ONLINE APPENDICES

Appendix A Experimental Instructions

♢ Note that the instructions differ across conditions only in the section of the instructions labelled as **"Information about Poll Results"**.

Instructions

In this study you will be interacting with a fixed group of fourteen other participants for a number of rounds. In each round, the fifteen participants will have the opportunity to vote in an election. The study will consist of 3 practice rounds and 15 regular decision-making rounds. Your performance in the regular rounds counts towards your final earned amount, while practice rounds do not count. For each round, the sequence of actions is illustrated below. In every step, new information will appear at the top of the screen, so please have a look at it carefully before you make any decision or proceed to the next step.

Figure 3 here

In each period, you will have the opportunity to vote in an election. One candidate is of PARTY K and the other one is of PARTY J. *Your payoff in each round will depend on the distance of your ideological position from the ideological position of the election winner and on the quality of the election winner.*

Ideological Positions

At the start of each period you will be given a 'position number' between 1 and 15. This number affects how you value the positions of the two candidates. The candidate of Party J is in position 6 and the candidate of Party K is in position 10. These positions remain fixed for both candidates for the entirety of the study, but your position may change every period. In any given round, each of the 15 participants in your group takes a different position. So, every round some participant takes position 1, another participant takes position 2, another participant takes position 3, and so on, up to position 15. The distribution of participants to positions changes every round. Your 'ideological score' from the victory of each candidate is equal to 100 points minus 5 times the difference between your position and the candidate's position.

Candidate Quality

For each of the two candidates an integer number has been randomly drawn for every round. The possible values that this number can take are between 1 and 120 and each number is equally likely to be selected. This 'quality number' reflects the competency of the candidate in handling policy matters. The higher the number is the better the quality of the candidate is. A new quality number was randomly redrawn every period for each candidate. Only some participants in each round will have the opportunity to learn its value.

Informed and Uninformed Participants

In every round some participants are told the quality numbers that have been drawn for the two candidates, e.g. "Candidate J's quality is 100 and candidate K's quality is 24." These are the informed participants. The rest of the participants receive no additional information. Who receives this information is determined by the ideological positions. Participants with positions $\{1, 2, 3, 5, 7, 9, 11\}$ are informed. Participants with positions $\{4, 6, 8, 10, 12, 13, 14, 15\}$ are uninformed. This fact does not change across rounds.

Payoff Example

For example, assume that in a particular round you are in position 3, K's quality in this round is 75 and J's quality in this round is 13. Since candidate K takes position 10, your 'ideological payoff' from K's victory in this round is: $100 - 5 * |3 - 10| = 65$. You also earn an additional score equal to the winner's quality. So, if candidate

K wins the election then your total payoff is: $65 + 75 = 140$. On the other hand, Candidate J has position 6. Then, if candidate J wins the election then your total payoff is: $100 - 5 * |3 - 6| + 13 = 85 + 13 = 98$. Please notice that if the difference in the quality between the two candidates in a given round is greater than 20, then you will always receive a higher payoff if the candidate with the higher quality wins, regardless of your ideological position.

Figure 1 here

Polls

After the 'informed voters' receive their information, five polling companies will conduct voting intention polls. In each poll, four out of the fifteen participants will be randomly chosen to state their voting preferences. *This means that you may be asked to state your voting intention by one polling company, or by many, or by none.* If you are contacted by many companies, you only have to state your answer once, and the same answer will be used for all of them. Notice that at the time that polls take place, seven voters are informed of the actual quality of the two candidates in the forthcoming election and eight voters are uninformed.

♢ **Information about Poll Results** - *All five polls are revealed (Control condition in E1 and E3)*

After polls have taken place, the findings of the five companies will be revealed. All participants will observe the fraction of votes that each of the two candidates received in the polls of these five companies.

♢ **Information about Poll Results** -*Two biased polls are revealed (Treatment condition in E1 and E2)*

After polls have taken place, the findings of two companies will be revealed. All participants will observe the fraction of votes that each of the two candidates received in the polls of these two companies.

♢ **Information about Poll Results** -*Two out of the five polls are randomly revealed. Subjects are a priori informed about this (Control condition in E2)*

After polls have taken place, the findings of two companies will be revealed to you. These two companies will be selected randomly out of all five that conducted polls. All participants will observe the fraction of votes that each of the two candidates received in the polls of these two companies.

♢ **Information about Poll Results** - *Two biased polls are revealed. Subjects are a priori informed about this (Treatment condition in E3)*

After polls have taken place in each round, the findings of the two companies which exhibit the greatest support for candidate K will be revealed to you. All participants will observe the fraction of votes that each of the two candidates received in the polls of these two companies. For example, consider some illustrative poll results for the five polling companies (A to E), in the following table. If those were the results of all five polls in a given round, then only the results of companies C and E would be revealed to you in that round. If there are ties, these will be broken with a random draw.

COMPANY	A	B	**C**	D	**E**
Candidate K	34%	50%	**100%**	50%	**75%**
Candidate J	66%	50%	**0%**	50%	**25%**

Beliefs about Election Results

After the poll results have been announced to you, and before elections take place, you will be asked to state the vote share that you expect each candidate to receive in the upcoming elections.

Elections and Payoffs

In the end of each period, elections take place, where each participant may vote or abstain. The winner of the election is determined by simple majority. In case of a draw, each candidate receives an equal chance of being selected as the winner.

Round Payoffs and Aggregate Payoffs from the Study

As described earlier, your total payoff from each round is the sum of the winner's quality and your 'ideological payoffs' from the candidate's victory. *Your total payoffs from this study will be the sum of all payoffs that you accumulate in each of the 15 regular rounds, plus your participation fee.* They will be paid to you in cash, at the end of the study. Each earned point will correspond to **half a penny**. You will now participate in three practice rounds. If you have any questions, please raise your hand and your question will be addressed individually.

Appendix B Additional Econometric Analysis

The analysis of the experimental results showed that biased exposure to polls increases the likelihood of 'favoured' candidate K being elected. This is our main treatment effect, and one key question is why this is happening. Because of the relatively complex environment we are studying, it is unlikely that voters use the strategic structure of the environment to predict behaviour deductively, thus, in this section, we provide additional econometric analysis focusing on the effects of feedback and learning on beliefs and behaviour.

Accordingly, is the main treatment effect driven by voters' failure to account for the biased nature of polls? Our descriptive evidence points to partial and insufficient adjustment for biased polls in E2 and E3 and to no discounting at all in E1, but this needs to be investigated further econometrically. Our modelling strategy can be summarised as follows: if participants have enough opportunities to learn the biased nature of polls in the treatment conditions, beliefs should deviate from average poll information as participants gain experience. In the following analysis, we shall employ our measures of participants' beliefs to econometrically examine whether this is happening, hence complementing the descriptive results and the correlational evidence on beliefs.

