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## Influence of innovative activities on economic development of the Russian Arctic

To cite this article: V Tsukerman *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **302** 012109

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# Influence of innovative activities on economic development of the Russian Arctic

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**Abstract.** The study conducted the impact of innovative activity on the economic development of the Russian Arctic. The methodology of the study envisaged the ranking of four regions that are fully included in the Arctic zone of the Russian Federation by indicator «Innovative products production as a percentage of the total volume of products shipped ». The analysis of innovative activities level of the Russian Arctic in comparison with the average indicators of the country was carried out. It is shown that the Murmansk region is characterized by the highest volume of innovative products produced respectively, the Nenets Autonomous District - by the lowest. The direct impact of the production and sale of innovative products on economic indicators primarily due to an increase in gross regional product (GRP), fixed assets and the number of employed people is shown. In this case the Murmansk region having a high level of innovative activities showed an excess of the values of the Nenets Autonomous District by twelve of the nineteen indicators. In addition by GRP, fixed capital investments, fixed assets wear level and average monetary incomes per capita the Murmansk region showed an excess of average Russian values. It should be noted that the Nenets Autonomous District which produces the smallest amount of innovative products is ahead of the Murmansk region by GRP and investments in fixed assets mainly due to the exploitation of oil and gas resources. Performed correlation analysis confirmed the influence of innovative activities on the economic development of the Arctic. High correlation of the innovative products volume with significant economic indicators is shown. The study confirmed the hypothesis of the influence of innovative activities on the economic indicators of the Arctic regions.

## 1. Introduction

Sustainable development of the Russian regions is primarily associated with industrial development which must implement innovative technologies and accordingly produce products that are competitive in world markets especially in terms of western sanctions.

Russian Arctic covers an area of more than 9 million square kilometers and is characterized by a population of 2.5 million, representing 2 percent of the country's population and 40 percent of the population of the Arctic countries. In the Russian Arctic more than 15 percent of the Russian Federation industrial products are produced and a quarter of exports are provided [1].

The strategic directions of innovative industrial development of the Arctic are associated with the existing large resources of solid minerals and hydrocarbons. According to expert forecasts the reserves of the Arctic shelf are estimated at 90 billion barrels of oil, more than 40 billion gas condensate and 47 trillion cubic meters of gas.



The Arctic contains no less unique reserves of solid minerals containing copper, nickel, precious metals, rare earth elements, tantalum, niobium, titanium, iron, phosphorus, chromium, manganese, tungsten, vanadium, molybdenum, polymetals, diamonds. The Arctic has the largest share of platinum metals (47%), gold (40%), vermiculite (100%), indigenous diamonds (100%), chromium, and manganese (90%), significant amounts of tin, antimony, cobalt, nickel, tungsten, phosphorus, aluminum, mercury. The cost of Arctic coal is estimated at 780 billion tons. According to experts the cost of mineral raw materials is estimated at 30 trillion dollars including hydrocarbon resources.

Studies aimed at assessing the level of innovative development are of great importance. Studies aimed at assessing the level of innovative development are of importance due to the increasing role of science, technology and innovative activities of production. In the future the Arctic regions will be able to ensure sustainable development not only using foreign advanced technologies but also capable of producing their own [2].

## 2. Materials and Methods

Scientific basis for the study is the theory of the development of complex systems, methods of economic analysis and a system approach that will allow considering the problems of innovative activity and determining its impact on the economic development of the Arctic regions.

The work used tools that allow to define indicators of the state of the Arctic economy which provides the necessary depth and complexity of the study. Considering the high degree of uncertainty in economic activities the research methodology involves the use of expert methods as well as factor and correlation analyzes necessary to establish the degree of interdependence of certain indicators. The Russian Federal State Statistics Service data were used as the information base for the study [3].

General issues of managing the innovative industrial development of the regional economies are considered by L.M. Gokhberg, I.A. Kuznetsova, E.B. Lenchuk, G.A. Vlaskin, A.A. Dynkin, N.I. Ivanova, R.M. Nizhegorodtsev, S.M. Nikitenko, A.E. Kurnosova, E.K. Chirkunova, N.P. Goridko, A.I. Tatarin, V.A. Tsuckerman, V.S. Zharov, A.V. Kozlov, S. Gutman, A. Tesli and others [4-17].

