

“Gerrymandering in the Laboratory”

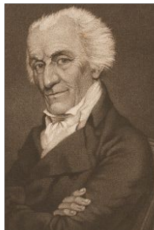
SunAh An Buddy Anderson Cary Deck

The University of Alabama

EC698 November 15, 2021

What is gerrymandering?

- ▶ The manipulation of the boundaries of electoral constituencies to favor one election outcome over another
- ▶ Etymology: in 1812 Massachusetts Governor Elbridge Gerry signed a bill redrawing state senate districts



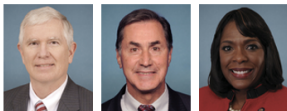
Elbridge Gerry



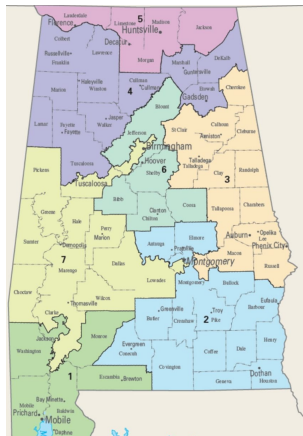
Gerry's Salamander

Alabama Congressional Districts

Alabama is 25%
African-American



Alabama Representatives



Alabama Congressional
Districts

Literature Review

- ▶ Optimal Gerrymandering
 - ▶ Two types of voters (Owen and Grofman 1988)
 - ▶ Continuum of perfectly observable types (Gilligan and Matsusaka 1999)
 - ▶ Imperfectly observable types (Friedman and Holden 2008; Gul and Pseendorfer 2010; Kolotilin and Wolitzky 2020)
- ▶ Implications of Gerrymandering
 - ▶ Majority minority districts (Cameron, Epstein and O'Halloran 1996; Grigg and Katz 2005)
 - ▶ Participation (Hayes and McKee 2009)
 - ▶ Policy choice (Shots 20002; Besley and Preston 2007)
 - ▶ Polarization (McCarty, Pool, and Rosenthal 2009)

Our Contest Map

- ▶ A Map consists of 3 Districts that each contain 3 Zones
- ▶ Districts are referenced by their color: White, Light Gray, and Dark Gray
- ▶ Players A and B compete for a prize of V by choosing effort expenditures, or bids, for each District
- ▶ To win the contest a player must win the majority of the Districts

A	A	
A		B
	B	B

Gerry_B

A	A	
A		B
	B	B

Symm_{1,1}

A	A	
A		B
	B	B

Symm_{1,3}

A	A	
A		B
	B	B

Symm_{3,1}

A	A	
A		B
	B	B

Gerry_A

Theoretical Predictions

- ▶ Player i 's expected payoff is $E\pi_i = \rho_i V - \sum_d e_{i,d|M}$ for
 - ▶ the probability ρ_i that player i wins the Map and
 - ▶ the expenditure $e_{i,d|M}$ of player i in district d on the given Map M

A	A	
A		B
	B	B

$Symm_{1,1}$

- ▶ The winner of District W wins the contest
- ▶ Standard Tullock Contest for lone, unclaimed Zone in White District
 - ▶ $E\pi_i = \frac{e_{i,W}}{e_{i,W} + e_{j,W}} V - e_{i,W}$ for $j \neq i$
 - ▶ $e_{A,W}^* = e_{B,W}^* = \frac{V}{4}$ and $\rho_i = 50\%$

Theoretical Predictions

Table: Summary of theoretic predictions

Map	District	$e_{A M}^*$	$e_{B M}^*$	ρ_A	ρ_B
$Symm_{1,1}$	W	$\frac{1}{4}V$	$\frac{1}{4}V$	$\frac{1}{2}$	$\frac{1}{2}$
$Symm_{1,3}$	W	$\frac{3}{8}V$	$\frac{3}{8}V$	$\frac{1}{2}$	$\frac{1}{2}$
$Symm_{3,1}$	W, L, and G	$\frac{1}{8}V$	$\frac{1}{8}V$	$\frac{1}{2}$	$\frac{1}{2}$
$Gerry_A$	W	$\frac{1}{4}V$	$\frac{1}{4}V$	$\frac{3}{4}$	$\frac{1}{4}$
$Gerry_B$	W	$\frac{1}{4}V$	$\frac{1}{4}V$	$\frac{1}{4}$	$\frac{3}{4}$

