Notes on "How Do Voters Respond to Information? Evidence from a Randomized Campaign" by Kendall, Nannicini, Trebbi, AER 2015.

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Goals

Campaign Information and Voters' Behavior

Large body of literature in political science on whether campaign information matters, but still relevant questions

- Gentzkow & DellaVigna (2009): "The consensus that communication had 'minimal effects' dominated research in political science, psychology, and communications for decades. (Gerber et al., 2007)".
- Early studies of political communication find little effect on voters' choice of candidates.

Large body of literature in political science on whether campaign information matters in the lab, but still relevant questions

- Are voters learning anything from campaign ads? Do they update their beliefs in real elections?
- What substantive messages affect them (if any)?

What candidates' attributes are most valued by voters: **valence** (Stokes 1963) or **ideology/policy**?

We tackle these issues in a real world **randomized campaign** (empirical research outside the lab can't address correlation of determinants of vote choice & variation in communication treatments).

What We Do

Our approach in a nutshell:

- In collaboration with the reelection campaign of **incumbent mayor**, we split a city in four groups
- Send different messages by both **direct mail** & **phone calls**: (1) valence, (2) ideology, (3) double, (4) none
- This allows us to look at *true* vote shares at precinct level
- We also surveyed eligible voters just before/after election
- We propose methodology to elicit voters' multivariate joint **priors** & **posteriors**
- We **estimate a structural model** based on rational information updating & random utility voting
- This allows us to evaluate the role of both **belief updating** & **preferences** w.r.t. campaign information

Related Literature

Large literature on persuasion (DellaVigna & Gentzkow, 2009) but mainly focused on:

- Turnout
- Self-reported votes
- Small-scale experiments

Gerber et al. (2011):

- Randomization over intensity of TV ads (not message)
- Self-declared choices
- They find short-lived effects inconsistent with Bayesian updating

Model Setup

- Electoral (mayoral) race between candidates A & B
- $V \in \Lambda$ finite discrete **valence** space
- $P \in \Pi$ finite discrete **policy/ideology** space
- Heterogenous voters with bliss points $q \in \Pi$
- Elected mayor implements policy point $p \in \Pi$ (Ansolabehere, Snyder, & Stewart 2001; Lee, Moretti, & Butler 2004)

Utility of voter i of type q_i is:

$$U(v, p; q_i) = \gamma v - |q_i - p|^\varsigma - \chi * (v * |q_i - p|^\varsigma) + \varepsilon_{i,j}$$

where v & p are (realized) valence & policy of elected mayor j; γ, ς, χ to be estimated; ε random utility component specific to match (i, j)

Voters' Information Set

$f_{V,P}^{i\,j}(v, p)$: Voter-i joint **prior** distribution function of V, P for $j = A, B$
 $\Rightarrow$ V and P may be correlated
 $\Rightarrow$ prior beliefs may depend on q

Experimental strategy implies exogenous variation in voters' information set. We randomly divide voters into types $H \in \{1, \ldots, 4\}$:

- $H = 1 \Rightarrow$ message about V but not P of A
- $H = 2 \Rightarrow$ message about P but not V of A
- $H = 3 \Rightarrow$ message about both V and P of A
- $H = 4 \Rightarrow$ message about neither V nor P of A

$f_{V,P}^{i\,j}(v, p | H = h)$: Type-$h$ joint **posterior** distribution function

Voting Behavior

Expected utility of voter i from the election of candidate $j = A, B$:

$$EU_j^i(h, q_i) = \sum_p \sum_v f_{V,P}^{i,j}(v, p | H = h) U(v, p; q_i) + \varepsilon_{i,j}$$

