Habit Formation in Voting: Evidence from Rainy Elections

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ONLINE APPENDIX

Figure A1: Share of Counties with Election-Day Rainfall by Year

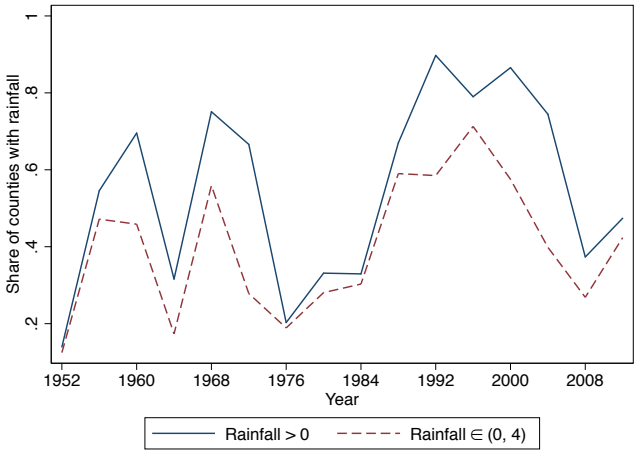


Figure A2: Cumulative Share of Counties with Election-Day Rainfall

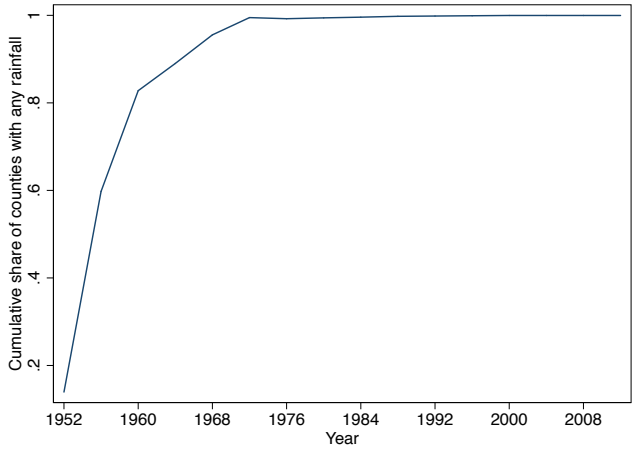


Figure A3: Histogram of Standard Deviation of Rainfall

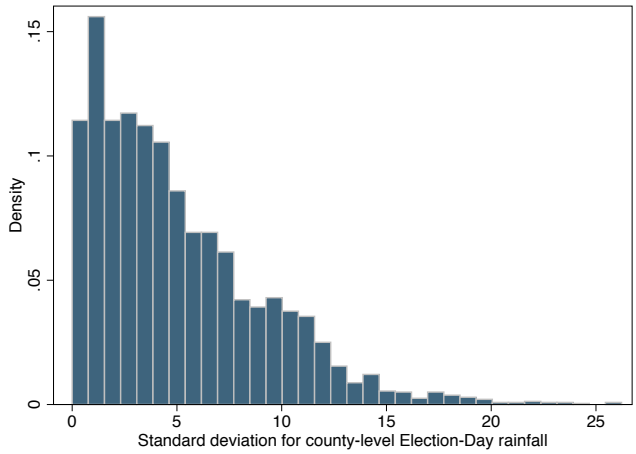
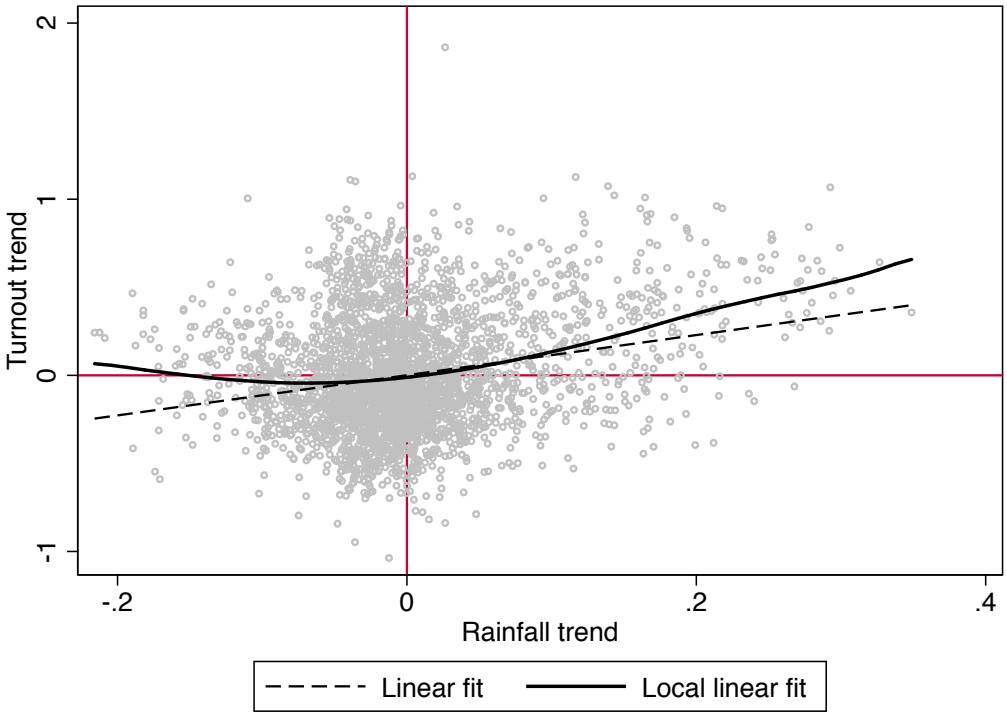


