Measuring the Competitiveness of Elections*

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Online Appendix

Abstract

The concept of electoral competition plays a central role in many subfields of political science, but no consensus exists on how to measure it. One key challenge is how to conceptualize and measure electoral competitiveness at the district level across alternative electoral systems. Recent efforts to meet this challenge have introduced general measures of competitiveness which rest on explicit calculations about how votes translate into seats, but also implicit assumptions about how effort maps into votes (and how costly effort is). We investigate how assumptions about the effort-to-votes mapping affect the units in which competitiveness is best measured, arguing in favor of vote-share denominated measures and against vote-share-per-seat measures. Whether elections under multi-member proportional representation systems are judged more or less competitive than single-member plurality or runoff elections depends directly on the units in which competitiveness is assessed (and hence on assumptions about how effort maps into votes). (148 words)

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A. Supplementary Material

A.1 *Definitions of distance metrics*

We can define the distance metrics discussed in the text more formally as follows.

$$R_{\bullet}^{(j)}(\boldsymbol{V}) = \underset{(R_1,...,R_J)}{\arg\min} \sum_h |R_h| \ s.t. \ S_j(\boldsymbol{V}+\boldsymbol{R}) = S_j(\boldsymbol{V}) + 1. \tag{1}$$

$$N_j^{+}(\boldsymbol{V}) = \underset{R_j}{\arg\min} \ R_j \ s.t. \ S_j(\boldsymbol{V}+\boldsymbol{R}) = S_j(\boldsymbol{V}) + 1 \ if \ \boldsymbol{R_{-j}} = (0,...,0). \tag{2}$$

$$N_j^{GS+}(\boldsymbol{V}) = \underset{R_j}{\arg\min} \ R_j \ s.t. \ S_j(\boldsymbol{V}+\boldsymbol{R}) = S_j(\boldsymbol{V}) + 1 \ \forall \ \boldsymbol{R_{-j}} \in \{\boldsymbol{R_{-j}} : \sum_{h \neq j} R_h \leq 0\}. \tag{3}$$

A.2 *Effort, votes, and seats*

In the main text, we discuss a hypothetical area which could be carved into different numbers of electoral districts. Table A.1 displays the distance to a seat gain for party B, denominated in different units: vote shares, raw votes, ads, and individual contacts.

Table A.1: Effort, votes, and seats

Number of seats in district	Number of voters in district	Share of vote B needs to gain a seat	Raw votes B needs to gain a seat	Ads B needs to run to gain a seat	Contacts B needs to make to gain a seat
1	n	$\frac{1}{2}$	$\frac{n}{2}$	$\frac{1}{2z}$	$\frac{n}{2y}$
2	2n	$\frac{1}{3}$	$\frac{2n}{3}$	$\frac{1}{3z}$	$\frac{2n}{3y}$
...	...	...	...	...	...
M	Mn	$\frac{1}{M+1}$	$\frac{Mn}{M+1}$	$\frac{1}{(M+1)z}$	$\frac{Mn}{(M+1)y}$

Note: We consider a hypothetical situation where two parties, A and B, compete for office in a PR system with districts of varying magnitude (M), where, in the absence of mobilization, party A is expected to get all the votes. This table illustrates the relationship between district magnitude and (i) the share of votes party B needs to gain a seat (i.e., the threshold of exclusion), (ii) the raw number of votes B needs to gain a seat, (iii) the number of ads B needs to run to gain a seat, and (iv) the individual contacts B needs to make to gain a seat. We assume that seats are allocated by the D'Hondt rule. We use z to denote the fraction of voters mobilized by each ad; y denotes the probability that a contact succeeds in mobilizing the voter. In Figure 1 of the main text, we assume that the number of eligible voters is $1,000 \cdot M$ (perfect apportionment), each ad mobilizes 10 percent of voters ($z = 0.1$), and that every other individual contacted is persuaded to vote ($y = 0.5$).

