Structural change and economic growth in modern Russia: The role of “resource-type” regions

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Abstract. Authors carry out comparative analysis of economic growth of the subjects of the Russian Federation and highlight their three types: predominance of manufacturing, predominance of services and predominance of mining industries. Based on the results of the research authors make a number of assumptions about the potential of the resource sector and “resource-type” subjects of the Federation as the engines of economic growth.

1. Introduction

From 2011 Russian economy was in the phase of stagnation that showed the inadequacy of the previous model of economic growth based on the export of raw materials and primary processing products of manufacturing industries (metallurgy, chemistry). According to this fact, in the economic literature and projects for economic policy two new challenges have been proposed to the role of the driver of economic growth in the modern Russia. Modern high-tech services are considered as one of the challengers in the frame of the catching-up post-industrialization concept [12, 13]. This approach was mostly reflected in the Strategy–2020. The concept of re-industrialization (new industrialization), which emphasizes the development of the manufacturing industry, is an alternative approach [1, 4].

At the same time one can say that the potential of the traditional Russian resource sector as a potential driver of economic growth is not exhausted. A number of foreign and Russian authors pay special attention to this fact and consider this sector not through the prism of the “resource curse” but as a basis for sustainable economic development [2, 7–9].

The problem of sectoral priorities of economic growth has a strong regional dimension. Reliance on the resource sector puts the focus on the problem of the integrated development of so-called “resource-type” regions, which are the subjects of the Russian Federation that form the backbone of the economy with export-oriented industries and mining industries of the first redistribution. To answer these questions it is necessary to conduct comparative analysis of the regions development with high shares of the manufacturing industry, “service economy” and mining sector. Assessment of the role of the various sectors in the economic growth of the Russian Federation subjects is given according to the data on the development of 80 Russian regions over the period 2005–2014.

2. Theory

The authors of the catch-up post-industrialization concept of the Russian economy consider the fact that within the Russian industrial sector there is no serious advantages, especially if compare it with the newly industrialized countries. Therefore, they believe that the breakthrough strategy should focus on the
development, especially high-tech services sector development [14]. It is expected that the accelerated development of high-tech services will create conditions for comprehensive technological modernization of all spheres of the Russian economy. Software development and other computer technologies stand out as the possible competitive advantages of Russia [11]. However, this raises the question about the extent to which the development of such services can become a growth driver of the Russian economy and ensure efficient use of available human, natural and capital resources.

The concept of re-industrialization (new industrialization) is an alternative to the idea of catching-up post-industrialization. At the same time it is based on a long tradition of perception of the manufacturing industry as the “engine of growth” [5]. Empirically, all developed countries had a manufacturing share of employment of at least 18–20% in the second half of XX century. High-growth countries usually experience rapid industrialization. Rodrik [15] showed that manufacturing industry exhibits unconditional convergence that is countries that start farther away from global productivity frontier demonstrates a higher rate of growth, regardless geography, policies, or any other country-specific characteristics.

The engine of growth hypothesis emphasizes capacity of manufacturing to provide special opportunities for capital accumulation and economy of scale. Investments in technology in manufacturing create positive externalities for other sectors, facilitating overall growth. The engine of growth hypothesis closely connected with the dual economy model [10] that implies the existence of two sectors in the economy: more productive modern and less productive traditional. The transition of labor and other resources from former to latter increase average labor productivity in the economy and provide overall economic growth even if there is no productivity growth within sectors.

At the same time the question arises, whether the manufacturing industry keeps its potential engine of economic growth in modern conditions. Those doubts stem from the fact that the de-industrialization has taken large-scale nature in the world economy. This trend is currently affecting not only developed countries but also middle- and low-income economies. Dasgupta and Singh [3] coined the term «premature deindustrialization» to address shrinking of manufacturing sector starting from the significantly lower level of income and manufacturing share that those in developed countries. Rodrik [16] argues that premature deindustrialization reduces the potential for catch-up growth. This raises the question about the extent to which economic policies can provide a way out of the trap of “premature deindustrialization.”

After the end of the period of high economic growth in Russia in 2009, public and political debates became increasingly concentrated on the topic of reindustrialization. The anti-crisis package, developed by the Russian government in 2008–2009 included several measures to support the manufacturing sector. For example, The List of Systemically Important Organizations included 111 manufacturing companies, more than any other sector [6]. Largest government loan guarantees were issued for manufacturing firms. Sharp increase in military spending (from 3.4% of GDP in 2008 to 4.2% in 2009, thereafter military spending continued to rise, reaching 4.6% in 2014) was also declared to support the most high-tech part of the Russian manufacturing industry.

