Guidelines for Choosing Priority Areas of Diversification for Sustainable Economic Development in the Region

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Abstract: An approach to assessing priority areas of diversification based on recommendations for the development of sectors is presented. The approach focuses on the sustainable development of the economy and increasing its economic complexity. It takes into account the evolutionary conditionality of the development of sectors, the impact of innovation activity of regions and the provision of sectors with resources. The possibilities of the approach were tested for 14 sectors of the economy of the Belgorod region based on the data of 2019. Sectors whose characteristics have the property of Pareto-optimality in the multi-criteria problem under consideration are considered as priorities when choosing the direction of economic diversification by the region. The methodology used makes it possible to take into account and display in real time in the initial information considered by any region the decisions already taken by other regions, which is an urgent task for the system of situational centers.

1 INTRODUCTION

An urgent task is to create a digital platform that allows determining the priority directions of the region's development. In accordance with the approach we have proposed, priority areas are selected based on recommendations for the development of sectors. This approach creates opportunities for sustainable development of the regional economy based on the theory of diversification and analysis of the structures of strong sectors. The theory of diversification and empirical estimates are presented in the works (Blien, Wolf, 2006; Fuchs, 2011; Illy, Schwartz et al., 2011). According to this theory, companies benefit from facing a heterogeneous environment consisting of different industries, as new ideas come from the external environment. Diversification, defined as the expansion of the *structure of the economy*, is an important goal in all countries and has become one of the most important priorities of economic development.

A number of studies have presented theoretical and empirical evidence of the existence of "local opportunities" based on accumulated competencies and knowledge. Such local opportunities work as a source for *related diversification* of regional economies (Storper, 1995). In the process of diversification, regions are more likely to expand sectors that are closely related to the strong sectors that have already developed in them (Frenken, Boschma, 2011; Klepper, 2006). Related diversification implies that economic development, both at the national and regional levels, largely depends on *specific local opportunities* that accumulate over time and which largely depend on technological mutual dependence, shared infrastructure, etc. This means that there is no universal solution to promote economic development and structural changes in the regions. It is necessary to take into account the peculiarities of each region when developing and designing industrial and regional economic policy.

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2 METHODOLOGY

2.1 Structure of Strong Sectors

Based on the concept of identified comparative advantages (Hausmann, Klinger, 2006), a matrix $A = (a_{c,p})$ describing the structures of strong sectors of regional economies is formed. To do this, we will use data on production volumes by sector. Matrix A contains data on the sectors of the economy that are developed in different regions at the level of the identified comparative advantages:

$$a_{c,p} = \begin{cases} 1, & \text{если } RCA_{cp} \geq 1; \\ 0, & \text{если } RCA_{cp} < 1. \end{cases}$$

where RCA_{cp} is the indicator of the revealed comparative advantages. If y_{cp}— the volume of production of the economic sector $p$of the region c, then

$$RCA_{cp} = (y_{cp} / \sum_p y_{cp}) / \left(\sum_c y_{cp} / \sum_{cp} y_{cp} \right). \quad (1)$$

The vector $(a_{c,p_1}, \cdots, a_{c,pm})$describes the structure of the region's strong economic sectors.

2.2 Economic Complexity

One of the guidelines of the presented approach to the diversification of the region's economy is to increase its economic complexity. Countries and regions exporting sophisticated goods usually have a higher level of per capita material well-being than countries and regions exporting simple goods. If diversification is associated with the emergence of new sectors of the economy, then sectors whose development contributes to increasing the economic complexity of the region can be considered as priority areas of diversification. Further, its assessment is carried out in accordance with the approach presented in the works (Hartmann, 2017; Hidalgo, Hausmann, 2009) with respect to regions and sectors.

