

Original Research Article

TRENDS AND PROSPECTS FOR THE CONVERGENCE OF PUBLIC-PRIVATE PARTNERSHIPS' FINANCIAL POTENTIAL IN UKRAINIAN REGIONS

ABSTRACT

Aims:

In Ukraine, the development of partnership between the state and business is at an early stage, especially has not explored the need and PPPs' financial potential for Ukrainian regional development. the possibility of using public-private partnership in the implementation of regional development programs in local economic and institutional realities has not identified. That can be achieved in the presence of convergent-divergent trends for PPPs' public, private and financial and credit levels in Ukrainian regions. This identified the necessity the analysis of Ukraine's regions in terms of convergence the levels of PPPs' financial potential.

The main aim of the research is to identify convergent-divergent processes (convergence / zoom) Ukrainian regions in terms of potential public-private partnership and analyze the prospects and directions of approaching depressed Ukrainian regions to more advanced.

Study design: The reviews were carried out in the period 2003–14 on the basis of studying the Ukrainian region development trends of PPPs' financial potential as well as on the basis of the research results obtained by country statistics.

Place and Duration of Study: Research Centre for Industrial Development Problems of NAS of Ukraine, Simon Kusnets Kharkiv National University of economics, Department of Financial services management between January 2014 and December 2015.

Methodology: Regression analysis and bibliographic retrieval have been used as the main methods of research, which allowed making a meaningful analysis of classic papers and researches of modern economists-practitioners devoted to the peculiarities of the Ukrainian trends in convergent-divergent trends for PPPs' financial potential. Computations were performed in Application Software Package "Statistica 8".

Results: The article demonstrates a procedure for determining the convergent-divergent trends and justification of prospects for increasing the public-private partnerships' financial potential in Ukrainian regions, which is based on the adjustment of the financial policy. There was calculated the probability of transition regions to cluster a higher level of PPPs' financial potential. proceeding from it there was advice for the state support this process which will increase the financial potential sectors PPP in Ukrainian regions.

Conclusion: Regions with a high probability cluster 3 require significant state support and formation of appropriate financial incentives to empower their development. Competence in government financial policy to prevent a significant decline against the backdrop of some other areas, by creating a system of relationships between the regions and the competitive advantages of the least developed among them.

Overall, the apparent disparity of Ukrainian regions for public-private partnership financial potential requires the formulation of proposals to help create conditions for interregional equalization. Additional analysis will identify factors that causes affect the process of convergence Ukrainian regions for levels of PPPs' financial potential and provide guidance for the development of competitive advantages of the least developed regions.

Key words: public-private partnership, financial potential, convergent-divergent trends, development.

1. INTRODUCTION

The present stage of development of Ukraine's economy is characterized by increasing inter-regional differentiation, expanding the number of depressed regions. It causes to the impossibility of a single financial policy, the inability to use the potential of regional cooperation, strengthening of centrifugal tendencies, increasing sensitivity response of financial indicators for the formation of crises in foreign markets. As a result, it becomes the factors that have a destabilizing impact on the national economy.

At the end of the XX century and at the beginning of XXI century in the United States and Europe are having a fundamentally new research directions of regional dynamics - mathematically reasonable investigation of the rate of convergence (convergence) and divergence (divergence) of the main indicators of socio-economic development of regions [435]. The scientists who developed the tools and approaches to analyse trends convergence and divergence are R. Barro, X. Sala-i-Martin, K. Glushchenko, E. Kolomak, D. Zvereva, A. Iodchina, A. Lybman.

In the 90 years of the twentieth century and at the beginning it was arised fundamentally new research directions of regional dynamics (US and Europe), such as mathematically reasonable investigation of the rate of convergence (convergence) and divergence (divergence) of the main indicators of socio-economic development of regions. Among the scientists who developed the tools and approaches to analyze trends convergence and divergence, it should be noted researchers such as Robert Barro and X. Sala-i-Martin [17-19], D. Quah [20]. In Russian studies it should be noted K. Glushchenko [3-5] A. Lybman [12-13] Raevneva, E.V., Bobkov, A. Y., Gaiman, A.A. [14-16], E. Kolomak [10-11] and others.