At the same time there is a question about the potential of increasing the competitive advantages of domestic manufacturing industry. According to this fact, it is quite reasonable position that the basis for economic growth of the domestic economy may be modernization of its traditional resource industries and creation on their basis value chain covering both manufacturing and services sectors. This approach focuses on the comprehensive development of the resource-type regions. In this paper, we use data on the panel of the Russian regions (formally referred as federal subjects of the Russian Federation) for 2005-2014 years to estimate the impact of structural change on economic growth. In the paper, we employ two measures of sectoral changes: shares of the sector in output and employment.

In the paper, we address to interrelated research questions: (a) did the regions with a larger share of the manufacturing sector in employment and output demonstrate higher rates of economic growth, (b) did the regions expanding the manufacturing sector demonstrated higher rates of economic growth.

2. Data
The primary source of our dataset is Russian Federal State Statistics Service (Rosstat) publications. They
contain information about shares of major sectors in output (2004-2014) and employment (2000, 2005-2014) for 80 Russian regions. List of sectors is presented in Table 1.

**Table 1.** Sectoral shares of output and employment.

| 1.1. Share of output | 1.2. Share of employment |
|----------------------|--------------------------|
| 1.3. Sector          | 1.4. Abbreviation         | 1.5. Sector          | 1.6. Abbreviation |
| 1.7. Agriculture, Hunting, Forestry, and Fishing | 1.8. agr | 1.9. Agriculture, Hunting, Forestry, and Fishing | 1.10. agr |
| 1.11. Mining and Quarrying | 1.12. mine | 1.13. Mining and Quarrying | 1.14. mine |
| 1.15. Manufacturing | 1.16. manuf | 1.17. Manufacturing | 1.18. manuf |
| 1.19. Public Utilities (Electricity, Gas, Water) | 1.20. elect | 1.21. Public Utilities (Electricity, Gas, Water) | 1.22. elect |
| 1.23. Construction | 1.24. const | 1.25. Construction | 1.26. const |
| 1.27. Wholesale and Retail Trade, repair of motor vehicles, personal and household goods | 1.28. trade | 1.29. Wholesale and Retail Trade, repair of motor vehicles, personal and household goods | 1.30. trade |
| 1.31. Hotels and Restaurants | 1.32. hosp | 1.33. Hotels and Restaurants | 1.34. hosp |
| 1.35. Transport, Storage, and Communications | 1.36. transp | 1.37. Transport, Storage, and Communications | 1.38. transp |
| 1.39. Real Estate | 1.40. real | 1.41. Real Estate | 1.42. real |
| 1.43. Education | 1.44. edu | 1.45. Education | 1.46. edu |
| 1.47. Healthcare and social services | 1.48. health | 1.49. Healthcare and social services | 1.50. health |
| 1.51. Other community, social and personal services | 1.52. serv | 1.53. Other community, social and personal services | 1.54. serv |
| 1.55. Finance | 1.56. finance | 1.57. Other activities | 1.58. other |
| 1.59. Government services, military, social security | 1.60. state | 1.61. | 1.62. |

The data on shares of the sector in output and employment was complemented with data on the gross regional product (GRP) per capita. We adjusted them to constant 2000 prices using GDP deflators and calculated annual grow rates.

As control variables, we use the index of economic openness of the region, development level of the region, population, and human capital. The index of openness is defined as the share of export plus import in GRP. It was calculated using yearly average dollar exchange rates because data on export and import
are reported by Rosstat in US dollars. The relative level of development of the region was calculated as the region’s GRP per capita as a share of Moscow’s GRP per capita (the low value means relatively poor region, variable “rich”). As a proxy for human capital, we used a percentage of employed with university education in total employment of the region (variable “college”).

Table 2 presents descriptive statistics of our panel dataset.

Table 2. Descriptive statistics of the panel dataset.

| 1.63. Variable | 1.64. Mean | 1.65. Standard deviation | 1.66. Observations |
|----------------|------------|--------------------------|--------------------|
| 1.73. GRP growth | 1.74, 5.45 | 1.75, 8.65, 1.76, 2.02, 1.77, 8.42 | 1.78, 1035, 1.79, 80, 1.80, 12.94 |
| 1.81. rich | 1.82, 0.29 | 1.83, 0.23, 1.84, 0.22, 1.85, 0.07 | 1.86, 1115, 1.87, 80, 1.88, 13.94 |
| 1.89. college | 1.90, 25.28 | 1.91, 5.66, 1.92, 4.45, 1.93, 3.52 | 1.94, 957, 1.95, 80, 1.96, 11.97 |
| 1.97. openness | 1.98, 0.32 | 1.99, 0.31, 1.100, 0.26, 1.101, 0.19 | 1.102, 878, 1.103, 80, 1.104, 10.98 |
| 1.105. ln population | 1.106, 7.15 | 1.107, 0.9, 1.108, 0.9, 1.109, 0.04 | 1.110, 1200, 1.111, 80, 1.112, 15 |