A.3 *Raw votes, vote shares, or vote shares per seat?*

The main text also discusses the units in which vote distances should be expressed—raw votes, vote shares, or vote shares per seat—if they are to reflect cost distances. To elaborate on that discussion, suppose that the technology of mobilization is scalable. In this case, we can approximate Equation (1) from the main text as follows:

$$MBE = \left(\frac{\textit{increment in vote share}}{ad}\right)\left(\frac{\textit{increment in seat share}}{\textit{increment in vote share}}\right)Mb \qquad (4)$$

By assumption, the first term is z. Let $n_j^+ = \frac{N_j^+}{V_\bullet}$ be the minimum vote share gain that j needs to win another seat. (One could alternatively use $R_\bullet^{(j)}$ or N_j^{GS+}, rather than N_j^+, in these calculations.) Then the second term can be approximated as $\frac{(1/M)}{n_j^+}$, since the party gains a seat share of $\frac{1}{M}$ when it gains a vote share of n_j^+. Substituting and simplifying, we find that $MBE = \frac{zb}{n_j^+}$. In other words, the MBE is proportional to the reciprocal of the distance n_j^+, which is denominated in vote shares.

Now suppose that mobilization consists of contacting individual voters. In this case, the first term in Equation (4) just introduced should be replaced by $\left(\frac{\textit{increment in vote share}}{\textit{contact}}\right)$.

By assumption, the increment in vote share per contact would be y votes out of $V_\bullet$, or $\frac{y}{V_\bullet}$. Substituting and simplifying, we find that $MBE = \frac{b}{N_j^+}$. Thus, in this case, the MBE is proportional to the reciprocal of the distance N_j^+, which is denominated in raw votes.

B. Supplementary Analyses

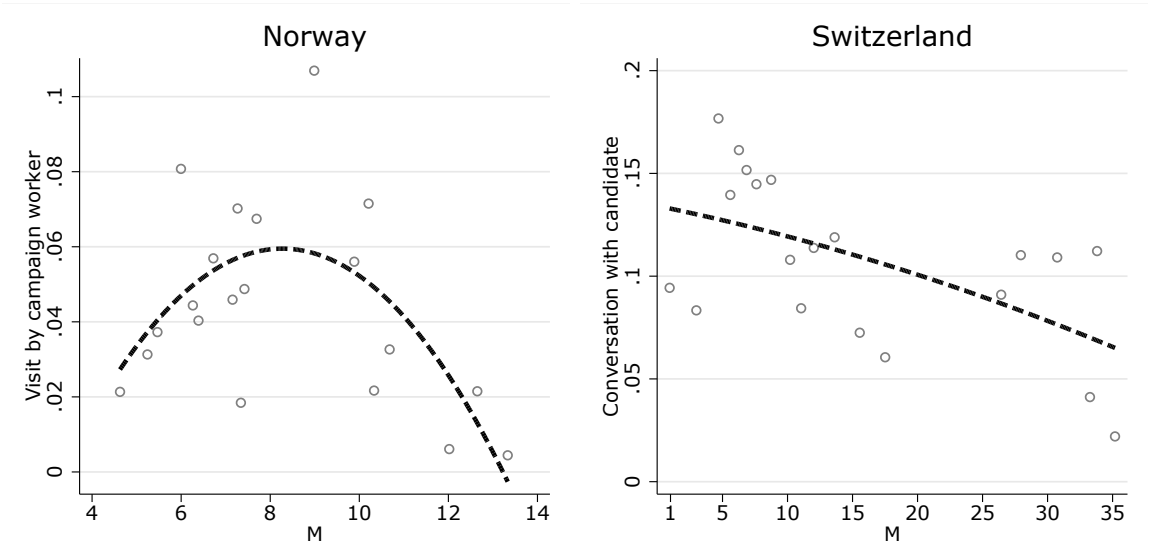

Figure B.1: Direct contact and district magnitude: voter survey evidence (quadratic fit)

Note: The figure shows the relationship between a non-scalable mobilization technology—direct contact by campaign workers and candidates—and district magnitude, with a non-linear model fitted to the data. This figure complements the linear fit model presented in the main text as Figure 2. The left-hand panel uses data from the 1965-1969 Norwegian Election Studies surveys (N=3,099) made available by Norwegian Center for Research Data (NSD). Respondents were asked whether any party's campaign worker visited them during the campaign. The right-hand panel uses data from the 1987-1991 Swiss National Election Studies surveys (N=1,895) made available by the Swiss Centre of Expertise in the Social Sciences (FORS). Respondents were asked if they made use of conversations with candidates as information regarding the election campaign. In each panel, we show binned scatterplots residualized by year fixed effects and survey respondent background characteristics (age, gender, education level, and marital status). Each bin includes the same number of observations.

