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# A stochastic model of the 2007 Russian Duma election

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**Abstract** In this paper we consider the nature of local Nash equilibrium (LNE) for a model of the 2007 Duma election in Russia, using estimates of valence obtained from sociodemographic variables.

We then extend this sociodemographic valence model by including institutional valences, the approval by voters of the various institutions, including the President, the Prime Minister, the State Duma and the Federation Council. We show by simulation that the vote maximizing LNE of this general stochastic model were not at the electoral origin. The dominant feature of the election was the influence of approval or disapproval of President Putin on each voter's political choice.

**Keywords** Stochastic model · Election · Russian Duma

**JEL Classification** H10

## 1 Introduction

Recent work has argued that institutional characteristics of political systems, such as presidentialism versus parliamentarianism, or majoritarianism versus proportionality will have significant effects on the size of government and the extent of redistributive politics.[1] However, these arguments have been based on cross country empirical analyses, sometimes combined with a relatively simple one dimensional spatial model (Downs 1957; Riker and Or-

[1] Bawn and Rosenbluth (2005) and Persson and Tabellini (2000, 2003).

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deshook 1973) which emphasizes the location of the median voter. The present paper focuses on constructing an empirical model of the election in Russia in 2007, involving a large number of parties, in a situation where the policy space can be assumed to consist of two or more dimensions. We use a formal apparatus that has already proved useful in accounting for party position in a variety of countries, including Israel, the Netherlands, the United Kingdom and the United States.[2]

The formal model which we use is based on the assumption that elections are partly based on the judgments of voters as regards the competence or quality of party leaders or political candidates. In this respect, the formal model can be linked to Madison's understanding of the nature of the choice for the president of the United States. Schofield (2006a) has suggested that Madison's argument may well have been influenced by Condorcet's work on the so-called "Jury Theorem" (Condorcet 1785). Condorcet's work has recently received renewed attention (Ladha 1992, 1993; McLennan 1998) and formal models have been presented based on the notion of *valence*, the perception of the quality of the political leader (Ansolabehere and Snyder 2000; Groseclose 2001; Aragones and Palfrey 2002, 2005; Zakharov 2009). The work in this research program can be seen as a contribution to the development of a Madisonian conception of elections in representative democracies as methods of aggregation of both preferences and judgments (Madison 1787).

The usual spatial model is based on the assumption that it is only candidate *positions* that matter to voters. However, as Stokes (1963, 1992) has emphasized many years ago, the non-policy evaluations, or *valences*, of candidates by the electorate are equally important. Recent empirical work by Clarke et al. (2009a: 159) has compared a 'Downsian' or spatial model of the 2000 US presidential election with a valence model of the same election, based on the perceptions of the character traits of the candidates by the voters. They found that "the two models have equal explanatory power."

This paper develops a stochastic electoral model which combines elements of the Downsian stochastic vote model with 'Stokesian' valence, in which each candidate or party leader is characterized by an *intrinsic valence* (or quality). The estimates of intrinsic valence for each party were obtained as intercept terms from a standard multinomial conditional logit (MNL) model of the election. The underlying policy space was obtained from factor analysis of positive/negative responses to a list of forty concepts, such as 'Capitalism' and 'the Church', etc.

We then examined the conditions for existence of 'a local Nash equilibrium' (LNE) under vote maximization. A LNE is simply a vector of party positions with the property that no party may make a small unilateral move and yet increase utility (or vote share). Schofield (2007) has presented a theorem which gives the necessary and sufficient conditions for the validity of the *mean voter theorem*, that all parties should converge to the electoral origin.[3] This result is presented in terms of a 'convergence coefficient' incorporating all the parameters of the model. This coefficient, $c$, involves the differences in the exogenous valences of the party leaders, and the 'spatial coefficient', $\beta$. When the policy space, $X$, is assumed to be of dimension $w$, then the necessary condition for existence of an LNE when all parties are located at the electoral origin is that the coefficient $c$ is bounded above by $w$. When the necessary condition fails, then parties, in equilibrium, will adopt divergent positions. In

[2]See Miller and Schofield (2003, 2008), Schofield et al. (2003), Schofield and Miller (2007), Schofield and Sened (2005, 2006).

[3]The electoral origin is the mean of the distribution of voter preferred points. A vector of party positions when all parties are at the origin is termed the *joint origin*.

general, parties whose leaders have the lower valences will take up positions further from the electoral mean.

Simulation of a four-party model for the 2007 Russian Duma election showed that the condition for convergence was satisfied. Indeed, simulation of the model did indicate that the joint origin was a LNE.

We then incorporated sociodemographic characteristics in what we call the joint model. These sociodemographic variables included ‘education’, ‘income’, ‘age’, ‘gender’. Such variables are used frequently to estimate the propensity of different subgroups in the polity to choose one party over another. They can be regarded as *sociodemographic valences*, generated by common perceptions of the parties by different societal subgroups.

We also incorporated a number of variables related to the perception of the voter as to the nature or quality of government institutions, including ‘general efficacy’ (whether the voter had a say in policies), ‘approval of the president’, ‘approval of the prime minister’, ‘approval of the State Duma’, and ‘approval of the Federation Council’. The ‘approval of President Putin’ had a significant and negative effect on the support for two of the parties, the Liberal Democratic Party of Russia (LDPR) and Fair Russia (SR).

Because these perceptions are tied to individuals who are located in the policy space, the LNE positions, in principle, will depend on how these perceptions are distributed among the electorate.

We developed a simulation package based on a gradient technique which allowed us to estimate vote maximizing LNE of any such spatial model.

The position of each party in the LNE of this model was termed the *weighted electoral mean* of the party. To account for the difference between the vector of weighted electoral means and the estimated vector of party positions, we introduced the notion of activist valences. In this more general model, activists are assumed to provide political and economic resources to parties, who then use these resources to enhance their image before the electorate.[4]

We suggest that the influence of activists was relatively insignificant in this election, with electoral perception of Putin the most important component of the election.

The next section presents the formal model, followed by the empirical model and some concluding remarks.