1.113. Shares of gross regional product:

| 1.114. agr | 1.115, 9.47 | 1.116, 5.86 | 1.117, 5.54 | 1.118, 2.01 | 1.119, 879 | 1.120, 80 | 1.121, 10.99 |
| 1.122. mine | 1.123, 7.64 | 1.124, 12.22 | 1.125, 11.81 | 1.126, 3.38 | 1.127, 879 | 1.128, 80 | 1.129, 10.99 |
| 1.130. manuf | 1.131, 18.3 | 1.132, 10.62 | 1.133, 10.25 | 1.134, 3.02 | 1.135, 879 | 1.136, 80 | 1.137, 10.99 |
| 1.138. elect | 1.139, 4.78 | 1.140, 2.58 | 1.141, 2.39 | 1.142, 1.02 | 1.143, 879 | 1.144, 80 | 1.145, 10.99 |
| 1.146. const | 1.147, 7.76 | 1.148, 3.81 | 1.149, 2.96 | 1.150, 2.43 | 1.151, 879 | 1.152, 80 | 1.153, 10.99 |
| 1.154. trade | 1.155, 14.51 | 1.156, 5.17 | 1.157, 4.87 | 1.158, 1.8 | 1.159, 879 | 1.160, 80 | 1.161, 10.99 |
| 1.162. hosp | 1.163, 1 | 1.164, 0.6 | 1.165, 0.49 | 1.166, 0.35 | 1.167, 879 | 1.168, 80 | 1.169, 10.99 |
| 1.170. transp | 1.171, 10.79 | 1.172, 4.6 | 1.173, 4.28 | 1.174, 1.76 | 1.175, 879 | 1.176, 80 | 1.177, 10.99 |
| 1.178. finance | 1.179, 0.3 | 1.180, 0.48 | 1.181, 0.34 | 1.182, 0.34 | 1.183, 879 | 1.184, 80 | 1.185, 10.99 |
| 1.186. real | 1.187, 7.29 | 1.188, 3.21 | 1.189, 2.87 | 1.190, 1.47 | 1.191, 879 | 1.192, 80 | 1.193, 10.99 |
| 1.194. state | 1.195, 7.65 | 1.196, 4.57 | 1.197, 4.21 | 1.198, 1.9 | 1.199, 879 | 1.200, 80 | 1.201, 10.99 |
| 1.202. edu | 1.203, 4.33 | 1.204, 1.85 | 1.205, 1.8 | 1.206, 0.49 | 1.207, 879 | 1.208, 80 | 1.209, 10.99 |
| 1.210. health | 1.211, 4.95 | 1.212, 1.69 | 1.213, 1.58 | 1.214, 0.63 | 1.215, 879 | 1.216, 80 | 1.217, 10.99 |
| 1.218. serv | 1.219, 1.32 | 1.220, 0.45 | 1.221, 0.38 | 1.222, 0.24 | 1.223, 879 | 1.224, 80 | 1.225, 10.99 |
1.226. Shares of employment:

