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TRANSITION FROM THE INDUSTRIAL CLUSTERS TO THE SMART SPECIALIZATION: A CASE STUDY*

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Abstract. Kazakhstan faced the problem of falling industrial production and decrease in efficiency of former managerial methods of territorial development. Transition to the new Smart Specialization approach provides better understanding of the specifics of the region and provides the highest return on investment in innovation. The authors produce rationale for the selection of regions of Kazakhstan to determine their smart specialization. There were determined the regions, in which it is advisable to develop the general purpose technologies, and the territories, where it is more profitable to focus on applied research and transmitting them into practice in relation to existing products and technological processes.

Keywords: industrial policy; smart specialization; innovations; development of industrial regions; Kazakhstan

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JEL Classifications: O15, O5, O53; P4; P47

1. Introduction

Over the past 15 years Kazakhstan has made significant progress in creating jobs, reducing poverty and sharing prosperity through job creation and wage growth. Job creation has also led to increase in social mobility and building of a middle class. In Kazakhstan a high level of job creation was marked between 2003 and 2013, and growth took place mainly in a service sector (especially trade and education) and a construction sector, offsetting loss of jobs in agriculture (Kazakhstan - Low oil prices; an opportunity to reform. Kazakhstan Economic Update Spring 2015. World Bank Group.). Jobs are increasingly moving out of agriculture into urban services sector. The

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question now is how to increase access to good jobs. Employment growth was higher in occupations that require skills of middle and high level, but many workers do not meet these requirements. Most of the working population is still working in low-productivity sectors.

The main task is to overcome the geographic differences in poverty between regions and between rural and urban areas. It is necessary to continue to create jobs in private sector, focusing on their quality, productivity and skills development to enable workers to move to more highly paid professions. There are still difficulties in securing permanent co-prosperity.

Recent trends of economic development in the Republic of Kazakhstan show the need to review industrial policy. Productivity growth slowed down significantly reaching its lowest level in recent years. Sectoral and geographical mobility contributed to preservation of positive dynamics of labor market and poverty reduction. Slowing growth in a service sector in cities ensures creation of jobs and reduction of unemployment.

The cities of Kazakhstan were created in the Soviet years in result of industrialization, opening and development minerals, development of a virgin soil and also transport construction. From 1920 to 1983 the number of the cities grew from 19 to 82, characteristic feature of development of the cities became prevalence of the small cities. In 2016 from 87 cities 60 are the small cities with the population to 50 thousand inhabitants, in which about 1.4 million people live. Transformation of city settlements in rural in 2007 increased the number of villagers. In 2006 in the Strategy of territorial development Kazakhstan for the first time refused from alignment of living conditions in the cities and suggested to be focused on the cities –"growth poles". The expected scheme of territorial development of the country puts emphasis on development of agglomerations – disputable thesis about dependence of growth of economy from concentration – "increase economic density" in a basis of the Expected scheme of territorial development of the country till 2020.The government put a thesis about dependences of growth of economy on concentration. Formation agglomerations will become a key form the territorial organization of Kazakhstan from low population density, in 2030 there will live in the cities, the population of 70%, believes the Government.

