Do (too many) elections depress participation? How the position, frequency and nature of domestic ballots affect turnout in European Parliament elections

Appendix

François Briatte, Camille Kelbel, and Julien Navarro

This appendix describes our data in more detail and documents the series of robustness checks that we performed on each of the models presented in our results.

The replication scripts, which are available from the editor's website, will reproduce all tables and figures in Appendix A, B and C, as well as the descriptive quantities cited in the main text, and a few additional regression diagnostics.

All results were obtained with Stata 18.0 and should be safely replicable with earlier versions of the software, conditional on the package dependencies stated at the top of the replication scripts.

Appendix A. Sample composition

The first and second columns of Table A1, below, show the composition of our sample, which contains $N = 175$ European Parliament (EP) elections distributed over $G = 28$ countries. The next columns show the other kinds of elections that we observed in order to measure most of our predictors, such as the number of electoral contests between two EP elections, or the time elapsed since the last election (see the main text for details).

The average and median number of EP elections per country are 6.25 and 6 respectively, which means that our data are cross-sectionally dominated ($G > T$), of the small N, small T kind.[1] Furthermore, those elections occurred on 15 different years over the 41 years from 1979 to 2019, which results in a highly unbalanced panel.

Table A1. Countries and elections examined

	EP		Parliamentary		Other	
Country	***N***	**Range**	***N***	**Range**	***N***	**Range**
Austria	6	1996-2019	8	1994-2017	10	1992-2016
Belgium	9	1979-2019	13	1977-2019	23	1976-2019
Bulgaria	4	2007-2019	5	2005-2017	15	2003-2016
Croatia	3	2013-2019	3	2011-2016	12	2009-2017
Cyprus	4	2004-2019	4	2001-2016	12	2001-2018
Czechia	4	2004-2019	5	2002-2017	15	2000-2018
Denmark	9	1979-2019	15	1975-2015	20	1978-2017
Estonia	4	2004-2019	5	2003-2019	7	1999-2017
Finland	6	1996-2019	7	1995-2019	17	1992-2018
France	9	1979-2019	19	1978-2017	43	1977-2017
Germany	9	1979-2019	12	1976-2017	--	--
Greece	9	1981-2019	16	1977-2015	14	1994-2019
Hungary	4	2004-2019	8	2002-2018	7	2002-2016

[1] This means that, in our data, neither is T large enough for the estimation of time series regression within each panel, nor is G large enough for consistent results to be obtained by averaging across units (Pesaran and Smith 1995, cited in Thombs 2022). For that reason, we did not attempt to model the data dynamically.

Ireland	9	1979-2019	12	1977-2016	35	1974-2019
Italy	9	1979-2019	12	1976-2018	30	1975-2016
Latvia	4	2004-2019	6	2002-2018	8	2001-2017
Lithuania	4	2004-2019	7	2000-2016	12	2002-2019
Luxembourg	9	1979-2019	9	1979-2018	10	1975-2017
Malta	4	2004-2019	4	2003-2017	4	2003-2019
Netherlands	9	1979-2019	13	1977-2017	24	1978-2019
Poland	4	2004-2019	5	2001-2015	19	2000-2018
Portugal	8	1987-2019	11	1983-2015	21	1982-2017
Romania	4	2007-2019	3	2008-2016	18	2003-2019
Slovakia	4	2004-2019	5	2002-2016	22	2000-2019
Slovenia	4	2004-2019	6	2000-2018	23	2002-2018
Spain	8	1987-2019	12	1982-2019	12	1983-2019
Sweden	6	1995-2019	8	1991-2018	10	1991-2018
United Kingdom	9	1979-2019	11	1974-2017	3	1975-2016

Parliamentary elections are national ones only. Other elections include local elections, presidential elections, and national referenda, as collected by the authors. Data are left-censored to 5 years prior to the first EP election, and right-censored to the last one (2019). Local elections, which cover communal, departmental, municipal, provincial and regional elections, are missing for Germany.