| 1.227. agr | 1.228. 12.52 | 1.229. 5.91 | 1.230. 5.67 | 1.231. 1.77 | 1.232. 877 | 1.233. 80 | 1.234. 10.97 |
| 1.235. mine | 1.236. 1.85 | 1.237. 2.93 | 1.238. 2.89 | 1.239. 0.55 | 1.240. 877 | 1.241. 80 | 1.242. 10.97 |
| 1.243. manuf | 1.244. 15.16 | 1.245. 6.2 | 1.246. 6.11 | 1.247. 1.33 | 1.248. 877 | 1.249. 80 | 1.250. 10.97 |
| 1.251. elect | 1.252. 3.33 | 1.253. 1.49 | 1.254. 1.46 | 1.255. 0.33 | 1.256. 877 | 1.257. 80 | 1.258. 10.97 |
| 1.259. const | 1.260. 7.1 | 1.261. 2.04 | 1.262. 1.87 | 1.263. 0.92 | 1.264. 877 | 1.265. 80 | 1.266. 10.97 |
| 1.267. trade | 1.268. 15.82 | 1.269. 3.41 | 1.270. 3.09 | 1.271. 1.49 | 1.272. 877 | 1.273. 80 | 1.274. 10.97 |
| 1.275. hosp | 1.276. 1.65 | 1.277. 0.52 | 1.278. 0.46 | 1.279. 0.25 | 1.280. 877 | 1.281. 80 | 1.282. 10.97 |
| 1.283. transp | 1.284. 7.91 | 1.285. 1.87 | 1.286. 1.8 | 1.287. 0.54 | 1.288. 877 | 1.289. 80 | 1.290. 10.97 |
| 1.291. real | 1.292. 6.1 | 1.293. 2.39 | 1.294. 2.31 | 1.295. 0.69 | 1.296. 877 | 1.297. 80 | 1.298. 10.97 |
| 1.299. edu | 1.300. 9.58 | 1.301. 2.3 | 1.302. 2.26 | 1.303. 0.6 | 1.304. 877 | 1.305. 80 | 1.306. 10.97 |
| 1.307. health | 1.308. 7.32 | 1.309. 1.24 | 1.310. 1.19 | 1.311. 0.38 | 1.312. 877 | 1.313. 80 | 1.314. 10.97 |
| 1.315. serv | 1.316. 3.69 | 1.317. 0.7 | 1.318. 0.59 | 1.319. 0.37 | 1.320. 877 | 1.321. 80 | 1.322. 10.97 |
| 1.323. other | 1.324. 7.96 | 1.325. 2.28 | 1.326. 2.18 | 1.327. 0.76 | 1.328. 877 | 1.329. 80 | 1.330. 10.97 |

T-bar indicates the average number of observations per region.

3. Methods

We estimate two sets of fixed effects panel regressions: (a) with shares of sectors in output and employment as explanatory variables, (b) with relative changes of sector shares in output and employment. For both sets we separately estimate specifications with shares/relative changes of shares in output and employment. Other variables include log population size, the degree of openness, human capital (“college”), the relative level of development of the region (“rich”) and annual time dummies.

As out dataset is a panel, we could take into account unobserved characteristics of the regions by using either fixed or random effects regressions. However, Hausman tests show that region specific effects are not independent of the explanatory variables. The requirement of random effects models is not fulfilled, so we had to opt for fixed effects models.

In our estimation method, we must be careful about interpretation. Statistically significant negative coefficients of relative changes of the sectors shares could not be symptoms of the harmfulness of the sectors for growth, but rather a result of adjustment frictions. Another possible explanation is reverse causality: different sectors respond differently to the recession, some drastically reduce employment (for example, construction), some tend to keep labor (healthcare). Do address this issues we estimate models 1 and 2 years lags of sector variables.

4. Results

Did regions with bigger shares of manufacturing grow faster?

We start by estimating models with shares of sectors in output as explanatory variable (Table 3).

The share of manufacturing is significant with a negative sign in no lag and 1 year lag regressions in both all sample and without outliers specifications. The share of mining is also significant and has an even higher negative coefficient. Services (hospitality, education, healthcare and “community,
social and personal services”) on the opposite, statistically significant with a positive sign. The important exception is a trade that is statistically significant with a negative sign.

**Table 3. Impact of industry shares in total output on GRP per capita growth rate.**

| Variables | All regions                                                                 | Without outliers                                                                 |
|-----------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|           | No lag 1 year lag 2 year lag No lag 1 year lag 2 year lag                   |                                                                                 |
| mine      | -1.145*** (0.292) -0.740*** (0.196) -0.794*** (0.376) -1.156*** (0.271) -0.671*** (0.209) -0.876** (0.390) |                                                                                 |
| manuf     | -0.767*** (0.236) -0.388*** (0.192) -0.0613 (0.288) -0.768*** (0.216) -0.0995 (0.182) 0.198 0.0985 |                                                                                 |
| elect     | -0.0134 (0.314) 0.118 -0.0280 (0.490) 0.332 (0.323) 0.332 (0.417)            |                                                                                 |
| const     | -0.396 (0.305) -0.174 -0.185 (0.342) 0.304 (0.172) 0.330 (0.330)             |                                                                                 |
| trade     | -0.589*** (0.277) -0.0154 -0.0615 (0.356) 0.271 (0.186) 0.347 (0.347)         |                                                                                 |
| hosp      | 2.068** (0.832) -0.995 -0.535 1.782*** (1.148) -0.717 -0.949                 |                                                                                 |
| transp    | -0.486 (0.296) -0.321 -0.206 (0.471) 0.294 (0.288) 0.480 (0.287)             |                                                                                 |
| finance   | 0.716 (0.998) 0.740 -0.949 0.245 0.807 -0.584                               |                                                                                 |
| real      | -0.471 (0.370) -0.192 -0.320 -0.449 -0.218 -0.466                        |                                                                                 |
| state     | 0.305 (0.618) 0.0187 -0.497 0.373 -0.0113 -0.444                         |                                                                                 |
| edu       | 2.440** (1.121) 2.348** 0.751 2.794*** (1.528) 2.115** 0.130                  |                                                                                 |
| health    | 1.014* (0.578) 0.621 0.218 0.930* 0.379 0.536                             |                                                                                 |
| serv      | 2.988* (1.551) 1.183 1.545 2.505* 0.871 1.324                             |                                                                                 |
| openness  | -3.562 (2.211) -0.730 -0.00119 -1.052 -1.037 0.0165                       |                                                                                 |
| college   | -0.103 (0.108) -0.0807 -0.153 -0.144 -0.136 -0.198                       |                                                                                 |
| rich      | 68.70*** (15.42) 45.66*** 45.50*** 58.95*** 38.53*** 46.82**               |                                                                                 |
| lnpopul   | 0.867 (11.74) -0.413 -19.87 -2.044 0.446 -14.87                           |                                                                                 |
| Constant  | 2.595 (86.70) 7.219 155.2 26.09 5.120 127.6                              |                                                                                 |
| Observations | 719 639 559 692 615 538                                               |                                                                                 |
| R-squared | 0.449 0.365 0.296 0.413 0.337 0.289                                     |                                                                                 |
| # regions | 80 80 80 77 77 77                                                       |                                                                                 |