The assessment of the economic complexity of the regionECI_c is proportional to the average level of economic complexity of strong sectors in the structure of its economy:

$$ECI_c = a_1 \sum_p r_{c,p} ECI_p, \quad (2)$$
$$r_{c,p} = a_{c,p} / k_{c,0},$$
$$k_{c,0} = \sum_p a_{c,p}$$

where $a_1$is a positive constant. The assessment of the economic complexity of the sector $ECI_p$is proportional to the average level of economic complexity of the regions in the structure of the economies of which this sector is strong:

$$ECI_p = a_2 \sum_c r^*_{p,c} ECI_c \quad (3)$$
$$r^*_{p,c} = a_{c,p} / k_{p,0},$$
$$k_{p,0} = \sum_c a_{c,p}$$

where $a_2$is a positive constant.

Let $\boldsymbol{c} = (ECI_{c_1}, ECI_{c_2}, \dots)^T$ be a vector-column of estimates of economic complexity for regions; $\boldsymbol{p} = (ECI_{p_1}, ECI_{p_2}, \dots)^T$ — vector-column of estimates of economic complexity for sectors; $\boldsymbol{R_1} = (r_{c,p})$, $\boldsymbol{R_2} = (r^*_{p,c})$— matrices of weights. Then $\boldsymbol{c} = a_1 a_2 \boldsymbol{R_1 R_2 c}$, $\boldsymbol{p} = a_1 a_2 \boldsymbol{R_2 R_1 p}$. Thus, estimates of the economic complexity of regions are defined as the eigenvector of the matrix$\boldsymbol{R_1 R_2}$, and estimates of the economic complexity of sectors are defined as the eigenvector of the matrix $\boldsymbol{R_2 R_1}$.. Since these matrices are stochastic (Sciarra et al., 2020), we will use the eigenvector of the matrix $\boldsymbol{R_1 R_2}(\boldsymbol{R_2 R_1})$ as the values of estimates of the economic complexity of regions (sectors), which corresponds to the second maximum eigenvalue.

2.3 The Likelihood of the Emergence of New Strong Sectors in the Region

Let us denote $w_{i,j} = (\boldsymbol{R_1 R_2})_{ij}$. In the work (Afanasiev, Kudrov, 2021) it is shown that the value $w_{i,j}$can be interpreted as a characteristic of the *degree of nesting* of a set of strong sectors of the region $c_i$into a set of strong sectors of the regionc_j. The lower this ratio, the fewer strong sectors of the regionc_i are included in the many strong sectors of the regionc_j. Therefore, nesting indicators reflect the evolutionary conditionality of the structures of strong sectors of regional economies.

Using nesting indicators, a model has been developed (Afanasiev, Kudrov, 2021) that allows predicting the emergence of new strong sectors in the region's economy. As a result of testing the model for each region, the probabilities of the emergence of new strong sectors in its structure are estimated. Quantitative estimates make it possible to justify the feasibility of developing a new strong sector in the region, taking into account the evolution of past economic activity, and can be considered as a measure of the evolutionary conditionality of the emergence of a sector in the region as a strong one. If

the predicted probability value exceeds 0.5, then the emergence of a new strong sector in the region can be considered evolutionarily conditioned.

2.4 The Impact of the Region's Innovation Activity on the Development of the Sector

To assess the impact of the region's innovation activity $j$on the development of the sector, components of the economic basis are used, including characteristics of regional differentiation and indices of innovation activity. The description of the economic basis $\{L_j, te_j, s_j^1, s_j^2\}$and the methodology of its application for assessing socio-economic development at the regional level are presented in (Aivazian, Afanasiev, Kudrov, 2018, 2020). Innovation activity indices based on the stochastic boundary concept are presented in (Lysenkova, Afanasiev, 2020). The expanded economic basis$\{L_j, te_j, s_j^1, s_j^2, INN_j\}$, including the innovation activity index, reflects not only the economic structure of the regional economy, but also the specifics of the innovation activity of the regions, focused on a specific result of innovation activity. If the index of innovation activity statistically depends on some components of the economic basis, then in order to prevent the effect of multicollinearity, it is advisable to consider a modification of the index cleared of the influence of these components. A regression analysis of the production volumes of each sector of the economy is carried out using an expanded economic basis. Let's build regressions of the form