## 2 A stochastic model of elections

Details of the pure spatial stochastic electoral model are given in Schofield (2007). This model is an extension of the standard multiparty stochastic model, modified by inducing asymmetries in terms of valence. The model is denoted $\mathbb{M}(\boldsymbol{\lambda}, \beta)$, where voter utility is given by the expression

$$u_{ij}(x_i, z_j) = \lambda_j - \beta\|x_i - z_j\|^2 + \varepsilon_j. \tag{1}$$

Here the intrinsic valence vector $\boldsymbol{\lambda} = (\lambda_1, \lambda_2, \ldots, \lambda_p)$ satisfies $\lambda_p \geq \lambda_{p-1} \geq \cdots \geq \lambda_2 \geq \lambda_1$, where $(1, \ldots, p)$ label the parties, and $\lambda_j$ is the intrinsic valence of party $j$. In empirical models, the valence vector $\boldsymbol{\lambda}$ is given by the intercept terms.

The points $\{x_i\colon i \in N\}$ are the preferred policies of the voters and $\{z_j : j \in P\}$ are the positions of the parties. The term $\|x_i - z_j\|$ is simply the Euclidean distance between $x_i$ and $z_j$. The error vector $(\varepsilon_1, \ldots, \varepsilon_p)$ is distributed by the type I extreme value distribution, $\Psi$.

[4]This feature of the model was based on earlier work by Aldrich (1983).

We can also define a stochastic electoral model, which utilizes socio-demographic variables and voter perceptions of institutional quality. For this model we assume that voter $i$ utility is given by the expression

$$u_{ij}(x_i, z_j) = \lambda_j + (\theta_j \cdot \eta_i) + (\alpha_j \cdot \tau_i) - \beta\|x_i - z_j\|^2 + \varepsilon_j. \tag{2}$$

Here $\boldsymbol{\theta}$ is a set of $k$-vectors $\{\theta_j : j \in P\}$ representing the effect of the $k$ different sociodemographic parameters (age, education, income, gender, rural/urban, religious orientation) on voting for party $j$ while $\eta_i$ is a $k$-vector denoting the $i$th individual's relevant "sociodemographic" characteristics. The compositions $\{(\theta_j \cdot \eta_i)\}$ are scalar products, called the sociodemographic valences for $j$.

Similarly, the terms $\{(\alpha_j \cdot \tau_{ij})\}$ are scalar products, giving voter $i$'s perception of the quality of various political institutions, such as the President, Prime Minister, the State Duma and the Federation Council. We call these terms *institutional valences*, and let $\boldsymbol{\alpha}$ be the set of vectors $\{\alpha_1, \dots, \alpha_p\}$.

When $\beta$ is assumed zero then the model is called pure *sociodemographic* (SD), and denoted $\mathbb{M}(\boldsymbol{\lambda}, \boldsymbol{\theta})$. When $\{\theta_j\}$ and $\boldsymbol{\alpha}$ are all assumed zero then the model, $\mathbb{M}(\boldsymbol{\lambda}, \beta)$, is called *pure spatial*. When the intrinsic valences, sociodemographic variables and perceptions are included then the model is called *joint*, denoted $\mathbb{M}(\boldsymbol{\lambda}, \boldsymbol{\theta}, \boldsymbol{\alpha}, \beta)$.

In all models, the probability that voter $i$ chooses party $j$, when party positions are given by $\mathbf{z}$ is:

$$\rho_{ij}(\mathbf{z}) = \Pr[[u_{ij}(x_i, z_j) > u_{il}(x_i, z_l)], \text{ for all } l \neq j]. \tag{3}$$

A local Nash equilibrium (LNE) is a vector, $\mathbf{z}$, such that each party, $j$, chooses $z_j$ to locally maximize the expectation $\sum_i \rho_{ij}(\mathbf{z})$, conditional on the positions of the other parties. Theorem 1 in Schofield (2007) shows that the necessary and sufficient condition for convergence to the origin in the pure spatial model, $\mathbb{M}(\boldsymbol{\lambda}, \beta)$, is that the $w$ by $w$ *characteristic matrix,*

$$C_1 = 2\beta(1 - 2\rho_1)\nabla_0 - I, \tag{4}$$

has negative eigenvalues. Here $I$ is the $w$ by $w$ identity matrix, and

$$\rho_1 = \left[1 + \sum_{k \neq 1} \exp[\lambda_k - \lambda_1]\right]^{-1} \tag{5}$$

is the probability that a voter picks the lowest valence party when all parties are at the electoral origin. The $w$ by $w$ matrix $\nabla_0$ is the covariance matrix of the distribution of voter ideal points, with total variance $\sigma^2$. It follows from this result that a necessary condition for $\mathbf{z}_0 = (0, \dots, 0)$ to be an LNE is that a convergence coefficient, $c$, defined by

$$c = 2\beta(1 - 2\rho_1)\sigma^2$$

is bounded above by the dimension, $w$. When this condition fails, then all parties will adopt divergent positions, with the lowest valence party typically furthest from the electoral origin. A sufficient condition for convergence to $\mathbf{z}_0$ in the two dimensional case is that $c < 1$.

With activist valence functions $\{\mu_j : j \in P\}$ the utility model is:

$$u_{ij}(x_i, z_j) = \lambda_j + \mu_j(z_j) + (\theta_j \cdot \eta_i) + (\alpha_j \cdot \tau_i) - \beta\|x_i - z_j\|^2 + \varepsilon_j \tag{6}$$

giving a model, $\mathbb{M}(\boldsymbol{\lambda}, \boldsymbol{\mu}, \boldsymbol{\theta}, \boldsymbol{\alpha}, \beta)$. For this case, Schofield (2006b) shows that the first order balance condition at an equilibrium, $z_j^*$, is given by the gradient balance condition

$$\frac{d\mathcal{E}_j^*}{dz_j}(z_j^*) + \frac{1}{2\beta}\frac{d\mu_j}{dz_j}(z_j^*) = 0. \tag{7}$$

The first term in this equation is the *centripetal marginal electoral pull*, defined at $z_j$ by

$$\frac{d\mathcal{E}_j^*}{dz_j}(z_j) = \left[z_j^{el} - z_j\right],$$

$$\text{where } z_j^{el} \equiv \sum_{i=1}^{n} \varpi_{ij} x_i$$

is the *weighted electoral mean* of party $j$.