*** p<0.01, ** p<0.05, * p<0.1

All specifications include annual time dummies. Robust standard errors are in parenthesis.
Of the control variables only relative level of the region’s development is statistically significant, and somewhat counterintuitively it has a positive sign. That means that the gap in economic development among regions increased, as relatively rich regions, grew faster.

Table 4. Impact of industry shares in total employment on GRP per capita growth rate.

| Variables | All regions | Without outliers |
|-----------|-------------|------------------|
|           | No lag | 1 year lag | 2 year lag | No lag | 1 year lag | 2 year lag |
| mine      | -2.285 | -3.851*** | 0.414 | 0.683 | -2.803** | 0.461 |
|           | (1.585) | (1.298) | (0.604) | (1.483) | (1.200) | (0.748) |
| manuf     | -0.753 | -1.089** | -0.603** | -0.631 | -0.874** | -0.495** |
|           | (0.545) | (0.451) | (0.260) | (0.516) | (0.416) | (0.245) |
| elect     | -1.091 | -1.360 | -0.400 | 1.626 | -0.540 | -1.808 |
|           | (1.394) | (1.582) | (1.503) | (1.692) | (1.499) | (1.554) |
| const     | -0.383 | -1.562*** | -0.716 | -1.248* | -1.832*** | -0.795 |
|           | (0.866) | (0.568) | (0.603) | (0.717) | (0.658) | (0.574) |
| trade     | 0.0003 | 0.136 | -0.881*** | 0.0454 | 0.243 | -0.883*** |
|           | (0.719) | (0.579) | (0.239) | (0.670) | (0.541) | (0.247) |
| hosp      | -1.176 | -2.784 | -1.551 | -1.103 | -2.756 | -2.168 |
|           | (1.920) | (2.160) | (1.879) | (1.880) | (2.225) | (1.858) |
| transp    | -0.582 | -2.084*** | -0.311 | -0.721 | -1.869*** | 0.186 |
|           | (0.762) | (0.755) | (0.670) | (0.735) | (0.702) | (0.544) |
| real      | -0.168 | -0.684 | 0.238 | -0.210 | -1.546** | 0.191 |
|           | (0.656) | (0.926) | (0.684) | (0.715) | (0.740) | (0.683) |
| edu       | -0.743 | -0.221 | 0.929 | -1.101* | -0.439 | 0.820 |
|           | (0.602) | (0.874) | (0.699) | (0.603) | (0.916) | (0.717) |
| health    | -0.378 | -1.267* | -0.802 | -0.0466 | -1.024* | -0.588 |
|           | (0.830) | (0.641) | (0.764) | (0.813) | (0.613) | (0.702) |
| serv      | 0.469 | 3.638** | 1.736 | 0.151 | 2.344* | 0.468 |
|           | (1.552) | (1.660) | (1.353) | (1.252) | (1.378) | (0.976) |
| other     | -0.712 | -0.769 | 0.768 | -0.171 | -0.379 | 0.778 |
|           | (0.689) | (0.862) | (0.858) | (0.497) | (0.810) | (0.824) |
| openness  | -2.963 | -2.338 | -3.252 | -3.210 | -0.915 | -2.220 |
|           | (3.996) | (4.475) | (4.017) | (4.425) | (4.399) | (3.691) |
| college   | -0.0879 | -0.0792 | 0.0657 | -0.204 | -0.225 | -0.00918 |
|           | (0.133) | (0.171) | (0.192) | (0.137) | (0.183) | (0.165) |
| rich      | 23.27 | 35.19 | 32.19 | 12.03 | 21.63 | 21.84 |
|           | (22.75) | (31.81) | (22.81) | (24.66) | (41.14) | (18.02) |
| lnpopul   | -5.768 | 8.711 | -10.16 | 5.519 | 14.19 | -6.976 |
|           | (15.17) | (16.17) | (13.90) | (15.52) | (18.58) | (14.11) |
| Constant  | 90.92 | 8.361 | 85.75 | 4.653 | -27.82 | 72.47 |
|           | (121.3) | (112.0) | (100.0) | (120.5) | (126.7) | (102.4) |
| Observations | 638 | 558 | 557 | 614 | 537 | 536 |
| R-squared | 0.252 | 0.261 | 0.193 | 0.270 | 0.261 | 0.201 |
| # regions | 80 | 80 | 80 | 77 | 77 | 77 |

