соціально-економічної диференціації та інтенсифікації економічної безпеки регіону. Відповідно до здійсненого кластерного аналізу й використаного адаптивного методу оцінювання економічної безпеки регіонів для моніторингу та стратегічного планування соціально-економічного розвитку регіону було досліджено соціально-економічний розвиток регіонів України. Згідно з результатами аналізу було встановлено, що за багатьма економічними та соціальними показниками спостерігається значна розбіжність, що може підтверджувати диспропорції у регіональному розвитку

Ключові слова: регіональні диспропорції, соціально-економічні показники регіонального розвитку, кластеризація, оцінювання, одномірний відносний показник рангового розкиду

The Impact of Interregional Economic Differentiation on the Economic Security of the Regions of Ukraine

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(Received: 10.09.2020, Revised: 12.10.2020, Accepted: 15.11.2020)

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Abstract. Interregional economic differentiation is inherent in most countries of the world. On the one hand, economic differentiation is a natural phenomenon, on the other hand, it shows the inefficiency of the national budget policy. However, for the development of effective mechanisms for reducing interregional economic differentiation, the primary task is to objectively assess the national policy. The purpose of the study is to analyse and evaluate the socio-economic differentiation of regional development. The study considers the systematisation of theoretical provisions and methodological recommendations for the analysis and regulation of differentiation of socio-economic development of regions in the system of their economic security. A method of analysis is proposed for investigating the structure and dynamics of differentiation of socio-economic development of regions. The need to use a set of statistical characteristics and the method of cluster analysis has been proved. A methodological approach to calculating a one-dimensional relative indicator of rank spread is proposed, which forms an idea of the distribution of economic differentiation within the economic group being studied for differentiation. The analysis of methods used in the tasks of investigating the structure and dynamics of differentiation of socio-economic development of regions is carried out, and a methodology for assessing the level of differentiation is proposed. The concept of socio-economic differentiation of regions is revealed. Areas of regulation of socio-economic differentiation and intensification of economic security of the region are proposed. The socio-economic development of the regions of Ukraine was investigated according to the cluster analysis and the adaptive method of assessing the economic security of regions used for monitoring and strategic planning of the socio-economic development of the region. According to the results of the analysis, it was found that there is a significant discrepancy in many economic and social indicators, which can confirm the disparity in regional development

Keywords: regional imbalances, socio-economic indicators of regional development, clustering, evaluation, one-dimensional relative indicator of rank spread

Introduction

The regional differentiation in Ukraine has reached a scale at which it becomes a factor of violation of economic security. To neutralise such threats, it is necessary to monitor them and develop an effective set of measures to prevent and overcome the most dangerous manifestations of an unbalanced national economy [1]. Reducing the level of differentiation of socio-economic development of regions that differ in type, population composition, different potential, geographical location, and degree of participation in socio-economic processes requires rethinking the key approach to their

development. An important condition for regulating excessive socio-economic differentiation is to change approaches to regional development policies, which for a long period were mainly based on centralised principles and an economic concept (in particular, subsidising lagging areas and sectors). The reflexive rather than proactive nature of the established approaches to the national regional policy indicates an urgent need to form and implement a new policy of regional (local) development.

The growing scale of economic differentiation of regional development is an important problem of the

Suggested Citation:

Lebedchenko, V.V. (2020). The impact of interregional economic differentiation on the economic security of the regions of Ukraine. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 7(2), 126-136.

economic development of Ukraine at the present stage. "Such trends can be traced at all territorial levels: at the country level, as the differentiation of the development of individual regions, and at the level of an individual region, as the differentiation of the development of individual territorial units within the region. But economic differentiation cannot be considered as an absolutely negative phenomenon: the country's economic space cannot be completely homogeneous, and a certain level of differentiation is natural" [2]. At the same time, a high degree of regional differences means identifying a group of depressed regions within the country, which can lead to deep social conflicts over the territorial distribution of resources and negatively affect the economic, social, and political stability of the state. In addition, "the lack of an effective and consistent national regional policy further aggravates the situation, which creates an additional level of economic threat. Consequently, there is a natural need to search for possible ways to overcome regional development imbalances, in particular by borrowing the experience of developed countries" [3], which primarily determines the relevance of the study.