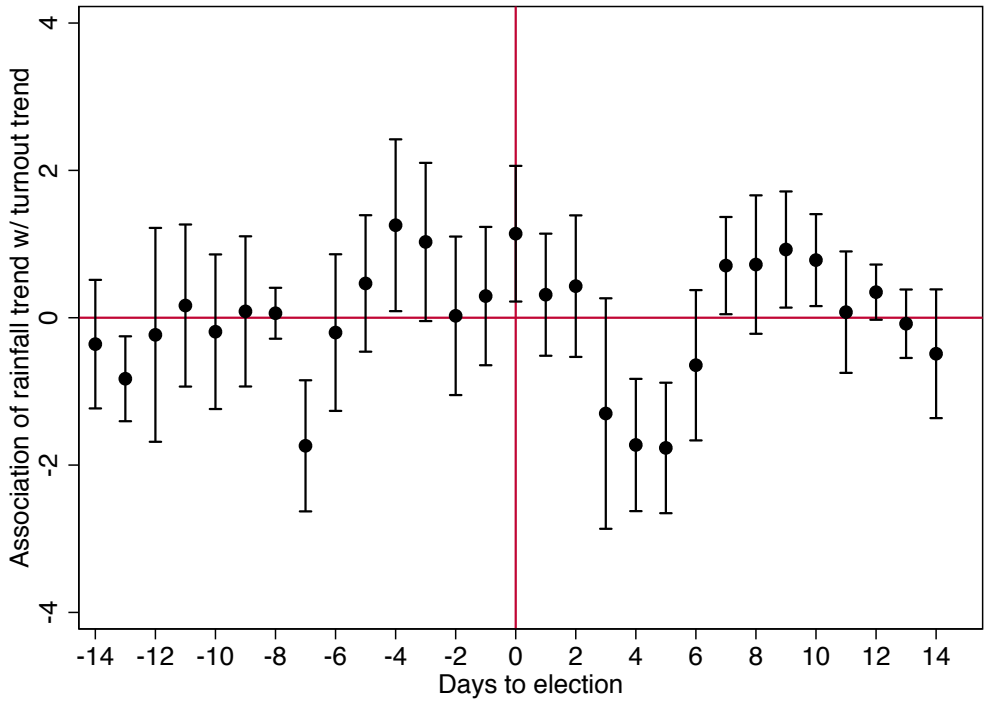
Figure A4: County-Level Trends in Turnout and Election-Day Rainfall



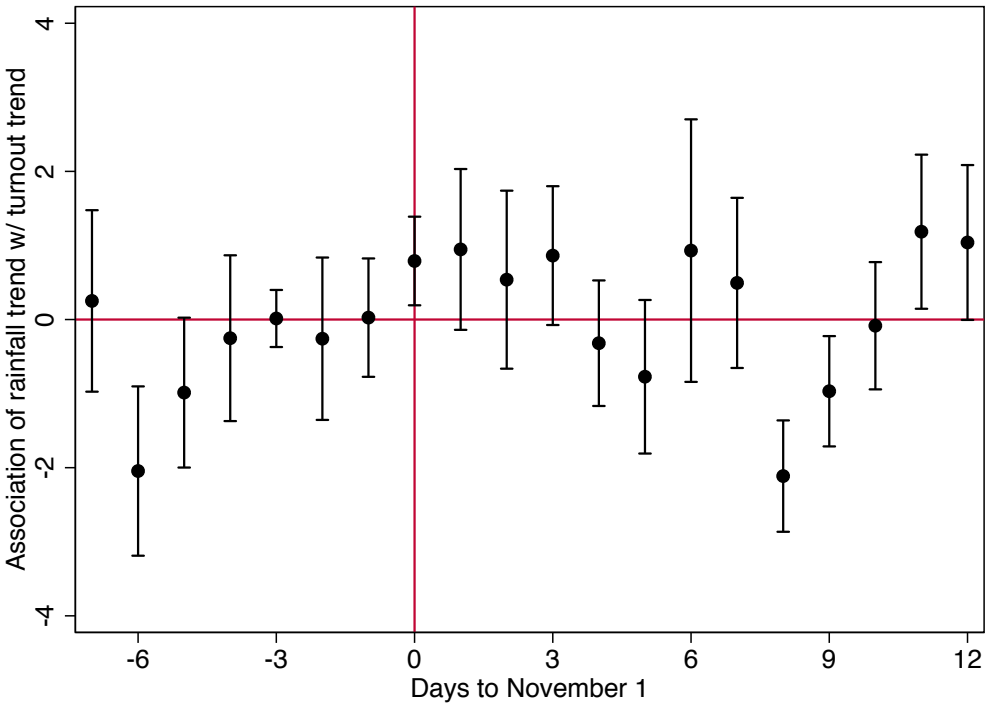
Note: After purging Election-Day rainfall and turnout of county and year effects, we estimated county-specific linear trends in these variables. The local linear regression has a bandwidth of 0.1.

