

Multilevel modelling of invalid voting rates in the Bulgarian local elections 2015 and 2019

Applied Modeling in Economics, Finance and Social Sciences

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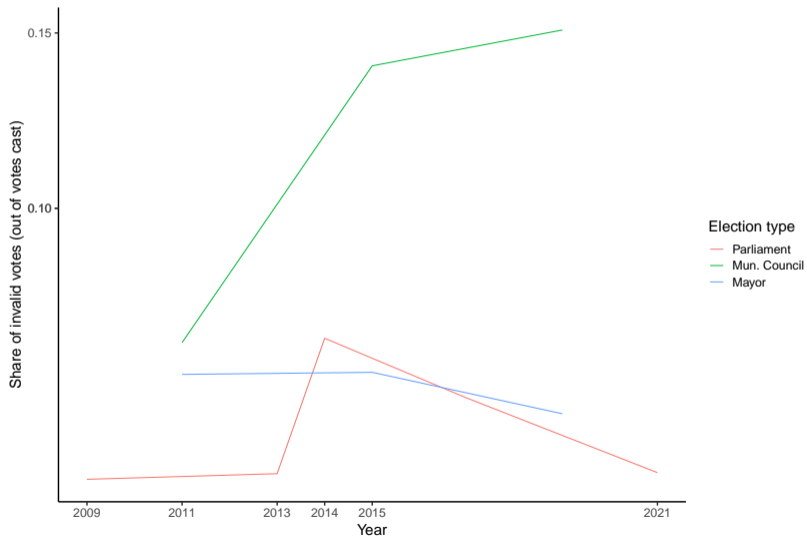
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Introduction

- Trust in the electoral process
- Legitimacy of government
- Invalid voting rate on the rise in recent local elections

Invalid votes in Bulgarian elections elections (2009 - 2021)



Short Overview of the Bulgarian Election Systems

- Proportional election system (parliament, municipality councils)
- Eligibility restriction: domestic domicile rule (local elections)
- Majority vote in two rounds for in presidential and mayor elections
- Candidate preferences vote since 2014
- Mandatory voting since 2016 (not enforced)
- Empty vote option introduced in 2016

Possible Reasons for Invalid Voting

Classification proposed by Kouba and Lysek (2019)

1. Unsupportive: critical citizens, distrust in authorities
2. Disempowered: apathy, lack of interest in the political process
3. Disenchanted: alienation from the political system
4. Electoral authority decisions: unintentional errors, capability/effort to detect invalid votes (Aldashev and Mastrobuoni 2016), election fraud

Data

- Data on 11806 (2019) / 11667 (2011) polling stations in Bulgaria in the municipality council elections
- 265 municipalities (election districts)
- Excluding mobile and special polling stations (hospitals, prisons)
- Invalid voting in 2019 does not include explicitly empty votes (no support for any party)
- Census data on settlement type, age, education and ethnicity composition (settlement level, 2011)
- School performance at national examination of 7-th grade students in public schools
- National Employment Agency data on registered unemployment (municipality)
- National Statistics Institute data on poverty (municipality, 2018)

Predictors: Societal Factors

- Urbanisation: Regional capital/Town/Rural, population size (Uggla 2008)
- Unemployment (Kouba and Lysek 2016; Fatke and Heinsohn 2017)
- Poverty: share of persons below the poverty line (Pion 2010; Socia and Brown 2017)
- Ethnic diversity: share of persons with Roma and Turkish ethnicity (Martinez i Coma and Werner 2019)
- Education: share of persons with a higher education degree, neighbourhood school performance (Driscoll and Nelson 2014; Aldashev and Mastrobuoni 2016)
- Median age (Ackaert *and others* 2011; Fatke and Heinsohn 2017; Socia and Brown 2017)
- Voter turnout

Predictors: Institutional Factors

- Vote share of the winning party (Galatas 2008)
- Number of parties (Jackman 1987; Fatke and Heinsohn 2017)
- Number of seats in the municipal council (Power and Garand 2007)
- Number of registered voters in the voting station