The World Bank study provides the following assessment of the situation in the Republic of Kazakhstan: «Recognizing that cities are hubs of economic opportunity and prosperity, urbanization is one of the seven major systemic reforms envisioned in the Kazakhstan 2025 strategy. But the pace of urbanization in Kazakhstan is slow. Internal migration flows in Kazakhstan in 2010–15 accounted for an average of only about 1.7 –2.3 % of the population. In Canada, the comparable share is 14.0 percent; in Japan, it is 4.0 percent; and in the United States, it is 11.0 %. Recent research identifies two key constraints to urbanization in the country: the high cost of living in cities and a near absence of a rental housing market. Primarily because of the high cost of housing, the cost of living in Almaty, the largest city, and Astana, the capital, is 190 % and 240 %, respectively, of the national average. Real housing prices in Astana were three times higher in 2016 than in 2001, and prices more than quadrupled in Almaty over the same period. Along with significantly higher food costs, this means that Kazakhstan's cities are unaffordable for many rural residents who wish to relocate to places where job opportunities may be greater. At around 95 %, Kazakhstan also has one of the highest home ownership rates in the world, but the rental market is small and targets mostly upper-income residents. In the absence of affordable rental housing, most potential internal migrants in Kazakhstan are not able to move to urban areas for work. A large body of research suggests that these kinds of barriers lead to exclusion of lower-income people and restrain economic growth. Disproportionate increases in housing prices can severely limit population flows to highly productive locations and sectors. In other countries, the rising cost of urban housing has been one of the primary causes of greater inequality (Bussolo, Maurizio, Dávalos, M. E., Peragine, V., Sundaram, R.. 2019; Foray, D., Goddard, J., Beldarrain, X. G., Landabaso, M., McCann, P., Morgan, K., Ortega-Argilés, R. 2012).

Structural reforms aimed to encourage private sector participation are actively implemented. There were made

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commitments to reduce the number of permits by 50% and to introduce new laws, implementing the principles of self-regulation. State conducts an ambitious program of regulatory and institutional reforms to diversify economy and to increase participation of a private sector. The government implements a plan for privatization of some state-owned enterprises, however, which results are now ambiguous. But the prospects of number for the working-age population are not unambiguous. And this situation creates problems for further development (Figure 1).

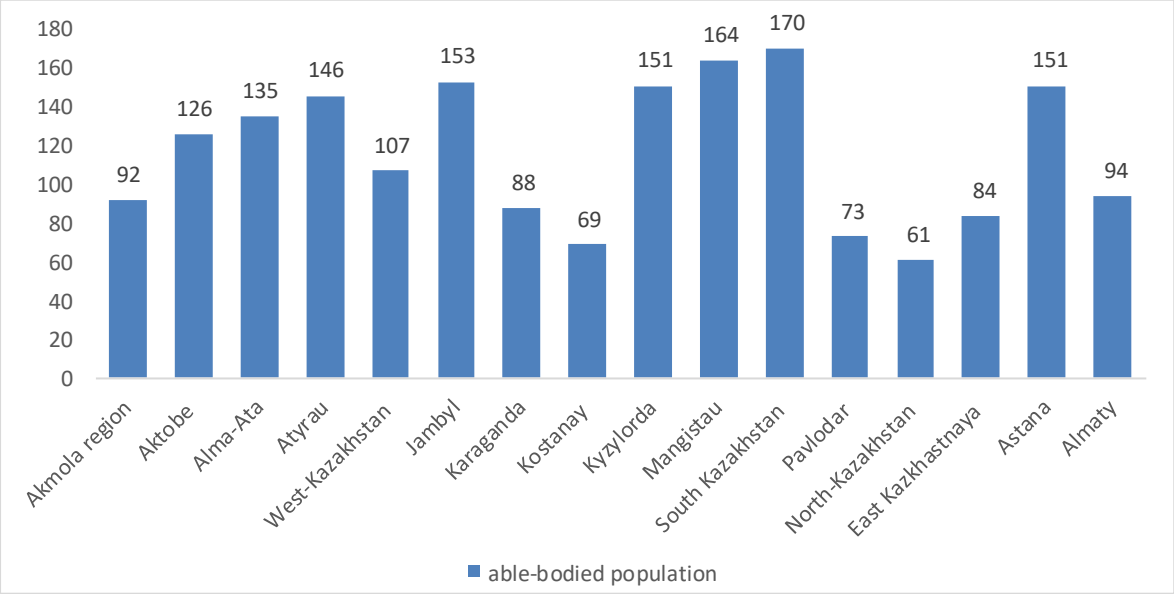

Fig 1. Growth of number of able-bodied population of Kazakhstan and regions up to 2050

Source: Compiled by the authors by the source Center for Applied Economics Research www.cipe.kz

In the study of World Bank «Toward a New Social Contract: Taking On Distributional Tensions in Europe and Central Asia» study shows tensions in the region. Inequality in access to economic opportunities based on geographical location is one of the factors of tension (Figure 2).