Here the weights $\{\varpi_{ij}\}$ are individual specific, and defined at the vector $\mathbf{z}$ by:

$$[\varpi_{ij}] = \left[\frac{[\rho_{ij}(\mathbf{z}) - \rho_{ij}(\mathbf{z})^2]}{\sum_{k\in N}[\rho_{kj}(\mathbf{z}) - \rho_{kj}(\mathbf{z})^2]}\right]. \tag{8}$$

The second gradient term, $\frac{d\mu_j}{dz_j}(z_j)$ is the *centrifugal marginal activist pull at* $z_j$.

In the model $\mathbb{M}(\boldsymbol{\lambda}, \boldsymbol{\theta}, \boldsymbol{\alpha}, \beta)$, the valence functions are constant, so the marginal effects, $\frac{d\mu_j}{dz_j}$, will be zero. However, these weights will vary from one individual to another. In the analysis of the Russian Duma election presented in the next section, we shall make use of the sociodemographic and institutional valences.

## 3 The election in Russia in 2007

The election results in terms of votes and seats for the December 2007 election are given in Table 1. We used a survey conducted by VCIOM (Russian Public Opinion Research Center) in May 2007. Some 1588 adult citizens were interviewed in 46 Russian regions, out of a total of 83. The Appendix gives the question wordings, while Table 2 gives the results of the approval ratings for various political institutions.

About 67% of the respondents indicated that they would vote for some party if the election were held at the time of the survey. Table 3 gives the sample vote and actual vote shares for eleven parties competing in the election.The distribution of vote in the sample is similar to the distribution of actual vote in the December election. See Table 3.

We constructed a model focusing on the vote choice for just four parties. The first party is the pro-Kremlin United Russia party (ER). The party's political platform is vaguely nationalistic. In recent election campaigns, the party mainly took credit for the country's economic and political revival. It is commonly believed that the United Russia received an unfair advantage due to the lopsided coverage on the state television channels and political pressure. In particular. the party enjoyed an open endorsement by the then President Vladimir Putin. It has also been asserted that some form of election fraud had taken place. The support for the pro-Kremlin United Russia actually declined from 45% in the May sample to 40% in the December election. According to some sources, the decline may have been due to the popular dissatisfaction with the rising food prices in the third and fourth quarters of 2007.

**Table 1** Party Votes and seats

| Party | Votes (1000) | Vote % | Seats | Seat % |
|---|---|---|---|---|
| United Russia (ER) | 44,714 | 64.3 | 315 | 70 |
| Communist Party (CPRF) | 8,046 | 11.57 | 57 | 12.7 |
| Lib Dem Party Russia (LDPR) | 5,660 | 8.14 | 40 | 8.9 |
| Fair Russia (SR) | 5,383 | 7.74 | 38 | 8.4 |
| Agrarian Party (ARP) | 1,600 | 2.30 | 0 | 0 |
| Russian Dem Party (Yabloko) | 1,108 | 1.59 | 0 | 0 |
| Civilian Power | 733 | 1.11 | 0 | 0 |
| Others | 912 | 2.2 | 0 | 0 |

**Table 2** Approval of Institutions

| | President | Govt. | Prime Min. | State Duma | Fed. Coun. |
|---|---|---|---|---|---|
| 0 (disapprove) | 12.72 | 42.54 | 29.88 | 54.24 | 39.27 |
| 0.5 (don't know) | 8.55 | 21.66 | 26.48 | 22.49 | 34.83 |
| 1 (approve) | 78.73 | 35.80 | 43.64 | 23.26 | 25.90 |

**Table 3** Factor averages across the supporters of eleven parties

| Party | Sample | Vote | Fact 1 | Fact 2 |
|---|---|---|---|---|
| Agrarian Party (AGR) | 0.63 | 1.47 | −0.16 | −0.92 |
| United Russia (ER) | 45.72 | 40.96 | 0.05 | 0.30 |
| Communist Party (CPRF) | 7.12 | 7.37 | −0.76 | −1.59 |
| Liberal Democrats (LDPR) | 4.22 | 5.13 | −0.53 | 0.69 |
| Patriots of Russia | 0.25 | 0.57 | 0.22 | −0.10 |
| Fair Russia (SR) | 6.17 | 4.93 | −0.60 | −0.87 |
| Civilian Power (Free Russia) | 0.69 | 0.67 | −0.43 | 0.31 |
| Union of Right Forces (SPS) | 0.57 | 0.61 | −0.47 | 1.14 |
| Yabloko | 0.76 | 1.01 | −0.56 | 0.20 |
| Russian Republican Party | 0.25 | | −0.16 | 1.36 |
| Democratic Party of Russia | 0.19 | 0.08 | −0.25 | 0.75 |
| "Will not vote" | 17.88 | | 0.23 | −0.06 |
| "Cannot answer" | 14.92 | | 0.43 | −0.04 |
| Did not vote | | 36.3 | | |

Most of the rest of the vote, both in the elections and in the sample, went to the three runner-up parties. The runner-up parties included Vladimir Zhirinovsky's Liberal Democratic Party (LDPR), with its aggressive and nationalistic rhetoric. However, its voting record in the Duma indicates the party's loyalty toward Russia's presidents (Yeltsin, then Putin).

The key points of the ideology of the Communist Party (CPRF) is Soviet nostalgia and xenophobia. Both the Communist Party and United Russia sought, and obtained, the support of the Russian Orthodox Church. The Communist Party traditionally targeted elderly (and poor) voters. Fair Russia (SR) targets the same electorate as the CPRF (with the same rhetoric), but is usually seen as more loyal to the Kremlin.

