Online Appendix for: The Effects of Lawn Signs on Vote Outcomes: Results from Four Randomized Field Experiments

Donald P. Green, Jonathan S. Krasno, Alexander Coppock, Benjamin Farrer, Brandon Lenoir, Josh Zingher

December 28, 2015

Table of Contents

A Electoral Contexts

Experiment 1: New York 22nd Congressional District, 2012 General Election
New York's 22nd congressional district stretches from New York's southern border with Pennsylvania all the way to the state's northern border with Lake Ontario. The major population centers in the district are the cities of Binghamton, Utica, Cortland and Rome. The geographic composition of the 22nd district changed considerably following the 2010 round of redistricting. The newly drawn district became a combination of the old 24th district, which included Utica, Cortland and Rome, and a small portion of the old 22nd district, which included the city of Binghamton.

The 2012 U.S. House election in the 22nd district pitted moderate Republican Richard Hanna of Utica, the one-term incumbent from the old 24th district, against Democrat Dan Lamb of Binghamton. The old 22nd district's incumbent, Democrat Maurice Hinchey, declined to run for reelection in 2012 after serving ten terms. Hinchey endorsed first-time candidate Lamb, who had served as Hinchey's chief of staff since 1997. The campaign between Hanna and Lamb was centered on the issue of hydraulic fracturing, a controversial method of extracting natural gas from shale rock formations. Lamb opposed hydraulic fracturing and drew considerable support from environmental

groups (Esch, 2012). Hanna supported hydraulic fracturing and received the endorsement from several pro-hydraulic fracturing groups and the New York Chamber of Commerce (Joint Landowners Coalition of New York, Inc, 2012). The Hanna campaign enjoyed a significant fundraising advantage; Hanna outraised Lamb nearly four to one (Niedt, 2012). Nevertheless, Lamb presented a credible challenge, raising $337,939 and running in a district with a substantial number of Democrats (48.8% of the vote went for Barack Obama). Given that New York had uncompetitive presidential and senatorial elections, the congressional candidates could get their messages out with little competition from other campaigns. In the end, Hanna won the election handily, capturing 61 percent of the vote.

Experiment 2: Albany Mayoral Primary Election, 2013

The 2013 Albany Democratic was held September 10, 2013. Albany is a city dominated by the Democratic Party; no Republican has won a citywide election since 1931. Therefore, the Democratic primary effectively served to determine who was going to replace longtime incumbent Gerald Jennings, who decided not to run for a sixth term. The primary was contested between former attorney and current city treasurer Kathy Sheehan, who held the backing of the Albany County Democratic Party, and African American former city councilman Corey Ellis. The primary would decide if Albany would elect its first female (Sheehan) or African American (Ellis) mayor. Sheehan polled well ahead of Ellis through the entire summer. Ultimately, Ellis proved unable to mount a serious challenge, and Sheehan won with 65 percent of the vote. Sheehan then went on to win over 80 percent of the vote in the general election.

Experiment 3: Virginia Gubernatorial General Election, 2013

The 2013 general election in Virginia was headlined by a tight gubernatorial race to succeed term-limited (Virginia governors cannot serve successive terms) Republican incumbent Bob McDonnell. The Democratic candidate was experienced businessman and fundraiser Terry McAullife, also a longtime Clinton ally, who had run unsuccessfully in the primaries in 2009. The Republican candidate was Ken Cuccinelli, selected by a convention dominated by Tea Party activists. Also running was Libertarian candidate Robert Sarvis. The context was widely perceived as difficult for Republicans because of the government shutdown, but the unpopularity of Obamacare was also perceived to be a potentially important factor in their favor. In the end, McAullife won with 48% of the vote, Cuccinelli received 45%, and Sarvis earned 7%. Cuccinelli, in his concession speech, attributed his defeat to being vastly outspent, with McAuliffe spending over $15m more.

