

The problems of spatial modernization of the economy and new approaches to way out from crisis: Kazakhstan's experience

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Abstract

Purpose – This study aims to analyze the main problems of spatial modernization of the economy, and to develop new approaches to way out from crisis, to accelerate of innovations process from the cities-centers to the underdeveloped regions.

Research design, data, methodology – The application of scientific methods in this research will allow to systematize the available data, from both a theoretical and empirical perspective. The study employs the method of ranking regions, the rate of innovation activity and comparative evaluation of R&D indicator. In addition, the authors proposed the method of modeling of innovation diffusion in the regions.

Results – This study confirms that the need help for the underdeveloped regions, but we should clearly understand the limits of opportunities and to choose the right mechanisms. Further, this study shows it's important to maintain the regions with high innovation activity, as they are growth poles, which are play the role of translator's innovations to the periphery.

Conclusions – According to the results of this theoretical and empirical study proved that modernization of the economy is realized faster in the regions with the best conditions for the diffusion of innovations, the higher the concentration of the population, a more developed infrastructure and reduced of administrative barriers.

Keywords : Spatial Modernization, Spatial Barriers, Regional Development, Innovation Cycle.

JEL Classifications : O31, R11, R12.

1. Introduction

The study of spatial problems of regions modernization and spatial constraints of innovation development is one of the main tasks for economic geography and regional economy. Geographically the regions are unevenly placed by the Research and Development (R&D) and social structure. To this end, the regional development should be focused on the future geopolitical conditions. That is, to create the strategic adaptation, this can be achieved by the economic space modernization in regions. Therefore, its analysis and evaluation are direct interest to economic entities included in the regional innovation process.

In the preceding studies on the theory of the structure and the efficient organization of economic space based on the "growth poles" (i.e. predominating and strongest developing), which take the diffusion of growth is expected to occur towards the surrounding region (Perroux, 1955; Aydalot, 1965; Boudeville, 1968). The general idea of this growth poles theory is that economic development, or growth, is not uniform over an entire region, but instead takes place around a specific pole.

Also highlight other theoretical views, such as explanation of regional disparities by Myrdal (1957) "cumulative regional growth", the "central place theory" by Christaller (1966), "expansion of poles" by Perroux and "growth poles" by Boudeville (1968), "the core-periphery model" by Friedman (1966), "generations of innovation" by Hagerstrand (1966), significantly supported the creation of a pole of growth and diffusion model (Rodrigo et al., 2006). In this case, the works of Perroux (1955) and Myrdal (1957) are considered to be perhaps the most significant contribution to the theory of economic growth poles, which exerted positive influence on surrounding space.

The empirical evidence confirms the existence of knowledge spillovers within regions, though the evidence on inter-regional knowledge spillovers is scarce and mixed (Frenken et al., 2010). Positive effects of knowledge spillovers have been found within and between regions (Moreno-Serrano et al., 2005), as well as the support of the most innovative active regions (Glazyev, 2010; Untura, 2012; Hmeleva, 2012).

Recent studies have confirmed these ideas. It is significant that previous studies have focused on territorial development, which is based on the use of endogenous potential of the regions (Coffey and Polese, 1985; Barquero, 1991; Garofoli, 2002). In addition, the R&D carried out in the region, the financial situation and the quality of human (or social) capital are the most important factors (Desrochers, 2001).

There are two ideas behind the principal research questions and

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hypotheses that are the subject of this research. The first of these is that, geographically, growth poles are considered to be centers for the generation and spatial diffusion of innovation. The second principal idea is center-periphery theory (or model) of spatial development, created by Friedman. Thus, this study will try to expand researches in the field of these two ideas, and also to solve the problem of modernization of the economy.

Given the influence of these regional factors on the innovation performance of regions, it is important to identify precisely which factors matter. Here, the literature offers a wide range of studies that promote a variety of variables to be crucial. The study confirms the existence of such inter-industry differences in the level of R&D, elements of which form the innovation system and define the specific features of modernization. Besides analysis of indicators of innovation activity and R&D, shows the current situation and the quality of the human capital.

The present research is aimed to analyze the main problems of spatial modernization of the economy, and to develop new approaches to way out from crisis, to accelerate of innovations process from the cities-centers to the underdeveloped regions, to introduce of new innovative products and to improve number of R&D employees.

The study is divided into the following sections. The Section 2 proposes to consider the theoretical aspects of spatial barriers modernization of the economy. Section 3 sets out the guidelines for the innovative activity analysis in the regions of Kazakhstan, conducting a comprehensive assessment of the R&D performance, the innovation cycle model. Section 4 is a concluding part.

2. Theoretical aspects of spatial barriers modernization of the economy

A constitutive element of this study of spatial development is a complete overview of the previous works. Long ago the regional science conclusively showed that the spatial inequality emerges as an objective effect of the competitive advantages concentration in certain territories and lack of these advantages in others. The tendency to concentration of economic activity in territories with the conditions favorable for business was discovered by G. Myrdal in the middle of the 20th century (Myrdal, 1957).

The theory of "central places" by Christaller (1966) is highly abstract, but allows us to formulate the general idea of proper settlement on one or another territory. Also known theory by Hagerstr and (1966) "generation of innovations" reflects the undulating nature of spatial development. It should be highlighted that diffusion of innovation is a crucial factor in determining the human capital for the center-periphery relations.