Appendix B. Correlational structure

Table B1 below provides the Pearson correlation coefficients for our dependent variables and predictors. The measurement strategy for each variable is provided in our main manuscript.

Table B1. Linear correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Turnout, as % of registered voters	1.00									
(2) Turnout, as % of voting-age pop.	0.92	1.00								
(3) Time elapsed since last election	0.28	0.22	1.00							
(4) Time to the next national election	0.24	0.13	-0.11	1.00						
(5) Weighted preceding electoral *rounds*	-0.33	-0.33	-0.80	0.08	1.00					
(6) Weighted preceding electoral *contests*	-0.28	-0.25	-0.90	0.14	0.92	1.00				
(7) First-order preceding election	0.06	-0.03	0.09	0.10	-0.06	-0.06	1.00			
(8) Concurrent election	0.46	0.44	0.18	0.09	-0.20	-0.17	-0.20	1.00		
(9) Compulsory voting	0.68	0.59	0.20	0.18	-0.17	-0.16	0.12	0.29	1.00	
(10) Electoral competitiveness	-0.08	-0.09	0.04	-0.04	-0.05	-0.05	0.04	-0.03	-0.10	1.00

$N = 175$, except for voter turnout as % of the voting-age population ($N = 169$)

Since correlations are insufficient to account for time dependence within each of our panel units, we followed Kostelka (2017) by running single-lag augmented Dickey-Fuller tests for non-stationarity in our main dependent variable (voter turnout as % of registered voters), which failed to identify any stationary panels, and a Wooldridge test for first-order autocorrelation,

which was significant at $p < 0.05$.[2] In addition, we also obtained confirmation that our data manifest contemporaneous correlation by running the cross-sectional dependence tests provided by Ditzen (2018).[3] Both series of tests guided our estimation strategy and further robustness checks.

[2] We also ran some of the additional serial correlation tests provided by Wursten (2018) in order to confirm the absence of autocorrelation at higher orders.

[3] Due to panel unbalance, detecting cross-sectional dependence in our data was not feasible through the same Pesaran test used by Kostelka (2017, fn. 15). Beyond cross-sectional dependence, the gaps in our panel structure also affected our tests for serial correlation and non-stationarity, which led us to serialize the observation years into continuous time periods continuously before running those tests. See the replication materials for further details.

Appendix C. Robustness checks

In the next pages, Tables C1 to C4 each show five distinct robustness checks for our regression models.[4] Two additional checks further appear in Tables C5 and C6 at the end of this section.

1. Choice of estimator

While fixed-effects are a common estimation strategy for the kind of data that we observe in this paper (see e.g. Park 2021), another common choice of estimator in the literature on voter turnout is the Prais-Winsten transformation, which adds a first-order autoregressive term to the regression equation in order to account for time dependence (Prais and Winsten 1954). The autoregressive term that we used in our specification of that transformation is based on a single-lag linear regression of the residuals, which is most likely to match the specification used in other similar studies (see. e.g. Franklin 2004, ch. 4, and Stockemer 2017).

Switching our models from fixed-effects to a Prais-Winsten transformation, which are respectively labelled as FE and PW in Tables C1 to C4, produces results that come close to the main results presented in our main text, at the exception of the effect of compulsory voting, which comes out as much larger under a Prais-Winsten transformation. This is unsurprising, given that compulsory voting is largely time-invariant in our data, and that time dependence is accounted for differently under each specification.

2. Sample subsets

i. Dropping Germany and Italy

Our data contain two countries, Germany and Italy, for which no single election date can be assigned to all local elections. For that reason, our estimates for the effect of the time elapsed since the last election are arguably less reliable for observations in those two countries than for the rest of our sample.