Random utility setup with shocks $\varepsilon_{i,j}$. Probability voter i votes for A:

$$\Pr\left[EU_A^i(h, q_i) \geq EU_B^i(h, q_i) \right]$$

We assume **extreme value distribution**: $\varepsilon_{i,j}$ i.i.d. $F(\varepsilon_{ij}) = exp\left(-e^{-\varepsilon_{ij}}\right)$

$$
\begin{aligned}
\ln L(\theta) &= \sum_{i=1}^N \sum_j d_{ij} \ln \Pr\left(Y_i = j\right) \\
&= \sum_{i=1}^N \sum_j d_{ij} \ln \frac{e^{\sum_p \sum_v f_{V,P}^{i,j}(v,p|H=h)U(v,p;q_i)}}{\sum_l e^{\sum_p \sum_v f_{V,P}^{i,l}(v,p|H=h)U(v,p;q_i)}}
\end{aligned}
$$

Non-Response

- Surveyed voters **may choose not to disclose their vote**
- Discarding this data may introduce bias if not '**missing completely at random**'
- We adopt approach of Ramalho & Smith (2012), modification of choice-based (CB) sampling: assume probability of response is constant conditional on vote decision
- Estimate two additional response probabilities β_j for vote $j = A, B$

$$
\begin{aligned}
\ln L(\theta) \;=\; & \sum_{i=1}^{N} o_i \sum_j d_{ij} \ln \beta_j \frac{e^{EU_j^i(h, q_i)}}{\sum_l e^{EU_l^i(h, q_i)}} + \\
& (1 - o_i) \ln \left(1 - \sum_j \beta_j \frac{e^{EU_j^i(h, q_i)}}{\sum_l e^{EU_l^i(h, q_i)}} \right)
\end{aligned}
$$

Voters' Subjective Updating
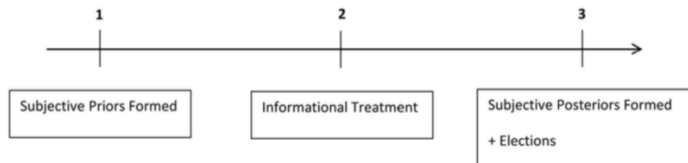
We assume:

- Truthful campaign information (factual ads)
- Rational updating (only for exposition, Bayesian)

Voter-i belief updating about candidate A implies:

$$f_{V,P}^{i,A}(v,p|H=h) = \frac{\Pr^{i,A}(H=h|V=v,P=p)}{\Pr^{i,A}(H=h)} \times f_{V,P}^{i,A}(v,p) \quad h=1,2,3$$

Voters' Subjective Updating (cont.)

We **elicit priors & posteriors** from survey (no distributional assumptions)

We don't impose any restriction on the signaling game played between A, B, and voters; and we then **assess subjective updating** from data

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Assumption

Under SUTVA, voter-i posterior distribution on candidate j is:

$$f_{V,P}^{i,j}(v, p | H = h, W) = \frac{\Pr^{i,j}(H = h | V = v, P = p)}{\Pr^{i,j}(H = h)}$$

$$\times \frac{\Pr^{j}(W | V = v, P = p)}{\Pr^{j}(W)} \times f_{V,P}^{i,j}(v, p) \qquad h = 1, 2, 3$$

$$f_{V,P}^{i,j}(v, p | H = 4, W) = \frac{\Pr^{j}(W | V = v, P = p)}{\Pr^{j}(W)} \times f_{V,P}^{i,j}(v, p)$$

Elicitation of (Multivariate) Priors and Posteriors

We fix the **cardinality** of both $|\Lambda| = 10$ & $|\Pi| = 5$ (see Miller 1956; Garthwaite, Kadane, and O'Hagan 2005)

Non-trivial problem of identifying joint distributions with:

- $10 \times 5 \times 2$ (v, p) pairs
- Regular voters (i.e. not experts)
- Phone interviews

We start by eliciting **marginal** distributions (non-trivial as well)

Assumption
Subjective belief distributions are unimodal

Marginal Distributions

Starting with ideology, we enquire about the **mode** ($\hat{p}$) of marginal prior:

Q1: How would you most likely define candidate A's political position?
Left (1); Center-Left (2); Center (3); Center-Right (4); Right (5);
Don't Know (-999)

For **flat prior** (-999) $\Rightarrow f_P^{i,A}(p) = 1/|\Pi| = .2$ for every p

Conditional on prior not being flat, we further enquire:

Q2: How large is your margin of **uncertainty**?
Certain (1); Rather uncertain, leaning left (2); Very uncertain, left (3);
Rather uncertain, leaning right (4); Very uncertain, right (5)

Marginal Distributions (cont.)

