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ECONOMIC MODELING OF REGIONAL DEVELOPMENT IN UKRAINE

Abstract: *The author examines the causes of regional differences, suggests the scenarios for smoothing regional inequalities, and identifies new trends for low economic potential regions. Analyzing a variety of concepts, models and approaches, the article provides the deep investigation of regional development peculiarities in Ukraine. The use of econometric modelling proposes the special regional policy measures could be the effective tools for regional inequalities reduction, and the economic growth stimulation. Assessing the scientific and industrial potential regions the author focuses on diversification of industrial structure, priority innovation development, and economic growth in backward regions. The western region traditionally has agrarian production orientation. The competition is still weaker at regional level. Concentration has a negative and highly significant effect on labour productivity growth. In spite of human capital endowment in Ukraine, one could mention the low labour productivity level in basic sectors of economy. The essence of the regional integration is determined as the process in which countries organise regional unions, cooperate with each other and coordinate any forms of activities in order to stimulate economic prosperity, strengthen trade relation, develop infrastructure, and stimulate mutually profitable relations among each other. The regional policy determination considers the regional disparities elimination and suggestion of the scenarios for smoothing regional inequalities. The main directions of regional development could be determined in accordance with regions' belongings to the special cluster group.*

Keywords: *cluster group, profitable relations, regional level, develop infrastructure, trade relation, the Ukrainian regions, regional peculiarities, econometric modeling*.

1. The peculiarities of regional development in Ukraine

The process of regionalization defines a utility maximization of regional rights widening in the resources' disposable. The territorial division of labor, regional specialization and cooperation cause the rise of region's interdependence. Economic and cultural diversity is explained via different adequate provision of material and social well-being at the Ukraine's regional level.

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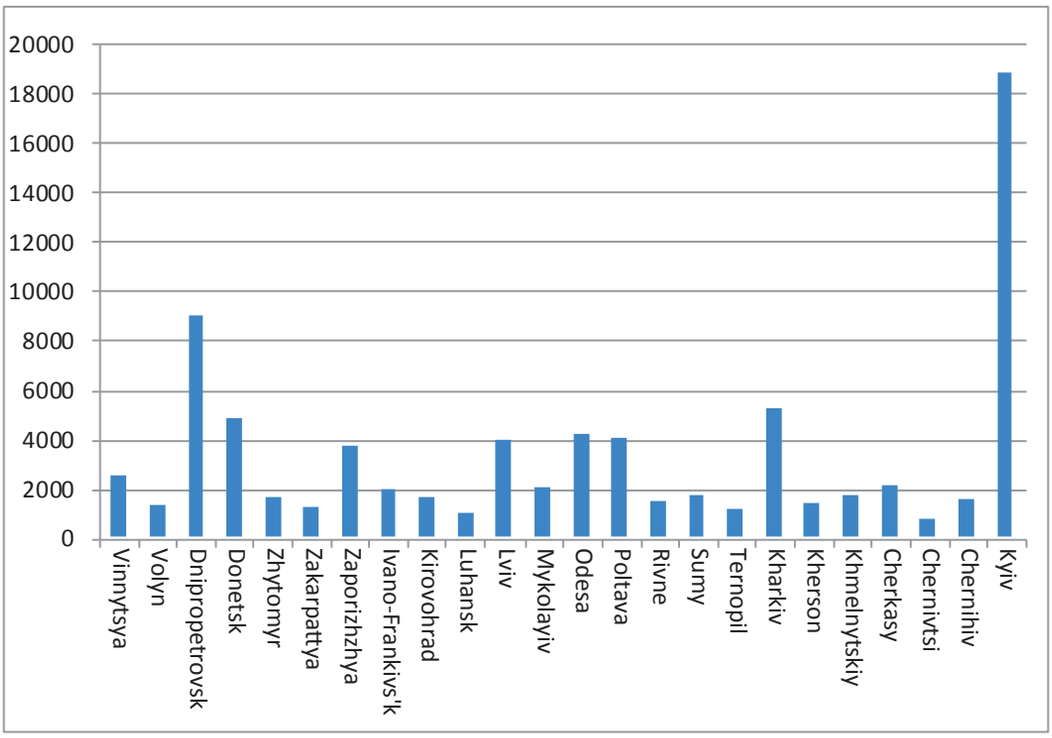
The Ukrainian regions are distinguished between industrialized east and rural western regions. The eastern region is specialized in production of basic industry, including metallurgy and the machine building, engineering, construction of electro-mechanical machines, coal extraction etc. The western region traditionally has agrarian production orientation. The favorable recreation areas are not completely used due to insufficient services sector development.

