Group polarization due to rhetorically-induced asymmetry and heuristic issue substitution

Michael Gabbay,[1*] Zane Kelly,[1] Justin Reedy,[2] John Gastil[3]

1 University of Washington, Seattle, WA
2 University of Oklahoma, Norman, OK
3 Pennsylvania State University, State College, PA
* gabbay@uw.edu

Funding for this work was provided by DTRA and ONR under grants HDTRA1-10-1-0075 and N00014-15-1-2549

Overview

- Group polarization effect causes shifts toward extreme
- Results of experiment on NFL betting in groups challenges standard polarization theories
- New theoretical mechanism for group polarization
  - Rhetorically-Induced Asymmetry (RIA) facilitates majority formation at extremes
  - Issue substitution shifts reference point
- New opinion network dynamics model: Accept-Shift-Constrict (ASC)
  - Uncertainty dynamics allows for proximate majorities to emerge and endure
  - Distinction between opinion and how opinion discussed (rhetoric)
  - Combination allows for groups to shift toward extreme without giving extremists higher network weights as done in typical modeling approach
- ASC model (and simpler RPM model) in qualitative and quantitative agreement with experiment

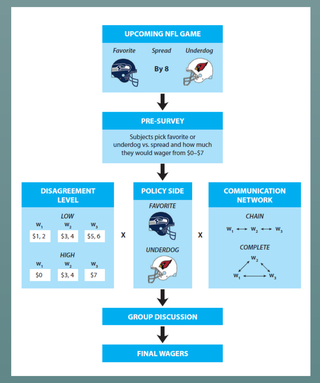
Group Polarization Effect & Gaps

- Group discussion among members on same side of issue shifts their opinions toward more extreme direction
  - Post-discussion opinion mean greater than pre-discussion mean
  - Originally observed for greater risk acceptance – "risky shift effect"
- Two main explanations…
- *Information sharing:* members exposed to new arguments supporting their side of issue
- *Norm-induced:* members seek to look more favorable than others in direction of norm
- Reference point under-theorized
  - Hampers application to natural settings
- Not integrated with stronger, concurrent attitude change phenomena – majority influence, consensus pressure
  - Cannot make predictions for specific initial opinion distributions
- Little experimental research on effects of network structure
  - No effect of topology (Friedkin 1999)

Experiment

- Triads discuss upcoming NFL game via chat interface
- Subjects asked to wager with respect to point spread
- 197 groups from Amazon Mechanical Turk
- Winnings donated to charity

Experimental setup



Experiment Results

Shift in mean group wager due to discussion

Condition	n	$\bar{\delta}$ ($)	SE ($)	$p(\bar{\delta})$	$\Delta\bar{\delta}$ ($)	$p(\Delta\bar{\delta})$	$t(df)$
Favorite	104	1.44***	0.19	9×10^{-12}	1.25***	.00008	4.10 (118.7)
Underdog	56	0.19	0.24	.43			
Fav./High	60	1.82***	0.26	4×10^{-9}	0.89*	.014	2.50 (101.4)
Fav./Low	44	0.92***	0.24	.0004			
Fav./Comp.	37	2.10***	0.30	3×10^{-8}	1.02**	.008	2.73 (76.8)
Fav./Chain	67	1.07***	0.23	.00001			
Und./High	22	0.27	0.54	.62	0.14	.82	0.24 (26.6)
Und./Low	34	0.14	0.20	.49			
Und./Comp.	31	0.14	0.32	.67	-0.11	.82	-0.23 (51.0)
Und./Chain	25	0.25	0.37	.50			

* $p < .05$, ** $p < .01$, *** $p < .001$

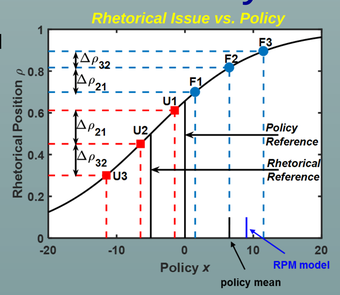
$\bar{\delta}$: average of mean wager shift over n groups
$\Delta\bar{\delta}$: diff. in $\bar{\delta}$ between conditions

- Favorite groups show risky shift, underdog ones do not
  - Inconsistent with informational and normative theories
- High disagreement groups show greater shift than low
- Complete networks show greater shift than chains

RIA & Issue Substitution Theory

- Distinction between policy (opinion) and ***rhetorical issue*** used to discuss policy
- Expect rhetorical issue to often be concave function of policy
- ***Rhetorically-Induced Asymmetry***: Concave relationship causes F2 to be closer to F3 than to F1 on rhetorical axis even though they are equally spaced on policy axis
  - More extreme pair reaches agreement