The most important trends and contradictions formation and development of public-private partnerships in various countries covered thoroughly in the works of foreign and Ukrainian scientists, such as B. Varnavskiy [1], V. Heyets [2], A. Golovinov [6] in number of articles, legal documents of many countries, policy and analytical reports of the OECD, the European Commission, which was exposed the institutional framework and regulation of PPPs in modern conditions. However, regional heterogeneity of public-private partnerships' financial potential in Ukraine remains little studied.

The main aim of the research is to identify convergent-divergent processes Ukrainian regions in terms of potential public-private partnership and analyze the prospects and directions of approaching depressed Ukrainian regions to more advanced.

2. METODOLOGY

Regression analysis and bibliographic retrieval have been used as the main methods of research, which allowed making a meaningful analysis of classic papers and researches of modern economists-practitioners devoted to the peculiarities of the Ukrainian trands in convergent-divergent trends for PPPs' financial potencial.

General scientific methods make up a methodological foundation of the research. They include: description, comparison, statistics review, system analysis and others, which help characterize this phenomenon development in a more comprehensive way. We also apply the methods of dialectic cognition, structural analysis and logic principles that provide for making authentic conclusions as regards the investigated topic.

Official statistical data of the state institutions organizations, publications of reference character, analytical monographs, annual statistical bulletins, Ukrainian National Academy of Science reports as well as annual Ukrainian State Statistical Bureau reports serve as an information grounds for our research.

Models of time series, including also trend analysis, were used for forecasting. Computations were performed in Application Software Package "Statistica 8".

3. RESULTS AND DISCUSSION

For definition of public-private partnerships' financial potential in the implementation of regional development programs in local economic and institutional reality it necessary to check convergent-divergent trends for PPPs' sector in the regions of Ukraine. It will reveal the convergent-divergent processes (convergence or zoom) regions Ukraine by sectors of public-private partnerships' financial

potential and analyse the prospects and directions of approximating different groups (clusters) Ukrainian regions.

Forming the conditions for financial convergence is crucial to create a system of relationships between the regions and the competitive advantages of the least developed among them. Thus the set limit expansion, which is due to economic efficiency, because efficiency depends on the convergence of existing differences in financial potential, levels and rates of development of regions, overcoming significant job opportunities in key macroeconomic indicators. It can assume that different regions show various trajectory and rate growth. In this case, the alignment of economic, including financial, regional development cannot occur. The objective of government financial regional policy in this case is the adoption of tools that can raise the level of equilibrium stable states growth of underdeveloped regions.

One such tool is the public-private partnerships (PPPs), which allows to attract additional resources, reallocate risks between the government and the business sector, guide efforts to solve important social goals and objectives while maintaining the state's powers and functions. Cooperation between the state and private capital in the form of PPPs is seen as a promising mechanism of less developed regions and crisis tool further rise developed regions. It was suggest closely study at the essence of the concept of convergence and identify the specific impact of this process on sectors of public-private partnerships` financial potential.

The most widely used two concepts of convergence – β (beta)- and σ (sigma)-convergence. β -convergence concept was introduced by Robert J. Barro and Sala-i-Martin and defined convergence as the process of “increasing” in which countries with lower levels of development have higher rates of economic growth. The second type of convergence is σ -convergence, which is defined as a reduction in the time variance of the indicators of constituency in countries or regions. Hypotheses of β -convergence and σ -convergence are interdependent, but not equivalent.

A lot of studies it was proved that with absolute β -convergence σ -convergence trend is not followed. It was showing [493-495] that β -convergence is a necessary condition for σ -convergence, but not sufficient, β -convergence implies the existence of the tendency of reducing inequality, but random shocks can distort the trend and even lead to a temporary increase in differences.

Within β -convergence distinguish absolute and conditional convergence. Absolute β -convergence provides that all regions seek common trajectory proportional growth. With this assumption implies that the regions have a uniform structure of the economy, differences in levels of development are temporary and due to extremely different initial levels of income. This assumption in terms of significant economic, institutional and geographical differences between regions is unrealistic. Conditional β -convergence implies that different regions have different growth trajectory proportional, defined by specific regional factors.

The term “convergence” is used in economics to describe the convergence of different economic systems, economic and social policies of different countries, ie the convergence or levelling of the difference. Possibilities achieve equilibrium means that regions with less financial potential should be developed more rapidly in order to compare with the leaders. Figure 1 presents algorithm for determining trends in convergence of Ukrainian regions for the public-private partnerships` financial potential.

