Municipal elections in Russia: spatial analysis for 2021-2022

Demidova Olga, Professor, Department of Applied Economics, NRU HSE, demidova@hse.ru

Turchak Diana, Bachelor Student, Programme Economics and Statistics, NRU HSE, dnturchak@edu.hse.ru

Introduction

The author of the term "electoral geography" and the founder of the corresponding discipline was a French geographer and political writer André Siegfried (Siegfried, 1949). The main stages of development of this area may be found in (Warf, Leib, 2011). Electoral-geographical analysis was carried out for many countries of the world, but most of all for the USA (Wu, 2023), Great Britain (Hearne, 2020), France (Fernández et al., 2022) (developed democracies). There are few such studies for Russia. The articles (Kuletskaya et al., 2023; et al., 2022.) show that in order to identify factors influencing the results of presidential elections, it is necessary to take into account spatial effects. Yu. Gaivoronsky in the article (Gaivoronsky, 2018) using linear regression models, concluded that "in Russia the factor of economic development is difficult to recognize as systematically significant". However, Russia is a very large and heterogeneous country, so the dependence on economic factors may be heterogeneous. In our study, we test this using geographically weighted regression on the example of Russian municipal elections 2021-2022.

We test two main hypotheses.

Hypothesis 1. The location of Russian municipalities based on the results of the electoral choice is not random; there is a clustering of regions with similar voting results.

Hypothesis 2. Economic factors have a significant impact on the results of municipal elections in Russia.

Data and variables

As data source we have used information about municipal elections in 2272 Russian municipalities in 2021 and 2022 years. We excluded from consideration the municipalities of Moscow (the modern capital of Russia) and St. Petersburg (the former capital), since the capital's residents are quite different from residents of other regions.

These elections included candidates from the main party United Russia, which supports the Russian President, and several opposition parties: Communist Party of the Russian Federation (left-wing party), Liberal Democratic Party of Russia (the name of this party may be misleading, it is actually a right-wing populist nationalist party), Just Russia - a party created on the initiative of the Russian presidential administration in order to take away votes from left-wing parties and parties with a strong nationalist bias. Candidates from other parties received very few votes, so we

did not consider them in our analysis. In addition to candidates belonging to various parties, there were also independent candidates who were not members of any parties; we also took them into account in our analysis.

We used the following variables as dependent variables in our models:

UR (United Russia) is the share of votes for candidates of the United Russia party,

CPRF is the share of votes for candidates of the Communist Party of the Russian Federation,

LDPR is the share of votes for the candidates of the Liberal Democratic Party of Russia,

JR (Just Russia) is the share of votes for the candidates of the Just Russia party,

SN (Self-nominated) is the share of votes for self-nominated candidates.

Table 1 contains basic descriptive statistics for these variables.

Table 1. Descriptive statistics for the share of votes for the candidates of different parties.

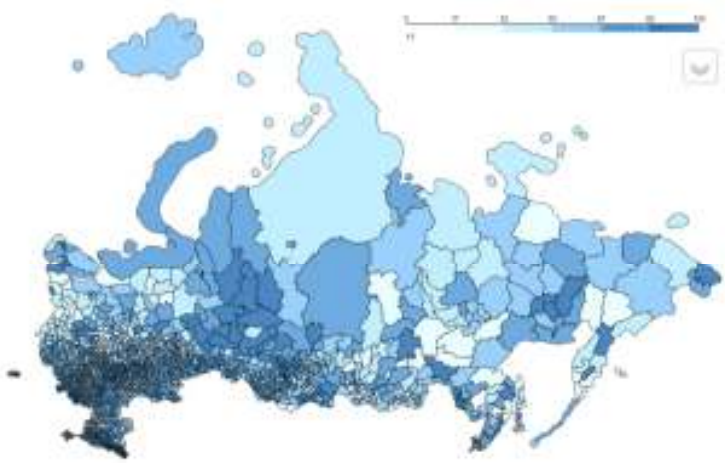
stats	UR	CPRF	LDPR	JR	SN
mean	68.43	9.42	4.68	4.44	11.78
median	72.00	7.00	3.00	2.00	7.00
min	0.00	0.00	0.00	0.00	0.00
max	100.00	89.00	97.00	80.00	100.00

In addition, we tested the hypotheses regarding the random location of municipalities on the shares of votes for candidates listed above using the global Moran, Geary and Getis-Ord indices (with boundary weighted matrix). The results obtained are presented in Table 2 and indicate that the location of the regions is not random; there is a positive autocorrelation (which corresponds to the clustering of regions according to the indicators under consideration). This partially confirms our first hypothesis.