Figure A5: Associations of Trends in Turnout and Trends in Rainfall on Alternative Days

Panel A: Days Relative to Election Day

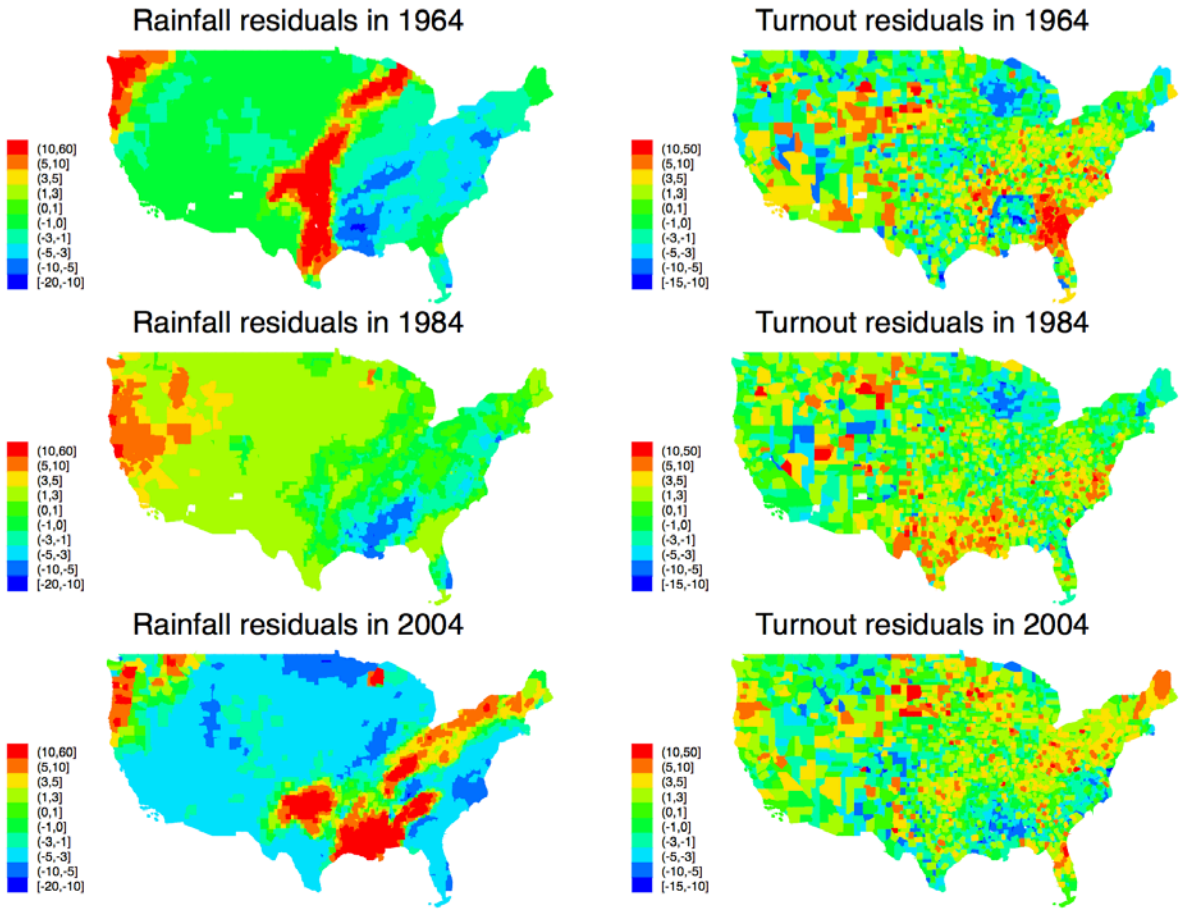


Panel B: Calendar Days



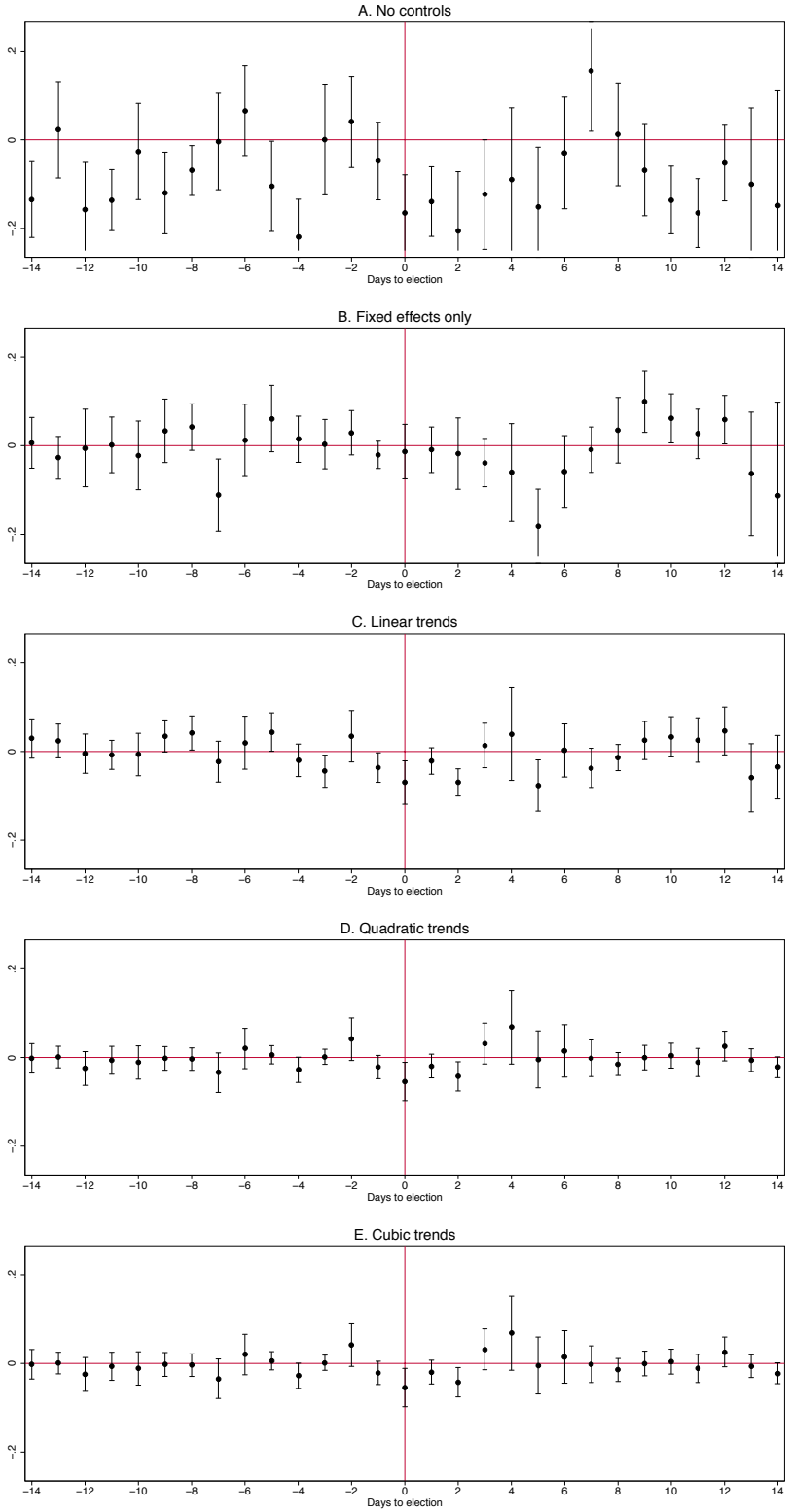
Note: After purging daily rainfall and turnout of county and year effects, we estimated county-specific linear trends in these variables. Each dot corresponds to the coefficient from a regression of the trend in turnout on the trend in rainfall on the specified day. Capped spikes are 95% CIs.