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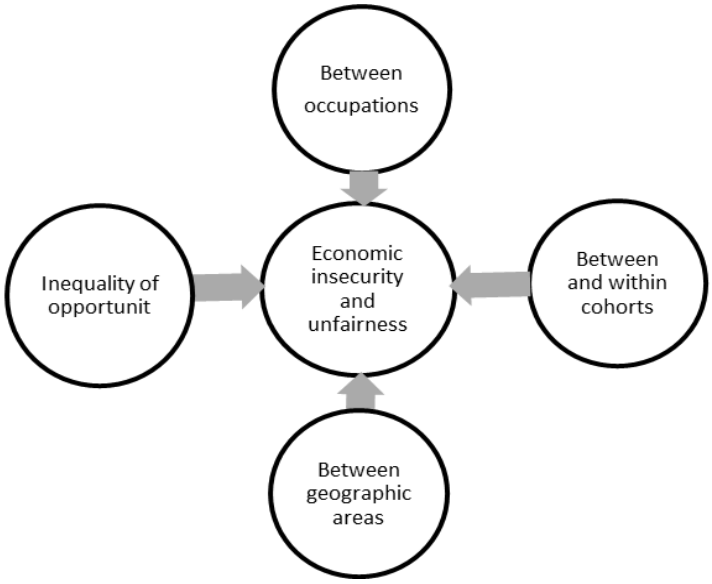

Fig. 2. Distributional tensions along four dimensions are explored

Source: compiled by the authors

The four distributional tensions have emerged amid concerns and resentment over the falling share of labor relative to capital in total income and over the increasing concentration of top incomes and wealth.

Nowadays transition to the new concepts of territorial development — smart specialization (OECD Synthesis Report on Innovation Driven-Growth in Regions: the Role of Smart Specialisation. 2013) is discussed in the country. Policy of smart specialization is aimed to the problem of fragmentation and duplication of innovation that ultimately leads to a lack of effectiveness of scientific research due to impossibility of having a critical mass of knowledge (Vukovic, D., Radulovic, D., Markovic, M., Kochetkov, D., Vlasova, N. 2017). The authors believe that innovation policy cannot be the same in relation to the regions that are different in its innovative profile, capacity and specialization. Regional development today depends on the balance between staff training, researches, industrial and business strategies.

Researches conducted by the authors show a decline in effectiveness of a cluster model by a number of manifestations of weak innovative features. In the classical sense, formulated by M. Porter, a cluster is a group of geographically adjacent interconnected companies and related organizations of a certain sphere, characterized by common activities and complementary to each other. In world practice, clusters are:
-regional forms of economic activity within related sectors, usually tied to one or another scientific institution;
- vertical production chains, narrowly defined sectors, in which the structures carrying out the adjacent stages of the production process (for example, the supplier-producer-marketer-customer sequence) constitute the core. In particular, this definition includes networks that are formed around parent companies;
- having a high degree of integration by industry associations or aggregates of structures with an even higher level of aggregation.

The main goal of clustering is to create an effective economic environment within the region by improving the quality of products, saving various types of resources (production, information) and creating innovations.
However, in the practice of economic activity, clusters may not coincide with the most promising areas of innovative development.