The aim of the paper is to analyze and determine the regional economic structure improvement and diversification on the basis of economic modeling in Ukraine. The global financial crisis has significant impact on the deterioration of domestic and external demand. The production output decrease in basic sectors of Ukrainian economy. The volume of industrial production, fixed capital investment, exports and imports of goods and services decreases in 2009. The consumer price index and inflation increase. To highlight the inflation rise estimates the available data. Inflation accelerates to 16,6% in December 2007 that the highest level in seven years. The rise in food prices in international markets and energy price shocks cause to cost-push inflation. The current account and financial account deficit is covered by the interventions of the National Bank of Ukraine. In the period of crisis the economic and social disparities within country are raised. The number of depressed regions increases, and the regional differences exacerbate. The global financial crisis drop in GDP is about 4 per cent and at least Latvia and Ukraine are likely to face double-digit decline. The fixed exchange rate to US dollar evokes the speculative motives for short-term lending from European banks, and results in increase the balance of payments deficits in 2009.

The reduction of gross regional product (GRP) has been estimated in all Ukrainian regions for 2015 (Figure 1). Comparing 2016 to 2015 there is estimated GRP value increases in Kyiv, Poltava, Dnepropetrovsk, Zaporizhzhya, Kharkiv, Odesa, Mykolayiv regions. The estimation of the basic economic indicators shows the tendency of industrial production shortage in heavy industry, including metallurgy and coal extraction industry. The high production costs, inefficient labour organization, and undeveloped infrastructure result in asymmetry of regional development.

Figure 1: Gross regional product in Ukraine 2015 (mln. USD)



Source: Data of the State Statistics Service in Ukraine.

The assessment of Ukrainian competitiveness in 2015-2016 demonstrates the markets concentration at national level and the high degree between regional markets. The competition is still weaker at regional level. Concentration has a negative and highly significant effect on labour productivity growth. Nevertheless of human capital endowment in Ukraine, one could mention the low labour productivity level in basic sectors of economy. The relatively low wage rate in the basic sectors of economy does not create stimulus for work competition for high quality of production and better working conditions. [Nosova 2017, p. 99].

The total factor productivity is doubled in Ukraine in 2001-2007, and it should be noted that the main contribution was the growth of labor productivity (62.2%), and productivity of capital – 30.6% . The real growth of overall productivity makes up 5, 97 per cent of real GDP per person employed in 2009. The labour productivity per person employed per hour is equaled to $ US 9,17 at the same period of time [Mogila et al. 2009, p.7]. Ukraine is not only struggling with an overall economic recession, but also with a process of economic transformation. Both developments have led to an imbalance of the labour market resulting in rising unemployment, higher inactivity rates and increasing quantitative and qualitative gaps with regard to supply and demand in the labor market. Scientists consider that one of the obstacles of successful economic reforming is undervalued costs of labour force per worker in Ukraine. Ukrainian government should review the level of minimum wage.

The labour productivity per capita assessment confirms its low level in Ukraine comparing to world competitiveness estimation for 55 countries. Shehovzeva outlines the regional competitiveness use which defines the regional labor and capital combination. Gross regional product per capita is the most significant index characterizing the regional potential for producing goods and services [Shehovzeva, p. 32]. Looking at the latest updates of the overall situation in Ukraine one could mention that the country has overcome the heavy crisis caused by armed conflict in eastern part of country. At the same time, 200% devaluation of Ukrainian national currency (hryvnia) in 2014-2015 made Ukrainian goods and services cheaper and more competitive. In 2016, for the first time since 2010, the economy grew more than 2%. Ukraine's GDP amounted to approximately 93.26 billion U.S. dollars in 2016 (Fig. 1).

The comparative analysis of regional development in Ukraine indicates greater degree of regional differentiation in the national economy of Ukraine compared to Poland. This is confirmed by the fact that the region's share in the GRP of the country in first place (the metropolitan region – Kyiv and Kyiv oblast) is 24.4 times higher than the share of the outsider region (Chernivtsi region). The Ukrainian regions obtain diverse innovation potential and capacities. The financial shortage causes the reduction of the quantity of enterprises applied innovations. The specific gravity of such enterprises decreases in the total volume of sold industrial production from 18 per cent in 2000 to 13 per cent in 2009. The lack of sufficient financing in innovations in regions causes the need for close links between business and R&D application. The share of industrial enterprises that introduced innovative products amounted to 10.5% during 2012-2014, innovation processes – 11.3%, organizational innovations – 2.3%, marketing innovations – 2.9%. (Fig. 2).