Theoretical and methodological foundations of the role and influence of innovation activity on the economic development of Russian regions are considered by of N.B. Anikov, A.G. Babkov, D.Z. Barieva, O.A. Donicheva, D.Yu. Fraimovich, S.A. Grachev, V.N. Makoveev, T.V. Pogodaeva, D.V. Zhaparova [18-22].

The following indicators were selected to analyze the impact of innovation activity on the economic development of the Arctic:

- GRP;
- GRP per capita;
- value of fixed assets;
- fixed assets wear degree;
- investments;
- investments per capita;
- average income per capita in relation to the subsistence minimum;
- average annual number of employed people;
- organizations associated with development and scientific research;
- number of people associated with in development and scientific research;
- number of employed people with academic degrees;
- costs for development and scientific research;
- costs for technological innovations;
- share of organizations engaged in technological innovations;
- volume of innovative products production;
- volume of innovative products production to the total volume of products shipped;
- number of developed advanced technologies;
- number of used advanced technologies.

### 3. Results

At the first stage the ranking of four regions that are fully included in the Russian Arctic [23] according to the indicator “The share of innovative products from the total volume of products shipped” for 2015-2017 was carried out. At the second stage a comparison of the level of innovation activity in the Arctic regions between each other and average indicators of the Russian Federation was made. According to the averaged data for the analyzed period the Murmansk region has the highest level of innovation activity while the Nenets Autonomous District has the lowest one. Table 1 shows the ranking of regions by indicators of innovation activity and economic development based on average indicators for 2015-2017.

Comprehensive analysis showed that innovation activity significantly affects the increase in economic development primarily due to an increase in gross regional product, fixed assets and the number of employed people.

The Murmansk Region is characterized by the highest level of innovation activity and exceeds indicators of Nenets Autonomous District by: volume of innovative products production – 300 times, number of highly qualified researchers – 246 times, costs for scientific research and development – 56 times, number of used advanced technologies – 29 times, number of employed people – 11 times, organizations associated with development and scientific research – 8 times, inventive activity coefficient – 5 times, fixed assets cost – 3 times, costs for creation and realization of technological innovations – 4 times, number of people engaged in scientific research and development – 4 times, specific gravity of organizations engaged in technological innovations – 2 times, GRP – в 2 times, fixed assets wear degree – by 4 %. By four indicators such as GRP, investments into the fixed capital (in calculation per capita), fixed assets wear degree and average income per capita, the Murmansk region is ahead of average Russian values.

It should be noted that by indicators of GRP and investments into the fixed capital (in calculation per capita) Nenets Autonomous District is ahead of the Murmansk region that can be explained by the industrial specialization of the regions in extraction of minerals and large volumes of oil and gas production.

Based on the correlation analysis the influence of innovation activity on economic development of the Arctic is determined (figure 1).