Define:

- (Increasing) **tightness** of the prior $\Rightarrow s \in \Sigma = \{1, ..., 4\}$
- $\phi_{P,s}$ **modal density** $\Rightarrow \phi_{P,1} = 1/\Pi = .2$; $\phi_{P,4} = 1$
- **Skewness** of the prior $\Rightarrow z \in \{-1; 1\}$ if $s = 2, 3$

Assumption

$$1/|\Pi| \leq \phi_{P,2} \leq \phi_{P,3} \leq 1$$

$$f_P^{i,A}(p \neq \hat{p}) = \left\{ \begin{array}{ll} 1 - 1/|\Pi| & s = 1 \\ g\left(\phi_{P,s}, z * (p - \hat{p})\right) & s = 2, 3 \\ 0 & s = 4 \end{array} \right.$$

As for $g(.) \Rightarrow \alpha_P (1 - \phi_{P,s})$ density in direction of asymmetry with $\alpha_P \in [1/2, 1]$ and linear decay in both directions

Example of (Valence) Marginal Prior
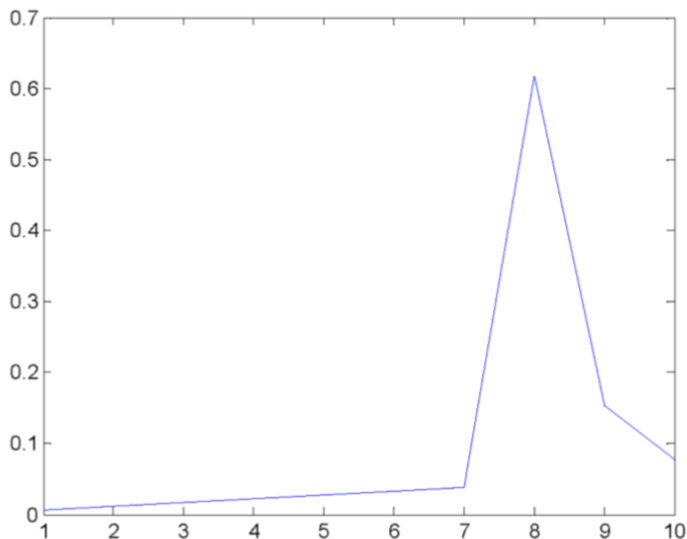
Joint Distributions: A Copula-based Approach

Infinite ways to get joint (bivariate) distribution from univariate marginals

We use **copulas**, introduced by Sklar (1959), which are tools for modeling dependence of several random variables

We focus on copula families with only one **dependence parameter** (ρ):

- Independence between P & $V \Rightarrow \rho = 0$
- Farlie-Gumbel-Morgensen (FGM) copula (weak dependence)
- Frank copula (strong dependence)

For each family, **we estimate ρ from vote data by ML** (jointly with all other parameters). Vuong LR tests can directly assess assumptions on the copula

Assumption

Dependence of subjective belief distributions is constant across time

Italian Local Politics 101

Since 1993, **direct election** of mayors:

- FPTP, runoff in cities above 15,000
- Mayors are crucial players in local politics
- High-salience elections

Usual **campaigning tools**:

- Public rallies & debates
- Often: direct mailing
- In larger cities: local TV appearances (but no ads)
- Rarely: phone banks
- Never: door-to-door canvassing

Welcome to Arezzo

Arezzo is a medium-sized city in the Center of Italy (Tuscany region)

It's the capital of a province that is named after it. 100,455 inhabitants (**77,386 eligible voters**)

Divided into **95 precincts** (smallest electoral unit) + 2 hospital precincts (with no enrolled voters). 42 polling places

Contestable elections: in 2011, incumbent mayor belonged to center-left coalition, but before him center-right won twice in a row