But as noted earlier, there are two dominant models: the growth poles and the core-periphery model. The first perspective refers to the attraction of activities and the concentration of growth in poles, from where the diffusion of growth is expected to occur towards the surrounding region (Perroux, 1955). The second model refers to the integrated spatial development; on the basis of the core-periphery theory by Friedmann (1966) has become an important contribution to under-

standing of spatial development patterns. This model shows that the underdeveloped regions will inevitably become a hindrance to development of innovation and modernization of the economy.

The spatial aspect of the growth pole theory triggered several questions concerning the relationships between the growth pole and the underdeveloped region, various effects of the growth pole on the underdeveloped regions, and the method of diffusion of economic growth from the growth pole to the underdeveloped regions. Nevertheless, theory of growth poles has undergone several variations to accommodate those geographic characters (Rodrigue et al., 2006).

The most operational for this study is the core-periphery model of spatial development, as the theory of Perroux, based on economic studies. This model is one of the most important contributions to the understanding of the spatial aspects. Between the city-centers and the periphery there is a mobile zone, which can take over the functions of the center. This model works on all levels –from the world's cities and large agglomerations to regional and local centers (Perroux, 1955).

Thus, the core-periphery model by Friedman shows that important roles in the development of the country are centers-cities. Thus, the core-periphery model by Friedman shows that an important role in the development of the country is allotted to the centers-cities. These cities are not been only an "important support", but they will be the main "engine", to translate modernization at the periphery (in the first place in the underdeveloped regions).

The two models (the growth poles and the core-periphery model), do not operate in a competitive way, but they are complementary to one another. In essence, the two models are applied in parallel in various combinations that depend on the particular characteristics and the stage of development of a country, the current international situation, and the strategic socio-economic choices of the governments.

Thus, it becomes clear underdeveloped regions will inevitably become a major barrier modernization of the economy and development of innovations. A criterion of selection of priorities of spatial development is competitive advantages of the underdeveloped regions, and such, which contribute to the modernization, not the reproduction of the raw materials rent.

Thus, the most important directions of spatial development are conditions, which are directed to accelerate of the spread of innovations in the space:

- support cities-centers, creating innovations and broadcasting them to the periphery;
- develop of the infrastructure, allowing to reduce the economic distance;
- improve of the factors of "second nature" – human and social capital.

Hence, the modernization is realized faster in the regions with the best conditions for the diffusion of innovations, the higher the concentration of the population, a more developed infrastructure and reduced of administrative barriers. It is obvious, that was identified all three barriers of spatial development, as well as clearly they should be minimized.

2.1. Spatial context and the innovative activity

In the context of spatial development of one of the most important directions is the innovation activity. Influence of innovations on the dynamics of spatial development has long been the subject of attention of many scientists. Thus, certain scientists noted of the innovative approach "the region is increasingly the level at which innovation is produced through regional networks of innovators, local clusters and the cross-fertilizing effects of research institutions" (Lundvall and Borras, 1993, p.39). In this case, the spatial proximity is very necessary for the efficient production and transfer of knowledge. Tendency and prospects of the global innovative-technological dynamics have been pointed out by Kuzika et al. (2008). These scientists have developed a methodology of integral macro forecasting have, and have also applied it for the development of long-term forecast of dynamics of regional development of the XXI century and innovative-technological development of Russia. Other authors have been proposed that the geographical dimension is fundamental to understanding the innovation process and rating estimation of innovative potential of regions (Kiselev, 2010; Untura, 2012).

Innovation activity is characterized by interactions and flows of knowledge between firms and institutions. Some scientists have been underlined about the influence of innovations on the dynamics of development of the economy. So, they have been noted the increase of innovation activity and the formation of a new technological mode, namely innovation and the introduction of innovative products will be able to overcome depression or crisis (Zonova and Demidova, 2010). The efficiency of the system may be influenced by both the availability of elements as well as by the intensity of interaction and the respective knowledge flows. Interactions of a particular kind can occur between all the elements constituting the system such as innovating private firms and public scientific-research institutes. For instance, the importance of lead users for inducing innovation and the importance of backward and forward linkages has been pointed out by Kline (1985) and Kline and Rosenberg (1986), while Hippel (1986).

Spatial context is crucial for the innovation activity in the regions (Moreno-Serrano et al., 2005; Nurlanova, 2012; Untura, 2012). Moreover, Glazyev discusses about the problem of development and realization of regional innovative policy, as well as the effectiveness of the functioning of the institutions of development of innovative activity (Glazyev, 2010). He proposes a scenario of rapid exit for the new long wave of economic growth (optimistic version). This scenario translates the crisis in the management mode, allowing the leading countries reduce the decline in the underdeveloped regions and send the remaining resources of the rise of innovation activity.

In a similar vein Hmeleva considers the optimistic scenario, which reduce the decline of the crisis (Hmeleva, 2012). The starting point is that there is little research that has analyzed the innovative activity of regions in relation to regional variables, with the result that there is no clear distinction between the effects attributable to the firm and the region.

