

The effects of malapportionment, turnout, and gerrymandering in Mexico's mixed-member system

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- Hegemonic party 1929–1997
- Three major parties: PRD left, PRI, PAN right, and minors
- Lower chamber of Congress elected every 3 years, concurrent w presidential race every 6 years
- Mixed system: 300 SMD + 200 PR seats
- Single-term limits removed in 2018
- Autonomous regulator (IFE) organizes elections and redistricting

Did 1997 reform remove **party bias** in representation?

- Potential problem wherever districts are drawn to allocate seats (Tufte 1973, Johnston 2002)

If party bias remains, what **factors** drive it?

- Do parties use redistricting in their advantage?
- How do demographic shifts over time affect parties?
- Turnout differentials?

Answers

- ① Persistent bias against the right
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It is the excess/defect seat share that a party with half of the votes gets:

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- Two-party system
- Constant-sum game
- Vote wasting: too-concentrated large party or too-dispersed small party suffer bias (Calvo&Rodden 2015)

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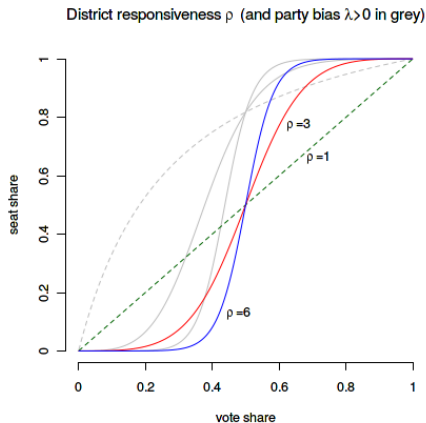
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Obstacle 1: measure party bias

Fitting votes–seats curves: $s = f(v)$

(Rae 1967, Tufte 1973, King&Browning 1987)

$$\frac{s}{1-s} = \lambda \left(\frac{v}{1-v} \right)^\rho$$



Three sources of party bias

Districts	Pop.	Turnout	Raw votes			Vote shares		Seat shares	
			left	right	total	left	right	left	right
Gerrymandering									
1 and 2	420	.5	147	63	210	.7	.3	1	0
3, 4 and 5	420	.5	84	126	210	.4	.6	0	1
nationwide	2100	.5	546	504	1050	.52	.48	.4	.6
Turnout									
1 and 2	420	.70	200	100	300	.67	.33	1	0
3, 4 and 5	420	.35	50	100	150	.33	.67	0	1
nationwide	2100	.5	550	500	1050	.52	.48	.4	.6
Malapportionment									
1 and 2	600	.5	200	100	300	.67	.33	1	0
3, 4 and 5	300	.5	50	100	150	.33	.67	0	1
nationwide	2100	.5	550	500	1050	.52	.48	.4	.6

Grofman, Koetzle & Brunell 1997:

Three additive components

$$\begin{aligned} \text{raw party bias} = & \text{gerrymandering (distributional)} \\ & + \text{malapportionment} \\ & + \text{turnout} \end{aligned}$$

- ① Fitting votes–seats curve with v yields **raw** party bias
- ② with \bar{v} yields the **gerrymandering**-based
- ③ with \bar{w} yields gerrymandering + malapportionment

→ Subtract (3) – (2) = **malapportionment**-based

→ Subtract (1) – (3) = **turnout**-based

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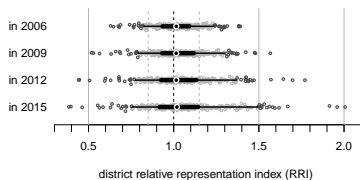
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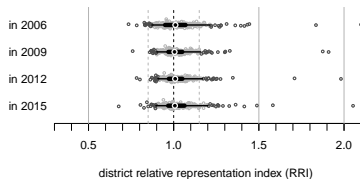
Malapportionment is substantial

$$RRI = \frac{Q}{\text{district size}}$$

2006 map (drawn with 2000 census)



2015 map (drawn with 2010 census)