Figure A6: Rainfall and Turnout Residuals, 2004



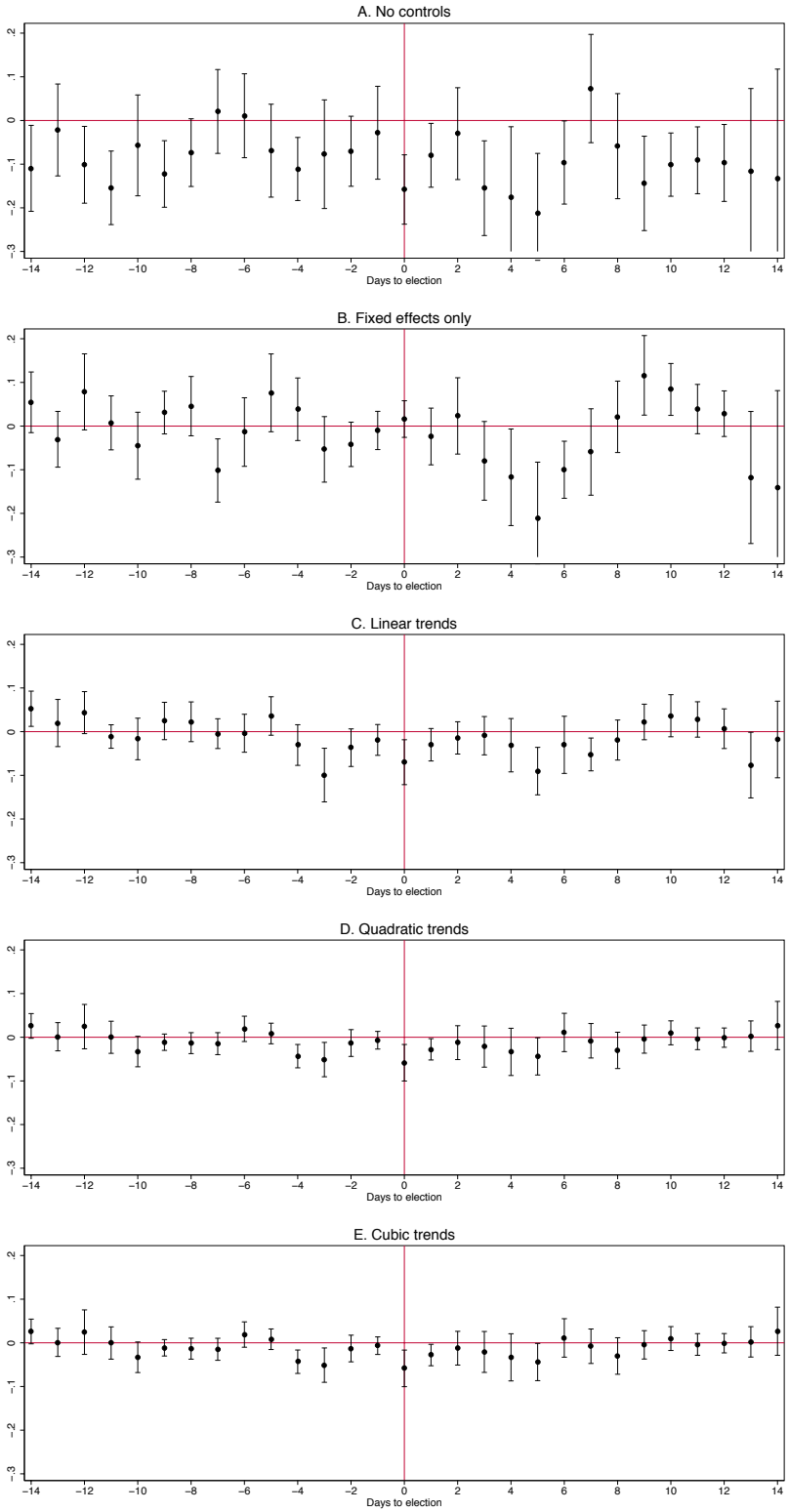
Note: Residuals from regressions of rainfall (mm) and turnout on year and county fixed effects and county trends.

Figure A7: Effects of Rainfall on Election Day and Nearby Days, Different Specifications



Note: Plot of α from regression: $turnout_{ct}$ = constant + α $other\_day\_rain_{ct}$ + β $election\_day\_rain_{ct}$ + e_{ct}, where e_{ct} may contain year/county fixed effects or county trends. α estimated separately for each placebo day. Capped spikes are 95% CIs. The absence of a cap indicates that the CI extends beyond the range of the y-axis.

Figure A8: Effects of Rainfall on Last Election Day and Nearby Days, Different Specifications



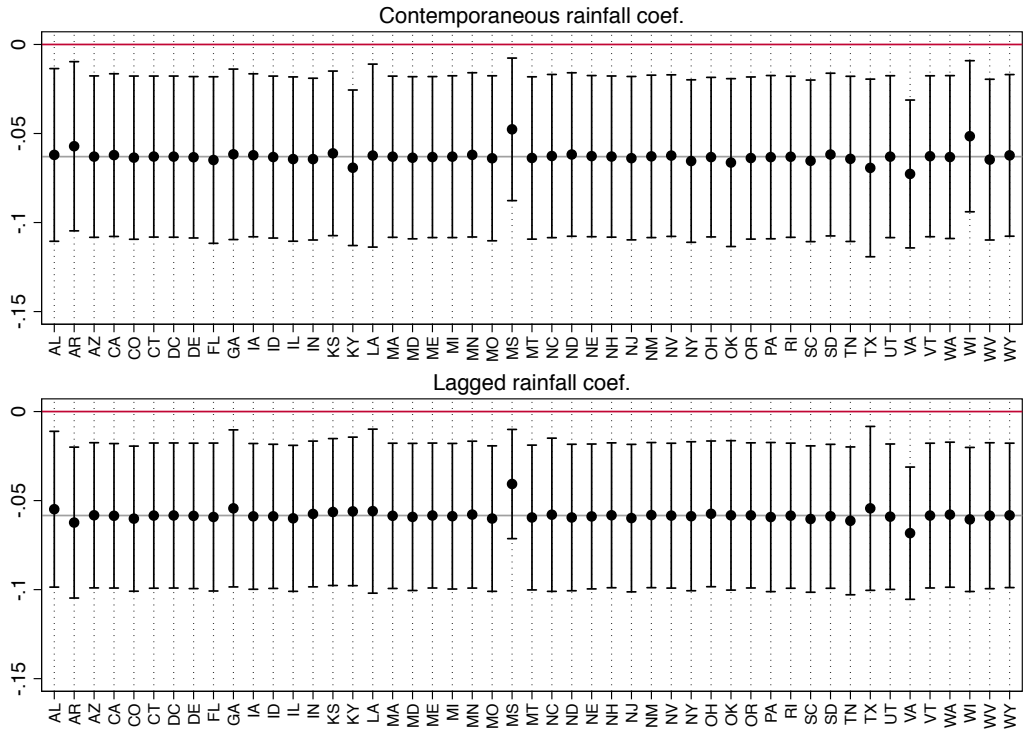
Note: Plot of α_1 from regression:

$turnout_{ct} = \alpha_0\, other\_day\_rain_{ct} + \alpha_1\, other\_day\_rain_{c,t\text{-}1} + \beta_0\, election\_day\_rain_{ct} + \beta_1\, election\_day\_rain_{c,t\text{-}1} + e_{ct}$

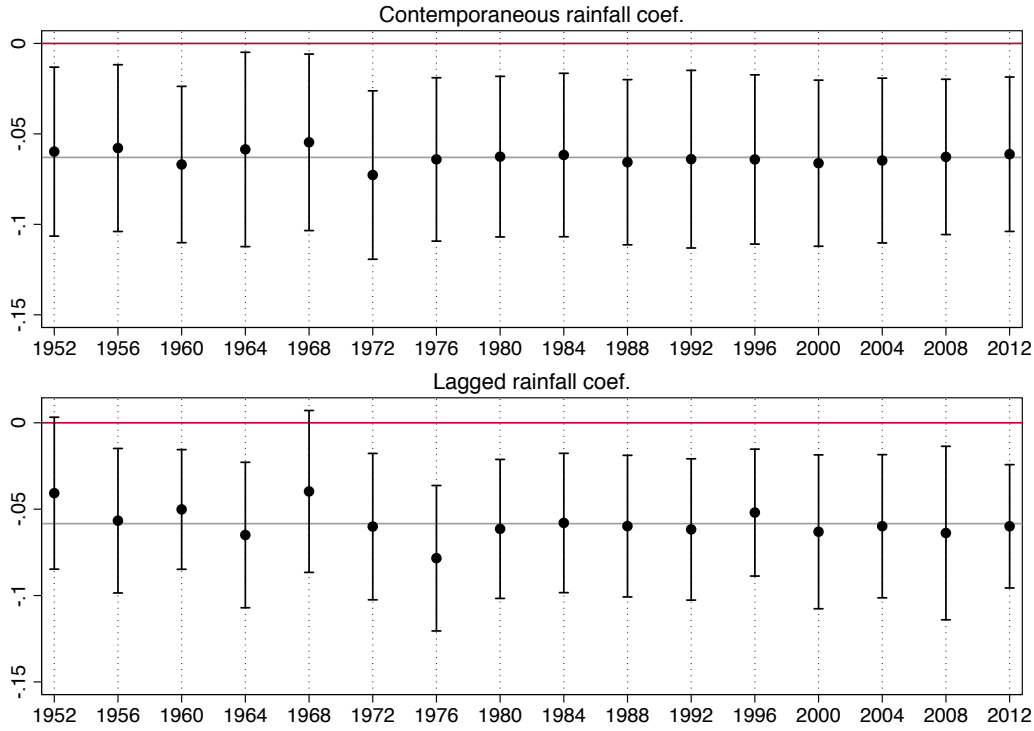
where e_{ct} may contain year/county fixed effects or county trends. Capped spikes are 95% CIs.