*** p<0.01, ** p<0.05, * p<0.1

All specifications include annual time dummies. Robust standard errors are in parenthesis.
Table 5. Impact of relative change in sector shares in total output on GRP per capita growth rate.

| Variables | All regions | Without outliers |
|-----------|-------------|------------------|
|           | (1)         | (2)              |
|           | No lag      | 1 year lag       | 2 year lag | No lag | 1 year lag | 2 year lag |
| agr       | -4.681***   | -0.518           | 5.667      | -4.337** | -0.463     | 5.106     |
|           | (1.674)     | (2.894)          | (4.413)    | (1.669)  | (2.756)    | (4.723)   |
|           | (0.248)     | (0.427)          | (0.568)    | (0.247)  | (0.436)    | (0.599)   |
|           | -3.075***   | -1.532           | -1.521     | -3.204***| -1.607     | -0.787    |
|           | (1.046)     | (1.337)          | (1.959)    | (1.098)  | (1.347)    | (1.688)   |
| elect     | -4.728**    | -2.852           | 4.477      | -4.653** | -3.178     | 4.993     |
|           | (1.806)     | (3.199)          | (3.165)    | (1.790)  | (3.200)    | (3.203)   |
|           | 0.899       | 0.278            | -0.623     | 0.776    | 0.203      | -0.271    |
|           | (1.062)     | (2.034)          | (1.932)    | (1.091)  | (2.059)    | (1.950)   |
| trade     | -3.097      | -1.686           | -3.179     | -2.704   | -1.534     | -1.717    |
|           | (2.069)     | (2.465)          | (2.970)    | (2.063)  | (2.496)    | (2.839)   |
| hosp      | -2.201***   | -0.509           | -1.631     | -2.394***| -0.427     | -1.324    |
|           | (0.647)     | (1.568)          | (1.342)    | (0.638)  | (1.609)    | (1.314)   |
| transp    | -6.291***   | -3.404           | 1.553      | -6.962***| -4.306     | 3.154     |
|           | (2.043)     | (3.104)          | (3.156)    | (2.003)  | (3.311)    | (3.289)   |
| finance   | -0.202      | -0.302           | 0.205      | -0.415   | -0.429     | 0.436     |
|           | (0.350)     | (0.501)          | (0.435)    | (0.328)  | (0.531)    | (0.419)   |
| real      | -2.940*     | -0.471           | -0.263     | -2.806*  | -0.517     | -0.355    |
|           | (1.564)     | (2.355)          | (2.746)    | (1.540)  | (2.422)    | (2.760)   |
| state     | -16.34***   | -1.850           | 4.888      | -16.16***| -0.716     | 3.900     |
|           | (2.814)     | (3.796)          | (6.935)    | (2.953)  | (3.920)    | (7.221)   |
| edu       | -18.53***   | 3.817            | -4.472     | -18.22***| 2.991      | -6.515    |
|           | (3.390)     | (4.133)          | (6.847)    | (3.418)  | (4.047)    | (6.920)   |
| health    | -20.03***   | 6.077            | 15.27**    | -19.89***| 6.362      | 17.70***  |
|           | (2.651)     | (5.269)          | (6.429)    | (2.726)  | (5.314)    | (6.630)   |
| serv      | -2.302      | -0.793           | -3.362     | -2.639   | -1.152     | -3.915*   |
|           | (1.807)     | (1.943)          | (2.031)    | (1.847)  | (2.029)    | (1.985)   |
| openness  | -1.905      | 0.367            | -8.655     | -2.034   | -0.569     | -9.607    |
|           | (2.758)     | (4.818)          | (6.163)    | (2.899)  | (4.856)    | (6.183)   |
| college   | -0.0320     | -0.0590          | 0.0458     | -0.0594  | -0.0442    | -0.0965   |
|           | (0.109)     | (0.216)          | (0.260)    | (0.127)  | (0.268)    | (0.259)   |
| rich      | 6.274       | 7.720            | 31.11      | 5.048    | 4.477      | 25.14     |
|           | (10.32)     | (30.47)          | (31.39)    | (9.095)  | (28.84)    | (31.17)   |
| lnpopul   | 15.13       | 15.70            | -0.244     | 23.33    | 28.47      | 8.851     |
|           | (18.56)     | (26.73)          | (29.33)    | (18.44)  | (26.98)    | (35.83)   |
| Constant  | -107.0      | -105.4           | 7.786      | -166.7   | -199.0     | -53.89    |
|           | (135.1)     | (194.3)          | (211.3)    | (135.3)  | (196.4)    | (258.2)   |
| Observations | 443     | 370              | 294        | 434      | 362        | 288       |
| R-squared | 0.671       | 0.277            | 0.378      | 0.679    | 0.290      | 0.401     |
| # regions | 77          | 77               | 77         | 75       | 75         | 75        |