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In the cluster model traditional industries dominate in access to resources. Cluster approach often limits the inter-regional communication and generates priority of promotion of available subjects over creation of the new ones. In scientific studies of developed countries, a considerable body of research is devoted to the processes of reducing the effectiveness of the former methods of managing the development of territories and the transition to a new approach of Smart Specialization (for example Antonelli, G., & Cappiello, G. 2016; Ignatavičius, R.; Tvaronavičienė, M.; Piccinetti, L. 2015; Romão, J., & Neuts, B. 2017; Tvaronavičienė, M.; Razminienė, K.; Piccinetti, L. 2015; Žižka, M., Hovorková Valentová, V., Pelloneová, N., Štichhauerová, E. 2018).

A review of recent publications in the post-Soviet space shows that the development of regional specifics and ensuring the greatest return on investment in innovation is given attention in the works of many authors (e.g. Goridko, N.P., Nizhegorodtsev, R.M. 2018.; de Melo, F., Maslennikov, V.V., Popova, E.V., Bezrukova, T.L., Kyksova, I.V. 2015; Mavlyanova, N., Denisov, I., Lipatov, V. 2015; Kapitonov, I.A., Taspenova, G.A., Meshkov, V.R., Shulus, A.A. 2017; Mingaleva, Z.; Sheresheva, M.; Oborin, M.; Gvarliani, T. 2017; Kantemirova, M. A.; Dzakoev, Z. L.; Alikova, Z. R.; Chedgemov, S. R.; Soskieva, Z. V. 2018; Lavrinenko, O.; Ignatjeva, S.; Ohotina, A.; Rybalkin, O.; Lazdans, D. 2019; Prause, G.; Tuisk, T.; Olaniyi, E.O. 2019).

At the same time, Kazakhstani science has not yet implemented a systematic statistical study of the main parameters and indicators of the sphere of regional specialization and the associated efficiency of investments in innovations in full.

The purpose of the research is determine those regions in which joint investment will make the greatest contribution to the economic development by supporting researches, development and innovation activities within the identified areas of specialization. The authors emphasize that this article examines not intraregional clusters of enterprises, but clusters of regions as mesoeconomic groups with similar conditions and factors of innovative regional and interregional development. The identification of such clusters - groups of regions can be the basis for the implementation of the concept of territorial development - smart specialization.

Methods of the research. In the process of the research, statistical methods of processing economic data were used, in particular methods of grouping, analysis of dynamics and structure.

2. Main results of the research

It is important to determine the role of innovation factors in the development of industrial regions of Kazakhstan to perform transition to innovative path of development. Some of these regions develop at the expense of intellectual effort, for others the innovations themselves are a foundation, and the others lack both scientific developments and their practical implementation (Goridko, N.P., Nizhegorodtsev, R.M. 2018).

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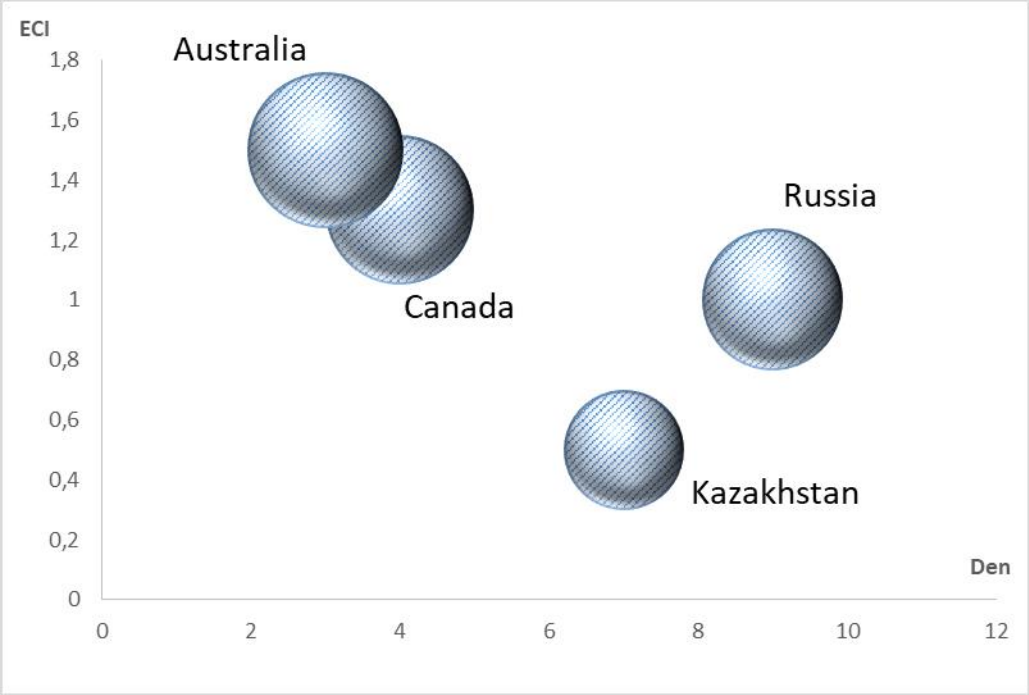