$$ln\ y_{ij} = const_i + \beta 1_i \ln L_j + \beta 2_i te_j + \beta 3_i s_j^1 + \beta 4_i s_j^2 + \beta 5_i INN_j + \varepsilon_{i,j}, \quad (4)$$

where $y_{ij}$is the production volume of the sector $i$in the region$j$; L_j— the scale of the region's economy j(the Rosstat indicator "Number of economically active population" is taken as a characteristic of the scale of the economy); te_j— assessment of the technical efficiency of regional production); s_j^1— index of industry specialization (the first main component of the GRP structure); s_j^2— index of industrialization (the second main component of the GRP structure); $\varepsilon_{i,j}$— regression error. The values of the main components were constructed according to the methodology and indicators of Rosstat according to the sectoral structure of gross regional product (GRP) (Aivazian, Afanasiev, Kudrov, 2016). INN is an index of innovation activity. One of the author's indexes is used here, built on the basis of the stochastic boundary concept based on data on international patent applications (TEMPZ), patent applications (TEPZ), granted patents (TEVP), newly developed production technologies (TETTCH) (Lysenkova, Afanasiev, 2020). From the set of sectors, those for which the parameter score is $\beta 5_i$positive and significant at the level of 95% are distinguished. The volume of production of each of these sectors depends on the level of innovation activity of the regions, determined by the INN index.

2.5 Resource Availability

The assessment of the sufficiency of providing the sector with resources in the region is determined by the level of compliance of the actual volume of production of the sector with the expected, due to the characteristics of the differentiation of the region. Estimates of resource availability can be obtained based on the *concept of identified comparative advantages*. With sufficient provision of resources, the indicator of the $E_RCA_{c_i p_j}$identified comparative advantages corresponding to the expected output of the sector $p_j$in the region $c_i$should be at least 1 in order for the sector to become strong. This means that the inequality must be satisfied

$$(E\_y_{c_i p_j} / (E\_y_{c_i p_j} + \sum_{p \neq p_j} y_{cp})) / \left(\sum_c y_{cp} / \sum_{cp} y_{cp}\right) \geq 1, \quad (5)$$

where$E_y_{c_i p_j} = exp\{\ln y_{c_i p_j} - \varepsilon_{i,j}\}$. Inequality (5) is equivalent to inequality

$$\varepsilon_{i,j} \leq ln\left(\left(1 - u_{p_j}\right) RCA_{c_i p_j} / \left(1 - u_{p_j} RCA_{c_i p_j}\right)\right) \quad (6)$$

where $u_{p_j} = \sum_c y_{cp_j} / \sum_{cp} y_{cp}$,$RCA_{c_i p_j}$ is determined by the formula (1). Note that the right side of inequality (6) is a negative value. This follows from the inequality $RCA_{c_i p_j} < 1$that is fulfilled, since the sectorp_j is not strong in the regionc_i. . So if the regression error$\varepsilon_{i,j}$ (4) is less than the value$\varepsilon *_{i,j} = ln\left(\left(1 - u_{p_j}\right) RCA_{c_i p_j} / \left(1 - u_{p_j} RCA_{c_i p_j}\right)\right)$, then

the sectorp_j has sufficient resource provision in the regionc_i in the sense that with the expected volume of production it will become strong. Otherwise, we believe that the resource provision of the regionc_i is not enough to turn the sectorp_j into a strong one.

2.6 Selection Task

Determining the priority direction of diversification of the region's economy$c*$ is associated with the choice of a sector $p_{j_{k(c*)}}$ for its development in the region $c*$to the level of a strong one. The rationale may be the solution of the multiple choice problem, taking into account a number of characteristics for each sector $p_{j_{k(c*)}}$ from a set of sectors $(p_{j_{1(c*)}},\dots,p_{j_{k(c*)}},\dots)$, that are not strong in the region $c*$. Including: the economic complexity of the ECI_{c*} region; the economic complexity of the sector$ECI_{p_{j_{k(c*)}}}$; assessment of the $qp_{j_{1(c*)}}$probability of the emergence of the sector $p_{j_{1(c*)}}$as a strong one in the region$c*$; a sign of the growth of economic complexity, IEC_{c*}; a sign of the innovative activity of the sector, r_INN_p; a sign of the resource availability of the sector$res_p_{j_{(c*)}}$. In addition to these characteristics, using a matrix$Y=(y_{cp})$ (where $y_{cp}$is the output of sector p of the economy of region c), it is not difficult to calculate an estimate from below of the region's GRP growth $c*$in the case when the sector $p_{j_{k(c*)}}$turns into a strong one. The solution to such a multiple choice problem is a set of sectors whose set of characteristics has the property of Pareto-optimality. Further, the Belgorod Region is considered as the region$c*$ for which the initial data are being formed and the task of choosing priority areas for economic diversification is being solved.

