Spatial aspects of Russian regions' convergence

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Issues concerning Russian regions economic growth continue to be relevant and attract interest of researchers for more than 20 years. Usually the (Barro, Sala-i-Martin, 1992) approach is used, which allows to determine which regions, poor or rich, grow faster. However, according to K. Glushenko (2011), Russian regions are characterized with increased diversity and do not converge to equilibrium path Therefore, many researchers divided Russian regions into several groups, characterized by various dynamics. Solanko (2008), using data for 1992-2001, found that Russian regions may be converging towards two separate steady states, namely "poorest regions seem to be converging among themselves, while growth experiences among other regions have been highly heterogeneous". Kholodilin et al, (2012) revealed that the overall speed of regional convergence in Russia was low by international standards, however, it was a strong regional convergence among high-income regions located near other high-income regions.

In this research an attempt is made to divide regions by state of budgets according to N. Zubarevich and E. Gorina (2015). To facilitate the technical side of research, regions with sufficient transferts from the federal center and "default" regions were aggregated into "poor" regions group, the "middle" income group remained the same, and the "rich" and "more responsible" regions were united into "rich" regions group (Figure 1).

Moreover, according to different authors, it is necessary to consider not only the regions' own economic growth, but also the state of neighboring regions. Lugovoy et al, (2007) noted that for the period 1998–2004 one can talk about significant spatial heterogeneity in economic development of Russian regions. Kolomak (2011) empirically demonstrated the heterogeneity of the Russian regions, and positive externalities were observed in the western regions, whereas negative externalities were observed in the eastern regions. Buccellato (2007), using data for 1999-2004, also noted that "the spatial component appears to be non-negligible and, consequently, conventional convergence estimates suffer a bias due to spatial dependence across observations". The bias in the estimates of the coefficients under the ignoring of spatial effects is also discussed in papers (Vakulenko, 2015; Semerikova, 2015).

The main hypotheses tested in this study are:

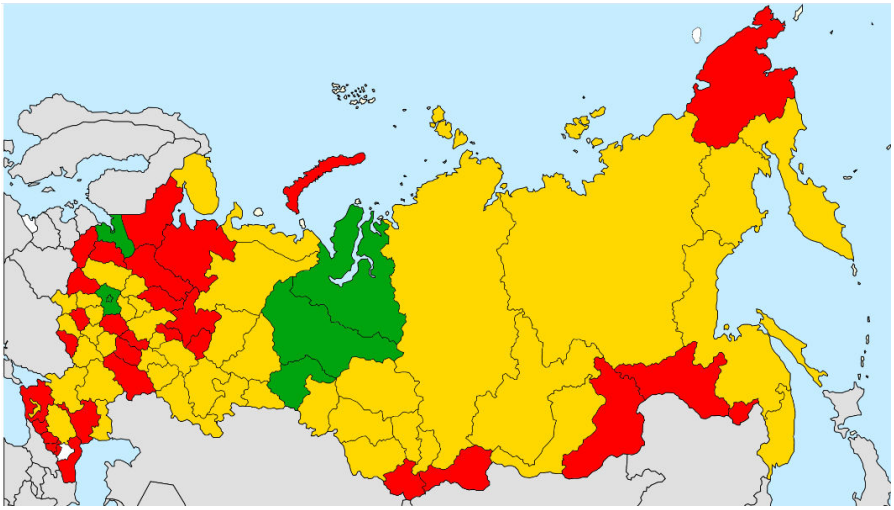
1) Factors affecting economic growth in poor, medium and rich regions are different.
2) The growth rate of poor, medium and rich regions varies.
3) The growth of Russian regions is affected not only by their internal factors, but also by the condition of other Russian regions

To test these hypotheses, I used the data for 80 Russian regions for 2000-2014 and a dynamic model. A characteristic feature of this model is the use of average GRP growth over the next 3 years (rather than 1 year, which allows to better identify long-term trends). In addition, all regions were divided into 3 groups (poor, medium, rich), mutually affecting each other.

$$\frac{1}{3}\ln\frac{Y_{i(t+3)}}{Y_{ie}} = \alpha + \delta \ln Y_{it} + \theta(W \ln Y)_{it} + (X\beta)_{it} + \varepsilon_i, \quad (1),$$

where i – number of the region, t – time , Y_{it} - Gross Regional Product (GRP) per capita (thousand rubles in basic prices of 2000 PPP), X1 = urbanshare – the share of urban population (measured in %), X2 = inv_gdp – ratio of investments and GRP in the correspondent region , X3 = highed – the share of the employed population with a higher education (measured in %) , X4 = road – density of highways, X5 = risk – investment risk measure, higher values of this indicator indicate higher investment risk, X6 = open – measure of economy openness (the ratio of the sum of exports and imports to the GRP).