Experimental Design

- ▶ 8 sessions (8 subjects per session)
- ▶ Sessions progress in 3 Stages

Stage 1: 10 periods selecting only effort bids

Stage 2: 3 periods selecting preferred map and effort bids

Stage 3: 1 period selecting preferred map prior to role and effort bids assignment

- ▶ Subjects randomly matched every period
- ▶ One period selected at random for payment
- ▶ Prize value $V = 80$
- ▶ Exchange rate of 4 \$Lab = 1 \$US
- ▶ Programmed in z-Tree (Fischbacher 2007)
- ▶ Conducted at TIDE Lab with \$5 participation payment

Experimental Design

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Figure: Effort selection for each Map

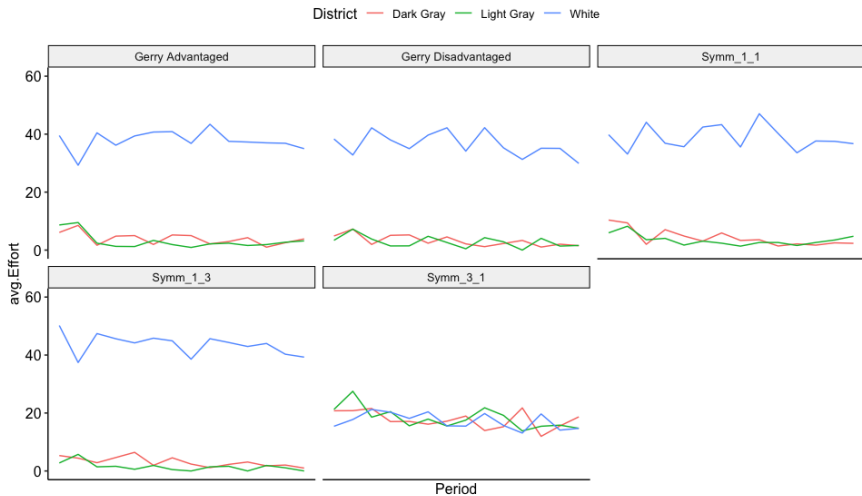
Bidding Behavior Relative to Theory

Table: Equilibrium vs Observed Bids

Map	District	Equilibrium	Observed
$Symm_{1,1}$	W	20	40.2
$Symm_{1,3}$	W	30	43.4
$Symm_{3,1}$	W, L, and G	10	17.6
Gerry Advantaged	W	20	39.2
Gerry Disadvantaged	W	20	36.3

Players A and B do not exhibit different bidding behavior so we can analyze the gerrymandered maps in the context of advantages and disadvantages.

Stage 1 Results



Average bidding behavior over Stage 1

Stage 1 Results

Table: Effect of Map Configuration on Total Bid in Stage 1

	Effort
Adv	-1.470 (1.207)
Disadv	-3.656*** (1.207)
Symm_1_3	1.417 (1.207)
Symm_3_1	7.189*** (1.207)
Constant	47.400*** (0.853)
Observations	3,200
R ²	0.028
Residual Std. Error	21.588 (df = 3195)

Note: *p<0.1; **p<0.05; ***p<0.01

Thoughts on Gerrymandering?

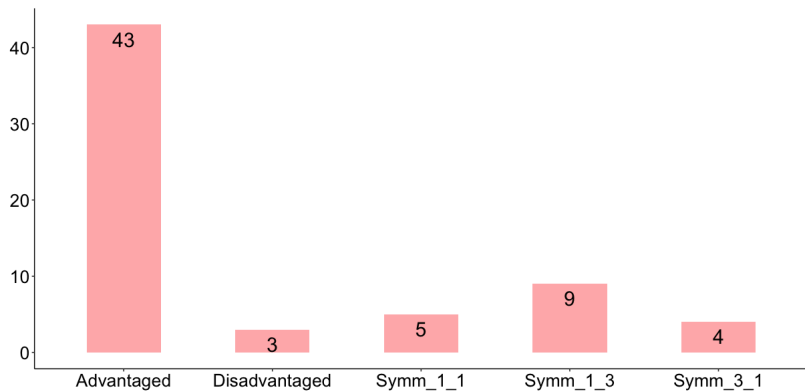
Subjects were asked:

Do you support gerrymandering (the manipulation of the boundaries of electoral constituencies to favor one election outcome over another)?