3 INVESTIGATION RESULTS

The matrix $A=(a_{c,p})$,describing the structure of strong sectors of regional economies is based on data on tax revenues for 2019 for 82 sectors in 79 regions of the Russian Federation. This approach makes it possible to characterize the structures of regional economies, including sectors focused on both external and internal markets. In the Appendix in Table P1 column 6 shows the number of strong sectors in the structure of the economy of each region, i.e. gives an assessment of diversification.

In the Appendix in Table P1 column 3 presents non-normalized estimates of the economic complexity of 82 sectors; column 7 – non-normalized estimates of the economic complexity of 79 regions, calculated as the values of eigenvectors in accordance with the standard approach described above. The values of the constants are determined as a result of solving the systems of equations (2) and (3): a_1 = 1.9305; a_2 = 1.9756. In columns 4 and 8 (Appendix, Table P1) normalized estimates of the economic complexity of sectors and regions are given, respectively. The point in Fig. 1 characterizes the region in the space "Number of strong sectors" (abscissa axis) — "Assessment of the economic complexity of the region" (ordinate axis). There is a non-linear relationship between the number of strong sectors and estimates of the economic complexity of the regions. At the same time, the correlation coefficient of the characteristics of the diversification of regional economies and estimates of the economic complexity of the regions is quite high and is equal to 0.635.

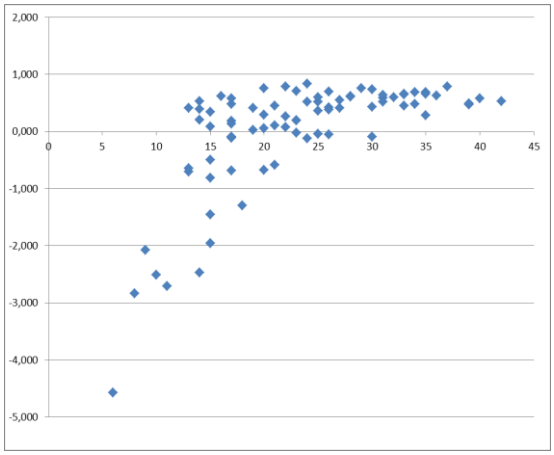

Figure 1: The dependence of normalized estimates of the economic complexity of regions on the number of strong sectors.

For each region, the probability of occurrence of any sector in its structure as a strong one is estimated. The simulation results presented in the paper (Afanasiev, Kudrov, 2021) do not contradict the hypothesis of the statistical significance of the influence of the characteristics of evolutionary conditioning on the probability of the emergence of a sector as a strong one. The lines of the matrix in Fig. 2 correspond to the regions and are arranged in accordance with their order in Table P1 in column 5; the columns are sectors and are arranged according to their order in Table P1 in column 1. The highlighted matrix elements in each line indicate which sectors have a favorable development forecast in the region:

the probability of such a sector appearing in the region is higher than 0.5. These assessments justify the feasibility of developing a new strong sector in the region, taking into account the evolution of past economic activity. For example, in the Belgorod region (line 1 of the matrix in Fig. 2) 11 sectors have probabilities of occurrence as strong above 0.5.