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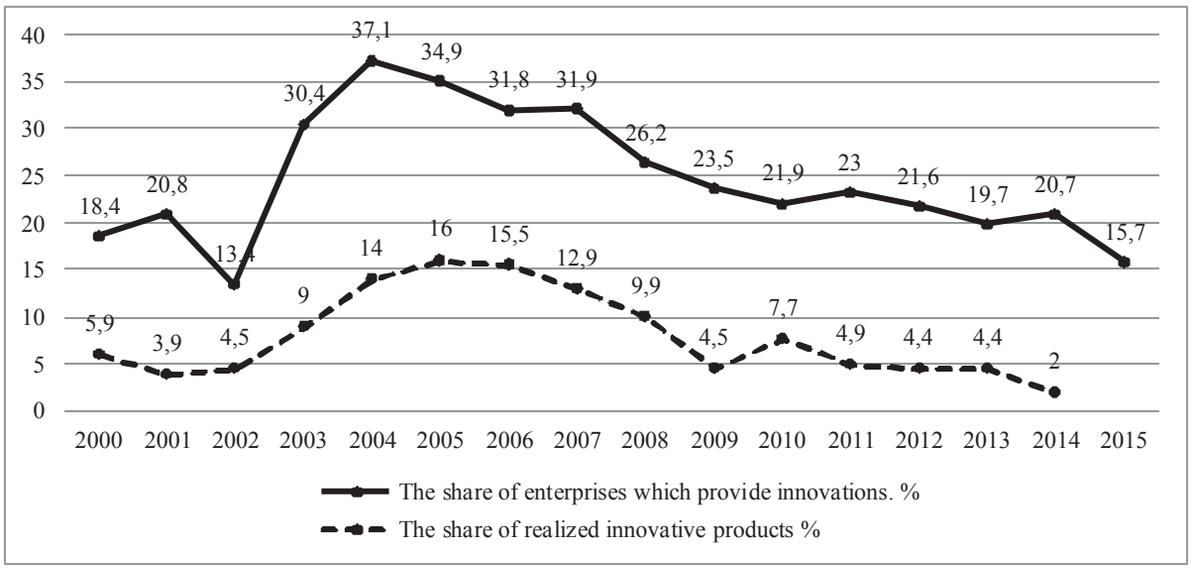
Figure 2: Development of innovative processes in the volume of industry (%)



Source: Data of the State Statistic Committee in Ukraine in 2007-2009.

According to the State Statistics Service data of Ukraine, at the start of 2007, 1.6 million of working population, people aged 15 to 70 years, were looking for work. The study of the State Statistics Service shows that, the real unemployment rate in Ukraine is the same as in EU – 7.3%. For example, in Poland, where massive amount of Ukrainians went to work, the percentage of unemployed is 13% of the economically active population.

At the end of 2015, the market situation remains tense and is characterized by a decrease in demand for labour in Ukraine. The main trends in the labour market could be defined by extremely low employment rate. The employment rate is 56.9%, including 57.6% in urban areas and 55.5% in rural. Employment rates among men were higher than among women – 62.5% and 51.9% respectively. Despite depressed growth of unemployment, the unemployment rate remains high, especially among young people. Industrial production indices decrease to 87% in 2015 in comparison to 89.9% in previous year in Ukraine [Ukraine in figures 2016, p. 236].

According to the State Statistics Service of Ukraine, real GDP declined by 6.8 per cent in 2014 and by 17.2% in the first quarter of 2015. As a result, the unemployment rate in Ukraine rose from 7.6% in the first quarter of 2014 to 9.6% a year later. In the regions directly affected by the military crisis, the unemployment rate increased from 9.1 to 14.4% in Donetsk oblast and from 8.4 to 15.3% in Lugansk oblast. Altogether, it is estimated that up to two million jobs were lost since the start of the crisis.

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recession, but also with a process of economic transformation. Both developments have led to an imbalance of the labour market resulting in rising unemployment, higher inactivity rates and increasing quantitative and qualitative gaps with regard to supply and demand in the labor market. Scientists consider that one of the obstacles of successful economic reforming is undervalued costs of labour force per worker in Ukraine. Ukrainian government should review the level of minimum wage.

The main factors contributing to the growth of total factor productivity are structural reforms in the economy, as well as a decrease in the share of the shadow economy. Reform of the labour market includes the liberalization of labor legislation which expands employment and creates more jobs. Labor Code should regulate narrow section of the relationship between employer and employee and provide balance the interests of employers and employees.

The challenge of global downturn provides the rise of number of undeveloped regions and the interregional disparities aggravation. The basic task of regional policy is aimed to study the causes of regional differences, suggest the scenarios for smoothing regional inequalities, and create adequate mechanism for low economic potential regions development.

2. Theoretical approaches to regional integration

The variety approaches of the economic analysis are directed to explain the economic process and to apply in models for stimulating regional development. In recent years scientists such as Bristow, Healy (2018), Burkert, Niebuhr, Wapler (2008), Naumenko (2013), Obodovska (2014). Polyakova, Babez (2006), Reutov (2006), Tyshchenko (2015) and others examine factors influencing the economic resilience of regions, contemporary problems of regional development, regional policy, trends, and development strategies.

The upswing of global industrialization, international division of labour, capital expansion, and foreign trade stimulate the developing countries' increased integration into the global economic system. Coordination, cooperation and networking problems are considered the essential questions of regional integration, as well as the existence of different integration concepts for a country's economic development. Some scientists point to the negative consequences of these processes (see for example, works of Amstrong, Taylor (2004), Burda (2007), Burkert, Niebuhr, Wapler (2008), Damelang, A., Steinhardt, M. (2008) and etc.). They mention an uneven and unfair distribution of common goods among countries and regions.