In **May 2011**, incumbent ran for reelection and allowed us to randomize his campaign messages by mail and by phone calls, in exchange for:

- Potentially useful information in case of runoff
- Professional advice

Our Randomized Campaign

We randomly assigned each precinct to **four groups**:

- Valence message: 24 precincts
- Ideology message: 24 precincts
- Both messages: 24 precincts
- No message (control group): 23 precincts

Moreover, we randomly split the first three into **two subgroups**:

- One treated by both direct mail and phone calls (12 precincts)
- One treated by direct mail only (12 precincts)

To increase the campaign effectiveness in the **week before election day**:

- 100% of families received mailers designed by professionals
- 25% of families in phone subgroups received phone call by volunteers (no robo call), ending with recorded message by the candidate

Polling Places by Treatment Group

Balancing Tests at the Precinct Level

	Reference group: no message					
	Valence by phone	Valence by mail	Ideology by phone	Ideology by mail	Double by phone	Double by mail
Enrolled	-66.083	-101.583	19.250	-63.667*	-65.500	-6.083
	[96.591]	[70.235]	[57.771]	[36.922]	[66.886]	[56.033]
First district	0.036	0.036	0.203	-0.047	0.203	-0.047
	[0.136]	[0.112]	[0.178]	[0.112]	[0.123]	[0.109]
Second district	0.116	-0.051	-0.051	-0.051	-0.051	0.033
	[0.188]	[0.140]	[0.151]	[0.154]	[0.086]	[0.128]
Third district	-0.014	0.236	-0.098	0.152	-0.014	-0.098
	[0.190]	[0.172]	[0.134]	[0.199]	[0.169]	[0.134]
Fourth district	-0.138	-0.221	-0.054	-0.054	-0.138	0.112
	[0.149]	[0.141]	[0.146]	[0.164]	[0.139]	[0.129]
Regional '10 turnout	-0.005	-0.003	0.016	0.012	0.000	-0.002
	[0.025]	[0.016]	[0.010]	[0.010]	[0.010]	[0.014]
Regional '10 left	0.011	0.013	0.013	0.012	0.004	-0.021
	[0.015]	[0.019]	[0.013]	[0.017]	[0.013]	[0.013]
Regional '10 right	-0.015	-0.017	0.011	0.007	-0.006	0.019
	[0.015]	[0.014]	[0.012]	[0.018]	[0.011]	[0.018]

Units: 95 precincts. OLS coefficients reported. Robust standard errors clustered at the polling place level in brackets.

Balancing Tests at the Precinct Level (cont.)

	Reference group: no message					
	Valence by phone	Valence by mail	Ideology by phone	Ideology by mail	Double by phone	Double by mail
European '09 turnout	-0.004	0.008	0.019	0.013	0.002	0.007
	[0.026]	[0.012]	[0.012]	[0.013]	[0.011]	[0.012]
European '09 left	-0.012	0.015	-0.016	-0.014	0.018	-0.028
	[0.030]	[0.026]	[0.016]	[0.025]	[0.019]	[0.021]
European '09 right	0.009	-0.015	0.018	0.009	-0.014	0.026
	[0.022]	[0.021]	[0.015]	[0.024]	[0.020]	[0.020]
National '08 turnout	-0.014	0.012	0.002	0.002	0.005	0.000
	[0.025]	[0.008]	[0.006]	[0.007]	[0.007]	[0.009]
National '08 left	0.016	0.026	-0.015	-0.004	0.020	-0.019
	[0.019]	[0.019]	[0.019]	[0.028]	[0.020]	[0.017]
National '08 right	-0.018	-0.023	0.013	0.004	-0.024	0.023
	[0.020]	[0.017]	[0.017]	[0.028]	[0.021]	[0.018]
City '06 turnout	-0.002	0.008	0.012	0.009	0.011	-0.006
	[0.020]	[0.011]	[0.009]	[0.013]	[0.011]	[0.013]
City '06 left	0.016	0.035	-0.029	-0.017	0.009	-0.029
	[0.029]	[0.024]	[0.023]	[0.034]	[0.021]	[0.022]
City '06 right	-0.014	-0.037	0.028	0.014	-0.008	0.022
	[0.029]	[0.024]	[0.022]	[0.033]	[0.021]	[0.024]

Units: 86 precincts (European), 84 precincts (National), 83 precincts (City). OLS coefficients reported. Robust standard errors clustered at the polling place level in brackets.