For socio-demographic variables, we chose gender, age, education, income, and size of township. Some 54.7% of the respondents were female, 45.3% male. The age of the respondents varied from 18 to 92, with a mean of 44.7 years. Rural residents comprised 26.67% of the sample. The mean self-reported level of education, on 0 to 1 scale, was 0.56; for income, the figure was also 0.56 on the same scale.

We assumed that the valence that a voter assigns to a party may depend on the voter's approval of various federal government institutions—the President, the Government in general, the Prime Minister, the State Duma, the Federation Council. Only a small part of the population (12%) disapproved of the presidency, and an even smaller part (8%) was undecided on the issue. For other institutions, the disapproval rates are much higher. The share of the respondents who answered "don't know" is also greater, suggesting that the attitudes are weaker.

The respondent's ideological preferences were measured by two survey questions. In the first question, the respondent was read a list of 40 words. After each item, (s)he was asked to identify whether (s)he felt positive toward the concept it represented. The second question was identical, except that the negative feelings were recorded (see Table 4). For each concept, we constructed a variable that took the value of $-1$ of the respondent's feeling was negative, $+1$ if the feeling was positive, and 0 otherwise. The Karhunen-Loeve transform was used to construct the two-dimensional ideological space as well as the position of each respondent.[5]

Each factor loading is proportional to the correlation between the values of the ideological factor and the attitude toward the concept. To use the terminology of Basinger and Hartman (2006), the concepts with high absolute factor loadings are 'ideologically integrated'.

The first ideological factor (or the position on the first dimension) can be interpreted as the degree of a voter's general (dis)satisfaction. High values of the first factor correspond to negative feelings toward 'justice' and 'labor', and, to a lesser extent, 'order', 'state', 'stability' and 'equality'. Also, those with high values of the first axis tend to feel neutral toward 'order', 'elite', 'West', and 'non-Russians'. Low values of the first factor correspond to positive attitudes to 'order', 'justice', 'stability' and 'equality', and negative attitudes toward 'elite', 'West', and 'non-Russians'.

The second factor can be called the voter's degree of economic liberalism. High values correspond to positive feelings to 'freedom', 'business', 'capitalism', 'well-being', 'success', and 'progress', and to negative feelings toward 'communism', 'socialism', 'USSR', and related concepts.

The supporters of different parties tend to have different ideological preferences. We took the mean of the positions of supporters of each party as an estimate of the parties position. As Fig. 1 suggests, the supporters of United Russia (ER) have a centrist position along both dimensions—partly due to the fact that they constitute 45% of the sample, and the sample means are zero for each ideological factor. The supporters of the Communist Party (CPRF) and Fair Russia (SR) tend to have similar ideological profiles, with low values on the second factor. The supporters of the LDPR tend to have low values along the first ideological factor (suggesting dissatisfaction), but positive values along the second factor

[5] In a similar study of American presidential voting, Ansolabehere et al. (2006) have shown that aggregation of a large number of survey items eliminates measurement error and reveals issue preferences.

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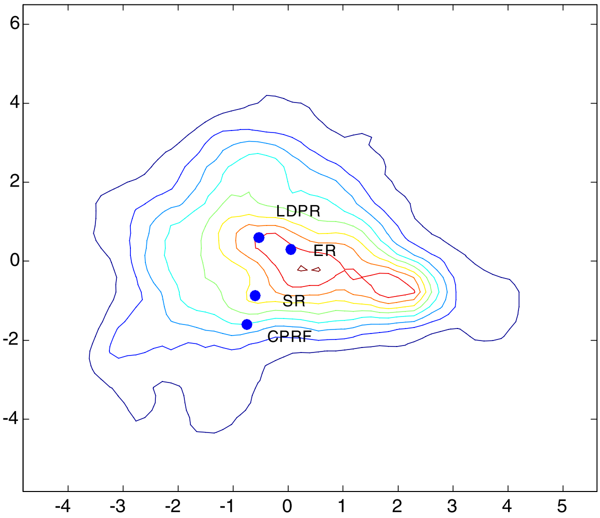
**Table 4** The frequency of positive and negative responses and factor loadings

| | Concept | Percent pos. | Percent neg. | Fact. 1 | Fact. 2 |
|---|---|---|---|---|---|
| 01 | Nation | 0.21 | 0.08 | 0.11 | −0.08 |
| 02 | Order | 0.57 | 0.01 | −0.18 | 0.01 |
| 03 | Freedom | 0.37 | 0.03 | −0.13 | 0.20 |
| 04 | Market | 0.10 | 0.15 | 0.26 | 0.08 |
| 05 | Russians | 0.34 | 0.02 | −0.15 | 0.03 |
| 06 | West | 0.02 | 0.23 | 0.21 | 0.10 |
| 07 | Socialism | 0.11 | 0.11 | −0.13 | −0.28 |
| 08 | Communism | 0.07 | 0.19 | 0.05 | −0.32 |
| 09 | Democracy | 0.15 | 0.09 | 0.11 | 0.07 |
| 10 | Tradition | 0.29 | 0.01 | −0.06 | −0.04 |
| 11 | Patriotism | 0.34 | 0.01 | −0.14 | −0.15 |
| 12 | State | 0.26 | 0.03 | −0.17 | −0.03 |
| 13 | Competitiveness | 0.05 | 0.07 | 0.07 | 0.12 |
| 14 | Sovereignty | 0.07 | 0.05 | −0.08 | 0.01 |
| 15 | Elite | 0.02 | 0.41 | 0.30 | 0.04 |
| 16 | Party | 0.02 | 0.16 | 0.04 | −0.14 |
| 17 | Power | 0.09 | 0.18 | 0.26 | −0.09 |
| 18 | Justice | 0.49 | 0.02 | −0.30 | 0.02 |
| 19 | Opposition | 0.01 | 0.17 | 0.12 | −0.06 |
| 20 | Business | 0.07 | 0.13 | 0.17 | 0.27 |
| 21 | USSR | 0.12 | 0.08 | −0.01 | −0.34 |
| 22 | Church | 0.21 | 0.02 | −0.13 | −0.01 |
| 23 | Revolution | 0.01 | 0.22 | 0.13 | −0.26 |
| 24 | Property | 0.14 | 0.04 | 0.13 | 0.14 |
| 25 | Success | 0.31 | 0.00 | −0.16 | 0.21 |
| 26 | Liberalism | 0.01 | 0.14 | 0.15 | −0.01 |
| 27 | Reform | 0.06 | 0.14 | 0.23 | −0.02 |
| 28 | Stability | 0.38 | 0.00 | −0.16 | 0.00 |
| 29 | Labor | 0.31 | 0.00 | −0.26 | −0.08 |
| 30 | Individualism | 0.02 | 0.12 | 0.05 | 0.10 |
| 31 | Non-Russians | 0.02 | 0.29 | 0.25 | −0.12 |
| 32 | Equality | 0.18 | 0.02 | −0.18 | −0.06 |
| 33 | Collectivism | 0.06 | 0.09 | 0.02 | −0.22 |
| 34 | Morality | 0.22 | 0.03 | −0.05 | −0.07 |
| 35 | Human rights | 0.32 | 0.02 | −0.15 | 0.12 |
| 36 | Wealth | 0.12 | 0.01 | 0.15 | 0.25 |
| 37 | Russia | 0.28 | 0.00 | −0.03 | 0.07 |
| 38 | Well-being | 0.37 | 0.01 | −0.11 | 0.25 |
| 39 | Progress | 0.21 | 0.01 | −0.03 | 0.27 |
| 40 | Capitalism | 0.15 | 0.02 | −0.09 | 0.22 |