Opportunities for Learning

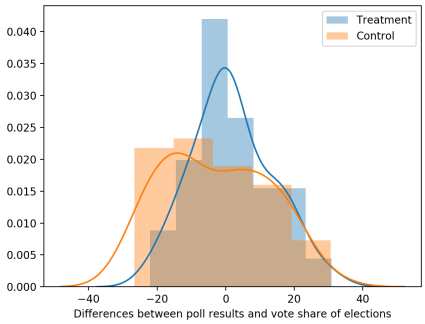
First of all, we need to examine whether it is reasonable to expect at all that participants in the treatment conditions (especially in of E1 and E2) will learn the biased nature of polls. This expectation comes from the fact that participants observe both the poll predictions and the electoral results in every experimental round. So, do participants have opportunities for learning? Figures B.1a-B.1c illustrate the distribution of the differences between average revealed polls and the actual election results of the same round (both of these results are represented by the voting share for K). If the illustrated distribution of differences in a given condition is concentrated on positive values, this means that poll results in this condition systematically overpredicted K's vote share, and participants had the opportunity to observe this for a number of rounds.

Figure B.1a refers to E1 and it indicates that in the treament condition the distribution is slightly more concentrated on higher values than in the control condition. The mean difference between average revealed polls and election results is 1.94 for the treatment and -2.97 for the control. Accordingly, in this experiment participants had limited opportunities to observe a discrepancy between average revealed polls and election results. On the other hand, Figures B.1b and B.1c indicate that the distributions for the treatment conditions of E2 and E3 are concentrated on positive values much more than the respective control conditions. In E2, the mean difference for the treatment and control condition is 8.9 and -1.4, respectively. The analogous mean differences in E3 are 9.1 and 0.47, respectively. This indicates that, in E2 and E3, there was a pattern whereby in the treatment – but not in the control – average revealed polls systematically overpredicted K's vote share. Hence, in the treatment conditions of E2 and E3, participants were exposed to systematic positive discrepancies between poll predictions and the actual performance of K. Consequently, in these experiments participants had the opportunity to infer the biased nature of polls, and this should impact on the evolution of their beliefs.

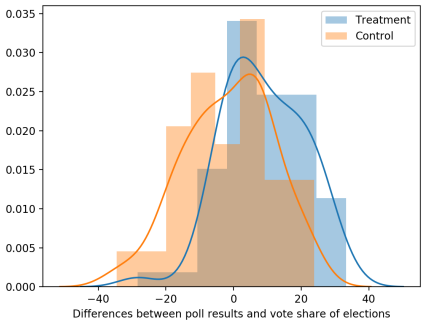
Models of Polls, Beliefs and Voting

We will now examine in detail the evolution of beliefs and voting behaviour at the session level. We consider one round as the unit of observation. Since the same subjects participate repeatedly in a given session and the number of sessions is relatively small, we cluster errors at the session level and use wild bootstrapping for estimating standard

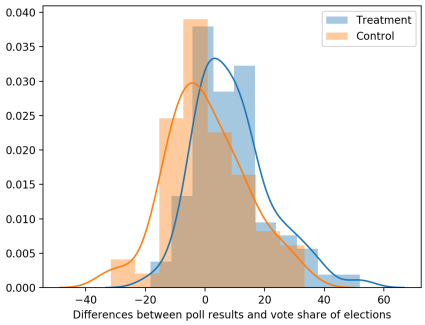
Figure B.1 Distribution of differences in the vote share of K: revealed poll results vs. elections



(a) E1



(b) E2



(c) E3

Notes. The figures present the distribution of differences between average revealed poll results (presented as K's voting shares) and the actual election results in the same voting round. Data are pooled across rounds and sessions of an experimental condition. Experimental conditions where these differences tend to be large are conditions where subjects have the opportunity to infer that polls are biased.

errors (Cameron and Miller, 2015). The first model we estimate (Model 1) takes the following form:

$$\begin{aligned} &Belief_t = \alpha + \beta_1 Poll_t + \beta_2 Late + \beta_3 Treatment + \\ &(\textit{all possible two-way interactions}) + \beta_7 Poll_t \times Late \times Treatment + \epsilon_t \end{aligned} \tag{B.1}$$

The dependent variable $Belief_t$ is 'average beliefs' about candidate K's vote share in round t. $Poll_t$ is 'average revealed polls' in round t.[26] $Late$ is a 'late rounds' dummy variable taking the value 0 for early rounds (rounds 1 to 10) and 1 for late rounds (rounds 11 to 15). $Treatment$ is a treatment dummy (1 if the session is in the treatment condition, 0 otherwise). Model 1 examines in a formal manner the effect of the revealed poll information on subjects' beliefs in order to shed light on whether they perceive the polls as biased or not and on whether there are learning effects.

We are principally interested in the interactions of the dummy variables with $Poll_t$. A significant negative coefficient in the interaction term $Late \times Poll_t$ could indicate that the degree to which revealed poll results manipulate beliefs weakens through time. This would be consistent with the notion that subjects distrust polls at the treatment condition as time passes by (but we would not expect the same for the control condition). On the other hand, a significant negative interaction between $Poll_t$ and $Treatment$ could imply that in the treatment condition there is a weaker relationship between beliefs and average announced poll results. We would strongly expect such a negative interaction to exist in E3, since participants are explicitly informed about the bias.

As Table B.1 indicates, the results of the model do not support the notion that subjects in E1 are able to learn and account for the bias in the treatment condition. In particular, there is no significant interaction between the 'late rounds' dummy and average revealed polls, although the respective coefficients are negative in both the treatment and the control. Results of E2 and E3 show a similar pattern. Interestingly, the interaction between $Late$ and $Poll_t$ is positive in the control but negative in the treatment condition in both E2 and E3. However, none of this is statistically significant. On aggregate, there seems to be weak, if any at all, evidence that subjects somewhat discount poll information in late rounds. The experimental condition also does not seem to make a difference: the estimated coefficient of $Treatment \times Poll_t$ is negative in all three experiments but none of the estimates is statistically significant; the estimated coefficient of the three-way interaction term does not have a consistent sign across the three experiments and it is not statistically significant in any of them.[27]

The second model we examine (Model 2) takes the form:

$$\begin{aligned} (Belief_t - Poll_t) = \alpha + \beta_1 (Poll_{t-1} - Vote_{t-1}) + \beta_2 Treatment \\ + \beta_3 Treatment \times (Poll_{t-1} - Vote_{t-1}) + \epsilon_t \end{aligned} \tag{B.2}$$

$Vote_t$ is the vote share which K received in the election of round t. We use Model 2 to explicitly examine whether there is evidence for learning. Again, we focus on reinforcement-type learners, who observe the model's variables through time. If they observed that $(Poll_{t-1} - Vote_{t-1})$ was large, this means that (in the previous round) polls overestimated the performance of K relative to the election outcome. We expect that if subjects learn, this will result in adjusting their beliefs in the current round (for K's share) downwards conditional on the poll results, hence we expect a decrease in $(Belief_t - Poll_t)$.

As Table B.2 indicates, the coefficients for $(Poll_{t-1} - Vote_{t-1})$ are small and not significant. This indicates that we do not find support in favour of the assumed

[26] Thus, this specification models voters as rather unsophisticated, forming inferences about each candidate's support by merely taking the average of the polls revealed to them.

[27] The results of Model 1 are robust with respect to the exact specification, in the sense that in versions of Model 1 with fewer interaction variables, the results do not change (this analysis is available upon request).

belief adjustment mechanism. However, the treatment dummy has a negative sign and is statistically significant for all three experiments. This indicates that beliefs are closer to poll results in the control condition (especially in E2 and E3).