The growth poles are conceived of as areas of concentrated and highly interdependent economic activity: "historically speaking, each special system whose economy has reached a certain level of growth

has one or more growth poles that may be defined as areas of concentrated and highly interdependent economic activity that have exerted a decisive influence on the nature and rhythm of economic development of the system or subsystems in question" (Perroux, 1955, p. 35). The idea is that the underdeveloped regions generally lack growth poles; and that these areas intermediate to the network poles of growth. Hence, regional growth poles represent the platform for the generation of innovative processes.

This research contributes to the discussion of the role played by spatial context in developing innovative activity in the regions. It specifies to what degree the spatial context between of the innovation centers and the underdeveloped regions, and why some regions are more innovative than others. It starts from the argument by Glazyev that need to support of underdeveloped regions, but should clearly understand the possibilities (Glazyev, 2010). In a similar vein to recent studies it takes in the search for and development of competitive advantages of the medium and underdeveloped regions (Hmeleva, 2012). On the basis of the observation of innovative activity of the various regions that are part of the same national innovation system, the question of the source of this disparity is often raised.

2.2. Spatial aspects of modernization of the economy in Kazakhstan

Today the problem of modernization of the economy in Kazakhstan and slacking of its dependence from the natural resources is one of the main tasks for economic geography and regional economy. Even in safe years before the crisis it was clear that the economic growth should be provided with the transient factors and it will be necessary to take steps in the direction of Kazakhstan transition to the steady growth based on modernization and innovations. The global financial and economic crisis which has begun at the end of 2008 has showed a significance of this problem, and also the need to provide the economy regions developments in Kazakhstan on the basis of innovative modernization.

The history shows that Kazakhstan possesses a vast territory, and all attempts at modernization of the economy of Kazakhstan have been unsuccessful. Krugman wrote that the regions are developing very slowly, using only natural resources (Krugman, 1991). But if the regions will use the human and technological resources it can achieve the great results, so these factors play a major role in the space modernization.

Thus, clear that there are some spatial barriers for the modernization of economy in Kazakhstan (Kireyeva, 2013). These are:

- enormous distances, vast areas with poor living conditions and poor infrastructure;
- low population density and sparse network of cities;
- regions with different level of human resources;
- low capabilities for innovation development.

It's obvious that it is very difficult to make changes in a space, so the choice of directions for the stimulation of the modernization of the economy in countries with a large territories, as a Kazakhstan limited by the relatively low level of capabilities.

The existing spatial barriers are due with the modern level of development of the regions of Kazakhstan, and there are the starting

conditions for modernization. (Kireyeva, 2012). It is important to understand what the balance of the developing and the underdeveloped areas, and what the influence on the possible modernization of the spatial factors development, as well as the policy of the state.

Here, the following initial conditions are proposed (Kireyeva, 2013):

- 1) in regions with a significant economic resources for modernization, a quarter of the population lives in medium regions – almost 2/3, in the least developed regions – 10-15% of the population of the country;
- 2) in Kazakhstan has created a hierarchical system of cities-centers, capable to broadcast the impulse of the modernization of the smaller of the city and the periphery; in the country are very few cities, especially large ones;
- 3) increase the territorial polarization of human capital in the form of zones of modernization and depression;
- 4) regional policy of the state is weak, but also deprived of reasonable priorities and objectives, cities-centers are recovering faster than the underdeveloped regions.

Thus, Kazakhstan follows the path of developed countries, wherein the peak of inequality fell to the first half of a last century. The attempts to make the underdeveloped regions of the stronger can solve the problem only temporarily. So, *the key to problem solving of modernization of the economy is search and develop the competitive advantages in the medium and underdeveloped regions, in conjunction with support measures of alignment of the social and economic disparities between the territories.*

3. Methods

In this study we used the scientific methods of research. The scientific method investigates phenomena, acquiring new knowledge, or correcting and integrating previous knowledge (Goldhaber and Nieto, 2010). These methods are intended to be as objective as possible, to reduce biased interpretations of results. There are difficulties in the understanding of the claimed methods. However these scientific methods are often presented as a fixed sequence of steps, they are better considered as general principles (Gauch, 2003).

In practice, the modernization is limited to individual approaches and directions. The application of scientific methods in this research will allow systematize the available data by means of a theoretical and empirical analysis. Kazakhstan has a huge territory and its regions essentially differ by nature and climatic conditions, the level of economic development, the life quality of population, the availability of natural resources (Baimukhamedova et al., 2012). There are different ways of outlining the basic method used for scientific inquiry. The scientific community and philosophers of science generally agree on the following classification of method components:

- generalization – process of establishing the common properties and signs of development of the regions, may be assigned any signs (abstract-general) (Gavrilov, 2002)
- hypothesis – method, which lies not simply in its perceived "truth", but perhaps more in its ability to stimulate the research

that will illuminate suppositions and areas of vagueness (Glen, 1994).

- system analysis – on the basis of the analysis of the regions as a whole set of elements in the totality of relations and connections between them (Ruzavin, 1999). This is an analysis of the current level of the innovative processes in the regions, the analysis of the ranking regions, comparative evaluation of R&D indicator in regions (Kireyeva, 2013)
- modeling method – development of a model of the innovation cycle (Kireyeva, 2012).