Firstly, regional integration provides increasing return effects and positive external aspects. The standard neoclassical model approach demonstrates regional capital and labour ratios diminishing over time. Secondly, proponents of the opposite opinion give arguments of

the existence of regional productivity differentials and labour market imperfections. As a rule, output and income grow at the same rate in all regions, although the regions differ in technology, propensity to save and natural growth of labour; these factors also determine the speed of expansion. At the same time, if the natural growth of labour is too fast (or too slow), then capital and labour tend to concentrate in a single region. The essence of the regional integration is determined as the process in which countries organise regional unions, cooperate with each other and coordinate any forms of activities in order to stimulate economic prosperity, strengthen trade relation, develop infrastructure, and stimulate mutually profitable relations among each other [Nosova 2010, p, 117].

The economic modelling is the process of the substitution of one object by another in order to provide information about the main features of the original object. Forrester [1961, p.39] distinguishes the following models: abstract and physical; dynamic and statistic; nonlinear and linear; stable and unstable and etc.

The estimation of economic models of regional development could be summarized in the following types of econometric models:

1. Empirical model.
2. Cluster analysis model.

The investigation of some empirical works demonstrates the absence of constant tendency for convergence in the world [Nosova 2011, p.67]. Estrin argues that transition has been less successful in convergence terms in other CIS countries, where starting from a very low base the situation deteriorated between 1994 and 2001, though the gap has closed a little since then [Estrin 2009, p. 8.]. Reutov estimates the competitiveness of international regional economic systems on the basis of parameters, technique of calculation, and suggests the uniform integrated parameter of competitiveness of region [Reutov 2006, p. 54]. Polyakova, Babez examine the main tendencies of regional innovation systems formation and conduct the cluster analysis of Ukrainian regions. They use the total volume of innovation costs per one thousand employed, internal current R&D costs, the number of applied patents, the number of people involved in R&D, the number of enterprises used innovations in their model [Polyakova, Babez 2006, p. 102]. The authors classify regions in 4 groups, where 1. the highest innovation activity; 2. the high innovation activity; 3. the average innovation activity; 4. the low innovation activity. 15 regions are estimated as backward areas with low potential for innovations. This research describes the uneven and insufficient development in Ukrainian regions.

The Ukrainian economic performance shows the dependence on world conjuncture. The regional imbalances cause the need for redistribution mechanism foundation into financing the development of depressed regions with low income per capita. The fiscal equalization could be provided until these regions could reach the level of average income per capita in Ukrainian regions. The determination of the regions, which are oriented on diversification of industrial structure, priority innovation development, will stimulate economic growth and will affect the growth in backward regions.

3. Economic modeling of regional development in Ukraine

To investigate economic perspectives of convergence (divergence) of regional development, we apply hierarchical cluster analysis and estimate the basic parameters for Ukrainian regions. The choice of selected model variables is based on the standard Cobb - Douglas production function use, where

$$Y = A \cdot K^{£} \cdot L^{\beta}, \quad (1)$$

where Y – total production;

L – labour unit;

K – capital unit;

A – total factor productivity;

£, β – the constant flexibility of labour and capital.

The production function specification is used for explanation of the minimum input requirements for production designated quantities of output on the basis of available technology. The parameters selection for cluster analysis is based on Cobb-Douglas production function application.

We assume that Gross Regional Product (GRP) is associated with total production in the region. The employment defines labour in the region. Industrial production index and fixed capital investment index determine regional capital. The number of organisations, conducting scientific research, total value of innovation costs per one thousand employed workers and foreign direct investment in region denote total factor productivity. We use annual data of economic performance from 2001 to 2009 for 27 Ukrainian regions. In detail the following variables are available and are considered where index i runs over all 27 regions, and index t over all time periods considered (years) [6].

$$GRP_{it} = F(IPI_{it}, FCII_{it}, EMP_{it}, FDI_{it}, NIO_{it}, TVCI_{it}), \quad (2)$$

where GRP_{it} – Real Gross Regional Product per Capita (UAH);

IPI_{it} – Industrial Production Index, where 2000 = 100% (%);

$FCII_{it}$ –Fixed Capital Investment Index (percentage from the previous year);

FDI_{it} – Foreign Direct Investment per Capita in Real Prices (UAH);

EMP_{it} – Employment of Working People from 17 to 70 Years (thousand people);

NIO_{it} - Number of Organisations, Conducting Scientific Research;

$TVCI_{it}$ – Total Value of Innovation Costs per one Thousand Employed Workers (%).

We apply industrial production index, fixed capital investment index, foreign direct investment per capita, employment, number of organisations, conducting scientific research, total value of innovation costs in the hierarchical cluster analysis for 27 Ukrainian regions in 2001 to 2009. The indicated period of time has been chosen due to the full set of data. We test the following hypothesis: the dependence of regional cluster classification on the input factors of production combination in regions.

We assess calculating distances between the most developed regions and the undeveloped regions in hierarchical clustering. We estimate the single linkage criteria, showing the distance between the closest neighbouring points. The estimation results outline that the Kyiv region is distinguished from other regions. Capital Kyiv is considered to be outlier from other Ukrainian regions for all estimated periods of time.