**Fig. 1** Party positions in Russia




(suggesting economic liberalism). The estimated positions of the four major parties were

$$\mathbf{z}^* = \begin{bmatrix} \textit{Party} & \textit{ER} & \textit{CPRF} & \textit{LDPR} & \textit{SR} \\ x & +0.2 & -0.6 & -0.5 & -0.5 \\ y & +0.2 & -1.6 & +0.5 & -1.0 \end{bmatrix}.$$

## 4 Equilibrium under the multinomial logit model

As in Sect. 2, we denote by $P$ the set of parties {CPRF (Communist Party), ER (United Russia), SR (Fair Russia), LDPR (Liberal Democrats)}. The set of respondents is denoted by $N$. Each voter $i$ is characterized by the vector $\eta_i$ of observable individual-specific nonpolicy factors, and by the observable position $x_i = (x_{i1}, x_{i2})$ on the two ideological dimensions. Each party $j$ is characterized by the ideological position $z_j = (z_{j1}, z_{j2})$.

Suppose that the utility that voter $i$ attributes to party $j$ is given by (2) for the joint model and by (1) for the pure spatial model, as in Sect. 2. The estimated probability that $i$ votes for party $j$ at the vector $\mathbf{z}$ of party positions is denoted $\rho_{ij}(\mathbf{z})$, and given by (3). Assuming that voter $i$ chooses party $d_i$, then the likelihood of the model is

$$LikeL = \sum_{i \in N} \rho_{id_i}(\mathbf{z}). \tag{9}$$

The estimation problem is to find the values of the various coefficients that maximize *LikeL*.

Ascertaining the ideological positions of political parties as they are perceived by the voters is a methodological problem. There are several ways to do it, such as expert survey of party elites (see Quinn et al. 1998, Benoit and Laver 2006), own expert judgment (Schofield 2007), or a systematized analysis of party manifestos (Budge et al. 1987, 2001). As noted above, we took the position for each party to be equal to the average of the positions of

**Table 5** The four party pure spatial model with base ER

| | Coef. | Coef. | Std. err. | $\|t\|$ | $prob > \|t\|$ |
|---|---|---|---|---|---|
| | $\beta$ | 0.181 | 0.015 | 12.08 | 0.000 |
| CPRF | `valence` | 1.971 | 0.110 | 17.79 | 0.000 |
| LDPR | `valence` | 0.153 | 0.141 | 1.09 | 0.277 |
| SR | `valence` | −0.404 | 0.161 | 2.50 | 0.012 |
| $n$ | | 1004 | | | |
| log likelihood | | –797 | | | |

respondents who chose that party. If $N_j =$ the number who chose party $j$, then

$$z_{js} = \frac{1}{N_j} \sum_{i|d_i=j} x_{is} \tag{10}$$

for $s = 1, 2$.

The findings show overwhelming support for the hypothesis that both policy and valence affects voting. Table 5 gives the estimation results for the pure spatial model.

Sociodemographic parameters, approval, and efficacy are also jointly significant, as shown in Table 6. The joint model, with sociodemographic variables and voter perceptions, performs significantly better than the pure spatial model. The Bayes factor (the difference in log likelihoods, as given in Kass and Raftery 1995) is very significant, and equal to $797 - 694 = +103$.

To determine the theoretical equilibrium for the pure spatial model, we proceed as follows.

The lowest valence party is SR with $\lambda_{SR} = -0.4$. Now $\lambda_{ER} = 0$, $\lambda_{LDPR} = 0.153$, $\lambda_{CPRF} = 1.971$. Thus

$$\begin{aligned} \rho_{SR} &= \left[1 + \sum_{k \neq SR} [\exp(\lambda_k - \lambda_{SR})]\right]^{-1} \\ &= \frac{1}{1 + e^{0.4} + e^{0.15+0.4} + e^{1.97+0.4}} \\ &\simeq 0.1. \end{aligned}$$

Now the electoral covariance matrix is $\nabla_0 = \left[\begin{smallmatrix} 2.95 & 0.13 \\ 0.13 & 2.95 \end{smallmatrix}\right]$, so, by (4):