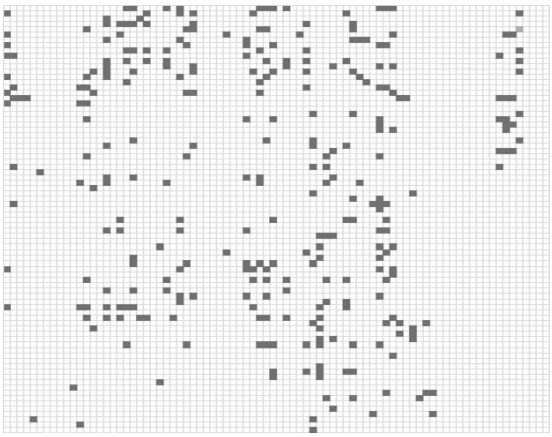

Figure 2: A matrix characterizing a favorable forecast for the development of a new strong sector in the region.

Table 1 can be considered as the result of a comprehensive assessment of the directions of economic diversification of a particular region. This is one of the possible forms of digital support for strategic decision-making. It is based on modern methods of assessment and concepts of regional development. Based on such information, expert decisions can be made and priority areas of diversification of the regional economy can be selected. The information can become the basis for setting priorities in the implementation of regional development projects aimed at increasing the number of jobs in the region and increasing the material well-being of the population.

Table 1: Comprehensive assessment of the considered diversification options according to 2019 data.
Table structure by columns:

(1) codes of sectors whose development to the level of strong ones is considered as possible options for diversifying the economy of the Belgorod region;

(2) assessment of the economic complexity of the sector from column 3 of Table P1;

(3) assessment of the evolutionary conditionality of the sector: "Yes" if the predicted probability of occurrence is higher than 0.5, otherwise "No";

(4) assessment of changes in the economic complexity of the region as a result of the emergence of a new strong sector: "Yes" if the economic complexity of the region increases, otherwise "No";

(5) "Yes" if the production volumes of the sector depend on the innovation activity of the regions, otherwise "No";

(6) "Yes" if the condition of resource availability of the sector in the region is met, otherwise "No";

(7) a bottom-up estimate of a % increase in the region's GRP in case the sector turns into a strong one.

(1)	(2)	(3)	(4)	(5)	(5)	(6)	(7)
1125*	0.0812	Yes	Yes	Yes	No	Yes	0.010
1160*	0.0534	Yes	Yes	Yes	No	Yes	0.152
1202*	0.0525	Yes	Yes	Yes	No	No	0.641
1290	0.0471	No	Yes	Yes	No	No	0.365
1205	0.0321	Yes	Yes	No	No	No	0.017
1315*	0.0286	Yes	No	No	Yes	No	0.099
1203	0.0258	Yes	No	No	No	No	0.318
1285	0.0172	No	No	No	No	No	0.607
1270*	0.0073	No	No	No	Yes	Yes	3.811
1220	-0.0046	Yes	No	No	No	No	0.560
1130	-0.0051	Yes	No	No	No	No	0.055
1155	-0.0124	Yes	No	No	No	Yes	0.089
1305	-0.0393	Yes	No	No	No	No	0.143
1320*	-0.0898	Yes	No	No	Yes	No	0.331

The choice of a sector for development in the region to a strong level based on the data presented in Table 1 is associated with the solution of a multi-criteria task. The solution to the problem is a set of sectors, the characteristics of each of which have the property of Pareto-optimality. There are six such sectors: "1125. Manufacture of leather and leather products"; "1160. Production of rubber and plastic products"; "1202. Production of computers, electronic and optical products"; "1270. Construction"; "1315. Railway transport activities"; "1320. Pipeline transport activities". They are marked with the symbol "*" in column 1 of Table 1.