Table 2. Results of Moran, Geary and Getis-Ord tests

Party	**Moran's I**	**z-statistics**	**Geary's C**	**z-statistics**	**Getis-Ord's G**	**z-statistics**
United Russia	0.312	21.787	0.693	-18.675	0.002	8.531
Communist Party	0.237	16.587	0.755	-11.903	0.003	11.012
LDPR	0.256	18.031	0.677	-7.672	0.003	11.263
Just Russia	0.147	10.35	0.812	-5.568	0.003	6.175
Self-nominated	0.204	14.725	0.76	-10.162	0.003	9.572

The maps also indicate the clustering of Russian regions according to the indicators under consideration; Figure 1 shows an example of a map of vote shares for the candidates of the United Russia party.



Map 1. The share of votes for the candidates of the United Russia party, %

Fig.1 The share of votes for the candidates of the United Russia, %

As explanatory variables, we used variables characterizing the economic situation in the region, the effectiveness of local government, and amenities:

BUDGET is the budget surplus/deficit, thousand rubles,

SME is the number of small and medium-sized businesses per 10,000 people,

ROAD_Q is the proportion of the length of local public roads that do not meet regulatory requirements in the total length of local public roads,

TRANSP_LINKS is the proportion of the population living in settlements that do not have regular bus and (or) railway connections with the administrative center of the mountain district (municipal district) in the total population of the mountain district (municipal district),

PRESCHOOL is the proportion of children aged 1-6 years receiving preschool educational services and (or) services for their maintenance in municipal educational institutions in the total number of children aged 1-6 years (unfortunately, no other variables related to education are provided for the municipality level),

HOUSE_IMPROV is the share of the population that received housing and improved living conditions in the reporting year in the total population registered as needing housing,

UTILITIES is the share of citizens who use social support to pay for housing and utilities at the end of the reporting period,

LIGHT is the proportion of illuminated parts of streets, driveways, embankments at the end of the year,

ENVIRONMENT is the share of environmental protection costs, including payment for environmental services, relative to municipal budget expenditures,

INVESTMENT is the share of investments in fixed assets at the expense of the municipal budget relative to the expenditures of the municipal budget,

URBAN is the percentage of the urban population as of January 1 of the current year.

Descriptive statistics of the explained variables are contained in Table 3 and show that Russian municipalities differ significantly in these economic indicators.

Table 3. Descriptive statistics for the explanatory variables

Variable	Mean	Std. Dev.	Min	Max
BUDGET	14627.38	116470.30	-664356.00	2032052.00
SME	238.41	162.85	0.00	2646.10
ROAD_Q	41.50	30.37	0.00	100.00
TRANSP_LINKS	7.19	18.45	0.00	100.00
PRESCHOOL	58.92	19.33	0.00	100.00
HOUSE_IMPROV	9.37	13.09	0.00	100.00
SOC_SUPPORT	24.81	11.20	0.00	95.31
LIGHT	62.16	28.28	0.00	100.00
ENVIRONMENT	5.35	11.10	0.00	97.98
INVESTMENT	3.47	7.43	0.00	99.88
URBAN	50.31	39.43	0.00	100.00

Models and Results of Estimation

To test our second hypothesis, we estimated linear regression models (1) and geographically weighted regressions (GWR) (2):

$$Y_i^p = \beta_0 + \sum_{j=1}^{K} \beta_j X_{ji} + \varepsilon_i, \quad (1)$$

$$Y_i^p = \beta_{0i} + \sum_{j=1}^{K} \beta_{ji}(u_i, v_i) X_{ji} + \varepsilon_i, \quad (2)$$

where $i = 1, \dots, n, n = 2272$ is a number of municipality, p = 1,…,5, Y_i^p is the share of votes for candidates of the United Russia, Communist Party, LDPR, Just Russia, Self-Nominated in *i*-th municipality, $X_1, \dots, X_K$ $(k = 10)$ are explanatory variables, ε_i are errors, u_i, v_i are the coordinates of the *i*-th municipality.