We conclude that the overall evidence (including descriptive and correlational evidence discussed in earler sections) indicates some weak tendency for beliefs in the treatment conditions of E2 and E3 to adjust for biased polls. However, when a learning mechanism is considered explicitly in Models 1 and 2, adjustment through time is hard to detect.

Table B.1 Effect on Beliefs (Model 1)

	E1			E2			E3		
	Pooled	Treatment	Control	Pooled	Treatment	Control	Pooled	Treatment	Control
Avg. poll info.	0.856***	0.848***	0.856***	0.815***	0.787***	0.815***	0.897***	0.847***	0.897***
	(-0.073)	(-0.038)	(-0.079)	(-0.04)	(-0.025)	(-0.043)	(-0.053)	(-0.059)	(-0.058)
Late rounds	16.819*	3.823	16.819	-2.863	14	-2.863	-0.342	7.117	-0.342
	(-8.458)	(-8.625)	(-9.097)	(-2.544)	(-6.408)	(-2.737)	(-10.386)	(-3.625)	(-11.299)
Late rounds*Avg. poll info.	-0.166	-0.021	-0.166	0.036	-0.092	0.036	0.044	-0.015	0.044
	(-0.102)	(-0.087)	(-0.109)	(-0.027)	(-0.08)	(-0.03)	(-0.141)	(-0.042)	(-0.154)
Is treatment*Avg. poll info.	-0.008			-0.027			-0.049		
	(-0.081)			(-0.046)			(-0.077)		
Is treatment	-0.118			-3.027			-2.158		
	(-4.939)			(-3.166)			(-4.762)		
Is treatment*Late rounds	-12.996			16.863**			7.459		
	(-11.655)			(-6.478)			(-10.947)		
Is treatment*Late rounds*Avg. poll info	0.145			-0.128			-0.059		
	(-0.13)			(-0.079)			(-0.147)		
Constant	9.094**	8.975*	9.094	11.694***	8.667**	11.694**	5.750**	3.592	5.75
	(-3.777)	(-3.424)	(-4.062)	(-2.764)	(-1.662)	(-2.973)	(-2.458)	(-4.273)	(-2.674)
Observations	120	60	60	120	60	60	135	75	60
R-squared	0.945	0.931	0.942	0.965	0.954	0.969	0.961	0.962	0.958

Robust standard errors clustered by session are in parentheses

$*p < 0.1, **p < 0.05, ***p < 0.01$

Table B.2 Effect on the Differences between Beliefs and Average Poll Information (Model 2)

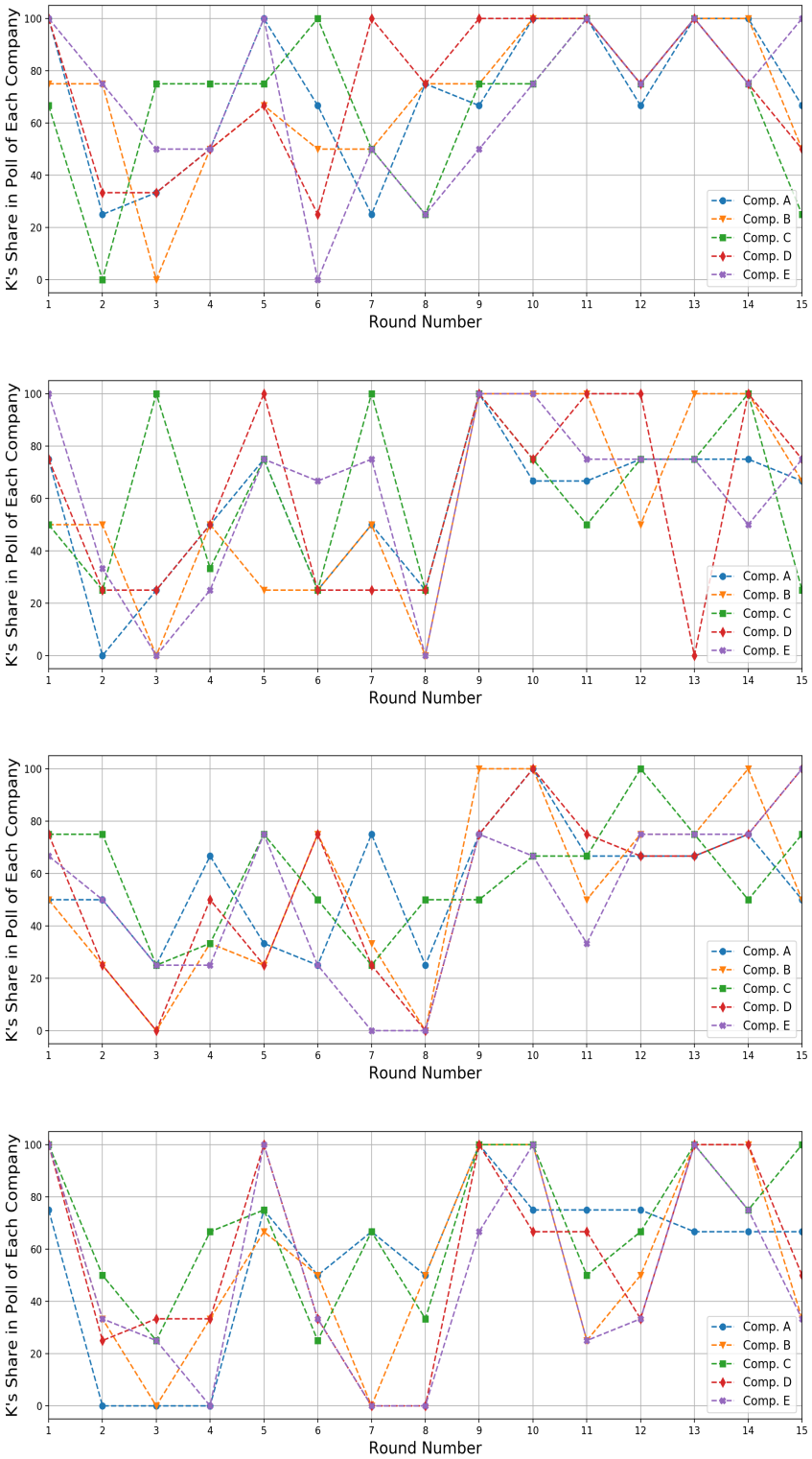
	E1			E2			E3		
	Pooled	Treatment	Control	Pooled	Treatment	Control	Pooled	Treatment	Control
ΔPV_{t-1}	0.034	-0.086	0.034	0.051	-0.032	0.051	-0.031	-0.064	-0.031
	(0.056)	(0.080)	(0.060)	(0.086)	(0.094)	(0.093)	(0.007)	(0.028)	(0.007)
Is treatment	-4.662**			-6.826***			-6.042***		
	(1.872)			(1.030)			(0.731)		
Is treatment *ΔPV_{t-1}	-0.12			-0.083			-0.033		
	(0.093)			(0.123)			(0.028)		
Constant	3.083***	-1.579	3.083***	1.304	-5.523***	1.304	1.118**	-4.924***	1.118
	(1.118)	(1.615)	(1.202)	(0.965)	(0.389)	(1.037)	(0.447)	(0.606)	(0.486)
Observations	112	56	56	112	56	56	126	70	56
R-squared	0.137	0.029	0.005	0.229	0.004	0.009	0.217	0.016	0.004

Notes. ΔPV_{t-1} is the difference between the revealed poll information and the actual vote share of K in the last round.
Robust standard errors clustered by session are in parentheses.