Rhetorical Issue vs. Policy

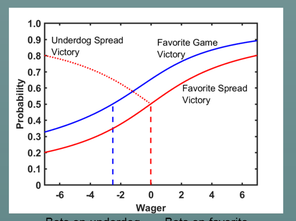


- ***Rhetorically-Proximate Majority*** (RPM) forms at F2, F3 average policy
  - Minority yields to majority to reach consensus at RPM policy
- Final policy more extreme than initial mean ⟹ ***group polarization!***
- ***Issue substitution*** shifts reference point
  - U group on more linear part of curve; weaker RIA implies less polarization
  - Can cause people on same policy side to be on different sides of rhetorical issue (U1 vs. U2, U3)

Theory in Experimental Context

- Correct rhetorical issue is *who will win against spread*
- Heuristic rhetorical issue is *who will win game*
- Claim that heuristic issue is substituted for correct issue
  - Attribute substitution
- Both rhetorical issues are concave function of wager
  - Due to risk aversion
- Have different reference points
  - Policy at which probability = 0.5

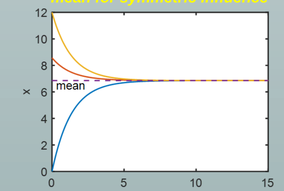
Subjective probability curves (spread=5)



Opinion Network Modeling

- Models seek to predict how opinions change given initial opinions and network of influence between people
  - e.g., DeGroot, Friedkin-Johnsen, Consensus Protocol, Bounded Confidence
- Assuming extremists are more resistant to persuasion is standard approach to group polarization
  - Influence increases with position extremity
  - Needed because mean remains constant for symmetric influence in most models
  - Cannot account for differential risky shifts in experiment

Opinions vs. time for DeGroot model showing constant mean for symmetric influence



$$x_i(t+1) - x_i(t) = \sum_{j=1}^{N} w_{ij}(x_j(t) - x_i(t)), \quad \sum_{j=1}^{N} w_{ij} = 1$$

ASC Model

$$\frac{dx_i}{dt} = \sum_{j=1}^{N} \kappa_{ij}(x_j - x_i) \exp\left\{-\frac{1}{2}\frac{(\rho(x_j) - \rho(x_i))^2}{\lambda_i^2}\right\}$$

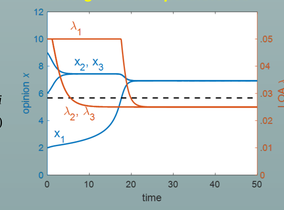
(*shift* / *accept*)

$$\frac{d\lambda_i}{dt} = \begin{cases} -\sum_{j=1}^{N} \kappa_{ij}(\lambda_i - \lambda_{min}) e^{-\Delta\rho_{ij}^2/2\lambda_i^2}, & |\Delta\rho_{ij}| \le \lambda_i \\ 0, & |\Delta\rho_{ij}| > \lambda_i \end{cases}$$

(*constrict*)

x_i: opinion of node i
$\rho(x_i)$: rhetorical issue position
κ_{ij}: coupling strength from $j \to i$
λ_i: latitude of acceptance (LOA)
λ_{min}: minimum LOA
$\Delta\rho_{ij} = \rho(x_j) - \rho(x_i)$

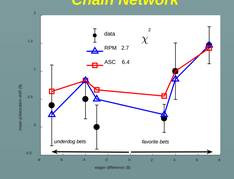
Opinions, LOAs vs. time in ASC model showing majority emergence and persistence



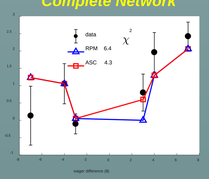
- ***Accept*** message as persuasive
  - Acceptance probability falls off rapidly beyond uncertainty range (LOA)
  - Depends directly on rhetorical issue position
- ***Shift*** opinion in proportion to opinion difference
- ***Constrict*** LOA if message originates from within LOA
  - Agreement from others solidifies position
- Uncertainty reduction dynamics enables proximate majorities to form and hold their position

Models vs. Data

Chain Network



Complete Network



- Simulation conducted using actual spreads and wagers
- Complete weights equal; middle node in chain given double weight
- Round simulation value up to nearest whole dollar
- 1 free parameter for RPM model, 3 for ASC
- Fit to minimize total χ^2 over both networks

Qualitative Agreement

- Only favorite side shows polarization
- Polarization increases with disagreement
- Complete shows greater polarization than chain

Quantitative Agreement

- RPM model passes χ^2 goodness of fit test: Q=.61
- ASC model passes: Q=.30

Potential Applications

- Small group decision making
  - Political leadership, judicial councils, juries, intelligence analysis, forecasting
- Public opinion
  - Extremism, divergent polarization, discussion networks, citizen deliberation