Statistical Model

$$p(\theta|y) = \frac{p(y|\theta)p(\theta)}{\int_{\theta} p(y|\theta)p(\theta)}$$

$i = 1, \dots, n$ polling stations

y_i : Number of invalid ballots

n_i : Number of ballots cast in station i

$MUNICIP[i] \in [1, \dots, 256]$ municipalities

$y_i \sim \text{Binomial}(p_i, n_i)$

$\text{logit}(p_i) = \alpha + \beta \mathbf{X} + v_{MUNICIP[i]}$

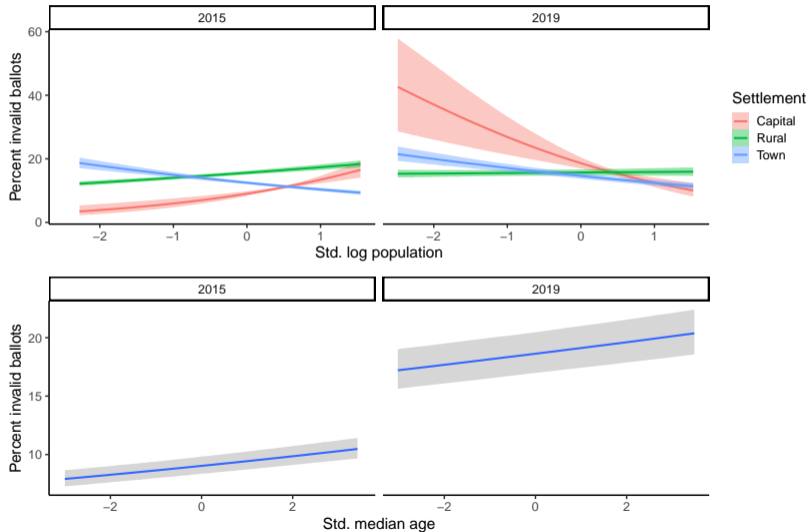
$v_{MUNICIP[i]} \sim \text{Normal}(0, \sigma)$

$\alpha \sim \text{Normal}(-1, 0.5)$

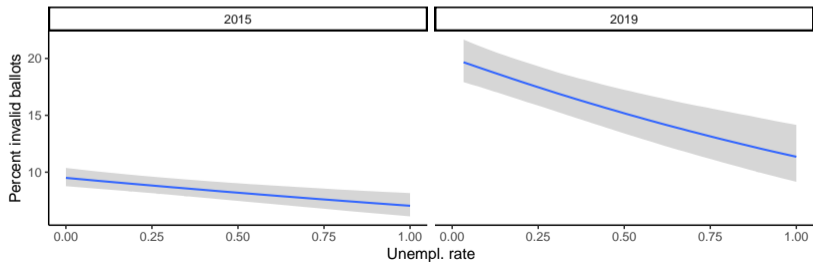
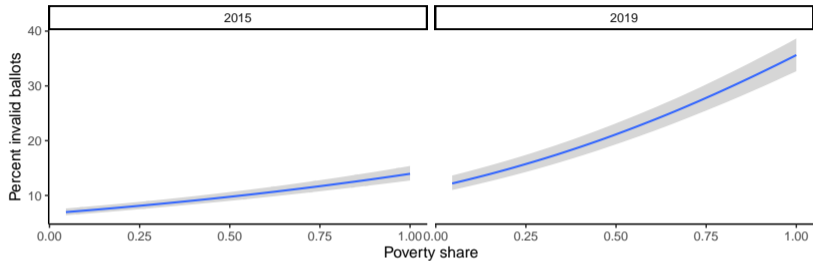
$\beta \sim \text{Normal}(0, \mathbf{I})$