4 DISCUSSION

The results are obtained that develop the methodology for choosing priority areas of diversification of the region's economy. The possibilities of information support and solving the

problem of determining the priority direction of diversification are shown on the example of the Belgorod region. As possible directions of development, 14 sectors that are not strong in the economy of the Belgorod region according to 2019 data are considered (column 1 of Table 1). Estimates of economic complexity based on a standard approach are given for each sector (column 2). Among them are 11 sectors whose development in the region is evolutionarily conditioned: the predicted probability of such a sector appearing as a strong one in the region is above 0.5 (column 3). Based on the standard approach, the change in the economic complexity of the region as a result of the development of each of the sectors to a strong level is estimated (column 4). Based on the regression approach, the sectors whose development depends on the innovation activity of the region are identified (column 5). The sectors whose expected output ensures their development to a strong level are indicated (column 6). Estimates of the GRP growth of the region in case the sector turns into a strong one are calculated (column 7). Among 14 sectors, 6 were identified whose characteristics have Pareto-optimality properties: "1125. Manufacture of leather and leather products"; "1160. Production of rubber and plastic products"; "1202. Production of computers, electronic and optical products"; "1270. Construction"; "1315. Railway transport activities"; "1320. Pipeline transport activities".

5 CONCLUSIONS

An approach to assessing priority areas of diversification based on recommendations for the development of sectors is presented. The approach focuses on the sustainable development of the economy and increasing its economic complexity. It takes into account the evolutionary conditionality of the development of sectors, the impact of innovation activity of regions and the provision of sectors with resources. The possibilities of the approach were tested for 14 sectors of the economy of the Belgorod region on the data of 2019. Sectors whose characteristics have the property of Pareto-optimality in the multi-criteria problem under consideration are considered as priorities when choosing the direction of economic diversification by the region.

Of course, the number of criteria under consideration can and should be expanded. First of all, due to the estimates of the number of jobs created, the increase in the socio-economic development of the region, the growth of material well-being as a result of the emergence of new strong sectors, the costs of developing the sector to the level of a strong one. The implementation of the proposed approach using digital technologies in regional situation centers can ensure coordination of decisions taken by regions when choosing priority areas of diversification. This methodology makes it possible to take into account and display in real time in the initial information considered by any region, the predicted results of decisions already made by other regions. One of the possible directions of using the presented approach for the development of the theory of diversification is the construction and analysis of the trajectories of the structures of strong sectors of regional economies.

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APPENDIX

In Table P1 the following information is located in the columns:

column 1 — sector code in accordance with the structure of tax revenue data; the symbol "*" indicates sectors whose production volumes depend on the innovation activity of the regions;

column 2 — the number of regions in which the sector is strong;

column 3 — non-normalized ECO of the sector ("*" — sectors that are strong in the Belgorod region);

column 4 — normalized estimate of the economic complexity of the sector with an average of 0 and a standard deviation of 1;

column 5 — name of the region;

column 6 — number of strong sectors in the region;

column 7 — non-normalized ECO of the region;

column 8 — normalized ECO of the region with an average of 0 and a standard deviation of 1;

column 9 — regression error values (4);

column 10 — threshold value of the right side of inequality (6) for checking the fulfillment of the condition of resource availability of the sector in the region.

Table P1: Estimates of the economic complexity of sectors and regions.

1	2	3	4	5	6	7	8	9	10
1020	40	0.0467*	0.6324	Belgorod region	24	0.0670	0.8364	–0.75	–0.152
1025	32	–0.0292	–0.0650	Bryansk region	31	0.0402	0.5933	0.304	0.443
1030	11	–0.0700	–0.4394	Vladimir region	37	0.0617	0.7883	0.043	–0.316
1046	11	–0.1167	–0.8681	Voronezh region	34	0.0285	0.4871	0.279	–0.040
1047	7	–0.1799	–1.4490	Ivanovo region	28	0.043	0.6183	0.412	–0.071
1055	13	–0.4351	–3.7938	Kaluga region	29	0.0584	0.7578	–0.177	0.258
1060	6	–0.5638	–4.9760	Kostroma region	33	0.0246	0.4515	–0.323	–0.354
1075	10	–0.0078*	0.1318	Kursk region	22	0.0618	0.7888	–1.087	–0.013
1080	12	–0.2254	–1.8670	Lipetsk region	36	0.0443	0.6306	–0.044	0.224
1081	15	–0.0847	–0.5743	Moscow region	39	0.0266	0.4696	1.265	0.028
1084*	17	–0.3330	–2.8561	Oryol region	30	0.0561	0.7372	0.134	–0.009
1090	41	0.0569*	0.7267	Ryazan region	16	0.0435	0.6228	0.347	–0.772
1095	38	0.0522*	0.6830	Smolensk region	31	0.0455	0.6415	1.523	–0.245
1100	50	0.0392*	0.5641	Tambov region	28	0.0419	0.609	–0.525	0.708
1105	13	0.0635*	0.7870	Tver region	42	0.0335	0.5322	0.09	0.084
1110	37	0.0238*	0.4223	Tula region	34	0.0514	0.6945	0.109	0.663
1115	9	0.0501	0.6641	Yaroslavl region	25	0.0318	0.5174	0.493	–0.612