Fig. 4. Level of economic complexity

Source: Compiled by the authors by the sources http://atlas.media.mit.edu/en/rankings/country/, http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS/ . http://data.worldbank.org/indicator/EN.POP.DNS

The urbanization is a long-term global trend, all developed countries have high urban saturation, not all highly urbanized countries are developed. Achievement of economic complexity is the base of model of sustained economic growth which is strongly connected with population density and an urbanization. Innovative potential of economy depends on developed human and social capital. The cities, large, comfortable for life, act as a key factor in attraction of talents. The economic power concentrates in the large cities more and more. The global cities became the main drivers of growth in the developed world and high-growth Third World countries. Growth of the cities will bring more from 60% to 90% in the general growth depending on the region of the world, and technological changes the creating "smart cities" increase in them concentration of the population (Urban world: Mapping the economic power of cities. Report. Mckinsey Global Institute). There is a communication between economic complexity of the country, urban saturation and density population. Level of economic complexity - the objective indicator reflecting long-term degree of competitiveness of the country and its stability. The countries with high economic complexity, comparable on population density with Kazakhstan, as a rule have high urban saturation.

The authors have grouped the regions of Kazakhstan due to four critical characteristics: the volume of the gross regional product (GRP), domestic expenditure on researches and development, expenditure on technological innovation and the volume of industrial output. Materials of the Committee on statistics of the Republic of Kazakhstan were used as statistical base of the research, taken at the regional level (http://www.stat.gov.kz).
Using the principle of Ward and the method of Euclidean distances, the authors obtained the dendrogram of distribution of regions, where Almaty stands out on one hand, and on the other - the rest of the set of regions, the Euclidean distance between them is very small in comparison to the distance between Almaty and the rest of the aggregate.

Then the authors used k-means method and received a graph of the distribution of average values (Figure 5) for

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clustering of all subjects of the Republic of Kazakhstan. The Figure displays the clear separation of the two clusters in terms of expenditures on researches and technological innovation.

