Online Appendix for "Primaries and Candidate Polarization: Behavioral Theory and Experimental Evidence"

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July 9, 2018

Supplementary Analyses

Candidate responses to previous elections

The regression in Table A1 is an alternative version of the estimates in column (4) of Table 1 in the manuscript that includes two additional covariates: the opposing party's normalized position in the previous election and the winning candidate's normalized position in the previous election. These results suggest that positions are responsive to experience in that more extreme (or moderate) positions taken by opponents in previous elections lead candidates to take more extreme (or moderate) positions in the next election. That this holds for previous election winners (whether from the same or opposing party) further suggests that candidates learn from their specific experiences (in contrast to the generic gradual adjustment capture by the *Experience* variable).

Details of Voting Behavior by Candidate Positions

Table A2 provides a more detailed description of voting behavior as a function of the candidates' positions than is described in the main text of the paper. Each cell shows the percentage of votes cast for the moderate candidate (the candidate closer to the median voter) for a given range of candidate positions.

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Table A1: Additional regression specification for analysis of normalized positions

	All Candidates (Feedback)
Primary (2S) Elections	-0.007
	(0.039)
Increased Polarization	-0.009
	(0.021)
Experience	0.001
	(0.001)
Previous Opponent	0.098*
	(0.045)
Previous Winner	0.134**
	(0.048)
Constant	0.355**
	(0.047)
Observations	5278
R^2	0.022

* $p < .05$ ** $p < .01$

Table A2: Votes for moderate by candidates' positions

		Extremist's Position					
		[0, .2)	[.2, .4)	[.4, .6)	[.6, .8)	[.8, 1]	Total
	[0, .2)	10% (10)	23% (115)	27% (165)	36% (135)	41% (100)	31% (525)
	[.2, .4)		36% (100)	43% (195)	48% (185)	53% (95)	45% (575)
Moderate's Position	[.4, .6)			47% (85)	57% (190)	50% (145)	53% (420)
	[.6, .8)				55% (20)	55% (110)	55% (130)
	[.8, 1]					40% (30)	40% (30)
	Total	10% (10)	29% (215)	38% (445)	48% (530)	49% 480	43% 1,680

Subject-Level Voting Behavior

Figure A1 shows voting behavior at the subject level that is consistent with strategic voting for moderates. To create this histogram, the percentage of votes is computed for each subject that is consistent with the strategic voting rule corresponding to the first row of Table 2 in the paper. The analogous figure for the the belief-induced ideal point behavioral rule is shown in Figure A2 (corresponding to the bottom row of Table 2 in the paper). These results reinforce the conclusion that the belief-induced ideal point rule is a better description of voting behavior for most subjects than strategic voting for moderates. Indeed, the first histogram shows that subjects vary widely (nearly uniformly) in their voting for moderates, while the second histogram shows that the belief-induced ideal point voting rule indeed describes most subjects extremely well (incredibly, only 14% of subjects can be classified as voting inconsistently with the rule more than half the time, while the median subjects behavior is consistent with the rule 77% of the time).

Fixed Roles Experiment

Procedures

I designed and conducted a different version of the experiment in an effort to increase the salience of the candidate positioning decisions and to create an experimental environment that more closely matches the theoretical analysis of best responses to out-of-equilibrium beliefs. Increased salience was achieved primarily by assigning subjects to fixed roles. Instead of choosing positions in each round before candidates are selected (as the main experiment), subjects are randomly assigned to roles as candidates and voters *before* the first election and then retain their roles throughout the experiment. In the 1S condition of the fixed role experiment, all subjects are candidates and are randomly matched in pairs for each election (one left candidate against one right candidate, with no subjects as voters). In the 2S condition, groups of 3 (two candidates and one voter) are matched against each other, so each play of the game involves 6 subjects. There are 30 elections in Part 1, all with feedback, so Part 1 of fixed role experiment is a close analogue to Part 2 of main experiment (the 30 elections with feedback). I conducted two sessions of the fixed role experiment with 1S elections (36 subjects) and three sessions with 2S elections (48 subjects) at the Pittsburgh Experimental Economics Laboratory in February 2016.