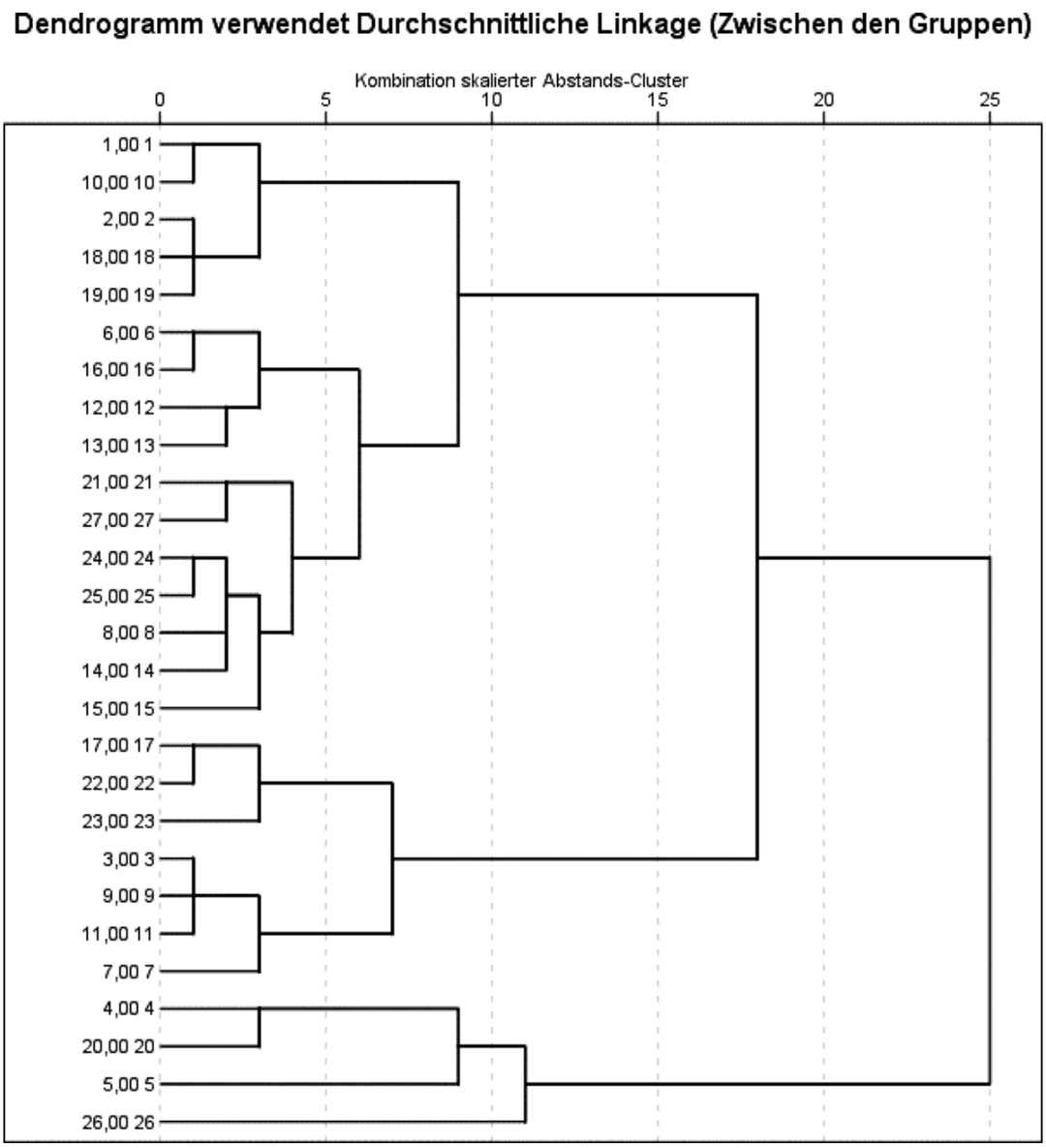
The centralized industrial organization and the inefficient regional structure formation resulted in the disproportionate regional division in the former Soviet Union. The present structure does not take into account the geographical location, the economic endowment, and regional specificity The strong specialization by regions producing specific kinds of heavy industry products caused to the division between highly industrialized developed regions with high urbanization and backward rural regions with agrarian orientation in the Ukraine.

The application of Ward's method calculates the simple Euclidean distances from each case in a cluster to the mean of all variables. The graphical analysis of the line of the significant coefficients Ward's method proves the basic three clusters determination. The three clusters differ in particular in regard to the levels of industrial development and scientific potential. One could mention the increase of heterogeneity with every step of econometric analysis. A hierarchical clustering model of 27 regions is graphically represented by dendogram corresponding to a hierarchy of distribution. It is evident that the first cluster includes the cities of Kyiv, Kharkiv, Dnipropetrovsk and Donetsk (Fig. 3).

The industrial, scientific potential of these regions are significantly low in comparison to the cluster 1. The cluster 2 and cluster 3 include some regions, which are specialised in agrarian production. The cluster mobility shows the low spread in economic development between regions.