Figure 1. Map of Russia (poor, medium and rich regions are colored correspondingly by red, yellow and green).



For choosing explanatory factors, the articles (Berkowitz and DeJong, 2005, 2011; Leonard et al., 2016; Martinez-Vazquez, J. and Timofeev, 2014; Libman, 2013; Alexeev and Chernyavskiy, 2015) were used. The tests carried out revealed that a model with random and temporal effects is the most appropriate. The results of the model estimation are given in Table 1. They can be interpreted as follows:

1) All the hypotheses received empirical confirmation.

2) There are convergence only for the “middle” and “rich” regions, and the speed of convergence for “rich” regions is higher.

3) Poor regions did not receive externalities from neighbors, and medium and rich regions have positive externalities.

4) Cities are considered drivers of economic growth only for rich regions. In the middle regions an opposite tendency is observed (apparently, this can be explained by the problem of single-industry cities).

5) Investments stimulate economic growth in medium and rich regions (in the latter to a greater extent), but for the poor regions they have the opposite effect (apparently, investments are inefficiently used).

6) The share of higher educated labor force affects the growth rate only in rich regions, and the influence is negative. Apparently, this indicator does not characterize the quality of human capital well.

7) High density of highways stimulates growth only in poor regions, so it makes sense to develop the infrastructure there.

8) The level of economic risk affects the growth rate only in the rich regions, and, in accordance with expectations, the lower the risk, the higher the growth.

9) Openness of the region to exports and imports stimulates economic growth only in rich regions.

Table 1.

Variables	coef	std.err	z	p > |z|	[95%	Conf. Interval]
urbansharep	-0.02487	0.024007	-1.04	0.3	-0.07192	0.0221882
urbansharem	-0.04183	0.019363	-2.16	0.031	-0.07978	-0.0038765
urbansharer	0.141543	0.046845	3.02	0.003	0.049729	0.2333561
inv_gdpp	-0.11668	0.016705	-6.98	0	-0.14942	-0.0839353
inv_gdpm	0.033996	0.014033	2.42	0.015	0.006493	0.0614998
inv_gdpr	0.079904	0.022824	3.5	0	0.03517	0.1246375
highedp	-0.02752	0.046111	-0.6	0.551	-0.1179	0.0628544
highedm	0.04202	0.038851	1.08	0.279	-0.03413	0.1181666
highedr	-0.16615	0.067088	-2.48	0.013	-0.29764	-0.034657
roadp	6.64E-05	2.33E-05	2.85	0.004	2.07E-05	0.0001122
roadm	1.06E-05	2.25E-05	0.47	0.638	-3.4E-05	0.0000546
roadr	-8.84E-06	9.43E-06	-0.94	0.349	-2.7E-05	9.64E-06
riskp	-0.0009	0.006284	-0.14	0.886	-0.01321	0.0114198
riskm	-0.0015	0.008268	-0.18	0.856	-0.01771	0.0147001
riskr	-0.06956	0.022115	-3.15	0.002	-0.1129	-0.0262105
openp	0.002948	0.004771	0.62	0.537	-0.0064	0.0122982
openm	-0.00966	0.006012	-1.61	0.108	-0.02144	0.0021239
openr	0.003835	0.00223	1.72	0.085	-0.00054	0.0082051
y0p	0.000477	0.002248	0.21	0.832	-0.00393	0.0048826
y0m	-0.00383	0.001732	-2.21	0.027	-0.00723	-0.0004377
y0r	-0.00689	0.003225	-2.14	0.033	-0.01321	-0.0005672
wy0p	-0.09083	0.082417	-1.1	0.27	-0.25236	0.0707072
wy0m	0.370255	0.066586	5.56	0	0.239749	0.5007611
wy0r	0.370761	0.1226	3.02	0.002	0.13047	0.6110525
Time dimmies	Yes					
_cons	0.099322	0.02221	4.47	0	0.055791	0.1428535