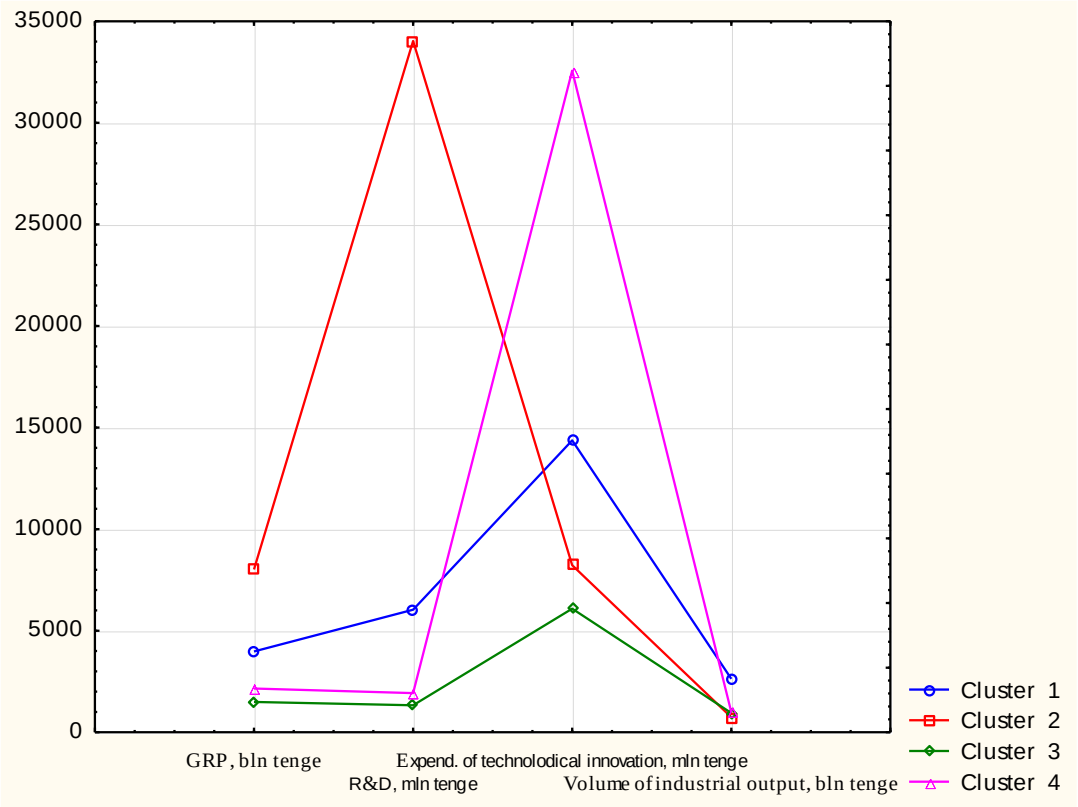

Fig. 5. The graph of the average values for the selected clusters (4 clusters, 16 regions of Kazakhstan)

Source: compiled by the authors according to the results of statistical cluster analysis

Measurement average for every cluster is shown in Table 1.

Table 1. Measurement average in clusters

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
GRP, bln tenge	3980,20	8018,30	1494,875	2154,84
Inner spends on research and development, mln tenge	6036,70	34030,30	1326,412	1926,52
Spends on technological innovations, mln tenge	14370,55	8228,30	6082,875	32568,24
Volume of industrial production, bln tenge	2629,86	738,95	947,713	990,28

Source: compiled by the authors according to the results of statistical cluster analysis

Cluster 1 is characterized by the highest volume of industrial production, the second largest GRP and average spends on research and technological innovations. Cluster is represented by two regions (Table 2), their economical profiles are different. Astana is a leader in GRP, as soon as a lot big national companies which are the main source of GRP have their offices in the city. Atyrau region is a leader in industrial production being one of the main Kazakhstan region with a highly developed oil industry.

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Table 2. Regions of Cluster 1

	Destination to the center of the cluster
Atyrau region	3150,003
Astana	3150,003

Source: compiled by the authors according to the results of statistical cluster analysis

Cluster 2 includes the only region which is Almaty. It has leading position both in GRP volume and in volume of resources spent on inner research and development.

Cluster 3 can be characterized with the minimal numbers of the cluster division.

Cluster includes 8 regions (Table 3), some of which have mostly dominating agricultural economical profile (Akmola region, Almaty region, Zhambyl region, North Kazakhstan region) and others have low spends on research and development and technological innovations which do not lead to the growth of GRP due to some organizational and technological reasons.