Elections 31-50 of the fixed role experiment are designed to elicit candidates' choices in an experimental setting closer to the theoretical analysis of best responses to out-of-equilibrium beliefs. Rather than allowing beliefs about opposing candidates to arise endogenously as uncontrolled, subjective beliefs, I rely on experimental control over the distribution of candidates. More specifically, in Part 2 of the 1S condition, opposing candidates' positions are not chosen by another human subject but are instead drawn randomly from a uniform distribution (over the positions between the median voter's ideal point and the opposing party's ideal point). Thus, I achieve control over the beliefs about the distribution of opposing candidates by controlling the positions of the opposing candidates themselves.

The procedure in the 2S condition is somewhat different to allow human voters to select candidates within each primary. The aim was to create a setup in which the initial

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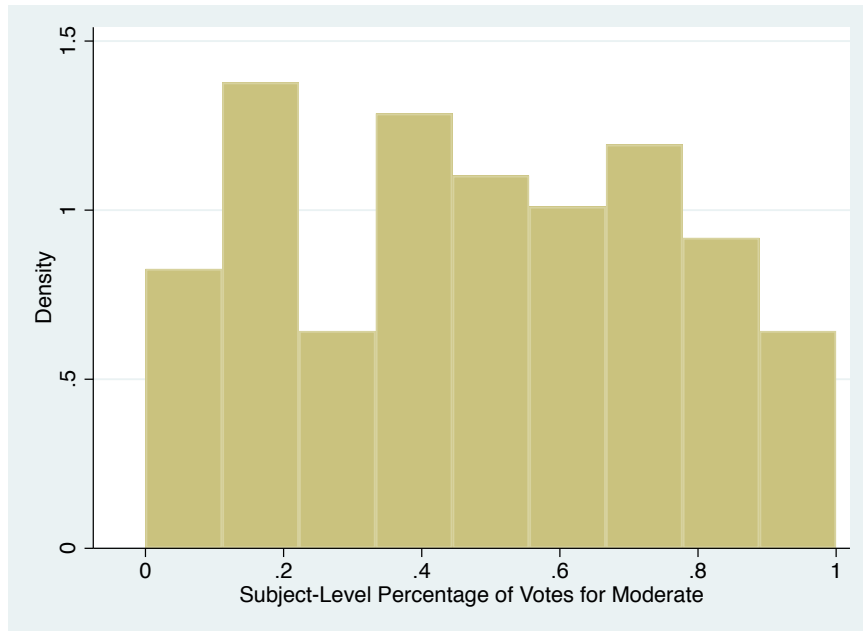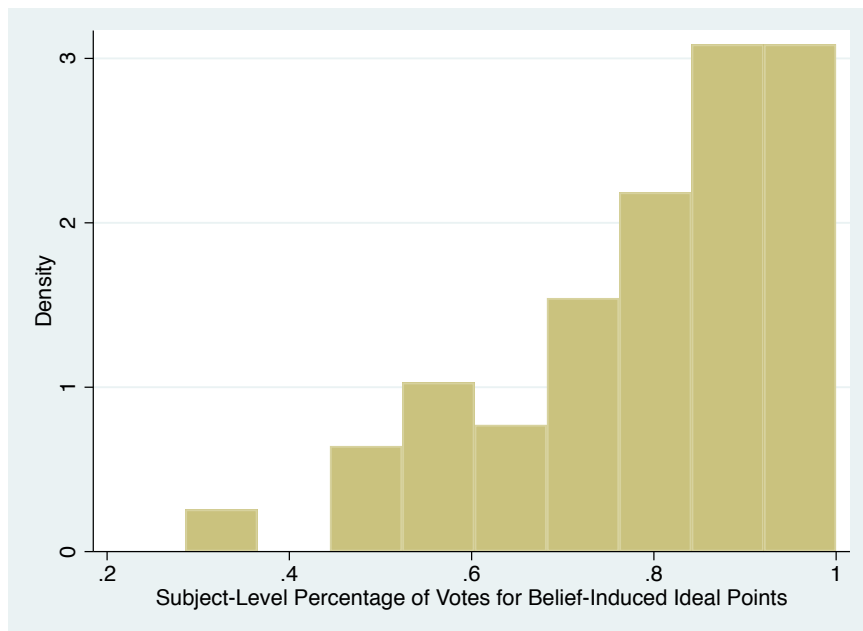Figure A1: Subject-Level Strategic Voting Behavior