*** p<0.01, ** p<0.05, * p<0.1
All specifications include annual time dummies. Robust standard errors are in parenthesis.
From estimations for the models with shares of sectors in employment as explanatory variable (Table 4), similar conclusions can be drawn for mining and manufacturing (for both specifications 1 year lag statistically significant with negative sign). 1 year lag estimations for construction and transport are also significant with a negative sign. Somewhat surprisingly, estimations for healthcare (1 year lag) and education (1 year lag, only specification without outliers) statistically significant with negative coefficients. That can be explained with inter-sectoral heterogeneity: high-growth regions are relatively rich regions with developed tertiary sector, at the same time, relatively poor low-growth regions are characterized by many low-paid jobs provided by the government in the public sector.

Did regions expanding manufacturing grow faster?
The results for the model with relative changes in sector shares in total output are presented in Table 5.

Estimations for relative changes in nine sectors are statistically significant with a negative sign (agriculture, manufacturing, public utilities, hotels and restaurants, real estate, government services, education). Yet none of 1 lags estimations are significant, so we would be wary interpreting these results as proof that expansion of these sectors reduces potential for growth. One possible explanation is that it is a result of adjustment frictions. If this explanation is true, the more specific capital require the sector, the stronger growth slowdown its expansion causing. That maybe the case with healthcare: it require highly specific physical and human capital. But the expansion of healthcare can increase the growth potential of the region in the long run as evidenced by statistically significant 2 year lag estimate with a big and positive coefficient.

Table 6 shows the results for models with a relative change of sectors in employment as explanatory variables. Estimations for construction and real estate are statistically significant in no lag specification, unsurprisingly as both sectors are pro-cyclical. The only significant lag coefficients are real estate (with a positive coefficient, while it is not significant in the specification without outliers), education and “other activities” (all with negative sign). The negative coefficient of education again emphasizes the same paradox: productive education sector is important for growth, but excessive employment in the sector reduces growth potential.

5. Conclusion
In this paper, we exploited panel dataset on 80 Russian regions for the period 2005-2014 to analyze the relationship between annual shares of sectors in output and employment and per capita gross regional growth. We did not found the evidence of positive impact of manufacturing on growth. Furthermore, our results indicate that regions with a higher share of manufacturing both in terms of output and employment grow slower during the reporting period. The impact of services on growth is paradoxical. We found the evidence that regions with bigger shares of healthcare and education in output growth faster, but a bigger share of this sector in employment, as much as expanding the share of these sectors in employment impede growth. One of the possible reasons for this paradox is that the high proportion of service industries in the regions-leaders (especially in the share of total employment) reflects not the degree of their development but stimulation of the public sector development in the relatively poor subjects of Federation. Composition of the leading regions by the share of sphere of services (Tuva, Chechnya, Republic of Altai, Ingushetia, Kabardino-Balkaria, Chita region, etc.) confirms this fact. The federal government invests substantial financial resources in the public sector, which includes industry data, to encourage development of these regions. As a result, increased share of services reflects the lower level of development of manufacturing and mining industries. Anyway, it is unlikely that the above regions can act as centers of development for the model of catch-up post-industrialization.