Experiment 4: Cumberland County, Pennsylvania County Commissioner Republican Primary 2015

The 2015 Republican primary for County Commissioner was contested by four Republican candidates: Incumbent Barb Cross, Incumbent Gary Eichelberger, Vince DeFilippo and Rick Schin (Eichelberger and Schin were coordinating their campaigns). Only registered Republicans were eligible to vote, and they cast their ballots for no more than two candidates. The main issue in the

Republican primary was taxes, with Eichelberger and Schin running on their "Taxpayer Protection Plan." The top two vote-getters were Eichelberger and Defilippo, who will proceed to the general election in November 2015.

B Randomization Protocols

Experiment 1: Randomization Protocol

The procedure by which units were assigned to treatment in the first experiment is as follows: First, we assigned a single precinct to treatment and all adjacent precincts to control.[1] This process continued until exactly 25 precincts were assigned to treatment, each of which were slated to receive 40 signs. Five precincts were deemed untreatable because they had no public land (e.g., Colgate University); these precincts were subsequently excluded from the list of treatment and control units. This restricted randomization process generates different probabilities of assignment to treatment condition for different units - in particular, precincts that are adjacent to an above average number of other precincts are less likely to be treated.

Two relatively innocuous complications deserve mention. The adjacency matrix used in this process was later discovered to be flawed; the coding errors in the matrix went unnoticed because the randomization did in fact generate a list of non-adjacent treatment units. Had an inadmissible randomization occurred, the error would have been detected. In order to calculate the probabilities of assignment to treatment condition, we use the original, incorrect adjacency matrix but exclude any randomizations that assigned adjacent precincts to the treatment group.[2] A second complication arises from that fact that four of the 97 precincts were coded as being merged with a neighboring precinct; in effect, these precincts were cluster-assigned to the same treatment condition. We analyze these merged pairs as if they were single precincts.

Experiment 2: Randomization Protocol

As noted above, restricted randomization schemes often produce differential probabilities of assignment for different units, necessitating the use of inverse probability weighting to obtain unbiased estimates of average causal effects. However, as the variability of the weights increases, the uncertainty attending to those estimates often increases as well. In order to combat this loss of precision, the Albany experiment added a further restriction to the set of permissible randomizations: we required that the randomization produce a certain level of covariate balance across treatment and control. As in the previous experiment, a single precinct was selected for treatment and all adjacent precincts were then assigned to control. This procedure continued until 18 treatment precincts were selected. We then repeated this procedure 100,000 times. The further restriction was applied to this

[1] Two voting precincts are said to be adjacent if they share at least one-half mile of border.

[2] When we calculate probabilities of assignment according to the original adjacency matrix without excluding impermissible assignments, the experimental results are substantively unchanged; if anything, the direct and indirect treatment effect estimates appear stronger.

set of 100,000: we sampled a single randomization from the full set and then conducted a weighted regression of a pre-treatment covariate[3] on assignment to direct treatment; when the t-ratio for the treatment indicator was less 1.0, the randomization was accepted into our final set of permissible randomizations. We repeated this procedure until we had 10,000 possible randomizations from which we selected (at random) the actual randomization to be deployed in the experiment. The inverse probability weights used in the analysis are based on this set of 10,000.

Experiment 3: Randomization Protocol

The randomization protocol for the Virginia experiment was very similar to the Albany procedure – 30 of 131 precincts were assigned to treatment such that no adjacent precincts were also assigned to treatment. 100,000 such randomizations were generated; this full set was restricted to 10,000 randomizations which passed the t-ratio < 1 criterion from a weighted regression of a pre-treatment covariate (Mitt Romney 2012 vote share in a precinct) on the direct treatment indicator.

Experiment 4: Randomization Protocol

In Pennsylvania, we first conducted 100,000 complete random assignments in which 20 of our 88 precincts were assigned to receive signs. We then restricted this set to those meeting a balance criterion. In this case, we ran 3 regressions treatment assignment on covariates, where each regression only considered two treatment conditions at a time. We rejected a random assignment if the p-value of any of the three joint f-tests was below 0.25. We collected 10,000 random assignments meeting this criterion and sampled one at random for use in the experiment.

