THEORIES OF THE SPATIAL ECONOMICS IN TERMS OF ECONOMIC INTEGRATION

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Abstract. *The purpose of the study* is to clarify theories of "spatial economics" and to analyse the theory of "new economic geography", in particular, to find out peculiarities of the spatial economics theories applying in the context of integration of Ukraine into the European Union and to simulate theoretically the consequences of Ukraine's accession to this integration group. *Methodology.* The theoretical and methodological basis of the research is the principles of the spatial economics theories, scientific works and researches of domestic and foreign scientists. The methodological grounds for the study are both general scientific and special scientific methods, which in the complex are used to achieve the purpose of the study. The historical-evolutionary and critical-constructive analysis, theoretical generalization (in the study of approaches to the analysis of the spatial economics theories); induction, deduction, generalization and comparison (in the study of the main principles of the theories of spatial economics using in terms of economic integration); abstract-logical and graphic interpretation (in the study of the peculiarities of integration of Ukraine into the European Union) are used. *Results.* The basic idea of the spatial economics theory is that the size of the market interacts with economies of scale at the firm level and transport costs, and forms the division of economic activity of the country in a spatial aspect. Applying the basic principles of the spatial economics theories to Ukraine made it possible to distinguish several main features: the difference in the country regions development; the probability of becoming a new "periphery" of the European Union; the relations between Ukraine and European Union in the "centre-periphery" aspect depend on the economy's openness and the cross-border interaction of Ukraine with the so-called "eastern periphery" of the European Union. *Practical implications* are to develop recommendations for the successful economic integration of Ukraine into the European Union. *Value/originality* is the theoretical generalization and development of the concepts of spatial economics in the international economic integration process. The highlighted theoretical positions can be used for further study of theories of spatial economics.

Key words: international economic integration, theory of new economic geography, periphery, spatial economics, economies of scale, economic growth.

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1. Introduction

The spatial theories of international trade and "new economic geography" theory make it possible to reveal the nature and peculiarities of the international economic integration process. The high level of interregional differentiation determines the urgency of the research of the European integration process within the theories of spatial economics.

The first spatial theory of economics model is described by J. von Thünen in "The Isolated State in Relation to Agriculture and Political Economy" (Thünen, 1826). Graphically the model is presented in the form of six concentric circles, where each next circle includes the previous one and indicates the use of land around the market centre: a) the "free" economy;

b) the forestry, which supplies products to the "centre" (1st circle); c) the farm with the typical crop rotation cycle; d) the economy is based on the main products of circle such as crops, land is used less intensively than in the previous circle; e) classical three-field grain farming; f) extensive stockbreeding, the agriculture only for consumer purposes.

J. von Thünen described in his model the combination and interaction of three factors of production placement: the agricultural products prices, rent, and distance to the market (Thünen, 1826).

The main idea of J. von Thünen is the denial of absolutely advantageous use of land existence because it depends on natural, social, and economic conditions. The distance from the "centre" causes the farming

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extensiveness, increases the transportation costs, and the cost of output per unit, although the market value of grain is approximately the same in all land systems.

Another model divides "world economy" into "the main centre" and "external peripheral areas". "The main centre" indicates the greatest capital, goods and labour concentration, and the nature of the interaction between central and peripheral structures is determined by the flows' direction, transforming the space into a kind of force field. The "peripherals" imports the capital by converting it into the cheap resources and the cheap consumption. The "centre" imposes to the "periphery" its value of standards so that "peripheral" territories receive the status of "developing countries" (Alhovitska, 2008).

W. Christaller (Christaller, 1933) described the spatial laws of cities location, which are needed to improve the territorial organization of society and to improve the administrative-territorial order of Germany in his work "The central place in Southern Germany". Under "the central place" W. Christaller understood a big city, a metropolis that is provided with all necessary goods by the cities around. The main assumption of Christaller's model is: the small cells settlements that are perfectly placed and form a regular triangular mesh, zones of goods' sale are evenly distributed and have the shortest way to the consumers. One can say that in any "centre" we have the same number of "cells" (settlements). W. Christaller has also introduced the concept of "range of services and products sales" that determinates the low profitability limit and the production efficiency and indicated three levels of the settlements' size: the settlement oriented on the sale; the transport orientation, and the administrative orientation.

The "centre-periphery" concept in the classical form was proposed by J. Friedmann in "Regional Development Policy: a Case Study of Venezuela" (Friedmann, 1966). J. Friedmann's model determines the "centre" as a developed city with the latest technologies, and the "periphery" means the less developed area around that supplies resources to the "centre" and at the same time consumes the new technologies.