$*p < .1, **p < .05, ***p < .01$

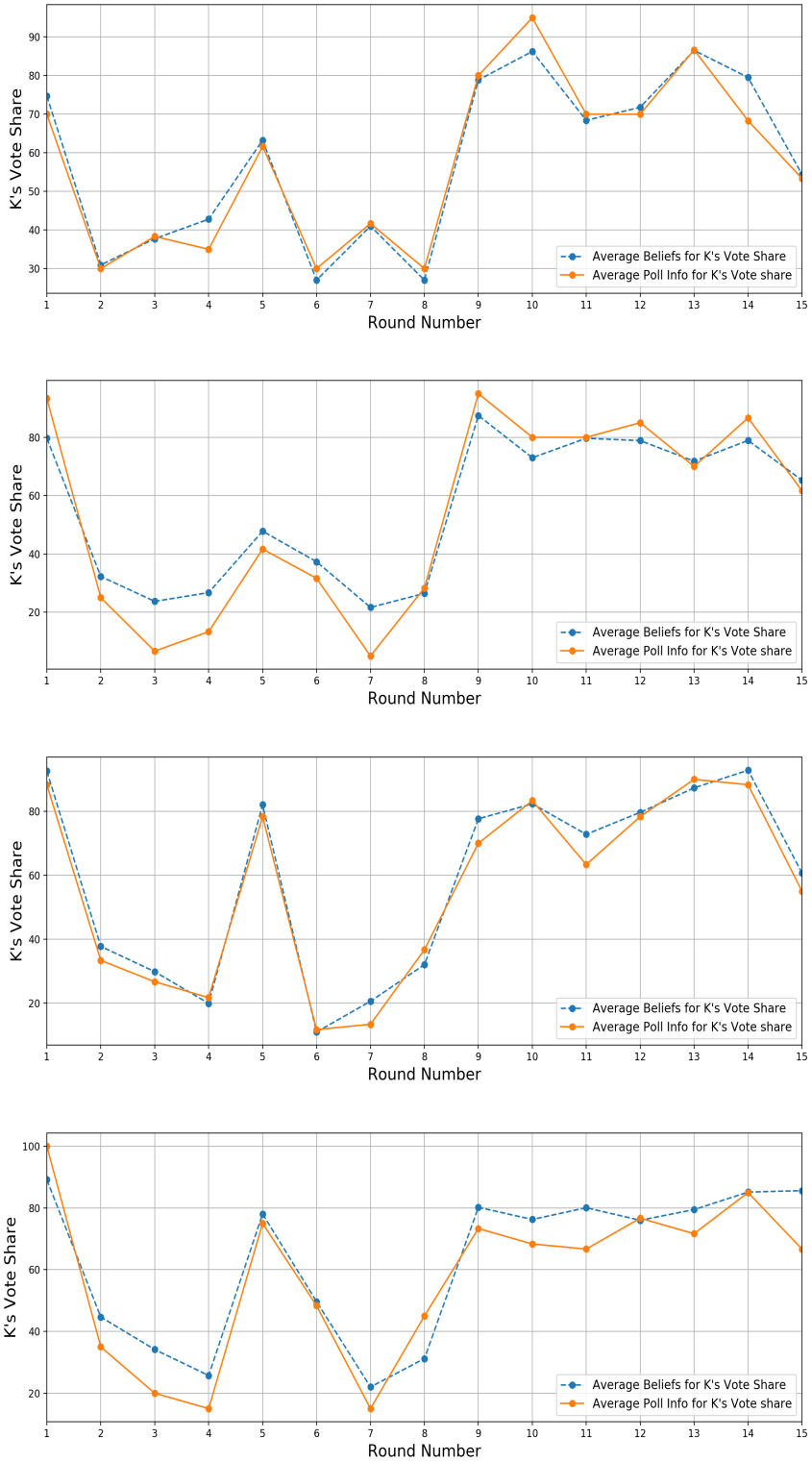
Appendix C Additional Graphs

Figure C.1 Poll outcomes in treatment sessions of E1 (T1-T4)



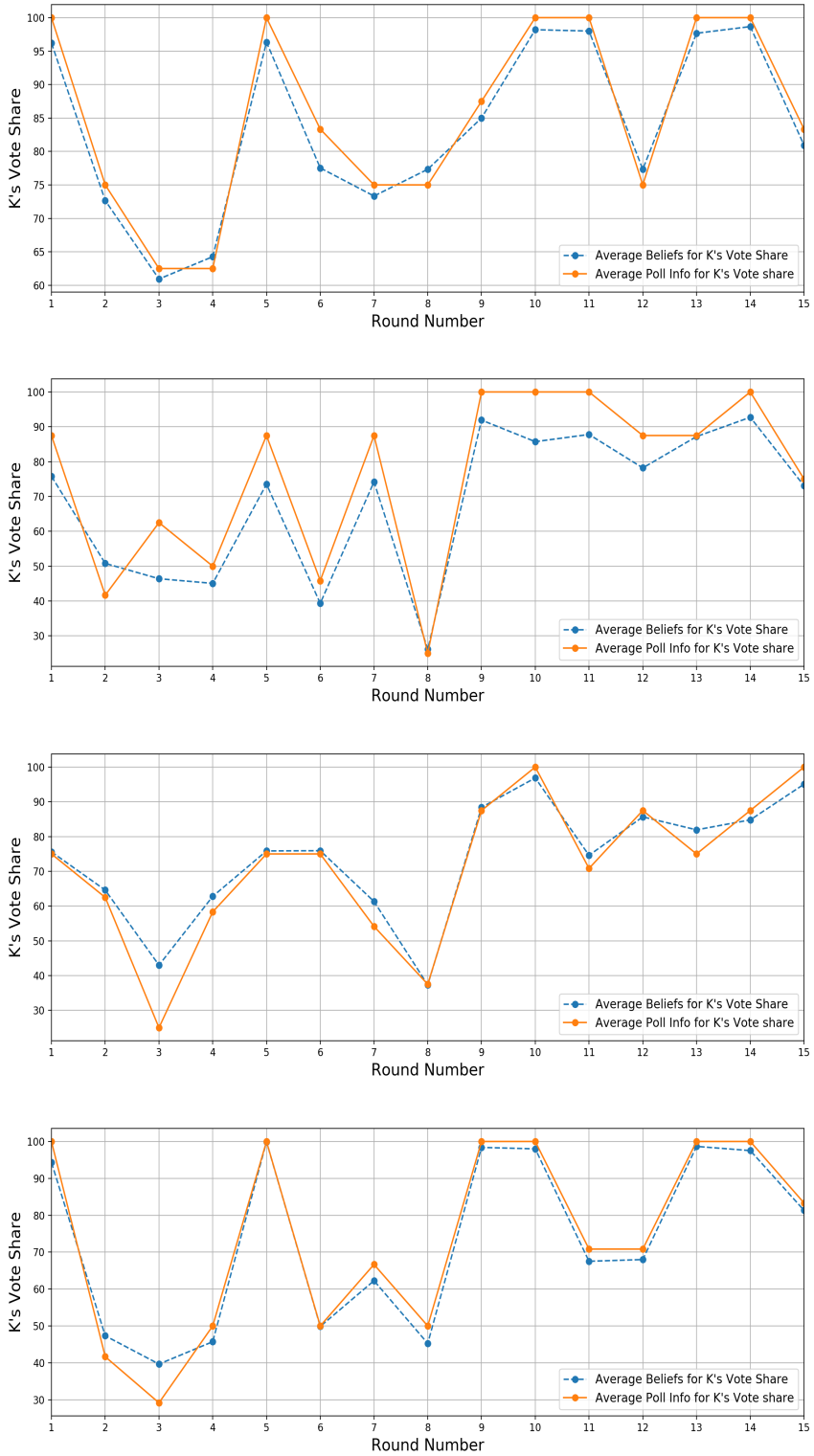
Notes. The graphs present the fraction of votes that candidate K receives according to the poll of each of the five companies in each period in treatment sessions of E1. The graphs for the four sessions T1-T4 are presented in sequence.