Table 3. Regions of Cluster 3

	Destination to the center of the cluster
Akmola region	2523,322
Almaty region	424,108
West Kazakhstan region	2270,158
Zhambyl region	1649,116
Kyzylorda region	2814,630
Mangystau region	2997,951
Pavlodar region	1391,608
North Kazakhstan region	1228,932

Source: compiled by the authors according to the results of statistical cluster analysis

Cluster 4 is a leader in spends on technological innovations. In terms of other metrics cluster 4 has slightly bigger numbers than cluster 3. It includes developed industrial areas (except for South Kazakhstan region) which mainly require modernization and introducing of new technologies (Table 4).

Table 4. Regions of Cluster 4

	Destination to the center of the cluster
Aktobe region	1548,548
Karaganda region	1162,254
Kostanay region	3748,094
South Kazakhstan region	506,667
East Kazakhstan region	1939,992

Source: compiled by the authors according to the results of statistical cluster analysis

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3. Discussion

Results of the research determine several clusters in which transition to smart specialization is possible.
Regions in which developing of general purpose technologies looks rational are Aktobe region, Karaganda region and East Kazakhstan region. Innovations in these areas are put into industrial production and are of high concentration. Great input into spends on technological innovations may be a starting point of the next level of these industrial regions development where innovations will get technical and technological realization.

Highly distinguished cluster of the capital of the country – Astana - may be determined as a territory where it is more profitable to put efforts into applied research and general purpose technologies realization in terms of existing products and technological processes. “Smart Astana” program started in November 2016. 5 centers of competences will be created in the capital with the input from the leading global companies of the world. These centers are center of urban and agro technologies, medical technology, energy and fintech.

Mayor of Astana said at the XI Innovation congress: “Today development of the world economy is determined by the global cities, and so we have an aim to make Astana Global Smart City. The new strategy of city development is realized, that is adapted to world trends of global cities development. We determined for ourselves 10 priority sectors which make steady city economy and will create a stable and productive employment. Some of them are development, tourism, financial center, modern production, solutions for a smart city, medicine, logistics and others”.

Regions in which innovations are a result of not only scientific but also creative activity (in a wide meaning of this word) stand alone in smart specialization. It is rational to develop so called creative branches in them. Almaty is a city of this category in Kazakhstan. It is financial, cultural and educational center of Kazakhstan. Despite the recognition of the importance of the process of specialization of regions for the development of the country, current policies, programs and forecasting schemes are contradictory and do not contain a clear desired target value of the level of urbanization. Strategy 2050 prioritizes the development of Astana and satellite cities around Almaty; support single-industry towns and small cities development.

The concept of Kazkhastan’s entry into 30 developed countries determines that a small population of geographically distant regional centers in the long term can also become a serious obstacle to economic development. The low overall population density in Kazakhstan is aggravated by the lack of urbanization. By 2050, this indicator, according to experts, will increase to 63-64%, which will remain below the world average. The general scheme of the organization of the Territory of the Republic of Kazakhstan plans to limit migration to cities by supporting the agricultural sector. Concentration of efforts on preservation and development of single-industry towns and small cities. According to the Forecasting scheme of the Territorial development, the further development of the country requires the concentration in the urban area of at least 70% of the country's population, which will allow the formation of a modern post-industrial economy. Given the low population of Kazakhstan, it is necessary in the near future to form a limited number of world-class modern urban centers. First of all, such cities in Kazakhstan can be the cities of Astana, Almaty, Shymkent, Aktobe and Ust-Kamenogorsk. According to forecasts, urbanization is expected to grow to 70% by 2050 (from the current 55%), with more than 35% of the urban population living in hub cities with a population of over 2 million (Almaty, Astana, Shymkent, Ust-Kamenogorsk).

Conclusions

Problem of determination and identification of sources of growth of different regions is actual for Kazakhstan. Country demonstrates hydrocarbon focus of sources of growth and development of economy. Due to focusing on unique competences and resources of the region and due to taking into account different ways of development,

policy of rational specialization leads to differentiation regional innovative strategies in the country and as a result to their diversity. This will lead to appearing of new points of growth and will enhance course to stable development of national economy.

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