J. Friedmann distinguished four types of economic districts: the core districts with highly developed branches of economy, high technologies and fast modern innovations; the rapidly developing peripheral regions that use the innovations of the core regions; the new territories development areas; the depressed areas – the underdeveloped areas of the distant periphery.

J. Friedmann divides "centre-periphery" relations into four levels: 1) the country territory with a certain number of core districts with the certain influence spheres; 2) the most significant core forms around a polarized region with a wide periphery; 3) peripheral regions that grow into the regional cores; 4) inter-peripheral relations (Friedmann, 1966).

The economy of two regions and two factors of production were proposed by J.-F. Tyss (Tyss, 2013).

One production factor (unskilled labour) is spatial and fixed and is used as a resource in the traditional sector. The second factor (skilled labour) is spatially mobile and is used as a resource in the industrial sector. In the so-called "centre-periphery" model, two main effects are present: companies' effect and labour effect. The scientist suggested the existence of two different regions' sizes; the larger one presents the high demand for the manufactured goods that increases the number of firms with highly paid workers. The growing assortment of the local production is the result of the increasing number of firms. This region attracts new workers causing cumulative causality process that leads to the accumulation of firms and skilled workers in the same region – "in the centre", while the second region becomes the "periphery" territory.

2. The scale effect in spatial economics theories

P. Krugman proved that the economies of scale in production along with consumers needs for the diversity can promote trade between the countries, which are identical from the point of view of technology and the factors of production provision (Krugman, 1991).

The world market allows some circumstances where the large states with low income have more opportunities to benefit from trade than small countries with low income. For example, in case of trade in goods where production involves increasing the scale of the return flow, large countries should have an advantage because of their internal markets capacious facilitate the realization of scale (Dovbenko, 2008).

The overall international economic integration effect is a set of the diversified effects in the short and long terms (Mokiy, Chornyy, Yuzba, 2008). In addition to benefits associated with the trade balances settlement, countries benefit from the specialization, economies of scale, and welfare growth. Economies of scale effects are directly related to the markets sizes, which increase with a free trade area and customs union creation. Reducing costs and respectively commodity prices reducing cause the internal and external demand growth and, in turn, stimulate innovation and lead to a general acceleration of economic growth. Another advantage is the increase of inter-company competition as a result of the trade barriers removal. The maximization of these effects is achieved within the scope of a single internal market functioning in the integration association, the economic and monetary union (Mokiy, Chornyy, Yuzba, 2008).

I. Lishchynskyi notes the following pattern: the greater positive effect of scale causes the more incentives for the agglomeration arise. Firms try to reduce their costs by the consolidating production and placing near the most important suppliers (Lishchynskyi, 2009).

According to E. Helpman, the bigger country benefits from economies of scale and it should be expected that these benefits will take the form of relatively lower

prices for industrial products. Consequently, one can note, that in the case when two countries are in autarky conditions and are identical in all respects, except their sizes, the larger country will have a relatively lower price for the industrial goods. However, if these countries begin to trade with each other, trade between them will not be inter-sectoral, but intra-industry.

G. Grubel and P. Lloyd proposed an Intra-industry Trade Index (IIT), known as the Grubel-Lloyd's Index (Grubel, Lloyd, 1975):

$$IIT_{ijk} = \frac{2\min\left\{X_{ijk}, X_{ikj}\right\}}{X_{ijk} + X_{ikj}}, \quad (1)$$

i – industry index j; k – country index; X_{ijk} – export of products from the industry i from country j to country k. The index can get 0 (when there is no intra-industry trade) or 1 (in case of intra-industry trade).

P. Krugman's approach is based on the function of benefits of Dixit-Stiglitz (Dixit, Stiglitz, 1997). In simplified form, this function is:

$$U = \left[\sum_{i=1,...,n} x^{\sigma}\right]^{\frac{1}{\sigma}}. \quad (2)$$

Function (2) makes it possible to make models with any number of similar but different goods i, and the substitution elasticity of products is uniquely determined by the parameter σ. Demand for goods i depends on its price p_i and prices for other goods p_j are as follows:

$$x_i = Kp_i^{-\frac{1}{1-\sigma}}, \quad (3)$$

$$K = \frac{Y}{\sum_{j=1,...,n} p_j^{-\frac{\sigma}{1-\sigma}}}, \quad (4)$$

where Y – total income/expenses of consumers; the indicator in the denominator (4) can be interpreted as a general index of prices. A similar preferences function is quite convenient for monopolistic competition modelling case: each firm produces its goods i; since the goods are slightly different, firms sell their goods at a price that exceeds the marginal cost, which allows them to cover the constant production costs. The number of firms (and, accordingly, goods) is n endogenous.