In GWR (Wheeler, 2021) we used Gaussian kernel function and cross-validation for the choice of the bandwidth. To estimate linear regression and GWR we have used packages spgwr written by Roger Bivand and Danlin Yu in R. The results of estimation are contained in the Tables 4-8.

Table 4. Results of votes for candidates of the United Russia party

Dep.variable UR	LR	MIN	1st Quantile	Median	3rd Quantile	MAX	N(t >1.96)	N(t <-1.96)
C	75.789***	34.488	76.500	76.993	77.686	79.456	2270	0
BUDGET	0.000**	0.000	0.000	0.000	0.000	0.000	2270	0
SME	-0.018***	-0.037	-0.020	-0.014	-0.013	-0.001	0	1988

ROAD_Q	-0.068***	-0.120	-0.091	-0.078	-0.071	0.206	0	2117
TRANSP_LINKS	-0.030	-1.440	-0.020	-0.016	-0.004	0.034	0	0
PRESCHOOL	-0.002*	-0.029	-0.005	-0.004	-0.002	0.577	0	1745
HOUSE_IMPROV	0.051	0.024	0.062	0.065	0.074	1.393	636	0
SOC_SUPPORT	0.004	-0.320	-0.003	0.007	0.008	0.017	0	135
LIGHT	0.001***	0.000	0.000	0.000	0.000	0.001	2247	0
ENVIRONMENT	-0.052**	-0.396	-0.048	-0.038	-0.038	-0.037	0	416
INVESTMENT	-0.005	-0.019	-0.018	-0.017	-0.008	0.160	0	0
URBAN	-0.010	-0.138	-0.018	-0.015	-0.002	0.019	0	0
AIC:	20238	20105.45						

Table 5. Results of votes for candidates of the Communist party

Dep.variable CPRF	LR	MIN	1st Quantile	Median	3rd Quantile	MAX	N(t >1.96)	N(t <-1.96)
C	7.0407***	5.62E+00	6.18E+00	6.44E+00	6.66E+00	1.13E+01	2270	0
SME	0.0053*	-7.83E-03	5.70E-03	6.70E-03	7.17E-03	7.58E-03	1503	0
ROAD_Q	0.0316***	-1.86E-02	3.39E-02	3.67E-02	4.14E-02	5.07E-02	2115	0
TRANSP_LINKS	-0.0384***	-1.40E-01	-4.46E-02	-4.43E-02	-4.36E-02	-2.37E-02	0	2069
PRESCHOOL	0.0004	9.76E-05	4.67E-04	2.31E-03	4.53E-03	9.86E-02	1385	0
HOUSE_IMPROV	-0.0129	-8.37E-02	-7.16E-03	-3.85E-03	-2.93E-03	-9.79E-04	0	0
BUDGET	0	-8.57E-06	-1.18E-07	-7.93E-08	-7.65E-08	-7.20E-08	0	246
SOC_SUPPORT	-0.0035	-8.73E-03	-5.86E-03	-5.48E-03	-1.59E-03	1.86E-01	0	0
LIGHT	-0.0002***	-3.66E-04	-2.60E-04	-2.58E-04	-2.54E-04	1.85E-02	0	2152
ENVIRONMENT	0.0268**	1.61E-02	2.98E-02	3.16E-02	3.19E-02	1.91E-01	1724	0
INVESTMENT	0.0002	-3.68E-02	1.14E-03	1.19E-03	1.32E-03	7.62E-03	0	0
URBAN	0.0041	-1.02E-01	-3.07E-03	-1.38E-03	-3.68E-04	1.47E-02	0	0
AIC:	17175	17155.1						