There are a large number of research papers devoted to the investigation of trends and uneven territorial development and laws of differentiation, which are reflected in the studies by: Yu.S. Ershov [4], D. Ushakov, M. Vinichenko, E. Frolova [5], A.G. Isaev [6], V.V. Lokosov, Yu.V. Ryumina and V.V. Ulyanov [7], D. Loginov, E. Karanina, M.V. Palkina [8], V.Yu. Maslikhina [9], O. Hrybinenko, O. Bulatova, O. Zakharova [10]. The research was dominated by questions about the scientific, practical, and methodological principles of functioning of territorial communities under the conditions of administrative and financial decentralisation, and questions about their development from the standpoint of deepening socio-economic differentiation as components of an important national regional policy are highlighted to a lesser extent.

Some methodological issues that require a broader scientific understanding and theoretical and empirical research are still not fully resolved. In addition, many issues related to socio-economic development and the methodology of the system of territorial differentiation management remain unclear. Literature analysis suggests that there is no single or established method for identifying problem regions. All this, combined with the relevance of the problem, determined the need to investigate it.

The purpose of the study is an analysis, assessment, and management of interregional economic

differentiation of the regions of Ukraine in the system of their economic security.

Materials and Methods

To solve the research objective, the following methods were used: historical method – to identify the conditions and start the process of public administration reform and regional differentiation; formal-logical method – to understand logical relationships with the goals and consequences of regional differentiation; systematic approach – to analyse and evaluate the consequences of a long and incomplete differentiation process.

The initial data for the analysis of socio-economic indicators of economic security of the regions were obtained as a result of statistical processing of information from the State Statistics Service of Ukraine, the Ministry of Finance of Ukraine, the Ministry of Economic Development of Ukraine, the Ministry of the Infrastructure of Ukraine, the Ministry of Social Policy, the Ministry of Development of Communities and Territories of Ukraine, etc. [11-15]. Calculations, in particular establishing relationships between various parameters, analysing various statistical initial data, intermediate and final results, including a graphical representation of these results, were performed in MS Excel and the SPSS (Statistical Package for the Social Science) software suites.

The paper presents the results of a study of interregional economic differentiation of the regions of Ukraine and determines its impact on the economic security of the regions. To identify regional imbalances in the socio-economic development of the regions of Ukraine, a multiparametric cluster analysis was carried out, which revealed the heterogeneity of the development of the regions of Ukraine. The initial data for calculations were indicators of socio-economic development of 24 regions of Ukraine (excluding the Autonomous Republic of Crimea and temporarily occupied territories) during 2014-2019, according to the State Statistics Service of Ukraine [14].

Indicators of socio-economic development of the regions that were selected for clustering are:

- gross regional product (mln. UAH);
- index of physical volume of retail trade turnover compared to the previous year, %;
- export, thous. USD
- import, thous. USD
- consumer price indices by region, %;
- industrial output indices, % compared to the previous year;
- agricultural product indices, %;

- capital investments, mln. UAH;
- number of businesses, units;
- net profit (loss) of enterprises, mln. UAH;
- migration growth, reduction (-) of the population, persons;
- natural growth, reduction (-) of the population, persons;
- average number of available population, persons;
- employment of the working-age population, %;
- household income, mln. UAH.

The corresponding module of the SPSS software suite is used to perform calculations using cluster analysis methods. To visually display clustering results, a dendrogram is used – a tree formed on a matrix of cluster proximity indicators. Tree nodes have subsets of objects. In this case, for each tree level, the set of objects from all nodes is the original set of objects. The connection of nodes between levels corresponds to the union of two sets of clusters. The edge length corresponds to the distance between clusters. The dendrogram was constructed using the intergroup relationship method. That

is, the distance between clusters is equal to the average of all distances between all possible pairs of points in two clusters. The information required to calculate the distance is based on all theoretically possible pairs of observations.

Results and Discussion

The development of individual territorial units in the structure of the state is the basis for ensuring its economic and social growth. “Consequently, a policy of stimulating the development of individual territories is being actively implemented all over the world on the way to equalising the existing imbalances in their development. Ukraine is no exception, which includes many border and mountainous areas, including those that track a long path of slow economic and social growth” [3].

The results of cluster analysis are presented in the form of a dendrogram (Fig. 1). The list of regions included in each of the clusters is shown in Table 1.