Figure C.2 Average beliefs vs. poll outcomes in control sessions of E1 (C1-C4)



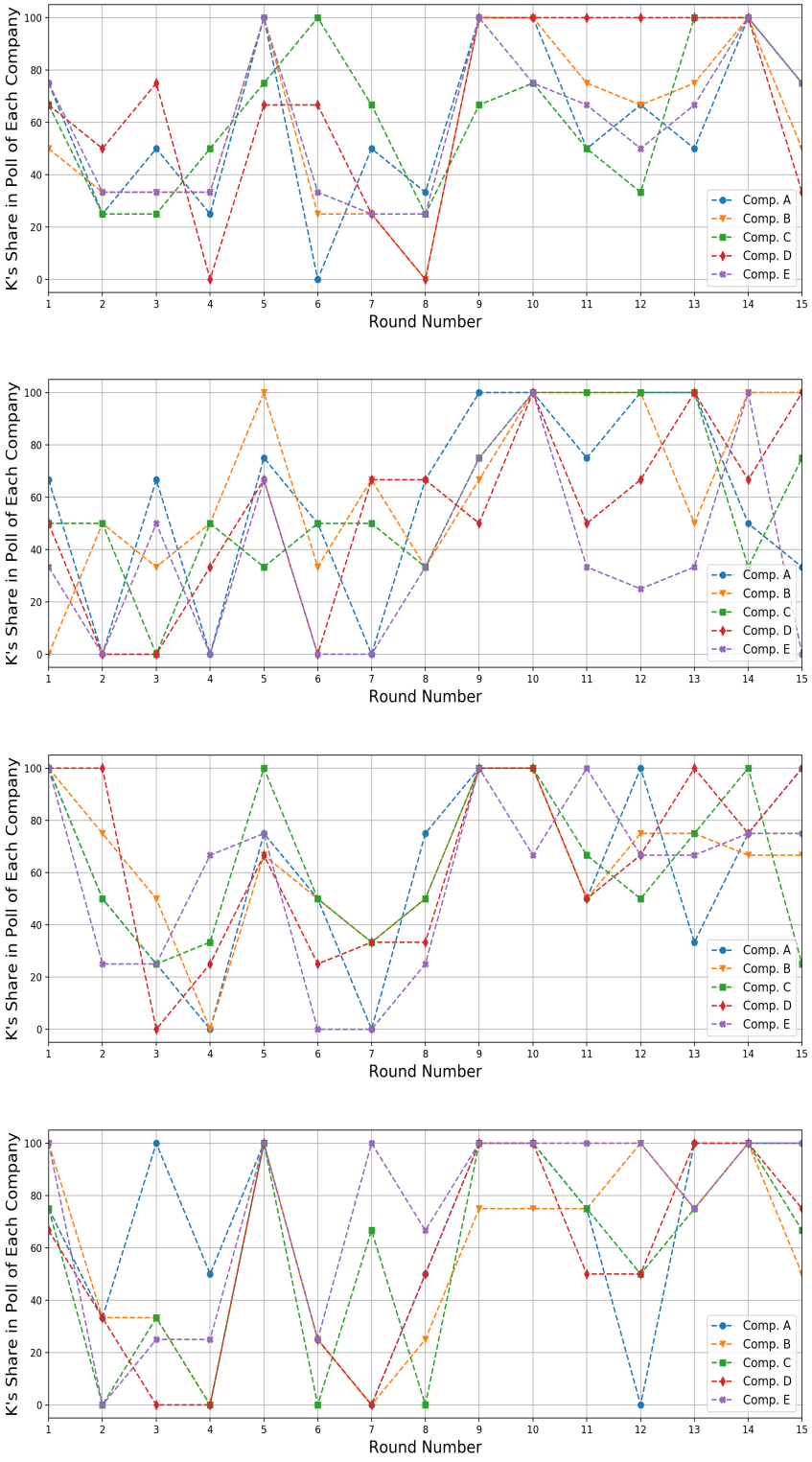
Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the four sessions C1-C4 are presented in sequence.

Figure C.3 Average beliefs vs. poll outcomes in treatment sessions of E1 (T1-T4)



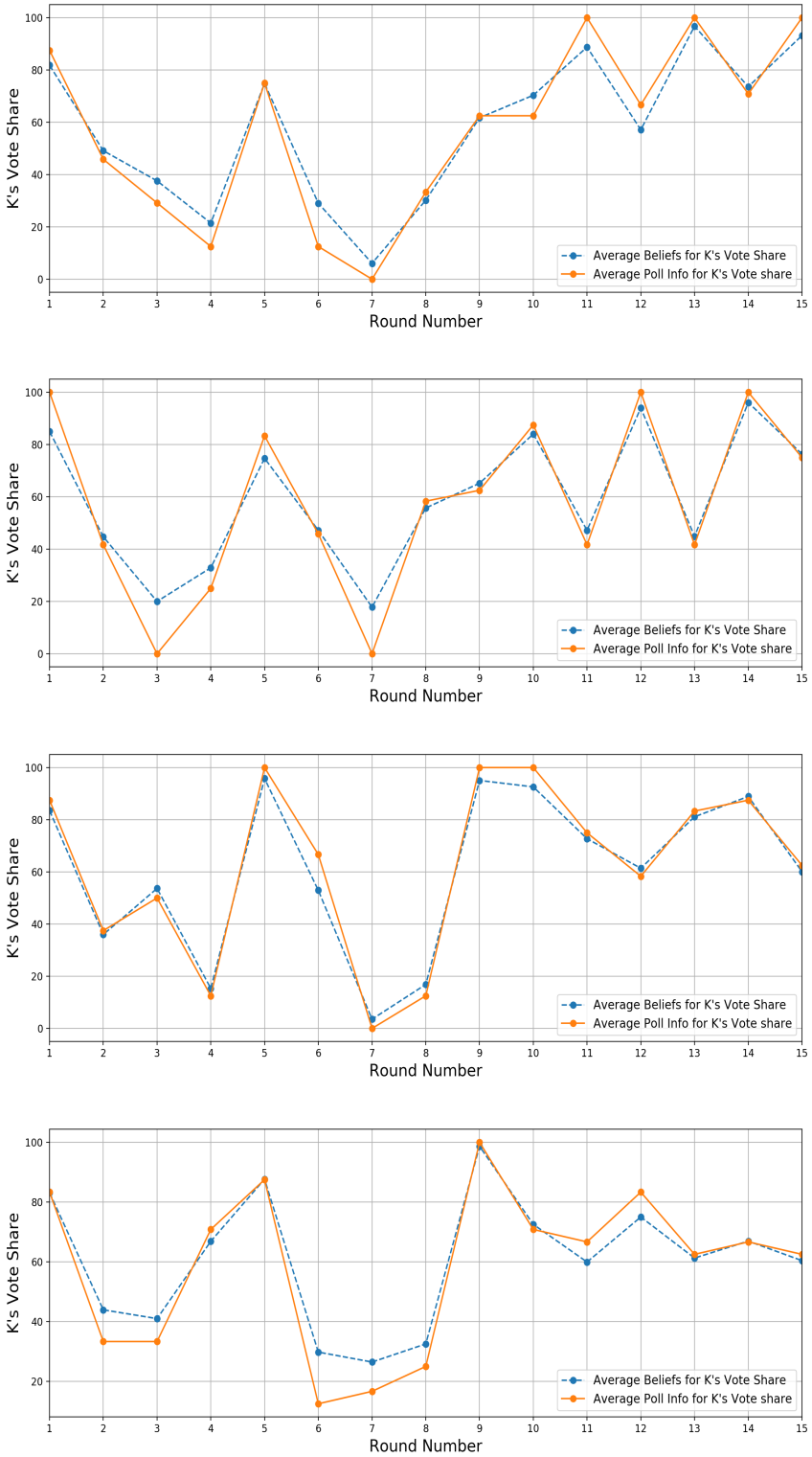
Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the four sessions T1-T4 are presented in sequence.