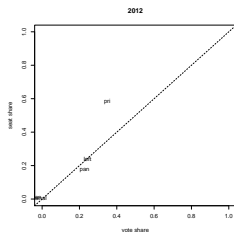
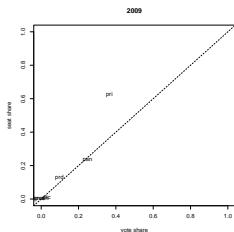
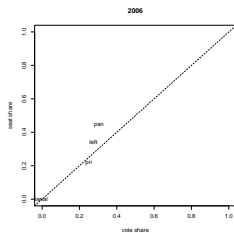
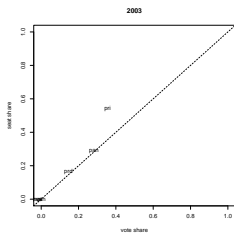
King 1990:

$$E(s_p) = \frac{e^{\lambda_p} v_p^\rho}{\sum_{q=1}^P e^{\lambda_q} v_q^\rho}$$

Bias is expressed relative to a
baseline party (PRI in our case)

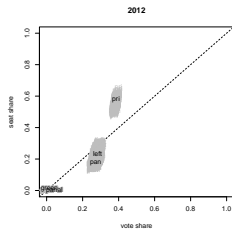
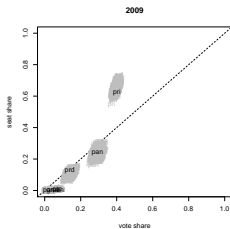
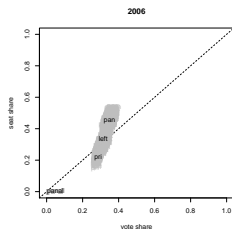
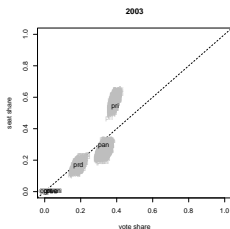
Obstacle 4: small-N

- Linzer 2012: approximates prob. distribution of national party vote returns from observed district outcomes (FMM)
- Use to simulate many elections w Monte Carlo draws

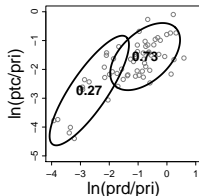
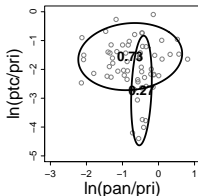
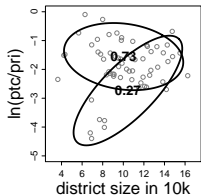
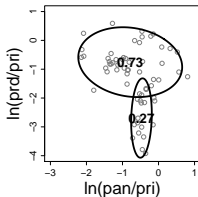
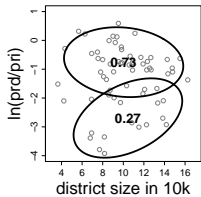
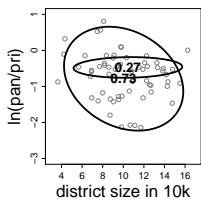


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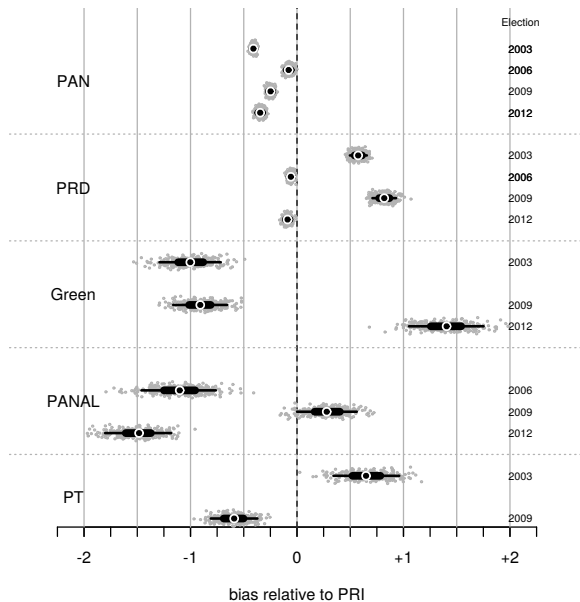
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Two components 2009