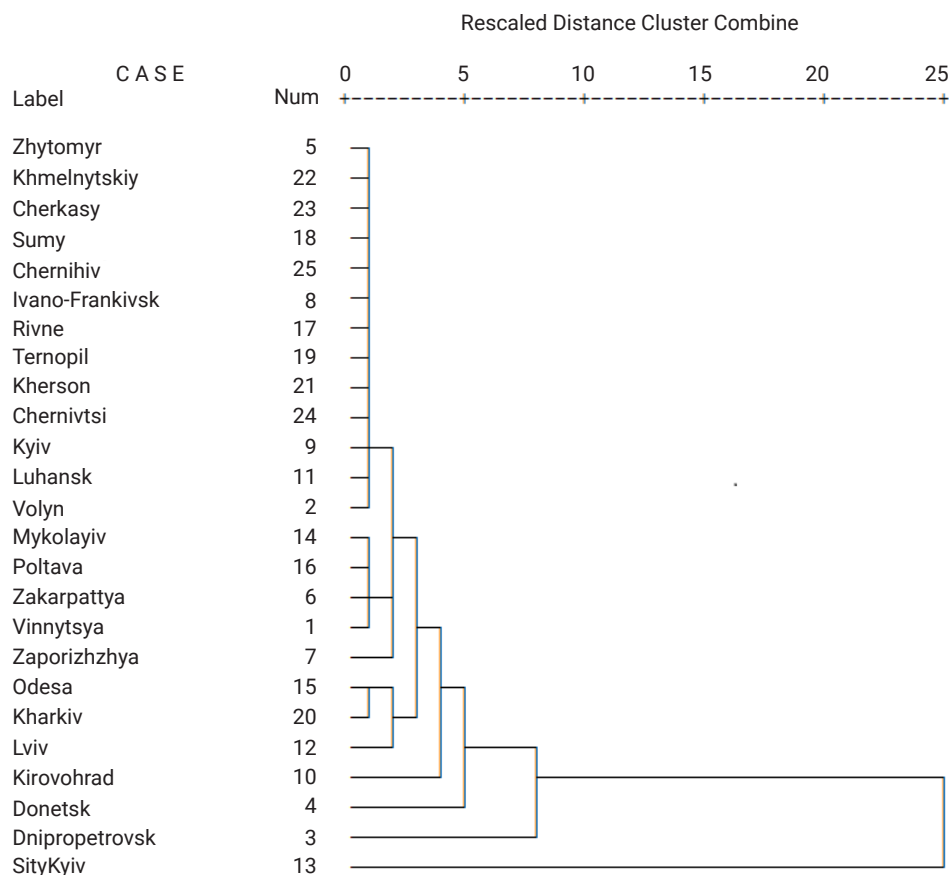


Figure 1. Dendrogram of clustering of regions (oblasts) of Ukraine

Source: compiled by the author

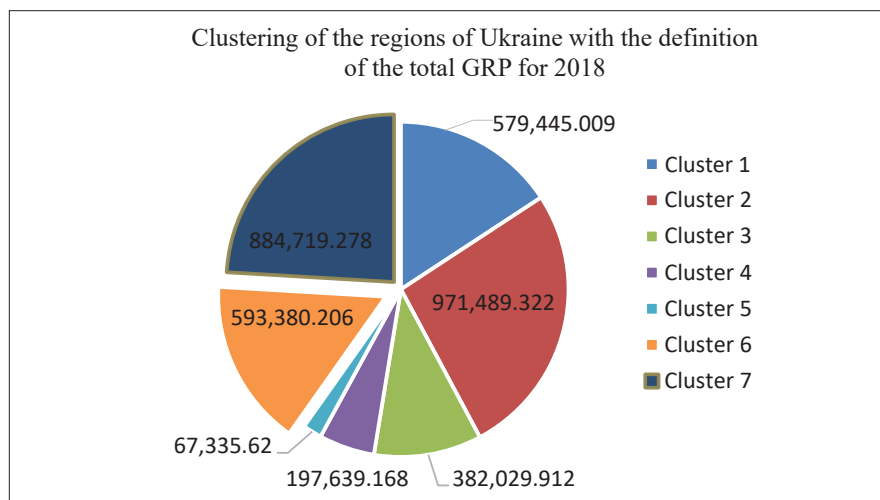
Table 1. Clustering of regions (oblasts) of Ukraine with the definition of total GRP in 2018