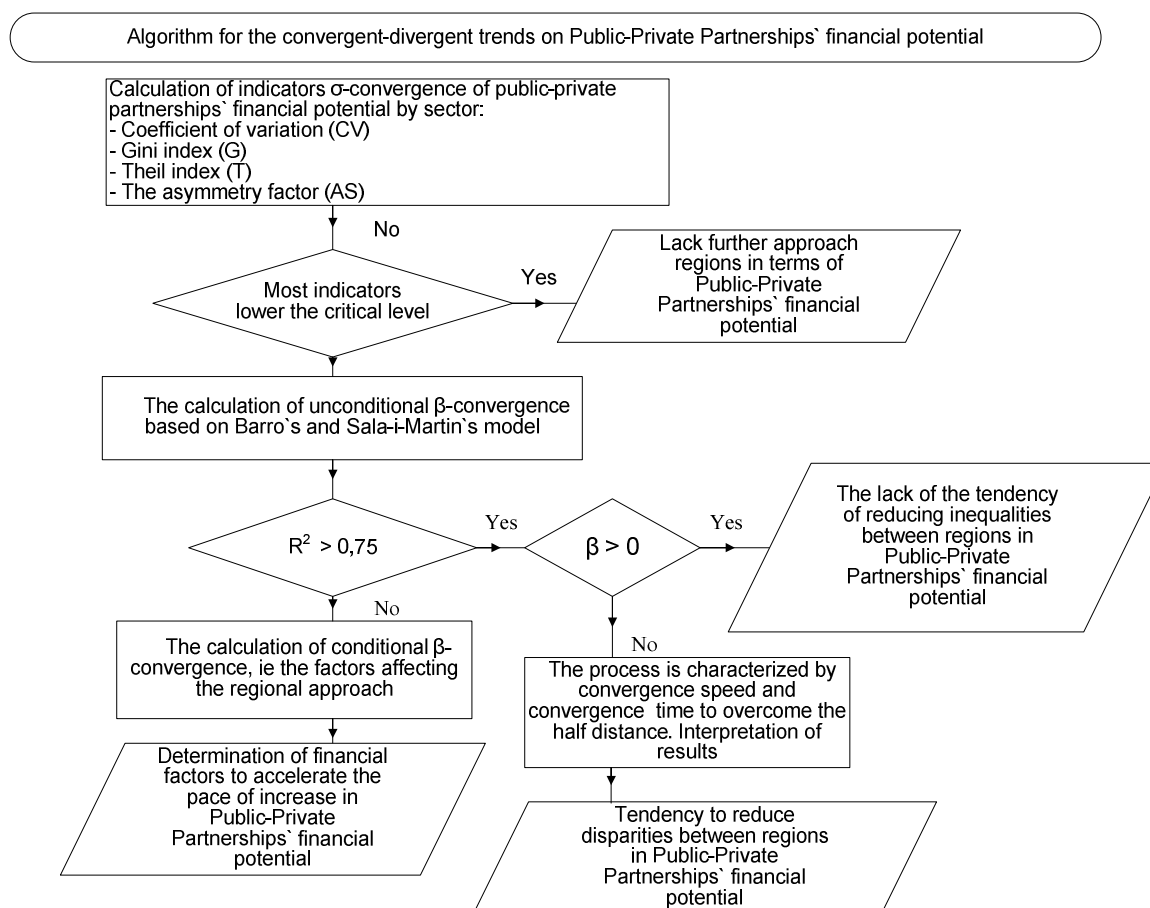


Fig. 1. Algorithm for determining trends in convergence of Ukrainian regions for the public-private partnerships' financial potential

To test the hypothesis of the presence of σ -convergence the most commonly used indicators of variation: variance, standard deviation or coefficient of variation. It preferably use the coefficient of variation: unlike variance or standard deviation is not dependent on the dimension and scale. In addition, it can use the following indicators of inequality: asymmetry coefficient, Gini coefficient and Theil index.

coefficient of variation (CV): $CV = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{\bar{x}^2}}$