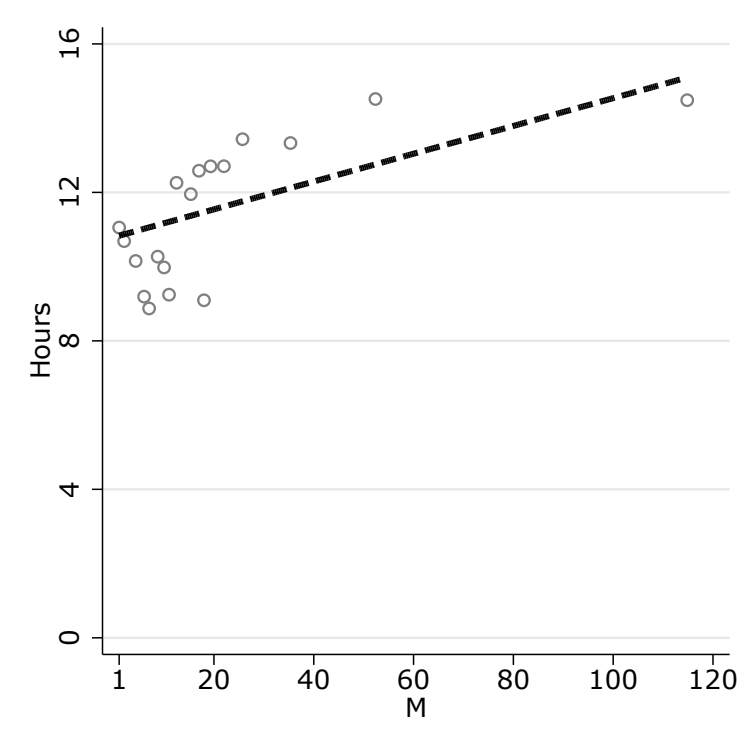

Figure B.2: Cross-national candidate survey evidence of the use of scalable mobilization technologies

Note: This figure uses data from Module 1 of the Comparative Candidates Survey (CCS) data set made available by FORS. Candidates were asked how many hours they spent on various campaign activities per week during the last month before of the election: (i) 0 hours, (ii) 1-5 hours (we code this as 3 hours), (iii) 5-10 hours (coded as 8 hours), (iv) 10-15 hours (coded as 13 hours), (v) 15-20 hours (coded as 18 hours), and (vi) "more than that" (coded as 25 hours). Some countries collapse category (iv) and (v) (coded as 15 hours). In this figure, we aggregate the hours spent on the following campaign activities: (i) "organizing and joining large rallies in the constituency," (ii) "providing information and communicating via the internet," (iii) "national newspaper interviews," and (iv) "national radio and TV interviews." Countries included (N): Switzerland (3,276), Ireland (166), Greece (241), Finland (1,433), Belgium (891), Netherlands (170), Portugal (453), Iceland (352), Hungary (402), Denmark (375), Romania (406), Norway (948), Italy (672), and the United Kingdom (1,472). The binned scatter points are based on the raw data, where each bin includes the same number of observations.