Cluster	Oblast	GRP of the oblast, mln. UAH	Total GRP, mln. UAH
Cluster 1	Vinnyska	119,637.354	579,445.009
	Zakarpatska	51,605.88	
	Zaporizka	149,135.064	
	Mykolayivska	83,352.388	
	Poltavska	175,714.323	
Cluster 2	Volynska	56,700.224	971,489.322
	Zhytomyrska	77,649.77	
	Ivano-Frankivska	83,228.023	
	Kyivska	202,321.36	
	Luhanska	36,367.798	
	Rivnenska	61,559.886	
	Sumska	70,680.648	
	Ternopilska	50,017.394	
	Khersonska	56,209.059	
	Khmelnyska	75,494.708	
	Cherkaska	96,301.08	
	Chernivetska	35,394.732	
	Chernihivska	69,564.64	
Cluster 3	Dnipropetrovska	382,029.912	382,029.912
Cluster 4	Donetska	197,639.168	197,639.168
Cluster 5	Kirovohradska	67,335.62	67,335.62
Cluster 6	Lvivska	180,433.374	593,380.206
	Odeska	176,359.338	
	Kharkivska	236,587.494	
Cluster 7	Kyiv city	884,719.278	884,719.278

Source: obtained by the author based on [15]

After analyzing the GRP for 2018 in accordance with the grouped clusters, the following conclusions can be drawn: Cluster 7, Cluster 6, and Cluster 3 account

for more than 60% of the country's total GDP for the year. Figure 2 shows the results of cluster analysis for the GDP in 2018.

**Figure 2.** GDP structure in 2018 by specific clusters

Source: calculated by the author based on [15]

Based on the results of regional clustering, the following conclusion can be drawn about the disproportionality of regional development: Cluster 7, Cluster 6, and Cluster 3 together form more than 50% of GDP. In addition, for example, Cluster 1 (5 oblasts) forms 15.7% of GDP, and Cluster 2 (13 oblasts) forms 24% of GDP.

All this once again indicates a significant differentiation of the regions of Ukraine from the standpoint of economic development. Figure 3 shows a map of Ukraine with regions plotted on it, which are divided into certain clusters by colours and numbers.



Figure 3. Map of Ukraine with the division of regions into groups of clusters according to the level of socio-economic development

Source: compiled by the author

In fact, a peculiar situation has developed in Ukraine, when most oblasts (recipient oblasts) began to receive subsidised transfers from donor oblasts, and the share of donor oblasts began to steadily decrease. “Structural changes in the Ukrainian economy did not ensure economic growth, as a result of which underdeveloped territories were clearly distinguished, in which basic socio-economic indicators began to differ significantly even from the national average. Notably, a number of such depressed regions also include those oblasts that have long had a high level of industrial and Infrastructure development” [16]. Imbalances in the economic development of the regions of Ukraine are complex in nature and “this factor leads to insufficient effectiveness of the national policy of equalising the economic development of the regions and to the need to take special measures aimed at reducing the asymmetry of the economic development of the regions of Ukraine” [17].

Nowadays, in the practice of economic research, the decile method of estimating differentiation is used, but it does not give an idea of the distribution of economic differentiation within the economic group being studied for differentiation. The study offers a methodological approach for calculating a one-dimensional relative indicator of the rank spread. The calculation of this indicator can be represented as a set of consecutive calculations:

1) selection of a key indicator that reflects the socio-economic development of regions. Some of these indicators are the indicators “GRP” or “value of GRP per capita”. Therefore, one of these indicators can be selected for the study and a sample can be formed at a certain point in time or time interval;

2) ranking the selected indicator in ascending order, i.e., placing the values of the indicator in order of the degree of economic development from the smallest to the largest;

3) determining the average value of the spread (gap) between the paired ranks of the selected indicator:

$$\bar{R} = \frac{\sum_{i=1}^n (R_i - R_{i-1})}{n} \quad (1)$$

where R_i and R_{i-1} – adjacent ranks, as they grow; n – the number of ranks in the population.

1. Determination of the average value of the selected key indicator ($\bar{X}$);

2. Calculation of a one-dimensional relative rank spread indicator showing intra-group differentiation:

$$D = \frac{\bar{R}}{\bar{X}} \quad (2)$$

Based on the proposed methodological approach, the analysis of differentiation of regional economic

3. Determination of the level of differentiation according to the scale (Table 2). At the last stage, the level of differentiation is determined in accordance with the proposed scale, obtained empirically.

Table 2. Scale for determining intra-group differentiation of an indicator

Value D	Differentiation scale
D<5%	Weak differentiation
5%<D<10%	Moderate differentiation
10%<D<30%	Significant differentiation
D>30%	High differentiation

Source: compiled by the author

development during 2014-2018 by GRP is carried out. The results of the analysis are presented in Table 3.