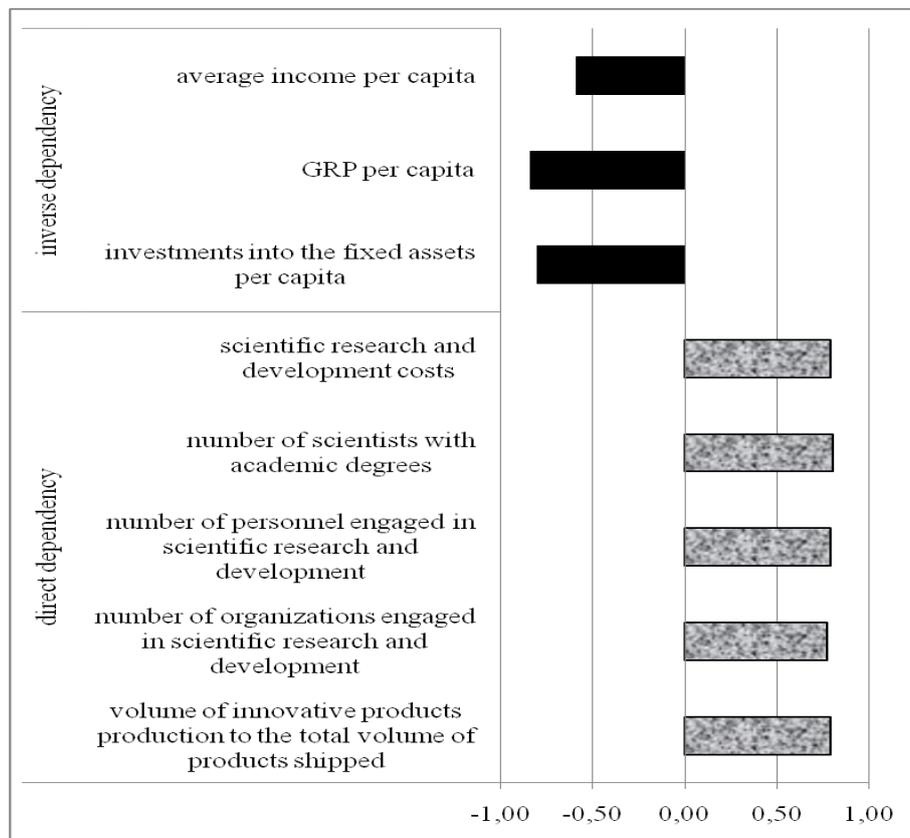


Figure 1. The values of correlation between the volume of innovative products production (as a percentage of the total volume of products shipped) and the main indicators of the Arctic

Indicator «Volume of innovative products production (as a percentage of the total volume of products shipped)» has a high correlation with only eight of the eighteen indicators. Significant direct dependence (correlation coefficient is 0.76) is between specific gravity of innovative products and absolute indicators of the volume of innovative products produced what can be explained by the multidirectional growth trends of the indicators. Funding of science reflects high dependence of highly qualified researchers, organizations, people and costs associated with development and scientific research.

Correlation between indicators of innovation activity and economic indicators GRP, investments into the fixed capital (in calculation per capita) and average income per capita has a negative value. Negative value of correlation (-0.59) is between the indicator «Average income per capita» and «Volume of innovative products production (as a percentage of the total volume of products shipped)». The Arctic regions are characterized by increased monetary incomes of the population associated primarily with the northern allowances and coefficients for working in adverse climatic conditions.

Thus the available resources such as scientific potential and high innovation activity are not used to increase the effectiveness of the innovative development of the Arctic which has virtually no effect on the main economic indicators.

Table 1. Levels of innovative activity in the Arctic regions

	Murmansk Region	Nenets Autonomous District	Russian Federation
GRP, million rubles*	417 748.4	246 062.2	69254134.3

GRP per capita, rubles*	510 830.0	4 990 259.7	472161.9
Fixed assets, million rubles	1 892 268.7	731 546.0	194649464
Fixed assets wear degree, %	42.6	44.4	50.9
Investments, million rubles	98 876.0	114 112.0	15966804
Investments per capita, rubles	130 145.0	2 603 756.7	108734
Average income per capita in relation to the subsistence minimum, rubles	336.93	418.00	3.21
Average annual number of employed people, thousand people	376.8	33.1	71842.7
Organizations associated with development and scientific research, units	31.0	4.0	3944
Number of people engaged in scientific research and development, number of people	2 248.3	47.7	707887
Number of scientists with academic degrees, units	492.7	2.0	103327
Costs for development and scientific research, million rubles	2 398.0	42.6	1019152.4
Costs for technological innovations, million rubles	1 201.6	271.6	1404985.3
Specific gravity of organizations engaged in technological innovations, %	6.8	4.2	7.5
Volume of innovative products production, million rubles	3 807.5	12.7	4166998.7
Volume of innovative products production to the total volume of products shipped, percents	1.47	0.006	7.2
Inventive activity coefficient	0.4	0.08	1.55
Number of developed advanced technologies, units	0.0	2	1402
Number of used advanced technologies	1 194.0	41	240054

\* due to lack of data GRP and GRP per capita were taken for 2016

#### 4. Conclusions

Performed correlation analysis confirmed the influence of innovative activities on the economic development of the Arctic. High correlation of the innovative products volume with significant economic indicators is shown.

The study confirmed the hypothesis of the influence of innovative activities on the economic indicators of the Arctic regions.

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