Thus, these results show that none of the potential drivers of economic growth has not become a real engine of the regional and the national economy development. This means that the proposed variants of policies to stimulate growth are not used in practice or their tools do not have sufficient efficiency.
Table 6. Impact of relative change in sector shares in total employment on GRP per capita growth rate.

| Variables | All regions | | | Without outliers | | |
|-----------|-------------|-----------------|-------------|-----------------|-------------|
|           | No lag | 1 year lag | 2 year lag | No lag | 1 year lag | 2 year lag |
| agr       | -0.837 | -5.831 | 9.153 | 4.411 | -12.84 | -1.709 |
|           | (5.334) | (7.101) | (7.533) | (8.157) | (9.625) | (6.849) |
| mine      | 0.951 | -0.255 | -1.533 | 1.005 | -0.377 | -1.458 |
|           | (1.089) | (1.261) | (1.279) | (1.074) | (1.247) | (1.287) |
| manuf     | 15.47 | 7.130 | -0.899 | 9.640 | -5.001 | -2.374 |
|           | (9.628) | (8.537) | (5.851) | (9.053) | (4.700) | (6.015) |
| elect     | -0.907 | 1.616 | 3.753 | 1.286 | 2.368 | 7.624 |
|           | (5.868) | (3.505) | (7.188) | (5.877) | (2.785) | (5.772) |
| const     | 9.751** | 8.338 | 9.163 | 9.818** | 0.394 | -1.973 |
|           | (4.559) | (5.623) | (6.679) | (4.667) | (4.930) | (4.708) |
| trade     | 10.17 | -8.628 | -0.772 | 5.934 | -14.21* | -3.432 |
|           | (9.500) | (7.458) | (8.739) | (9.959) | (7.970) | (7.519) |
| hosp      | -1.980 | -0.541 | -0.399 | -0.230 | -1.366 | -2.338 |
|           | (2.957) | (3.025) | (2.926) | (3.531) | (2.920) | (3.196) |
| transp    | 11.91 | 7.936 | -4.561 | 6.373 | -5.575 | -11.32 |
|           | (11.01) | (11.45) | (7.360) | (8.208) | (8.973) | (8.174) |
| real      | 10.35* | -6.214 | 7.474* | 10.32* | -7.622 | 2.226 |
|           | (5.530) | (5.344) | (4.279) | (5.802) | (6.051) | (3.136) |
| edu       | -40.90** | -33.59*** | 5.517 | -23.72** | -32.05** | -11.18 |
|           | (15.87) | (14.86) | (17.22) | (11.39) | (12.46) | (13.08) |
| health    | -10.97 | -7.966 | -7.701 | -13.66 | -14.35 | -12.22 |
|           | (10.14) | (14.19) | (8.619) | (11.22) | (12.84) | (8.007) |
| serv      | -3.004 | -11.04 | 5.520 | -2.552 | -9.045 | 9.395** |
|           | (4.809) | (6.902) | (4.364) | (4.925) | (7.197) | (4.089) |
| other     | -8.172 | -16.44** | 9.099 | -6.999 | -16.42** | 6.789 |
|           | (7.794) | (6.889) | (6.930) | (7.809) | (6.897) | (7.002) |
| openness  | -4.537 | -4.322 | -1.402 | -3.193 | -2.726 | 0.226 |
|           | (3.263) | (4.400) | (5.542) | (2.911) | (4.242) | (5.252) |
| college   | -0.116 | -0.0360 | -0.193 | -0.190 | -0.185 | -0.234 |
|           | (0.170) | (0.193) | (0.293) | (0.174) | (0.166) | (0.266) |
| rich      | 30.20 | 32.89 | 70.32** | 17.48 | 24.43 | 56.79* |
|           | (22.60) | (24.30) | (27.92) | (24.27) | (35.91) | (32.34) |
| Inpopul   | 3.488 | 8.322 | -22.39 | 10.81 | 20.62 | -18.28 |
|           | (18.01) | (24.40) | (20.94) | (16.83) | (24.26) | (20.77) |
| Constant  | -19.06 | -53.68 | 149.8 | -66.82 | -136.0 | 126.4 |
|           | (124.9) | (169.1) | (148.3) | (118.1) | (169.6) | (146.0) |
| Observations | 599 | 525 | 450 | 578 | 507 | 435 |
| R-squared | 0.288 | 0.242 | 0.181 | 0.298 | 0.249 | 0.167 |
| # regions | 79 | 79 | 79 | 76 | 76 | 76 |

*** p<0.01, ** p<0.05, * p<0.1

All specifications include annual time dummies. Robust standard errors are in parenthesis.
According to this fact, it appears that the question of the potential development of “resource-type” regions remains open. However, its implementation requires the use of both federal and sub-national policy instruments of smart specialization focused on the search for new competitive advantages associated with the formation of value chains based on the resource sectors of the economy.

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