Gini coefficient (G): $G = \frac{1}{n} * \frac{1}{n(n-1)} \sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|$

asymmetry coefficient (AS): $AS = \sqrt{\frac{n}{\sum_{i=1}^n (x_i - \bar{x})^2} * \frac{\sum_{i=1}^n (x_i - \bar{x})^3}{\sum_{i=1}^n (x_i - \bar{x})^2}}$

Theil index: $T = \sum_{k=1}^n \left(\frac{x_i}{\sum_{i=1}^n x_i} \ln \frac{x_i}{\sum_{i=1}^n x_i / n} \right)$

де x_i і x_j – variable value in i та j -th regions;

$i=1 \dots n, j=1 \dots n$;

n – number of regions.

For testing the hypothesis it was used calculated integral indicators of levels public-private partnerships financial potential Regions of Ukraine for 2003-2014 years. Indicators include σ -convergence coefficient of variation (CV), the Gini coefficient (G), Theil index (T) and asymmetry factor (As). Tables 1-3 show indicators for definition of σ -convergence of PPPs' financial potential by sectors.

Table 1. Indicators for definition of σ -convergence of PPPs' financial potential by public sector

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
G	4,5	4,83	2,87	3	3,91	3,47	3,12	2,82	3,54	4,67	6,14	3,64
CV	0,31	0,42	0,3	0,31	0,28	0,28	0,3	0,3	0,38	0,5	0,53	0,33
T	1,18	2,01	1,14	1,16	0,97	0,94	1,05	1,1	1,72	2,72	2,81	1,34
As	0,43	1,24	0,54	0,46	0,8	0,99	1,46	0,83	1,05	1,4	2,66	0,82

Table 2. Indicators for definition of σ -convergence of PPPs' financial potential by private sector

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
G	4,11	3,71	5,13	4,71	4,2	5,08	5,27	5,45	3,05	4,43	4,82	6
CV	0,4	0,37	0,47	0,48	0,45	0,41	0,32	0,36	0,29	0,33	0,35	0,36
T	1,63	0,19	2,39	2,3	1,4	1,09	0,89	1,35	5,96	3,13	2,93	1,21
As	2,28	1,62	2,18	2,44	2,37	1,38	0,52	0,76	0,96	1,12	0,86	1,02

Table 3. Indicators for definition of σ -convergence of PPPs' financial potential by financial and credit sector

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
G	6,92	4,25	2,53	2,41	5,61	7,63	2,29	1,52	2,33	3,73	3,7	3,69
CV	0,6	0,39	0,19	0,17	0,58	0,69	0,18	0,11	0,18	0,31	0,3	0,38
T	3,36	1,52	0,42	0,38	3,33	4,54	0,41	0,15	0,37	1,17	1,03	1,6
As	2,7	2,7	0,71	0,51	2,32	2,29	1,26	0,14	1,94	0,88	1,16	1,41

For coefficient of variation (CV) set is considered homogeneous if the ratio does not exceed 33%. Asymmetry, Gini and Theil index varies from 0 to $\ln R$. Extreme values correspond to the absolute equality of interregional and concentration of all activity in one region, respectively. The higher the index is the higher spatial differences.

The results that are shown in tables 1-3 make it possible to reject the hypothesis of the presence of σ -convergence. This demonstrates the low level of regional adaptability to changing conditions.

The base for empirical estimates is a model absolute β -convergence. As the base model in the proposed complex was considered a Barro's and Sala-i-Martin's model (model absolute β -convergence), which provides that in the long term come to the regions common to all trajectory of proportional growth.

The assumption of this model is that in the long term regions should come to a common trajectory of sustainable growth. Formally absolute convergence model can be represented as:

$$\frac{\ln(y_t/y_0)}{T} = \alpha + \beta \ln(y_0) + \varepsilon, \varepsilon \sim N(0, \sigma^2)$$

де T – the number of years;

y_t, y_0 – dimension, which includes the rate of technological progress and the level of per capita income in a stable equilibrium in the end (T) and primary (0) time points, respectively;

α, β – convergence model parameters;

ε – random component.

The rate of convergence is determined by the sign and value of the coefficient β . If $\beta < 0$, the variable in the study observed convergence. If $\beta > 0$, it is the divergence. The calculation was done using regression models growth rate parameters. The evaluation results of the model parameters are presented in the table 4.