Results: raw party bias



Results: components

party bias	Actual map			Hypothetical map		
	pan-pri	prd-pri	min-pri	pan-pri	prd-pri	min-pri
2003 election						
(with 2006 map)						
raw	-.37 (0)	+.72 (0)	-1.01 (0)	-.41 (0)	+.57 (0)	-1.00 (0)
gerrym.	-.09 (0)	+.69 (0)	-.88 (0)	-.13 (0)	+.62 (0)	-.90 (0)
turnout	-.26 (0)	-.11 (0)	-.08 (0)	-.26 (0)	-.09 (0)	-.09 (0)
malapp.	-.01 (.11)	+.14 (0)	-.05 (0)	-.02 (.12)	+.05 (0)	-.02 (0)
2006 election						
raw	-.08 (0)	-.06 (0)	-1.10 (0)			
gerrym.	+.28 (0)	+.30 (0)	-.62 (0)			
turnout	-.36 (0)	-.41 (0)	-.43 (0)			
malapp.	-.00 (.42)	+.05 (0)	-.05 (0)			
2009 election						
raw	-.25 (0)	+.82 (0)	-.91 (0)			
gerrym.	-.11 (0)	+1.01 (0)	-.79 (0)			
turnout	-.14 (0)	-.24 (0)	-.12 (0)			
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2012 election						
(with 2015 map)						
raw	-.35 (0)	-.09 (0)	+1.40 (0)	-.32 (0)	-.13 (0)	+1.03 (0)
gerrym.	-.28 (0)	-.07 (0)	+1.41 (0)	-.24 (0)	-.05 (.06)	+1.02 (0)
turnout	-.07 (.02)	-.08 (0)	+.02 (0)	-.08 (.26)	-.09 (0)	+.01 (0)
malapp.	+.01 (.42)	+.06 (0)	-.02 (0)	-.00 (.38)	+.01 (0)	+.00 (0)

- Turnout always pro-PRI
- Malapp. always pro-left
- Redistricting abates malapp.
- Possibly cancelling effects

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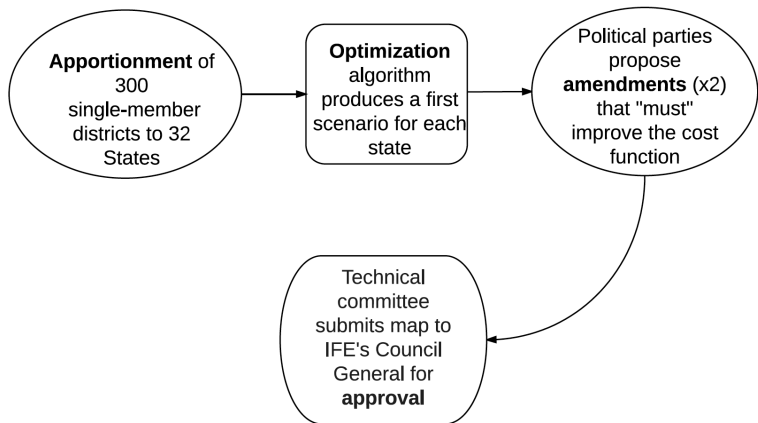
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The redistricting process



Redistricting by experts in 1997, 2006, 2015 (abandoned), and now 2018

- 1 apportionment of 300 seats to 32 states
- 2 optimization algorithm \rightarrow proposal
- 3 parties propose amendments (“must” improve score)
- 4 new map

$$\text{Score} = .4 \times \text{PopBalance} + .3 \times \text{MunicBoundaries} \\ + .2 \times \text{TravelTime} + .1 \times \text{Compactness}$$

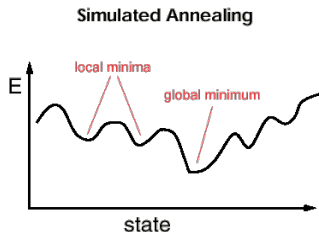
IFE considers $\pm 15\%$ imbalance normal (!)

Optimization algorithm

Simulated annealing = probabilistic meta-heuristic for optimization
locates a good approximation to the global optimum of the cost
function in a large search space

Thousands of iterations using electoral *secciones*

Combinatorial optimization algorithm used to generate the first
scenario in each state



IFE claims that this is a public process, but the
operation and procedures are done **behind closed doors**

Proposals and counterproposals