C Results for Vote Margin and Turnout

In this appendix, we present the same models as in the main text, but with two different dependent variables: vote margin and turnout, where turnout is the total number of votes cast in the election and margin is the total votes cast for the advertising candidate minus votes cast for all other candidates. As shown in the tables below, the results for vote margin are largely in line with the vote share results reported in the main text. We find essentially no effects on turnout, suggesting that the positive effects of signs on vote margin are largely due to persuasion, not mobilization.

[3]The covariate used was the percentage of likely Sheehan supporters among the registered Democrats within a precinct.

Table C.1: Impact of Lawn Signs on Margin and Turnout (Experiment 1)

	Vote Margin		Turnout	
	Model 1	Model 2	Model 1	Model 2
Assigned Lawn Signs (n=23)	15.582	34.786	53.002	10.331
	(28.327)	(18.207)	(48.748)	(15.741)
Adjacent to Lawn Signs (n=49)	−9.242	11.713	110.329	11.914
	(27.305)	(17.885)	(52.796)	(11.759)
Constant	−95.074	−60.879	448.835	32.504
	(23.803)	(15.423)	(34.762)	(19.343)
Covariate Adjustment	no	yes	no	yes
N	88	88	88	88
R^2	0.015	0.666	0.066	0.959

Column 2 covariates: Congressional Vote Share '06, '08, '10 and Presidential Vote Share '08. Column 4 covariates: Congressional Turnout '06, '08, '10 and Presidential Turnout '08

Table C.2: Impact of Lawn Signs on Margin and Turnout (Experiment 2)

	Vote Margin		Turnout	
	Model 1	Model 2	Model 1	Model 2
Assigned Lawn Signs (n=15)	24.673	4.427	38.407	9.029
	(17.196)	(14.470)	(23.037)	(13.372)
Adjacent to Lawn Signs (n=41)	21.436	5.563	33.191	8.012
	(12.565)	(12.363)	(15.131)	(11.276)
Constant	32.415	−30.993	92.776	−43.402
	(9.733)	(15.629)	(11.927)	(15.695)
Covariate Adjustment	no	yes	no	yes
N	69	69	69	69
R^2	0.048	0.501	0.067	0.695

Column 2 covariates: Registered Democrats and Mayoral Vote Share '05 and '09. Column 4 covariates: Registered Democrats and Mayoral Turnout '05 and '09.

Table C.3: Impact of Lawn Signs on Margin and Turnout (Experiment 3)

	Vote Margin		Turnout	
	Model 1	Model 2	Model 1	Model 2
Assigned Lawn Signs (n=30)	84.697	45.304	−11.279	−64.870
	(47.141)	(34.952)	(104.825)	(56.283)
Adjacent to Lawn Signs (n=76)	72.074	34.385	35.978	−16.077
	(39.568)	(32.779)	(96.364)	(50.347)
Constant	−436.675	−256.773	1,141.189	224.736
	(33.171)	(38.569)	(87.706)	(94.425)
Covariate Adjustment	no	yes	no	yes
N	131	131	131	131
R^2	0.043	0.652	0.003	0.736

Column 2 covariates: Gubernatorial Vote Share '09 and Presidential Vote Share '12. Column 4 covariates: Gubernatorial Vote Turnout '09 and Presidential Vote Turnout '12.