1120	26	0.0740	0.8830	Moscow	24	–0.0386	–0.1212	1.831	0.253
1125	21	0.0812	0.9496	Republic of Karelia	26	0.0215	0.4239	–0.302	0.209
1130	36	–0.0051	0.1569	Komi Republic	14	–0.2957	–2.4514	1.398	–0.647
1135	25	0.0054*	0.2530	Arkhangelsk region	20	–0.0186	0.0599	–0.154	–0.493
1140	22	0.0617*	0.7703	Volgograd region	25	0.0413	0.6031	0.882	0.152
1145	5	0.0021	0.2231	Kaliningrad region	15	0.0126	0.3434	0.536	–0.157
1.150	12	–0.1497	–1.1715	Leningrad region	14	0.0332	0.5298	0.751	–0.303
1155	25	–0.0124	0.0897	Murmansk region	17	–0.0367	–0.1042	0.603	–0.766
1158	15	0.0336*	0.5126	Novgorod region	32	0.0404	0.5948	0.268	0.343
1160	30	0.0534	0.6942	Pskov region	35	0.0503	0.6848	0.015	0.204
1165	44	0.0536*	0.6958	Saint Petersburg	23	–0.0031	0.2004	0.752	0.476
1170	28	0.0259*	0.4418	Republic of Adygea	22	–0.016	0.0841	–0.062	0.108
1175	14	0.0337*	0.5132	Krasnodar Territory	27	0.0354	0.5494	0.406	0.224
1176	1	0.0140	0.3325	Astrakhan region	9	–0.2532	–2.0656	0.364	–0.691
1177	5	0.0329*	0.5058	Volgograd region	17	0.0274	0.4776	0.129	–0.326
1180	8	0.0665*	0.8148	Rostov region	33*	0.0461	0.6469	–0.331	0.111
1185	18	0.0475	0.6402	Republic of Dagestan	19	0.0198	0.4081	–1.482	0.378
1190	11	–0.1165	–0.8667	Republic of Ingushetia	15	–0.0168	0.0769	–2.532	1.057
1195	6	–0.0898	–0.6210	Kabardino-Balkarian Republic	17	0.0381	0.5739	–1.043	–0.900
1200	31	0.0365*	0.5387	Karachay-Cherkess Republic	27	0.0202	0.4122	–0.079	0.084
1201	20	0.0640*	0.7912	Republic of North Ossetia - Alania	14	–0.0029	0.203	–0.704	–0.107
1202	27	0.0526	0.6864	Chechen Republic	13	0.0186	0.3976	–10	–8.399
1203	29	0.0259	0.4411	Stavropol Territory	23	0.0527	0.7067	0.232	–0.254
1205	34	0.0321	0.4981	Republic of Bashkortostan	17	–0.1003	–0.6803	–0.312	0.076
1215	16	–0.0036	0.1704	Republic of Mari El	31	0.0325	0.5232	–0.28	–0.190
1220	27	–0.0046	0.1613	Republic of Mordovia	15	0.0582	0.7559	–0.2	0.328
1221	9	–0.1234	–0.9300	Republic of Tatarstan	13	–0.1025	–0.7004	–0.112	–0.376
1223	19	–0.0331	–0.1002	Udmurt Republic	15	–0.078	–0.4782	–0.182	–0.723
1225*	28	0.0155	0.3459	Chuvash Republic	40	0.0383	0.5761	–0.057	0.403
1245	36	–0.0198	0.0214	Perm Territory	20	–0.0983	–0.6619	0.179	–0.428
1250*	48	0.0106*	0.3008	Kirov region	35	0.0473	0.6575	0.153	0.024
1255	46	0.0347*	0.5224	Nizhny Novgorod region	24	0.033	0.5277	0.311	–0.202
1261	57	0.0196*	0.3836	Orenburg region	6	–0.5249	–4.5284	–0.315	–1.157
1262	9	0.0233	0.4173	Penza region	26	0.0513	0.6941	–0.1	–0.108
1263*	33	0.0152*	0.3433	Samara region	20	–0.1144	–0.8084	–0.2	–0.486