3.1. The current level of innovation processes in regions

Innovation *"is the object embedded in production as a result of the carried out research or discovery, qualitatively different from the previous analogue"* (Utkin, Morozova, 1996, p.10).

It is obvious, that it is very important to explore regional context of the innovation process.

The economic geography has placed agglomeration, knowledge spillovers, regional economic growth and spatial context at the center of its research (Feldman, 2000). The basis of the idea by Feldman: "the concept of location is defined as a geographical unit that facilitates interaction and communication, the search for knowledge, and coordination tasks" (Feldman, 2000, p. 373). Certain empirical evidence shows the existence of knowledge spillovers within regions, but the evidence of the inter-regional relations of knowledge spillovers is still not investigated (Frenken et al., 2010).

For instance, Kazakhstan possesses a vast territory, so that many regions have different levels of innovation capacity, which influence on the process of the modernization of the economy. Innovations contribute to the renewal of the regions, adaptation to scientific and technical progress and knowledge spillovers (Dunenikova, 2003). Thus, the coefficient of use of innovative potential depends on the location of the individual plants in the region, the structure of economic activity, specialization, as well as institutional initiatives of individual enterprises and administrations of regions (Untura, 2012).

Thus, Table 1 demonstrates the level of innovative activity in the regions of Kazakhstan.

This data shows that two-thirds (2/3) of the regions have been positive indicators of the innovative development during the analyzed period (2008-2011) and one-third (1/3) of the regions have negative indicators. It is clear that the efficiency indicators have been higher in regions with large, densely populated agglomerations such as Zhambyl, Karagandy, East-Kazakhstan, Aktobe, Kyzylorda. And the lowest indicators of innovation activity have found in the regions Akmola, Almaty, Mangistau and North-Kazakhstan.

<Table 1> Innovation activity rate of Kazakhstan's regions 2008-2011

	2008, %	2009 %	2010, %	2011, %
The Republic of Kazakhstan	4,8	4,0	4,0	4,3
Akmolinsk region	2,1	1,2	1,2	0,7
Aktobe region	5,6	4,1	4,0	6,1
Almaty region	2,1	1,9	1,4	0,9
Atyrau region	3,7	2,7	2,9	3,7
West-Kazakhstan region	4,9	4,9	4,5	4,6
Zhambyl region	8,8	6,0	4,4	7,8
Karagandy region	6,1	6,5	6,2	7,0
Kostanay region	2,5	2,0	1,5	2,6
Kyzylorda region	2,4	3,0	1,5	6,1
Mangystau region	2,3	1,9	1,4	1,1
South-Kazakhstan region	2,8	2,4	2,2	3,4
Pavlodar region	8,1	3,6	3,8	5,1
Nord-Kazakhstan region	2,2	2,5	2,6	2,4
East-Kazakhstan region	5,6	4,3	5,9	6,4
Astana city	3,0	1,8	2,1	2,6
Almaty city	7,2	6,4	6,7	5,4

Source: Statistical Yearbook of the Republic of Kazakhstan by the Agency for statistics (2011)

Generalization: it's important to maintain the regions with high innovation activity, as they are growth poles and they will play the role of translator's innovations to the periphery.

3.2. The analysis of ranking regions in the field of innovative activity

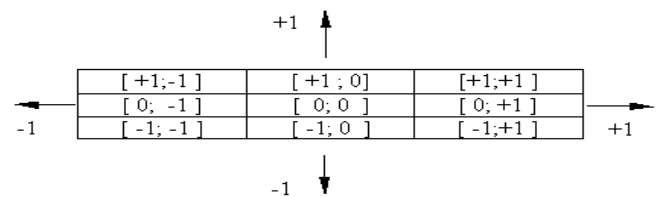
The policy of industrial development of the "poles growth" or cities with almost total disregard stimulation for the equalization policy dominates until now (Perroux,1955). As a result the inequality of development zones of the modernization and underdeveloped periphery has grown up (Kireyeva,2012). So, analysis of ranking regions in terms of innovative activity will help determine the spatial priorities of modernization of the economy.

Procedure for ranking regions may help in verification methods, i.e. select "cumulative conditions" (Myrdal, 1957), in the form of indicators reflecting the development of new sectors of the economy, arrival on the territory of the state corporations, activation of small business and other (Untura, 2012). Leontiev conducted the analysis of innovative factors of the region development by the method of input-output balances (Leontiev, 1997). Granberg proposed analysis of innovative activity of regions by evaluating of the structure and dynamics of the gross regional product (Granberg et al., 1998).

Thus, the total lacks of all existing methods of the analysis of innovative activity are study and measure, but need research the eco-

nomical situation and its consequence. The proposed alternative direction is connected with the phase of the analysis of innovative factors of regional development.

So, *hypothesis* that are two sources of all the changes in the economic activities of the region: the ability and sensitivity of the region to innovation. The economic equivalent of innovation receptivity of the region are extensive factors of regional growth (associated with the increase in production volumes in the result of increase of involved resources), and the equivalent of innovation the ability of the region are intensive factors of regional growth (associated with effective use of resources). According to this hypothesis the innovation activity of the region can be presented in the following Figure 1(Source: compiled by the authors).