Figure A2: Subject-Level Belief-Induced Ideal Point Voting Behavior

distribution of candidates within each party is identical to the 1S election but where the distribution of the candidates in the general election depends on the behavior of primary voters. This setup closely matches the theoretical analysis while at the same time allowing the effect of primaries to arise endogenously from subjects' behavior. However, this setup does not manipulate beliefs or information directly the way that the direct test does in the main text of the paper. In elections 31-40, all subjects act as voters and are paired against one voter from the other party. The voters simultaneously choose between two random candidates from a uniform distribution on their own side of the policy space, and the outcome of each election is the candidate closest to the median voter's position. In elections 41-50, all subjects then act as candidates and face an opposing (computer) candidate with a position drawn randomly from the results of the previous set of elections (31-40). This design allows voting behavior to arise endogenously (in elections 31-40) and then holds it constant in subsequent elections (41-50) to preclude changes in voting behavior that might result from strategic interaction with candidates; this setup also removes any potential for intra-party competition and renders beliefs about opposing primary voters' behavior as the only factor relevant to the positioning decision.

Results

Figure A3 shows the average positions over time in the fixed roles experiment, plotted separately for 1S and 2S elections. In contrast to the original setup, primaries with fixed roles cause candidates to take more extreme positions than they do in 1S elections. The top panel of Figure A3 suggests that this effect is modest but persistent over time. Similar to the original experiment, I find that positions consistently diverge from the median voter's position in all 30 elections regardless of the election format. In the first five rounds, the average normalized position in 1S elections is .376 compared to .531 in 2S elections. In the last five rounds, the average in 1S elections diminishes to .251 compare to .353 in 2S elections. The regression analyis in Table A3 provides more precise estimates of the effect of primaries while controlling for experience. Primary elections have a significant effect on the divergence of all candidates' positions from the median voter (column 1), which then translates to a greater divergence in party candidates' positions (column 2), and election outcomes (column 3). Every candidate decision is consequential, yet increasing the salience of candidates' decisions is not sufficient to generate full convergence to the median voter's ideal point even though candidates' positions gradually become more moderate over time.