Table 6. Results of votes for candidates of the Liberal Democratic Party

Dep.variable LDPR	LR	MIN	1st Quantile	Median	3rd Quantile	MAX	N(t >1.96)	N(t <-1.96)
C	3.3772***	3.29780	3.36040	3.36280	3.37040	3.40520	2272	0
SME	0.0029*	0.00291	0.00292	0.00293	0.00293	0.00295	0	0
ROAD_Q	0.0046	0.00426	0.00464	0.00472	0.00475	0.00547	0	0
TRANSP_LINKS	0.0164**	0.01605	0.01633	0.01634	0.01637	0.01649	2272	0
PRESCHOOL	0.0008**	0.00076	0.00076	0.00076	0.00076	0.00077	2272	0
HOUSE_IMPROV	0.0047	0.00418	0.00484	0.00486	0.00492	0.00517	0	0
BUDGET	0	0.00000	0.00000	0.00000	0.00000	0.00000	0	0
SOC_SUPPORT	-0.002	-0.00205	-0.00203	-0.00202	-0.00202	-0.00201	0	0
LIGHT	0	0.00003	0.00003	0.00003	0.00003	0.00003	0	0
ENVIRONMENT	0.0079	0.00766	0.00783	0.00783	0.00785	0.00795	0	0
INVESTMENT	-0.0071	-0.00707	-0.00704	-0.00704	-0.00703	-0.00699	0	0
URBAN	0.0057*	0.00547	0.00562	0.00562	0.00564	0.00571	0	0
AIC:	14972	14957						

Table 7. Results of votes for candidates of the Just Russia Party

Dep.variable JR	LR	MIN	1st Quantile	Median	3rd Quantile	MAX	N(t >1.96)	N(t <- 1.96)
C	2.68200***	Min.	2.4012	2.4187	2.4423	2.6967	2270	0
SME	0.00357**	2.1698	0.0019	0.002083	0.002735	0.0153	328	0
ROAD_Q	0.02268***	-0.00032	0.0276	0.027862	0.028235	0.02889	2220	0
TRANSP_LINKS	0.01050	0.002369	0.0107	0.014122	0.015063	0.01852	1	0
PRESCHOOL	0.00026	-0.01725	0.0002	0.000217	0.000239	0.0182	0	0
HOUSE_IMPROV	-0.02084*	0.000176	-0.0164	-0.01245	-0.01158	-0.00958	0	263
BUDGET	0.00000	-0.06537	-1E-07	-1.1E-07	-1.1E-07	-1E-07	0	0
SOC_SUPPORT	-0.00386	-3.5E-07	-0.0039	-0.00387	-0.00379	0.0111	0	0
LIGHT	0.00000	-0.0041	1E-05	1.85E-05	2.02E-05	2.3E-05	0	0
ENVIRONMENT	-0.00298	-0.0001	-0.0072	-0.00658	-0.00367	0.01374	0	0
INVESTMENT	-0.00218	-0.00866	-0.0019	-0.00102	-0.0008	-0.00036	0	0
URBAN	0.00429	-0.00772	0.0063	0.00861	0.009188	0.01094	1594	0
AIC:	15307	15278.3						

Table 8. Results of votes for candidates of the self-nominated candidates

Dep.variable SN	LR	MIN	1st Quantile	Median	3rd Quantile	MAX	N(t >1.96)	N(t <- 1.96)
C	10.4253***	9.47	10.41	1.08E+01	1.10E+01	1.67E+01	2272	0
SME	0.002	-0.01	0.00	-5.88E-04	2.19E-03	1.17E-02	209	0
ROAD_Q	0.0111	-0.06	0.01	9.39E-03	1.54E-02	2.43E-02	350	0
TRANSP_LINKS	0.0531***	0.02	0.03	3.35E-02	3.44E-02	1.06E-01	2110	0
PRESCHOOL	0.0004	-0.06	0.00	5.22E-04	5.66E-04	8.27E-04	0	0
HOUSE_IMPROV	-0.0053	-0.04	-0.04	-3.47E-02	-3.27E-02	6.03E-02	0	0
BUDGET	0.000*	0.00	0.00	-4.11E-07	-4.03E-07	-3.12E-07	0	2020
SOC_SUPPORT	0.0079	0.00	0.01	7.18E-03	8.97E-03	6.43E-02	114	0
LIGHT	-0.0003**	0.00	0.00	-2.48E-04	-2.41E-04	-1.23E-04	0	2269
ENVIRONMENT	0.0209	0.01	0.02	1.93E-02	2.09E-02	3.59E-02	0	0
INVESTMENT	0.0089	-0.01	0.01	1.18E-02	1.23E-02	1.38E-02	0	0
URBAN	-0.0063	-0.02	-0.01	-4.92E-03	-4.40E-03	2.66E-02	0	0
AIC:	18479	18416.4						