The typical features for all clusters combine insufficient tax regulation (the highest tax rate of 60, 3 per cent in the world), and inadequate investment due to saving rate decline. The region transference between clusters could be explained by regional policy inconsistency. Some regions with average industrial potential move to the cluster 3. The industrial production reduction and low labour productivity in basic sectors of economy make worse the regional differences. In sum results suggest that there could be seen the dependence between all three regional clusters classification on the input factors of production combination in regions.

Figure 3: Dendogram Ward's Method 2009



The first cluster shows relatively higher than average level of economic estimation in comparison with two others. It distinguishes via the biggest industrial production

It should be mentioned that there are substantial differences between the cluster 1 and the clusters 2, 3, which strengthens the significant difference between the industrially developed regions and average developed regions, backward regions. The estimation confirms the low convergence between the first and the second, the third clusters. The relationship between main economic indicators of economic development of average developed and backward regions demonstrates less heterogeneity and more homogeneity.

The capital Kyiv inclusion from the cluster 1 demonstrates the estimation results for 2009. Within this period there was the structural break, which could be seen in the given assessment. The business activity decrease, macroeconomic instability and insufficient quality of institutions constitute a major impediment to Ukraine's regional economic performance are reflected in the regional indicators for 2009. The regional content of the cluster 2 and the cluster 3 are shown as unstable and changeable for all estimation periods.

In order to receive the consistent results on the regions' list of average developed and backward regions we exclude the first cluster from hierarchical cluster analysis. The estimation results could be seen in Fig. 4. The Ward's method estimation proves the division between cluster 2 and cluster 3. The assessment results shows less heterogeneity between regions with every step of the hierarchical cluster analysis. The main regions Autonomous Republic Crimea, Zaporizhzhya, Kyivskay, Lviv, Odesa, Luhansk, Mykolayiv appear in all tests and form the cluster 2. This cluster includes regions with average industrial and scientific potential. The rest regions form the cluster 3 with lower than average development capacities. Some agrarian regions perform below the country's average cluster 3. The cultural and geographical differences, insufficient endowments of crucial productive factors reflect the peculiarities of weak structural development. The cluster 1 includes four regions with high industrial and scientific potential. Kyiv, Kharkiv, Dnipropetrovsk and Donetsk regions show the best performing capital, labour, R&D capacities in the country. Its value is the biggest in comparison with other regions. The bulk of all foreign capital is concentrated in the capital. FDI per capita makes up $ US 5176 at the same period. The Kyiv region has the highest capital accumulation and per capita income distribution in comparison to other regions.

Regions with lower industrial production index, fixed capital investment index, FDI inflow per capita, and small investment in R&D form cluster 2. The regions with low industrial potential make up cluster 3. These regions are traditionally specialised in agrarian production.

The allocation of resources and structure of production anticipate the backwardness of these regions. Agricultural subsidies amount to US $ 1,1 billion in direct support and US $ 0,65 billion in tax exemptions [Regional Statistical Survey Ukraine in 2009, 2010]. The absence of significant structural changes reflects serious problems existence in agricultural sector. The moratorium on the selling of agricultural land constitutes the impediment for market relations development. Labour market imperfection work evokes low labour productivity in the agrarian sector. The labour relationship between employer and employee does not create incentives for the best use of available talent in agricultural production and limits production modernization.

The hierarchical cluster analysis reflects the spread in the performance between regions and the need of the specific factors impacts assessment. The longer estimation period of research should be taken in consideration for ongoing statistical analysis. The comparison of gross value added per capita marks the significant difference between the industrialized region in the cluster 1 and the others clusters. The disparity of gross value added per capita of the city of Kyiv is more than six times the lowest Chernivtsi region.

The lowest gross regional product per capita is estimated in cluster 3, including Chernivtsi, Ternopil, Zakarpattay, Zhytomyr, Vinnytsya, Khmelnytsky, Kherson regions (See table 1). The State Statistics Committee of Ukraine assesses the negative real growth rate in Donetsk, Zakarpattay, Lviv, Odesa, Poltava, Kherson regions in 2009. The fixed capital investment distribution reflects the tendency of capital concentration in the regions belonging to cluster 1. The difference of the share of enterprises conducting innovations in the total volume of industrial enterprises of the city Kyiv is ten times more than in the lowest indicator in Rivne in 2009 (See table 1). The estimation data of gross regional product per capita, fixed capital investment, FDI, the share of enterprises conducting innovations proves that Kyivskay, Odesa, Mykolaiv, Poltava regions have sufficient industrial and innovation potential to improve their position and to move to cluster 1.

The ascription of all regions to the particular cluster depends on the overall estimation of all parameters in the period from 2001-2009. The division into three clusters highlights the significant factors estimation influencing the existence of disproportions between the regions. The regional policy for regions in cluster 3 have to be concentrated on promotion the growth of backward regions through subsidies, tax allowances, and foreign capital attraction. The research results emphasize the existence of the dependence of regional cluster classification on the input factors of production combination in regions.