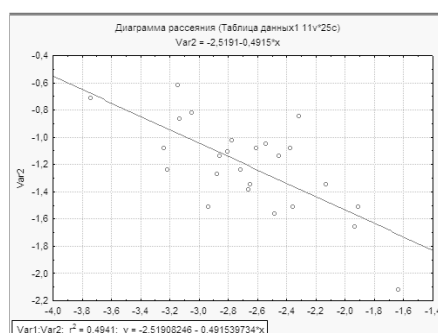
Table 4. Checking for trends in an effort to Ukrainian regions trajectory of proportional growth of the PPPs` financial potential

Indicator	β	R^{2*}
PPPs` financial potential for public sector	-0,492	0,4941
PPPs` financial potential for private sector	-0,357	0,1302
PPPs` financial potential for financial and credit sector	-0,803	0,4370

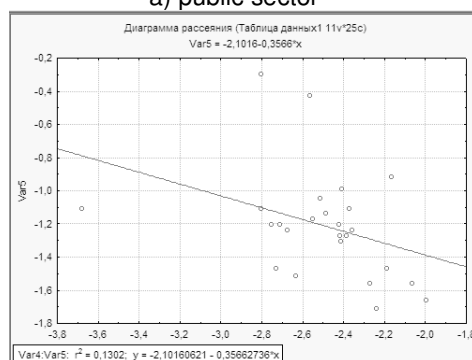
* R^2 – assessment of the significance of the constructed model. If $R^2 > 0,6$, model is adequate.

Graphical analysis of the relationship between the growth financial potential of PPP and its level suggests the weak convergent-divergent processes during the period, as evidenced by a small angle of direct (Fig. 2 (a-c)). Convergent-divergent trends are not observed.

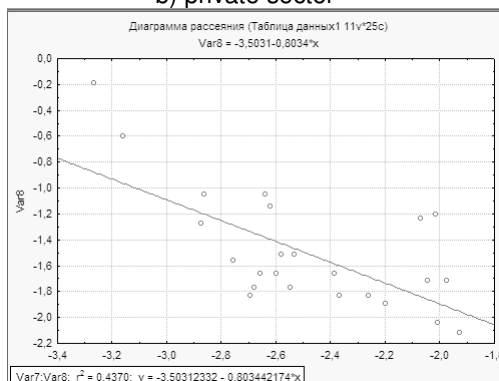
Analysis of the data, that is presented in table 4 and figure 3, suggests the statistical insignificance of parameters for absolute convergence model, confirming the hypothesis of the absence of a unified for all regions of the equilibrium trajectory of growth.



a) public sector



b) private sector



c) financial and credit sector

Fig. 2. Representation of the convergence in Ukrainian regions of the public-private partnerships` financial potential

The using performance differentiation, which is calculated by groups and formed depending on the chosen index, significantly enriching the possibilities of analysis and interpretation of data, can

quantify the uneven within individual groups. Because of space-time analysis of regional socio-economic differentiation allowed to select resistant clusters of regions with different levels of public-private partnerships' financial potential, it is advisable to assess the level of convergence for each of the clusters. The evaluation results of the model parameters within clusters are shown in table 5.

Table 5. Checking availability trends in an effort to single regions trajectory of proportional growth in clusters

Indicator	Cluster	α	β	R^2
PPPs' financial potential for public sector	1	-1,67	-4,7	1,00
	2	-3,06	-0,75	0,97
	3	-2,23	-0,32	0,88
	4	0,46	-2,13	0,46
PPPs' financial potential for private sector	1	-1,85	-0,55	1,00
	2	-1,76	-0,28	0,02
	3	-2,42	-0,48	0,49
	4	-2,92	-0,59	0,64
PPPs' financial potential for financial and credit sector	1	-12,85	-3,88	1,00
	2	-1,76	-0,26	0,93
	3	-3,28	-0,67	0,54
	4	-1,53	0,06	0,0035

The results indicate a pronounced convergence in the first cluster, indicating their relationship for the PPPs' financial potential by sectors. The lowest tendency to reduce disparities between regions is observed in the PPPs' financial potential by private sector, because of inconsistent business development in Ukraine and the inability of the private sector to participate in public-private partnerships.