We taking into account that “the standard error calculations in GWR are only approximate” (Wheeler, 2021). But since we have a large number of observations, we used pseudo-t – statistics for each local regression estimates and considered insignificant local coefficients for which pseudo-t in absolute value is less than 1.96. In Tables 4-8 we presented the number of observations for which pseudo-t – statistics > 1.96 and the number of observations for which pseudo-t – statistics < - 1.96; we considered the corresponding local coefficients pseudo-significant. Note that the AIC for GWR decreased in all cases, which supports the GWR estimate. GWRs allow us to draw more detailed conclusions about the factors influencing the electoral choice of voters.

The results obtained confirm our second hypothesis about the influence of the economic situation of regions on election results. The most interesting results are listed below.

1) According to the general linear regression model, the higher the budget surplus (deficit), the higher (lower) the share of votes for United Russia representatives. And according to the GWR assessment, this result holds for almost all municipalities. The same result occurs when voting for independent candidates.
2) From the estimates of the coefficients for the SME variable in linear regression and for most GWR estimates, it follows that the better small and medium-sized businesses are developed in a region, the lower the share of voters supporting UR and the higher the share of voters supporting independent candidates (in a small number of regions) and opposition parties (for most regions this is the Communist Party, but in a small number of regions also the Just Russia Party).

Thus, the use of municipal level data (analogous to NUTS3 for Europe) and geographically weighted regression allows us to study in more detail the relationship between economic and political processes in Russia.

References

1. Fernández García, T., Gutíerrez Posada, D., Rubiera Morollón, F., & Torre, A. (2022). Liberté, Égalité, Fraternité? The Role of Spatial Inequalities in Understanding the Growth of the Anti-System Vote in 2022 French Presidential Elections. The Role of Spatial Inequalities in Understanding the Growth of the Anti-System Vote in 2022 French Presidential Elections. Available at SSRN: https://ssrn.com/abstract=4453174 or http://dx.doi.org/10.2139/ssrn.4453174
2. Gaivoronsky, Yu. O. (2018). Factors of nationalization of the party system in modern Russia. Policy. Political Studies, 1, 45-61 (in Russian)
3. Hearne, D. (2020). A spatial analysis of the Brexit vote in the West Midlands. Regional Studies, Regional Science, 7(1), 232-243.
4. Kuletskaya L. E., Demidova O. A., E. V. Semerikova O. A. (2023). Spatial-econometric approach to modeling election results in Russia: municipal level // Economics and mathematical methods. V. 59. No. 3. P. 137-148. (in Russian)
5. Podkolzina E., Kuletskaya L., Demidova O. Spatial modelling of voting preferences: The “Mystery” of the Republic of Tatarstan // Applied Econometrics. 2022. Vol. 67. P. 74-96.
6. Siegfried, A. (1949). Géographie électorale de l'Ardèche: sous la IIIe République. – Paris: Armand Colin, 1949. – 139 p.
7. Wheeler, D. C. (2021). Geographically weighted regression. In Handbook of regional science (pp. 1895-1921). Berlin, Heidelberg: Springer Berlin Heidelberg.
8. Warf, B., & Leib, J. (Eds.). (2011). Revitalizing electoral geography. Ashgate Publishing, Ltd..
9. Wu, S. (2023). The Spatial Data Analysis of Determinants of US Presidential Voting Results in the Rustbelt States during the COVID-19 Pandemic. ISPRS International Journal of Geo-Information, 12(6), 212.