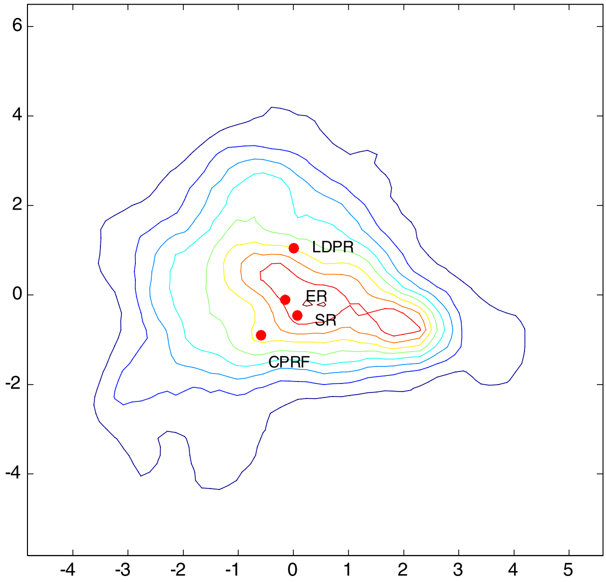
$$\begin{aligned} C_{SR} &= 2\beta(1 - 2\rho_1)\nabla_0 - I \\ &= 2 \times 0.181 \times 0.8 \times \begin{bmatrix} 2.95 & 0.13 \\ 0.13 & 2.95 \end{bmatrix} - I \\ &= \begin{bmatrix} 0.85 & 0.03 \\ 0.03 & 0.85 \end{bmatrix} - I. \end{aligned}$$

The eigenvalues are both negative, and the joint origin should be a LNE. Simulation of this model found the joint origin to be an LNE for this model.

**Table 6** Estimation of the Joint Model with base ER

| | Coefficients | Coef. | Std. err. | $\|t\|$ | $prob > \|t\|$ |
|---|---|---|---|---|---|
| Party | Spatial coeff $\beta$ | 0.152 | 0.017 | 8.88 | 0.000 |
| CPRF | education | −0.524 | 0.482 | 1.09 | 0.277 |
| | income | −0.205 | 0.767 | 0.27 | 0.789 |
| | age | −0.037 | 0.007 | 4.96 | 0.000 |
| | gender | 0.330 | 0.238 | 1.39 | 0.166 |
| | rural | 0.137 | 0.260 | 0.53 | 0.597 |
| | efficacy | 0.521 | 0.348 | 1.50 | 0.135 |
| | approve_Putin | 1.062 | 0.441 | 2.41 | 0.016 |
| | approve_PM | −0.514 | 0.359 | 1.43 | 0.153 |
| | approve_gov | 0.385 | 0.350 | 1.10 | 0.272 |
| | approve_Duma | 1.059 | 0.389 | 2.72 | 0.007 |
| | approve_State Fed | −0.638 | 0.410 | 1.56 | 0.120 |
| | Valence | 2.903 | 0.818 | 3.55 | 0.000 |
| LDPR | education | −0.109 | 0.593 | 0.18 | 0.854 |
| | income | 0.324 | 0.944 | 0.34 | 0.731 |
| | age | 0.008 | 0.009 | 0.91 | 0.362 |
| | gender | −0.288 | 0.296 | 0.97 | 0.331 |
| | rural | −0.044 | 0.327 | 0.13 | 0.893 |
| | efficacy | −0.230 | 0.443 | 0.52 | 0.603 |
| | approve_Putin | −0.988 | 0.457 | 2.16 | 0.031 |
| | approve_PM | −0.263 | 0.456 | 0.58 | 0.564 |
| | approve_gov | 0.192 | 0.463 | 0.41 | 0.678 |
| | approve_Duma | 0.852 | 0.556 | 1.53 | 0.126 |
| | approve_State Fed | −1.044 | 0.588 | 1.77 | 0.076 |
| | Valence | 0.744 | 1.012 | 0.74 | 0.462 |
| SR | education | −0.415 | 0.744 | 0.56 | 0.577 |
| | income | 2.552 | 1.161 | 2.20 | 0.028 |
| | age | −0.059 | 0.011 | 4.94 | 0.000 |
| | gender | −1.583 | 0.403 | 3.92 | 0.000 |
| | rural | −0.412 | 0.405 | 1.02 | 0.309 |
| | efficacy | 0.009 | 0.526 | 0.02 | 0.985 |
| | approve_Putin | −0.989 | 0.574 | 1.72 | 0.085 |
| | approve_PM | −0.284 | 0.577 | 0.49 | 0.622 |
| | approve_gov | 0.310 | 0.582 | 0.53 | 0.595 |
| | approve_duma | 1.881 | 0.642 | 2.93 | 0.003 |
| | approve_State_Fed | −1.360 | 0.708 | 1.92 | 0.055 |
| | Valence | 2.516 | 1.128 | 2.23 | 0.026 |
| $n$ | | 1004 | | | |
| | log likelihood | –694 | | | |

**Fig. 2** Equilibrium positions in Russia under the joint model




We also simulated a local Nash equilibrium for the joint spatial voting model, as defined in Sect. 2. This LNE was given by

$$\mathbf{z}^{el} = \begin{bmatrix} Party & ER & CPRF & LRPR & SR \\ x & -0.1 & -0.6 & +0.0 & +0.1 \\ y & +0.0 & -1.0 & +1.0 & -0.2 \end{bmatrix}.$$

The computed equilibrium vector is different both from the joint origin and from the observed positions as shown in Fig. 1. Assuming that the difference is due to activist groups, we infer that

$$\begin{aligned} &\mathbf{z}^{*} - \mathbf{z}^{el} \\ &= \begin{bmatrix} Party & ER & CPRF & LDPR & SR \\ x & +0.2 & -0.6 & -0.5 & -0.5 \\ y & +0.2 & -1.6 & +0.5 & -1.0 \end{bmatrix} \\ &\quad - \begin{bmatrix} Party & ER & CPRF & LDPR & SR \\ x & -0.1 & -0.6 & +0.0 & +0.1 \\ y & +0.0 & -1.0 & +1.0 & -0.2 \end{bmatrix} \\ &= \begin{bmatrix} Party & ER & CPRF & LDPR & SR \\ x & +0.3 & +0.0 & -0.5 & -0.6 \\ y & +0.2 & -0.6 & -1.5 & +0.8 \end{bmatrix} \\ &= \frac{1}{2\beta} \left[ \frac{d\mu_{ER}}{dz_{ER}}, \frac{d\mu_{CPRF}}{dz_{CPRF}}, \frac{d\mu_{LDPR}}{dz_{LDPR}}, \frac{d\mu_{SR}}{dz_{SR}} \right]. \end{aligned}$$

This last expression is the estimated gradient of activist forces on these four parties.