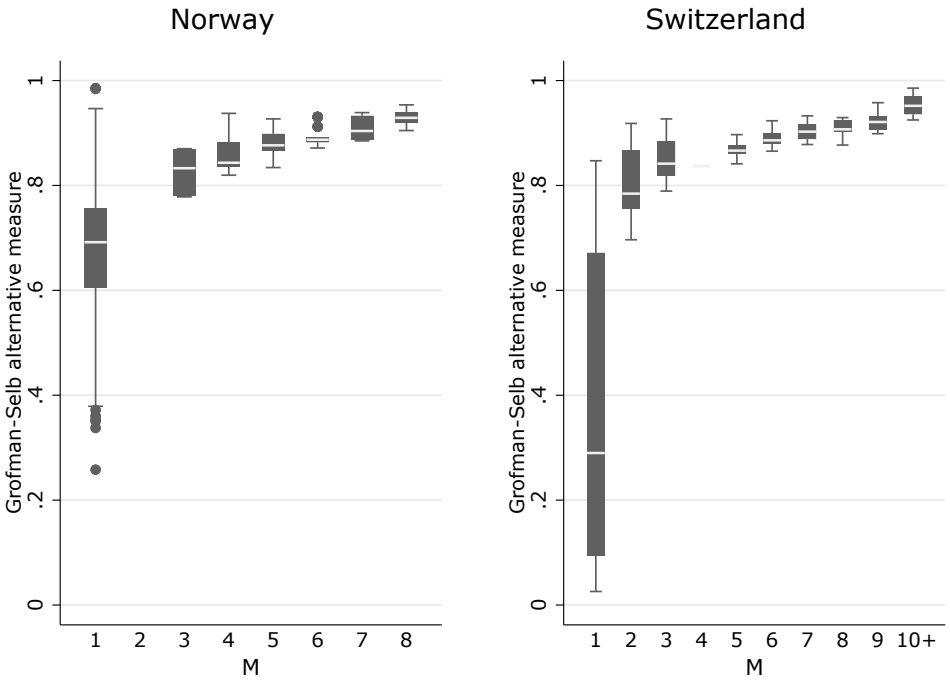

Figure B.3: Relationship between competitiveness and district magnitude with Grofman and Selb's non-normalized alternative measure

Note: The left-hand panel relates Grofman-Selb's (2009) non-normalized index of competition to district magnitude using the balanced panel data set of Cox, Fiva and Smith (2016) covering Norway, 1909-1927. Two-round elections were used from 1909-1918, proportional representation from 1921-1927. In the pre-reform period we construct the distance measures using the electoral results from the first round. The right-hand panel does the same using data from Switzerland, 1971-2003 (Grofman and Selb, 2011). We exclude one district where voting is compulsory (Schaffhausen).

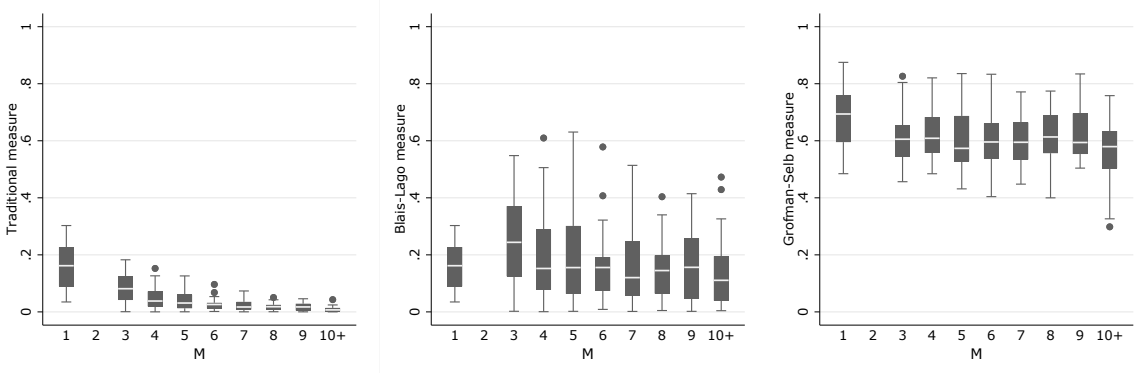

Figure B.4: Alternative measures of competition and their relationship with district magnitude: Spain, 1977-2004

Note: The left-hand panel relates the minimum vote share gain that would earn an additional seat for a single party to district magnitude. The middle panel relates Blais and Lago's (2009) measure to district magnitude. The right-hand panel relates Grofman-Selb's (2009) index of competition to district magnitude.