In Tables C1 to C4, column SS1 re-estimates our main (fixed-effects) models without those two countries, which drops the sample size to $N = 157$ country-year observations in Models 1 and 3, and to $N = 154$ observations in Models 2 and 4. The coefficients for these models are all similar in direction, magnitude and statistical significance to that of the main models.

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[4] Except for the the Prais-Winsten ones, all models in Tables C1 to C4 include year dummies, which we omit, along with the constant terms of the models. The tables show the root mean squared error (RMSE) of all models, which is the only goodness-of-fit metric that can be consistently measured across all specifications. All models use country-level cluster-robust standard errors, and our replication materials show that switching to panel-corrected standard errors (PCSEs) produces very similar results. The replication materials further show that including year dummies in both the Prais-Winsten and PCSE specifications does not produce any sign inversion in the coefficients.

ii. Dropping France, Lithuania and Poland

Our data also contain three countries in which the political system differs substantially from the rest: France, Lithuania and Poland, which are all semi-presidential regimes. These countries might substantially differ from the rest of our sample, which is composed exclusively of countries that are governed through parliamentary regimes.

As we did above, in Tables C1 to C4, column SS2 re-estimates our main (fixed-effects) models without those three countries, which reduces the sample size by dropping $N = 17$ country-year observations from the models. The coefficients for these models are all similar in direction, magnitude and statistical significance to that of the main models.

3. Alternative dependent variable: voting-age population turnout rates

Although we used the measure of electoral turnout that is the most often available across countries, we also collected turnout as a percentage of the voting-age population (VAP) instead of as a percentage of registered voters.[5] As indicated in Table B1, both measures are highly linearly correlated. However, voting-age population turnout avoids issues that might relate to voter registration, an issue that we expect to be of limited scope in European Union countries, but that nevertheless deserves consideration (see Martinez i Coma and Nai 2017, p. 78).

In Tables C1 to C4, column VAP re-estimates our main models on VAP turnout rates. As expected, these new models are broadly consistent with our main models, with two exceptions: compulsory voting, which fails to reach statistical significance, and electoral competitiveness, which only reaches statistical significance in the VAP models. It should further be noted that VAP turnout rates were unavailable for $N = 6$ country-year observations that were included in our main models.

4. Alternative measure of compulsory voting

Due to variations in the application of compulsory voting (CV) regulations between and within countries, we tested an alternative measure of CV enforcement by setting our CV dummy to 0 in Bulgaria and Italy, where CV was only nominally enforced over the entire observation period, and in Greece after year 2000, which is the year in which Greece lifted all CV-related sanctions (IDEA, n.d.). The changes amount to only 8 differences (out of 175 observations) between our original and alternative measures of CV.

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[5] For other possible ways to measure turnout, see Stockemer 2017. As stated in the main text, we did not explore those measures in the absence of sufficiently precise demographic information on the electorate of each European Parliament election included in our sample.

Table C5 compares the estimated effects of both CV predictors under the fixed-effects specifications of Models 1–4. As expected, the recode does not produce any meaningful difference in the direction of that predictor, but it does affect its magnitude and statistical significance. While this check does not account for the full extent of historical (and, sometimes, subnational) variations in the enforcement of compulsory voting, which is beyond the scope of our study, it does suggest that studying these variations is required to produce precise estimates of how compulsory voting affects voting patterns, including through behavioural patterns that might or might not persist beyond its periods of effective legal enforcement.

5. Controlling for first EP elections

Part of the literature on turnout in European Parliament (EP) elections has hypothesized that turnout might have been higher in the very first election of that kind in each EU member state (see e.g. Franklin 2001 or Franklin and Hobolt 2011). Absent of any covariate, it is possible to estimate that effect at approximately 6 percentage points in our data, with a country-level robust standard error of approximately 2.[6]

In order to assess whether first EP elections might retain some of that effect in our models, we re-estimated Models 1–4 with an additional dummy coding for those elections. The estimated coefficients for that predictor, none of which reach either a nontrivial effect size or attain statistical significance, are shown in Table C6. The absence of such an effect in our models is relatively unsurprising, insofar as our models include year dummies that likely capture the same effect, in years 1979 and 2004 in particular.