**Table 7** Predicted voteshares in the four party model, with the altered zero-approval sample

| | ER | CPRF | LDPR | SR |
|---|---|---|---|---|
| Original sample | 0.723 | 0.112 | 0.066 | 0.097 |
| Neutral Putin approval | 0.609 | 0.163 | 0.112 | 0.116 |
| Zero Putin approval | 0.430 | 0.253 | 0.194 | 0.121 |

## 5 Discussion of empirical findings

Approval for the Prime Minister and government did not have any significant effect on the vote. Approval of the State Duma had a positive and significant effect on the CPRF vote; for other parties, that effect was not significant.

The magnitude of the 'Putin effect' on the level of support for the United Russia can be estimated by setting the approval scores equal to zero for all respondents, then re-estimating the probabilities of voting according to the four-party model with the full set of explanatory variables. The expected voteshares for each party by can be obtained by averaging the estimated probabilities for each party across all respondents in the four-party subsample.[6] The results of this estimation appear in Table 7.

One can see that the high approval of President Putin significantly affected the support for United Russia. In the original four-party subsample, 72% of the votes went to that party. If the approval for Putin uniformly decreased to 0.5 (equivalent to a "don't know" answer to the question whether the respondent approved of Putin), the support for the United Russia would decline to 61%. If everyone completely disapproved of Putin, United Russia would receive only 43% of the vote that went to the four parties, or only 27% of the popular vote, if we assume that the share of the abstaining or undecided voters, as well as the vote share of the small parties, remained constant. The main beneficiaries of the decrease in approval would be the Communist Party and LDPR, with more modest gains by SR.

Thus this work validates what has been common knowledge: the popularity of United Russia was due to the high approval rating of Vladimir Putin, and to the party's perceived connection to the president.

The respondents who supported parties other than the United Russia also had lower internal efficacy scores. One can see that an increase in one's efficacy score will increase her probability of supporting United Russia, at the expense of all other parties for the four-party model, where all three efficacy terms are negative and significant. In the estimated seven-party model, the efficacy terms for the three small parties are not significant.

Education was found to have no effect on the political preferences of the voters. For the full eleven party model, the education terms were individually insignificant, with the exception of the SPS, where it was significant only at the 10% level. Education was the only significant individual non-policy factor found to affect the voter's latent utility for SPS. A more educated voter was more likely to support SPS, at the expense of all other parties.

The income effect is significant only for the LDPR. A voter with a lower perceived income will be more likely to support LDPR. The effect is quite large in magnitude. An decrease in self-reported income by one level (from "medium" to "high", for example) would have approximately the same effect on the voter's probability of supporting the LDPR as a change in approval from maximum to minimum.

[6]The expected voteshares for the unaltered subsample are equal to the actual voteshares in that subsample. (This is a property of the logit model.)

**Table 8** Predicted probabilities of voting for the parties with variables `gender (female)`, `income`, `education`, `rural`, `age`, `efficacy`, `approve` `set at mean values`

| Fact 1 | Fact 1 | ER | CPRF | LDPR | SR |
|---|---|---|---|---|---|
| 0 | 0 | 0.861 | 0.042 | 0.019 | 0.076 |
| +3.4 | 0 | 0.924 | 0.020 | 0.011 | 0.043 |
| –3.4 | 0 | 0.758 | 0.082 | 0.030 | 0.128 |
| 0 | +3.4 | 0.936 | 0.006 | 0.031 | 0.025 |
| 0 | –3.4 | 0.609 | 0.202 | 0.009 | 0.178 |

Gender was the one of the most important factors that affected party preferences. Out of 67 LDPR supporters in the sample, 55 were males. United Russia had a slightly higher proportional of women supporters (414 out of 726), while the Communist Party and the SR has an equal number of male and female supporters. When controlling for all other factors, male voters were more likely to support the Communist Party and the LDPR at the expense of the SR and United Russia. For the extended dataset including the supporters of the three small parties, female voters were more likely to support Yabloko and equally likely to support either SPS or the Agrarian Party.

Age was also found to have a significant effect for almost all parties. The effect (relative to the United Russia) was largest for the CPRF. Indeed, the average age of CPRF supporters was 59. This finding suggests that the factors that make CPRF more popular among the older population are not captured by either ideological preferences, the approval of government, or internal efficacy. The advanced age of CPRF supporters also explains the gender bias: in 2006, the average life expectancy of Russian males was only 60.3 years compared to 73.2 years for females. The age effect for the SR was similar (with the average age of the supporters being 54.9 years). For LDPR, the age effect was negative and significant. The average age of 36.8 for the LDPR supporters was the lowest across the seven parties in the extended sample. The age effect for SPS was positive and marginally significant.[7]

The final sociodemographic factor that we studied was whether the respondent lived in a rural or urban area. There were no rural residents among Yabloko supporters and only one among the SPS. The proportions of rural residents among the supporters of the CPRF, United Russia and the SR were very similar to the proportion in the general population (30%, 28.5%, 29.5%, and 30%, respectively). As a result, the coefficients for the rural variable for the CPRF and for the SR were insignificant. This corroborates the claim that the Communist Party lost the support of rural voters (Wergen and Konitzer 2006). The only party to have a significantly smaller proportion of rural voters was the LDPR (23.8%).

Tables 8 and 9 examine the effects of ideology on the voter's probability of supporting the four major parties for the four-party model. The analysis suggests that poorly educated, low-income, young females, who approve of the federal government and have centrist ideology, are most likely to support United Russia. The model estimates the probability to be 96%. The most likely supporters of LDPR are young urban men with above average income, who disapprove of the government, have low efficacy scores, profess liberal economic ideology and are dissatisfied. The most likely supporters of CPRF and SR were dissatisfied elderly males with below-average income who disapprove of the government, have low efficacy scores, and have anti-market economic views. A voter belonging to this group is expected to support CPRF with a probability of 48% and SR with a probability of 22%.