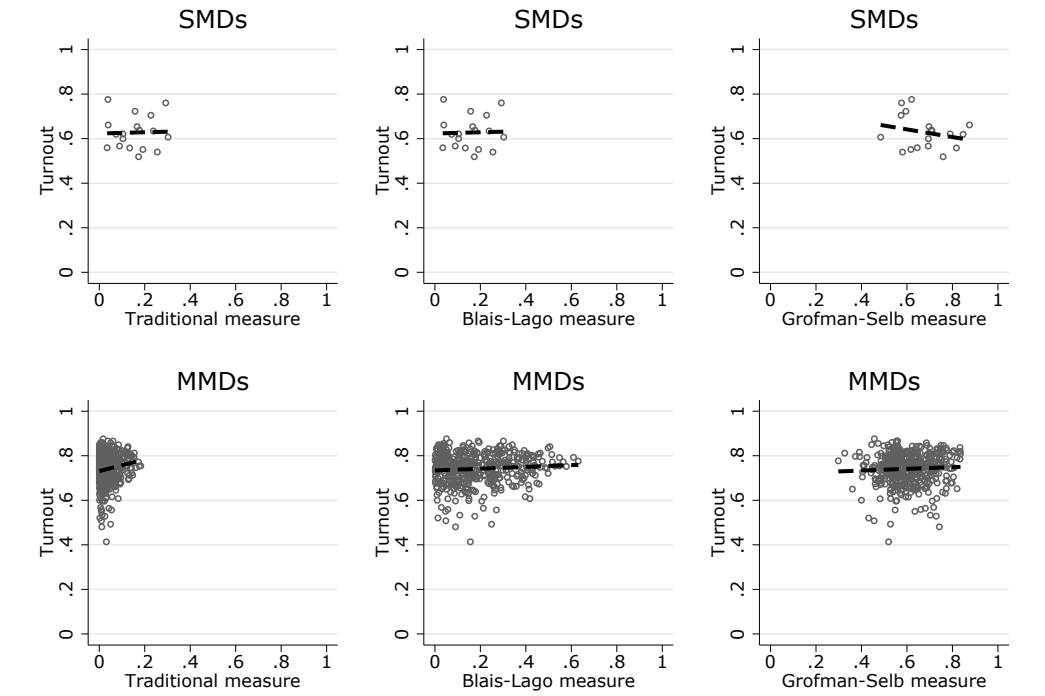

Figure B.5: Alternative measures of competition and their relationship with voter turnout in SMDs and MMDs: Spain, 1977-2004

Note: The figure relates voter turnout to three alternative measures of competition. In the top panel the horizontal axes display the minimum vote share gain that would earn an additional seat for a single party. In the middle panel the horizontal axes display Blais and Lago's (2009) measure. In the bottom panel the horizontal axes display Grofman-Selb's (2009) index of competition.

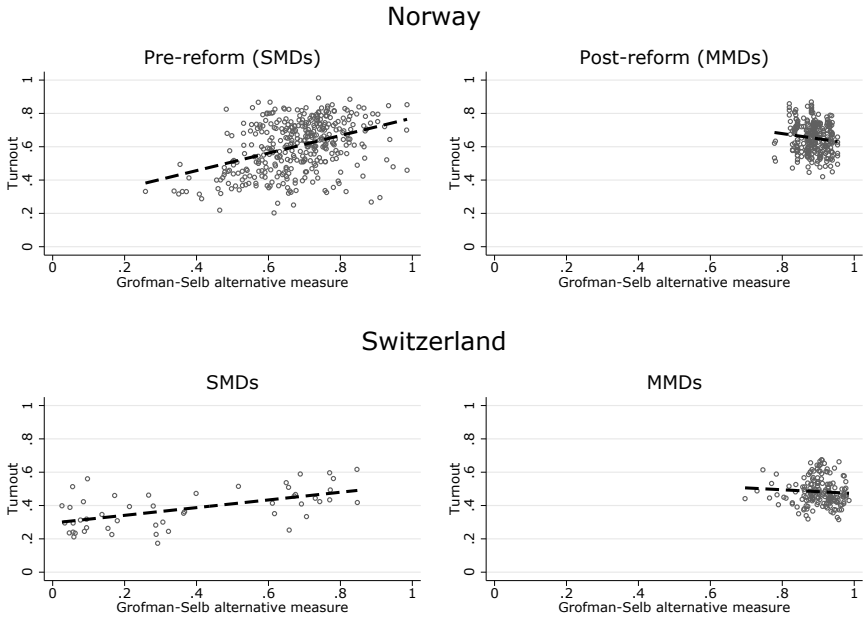

Figure B.6: Grofman and Selb's non-normalized measure and its relationship with voter turnout