The (Randomized) Electoral Messages

We influenced voters' information only with two campaign tools (H), at the margin of the overall campaign (W). But:

- Voters received **only our mailers** from the incumbent campaign
- Voters received **only our phone calls** from either campaign

To stay away from the game between incumbent, opponents, and voters:

- We based each message on information provided by the incumbent
- We let him choose between **two alternative** ideology messages

To devise actual informational treatments:

- We corroborated each message with **factual** and **verifiable** info

Our Surveys

Before implementing the informational treatments, we surveyed about 2,200 eligible voters asking about:

- personal characteristics
- **own ideology**
- **prior beliefs** on valence & ideology of the incumbent and main opponent (mode/uncertainty)

Starting from the day immediately after the election, we re-surveyed the same individuals (when available) asking about:

- **voting behavior**
- **posterior beliefs** on valence & ideology of the incumbent and main opponent (mode/uncertainty)

Election Results at a Glance

In the entire city:

	Mean	Median	S.d.	Min	Max	Obs.
Turnout	0.71	0.71	0.05	0.39	0.79	95
Incumbent share over valid	0.51	0.51	0.06	0.35	0.67	95
Incumbent share over total	0.50	0.49	0.06	0.34	0.63	95
Incumbent parties over valid	0.54	0.54	0.06	0.36	0.68	95
Incumbent parties over total	0.45	0.44	0.06	0.29	0.58	95

Across treatment groups:

	Variable of interest: incumbent share over total						
	Valence by phone	Valence by mail	Ideology by phone	Ideology by mail	Double by phone	Double by mail	No message
Mean	0.53	0.49	0.50	0.51	0.51	0.46	0.49
S.d.	0.07	0.06	0.04	0.08	0.05	0.05	0.05
Obs.	12	12	12	12	12	12	23

Reduced-form Aggregate Estimates, All Groups

	Reference group: no message					
	Valence by phone	Valence by mail	Ideology by phone	Ideology by mail	Double by phone	Double by mail
Turnout	-0.011 [0.031]	-0.000 [0.015]	0.013 [0.011]	0.010 [0.013]	-0.006 [0.009]	-0.006 [0.013]
Incumbent share	0.041** [0.019]	0.004 [0.025]	0.013 [0.016]	0.021 [0.025]	0.027* [0.015]	-0.023 [0.015]
Incumbent parties	0.032* [0.018]	0.018 [0.023]	0.015 [0.016]	0.029 [0.026]	0.021 [0.014]	-0.015 [0.015]

Units: 95 precincts. OLS coefficients reported. Robust standard errors clustered at the polling place level in brackets.

To Get an Idea

Some evidence of beneficial effect of valence message by phone calls:

- **4.1 percentage points**, i.e. $+8\%$

Estimates are rather imprecise (95 obs.) and the effect of this treatment is not statistically different from other treatments

However, with respect to control group:

- Phone calls (any type) increase incumbent share by **2.7 percentage points** (p-value: 0.019)
- No effect of direct mailing (as Green and Gerber 2004)
- And the two effects are statistically different at 10% level

Accordingly, we focus on phone calls as relevant treatment

Reduced-form Aggregate Estimates, Phone Calls

	Reference group: mail or no message		
	Valence by phone	Ideology by phone	Double by phone
Turnout	-0.012 [0.030]	0.012 [0.011]	-0.006 [0.010]
Incumbent share	0.040** [0.019]	0.012 [0.015]	0.026* [0.013]
Incumbent parties	0.026 [0.020]	0.008 [0.016]	0.014 [0.012]

Units: 95 precincts. OLS coefficients reported. Robust standard errors clustered at the polling place level in brackets.