[7] Mishler and Rose (2007) found that age and generational differences were significant in determining an individual's support for the current political regime.

**Table 9** Predicted probabilities of voting for the parties with variables `gender` (`male`), `income`, `education`, `rural`, `age`, `efficacy`, `approve` `set at mean values`

| Fact 1 | Fact 2 | ER | CPRF | LDPR | SR |
|---|---|---|---|---|---|
| 0 | 0 | 0.725 | 0.074 | 0.107 | 0.092 |
| +3.4 | 0 | 0.835 | 0.038 | 0.069 | 0.056 |
| −3.4 | 0 | 0.577 | 0.131 | 0.151 | 0.139 |
| 0 | +3.4 | 0.784 | 0.011 | 0.173 | 0.030 |
| 0 | −3.4 | 0.452 | 0.314 | 0.044 | 0.189 |

A number of other model specifications were tried. First, we tested the hypothesis that certain factors—such as the willingness to discuss politics, education, or internal efficacy—can affect the importance of ideology in an individual's evaluation of a political party. The importance of ideology was found to be unaffected by any of these variables, in contrast to some previous studies.[8]

Second, we considered the possibility of regional economic conditions affecting the vote.[9] The survey did not contain questions on retrospective self-evaluation of economic conditions, either in the short or long term. As a substitute we used two measures of actual economic conditions: the absolute level of mean disposable income, and the percentage change in that level from 2000 to 2006. We found two statistically significant effects. First, the support for the Communist Party was higher in the regions with lower economic growth. Second, the support for Fair Russia was higher in the regions with absolutely higher income. However, the magnitude of either effect was small compared to the effects of either approval or internal efficacy.

There were several reasons why we used only the first two ideological factors. First, the eigenvalues for the first two factors were much higher than for the subsequent factors. Second, it was not possible to give a transparent interpretation of the subsequent factors. Indeed, the inclusion of additional factors did not significantly improve the fit of the model. The log likelihood was 769 for zero factors, 760 for one factor, 721 for two factors, 714 for three factors, and 712 for four factors.

This paper does not control for several other factors that affected voter preferences. Most importantly, variables defined by the parties' differential access to local mass media outlets, and the degree to which the law is selectively applied in favor of United Russia, do vary considerably across regions. Such regional variance is not included.

Certainly, neither media bias (White et al. 2001) nor vote-rigging (Myagkov et al. 2005), can be overlooked as factors that contributed to the success of United Russia in the December, 2007, election. However, this consideration does not alter this paper's conclusion: the principal variable in the election was the high approval rating of President Putin.

While the analysis presented here does not examine the origins of Putin's popularity, most accounts suggest that the primary source was the economic reward due to the high price of oil.

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[8] Zakharov and Fantazzini (2008) found that education significantly increased the weight of ideology in determining vote choice in the United Kingdom and the Netherlands.

[9] See Owen and Tucker (2008) for economic voting in Poland.

## 6 Concluding remarks

This paper has attempted to apply a formal model of elections as a contribution to the growing literature on the application of the quantitative theory of elections to the study of newly democratic countries such as Russia.[10] We show here that such empirical models can be interpreted in terms of a formal stochastic model. The analysis indicates that any centripetal tendency towards an electoral center is relatively weak. Moreover, perceptions of voters about the quality of institutions and leaders plays a significant role in the electoral outcome. Indeed, the electoral approval of President Putin was the single most important factor affecting the voter's choice in favor of United Russia.[11] This mirrors the findings by Clarke et al. (2009a) and Clarke et al. (2005, 2009b), for Canada, the United States and the United Kingdom, that electoral perceptions and spatial policy positions interact to generate electoral outcomes.

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## Appendix

### Question wording

*Age* What is your age in full years?

*Education.* "What is your education? 1—Primary education or below, 2—Incomplete secondary education, 3—Secondary education, 4—Vocational school, 5—Less than 4 years of higher education, 6—4 or more years of higher education." Those who responded "Don't know" were assigned the value of 3.5.

The variable `education` was obtained as follows: (response-1)$\times$ 0.2.

*Income.* "To which income group does your family belong? 1—Cannot afford to buy food, 2—Can afford food but cannot afford clothing, 3—Can afford clothing but not durable goods, 4—Can afford all durable goods but cannot afford real estate, 5—Can afford real estate." For the variable `income`, those who responded "Don't know" were assigned the value of 3.

The variable `income` was obtained as follows: (response-1)$\times$ 0.25.

*Approval.* "Do you approve of A. President, B. Prime Minister, C. Government, D. State Duma, E. Federation council." Each question was coded as follows: "1—Yes, 2—No, 1.5—Can't answer."

Each of the approval variables was obtained as follows: 2—response.

[10] See Powers and Cox (1997), Fidrmuk (2000a, 2000b), Hesli and Bashkirova (2001), Brader and Tucker (2001), Treisman and Gimpelson (2001), Mishler and Willerton (2003), Richter (2006), Colton and Hale (2008).

[11] Putin's popularity has been sustained for a number of years. See Andrew Harding, "Why is Putin Popular?", BBC News (8 March, 2000). http://news.bbc.co.uk/1/hi/world/europe/669247.stm.

*Size of township.* "Where do you live? 1—Moscow or St. Petersburg, 2—City over one million, 3—500 thousand to one million, 5—100 thousand to 500 thousand, 6—50 thousand to 100 thousand, 7—urban-type settlement, 8—village."

The variable `rural` was generated by assigning the value of 1 for "8—village" and 0 otherwise.

*Ideological attitude.* "Please say if you feel positively (negatively) to each of the following concepts." Table 4 list the 40 concepts.

*Internal efficacy.* "Do you think that the ordinary voters like you have a say in who will be in power in the future, and on the country's future policies? 1—Yes, a lot depends on the regular voters, 2—A few things depend on the voters, 3—Nothing depends on the voters, all main decisions will be made without their consent". The "can't answer" response was coded as 2. The variable `efficacy` was generated as 1.5–0.5$\times$ response.

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