<Figure 1> Innovative activity and innovative susceptibility in region

The forces of innovative activity in the region may possess the following values of the phase:

$$x = 0, (-) 1,$$

Where: $x = 1$ – the phase of innovative capacity growth in the region;

$x = 0$ – the phase of the innovative capacity conservation in the region;

$x = -1$ – the phase of innovative capacity loss in the region.

Similarly, the force of innovative susceptibility of the region may possess the following values:

$$y = 0, 1,$$

Where: $y = 1$ – the phase of innovative susceptibility growth in the region;

$y = 0$ – the phase of innovative susceptibility conservation in the region;

$y = -1$ – the phase o of innovative susceptibility loss in the region.

Thus, it is possible to carry out the ranking of economic forces in the region for innovation potential. Table 2 shows the results of the ranking in terms of innovation capacity in regions of Kazakhstan.

While analyzing the factors determining the extent of innovative activity of the studied regions, it was found out that the greatest spatial barrier in the development of innovations have economic factors, among which are decisive: the lack of own funds of enterprises (32%),

high cost of innovation (16%), the lack of financial assistance from the state (13%) and less significant influence high economic risk

and low demand for new products and services.

Among the main internal barriers to innovation – low innovation potential of enterprises (11%), the lack of information about new technologies (12%), the lack of qualified staff (6%).

Generalization, economic inequality of regions is very large and will grow, for this reason need to search and development of the competitive advantages of the average developed and underdeveloped regions of the country combined with support for the alignment of regional policy measures.

<Table 2> Calculation of the ranking by indicator of innovative capacity

Region	No	Category	Scores
East-Kazakhstan	1	region with high dynamics of innovative development	0,513
Pavlodar	2	region with high dynamics of innovative development	0,411
Zhambyl	3	region with high dynamics of innovative development	0,281
Almaty city	4	region with high dynamics of innovative development	0,264
Karaganda	5	region with high dynamics of innovative development	0,249
Aktobe	6	region with average dynamics of innovative development	0,236
Astana city	7	region with average dynamics of innovative development	0,225
Kostanay	8	region with average dynamics of innovative development	0,223
Kyzylorda	9	region with average dynamics of innovative development	0,182
Nord-Kazakhstan	10	region with low dynamics of innovative development	0,156
South-Kazakhstan	11	region with low dynamics of innovative development	0,134
Akmolinsk	12	region with low dynamics of innovative development	0,129
West-Kazakhstan	13	region with low dynamics of innovative development	0,116
Atyrau	14	region with low dynamics of innovative development	0,101
Almaty	15	region with low dynamics of innovative development	0,059
Mangystau	16	region with low dynamics of innovative development	0,052

Source: Statistical Yearbook of the Republic of Kazakhstan by the Agency for statistics (2011)

3.3. Comparative evaluation of R&D indicator in regions

The term R&D or Research and Development refers to a specific group of activities within a business. R&D indicator is the most important element in innovation processes are the creative minds. Organized in groups, teams or just by oneself, professional R&D employees are the innovative entity in industrial innovation processes. R&D employees search for and recombine existing knowledge in or-

der to create and to develop innovative products. The new regional innovation economics it is argued that a stimulating and supportive regional environment facilitates their innovation activities causing their productivity to differ systematically inter-regionally (Desrochers,2001). Hence, the R&D employees can be considered the necessary resource for innovation processes, while the factors presented below represent supportive elements (Broekel and Brenner, 2011).

The problem of staffing for innovative economy stays unsolved today. Innovative development of the country is impossible without the highly qualified personnel such as engineers, developers and innovation managers. The absence of the required number of these specialists in government and among the entrepreneurs is a barrier for the innovation development (Gohberg and Kuznecova 2009). Hence, it's to be analyzed the indicator R&D, to help understand where better to start innovative processes. This very simple insight is, however, seldom discussed in the literature. In contrast to the other regional indicators this is not substitutable.

Thus, Kazakhstan is presented as one of the most highly educated countries in the world, but in terms of economic development is a little behind the most countries. From a quantitative point of view the scientific potential of qualified specialists does not meet the needs of innovative development. Data on the number of staff employed in R&D can be seen in Table 3.

According to these data it is visible, that the human resources are not sufficiently used in science and technology. During the analyzed period the number of employees has been almost unchanged. This table indicates the observed increase in staff in developed regions. However, that there was a significant reduction in the regions such Aktobe, West-Kazakhstan, Kyzylorda and South-Kazakhstan there. So, the general condition of science in Kazakhstan demands to reform the current system of innovation to attract the staff in regions with low rate of R&D indicator.

The regional economic policy should focus on creating of enabling environment for an innovation stage in the underdeveloped regions, such as to create of educational and scientific centers. It should be noted that the localized areas create a significant proportion of the value added of country, and thus the regional conditions largely determine the competitiveness of manufactured goods (Nurlanova, 2009). Thus, the innovative activities support is reasonable for the creation and development of such structures as industrial parks, technology incubators, and data banks of innovation. The key to the R&D and innovation process are the aspects of human and social capital (Broekel and Brenner, 2011).