Figure C.4 Poll outcomes in treatment sessions of E2 (T1-T4)



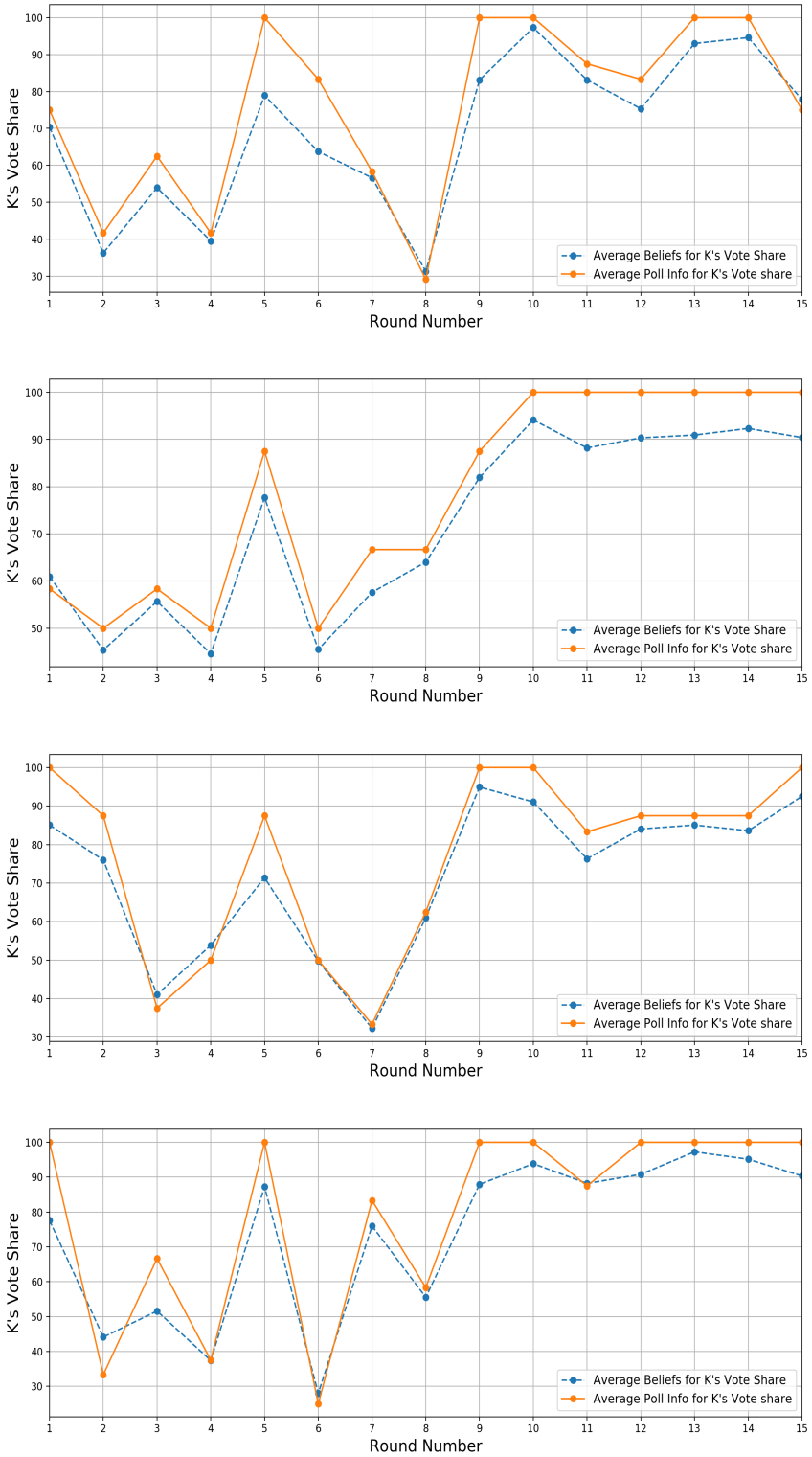
Notes. The graphs present the fraction of votes that candidate K receives according to the poll of each of the five companies in each period in treatment sessions of E2. The graphs for the four sessions T1-T4 are presented in sequence.

Figure C.5 Average beliefs vs. poll outcomes in control sessions of E2 (C1-C4)



