Resource regions of Russia: socio-economic indicators and innovative development

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Abstract. The article is devoted to the study of the influence of the natural resources located in the regions of Russia on the level of socio-economic and innovative development. At the first stage of the study, a cluster analysis was applied to the database of indicators of the level of extraction specialization in the regions of Russia. During the next stage of the study, hypotheses on the connection between socio-economic indicators and specialization of the region in extractive industries were tested via multifactor regressions. Positive dependence of socio-economic variables on resource specialization variables with a high level of significance was revealed. However, most of Russia's resource regions have low level of innovative production, which can have a negative influence on country's economic growths.

1. Introduction

The extractive industries of the Russian Federation play a key role in the development of the country. However, current development of the Russian economy follows the resource-inertial trajectory [1, 2].

The aim of the work is to identify the dependence of the level of socio-economic indicators and innovative development on the level of resource specialization of Russian regions. To achieve this goal, the following tasks were accomplished (1) empirical analysis of indicators of socio-economic and innovative development, as well as the level of specialization in extractive industries for Russian regions; (2) the allocation of resource regions and their classification in accordance with the indicators of resource specialization; (3) analysis of the relationship between the degree of resource specialization and the level of socio-economic and innovative development.

Recent studies indicate a negative relationship between resource dependence and variables, explaining the growth of productivity at the macro level [3]. A wide range of explanatory variables for such analysis includes: the development of human capital (Gylfason, 2001, Stijns, 2006, Shao and Yang, 2014), the growth of export of processing industries (Wood and Berge, 1997), investment, education and transparency (Papyrakis and Gerlagh, 2007) and institutional development (Mehlum, 2006; Boschini et al., 2013) [4-6].

There is a number of studies that challenge both the negative relationship between resources and development in general, and the choice of specific indicators for analysis [7]. Another critical approach relates to the time series used for the analysis of the “resource curse” (Alexeev and Conrad,

2009; Stijns, 2005; et al., 2011; James, 2015). It is important to note that most of the researchers reviewed the time interval of 1960-1990, when most of the developed countries moved from the industrial to the postindustrial type of economy, or, in the case of countries with a lower level of development - from mostly pre-industrial to industrial [8].

Most of the research on the influence of the natural resource on the economy of the territory was carried out at the macro level. However, in the situation of the heterogeneous structure of the regional economy and the level of socio-economic development within a single country, a more detailed analysis of the relationship of specialization in extraction and economic indicators is needed [9, 10].

2. Methods of research

At the first stage of the study, a cluster analysis was applied to the database of indicators of the level of extraction specialization in the regions of Russia. The Ward Method was chosen as a clustering algorithm, because it provides compact and well-separated clusters [11]. During the next stage of the study, hypotheses on the connection between socio-economic indicators and specialization of the region in extractive industries were considered. Econometric tools of multifactor regressions were used to test possible dependencies.

An important issue in such analysis is the choice of indicators and factors, as well as their calculation method [12, 13]. Independent variables, such as the share of the mining industry in the GRP, the share of employment in extractive industries, the proportion of mineral extraction tax in total tax revenue, were calculated as a percentage of the overall performance of the regions. This allowed not only to conduct inter-regional comparisons, but also to assess the production, fiscal and social structure within the regions. The dependent variables, such as income per capita, the level of investment per capita and GDP per capita were calculated as the relation of the absolute values and the population of the region. Per capita indicators allow more accurate assessment of the level of development of the territories under consideration.

3. Results and discussion

As a result of cluster analysis all 85 regions of Russia were divided in 4 groups. Group 1 “Monoresource regions” consist of Khanty-Mansiysk Autonomous District, Yamalo-Nenets Autonomous District, Kemerovo Region, which specialize in extraction of one particular natural resource. Group 2 “Hydrocarbon resource region” has Nenets Autonomous District, Komi Republic, Astrakhan Region, Republic of Bashkortostan, Republic of Tatarstan, Udmurt republic, Perm Region, Orenburg region, Samara Region, Tyumen region, Krasnoyarsk region, Irkutsk region, Tomsk Region, The Republic of Sakha (Yakutia) and Sakhalin region. Group 3 ‘Non-hydrocarbon resource regions” included Magadan Region, Chukotsky Autonomous District, Belgorod region, The Republic of Karelia, Murmansk region, Amur region, Arhangelsk region, The Republic of Khakassia, Transbaikal region. Group 4 “Non-resource regions” consists of all the other regions.

The first, second and third groups, composing the list of resource regions of Russia, have relatively high indicators of socio-economic development. Such indicators as monthly income per capita, investment per capita, GRP per capita are at a level above the Russian average for most of the considered territories. However, in terms of output of innovative products, this indicator exceeds the average Russian level only for 6 resource regions out of 27 (table 1).

Table 1. Main indicators of socio-economic and innovative development of Russia’s resource regions in 2016, thousand rubles.