Responses:

- ▶ Yes: 3
- ▶ No: 61

Stage 2: Map Selection



Politics and Gerrymandering

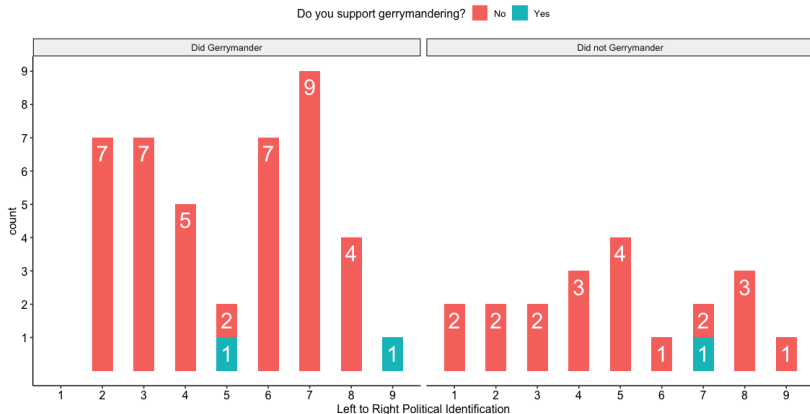
Subjects were also asked:

On a scale of 1 to 9, how would you describe your political views with 1 being extremely liberal (i.e. to the left of the Democratic Party), 5 being centrist (i.e. falling between the Democratic Party and the Republican Party), and 9 being extremely conservative (i.e. to the right of the Republican party).

Responses:

1	2	3	4	5	6	7	8	9
2	9	9	8	7	8	12	7	2

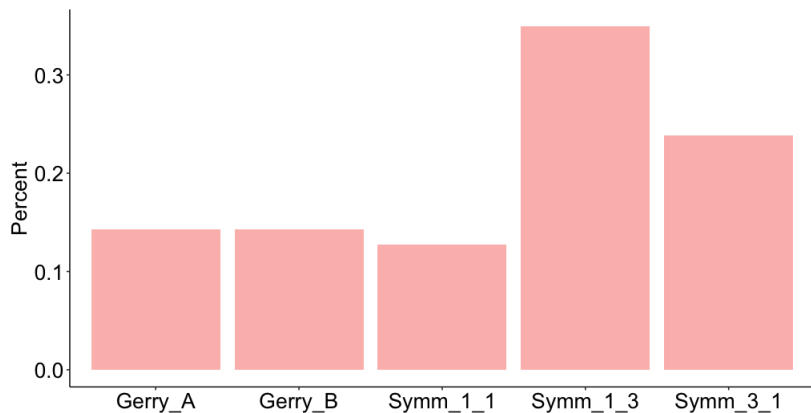
Politics and Gerrymandering



χ^2 test rejects gerrymandering depends on political views
(p-value = 0.3106)

Stage 3: Map Selection

People tend to pick symmetric maps when they do not know their role, **but not the socially optimal map.**



Summary

- ▶ Subjects bid in an intuitive manner
 - ▶ (largely) ignore non-competitive districts
 - ▶ (over)bid on competitive districts on average
 - ▶ evidence in $Symmetric_{3,1}$ of minimal winning coalitions
 - ▶ gerrymandering leads disadvantaged people to be discouraged on average
- ▶ View on gerrymandering
 - ▶ report not liking gerrymandering, regardless of political persuasion
 - ▶ prefer to compete on inefficient but “fair” maps when they cannot be self-serving
 - ▶ overwhelmingly engage in gerrymandering when they can

Advantage and Disadvantage Comparison

