

New Economic Geography as the Theoretical Platform of Region Innovative Development

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Abstract

The article shows the evolution of the policy of innovative development of the regional economy in recent decades. Particular attention is paid to industrial and technological component of the theory of New economic geography and justification of the growing role of institutional factors in the innovative development of the regions. Based on the analysis of the main ideas of the theory of Nobel laureate Paul Krugman, the author identifies the base institutional factors of competitiveness policy of the regional economy in the 21st century. The directions of this policy in the technology developed countries are: support of cooperation system of all levels and subsystems of national innovative system; strengthening of institutes of innovative economy, including support of the competition and improvement of intellectual property protection system, partnership of the government, the regional authorities and a business sector in implementation of innovative programs and projects.

Keywords: placement of regional economy, New economic geography, regional innovation policy

1. Introduction

The problem of innovation development in the region is not a new topic for the world community; territorial centers of science and new technologies has always existed in the world, but the formulation of its priority, selection as the main direction of regional economic regulation in industrialized countries belongs to the beginning of the 1990s. The changing role of the region in the realization of innovation sphere is particularly identified in the exchange of the central concepts of the government regulation object: from the Science Policy in the 1960-1970s to the Science and Technology Policy (S&T) in the 1970-1980s. In the 1980-1990s S&T has transformed to a policy based on a combination of technology and economy – Economy and Technology Policy (E&T), and, finally, in the 1990s in many developed countries almost simultaneously began the integration process of scientific, industrial, partly economic and regional policies into innovation one, which in this article we are going to discuss in the framework of New Economic Geography (NEG).

2. Literature Review

The New Economic Geography is a type of economic analysis, which is aimed to explain the agglomeration effects and advanced development of regional economy by creating models of an imperfect competition with increasing returns. Development of NEG, according to Thisse (2011), was a result of the increased interest of economists to the new problems of territorial organization of world economy, appearing new centers of economic growth, that were previously depressed. Emergence of the new direction in economic science is associated with the name of Paul Krugman who developed the idea of famous scientists of the regional economic theory and who first tried to apply a new analytical tools to research the subject sphere of economic geography (Krugman, 1991a). The finalization of the New Economic Geography is connected with studies of Krugman (1991a, 1991b, 1996, 1998) and Fujita et al. (1999). Despite the critique of a number of authoritative scientists, Paul Krugman was awarded the Nobel Prize (2008) for the analysis of placement of economic activity.

2.1 The first model of the economy placement in the NEG

New economic geography as a scientific discipline has been opened in famous article «Increasing returns and economic geography» (Krugman, 1991a). Krugman's model describes the two regions, which economies has two sectors - competitive agriculture with constant returns and immobile farmers, where all the factors of production are dispersed in space; monopolistically competitive industry, which is characterized by increasing returns at the firm level, mobile factors of production (including mobile workers), the ability to migrate to the region with higher wages and transportation costs.

In agriculture, in view of the constant impact of the size and immobility of factors of production the placement of farmers is determined externally, through the distribution of agricultural land. In industry, on the contrary, there are increasing returns and consequently a desire to be placed in a large market in order to minimize transportation costs. Industry products is experiencing the effects of «melting» in transit. With poor transport and road infrastructure, a significant portion of the manufactured product «melts» in the transport process.

2.1.1 Agglomeration effects in the traditional economy

The interaction between the mobility of production factors, increasing returns and transport costs creates forces for agglomeration: firms start to concentrate production in areas with good access to markets, but market access is good exactly where other firms are concentrated. A positive feedback, when industrial production is concentrated in a large market, but the market will be large, where industrial production is concentrated. Very quickly, the centripetal force as a result of the interaction of economies of scale, transport costs and factor mobility lead to the fact that the industry is concentrated in only one region. The role of centrifugal forces performs the immobility of dispersed located agriculture.