Figure 4: Dendogram Ward Method 2009 (without developed regions)

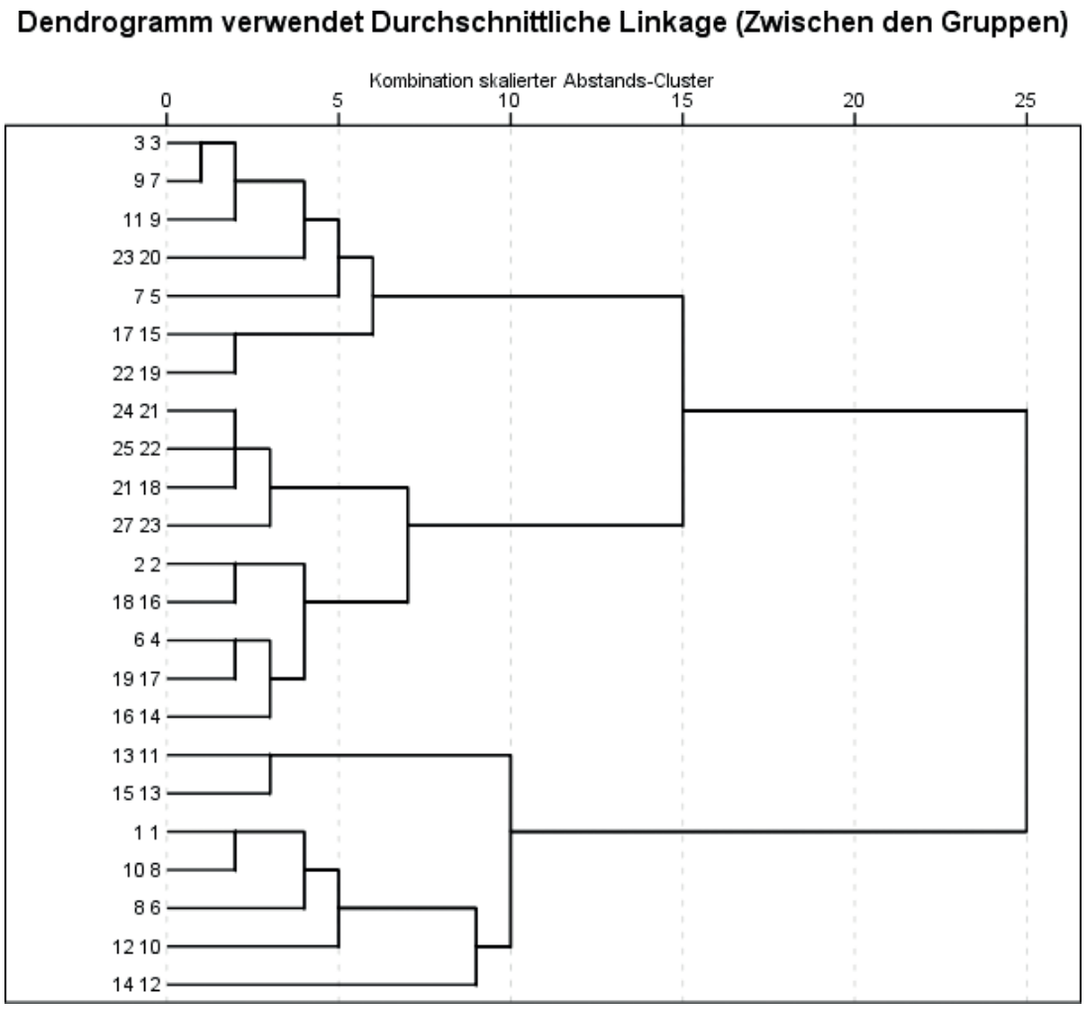


Table 1: The cluster classification of Ukrainian regions based on the main economic indicators in 2001-2009

№ Cluster	Regions of the Cluster	The Title of the Cluster
I	Kyiv (26) Kharkiv (20) Dnipropetrovsk (4) Donetsk (5)	High scientific and industrial potential
II	Autonomous Republic Crimea (1) Zaporizhya (8) Kyivskay (10) Lviv (13) Odesa (15) Luhansk (12) Mykolayiv (14)	Average scientific and industrial potential

№ Cluster	Regions of the Cluster	The Title of the Cluster
III	Vinnytsya (2) Volyn (3) Zhytomyr (6) Zakarpattya (7) Ivano-Frankivsk (9) Kirovohrad (11) Poltava (16) Rivne (17) Sumy (18) Ternopil (19) Kherson (21) Khmelnitskiy (22) Cherkasy (23) Chernivtsi (24) Chernihiv (25) The city of Sevastopol (27)	Low scientific and industrial potential

Conclusion

The analysis of empirical works on convergence (divergence) depicts that they are not adequately explained by the neoclassical model. The neoclassical model does not take into account the most significant differences between regions, and does not examine the specific factors. The research strengthens the dependence of regional cluster classification on the input factors of production combination in Ukrainian regions.

The application of hierarchical cluster analysis for 27 Ukrainian regions for 2001 to 2009 confirms the low convergence between the first and the second, the third clusters. The difference between the main economic indicators of economic development of average developed and backward regions demonstrates less heterogeneity and more homogeneity. The sufficient industrial and scientific endowment inheritance creates opportunities to exploit potentials and improvement countries position in cluster 2.