<Table 3> Number of personnel engaged in R&D of Kazakhstan's regions 2008-2011

	2008, person	2009, person	2010, person	2011, person
The Republic of Kazakhstan	17 774	16 304	15 793	17 021
Akmolinsk region	468	559	555	615
Aktobe region	532	335	157	195
Almaty region	790	547	440	759

Atyrau region	681	633	554	582
East-Kazakhstan region	657	542	1 757	1 852
Zhambyl region	417	414	474	344
West-Kazakhstan region	1 140	1 039	170	459
Karaganda region	436	333	735	875
Kostanay region	72	74	415	324
Kyzylorda region	801	841	79	98
Mangistau region	353	259	404	474
Pavlodar region	187	181	258	187
Nord-Kazakhstan region	147	200	136	106
South-Kazakhstan	1 636	1 692	295	442
Astana city	1 468	1 430	1 146	1 531
Almaty city	7 989	7 225	8 218	8178

Source: Statistical Yearbook of the Republic of Kazakhstan by the Agency for statistics (2011)

In the current debate wherein the coordinated R&D strategies, especially in levels of innovation, the empirical results are mixed and relatively limited. This might be connected to the fact that, apart from the industrial organizational models on joint ventures, theoretical literature largely remains mute (Cefis et al., 2009).

Generalization, indicator R&D shows that for the Kazakhstan it's important to reform the current system of regional innovative development, as well as to attract staff from the cities-centers in underdeveloped regions. But it is obvious, the reproduction of the human capital in the peripheral territories occurs when optimization of the system of education and health in the conditions of depopulation, but reduction in the network should be gradually to be able to adapt for population.

3.4. Model of innovative cycle

In general, proposed the effective model of the innovation of the innovation cycle in the regions, which includes the separation of the main types of process innovation –technological and managerial. This model is shown in Figure 2.

The suggested model consists of five major stages, starting from research and ending with the innovation diffusion. This model reflects the transformation of the results of the innovation process from the reception of new knowledge to a failure of innovation, and demonstrates clearly at what stages require modernization. This model allows defining the nature of the interaction among the participants of the process of innovative development of the region; establishing the procedure for information exchange and the sequence of use of the tools necessary for the effective formation of the innovative sphere of the region.

These structural and technological changes occurring in the economy (innovation) are labeled by P. Romer. He pointed out that the innovation cycle creates a new theory of growth (Romer, 1986). In this context, the use of the regional model of the innovation cycle is car-

ried out in two main directions:

1. to develop a specialized and integrated model of functioning of the economy of the regions (introduction of innovations, modernization of production);
2. to create of integrated models, oriented to application in practical activities of the regional innovation.

4. Conclusion

This work marks a starting point for further research in the field of spatial modernization of the economy. It provides some suggestions for improvement of future studies dealing with this subject. It also delivers industry specific insights into the coherence between the city-centers and peripheral regions. One of the most important outcomes of the present study is that the group leaders presented in the most developed regions in the socio-economic plan. Therefore we proposed to creation and development of innovative areas in these regions. And the innovation process within the individual branches of the innovation economy could be faster thanks to special institutional, infrastructural and human potentials. One of the most important outcomes of the present study is that the group leaders presented in the most developed regions in the socio-economic plan. Therefore we proposed to create and develop of innovative centers in these regions, as they can play an important role of translator's innovations to the periphery.

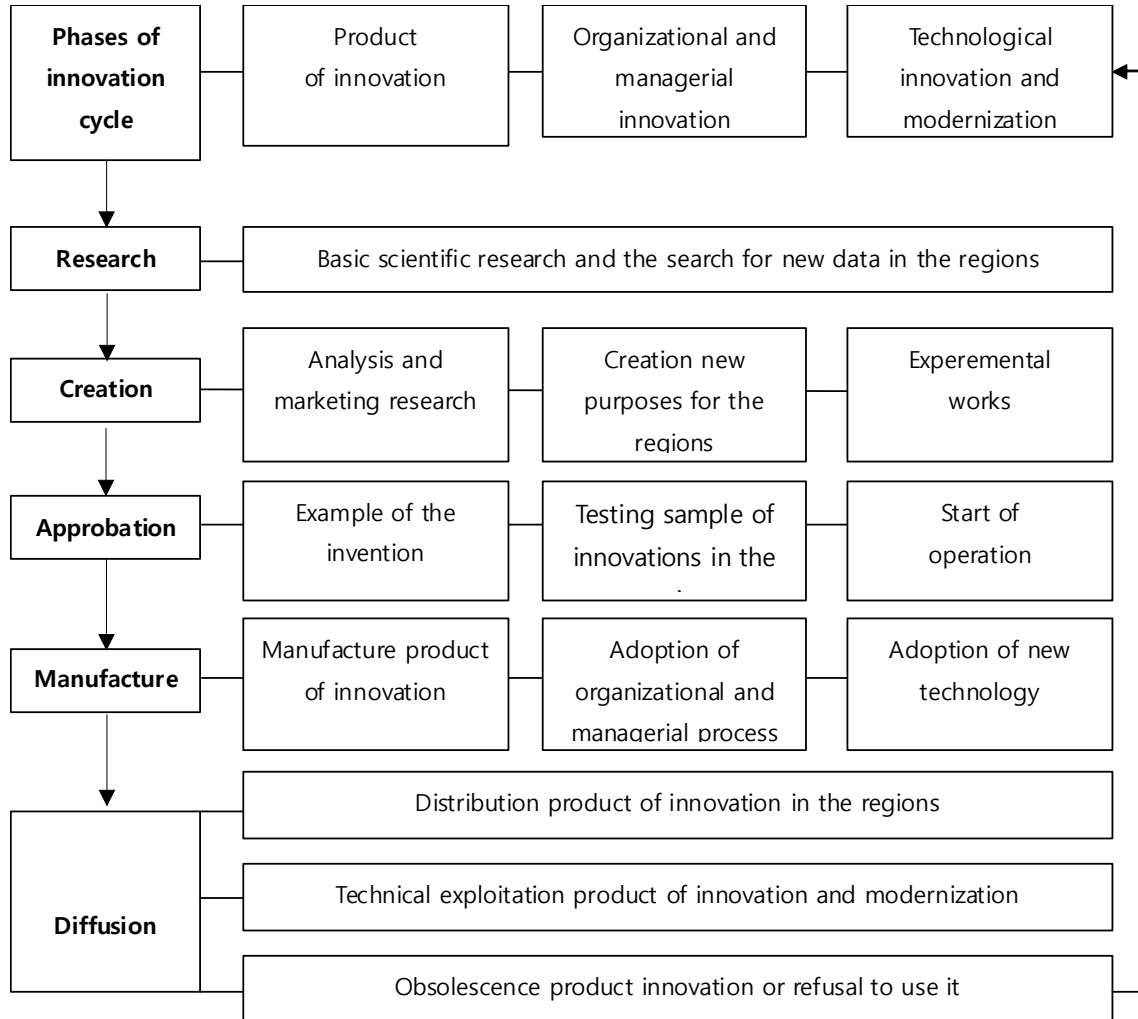
On the basis of these research findings of this paper, the practical implications are listed below:

First, the analysis suggests that need help for the underdeveloped regions, but we should clearly understand the limits of opportunities and to choose the right mechanisms, even if in the country there are financial resources for large-scale redistribution. This means that the key to problem solving of modernization of the economy is search and develop the competitive advantages in the medium and underdeveloped regions, in conjunction with support measures of alignment of the social and economic disparities between the territories.

Second, it's important to create the centers of innovation development outside of urban agglomeration, as they are growth poles and they will play the role of translator's innovations to the periphery. These centers can be created in a few large regions of the country with high innovation potential in different areas of science. Then, they will be able to get the state support and financing, including foreign. In such cities, should be develop the educational-scientific complexes (qualitative university and modern research facilities) with an effective system of stimulation of scientific activities.

Third, the ranking of the regions can help to allocate traditional conditions (which are difficult to change) and the cumulative conditions, in the form of indicators reflecting the development of new sectors of the economy, the advent of innovative companies, activation of small business, etc.

Fourth, it will be necessary to improve the quality of human capital. Thus, the analysis of R&D indicator shows that for the Kazakhstan it's important to reform the current system of regional innovative development, as well as to attract staff from the cities-cen-



Source: compiled by the authors

<Figure 2> Model f innovation cycle

ters in underdeveloped regions. But it is obvious, the reproduction of the human capital in the peripheral territories occurs when optimization of the system of education and health in the conditions of depopulation, but reduction in the network should be gradually to be able to adapt for population.

Fifth, proposed by the author's vision the effective model of the innovation process in the regions, which demonstrates clearly at what stages require modernization, starting from research and ending with the innovation diffusion.

It's clear, spatial barriers for the modernization of Kazakhstan are: the enormous distances, vast territories with unfavorable living conditions and the low level of skills of the human resources, low population density and a sparse network of cities.

This work marks the modernization of the economy is realized faster in the regions with the best conditions for the diffusion of innovations, the higher the concentration of the population, a more developed infrastructure and reduced of administrative barriers. It is obvious, that was identified all three barriers of spatial development, as well as clearly they should be minimized. Similar barriers exist in

some other countries, for example, Russia, Belarus, Ukraine and others. The results obtained in the research can be applied in other countries with similar spatial barriers on the way to modernization of the economy

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References

- Aydalot, P. (1965), "Note sur les economies exaterenes et quelques notions connexes", *Review Economique*, 16, 944-973.
- Baimukhamedova, G., Nurlanova, N. & Akhmetova,S. (2012), "Estimation of the Level of Sustainable Development in Kazakhstan Regions and Recommendation for its Increase", *Journal of Distribution Science*, 10(7), 23-31.
- Barquero, V.A. (1991), *Local Development, A strategy for the job*