When the aggregate index, which also takes into transport costs, economies of scale and the share of non-agricultural products in costs, oversteps certain bounds, the population of the region begins to concentrate in the center, and the two regions differ in their development trajectories. If the small part of the population employed in industry of the region, if transport costs are high, then the effect on the amount of savings is weak and there is no positive feedback, economic externalities.

In the case of high transport costs, intra-regional trade is insignificant, so the wages that workers can get depends only on the size of the local competition. On the other hand, when transport costs are low, a typical firm sells active in both regions, but due to the fact that it had better access to markets if it is located in a region with a larger population, it can afford to pay higher wages and purchasing power of these salaries is also higher because workers have better access to consumer goods. The increasing concentration of industrial workers in one region eventually leads to an even greater concentration in this region.

Two regions gradually differentiate into the industrial core and agricultural periphery. In order to realize economies of scale and minimize transportation costs, industrial firms are located in a region with high demand, but demand for accommodation itself depends on the location of industrial firms. The emergence of center-periphery model depends on transport costs, economies of scale and the share of industry in regional income.

2.2 The second model of the economy placement in the NEG

In his second model, Krugman (1993) describes 12 placements, so it is often called clock model. Transportation is only possible in a circle. As a result, there are two iterations of the model of industrial agglomeration, located almost opposite each other. These agglomeration create a kind of shadow, which prevents the formation of other agglomerations too close.

In this model, factors of production are immobile. But here is also the opportunity for increasing returns due to differences between agriculture with constant returns and the industrial sector with increasing returns.

Both sectors use intermediate production factors. The basic idea is that the producers of intermediate goods in the region with a large industrial sector will have better access to markets and producers in these markets, in turn, will have the advantage of better access to intermediate goods produced in their own region (supply communication). There is a single industrial complex.

Delivery transport costs of industrial goods between the two regions is gradually changing. If they are high, each region is self-sufficient. If they gradually fall, industrial firms then begin to export their products. In this case, the producers of the region with a little more industrial sector get the advantage of better access to markets as well as to suppliers. If transport costs fall below a critical level, the process of differentiation between regions will take and industrial firms will concentrate in the nucleus, and peripherals will go to primary production. The industrial sector in lagging regions is destroyed by industrial exports in the region leader.

The impact of this process depends on the size of the industrial sector, more specifically on the share of manufactured goods in the costs. If it is small, the core region does not get much higher salary from its role. But if the proportion is high, then the salaries in core would be higher than in the periphery and the process of polarization will be held.

2.2.1 Agglomeration effects in the context of globalization

The same model predicts that the continued reduction in transport costs (the globalization process) will gradually turn the wheel of fortune. The reason is that the peripheral region has the advantage of lower wages. Initially, this advantage is covered by better access to markets of the central region (marketing communication), and the factors of production (supply connection). But as transport costs fall, the importance of these connections is also reduced.

Therefore, the second critical point is when the industry finds it profitable to move to places of low wages. This is an interesting result, the hypothetical history of the world is built as a result of a monotonic change in transport costs over time. We can observe the evolutionary path of the world economy, in which the inequality of nations and the world into primary and industrial producers first arises spontaneously, then disappears in the same way (Krugman, 1996).

Economic logic of NEG models is simple: *ceteris paribus*, manufacturers will concentrate its production in a few places, because there is an effect of economies of scale at the plant level. At the same time, with a non-zero transport costs these areas will have a good market access, where market size is measured as the number of consumers and workers. This process has the ability to self-empowerment: the core attracts firms or workers, which increase the size of the market, attracting more firms and workers in small regions and so on. Two different mechanisms can generate this self-reinforcing process. The first is based on the connection between mobile workers and the demand for goods. The second is based on vertical links between imperfectly competitive mining and manufacturing industries.

As economic integration affects the trade and transport costs, it really changes the placement of industries, facilitates the movement of goods, capital and labor. Reduction of tariffs and other trade barriers increases the foreign demand for local goods. If foreign markets are larger than local, domestic manufacturers have relocated closer to these markets. In closed economies, centers are located far from the border, there are little positive externalities.