Table 3. Results of calculations of the level of differentiation of oblasts of Ukraine for 2014-2018

2014		2015		2016		2017		2018	
Chernivetska	15,049	Chernivetska	18,506	Chernivetska	21,239	Chernivetska	28,591	Chernivetska	33,903
Ternopil'ska	21,676	Luhanska	23,849	Ternopil'ska	31,072	Luhanska	30,285	Luhanska	35,206
Kherson'ska	23,250	Ternopil'ska	26,656	Luhanska	31,356	Ternopil'ska	40,747	Ternopil'ska	49,133
Zakarpatska	24,120	Zakarpatska	28,952	Zakarpatska	32,390	Zakarpatska	43,043	Zakarpatska	52,445
Volyn'ska	24,195	Volyn'ska	31,688	Volyn'ska	35,744	Kherson'ska	47,868	Kherson'ska	55,161
Chernihiv'ska	28,156	Kherson'ska	32,215	Kherson'ska	38,743	Rivnenska	48,836	Rivnenska	56,842
Rivnenska	28,724	Rivnenska	35,252	Rivnenska	39,469	Volyn'ska	51,972	Volyn'ska	60,448
Kirovohrad'ska	28,758	Chernihiv'ska	36,966	Chernihiv'ska	43,362	Kirovohrad'ska	53,031	Kirovohrad'ska	64,436
Zhytomyr'ska	29,815	Zhytomyr'ska	38,425	Kirovohrad'ska	46,021	Sumska	56,530	Sumska	68,489
Sumska	30,397	Kirovohrad'ska	38,447	Sumska	46,287	Chernihiv'ska	56,672	Chernihiv'ska	70,624
Luhanska	31,393	Khmelnitska	41,088	Zhytomyr'ska	47,919	Zhytomyr'ska	61,470	Khmelnitska	75,646
Khmelnitska	32,162	Sumska	41,567	Khmelnitska	48,859	Ivano-Frankiv'ska	63,850	Zhytomyr'ska	77,110
Mykolayiv'ska	35,408	Ivano-Frankiv'ska	45,854	Ivano-Frankiv'ska	51,404	Khmelnitska	63,882	Ivano-Frankiv'ska	78,443
Ivano-Frankiv'ska	37,643	Mykolayiv'ska	48,195	Mykolayiv'ska	57,815	Mykolayiv'ska	69,371	Mykolayiv'ska	79,916
Cherkaska	38,466	Cherkaska	50,843	Cherkaska	59,412	Cherkaska	73,176	Cherkaska	93,315
Vinnytska	43,990	Vinnytska	59,871	Vinnytska	74,411	Vinnytska	92,427	Vinnytska	111,498
Zaporizka	65,968	Zaporizka	89,061	Zaporizka	104,323	Zaporizka	130,377	Zaporizka	147,076
Poltav'ska	69,831	Lviv'ska	94,690	Lviv'ska	114,842	Lviv'ska	147,404	Odeska	173,241
Lviv'ska	72,923	Poltav'ska	95,867	Poltav'ska	116,272	Odeska	149,530	Poltav'ska	174,147
Odeska	74,934	Odeska	99,761	Odeska	119,800	Poltav'ska	150,904	Lviv'ska	177,243
Kyiv'ska	79,561	Kyiv'ska	104,030	Kyiv'ska	128,638	Kyiv'ska	157,043	Donetska	192,256
Kharkiv'ska	96,596	Donetska	115,012	Donetska	137,500	Donetska	166,404	Kyiv'ska	198,160
Donetska	119,983	Kharkiv'ska	124,843	Kharkiv'ska	154,871	Kharkiv'ska	187,454	Kharkiv'ska	233,321
Dnipropetrov'ska	176,540	Dnipropetrov'ska	215,206	Dnipropetrov'ska	244,478	Dnipropetrov'ska	313,830	Dnipropetrov'ska	369,468
Kyiv city	357,377	Kyiv city	451,700	Kyiv city	559,140	Kyiv city	699,185	Kyiv city	833,069
$\bar{R}$	14,263	$\bar{R}$	18,049	$\bar{R}$	22,412	$\bar{R}$	27,941	$\bar{R}$	33,298
$\bar{X}$	63,476	$\bar{X}$	79,541	$\bar{X}$	95,414	$\bar{X}$	119,355	$\bar{X}$	142,423
D	0.2247	D	0.2269	D	0.2349	D	0.2341	D	0.2338

Source: compiled by the author

Based on the calculated differentiation indicator in the period from 2014 to 2018, its average value can be calculated ($\bar{D}$), which for this period is 0.2309, which indicates a significant interregional economic differentiation. Among the main reasons for interregional differentiation are the following:

- agglomeration factors;
- effect of concentration of production and economic activity on the urbanisation principle;
- development of transport and geographical conditions;
- narrow specialisation of economic activity in some oblasts of Ukraine;
- inefficient distribution of the national budget, which does not contribute to proportional regional development.