Note: The figure relates voter turnout to Grofman and Selb's non-normalized measure of competitiveness. In the left-hand panel, we use the balanced panel data set of Cox, Fiva and Smith (2016) covering Norway, 1909-1927. Two-round elections were used from 1909-1918 (pre-reform), proportional representation from 1921-1927 (post-reform). In the pre-reform period we construct the distance measures using the electoral results from the first round. Voter turnout is measured in the final round, as in Cox, Fiva and Smith (2016). In the right-hand panel, we use data from Switzerland, 1971-2003 (Grofman and Selb, 2011). We exclude one district where voting is compulsory (Schaffhausen).

Table B.1: Alternative measures of competition and their relationship with voter turnout: Norway, 1909-1927

	(1) SMD	(2) SMD	(3) SMD	(4) SMD	(5) MMD	(6) MMD	(7) MMD	(8) MMD
Traditional	-0.560				0.601			
	(0.047)				(0.562)			
B-L		-0.560				0.051		
		(0.047)				(0.114)		
G-S 1			0.526				-0.061	
			(0.075)				(0.102)	
G-S 2				0.526				-0.309
				(0.075)				(0.360)
Constant	0.697	0.697	0.246	0.246	0.636	0.645	0.692	0.926
	(0.015)	(0.015)	(0.052)	(0.052)	(0.019)	(0.018)	(0.066)	(0.320)
N	368	368	368	368	276	276	276	276
R^2	0.256	0.256	0.161	0.161	0.022	0.004	0.003	0.016

Note: Simple linear regression of (final round) voter turnout against the three alternative measures of competition considered in the main text, as well as the non-normalized measure (G-S 2) proposed by Grofman and Selb (2009). We use the balanced panel data set of Cox et al. (2016) covering Norway, 1909-1927. In columns (1) – (4), we use data from 1909-1918 (two-round elections). In columns (5) – (8), we use data from 1921-1927 (proportional representation). Clustered standard errors (in parentheses) at the SMD (n=92) or MMD (n=22) level. In the pre-reform period we construct the distance measures using the electoral results from the first round. Voter turnout is measured in the final round, as in Cox et al. (2016).

Table B.2: Alternative measures of competition and their relationship with voter turnout: Switzerland, 1971-2003

	(1) SMD	(2) SMD	(3) SMD	(4) SMD	(5) MMD	(6) MMD	(7) MMD	(8) MMD
Traditional	-0.190				0.430			
	(0.036)				(0.337)			
B-L		-0.190				0.184		
		(0.036)				(0.090)		
G-S 1			0.231				-0.002	
			(0.048)				(0.075)	
G-S 2				0.231				-0.112
				(0.048)				(0.183)
Constant	0.491	0.491	0.295	0.295	0.474	0.463	0.484	0.584
	(0.023)	(0.023)	(0.023)	(0.023)	(0.014)	(0.013)	(0.051)	(0.165)
N	50	50	50	50	169	169	169	169
R^2	0.325	0.325	0.319	0.319	0.023	0.067	0.000	0.005

Note: Simple linear regression of voter turnout against three alternative measures of competition considered in the main text, as well as the non-normalized measure (G-S 2) proposed by Grofman and Selb (2009). In columns (1) – (4), we use data from SMDs and in columns (5) – (8), we use data from MMDs. We report regular heteroscedasticity-robust standard errors in parentheses for column (1), (2), (3), and (4) because we have only 7 SMDs. In columns (5), (6), (7), and (8) we report cluster-robust standard errors (n=20) in parentheses. Regular heteroscedasticity-robust standard errors in parentheses. Data from Switzerland, 1971-2003. We exclude one district where voting is compulsory (Schaffhausen).