Individual (Survey) Data

To gain efficiency and validate the aggregate evidence, we look at voting behavior and beliefs of surveyed individuals

We have non-missing data on **1,455** eligible voters:

- **1,306** (89%) turned out to vote
- Among those who voted, **57%** for the incumbent (self-declared)
- **49%** for parties supporting the incumbent

As expected, individual characteristics (from pre-election survey) are balanced across treatment groups

Reduced-form Individual Estimates, All Groups

| | Reference group: no message | | | | | |
	Valence by phone	Valence by mail	Ideology by phone	Ideology by mail	Double by phone	Double by mail
Turnout	-0.024 [0.027]	-0.019 [0.034]	0.006 [0.026]	0.033 [0.022]	-0.019 [0.028]	-0.003 [0.029]
Incumbent share	0.095** [0.039]	-0.061 [0.049]	0.018 [0.049]	-0.028 [0.043]	0.035 [0.050]	0.004 [0.050]
Incumbent parties	0.109*** [0.040]	-0.007 [0.060]	-0.008 [0.061]	-0.044 [0.046]	0.009 [0.051]	-0.014 [0.049]

Units: 1,455 eligible voters (turnout), 1,306 actual voters (incumbent share and incumbent parties). Probit marginal effects reported. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

To Get an Idea

Strong evidence of beneficial effect of valence message by phone calls:

- **9.5 percentage points**, i.e., $+16\%$
- All families in the survey sample received the campaign phone calls (only 25% of them in the aggregate data)

Conditional on effective tool (phone calls), **valence message** gets more votes than ideology (difference significant at 10%)

Conditional on message, **phone calls** get more votes than direct mailing (difference significant at 1%)

Again, we can focus on phone calls as relevant treatment

Reduced-form Individual Estimates, Phone Calls

| | Reference group: mail or no message | | |
	Valence by phone	Ideology by phone	Double by phone
Turnout	-0.026	0.005	-0.021
	[0.023]	[0.023]	[0.023]
Incumbent share	0.110***	0.035	0.051
	[0.033]	[0.043]	[0.045]
Incumbent parties	0.123***	0.005	0.022
	[0.032]	[0.053]	[0.044]

Units: 1,455 eligible voters (turnout), 1,306 actual voters (incumbent share and incumbent parties). Probit marginal effects reported. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

Voters' Beliefs About Incumbent (Summary Stats)

	Reference group: mail or no message		
	Valence by phone	Ideology by phone	Double by phone
Valence mode	0.326** [0.157]	-0.039 [0.144]	-0.092 [0.096]
Valence uncertainty	-0.052*** [0.013]	0.002 [0.018]	-0.003 [0.018]
Ideology mode	-0.049 [0.052]	-0.104** [0.052]	-0.052 [0.059]
Ideology uncertainty	-0.052* [0.023]	-0.046** [0.019]	-0.032 [0.019]

Units: 1,455 eligible voters. OLS coefficients (mode) or Probit marginal effects (uncertainty) reported. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

Beliefs About Incumbent (From Model Estimation)

| | Reference group: mail or no message | | |
	Valence by phone	Ideology by phone	Double by phone
Average valence	0.310** [0.148]	-0.022 [0.142]	-0.100 [0.098]
Valence std. dev.	0.005 [0.082]	0.063 [0.095]	0.025 [0.093]
Average ideology	0.015 [0.063]	-0.121** [0.056]	-0.102* [0.055]
Ideology std. dev.	-0.036 [0.060]	-0.090** [0.039]	-0.127*** [0.044]

Units: 1,306 actual voters. OLS coefficients reported. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

Beliefs About Ppponent (Summary Stats)

| | Reference group: mail or no message | | |
	Valence by phone	Ideology by phone	Double by phone
Valence mode	-0.094 [0.106]	-0.043 [0.133]	-0.051 [0.088]
Valence uncertainty	-0.028 [0.047]	-0.029 [0.045]	0.008 [0.054]
Ideology mode	0.023 [0.048]	0.141** [0.062]	-0.016 [0.063]
Ideology uncertainty	-0.044 [0.028]	-0.089*** [0.030]	0.001 [0.032]