Agglomeration of economic activity primarily occurs in sectors where there are the effects of increasing returns, significant market power, consumers and suppliers are mobile and trading costs are low. In models of new economic geography as a result of the company are located in areas with good access to markets.

2.3 NEG and the government innovation policy

In our opinion, approach of New Economic Geography is more exact than others in explaining of the territorial economic development that is connected with the growth of innovative assets cost that are situated in the region and are involved in global system of economic exchanges. We consider the policy of New Economic Geography as dialectic denial of regional S&T and T&E policies, a new view on regional development as market saturation of economically connected territory (regions) of one or several countries of resources, technologies and products of innovative economy.

In spite of the fact that P. Krugman does not consider the role of the government in NEG, the analysis of state regulation of the innovative sphere in the developed countries shows that it has passed deep evolution and is based on the principles of NEG especially since the end of 1990s.

In the 70-80th of the XX century, the state policy consisted in scientific and industrial support of innovations in the separate directions, branches and regions. This period is characterized by expansion of the government financing of fundamental science sector, technological innovations and stimulation R&D as in big companies as in small and medium-sized ones; assistance in improvement of innovative management; state stimulation of cooperation between the research centers, universities and the companies. In the 1970'th the main components of the mechanism of state regulation in the USA, England, Germany, France, Japan were: programs on development of definite regional branches, target programs of starting the research centers, selective encouragement of import, development of venture and state funds of S&T development etc. More than that, the logic of parallel regional realization of S&T development and programs is accurately represented. It provides the solution of number of tasks: receiving synergetic effects, creating the competition between developers, formation of a network of regions – «locomotives» of S&T policy aimed to «start» mechanisms of diffusion of innovations, support of effective information communications and contacts between the companies, developers and others (Puga & Venables, 1997).

The 1980th are distinguished from 1970th by active regionalization of scientific researches through creating scientific parks and the technopolises, focused on development of local economy, modernization of stagnating branches, strengthening the union of education, science and production (Curry, 1989).

The first strategic international research unions and consortia are founded; their purpose is getting access to the latest foreign development, stimulating the companies located in the country, but belonging to foreign owners, running joint R&D. During this period are actively practiced both direct and indirect measures of state regulation of innovative development of regions. The special place in system of direct measures of government influence on innovative business

is taken by the actions that stimulate cooperation between universities and the industry and development of small knowledge-intensive business (Puga & Venables, 1997).

Support of regions' innovative development has been relatively recent undertaken in foreign countries (the second half of the 90s-early 2000s), but immediately gained widespread. In most developed and some developing countries, the allocation of federal funds for innovation in the regions is currently one of the main elements of the regional policy implementation. In particular, this policy has been implemented in many countries of the European Union to align the development of certain areas and is funded through the European Structural Funds. It is believed that the co-financing of research and implementation of its results creates additional opportunities for socio-economic development in the regions of the EU without distortion of incentives for economic agents, as well as improves the global competitiveness of these regions.

The European experience shows that the implementation of measures to promote innovative development of the state is usually the most effective on the meso level, which occupies an intermediate position between the macro level (the level of the country as a whole) and micro-level (the level of individual firms and businesses). By the meso-level are treated as separate parts of the country (region), as well as associations of firms (clusters). At the same time, the implementation of support for innovation development of regions can be performed as an alternative approach, as well as complementary, depending on the mechanisms for their implementation and the availability of sufficient financial resources in the country.

Since the beginning of the 1990th the innovative policy organically integrated a complex of scientific, industrial and regional policy. Main objective of government innovative policy during this period consisted in creation and support of the business environment that favored the formation of innovations, institutional registration of national innovative systems, support of cluster initiatives, continuous improvement of mechanisms of the state assistance of commercialization of scientific researches results and experimental development.