Turning now to the elections against random opponents' positions, I find that behavior against random candidate positions is no different than behavior against human players. In 1S elections, the mean normalized position is .329 against human candidates and .328 against randomly drawn positions. In 2S elections, the difference in candidate positions is statistically signficant when all rounds are compared (.417 against humans versus .359 against random positions, $p < .01$), but this difference disappears when accounting for learning by using only the last 10 elections against human players for the comparison (.344 against humans versus .359 against random positions, $p = .53$). In addition, there is no difference in strategic voting when selecting between random positions and positions chosen by human players, though the overall rate of voting for moderate candidates is higher in the fixed roles experiment than it was in the original (64% of votes are for moderates against
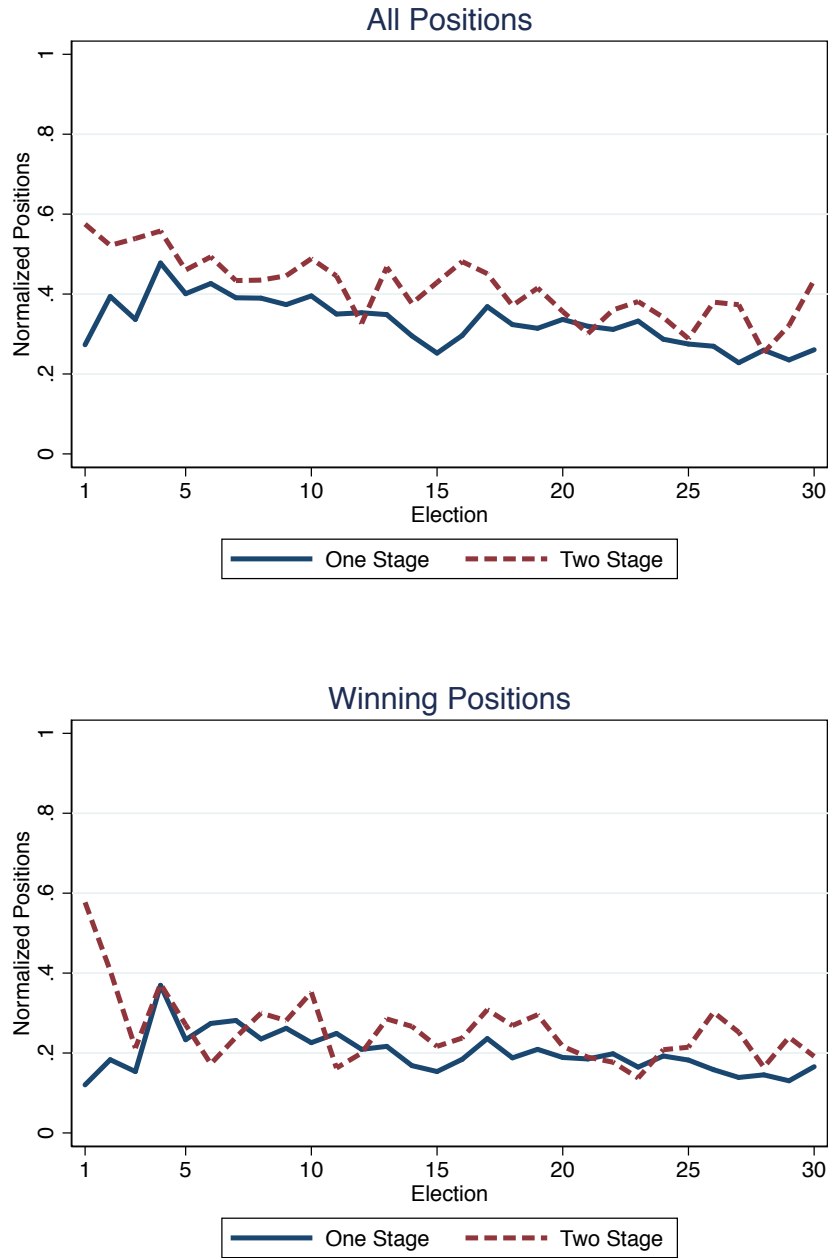
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All Positions

Winning Positions

Figure A3: Average positions and outcomes in the Fixed Roles Experiment

Table A3: Regression analysis of positions in the Fixed Roles Experiment

	(1)	(2)	(3)
	All	Party	Winner
Primary (2S) Elections	0.088**	0.056**	0.057**
	(0.015)	(0.017)	(0.016)
Experience	-0.006**	-0.006**	-0.004**
	(0.001)	(0.001)	(0.001)
Constant	0.417**	0.415**	0.253**
	(0.016)	(0.016)	(0.015)
Observations	2040	1560	780
R^2	0.0391	0.0338	0.0400

* $< .05$ ** $< .01$

human players and 66% are for moderates against random positions, $p = .59$). These results suggest that candidates in the fixed roles experiment are primarily level-1, choosing positions *as if* their opponents choose their positions randomly (level-0), providing some additional support for the behavioral theory.