$\sigma \sim \text{Exponential}(1)$

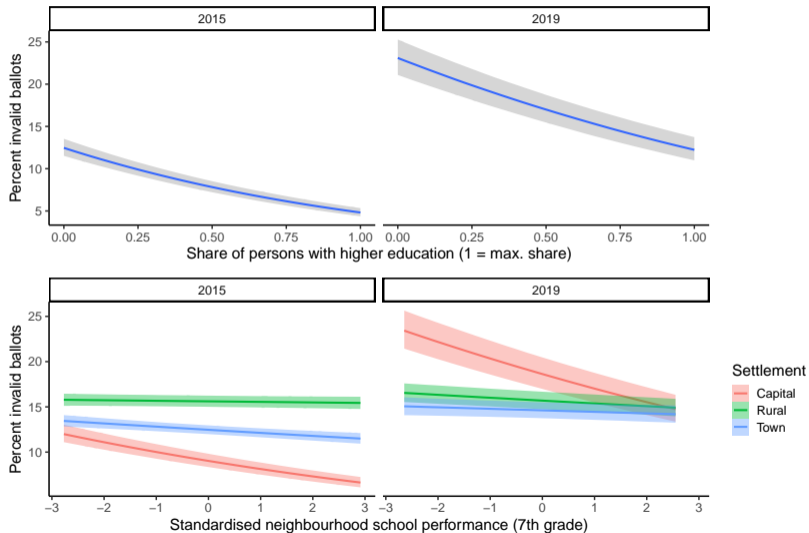
Results 1: Population Size and Age



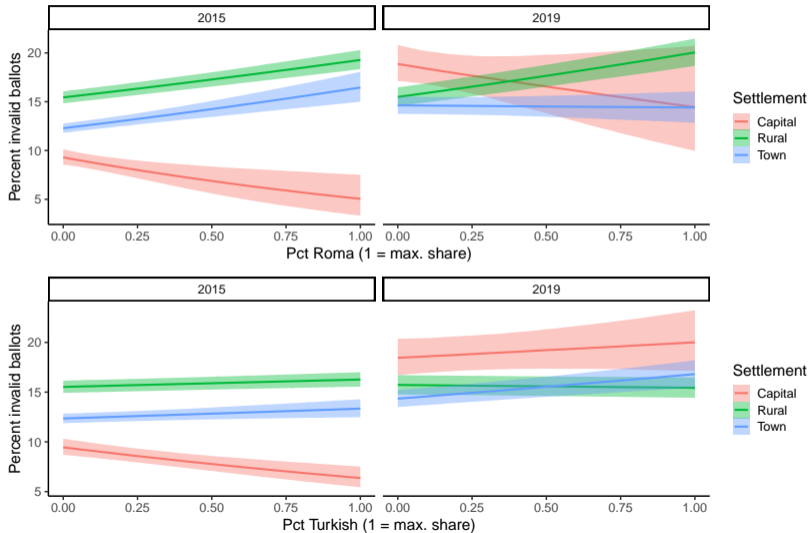
Results 2: Poverty and Unemployment



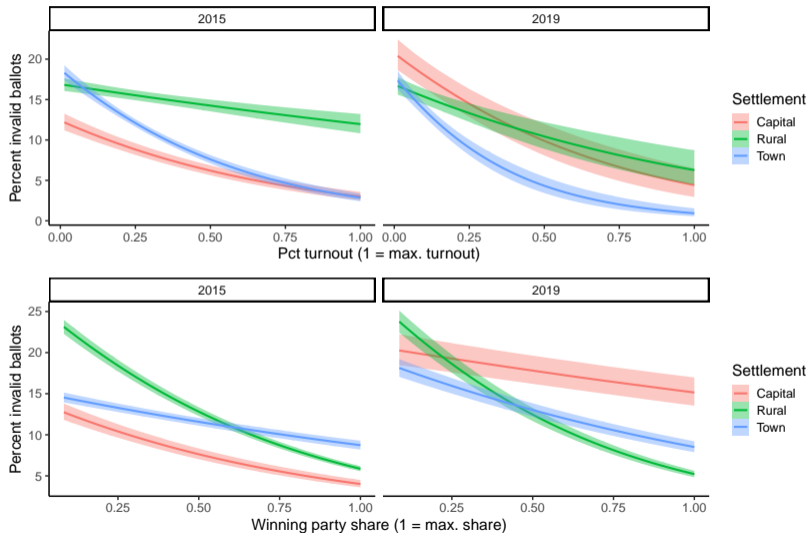
Results 3: Education



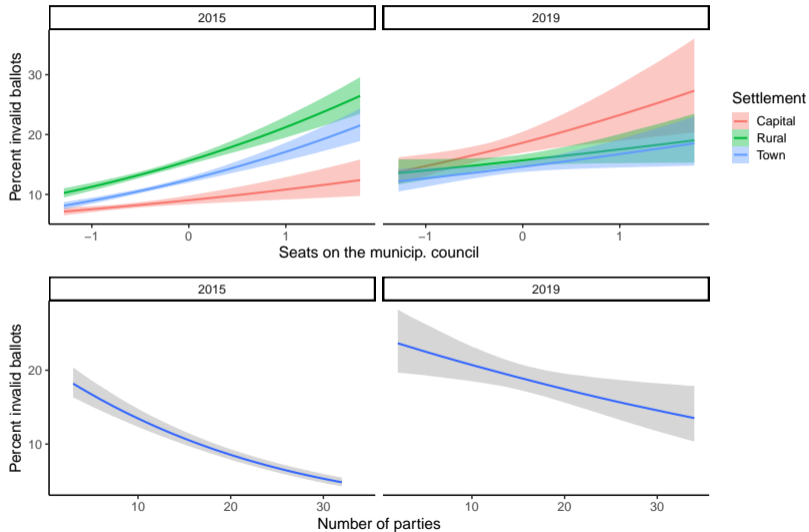
Results 4: Ethnic Diversity



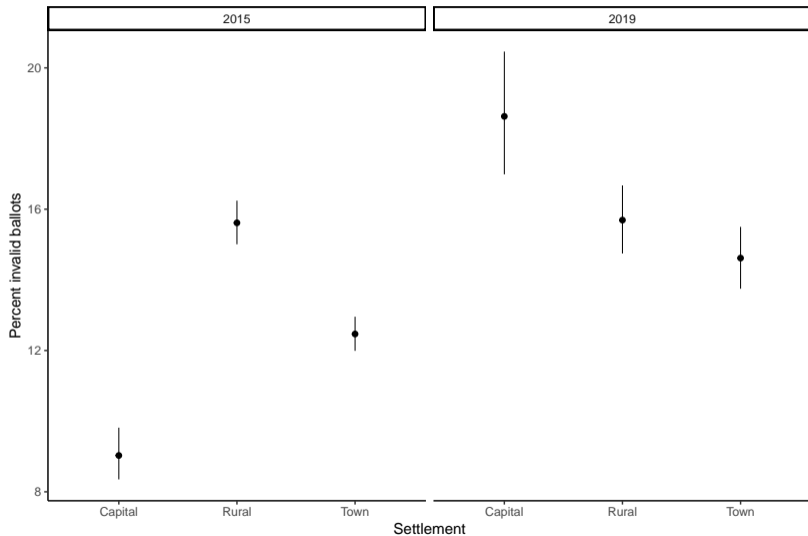
Results 5: Turnout and competition



Results 6: Number of Parties and District Magnitude



Results 7: Settlement Type



Conclusions

- Population size: positive association with invalid voting in rural areas and negative in small urban settlements
- Higher share of invalid voting in settlements with older population
- Poverty rate: positive association with invalid voting in both 2011 and 2019
- Unemployment: negative effect in both 2011 and 2019, larger effect in 2019
- Invalid voting less likely in cities with a higher share of educated persons
- Higher poverty rates associated with higher invalid voting
- Education appears to be associated with lower rates of invalid voting
- Higher ethnic diversity associated with higher rates of invalid voting (Roma ethnicity) in rural and small town settlements
- High voter turnout and winner party shares appears to be strongly associated with lower rates of invalid voting
- Turnout, winning party votes share and the number of parties appear negatively associated with invalid voting