At the present time, the international community use the assessment practices and comparison of innovative development both the certain countries, and their regions, and in certain cases even municipalities. Currently, the most known systems of innovative development evaluation of the region is Regional innovation scoreboard, which used in the European Union, and Portfolio innovation index, mainly used in the United States.

In the European Union there is a two-tier system of innovative measurement-on level evaluation of innovative development of the EU (EIS) and at the level of innovative development of the EU regions (RIS). The evaluation system of innovative development of the European countries began to be used with the 2000, and in 2002, based on it created a system of evaluation of innovative development of the regions of the EU, which included part of the performance of the country studies (Hollanders et al., 2009). So, now the innovative activity of the European Union is measured on the basis of 29 indicators, and to evaluate the innovative development of regions 16 indicators are used. This is due to the fact that at the regional level there is a smaller amount of available statistical data than at the country level. Imperfection of statistics at the regional level is the reason that within the RIS does not apply absolute ranking of individual regions, and are selected and ranked groups of regions with similar levels of innovation development.

However, the structure of country and regional innovation survey remained common. Evaluation of innovation development areas includes three blocks of indicators – innovation enablers, firm activities and innovation output. An evaluation of innovative development of regions in the EU results in five types of innovation territories – high innovators, medium-high innovators, average innovators, medium-low innovators, low innovators. Analysis of the RIS 2014 shows that almost all the eastern regions of the European Union are on average innovators level of PIS, high innovators, according to PIS, are the regions of the north-western European regions.

The United States system for measuring of innovation development areas slightly differs from the European one. The composite index of innovative development of the Americas regions (states and counties) was developed by a number of American research centers on the initiative of the Economic Development Office, US Department of Trade (Crossing the next regional frontier: Information and Analytics Linking Regional Competitiveness to Investment in a Knowledge-Based Economy, 2009).

This index consists of four blocks, each of which is assigned different weights: human capital (30%), economic performance (30%), productivity and employment (30%) and well-being (10%). Each block consists from five to seven indicators reflecting its content. On the basis of PII 3000 areas within the United States are analyzed and on the basis of their relative level of innovation development the classification of regions takes place. The criterion for dividing serves the value of innovation indicators in the area as a percentage of the average level of innovation development in the USA as a whole index, which divides regions into five groups: with indices above 110%, from 100 to 110%, from 90 to 100%, from 80 to 90%, less than 80% (Crossing the next regional frontier: Information and Analytics Linking Regional Competitiveness to Investment in a Knowledge-Based Economy, 2009).

Despite the differences in approaches to the evaluation of the regions innovative development in the European Union and the United States, there are common elements in these methodics. The structure of both indices is that they combine both innovation resources (inputs) and the results (outputs). As a rule, the leader regions combine high scores on both resource and result subindices. However, there are cases when this condition is not satisfied. For example, in the region may be a high value on the resource sub-index and low on result one.

This means that the generated potential is not fully realized due to the presence of the delay effect. The opposite situation is observed when low scores on the resource sub-index are accompanied by high values in regions of result sub-index. For these regions the impact of high values may result from the influence of other factors that are not accounted for in the framework of the resource sub-index (as an example, the presence of regional companies engaged in the extraction of natural resources).

2.4 How to achieve technological superiority: the NEG explanations

New economic geography models also describe the effects of skipping, 'big jumping' - the mechanism explains the phenomenon of leaders changing in periods of rapid technological change, when «the last become the first». Technologically and economically backward nations have less experience. The new technique allows them to take advantage of lower wages in order to enter the market. If new equipment or technology, institutions, structures are more productive than the old ones, then there is a change of leaders. These are examples of leadership in England in the early phases of the Industrial Revolution, or strengthen American leadership in the first half of the 20th century. Often, the factors that provided the country with an opportunity to become a leader at one stage of technical and economic development, in the next stage become a brake and prevent its dynamic development. The initial success turns in the subsequent failure.