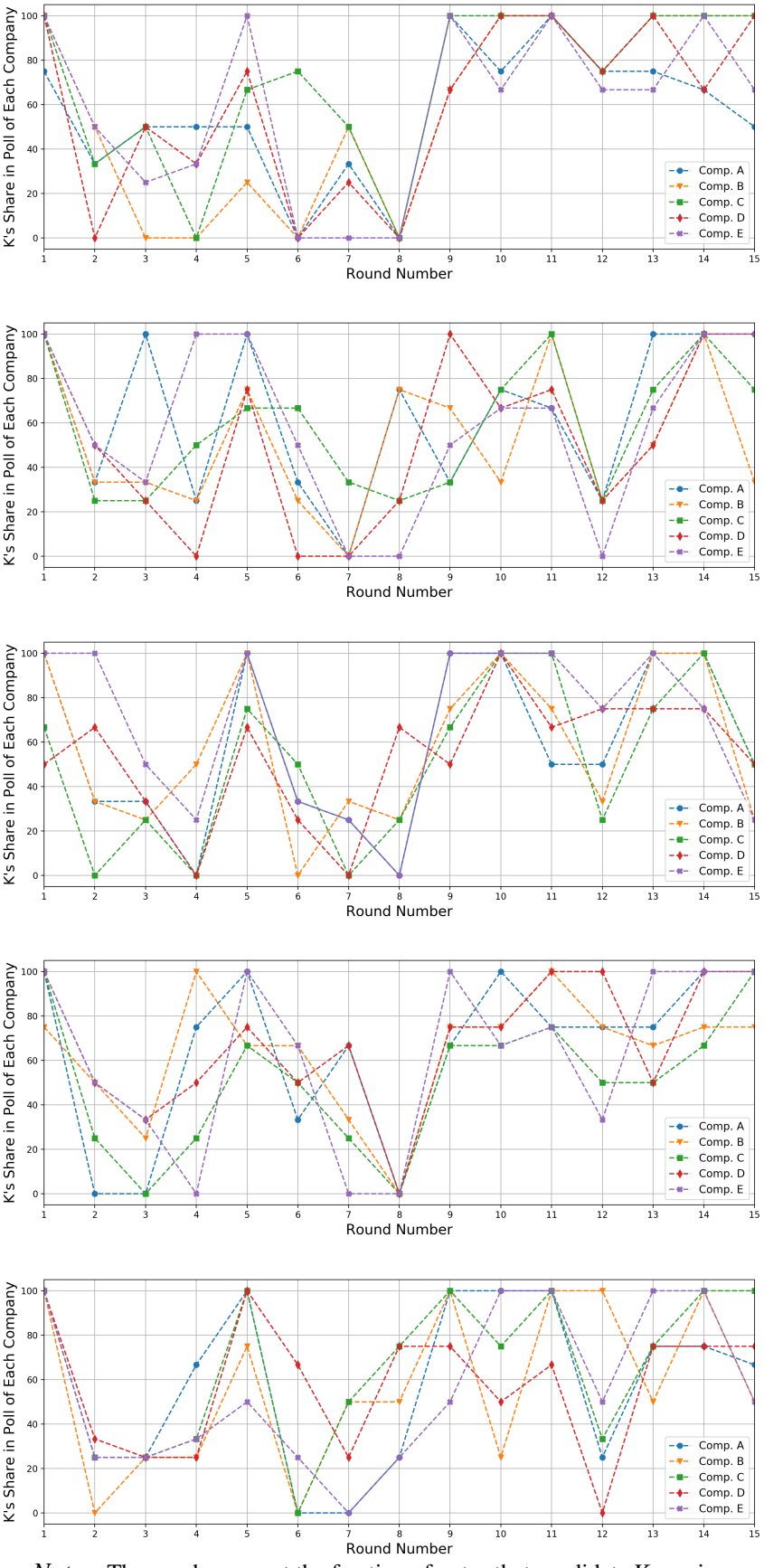
Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the four sessions C1-C4 are presented in sequence.

Figure C.6 Average beliefs vs. poll outcomes in treatment sessions of E2 (T1-T4)



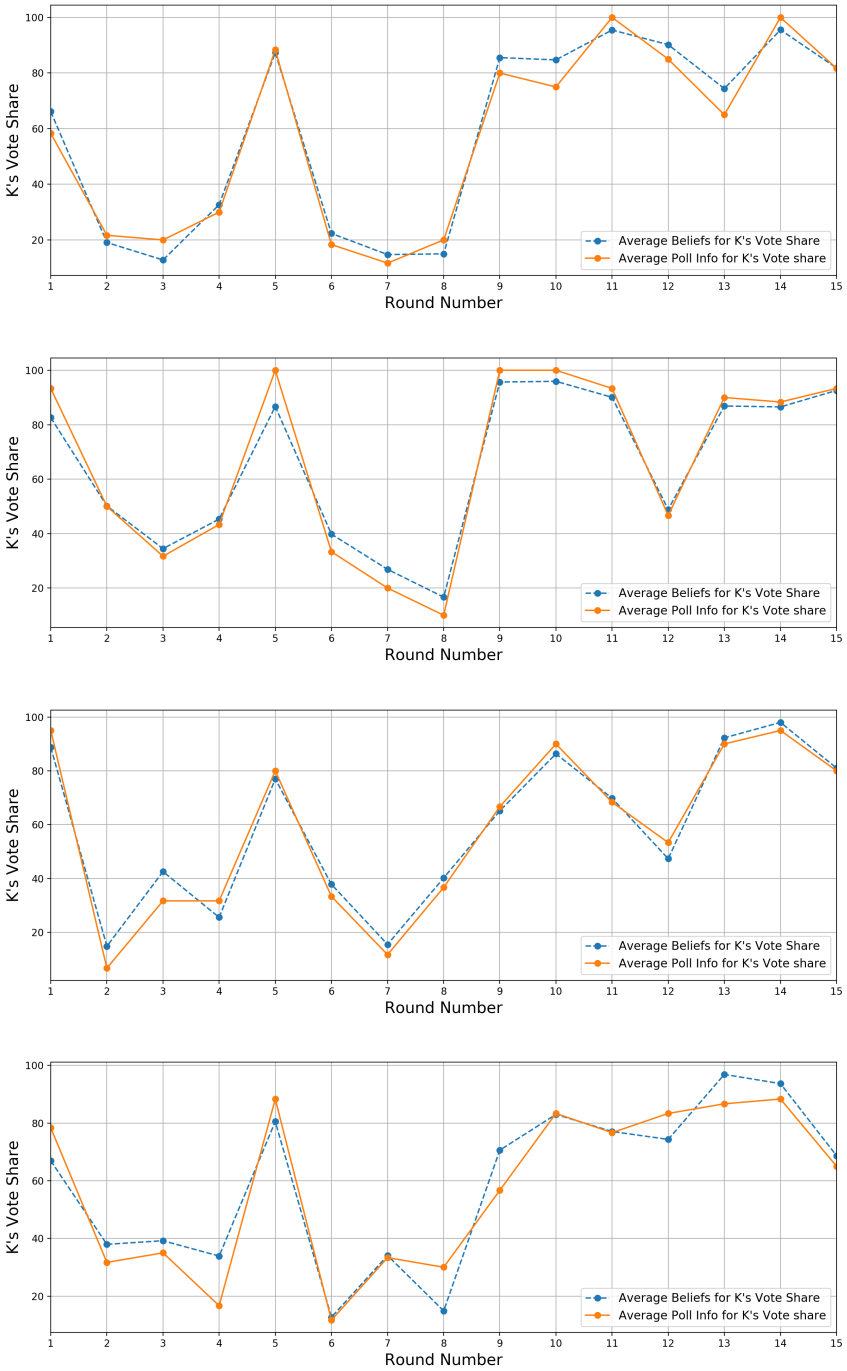
Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the four sessions T1-T4 are presented in sequence.