Table C.4: Impact of Lawn Signs on Margin and Turnout (Experiment 4)

	Vote Margin		Turnout	
	Model 1	Model 2	Model 1	Model 2
Assigned Lawn Signs (n=20)	5.859	−9.335	−47.222	7.223
	(26.721)	(19.548)	(64.914)	(28.411)
Adjacent to Lawn Signs (n=44)	−1.170	−6.031	−21.082	14.528
	(22.994)	(12.054)	(57.357)	(22.331)
Constant	−124.637	−19.087	360.647	5.229
	(16.563)	(22.042)	(46.072)	(28.481)
Covariate Adjustment	no	yes	no	yes
N	88	88	88	88
R^2	0.001	0.627	0.009	0.877

Column 2 covariates: Gubernatorial Vote Share '02, '06, '10 and Presidential Vote Share '00, '04, '08. Column 4 covariates: Gubernatorial Turnout '02, '06, '10 and Turnout '00, '04, '08.

D Heterogeneous Effects

At the suggestion of a reviewer, we assess whether the effects of lawn signs are heterogeneous.[4] Specifically, we assess whether lawn signs have larger effects when directed at precincts with greater party support for the advertising candidate. For each experiment, we selected one covariate to proxy for the level of party support within a precinct. In experiments 1, we used 2008 Democratic presidential vote share. In experiment 2, we used 2009 Democratic mayoral vote share. In experiments 3 and 4, we used 2012 and 2008 Republican presidential vote share, respectively. We normalized these variables with a z-score transformation. The coefficients on the treatment indicators represent the effects of treatment in a precinct with average party support for the advertising candidate. The coefficients on the interaction terms represent the change in treatment effects associated with a one standard deviation increase in party support.

None of the coefficients on the interaction terms are estimated with sufficient precision to make confident claims about treatment effect heterogeneity. One might theorize, however, that lawn signs will exhibit stronger effects in areas with stronger partisan support for the advertising candidates. Three of the four experiments show interactions in line with this hypothesis. In experiments 1, 2, and 3, we observe positive interactions. The signs of the interaction coefficients for experiment 4 do not match this theory: the signs of the interactions are negative. Because experiment 4 took place in a primary, however, one might make the argument that our predictions of partisan treatment effect heterogeneity might not hold.

When we pool the interaction terms by taking a precision-weighted average across experiments, we estimate that the average interaction effect for the direct treatment is 0.009 with a standard error of 0.007. The estimated average interaction effect for the indirect treatment is 0.007, with a standard error of 0.007. Pooling across experiments in this fashion does not increase precision sufficiently to reject the null hypothesis of no interaction effect with party support.

[4] These analyses were not specified in our preanalysis plans.

Table D.5: Heterogenous Effects by Past Party Support

	Vote Share of Advertising Candidate			
	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Assigned Lawn Signs	0.031	−0.009	0.020	−0.014
	(0.017)	(0.060)	(0.009)	(0.026)
Adjacent to Lawn Signs	0.021	0.011	0.020	−0.020
	(0.014)	(0.046)	(0.007)	(0.021)
Past Party Support	0.027	−0.020	0.028	0.020
	(0.042)	(0.033)	(0.009)	(0.021)
Assigned * Support	0.031	0.033	0.010	−0.021
	(0.030)	(0.063)	(0.008)	(0.027)
Adjacent * Support	0.011	0.053	0.008	−0.016
	(0.025)	(0.033)	(0.008)	(0.020)
Constant	0.159	0.306	0.539	0.477
	(0.110)	(0.238)	(0.045)	(0.113)
Covariate Adjustment	yes	yes	yes	yes
N	88	69	131	88
R^2	0.829	0.277	0.829	0.181

Robust standard errors are in parentheses.
Past Party Support is centered at zero and in standard units.
Covariates for each experiment are listed in in Tables 3-6.

References

Esch, Mary. 2012. "NY Anti-fracking Candidates Fared Poorly at Polls.".
URL: *http://www.businessweek.com/ap/2012-11-08/ny-anti-fracking-candidates-fared-poorly-at-polls*

Niedt, Bob. 2012. "U.S. Rep. Richard Hanna, challenger Dan Lamb go toe-to-toe in Cortland forum.".
URL: *http://connect.syracuse.com/user/bniedt/posts.html*