Krugman's explanation of changing economic leaders based on the nature of technological change. They are evolutionary (incremental) and revolutionary (radical). Gradual technological changes are mainly caused by learning in work process and occur more quickly in countries with already established advantages in technologically advanced sectors.

However, there are periods of radical technological breakthroughs that will fundamentally change the technological foundations of society. Such breakthroughs open a window of opportunities for new players. When an innovative technology becomes available, initially it does not seem much better than the old one; and for the nation, which has the lead in the old technology, it may even seem worse.

New technology leaders - is often poorer country than the old leaders. But precisely because of their poverty, they dare to introduce new technology to take risks, that does not seem rational and sensible to old leader. Old country-leader workers have higher wages, so the new technology or industry that initially is less productive and less profitable than the older one is not attractive for them. However, new, poorly tested technologies may be of interest to an outsider, in which old former technology got less developed, because wages are lower than those of the leader.

The idea of a link between high wages for workers of leaders and their failures in the rapid introduction of new technologies and the transition to new economic activities with higher productivity, belongs to J. Curry and other authors (Curry, 1989). He wrote about the overvaluation of the Dutch currency among the factors that led to the economic decline of Holland in the 18th century. Similarly, England then gave the leadership to the US: its currency has also been overstated. The American producers pay less wages and had no experience in the old technology. In the context of the ongoing technological revolution it became their advantage (Brezis et al., 1993).

In the near future, according to Krugman, the US may lose its leadership, because the dollar as overvalued today. For simplicity, we can assume that the overvalued currency and exchange rate is equivalent to real wages overvaluation (Krugman, 2010).

Drawing on fifteen years of research Paul Krugman (Krugman, 1991a; Brezis et al., 1993; Fujita et al., 1999; Krugman, 2010) consider the mechanism of innovative development, which is based on the change technology country-leader. In a situation of minor (evolutionary) improvement in the economic leader of the dominant technology remains. Krugman's research showed us why the country-leader is not responsive to new technologies that provide great productivity. Introduction of new technology always involves considerable uncertainty and risk. In the presence of uncertainty any monopolist will take less innovative effort than his potential rivals, relying more on the rental income and the preservation of its previous position - even though he knows that this rent will gradually disappear.

The reluctance of countries to introduce new technology is the result of decisions of individual firms, which may or may not be rational, because technological competence is at the national level rather than at the level of individual firms. Firms in country-leaders do not want to introduce a new technology, because from the point of view of an individual firm

this technology was originally alien to a country where is a collective experience of using old technology.

In times of normal, incremental technological change, increasing returns to scale helps to strengthen economic leadership. But in times of new inventions or major technological breakthroughs economic leadership, as it is associated with high salaries, can slow down the introduction of new ideas in the developed countries. When it comes to radical technological change, economic leadership itself becomes the source of his failure.

To first backward country has become a new economic leader, simultaneously performance of several conditions is needed: 1) the difference in wages between the leading countries and potential new leader must be strong; 2) new technology should appear for experienced producers initially unproductive compared to the old; 3) experience in the old technology must not be applied when using new technology; 4) the new technology should enable a significant improvement in productivity compared with the old.

This mechanism of advanced innovative development works not only at the national but also regional and municipal levels.

These findings Krugman supports with the conclusion that the state government in order to create or maintain a competitive economy should support innovative firms and innovative development of regions based on a combination of scientific, industrial, technological, organizational, market, monetary and other factors.