Our results suggest that the special regional policy measures may be the effective for regional inequalities reduction, and the economic growth stimulation. Efficient allocation of resources aims the adoption of micro and macroeconomic measures for labour productivity per capita increase, concentration of production growth, entrepreneurship development; and the regions' competitiveness positions improvement. The spillover effect, reduction of regional productivity differentials, and labour efficiency rise are stimulated by foreign capital inflow and labor force education and training. Lasting a long time regional growth could be achieved on the basis of elaboration and application of innovations in all sectors of production in regions.

The regional policy determination considers the regional disparities elimination and suggestion of the scenarios for smoothing regional inequalities. We consider the following basic tasks for sustainable regional development:

- the regional economic structure improvement on the basis of the production structure diversification in the regions, including the predominance of several specific sectors of economy;
- the concentration of state and business resources in the sphere of advanced new technologies;
- the interregional competition development, and, as a result, regional products' competitiveness increase to the average level in backward regions;
- to provide regional economic independence in decision making process for basic economic and social tasks solution.

The main directions of regional development could be determined in accordance with regions' belongings to the special cluster group. The following policy measures could be proposed for three groups of clusters:

- to provide the top-priority investment in R&D and in education, informational network improvement in cluster 1, which could become a locomotive for future regional innovation development;
- to increase per capita income to the average level in regions through the diversification of the production structure, subsidies elimination, unprofitable state enterprises close, human capital investment, infrastructure development in cluster 2;
- to increase fixed capital investment, to provide education improvement, subsidies, tax exemptions to backward regions until they reach the average minimum per capita in cluster 3.

Bibliography

1. Amstrong, H.W., Taylor, J. (2004), Regional Economics and Policy. Publisher: Willy Blackwell.

2. Bristow, G., Healy, A. (2018), *Economic Crisis and the Resilience of Regions. A European Study*, Edt. by Gillian Bristow and Adrian Healy, Cardiff University, UK.

3. Burda, M. (2007), What Kind of Shock Was it? Regional Integration and Structural Changein Germany after Unification, Kiel Working Papers, 1306, Kiel Institute for World Economics.

4. Burkert, C., Niebuhr, A., Wapler R. (2008), *Regional Disparities in Employment of High-*

skilled Foreigners, Journal of International Migration and Integration, Vol. 9, No. 4.

5. Damelang, A., Steinhardt, M. (2008), *Integration Policy at Regional Level in Germany*, Focus Migration Policy Brief, No. 10.

6. Forrester, J.W. (1961), *Industrial Dynamics*. Cambridge M.A. 459 p.

7. IMD World Competitiveness Scoreboard (2016). Available at: http://scoreboard-2016%20(1).pdf

8. Mogila I., Gorshkov N, Kozhemaykin S. (2009), *Productivity of Labor and Capital, Productivity and Total Factor Productivity Dynamics and Factors of their Influence,* Economics of Ukraine, No. 8, p. 4-16.

9. Naumenko Z. (2013), Regional Economic Growth Disparities in Ukraine: Input-Output -Analysis. Available at: http: //dx.doi.org/10.1515/saeb-2017-0028

10. Nosova O.V. (2017), *The Effects of Industrial Policy on Regional Development in Ukraine*, Zarządzanie Publiczne, Nr 4(42), p. 90 – 101.

11. Nosova O.V. (2011), *The Economic Convergence or Divergence Processes in the Ukrainian Regions*, Scientific journal No. 670, Vol.7, University of Szczecin, p. 63-77.

12. Nosova O.V. (2010), Econometric approach to the regional integration analysis. *Quantitative Methods in Accounting and Finance,* Research papers of Wroclaw University of Economics. Edt. by E. Nowak, R. Motorin. - Publishing House of Wroclaw University of Economics. – 2010. - P. 115 – 120.

13. Obodovska, V. (2014). *The Regional Policy of Ukraine and Poland: Nowadays Character and Prospects of Development*, Kyiv, Taras Shevchenko National University of Kyiv.

14. Polyakova, U., Babez, I. (2006), *Perspectives of participation of Ukrainian regions in the formation of the national innovation system in the conditions of globalization*. Regional economy, №3, p. 96 -102.

15. Regional Statistical Surveys Ukraine in 2009. State Statistical Committee in the Ukraine. Available at: http//www.ukrstat.gov.ua

16. Reutov, V. (2006), *International Competitiveness of the Region: Essence, Methods of Evaluation*, Economy and the State, 2006 , № 4, p. 52 – 54.

17. Shehovzeva, L. *Methodology of developing a strategy for developing the marginal region of the country in the context of the SEZ. Forecasting and development strategies of a special economic zone of Russia*. Interuniversity collection of scientific papers, Kaliningrad University, Kaliningrad, 2000, p. 20 – 32.

18. Skryzhevska, Y. (2017), *Inequalities of regional development in Ukraine: causes, consequenses, and prospects.* Miami: Miami University.

19. Tyshchenko, O. (2015), *Regional development of national economies in Poland and Ukraine: common features and differences*. Kyiv: Vadym Hetman Kyiv National Economic University.