Region	Per capita income per month	Investments per capita	GRP per capita	Share of innovative goods and services in GDP, %	Production of innovative goods and services per capita

Sakhalin region	49.6	508.8	1701.8	11.16	189.8
Republic of Tatarstan	32.6	165.4	473.9	20.36	96.0
Samara Region	26.8	80.1	386.9	18.78	72.7
Magadan region	50.8	267.1	851.1	7.19	61.5
Perm Region	28.4	90.0	397.8	9.19	36.6
Republic of Bashkortostan	28.1	88.7	323.6	10.58	34.3
Tyumen region	28.0	177.0	619.2	3.58	21.8
Krasnoyarsk region	28.0	145.7	564.5	3.64	20.5
Komi Republic	31.5	235.7	610.7	3.24	19.9
Belgorod region	29.6	92.6	442.8	4.28	18.9
Tomsk region	24.3	94.1	439.9	3.78	16.6
Kemerovo Region	21.3	57.9	310.1	3.85	12.0
Udmurt republic	23.9	56.3	328.0	3.48	11.4
Astrakhan Region	22.8	116.4	314.9	3.44	10.8
Transbaikal region	22.8	77.9	229.8	4.19	9.7
Irkutsk region	22.3	107.3	420.1	2.27	9.5
Orenburg region	22.0	82.9	388.5	1.89	7.4
Amur region	29.7	160.2	343.6	1.98	6.8
Khanty-Mansi AO - Yugra	44.2	488.5	1928.2	0.33	6.2
Murmansk region	36.1	133.4	512.2	1.12	5.8
Yamalo-Nenets AO	67.5	2046.9	3395.2	0.15	4.9
Republic of Sakha (Yakutia)	38.9	285.9	781.5	0.38	2.9
Chukotka AO	63.9	195.7	1273.1	0.17	2.2
Republic of Karelia	25.7	56.4	335.2	0.09	0.3
Republic of Khakassia	21.2	49.8	319.8	0.06	0.2
Nenets AO	70.0	1938.9	4956.8	0.00	0.1
Tyva Republic	14.1	26.9	149.8	0.05	0.1
Russian Federation	**30.7**	**99.7**	**443.5**	**5.91**	**26.2**

Three multifactorial regressions of testing influence of resource specialization were built. The models differed in dependent variables, such as per capita incomes, per capita investment and per capita GRP.

All regressions under consideration were significant, with the R-square and the normalized R-square having high levels, which indicates the high quality of the built model (table 2).

Table 2. Multifactorial regression results for GRP per capita.

Regression statistics	
Multiple R	0,861515
R-square	0,742208
Normalized R-square	0,708583
Standard Error	578,1163

Dispersion analysis

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	22131707	7377236	22,0731	5,85E-07
Residual	23	7687024	334218,4		
Total	26	29818731			

The share of production in GRP was a significant factor for all the regressions tested; the share of mineral extraction tax in tax revenues was significant for explaining per capita investment and per

capita GRP; employment in the extractive industry has an impact on per capita income per month and the share of production in GRP (formulas 1-3).

$$y_1 = 19.5 + 0.26*x_1 + 1.46*x_3, \quad (1)$$

$$y_2 = -198.3 + 2.8*x_1 + 5.6*x_2, \quad (2)$$

$$y_3 = -325 + 14.3*x_1 + 7.9*x_2 + 83.9*x_3, \quad (3)$$

where y_1 – Per capita income per month; y_2 – Investments per capita, y_3 - GRP per capita, x_1 – Share of extraction in GRP; x_2 – Share of Mineral extraction tax in the tax revenues, x_3 - Employment in the extraction industry.

Positive dependence of socio-economic variables on resource specialization variables with a high level of significance was revealed for all tested regressions. However, despite this positive correlation a significant proportion of Russian resource regions can be classified as enclaves. Isolation of the regions occurs mainly due to the localization of mineral resources in hard-to-reach areas with severe natural, economic, geological conditions.

Empirical analysis showed that high indicators of socio-economic development, especially per capita investment, are characteristic primarily of Arctic enclave resource regions. This can be explained by the low level of population and high incomes as a result of Russia's social policy to increase the incomes of the population in the regions Far North and equated to them. In addition, these regions often specialize mainly in the production of hydrocarbons - an industry that requires a high level of investment [14].

At the same time, most of Russia's resource regions have low levels of innovative production, which at the present stage of the world economy development becomes the most important factor of the country's economic growths.

Thus, the "resource curse" of the resource regions associated with relatively high living standards of the population due to the extraction of resources and low indicators of innovative development, processing, creation of industries with high added value is revealed.

4. Conclusion

Empirical analysis showed that relatively high indicators of socio-economic development are characteristic of resource regions, primarily enclaves, located in the Far North of Russia. Most of the enclave regions, which specialize mainly in the resource-extracting sectors, have socioeconomic indicators above the average for Russia. At the same time, low levels of innovation development indicators are observed for all enclave resource regions. Only for six out of twenty-seven resource regions the share of innovation production in GRP was higher than the average for Russia. In the absence of a developed intraregional economy and an innovative type of specialization, this can lead to a decline in production efficiency and economic growth. The directions of innovation development within the framework of smart specialization based on knowledge and innovations, resource-efficient, environmentally friendly and competitive economy should include the processing sector and related industries such as petrochemicals, engineering, construction, services, financial sector and others.

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