Appendix: Estimated coefficients I

	2015	2019
Intercept	-0.31* [-0.46; -0.18]	-1.06* [-1.30; -0.83]
Settlement (Rural)	0.39* [0.30; 0.47]	0.27* [0.17; 0.38]
Settlement (Town)	0.11* [0.01; 0.20]	-0.01 [-0.11; 0.10]
Log pop (std)	0.45* [0.31; 0.58]	-0.47* [-0.64; -0.30]
School perf. score (std)	-0.11* [-0.12; -0.11]	-0.11* [-0.12; -0.10]
Share high education (std)	-1.03* [-1.09; -0.97]	-0.77* [-0.83; -0.70]
Population in poverty (std)	0.81* [0.72; 0.90]	1.45* [1.35; 1.53]
Unemployment (std)	-0.33*	-0.67*

Appendix: Estimated coefficients II

	$[-0.45; -0.20]$	$[-0.87; -0.45]$
Pct Roma (std)	-0.66^*	-0.32
	$[-1.04; -0.29]$	$[-0.71; 0.07]$
Pct Turkish (std)	-0.43^*	0.10
	$[-0.58; -0.27]$	$[-0.06; 0.27]$
Median age (std)	0.05^*	0.03^*
	$[0.04; 0.05]$	$[0.03; 0.04]$
Registered voters (std)	-0.02^*	-0.01^*
	$[-0.03; -0.01]$	$[-0.02; -0.00]$
Turnout (std)	-1.52^*	-1.74^*
	$[-1.67; -1.36]$	$[-2.08; -1.38]$
Number of parties	-0.05^*	-0.02^*
	$[-0.06; -0.05]$	$[-0.03; -0.01]$
Seats in council	0.20^*	0.28^*
	$[0.11; 0.30]$	$[0.13; 0.42]$
Winner vote share	-1.36^*	-0.39^*
	$[-1.44; -1.28]$	$[-0.46; -0.30]$
Log pop (std):Rural	-0.32^*	0.48^*

Appendix: Estimated coefficients III

	$[-0.45; -0.17]$	$[0.31; 0.66]$
Log pop (std):Town	-0.66^*	0.28^*
	$[-0.80; -0.52]$	$[0.10; 0.45]$
School perf. score (std):Rural	0.11^*	0.09^*
	$[0.10; 0.12]$	$[0.08; 0.09]$
School perf. score (std):Town	0.08^*	0.10^*
	$[0.07; 0.09]$	$[0.08; 0.11]$
Pct Roma (std):Rural	0.93^*	0.63^*
	$[0.57; 1.31]$	$[0.25; 1.03]$
Pct Roma (std):Town	1.00^*	0.30
	$[0.64; 1.40]$	$[-0.10; 0.69]$
Pct Turkish (std):Rural	0.48^*	-0.12
	$[0.34; 0.64]$	$[-0.29; 0.03]$
Pct Turkish (std):Town	0.52^*	0.09
	$[0.36; 0.68]$	$[-0.08; 0.25]$
Registered voters (std):Rural	0.03^*	0.06^*
	$[0.02; 0.04]$	$[0.04; 0.07]$
Registered voters (std):Town	0.08^*	0.06^*

Appendix: Estimated coefficients IV

	[0.07; 0.09]	[0.05; 0.08]
Turnout (std):Rural	1.11*	0.63*
	[0.93; 1.31]	[0.17; 1.08]
Turnout (std):Town	-0.54*	-1.40*
	[-0.77; -0.31]	[-1.97; -0.88]
Seats on council:Rural	0.18*	-0.15*
	[0.10; 0.25]	[-0.25; -0.05]
Seats on council:Town	0.17*	-0.12*
	[0.10; 0.25]	[-0.21; -0.02]
Winner vote share:Rural	-0.35*	-1.51*
	[-0.44; -0.27]	[-1.60; -1.43]
Winner vote share:Town	0.74*	-0.56*
	[0.63; 0.83]	[-0.66; -0.46]
<hr/>		
SD: mid	0.19	0.29
R ²	0.81	0.85
Num. obs.	11667	11806
loo IC	109873.97	110327.32
WAIC	109862.06	110320.74

Appendix: Estimated coefficients V

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