3. Concluding Remarks

According to the previous research, in EU the competition regional policy intrinsically connected with the NEG format and also includes the following institutional aspects (Gurieva, 2005; 2007; 2013):

1. Creating new state and administrative structures based on system character of innovations. For example, Nation Ministries of economic in France and Germany got new innovative functions, and there were created new ministries dealing with issues of innovative policy in Great Britain. Also there were made changes to the mechanism of coordination and new coordinating agencies were created in the majority of technology developed countries: in Finland is created Council for the scientific and technological policy chaired by the prime minister. This Council is responsible for strategic development and coordination of S&T policy, and also for all innovative system as a whole. The efforts of Council in 2003 Finland declared an intention to start handing an international award in size of 1 million euros for 'the technological development promoting improvement of quality of life'.
In Great Britain and Germany the problems of innovative activity are included in the sphere of competence of already existing Councils for science and researches.
2. Recognition at governmental level innovations as a strategic factor of economic development. It concludes an increasing role of strategic aspects of management, development of methodology of scientific and technical forecasting and planning. In particular, the new technology of forecasting and development of S&T priorities – foresight – has received a wide application. The purpose of the foresight is to define areas of the strategic directions of researches and innovations and the best competitive alternatives of national economy development based on the broad expert knowledge that is concentrated in business, science, education and state bodies. This purpose is served also by special state information campaigns for problems of innovations. Practice of carrying out similar campaigns was widely adopted in Great Britain, Germany, Sweden, Ireland, Finland, Denmark.
3. Strengthening of interstate integration and coordination of EU economy. So, in 2002 in EU National Councils on domestic market, the industry and Research Councils were united into Council of Competitiveness (internal market, industry, research and space). The great value in strengthening of coordination process of national innovative policies is played by the information systems of EU providing implementation of programs on marketing of innovations. In particular, it is the research of the world and the regional hi-tech markets, the analysis of regional S&T activity of EU countries and the perspective directions of innovative development, studying the private companies' attitude to innovations, promotion the most successful examples of innovative activity. These programs are formalized as annual reports on a condition of science, equipment, change of innovative behavior of the companies and the innovative environment. It is created and successfully works an information service CORDIS (service of information on R&D and innovative policy), which provides any reference information and also information on business opportunities of use of results of works on EU projects.

Thereby there was a transfer of the center of innovative policy on regional level and a lot of things in innovative development of territories began to depend on ability of the regional authorities and business quickly adapt existing innovative resources to reply to market calls, and also to develop and create the new one.

The modern New Economic Geography policy is a leading factor of competitiveness of national economy. It provides strategic objectives of the government to increase the efficiency of national innovative system and represents as a state mechanism of providing innovative type of development of regional economy.

The main directions of this policy in the technology developed countries are: support of cooperation system of all levels and subsystems of national innovative system; strengthening of institutes of innovative economy, including support of the competition and improvement of intellectual property protection system, partnership of the government, the regional authorities and a business sector in implementation of innovative programs and projects.

Definition of the long-term and medium-term goals of social and economic development of the country and its regions becomes the conventional starting moment of state regulation system of innovations in world leading countries.

In the various countries these purposes differ. So, in the USA, Japan and Great Britain at the beginning of the new century the following purposes were accepted as strategic: worldwide development of education, strengthening of its influence on economic growth and population standard of living, assistance to the accelerated development of NTP and, first of all, fundamental science, development of the balanced scientific, industrial and regional policy to achieve a sustainable development, ensuring social function of the state, movement to the planned improvement of vital standards, providing demographic balance, economic and social harmony in society and some other.

The purposes of S&T development, as a rule, are correlated with cyclic forecasts of changing the technological way for the 20-40-year period and are corrected in process of situation change. Characteristic tendency of the last decades is the increase in the horizon of S&T planning: today in the USA and Europe plan for many hundreds years forward.

As main objectives of development of the regional innovative sphere the following are allocated: increase in production with a high share of added value and competitive export opportunities, increase in a niche in the market of hi-tech production, achieving leadership in the concrete S&T direction, development of the human capital and capitalization of intellectual property, improvement of quality of life of people. The horizon of the purposes of region innovative development makes 5–10 years. Thus systematic is the central mechanism of innovative development strategy of economy in the developed countries.

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