Units: 1,455 eligible voters. OLS coefficients (mode) or Probit marginal effects (uncertainty) reported. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

Beliefs About Opponent (From Model Estimation)

| | Reference group: mail or no message | | |
	Valence by phone	Ideology by phone	Double by phone
Average valence	-0.127 [0.081]	-0.045 [0.133]	-0.071 [0.094]
Valence std. dev.	-0.077 [0.110]	-0.096 [0.107]	-0.048 [0.132]
Average ideology	-0.075 [0.067]	0.189** [0.075]	-0.032 [0.070]
Ideology std. dev.	0.041 [0.075]	-0.177*** [0.064]	-0.091 [0.057]

Units: 1,306 actual voters. OLS coefficients. Fixed effects for survey date included. Robust standard errors clustered at the precinct level in brackets.

To Sum Up

We find:

- Direct effects of information (effects of information on beliefs vs. effects on choice)
- Cross-effects of information (cross-learning about candidate B from candidate A's message plus B's lack of a message)

Informational treatments have the expected impact:

- valence phone calls increase evaluation of incumbent (by about **5%**)
- ideology phone calls move ideological perception of incumbent to the left (by about **5%**) and reduce uncertainty

Interesting interactions with beliefs on opponent:

- ideology phone calls move ideological perception of opponent to the right (by about **3%**) and reduce uncertainty

Probability of Response

We find:

- Probability of responding given vote for A is **0.76** [0.01]
- Probability of responding given vote for B is **0.99** [0.01]
- Contradicts idea that those voting for the loser may be less likely to disclose vote

MLE Estimates (Independent)

	Copula: Independent				
γ_L	1.08	γ_C	1.10	γ_R	0.37
	[0.21]		[0.14]		[0.13]
ζ_L	0.34	ζ_C	0.00	ζ_R	0.98
	[0.21]		[0.49]		[0.32]
χ_L	0.18	χ_C	0.02	χ_R	-0.03
	[0.14]		[0.09]		[0.05]
$\phi_{V,3}$	0.40	$\phi_{P,3}$	0.58		
	[0.15]		[0.16]		
$\phi_{V,2}$	0.40	$\phi_{P,2}$	0.38		
	[0.28]		[0.19]		
α_V	0.56	α_P	0.71		
	[0.05]		[0.19]		
ρ_A					
ρ_B					
LL	-1043.64				

MLE Estimates (Frank)

	Copula: Frank				
γ_L	1.10	γ_C	1.10	γ_R	0.35
	[0.23]		[0.14]		[0.13]
ζ_L	0.33	ζ_C	0.00	ζ_R	1.03
	[0.21]		[0.49]		[0.32]
χ_L	0.19	χ_C	0.02	χ_R	-0.04
	[0.15]		[0.09]		[0.04]
$\phi_{V,3}$	0.36	$\phi_{P,3}$	0.57		
	[0.15]		[0.16]		
$\phi_{V,2}$	0.36	$\phi_{P,2}$	0.37		
	[0.28]		[0.19]		
α_V	0.56	α_P	0.69		
	[0.05]		[0.18]		
ρ_A	-8.24				
	[90.46]				
ρ_B	-30.00				
	[1952.30]				
LL	-1043.10				

MLE Estimates (FGM)