Figure A9: Leave-One-Out Checks

Panel A: Leave Out One State

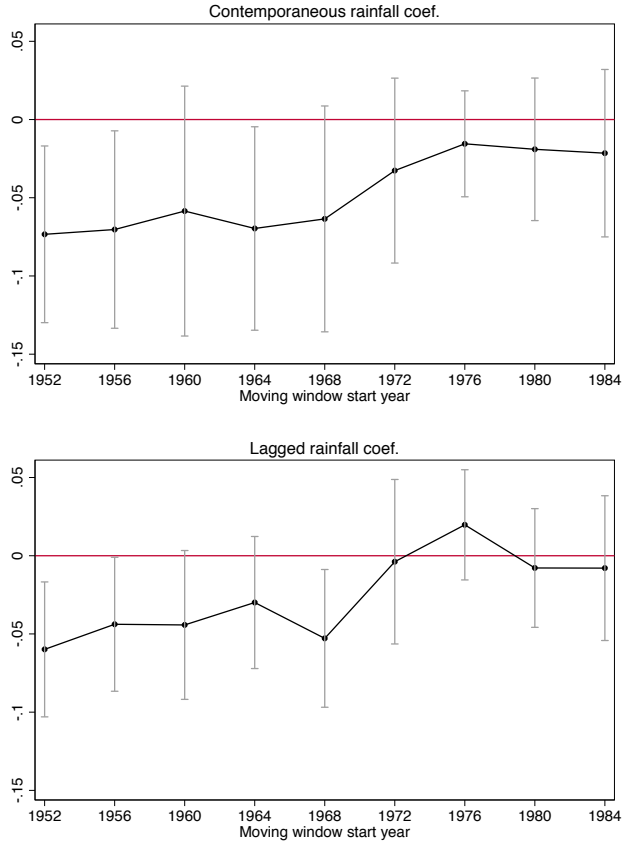


Panel B: Leave Out One Year



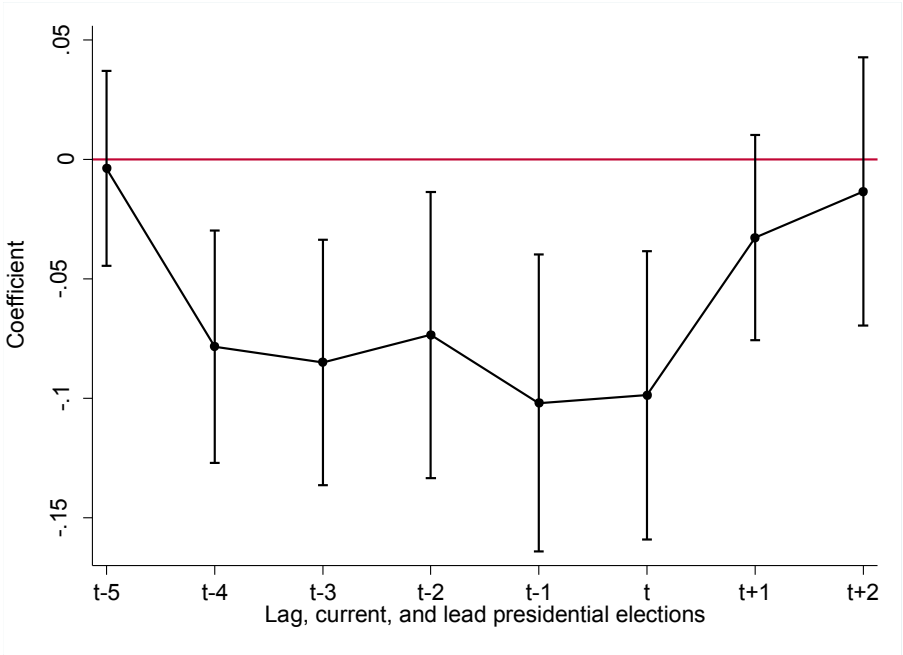
Note: Each estimate is based on a sample that omits the state or year on the x-axis. Dots are coefficients; capped spikes are 95% CIs. Light gray horizontal lines represent full-sample estimates.

Figure A10: Rolling Window Estimates



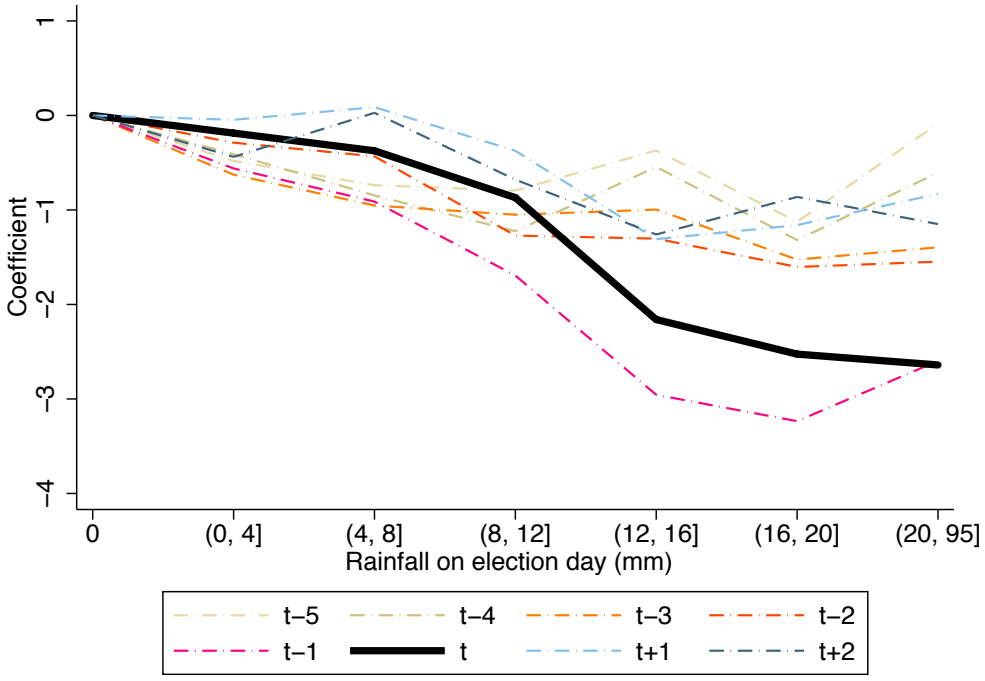
Note: Each estimate is based on a sample with eight elections starting in the specified year. Dots are coefficients; capped spikes are 95% CIs.

Figure A11: Additional Leads and Lags



Note: Coefficients and 95% CIs from a model jointly estimating election-day rainfall from period t-5 to t+2. Rainfall effects are modeled linearly. Model includes year fixed effects, county fixed effects, and county quadratic trends.

Figure A12: Checking nonlinearity of response function



Note: Coefficients from a model jointly estimating election-day rainfall from period t-5 to t+2. Rainfall effects are modeled nonlinearly using discrete bins with dry election days as the omitted category. Model includes year fixed effects, county fixed effects, and county quadratic trends.