[6] The code to produce this estimate appears in our replication material.

Table C1. Robustness checks for Model 1

	FE	PW	SS1	SS2	VAP
Time since last election	-0.171	-0.713	-0.122	0.105	-0.288
	(0.46)	(1.70)	(0.55)	(0.61)	(0.61)
First-order preceding election	-1.441	0.759	-1.308	-1.359	-1.549
	(1.25)	(2.37)	(1.28)	(1.44)	(1.23)
Weighted preceding electoral *rounds*	-3.046^{+}	-9.513	-3.350^{+}	-2.355	-4.044
	(1.68)	(6.67)	(1.64)	(3.46)	(2.84)
Concurrent election	5.479*	11.68***	5.914*	4.434^{+}	5.927**
	(2.34)	(2.99)	(2.64)	(2.30)	(1.94)
Time to next election	-1.001*	1.591	-0.930^{+}	-0.690	-0.857
	(0.47)	(0.97)	(0.53)	(0.45)	(0.52)
Electoral competitiveness	-0.216*	-0.0584	-0.166^{+}	-0.238*	-0.220*
	(0.09)	(0.14)	(0.09)	(0.11)	(0.09)
Compulsory voting	6.796	27.62***	4.253	7.290	6.736
	(4.71)	(5.64)	(9.99)	(4.59)	(4.99)
Year dummies	Yes	No	Yes	Yes	Yes
Observations	175	175	157	158	169
RMSE	5.63	9.38	5.67	5.58	5.58

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Constant term and year dummies omitted.

Table C2. Robustness checks for Model 2

	FE	PW	SS1	SS2	VAP
Time since last election	-0.171	-0.801	-0.154	0.0767	-0.241
	(0.44)	(1.34)	(0.54)	(0.60)	(0.59)
Preceding election = Presidential	-7.475*	-14.30**	-8.026*	-6.680^{+}	-6.681^{+}
	(2.99)	(3.90)	(3.03)	(3.35)	(3.31)
Preceding election = Subnational	0.801	-2.382	0.475	0.507	0.955
	(1.47)	(2.71)	(1.44)	(1.53)	(1.52)
Preceding election = Referendum	-0.563	-7.829**	-0.855	-0.0385	0.0129
	(1.91)	(2.49)	(2.04)	(1.94)	(1.86)
Weighted preceding electoral *rounds*	-2.754	-6.523	-3.015^{+}	-2.199	-3.725
	(1.78)	(5.09)	(1.70)	(3.74)	(2.93)
Concurrent election	6.099*	13.11***	6.656*	5.152*	6.350**
	(2.22)	(2.92)	(2.46)	(2.17)	(1.87)
Time to next election	-1.070*	1.167	-1.025^{+}	-0.749^{+}	-0.902^{+}
	(0.44)	(0.97)	(0.51)	(0.42)	(0.49)
Electoral competitiveness	-0.216*	-0.132	-0.157^{+}	-0.247*	-0.223*
	(0.09)	(0.14)	(0.08)	(0.11)	(0.09)
Compulsory voting	6.417	26.94***	2.462	6.932	6.380
	(4.58)	(5.79)	(8.86)	(4.59)	(5.14)
Year dummies	Yes	No	Yes	Yes	Yes
Observations	172	172	154	155	166
RMSE	5.56	9.77	5.57	5.53	5.55

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Constant term and year dummies omitted.
Baseline for preceding election set to parliamentary elections.