Should also be noted there is the high level of convergence trends on PPPs' financial potential by public sector, because of the high level of relationships between local authorities and government, their high orderliness and financial dependence.

The next step is to determine the stability analysis of regional development further in the PPPs' financial potential, which should be defined by means of club convergence. Club convergence means that the rate of development of converging to different levels in the long term if there are structural heterogeneity and Initial conditions greatly influence the development in the economy.

Instead regression analysis D. Kwa uses Markov's chain convergence. Investigation of Markov's chains could lead to the analysis of the matrix of transition probabilities, in which each element is the probability of transition from "state n to state m». The method consists of distribution to the environments by region, starting and ending times, so-called targeted years. Then regions is ranked according to growth and the present distribution they are allocated 20% of the group. The result is matrix of transition probability in regions from one quantile to another. Transition probability is calculated as the ratio of the frequency of passages to the initial number of regions in group:

$$P = \frac{n_{in}}{N_{i0}}$$

n_{in} – the number of regions that have moved from group i in group j ;

N_{i0} – the number of regions in the group i at the initial time.

Dividing regions and clusters by examining the dynamics of their assignment to a cluster afterwards define the number of stable positions and transitions to other clusters. It determines the potential for permanent formation of clusters in terms of PPPs' financial potential and the probability of transition to a higher level cluster. The transition each region for the period is reflected in the matrix of transitions (see table 6).

Table 6. Matrix transition Ukrainian regions between clusters in public-private partnerships' financial potential

Groups by level of PPPs' financial potential		The final state				Number of initial states in the cluster
		Cluster 1	Cluster 2	Cluster 3	Cluster 4	
The initial state	Cluster 1	23 (94%)	1 (2,2%)	0 (0%)	0 (0%)	24
	Cluster 2	1 (4%)	34 (73,9%)	7 (6,2%)	7 (8,5%)	49
	Cluster 3	1 (4%)	6 (13%)	84 (74,3%)	21 (25,6%)	112

	Cluster 4	0 (0%)	5 (10,9%)	22 (19,5%)	54 (65,9%)	81
	Number of final states in the cluster	25	25	46	113	

4. CONCLUSIONS

Ukraine has already exhausted itself as a country producing cheap labor force with predominantly low-technological and energy-inefficient industry. At the same time it has a chance to make a breakthrough on nanotechnologies market thanks to the accumulated intellectual potential.

In Ukraine conducts fundamental and applied research in the field of nanotechnology in areas such as medicine, biology, agriculture, environment, energy, industry, space exploration, kibernetka, electronics and others, the results of which received a number of practical results and technologies of world level. At the same time, the priorities of these studies need to be clarified in accordance with the global problems to be solved any country, including taking into account national specificities manifestation of these problems, and in accordance with the existing potential and possibilities of nanotechnology research as NBIC-society.

Comparative analysis of the publication activity of researchers in the field of nanotechnology in the leading countries of the world and Ukraine has shown that in general, the dynamics of research in Ukraine responsible global trends, but much slower. In order not to lose the existing potential in this area is needed state support of local development, especially at the stage of basic research and institutional support to the interaction of science and business at the stage of applied research.

The main fields of research in the field of nanoscience is the development of nanomaterials and nanobiotechnology nanoelektroniks. The peculiarity of Ukrainian research field is the high proportion of developments in the field of nanomedicine&nanobiology and that allows us to consider these areas as the competitive advantages of nanotechnology development in Ukraine. At the same time a very small number of publications in the field of nanoelectronics and nanotechnology in the energy sector shows a substantial backlog of global trends. In this regard, it is developments in the field of nanoelectronics should be a priority of state support for the revival of high-tech engineering.

The low level of patenting in nanotechnology development in Ukraine, says the need, on the one hand, to stimulate applied research, and on the other, improving procedures for obtaining protection. The almost complete absence of international patent speaks of the need for more active cooperation of Ukraine with the European and international patent organizations, in particular, in the preparation, filing and maintenance of patent applications under the Patent Cooperation Treaty.

It is important to create a system in Ukraine for long-term forecasting and strategic planning of scientific and technological innovation and development until 2030. However, above all, the need to assess the presence in Ukraine breakthrough research and development in nanotechnology, and to identify the possibility of commercialization and impact on economic development and solving urgent national problems.

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