1270*	33	0.0073	0.2706	Saratov region	21	–0.0135	0.1065	0.219	–0.556
1280*	28	0.0509	0.6714	Ulyanovsk region	25	0.0152	0.3668	–0.363	–0.442
1285	27	0.0172	0.3620	Kurgan region	26	0.0175	0.3876	–0.091	–0.277
1290	40	0.0472	0.6368	Sverdlovsk region	30	0.0229	0.4363	0.797	–0.145
1305	47	–0.0393	–0.1574	Tyumen region	8	–0.3363	–2.8186	–0.897	–0.017
1315*	36	0.0286	0.4665	Chelyabinsk region	35*	0.0071	0.2932	0.089	–0.500
1320*	35	–0.0898	–0.6219	Republic Altai	30	–0.0352	–0.0898	0.64	0.921
1325	20	–0.1135	–0.8395	Republic of Buryatia	25	–0.0047	0.1864	–0.771	0.150
1330*	19	–0.1723	–1.3791	Republic of Tyva	17	0.0044	0.269	–0.783	0.219
1340	23	–0.0230	–0.0073	Republic of Khakassia	22	0.0473	0.6577	–0.673	0.179
1345*	17	–0.0011	0.1932	Altai Territory	33	–0.2383	–1.931	0.063	–0.325
1.350	11	0.0064	0.2627	Trans - Baikal Territory	19	–0.1845	–1.4435	–1.027	0.318
1355*	14	0.0030	0.2310	Krasnoyarsk Territory	15	0.008	0.301	–0.648	–0.380
1360	4	0.0100	0.2952	Irkutsk region	15	0.0295	0.4965	–0.343	–0.685
1.363	3	0.0266	0.4478	Kemerovo region	20	–0.0104	0.1344	–0.406	–0.341
1365*	4	–0.0312	–0.0833	Novosibirsk region	39	–0.3	–2.49	0.6	–0.003
1375*	5	–0.0997	–0.7125	Omsk region	17	–0.0295	–0.0387	0.164	–0.566
1.380	3	–0.0220	0.0015	Tomsk region	10	–0.3225	–2.6943	0.147	–1.144
1385*	5	–0.0191	0.0277	Republic of Sakha (Yakutia)	11	–0.0221	0.0285	–0.756	–0.059
1390*	11	0.0560	0.7181	Kamchatka Krai	23	–0.0039	0.1933	1.136	0.023
1395*	8	–0.2530	–2.1204	Primorsky Territory	26	–0.0307	–0.0493	0.397	–0.043
1398*	14	–0.0658	–0.4013	Khabarovsk Territory	21	–0.0896	–0.5833	0.876	–0.073
1400	55	0.0178*	0.3668	Amur region	17	–0.0358	–0.0958	–0.217	0.863
1410*	58	0.0226*	0.4108	Magadan region	23	–0.0278	–0.0234	1.429	0.664
1420*	57	0.0245*	0.4287	Sakhalin region	18	–0.1673	–1.2877	0.263	0.546
1430	35	0.0271	0.4528	Jewish Autonomous Region	21	0.024	0.446	–0.67	–8.399
1440	24	0.0280	0.4611	Chukotka Autonomous Okrug	13	–0.0964	–0.6447	1.103	0.515
1445	14	0.0196	0.3838						
1447	3	0.0265	0.4466						
1450	6	0.0493	0.6560						