P. Krugman's approach (Krugman, 1991) differs from the positions of his predecessors of the study because he builds his analysis on the assumption that the only factor of production is labour. Paul Krugman's main idea is the assertion that economies of scale can be an independent cause of international trade, even in case of the comparative advantages absence. Consequently, let L be the only production factor, then all costs can be treated as labour costs:

$$L = n(F + cx), \quad (5)$$

$$n = \frac{L}{\sigma F}. \quad (6)$$

When a country begins to trade, internal firms continue to produce their own goods but domestic consumers buy foreign goods too. At the same time, trade benefits arise not because of differences between countries, according to the traditional theory of international trade but due to the similarity of countries.

Suppose, two countries do not differ in production (expenses) conditions and consumer tastes and use respectively L_1 and L_2. In the autarky conditions, the number of goods (brands) is:

$$n_1 = \frac{L_1}{\sigma F}, \qquad n_2 = \frac{L_2}{\sigma F}. \quad (7)$$

When countries begin to trade, with full employment, the total number of goods (brands) becomes the same:

$$\frac{L_1 + L_2}{\sigma F} = n_1 + n_2. \quad (8)$$

This situation is favourable for consumers because of the goods usefulness enhancement along with stable prices and the wide assortment of goods.

As for the transport costs between the two regions, P. Krugman proposed two assumptions: 1) transportation costs of agricultural products are zero; 2) transportation costs for industrial goods are in the form of so-called "iceberg". P. Krugman predicted that the transport costs for the transportation of goods are quite high and it is not favourable for the transportation of goods between regions. In this case, the regional economy shows the symmetrical structure of production. In case of trade barriers absence between the countries (tariff and nontariff), and the transportation costs are minimized, in economic terms, the supplier firms have a little difference between the consumers inside the country and outside it (Matveenko, 2011).

The integration effects according to the theory of P. Krugman are: the number of firms represented in the market of each country increases and foreign producers enter the market; the total number of firms in the world decrease; the remaining firms in the market become larger, and as a result, more efficient.

Consequently, the trade barriers abolition leads to the consolidation of firms. At the same time, integration has some negative consequences: many firms of the integration group will disappear. P. Krugman assumed that, conversely, all participants would benefit from the integration due to the average production cost reducing and the increasing of the range of products on the market.

In turn, K. Lancaster showed that due to economies of scale the equivalent number of differentiated goods will be larger because of the larger market. Accordingly, it can be assumed that the intra-industry trade volume will be positively correlated with the national market size, that is, it will be larger in a country that has common borders with its trading partners. The use of variables such as distance and borders allows testing the hypothesis that, in addition to the importance of distances for intra-

industry trade, common borders are important too (Lancaster, 1980).

P. Falvey discovered that the intra-industry trade volume varies conversely in relation to the tariffs changes and trade restrictions in general (Falvey, 2007).

A. Yermalonok and Y. Semak in their studies consider synergistic effects of the economic integration (Yermalonok, Semak, 2008). Analysing the regional integration economic effects, they came to the conclusion that the agglomeration and emergent effects are the main mechanisms for the synergistic integration effect creating. The agglomeration effect is associated with the quantitative indicators increase, while it is noted the transformation of the quantitative indicators into the qualitative ones and it is expressed in economies of scale. An emergent effect is related to the integration union essence as a system by reverse relations. At the same time, both positive and negative effects are possible.

One can say that joining the integration union creates a single market with the major firms that are the most effective and able to withstand the competitive pressure. In addition, the removal of political and economic barriers leads to the increasing trade between the members of the integration union and the reducing transaction costs.

The scale effect can be viewed through the prism of dynamic effects. In the short run, one should not expect significant positive results, but inefficient companies will gradually disappear from the internal market, the foreign direct investment inflow will increase and the technology will change, etc.

A new theory argues that the main part of the trade exchange, particularly the intra-industry trade between countries with the similar specialization is formed rather by the increasing returns on scale production and not by using the national advantages factors. The demand for products is decisive in the growth rate of production.