Table A1: Effect of Contemporaneous and Lagged Rainfall on Turnout – Alternative Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Election-Day rain, t	-0.012	-0.079	-0.063	-0.063	-0.071	-0.054	-0.054	-0.035	-0.063
	[0.031]	[0.026]***	[0.023]***	[0.023]***	[0.045]	[0.019]***	[0.021]**	[0.017]**	[0.025]**
Election-Day rain, t-1	0.016	-0.070	-0.058	-0.059	-0.064	-0.053	-0.053	-0.040	-0.063
	[0.021]	[0.026]***	[0.021]***	[0.021]***	[0.040]	[0.017]***	[0.020]***	[0.014]***	[0.021]***
ρ	-1.33	0.89	0.93	0.92	0.90	0.99	0.98	1.10	1.00
	[4.38]	[0.28]***	[0.33]***	[0.32]***	[0.45]**	[0.38]**	[0.35]***	[0.57]*	[0.35]***
Number of county-years	49,594	49,594	49,594	49,594	49,594	49,524	49,524	49,524	49,524
Number of counties	3,108	3,108	3,108	3,108	3,108	3,108	3,108	3,108	3,108
Election years	1952-2012	1952-2012	1952-2012	1952-2012	1952-2012	1952-2012	1952-2012	1952-2012	1952-2012
County and year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
County linear trends		✓				✓	✓	✓	✓
County quadratic trends			✓						
County cubic trends				✓					
Decade-county FE					✓				
Year fixed effects interacted with:						Log median income	Over-65 pop. share	White pop. share	Pop. Density

Note: Dependent variable is voter turnout (0-100). Brackets contain standard errors clustered at the state level. ρ is estimated using the delta method. The variables interacted with year fixed effects are for the first period of the sample (1952). * p<0.1, ** p<0.05, *** p<0.01

Table A2: Interactions with Electoral Characteristics

	Interaction with…				
	Alignment w/ winner, t-1	State pivot prob., t	Nat'l vote margin, t-1	Republican incumbent, t	Incumbent running, t
	(1)	(2)	(3)	(4)	(5)
Election-Day rain, t	-0.058	-0.061	-0.047	-0.077	-0.033
	[0.023]**	[0.029]**	[0.040]	[0.024]***	[0.042]
Election-Day rain, t-1	-0.058	-0.047	-0.067	-0.088	-0.107
	[0.021]***	[0.018]**	[0.014]***	[0.031]***	[0.012]***
(Variable) × (rain, t)	0.0012	-50	-0.018	0.018	0.041
	[0.0008]	[157]	[0.037]	[0.034]	[0.039]
(Variable) × (rain, t-1)	-0.0005	-105	-0.037	0.060	0.078
	[0.0007]	[96]	[0.031]	[0.040]	[0.030]***
Number of county-years	49,393	42,944	49,524	49,524	49,524
Number of counties	3,108	3,108	3,108	3,108	3,108
Election years	1952-2012	1952-2004	1952-2012	1952-2012	1952-2012

Note: Dependent variable is voter turnout (0-100). Sample includes presidential elections from 1952-2012. Brackets contain standard errors clustered at the state level. All regressions include year and county fixed effects, county-specific quadratic trends, and the main effects of any variables included in the interaction terms. Column (1) adds interactions with a measure of whether the county is aligned with winning candidate of the presidential election. To avoid endogeneity, we use a county's Republican vote share two elections ago to ascertain its partisan leaning. *Alignment with winner, t-1* is equal to the county's Republican vote share in *t-2* minus 50 if a Republican won the national election in *t-1*, and is equal to 50 minus the county's Republican vote share in *t-2* if a Democrat won in *t-1*. Column (2) adds interactions with a measure of predicted pivotalness. We use Campbell et al.'s (2006) model to calculate a predicted Democratic vote share, d_{st}, for each state s and election year t. The probability of a randomly drawn voter breaking a state-level tie is $(1/N_{st})\varphi(d_{st} - 0.5/\sigma_{st})$, where $\varphi(\cdot)$ is the standard normal density function, σ_{st} is the standard deviation of d_{st}, and N_{st} is the number of registered voters. Our conclusions do not change if we use predicted closeness rather than predicted pivotalness. The point estimates and standard errors for both the interacted pivotal coefficients are large because the probability of being pivotal is typically on the order of 10^{-4} percent. Column (3) adds interactions with the absolute value of the national vote share difference between the Republican and Democratic presidential candidates. Columns (4) adds interactions with an indicator for whether the incumbent President is a Republican, and column (5) adds interactions with an indicator for whether the incumbent President is running for re-election. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Effect of Contemporaneous and Lagged Rainfall on the Republican Vote Share

	(1)	(2)
Election-Day rain, t	-0.048	-0.042
	[0.028]*	[0.027]
Election-Day rain, t-1	0.048	-0.041
	[0.033]	[0.031]
Number of county-years	49,511	49,511
Number of counties	3,108	3,108
Election years	1952-2012	1952-2012
County covariates		✓

Note: Dependent variable is voter turnout (0-100). Brackets contain standard errors clustered at the state level. All regressions include year fixed effects, county fixed effects, and county-specific quadratic trends. County covariates are the white population share, the over-65 population share, log median income, and log population density. * p<0.1, ** p<0.05, *** p<0.01