Based on the conducted research, it is possible to identify positive and negative factors of differentiation of interregional economic development. Positive factors include:

- push effect for less developed regions;
- influx of the working-age population to more developed regions, which allows increasing the income of the migrating population without changing the country;
- increase in the efficiency of allocating and using available resources;
- availability and growth of regional competitiveness;
- capital inflows to more developed regions;
- increase in the level of national activity.

The negative consequences of significant differentiation of interregional economic development include:

- increase in the level of social injustice;
- increase in social discontent of the population;
- reduction in the level of economic security;

– rise in unemployment and incomes in less developed regions;

- population migration growth;
- significant urbanisation and overpopulation of large cities;
- growing political conflicts and crime;
- weakening of economic ties between regions;
- reduced competitiveness and investment attractiveness of regions with less economic development;
- the emergence of the “problematic” regions.

As can be observed, the negative consequences are much greater than the positive ones and they have a greater impact on national and regional economic security, so the differentiation of interregional economic development has a negative role for the national economy as a whole. Comparison of certain clusters of regions with the level of economic security of these regions, which is estimated by the adaptive method [18], shows a significant impact of differentiation on economic security and regional development. With the help of the developed methodological approach and tools for its implementation, it will be possible to create a management system that can identify the causes of the dangerous state of the region and develop measures to eliminate these provisions, and take actions to improve the economic security of the region.

In a previous study [18], an adaptive method for assessing the economic security of regions was developed for monitoring, evaluating and planning the economic and social development of the region. Testing of the proposed method based on data on the state and development of the regions allowed us to assess the state of economic security of the regions of Ukraine in 2018 (Table 4).

Table 4. Levels of economic security of the oblasts of Ukraine in 2018 by cluster

Cluster	Oblast	Level of economic security
Cluster 1	Vinnitska	0.24
	Zakarpatska	0.21
	Zaporizka	0.22
	Mykolayivska	0.21
	Poltavska	0.15
Cluster 2	Volynska	0.09
	Zhytomyrska	0.05
	Ivano-Frankivska	0.15
	Kyivska	0.1
	Luhanska	0.03
	Rivnenska	0.07
	Sumska	0.12
	Ternopil'ska	0.16
	Kherson'ska	0.03
	Khmelnitska	-0.04
	Cherkaska	0.01
	Chernivetska	0.09
	Chernihiv'ska	-0.3

Table 4, Continued

Cluster	Oblast	Level of economic security
Cluster 3	Dnipropetrovska	0.25
Cluster 4	Donetska	0.10
Cluster 5	Kirovohradska	-0.2
Cluster 6	Lvivska	0.24
	Odeska	0.26
	Kharkivska	0.27
Cluster 7	Kyiv city	0.4

Source: obtained by the author based on [18]

The most critical situation from the standpoint of economic security is observed in the regions of Cluster 2, and separately in 4 and 5, which can confirm the relationship between the differentiation of regions and the level of economic security. Based on the cluster analysis and the applied adaptive method of assessing the economic security of regions for monitoring and strategic planning of socio-economic development of the region, the socio-economic development of the regions of Ukraine is considered. Based on the analysis, a general conclusion can be drawn that there is a significant discrepancy in many economic and social indicators, which can confirm the disparity in regional development, which ultimately affects the economic security of these regions.

Conclusions

The analysis of methods used to investigate the structure and dynamics of differentiation of social and economic development of regions demonstrated the need

for the integrated use of cluster analysis and statistical characteristics of differentiation to study and ensure a high level of economic security of regions and the country as a whole. A methodology for determining the degree of differentiation of socio-economic development of regions is proposed. The importance of the task is to reduce imbalances in the social sphere, which is a prerequisite for improving the economy to ensure economic security in the region.

Interregional economic differentiation is already systemic in nature and reaches critical indicators for ensuring the economic security of the regions. Therefore, it is necessary to introduce a model that can ensure the coordination of socio-economic interests of the regions, will contribute to the organisation of favourable conditions for maintaining a high-quality level of economic security of the regions in the country. The development and implementation of a long-term strategy in this area are necessary to interrupt the process of economic imbalance.

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