- creation, Athens: Papazisis.
- Broekel, T. & Brenner, T. (2011) "Regional factors and innovative-ness: an empirical analysis of four German industries", *Annals of regional science*, 47(1), 169-194.
- Boudeville, J.R. (1968), *L' espace et les poles de croissance*, Paris: Presses Universitaires de France, 895-1000.
- Cefis, E., Rosenkranz, S. & Weitzel, U. (2009), "Effects of coordinated strategies on product and process R&D", *Journal of Economics*, 96(3), 193-222.
- Coffey, J. & Polese, M. (1985), "Local development: Conceptual bases and policy implications", *Regional Studies*, 19(2), 85-93.
- Christaller, W. (1966), "Central Places in Southern Germany", translated from 1933 German publication.
- Desrochers, P. (2001), "Local diversity, human creativity, and technological innovation", *Growth Change*, 32, 369-394
- Dunenkova, E. (2003), "Features the innovative development of the region on the basis of cluster approach", Materials of Intern,Scientific-Practical conference, Moscow, 236.
- Feldman, M. (2000), *Location and Innovation: The New Economic Geography of Innovation, Spillovers, and Agglomeration*, Oxford, UK: Oxford University Press, 373-394.
- Frenken, K., Ponds, F. & Van Oort F. (2010), "The citation impact of research collaboration in science-based industries: A spatial-institutional analysis", *Papers in Regional Science*, 89(2), 351-271.
- Friedmann, J. (1966), *Regional Development Policy: a Case Study of Venezuela*, Massachusetts: MIT Press, 279p.
- Garofoli, G. (2002), "Local Development in Europe: Theoretical models and international comparisons", *European Urban and Regional Studies*, 9(3), 225-239.
- Gavrilov, A. (2002), *Regional Economics and management*, Moscow: UNITY-DANA, 239.
- Glazyev, S. (2010), "The strategy of accelerated development of Russia in conditions of the global crisis", Moscow: UNITY-DANA, 290.
- Glen, W. (1994), *The Mass-Extinction Debates: How Science Works in a Crisis*, Stanford, CA: Stanford University Press, 37-38.
- Gohberg, L.M. & Kuznecova, I.A. (2009), "Innovations in the Russian economy. Capitalizing on the eve of the crisis", *Forsite*, 2(10), 28-46.
- Goldhaber, A.S. & Nieto, M.M (2010), "Photon and graviton mass limits", *Rev. Mod. Phys. (American Physical Society)*, 82, 939-979.
- Granberg, A., Masakova, I. and Zayceva, U. (1998), "Gross regional product differentiation as an indicator of regional economic development", *Statistical Issues*, 9, 3-11.
- Hagerstrand, T. (1966), "Aspects of the Spatial Structure of Social Communication and the Diffusion of Information", *Papers of the Regional Science Association*, 16(1), 27-42
- Hippel, E. (1986), "Lead user: a source of novel product concepts", *Management Science*, 32(7), 791-805.
- Hmeleva, G. (2012), "Innovation development of the region: intensive and extensive way", *Problems of theory and practice of management, Moscow*, 7(8), 45-56.
- Kireyeva, A. (2012) "Mono cities of Kazakhstan: the classification of the regions and exit effects of the doldrums", in Russian scientific-practical conference, Ulan-Ude, 195-201.
- Kireyeva, A. (2013), "The spatial perspective of modernization of the economy of the regions of Kazakhstan", *Vestnik UIB: Almaty*, 78-85.
- Kiselev, V. (2010), "Comparative analysis of innovation activity of the subjects of the Russian Federation", *Innovations*, 4, 44-55.
- Kline, S.J. (1985), "Innovation is not a linear process", *Research Management*, 28 (4), 36-46.
- Kline, S.J. & Rosenberg, N. (1986), "An overview of innovation", In: Landau R, Rosenberg N., *The positive sum strategy*, Washington: National Academy Press, 275-305.
- Krugman, P.R. (1991), *Geography and Trade*, Cambridge, MA: MIT Press,
- Kuzika, B., Yakovets, U. & Rudskiy, A. (2008), *Forecast of innovative-technological development of Russia taking into account global trends for the period up to 2030*, Moscow: Misk, 255.
- Leontiev, V. (1997), *Inter-Sectoral economy*, Moscow: Economics, 479.
- Lundvall, B.A. & Borrás, S. (1997), "The Globalising Learning Economy: Implications for Innovation Policy", Report based on contributions from 7 project under the TSER programme DGXII, Commission of the European Union.
- Moreno, R., Paci, R., and Usai, S. (2005), "Spatial spillovers and innovation activity in European regions", *Environment and Planning, London*, 37(10), 1793-1812.
- Myrdal, G. (1957), *Economic Theory and Underdeveloped Regions*, London: Duckworth.
- Nurlanova, N.K. (2009), *The regional paradigm of sustainable development in Kazakhstan: problems of theory and practice*, Almaty: Institute of Economics, 328 .
- Perroux, F. (1955), "Note sur les notion de pole de croissance", *Economie Appliquee*, 7(1-2), 307-320.
- Rodrigue, J.P., Comtois C. & Slack B. (2006), *The Geography of Transport Systems*, New York: Routledge, 297 .
- Romer, Paul M. (1986), "Increasing returns and long run growth", *Journal of Political Economic*, 94(5), 1002-1037.
- Ruzavin, G. (1999), *The methodology of scientific research*, Moscow: UNITY-DANA, 317.
- Untura, G. (2012), "Strategic support for the regions of Russia: problems of evaluation of the status of the territories of innovations", *Region: economy and sociology*, 1, 123-141.
- Utkin, E. & Morozova, N. (1996), *Innovation management*, Moscow: Economics, 208.
- Zonova O. & Demidova, O. (2010), "Formation of strategy of innovative development of the Kemerovo region", *Innovation activity*, 1.