Table C3. Robustness checks for Model 3

	FE	PW	SS1	SS2	VAP
Time since last election	-0.702	-0.803	-0.783	-0.0546	-1.137
	(0.66)	(1.34)	(0.78)	(0.66)	(0.86)
First-order preceding election	-1.140	0.845	-0.937	-1.278	-1.059
	(1.30)	(2.45)	(1.35)	(1.51)	(1.32)
Weighted preceding electoral *contests*	-6.038^{+}	-11.51	-7.072^{+}	-3.199	-8.809^{+}
	(3.33)	(7.04)	(3.55)	(4.22)	(4.56)
Concurrent election	5.529*	12.23***	5.929*	4.541^{+}	5.987**
	(2.25)	(2.98)	(2.53)	(2.27)	(1.80)
Time to next election	-0.957^{+}	1.697	-0.848	-0.700	-0.791
	(0.48)	(1.01)	(0.53)	(0.45)	(0.53)
Electoral competitiveness	-0.208*	-0.0560	-0.155^{+}	-0.232*	-0.209*
	(0.09)	(0.14)	(0.08)	(0.11)	(0.09)
Compulsory voting	7.093	27.71***	4.547	7.433	7.184
	(4.79)	(5.79)	(10.30)	(4.58)	(5.13)
Year dummies	Yes	No	Yes	Yes	Yes
Observations	175	175	157	158	169
RMSE	5.60	7.84	5.62	5.58	5.50

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Constant term and year dummies omitted.

Table C4. Robustness checks for Model 4

	FE	PW	SS1	SS2	VAP
Time since last election	-0.791	-1.114	-0.921	-0.259	-1.216
	(0.72)	(1.25)	(0.87)	(0.76)	(0.90)
Preceding election = Presidential	-7.783*	-15.96***	-8.377*	-7.007^{+}	-7.163*
	(3.07)	(4.06)	(3.08)	(3.47)	(3.18)
Preceding election = Subnational	0.401	-2.916	-0.0118	0.292	0.277
	(1.49)	(2.78)	(1.48)	(1.62)	(1.63)
Preceding election = Referendum	-0.718	-7.792**	-1.005	-0.136	-0.276
	(1.93)	(2.52)	(2.07)	(1.97)	(1.90)
Weighted preceding electoral *contests*	-6.212^{+}	-8.764	-7.339^{+}	-3.997	-9.190^{+}
	(3.47)	(5.95)	(3.63)	(4.62)	(4.75)
Concurrent election	6.094**	13.55***	6.585**	5.254*	6.350***
	(2.10)	(2.90)	(2.35)	(2.12)	(1.70)
Time to next election	-1.021*	1.221	-0.926^{+}	-0.753^{+}	-0.830
	(0.45)	(1.01)	(0.50)	(0.41)	(0.51)
Electoral competitiveness	-0.206*	-0.136	-0.143^{+}	-0.239*	-0.209*
	(0.09)	(0.13)	(0.08)	(0.11)	(0.09)
Compulsory voting	6.636	26.99***	2.562	7.060	6.729
	(4.67)	(5.91)	(9.15)	(4.64)	(5.31)
Year dummies	Yes	No	Yes	Yes	Yes
Observations	172	172	154	155	166
RMSE	5.52	8.61	5.50	5.52	5.46

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Constant term and year dummies omitted.
Baseline for preceding election set to parliamentary elections.

Table C5. Alternative measure of compulsory voting (CV)

	Estimated effect of CV (original measure)	Estimated effect of CV (alternative measure)
Model 1	6.796	14.35***
	(4.71)	(1.83)
Model 2	6.417	13.50***
	(4.58)	(1.49)
Model 3	7.093	14.19***
	(4.79)	(2.06)
Model 4	6.636	13.18***
	(4.67)	(1.69)

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C6. Effect of including a dummy for first EP elections

	Estimated effect of first EP election
Model 1 + First EP dummy	0.877
	(3.40)
Model 2 + First EP dummy	0.815
	(3.22)
Model 3 + First EP dummy	1.340
	(3.38)
Model 4 + First EP dummy	1.154
	(3.21)

Clustered standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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