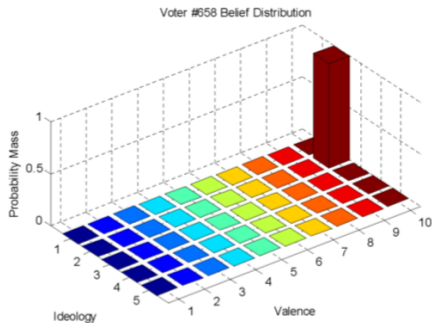|	Copula: FGM				
γ_L	1.09	γ_C	1.10	γ_R	0.36
	[0.23]		[0.14]		[0.13]
ζ_L	0.34	ζ_C	0.00	ζ_R	1.02
	[0.22]		[0.48]		[0.32]
χ_L	0.19	χ_C	0.03	χ_R	-0.04
	[0.15]		[0.09]		[0.05]
$\phi_{V,3}$	0.37	$\phi_{P,3}$	0.57		
	[0.15]		[0.16]		
$\phi_{V,2}$	0.37	$\phi_{P,2}$	0.37		
	[0.29]		[0.20]		
α_V	0.56	α_P	0.70		
	[0.05]		[0.18]		
ρ_A	-1.00				
	[10.37]				
ρ_B	-1.00				
	[17.90]				
LL	-1043.40				

To Get an Idea

$\Rightarrow$ Voung test favors:

- Independence vs. Frank or FGM Copula
- Heterogeneity in (γ, ζ, χ) as $q \in \{1, 2\} \mid \{3\} \mid \{4, 5\}$
- $\alpha_{V,2} = \alpha_{V,3}$; $\alpha_{P,2} = \alpha_{P,3}$

$\Rightarrow$ Specification results:

- Similar weights for valence and ideology (except **R** voters)
- Estimated ζ well below **1** (i.e. concave ideological loss function)
- Positive association between left and valence perceptions for A
- Positive association between right and valence perceptions for B
- More extreme positions associated with higher valence (Bernhardt et al. 2011)

Examples of Posterior of Treated vs. Control Voter
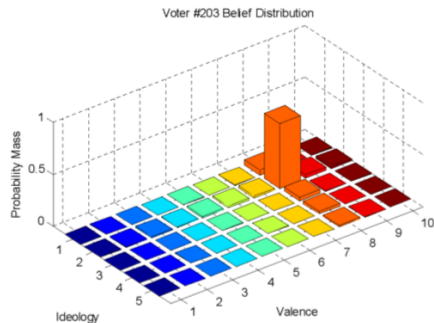
Construction of Counterfactual Electoral Campaigns

Assume we want to know what if everybody in the city got treatment $H = h$ (e.g., what if everybody got the valence message)

Simulated campaign follows these steps:

1. Take estimates of the structural parameters of the posterior beliefs $\Theta = (\phi_{V,3}, \phi_{V,2}, \phi_{P,3}, \phi_{P,2}, \alpha_V, \alpha_P, \rho_A, \rho_B)$ & assume they are constant in the week before election

2. For each voter i generate prior belief distributions based on prior survey answers & vector Θ

3. For each voter i find the nearest neighbor match j in the treatment group $H = h$ based on Mahalanobis distance on covariates

4. Take post-prior difference in marginals for j. Apply the differences to i's priors to find the simulated posterior of i

5. Compute i's expected utilities and vote choice

Counterfactual Electoral Campaigns

Counterfactual treatment	Predicted vote difference (in percentage points)
Blanket valence treatment only	2.2 [0.77, 3.33]
Blanket ideology treatment only	-2.2 [-3.37, -0.27]
Blanket valence plus ideology treatment	0.5 [-0.73, 1.84]
Valence treatment to center & right valence & ideology to left	1.3 [-0.19, 2.37]
Ideology to center & right valence & ideology to left	-2.4 [-3.87, -0.92]
Actual electoral campaign effect	1.8 [1.23, 3.14]

Bootstrapped 95 percent confidence intervals in brackets. Confidence intervals are based on 1,000 draws from asymptotic distribution of the ML parameter vectors.

Conclusion

We randomize electoral campaign of incumbent and study effects of different messages on voters' behavior and beliefs (after proper elicitation)

We find that:

- **Phone calls** plus **valence** message get votes to incumbent
- **Ideology** important in voting choice, but not as campaign treatment
- Ads are effective through **beliefs updating**
- **Second moments** matter: Uncertainty reduced

Unlike Gerber et al. (2011), campaign messaging matters. But:

- Our ads provided actual info instead of "evocative imagery"
- Our ads at the end of the campaign