P. Krugman predicts that the imperfect competition and the increasing returns make some opportunities for the strategic trade programs introduction to create the comparative advantages by the promotion and supporting those sectors where economies of scale is possible (Smal, 2009).

The traditional concepts of expansion and redirection of trade flows are realized in cases of economies of scale at the enterprise level but they need to be supplemented by new ones, namely: the cost reduction effect and the decrease of trading activity. The first one is related to the average production costs decrease with the growth of domestic production output due to the formation of integration areas, the second one – with the cheap import substitution from non-member countries by domestic products, which became cheaper due to economies of scale. The effect of costs reducing is stronger than the decrease of trading activity effect, and, therefore, it does not exclude the possibility of obtaining net benefits (Kavtsenyuk, 2008).

Economies of scale are directly related to the size of the market, which increases with the free trade area creation, a customs union creation and so on. The costs reduction and, correspondingly, commodity prices reduction help to increase both internal and external demand and, in turn, stimulates innovations and leads to the economic growth. Another advantage is the revival of inter-firm competition, which is caused by the trade barriers removal. It is possible to maximize these effects within the framework of common market, economic and monetary unions of the integration association. A. Filipenko refers the technological upgrades to the advantages too (Filipenko, 2005).

The most obvious consequence of the customs union is the expansion of the market. Market expansion promotes the economies of scale in many industries, which cannot be achieved on narrow national markets.

3. The "centre-periphery" model in the European integration process

We highlight some peculiarities of the EU enlargement process:
- countries are integrating into the European Union gradually moving from the free trade area to the political and economic unions, and each country needs different time for it;
- the EU is not a homogeneous integration group (there are rich and poor countries in political and economic aspects);
- the complete successful integration of countries into the EU is possible within the overcoming of obstacles on the way to this integration group. The EU countries are represented as a "core of gravity" (core 1) (Fig. 1).

Cores 1 and 2 are highly developed member countries. The European Union, in particular, can distinguish the central core 1, which consists of only six founding countries, but with the greatest political influence on the processes taking place within the framework of the integration group.

The countries integrated in (and after) 2004 are shown in the core 3, as well as the countries in core 4 belong to the so-called "internal periphery", and have no significant impact on the integration process acceleration and cannot obtain all rights and benefits without a transitional period. Core 3 includes countries that form the internal periphery (the EU member states integrated after 2004 – Poland, Hungary, Cyprus, Slovakia, Czech Republic, Slovenia, Estonia, Latvia, Lithuania, Malta).

Core 4 includes non-member countries but with a chance of successful integration through fulfilling certain conditions and overcoming the internal political and economic barriers. The peculiarity of the core 4 is that a country may remain outside the integration group for a long time or never integrate. Countries that form
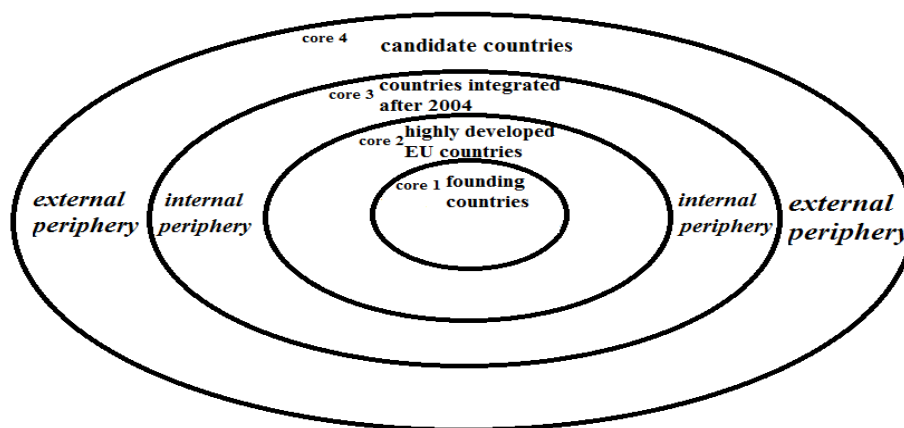
Fig. 1. The "centre-periphery" model in the European Union

Source: made by the author

the external periphery are candidate countries – Albania, Bosnia and Herzegovina, Montenegro, Moldova);

Association Agreement between the European Union and Ukraine gives an opportunity to the Ukrainian enterprises to receive free access to the market of the EU member states and, consequently, the benefits arising from the growth of sales of Ukrainian products. However, on the other hand, the inflow of European goods to Ukraine is expected. It is supposed, P. Krugman's open economy model implies Ukraine's integration into the EU. In case of the Ukrainian market opening for EU member states, the demand curve D and the supply curve S of the industry will take the form represented in Fig. 2

With the opening of the Ukrainian market for goods from EU countries, the supply curve S will move to position S1, which, in turn, will mean an increase in the number of firms in the Ukrainian market. The increase in the number of goods from the EU market will cause the price reduction in the internal market of Ukraine to *P1*. Due to the scale effect growth and the demand growth on the large assortment of products, even countries with similar economies and production structure can benefit because they trade in differentiated goods.