Figure C.7 Poll outcomes in treatment sessions of E3 (T1-T5)



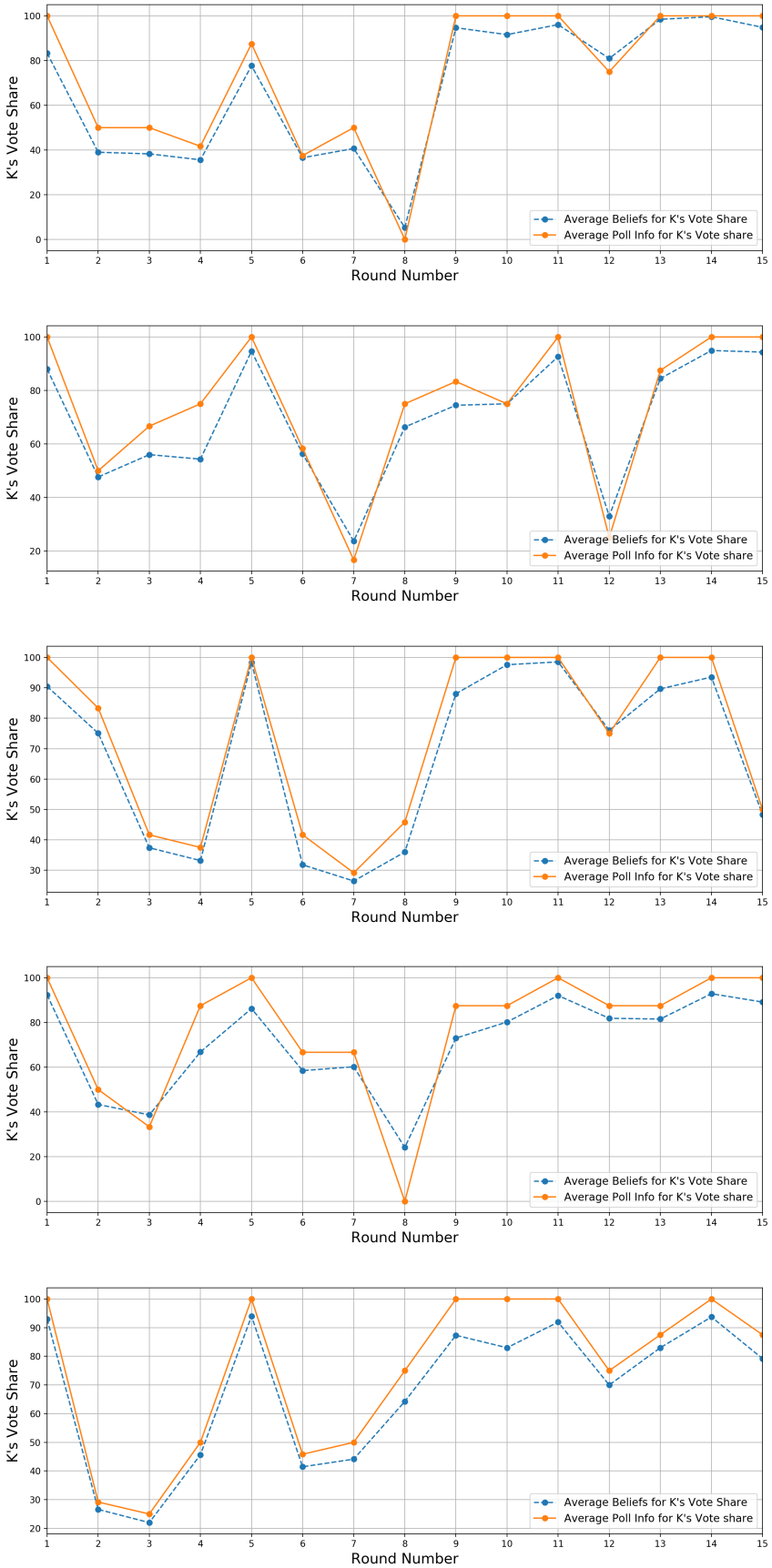
Notes. The graphs present the fraction of votes that candidate K receives according to the poll of each of the five companies in each period in treatment sessions of E3. The graphs for the five sessions T1-T5 are presented in sequence.

Figure C.8 Average beliefs vs. poll outcomes in control sessions of E3 (C1-C4)



Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the four sessions C1-C4 are presented in sequence.

Figure C.9 Average beliefs vs. poll outcomes in treatment sessions of E3 (T1-T5)



Notes. The dashed line presents the elicited beliefs on candidate K's vote share averaged over subjects. The solid line illustrates the vote share of candidate K according to polls, i.e. averaged across the five polling companies. The graphs for the five sessions T1-T5 are presented in sequence.

Appendix D Additional Tables

Table D.1 Descriptive summary of voting behaviour at the poll stage, pooled at session level, E1

	session	E1_C1	E1_C2	E1_C3	E1_C4	E1_T1	E1_T2	E1_T3	E1_T4
uninformed	J	26.09%	29.21%	29.67%	38.30%	17.20%	30.85%	46.67%	21.74%
	K	42.39%	47.19%	37.36%	51.06%	67.74%	53.19%	43.33%	47.83%
	N	31.52%	23.60%	32.97%	10.64%	15.05%	15.96%	10.00%	30.43%
informed	J	44.05%	42.50%	44.44%	43.82%	34.94%	45.24%	38.37%	51.19%
	K	55.95%	50.00%	54.32%	55.06%	62.65%	54.76%	59.30%	47.62%
	N	0.00%	7.50%	1.23%	1.12%	2.41%	0.00%	2.33%	1.19%

Table D.2 Descriptive summary of voting behaviour at the poll stage, pooled at session level, E2

	session	E2_C1	E2_C2	E2_C3	E2_C4	E2_T1	E2_T2	E2_T3	E2_T4
uninformed	J	30.21%	29.21%	33.71%	22.92%	28.71%	26.32%	27.37%	29.21%
	K	43.75%	56.18%	39.33%	51.04%	48.51%	37.89%	47.37%	41.57%
	N	26.04%	14.61%	26.97%	26.04%	22.77%	35.79%	25.26%	29.21%
informed	J	38.75%	45.45%	44.19%	46.91%	45.56%	46.84%	37.50%	34.94%
	K	57.50%	53.41%	55.81%	50.62%	48.89%	50.63%	62.50%	61.45%
	N	3.75%	1.14%	0.00%	2.47%	5.56%	2.53%	0.00%	3.61%

Table D.3 Descriptive summary of voting behaviour at the poll stage, pooled at session level, E3

	session	E3_C1	E3_C2	E3_C3	E3_C4	E3_T1	E3_T2	E3_T3	E3_T4	E3_T5
uninformed	J	34.88%	21.98%	29.03%	23.76%	30.85%	20.83%	27.84%	23.96%	32.97%
	K	50.00%	43.96%	41.94%	39.60%	38.30%	43.75%	47.42%	54.17%	56.04%
	N	15.12%	34.07%	29.03%	36.63%	30.85%	35.42%	24.74%	21.88%	10.99%
informed	J	43.82%	37.18%	43.02%	48.10%	37.04%	52.33%	44.83%	42.35%	44.57%
	K	49.44%	60.26%	56.98%	50.63%	62.96%	47.67%	54.02%	56.47%	54.35%
	N	6.74%	2.56%	0.00%	1.27%	0.00%	0.00%	0.00%	1.18%	1.09%

Notes. The tables present the distribution of answers in the polls, for each individual session of our three experiments. 'N' Stands for non-participation. The choices are pooled across the fifteen rounds. They are further split into votes of the 'informed', those who know the valences drawn, and those who do not - the 'uninformed'.