Fig. 2. Open economy model of P. Krugman

Source: (Krugman, 1991)

P. Krugman argued that the labour market is characterized by the high level of interregional migration, which promotes the integration of firms and workers in the integration process with a positive effect of scale and trade costs (Krugman, 1991).

In the "core-periphery" model of P. Krugman (Izotov, 2013), it is assumed the existence of two types of production in two regions. According to the model, all individuals in the economy jointly participate in the formation of Cobb-Douglas function of utility:

$$U = C_M^{\mu} C_A^{1-\mu}, \qquad (9)$$

where C_A – agricultural products consumption; C_M – consumption of the aggregate value of the industrial product.

In Equation (9), an industrial product will always have a share of costs μ, which is one of the key parameters that determine convergence or divergence of regions.

Suppose, there are two regions – Ukraine and the EU. Ukraine acts as the single largest region and the European Union unites 28 regions that act as the only entity. The next assumption is the abolition of all trade restrictions. So, we can assume two varieties of developments:

a) The European Union "entices" the labour force and the main types of production, and Ukraine will remain an agrarian periphery.

b) The European Union will enter the Ukrainian market and place some types of production here, the inflow of labour force will increase, and foreign direct investment will grow. The positive effect of scale will encourage firms from the EU to deploy their production facilities on the territory of Ukraine and serve more consumers at a distance.

The main idea of P. Krugman predicts the competition growth in the internal market of goods and labour with the new firm appearance and it will reduce the company's profits but the increasing demand for more expensive labour will increase the goods differentiation.

The migration in the economic integration process will lead to a fall in labour competition that will increase the company's profits and encourage it to place the production here in order to get the benefits of return on growth scale.

F. Graham argues that, in the economic integration process, a small country will be filled with goods manufactured in sectors with a high level of positive scale effect of a large country (Graham, 1923). The low level of economic integration provides a single equilibrium with an equable labour division in both regions. The reduced trading costs make possible three equilibrium situations in the industrial location model: one is unstable – with an equable labour distribution, and two stable ones – with a labour force concentration in one of two regions. At an average level of integration, the centripetal forces are too weak to unbalance the initial symmetric equilibrium.

According to P. Krugman, the scale effect exists exclusively at the firm level and the centrifugal factors that make firms focus on the goods production in one region, arise from three components: scale effect, transport costs, and mobility of factors production. The company will produce goods near the markets for minimal transport costs. In addition, P. Krugman outlined two groups of factors of the competitive advantages of the territories:

1) natural resources availability, favourable geographic and transport location, which allows minimizing transport costs;

2) artificially created advantages of the country (agglomeration effect due to the population density, which provides economies of scale), population mobility, developed infrastructure, etc. (Krugman, 1991).

4. Conclusion

Analysing the theory of "new economic geography" in the light of Ukraine's integration to the EU, one can come to the conclusions: the deeper economic integration into the European Union cause the greater inclusion of "peripheries" to the main territory, while "centre-countries" tend to close their borders. Ukraine is the complicated case because of the war with Russia. For the European Union, Ukraine has a status of the "periphery" not only in the geographical terms but because of the socio-economic indicators. Today, we can assume that the EU members that have joined the EU in 2004 are the "Eastern periphery", while the Ukrainian integration to the EU will inevitably arise the competition among "peripheries".

The European integration process provides the territorial division of the country rather provisional. Each region of Ukraine will have the disunity from the administrative functions. The "centre"-regions will grow faster due to the agglomeration effect and the specialization (production) of goods in the so-called "new" sectors and due to its geographical location. The "peripheral" territories that are specialized in the traditional goods production will benefit from the overall economic growth as a revenue growth of the unskilled workers.

Ukraine needs to overcome the centripetal forces in the integration process, which cause its transformation into the EU's periphery and, theoretically, can complicate or slow down the European integration.

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