

Malapportionment and representation

Party bias and responsiveness in Mexico

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How does malapportionment distort representation?

Sparsely populated areas get same representation as the densely populated

Studies of U.S. and U.K.

- instills bias when one party strong in small districts (as Tories were up to 1997, Johnston 2002)
- Reapportionment Revolution removed bias in different, predictable degrees (Cox&Katz 2002)
- no party bias from malapp. after mid-1960s (Grofman et al. 1997)

How does Mexico fare?

- ① malapportionment? Substantial
- ② Party bias? Not much, but big large-party bonus

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Mexican congressional districts

Redistricting in 1997, 2006, and 2015 (abandoned)

Redistricting process (FPTP):

- ① apportionment of 300 seats to 32 states
- ② optimization algorithm \rightarrow proposal
- ③ parties propose amendments (must improve score)
- ④ repeat 2 and 3
- ⑤ new map

Redistricting by experts, but behind closed doors

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

Topic will be salient when single-term limits dropped in 2015

The bigger project

Draw Mexico project = offspring of *Public Mapping Project in U.S.*

Remove opaqueness from redistricting process

DistrictBuilder is software (open-source)

- enables widespread DIY redistricting thru cloud computing
- internet lets anyone draw/inspect maps: crowdsourcing
- redistricting contests in 6 states → hundreds of legal plans

Application to **Mexico** [▶ Link: MexDemo](#) (Donations?)

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Hamilton method used:

- The quota (or price of a seat) is $Q = \frac{\text{nation's population}}{300}$
- First allocation is $\frac{\text{state's population}}{Q}$, rounded down
- Every state gets 2 seats min. + indigenous voting rights
- Unallocated seats, if any, awarded to states with largest fractional remainders

Most recent decennial census must be used

- ... but no obligation to redistrict as soon as available
- 6-year lag on average: 1997, 2006, 2015
- and IFE considers $\pm 15\%$ imbalance normal (!)

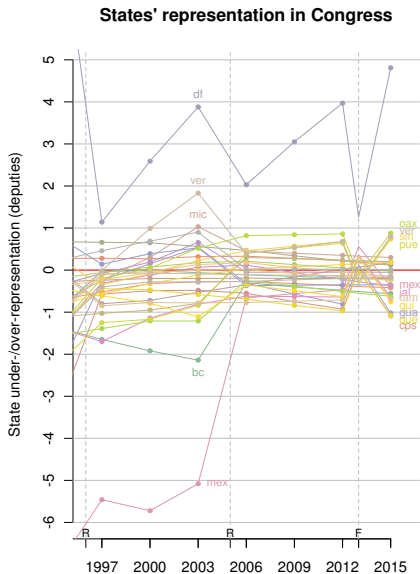
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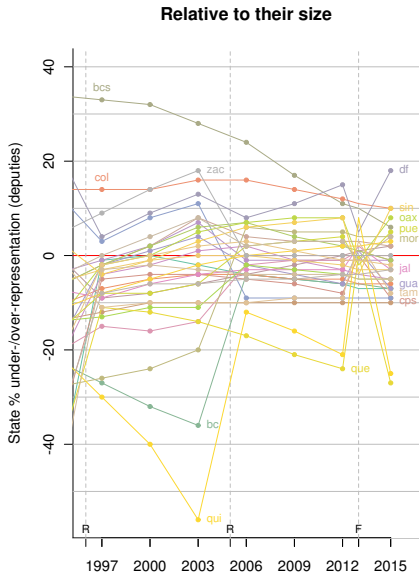
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Malapportionment between states

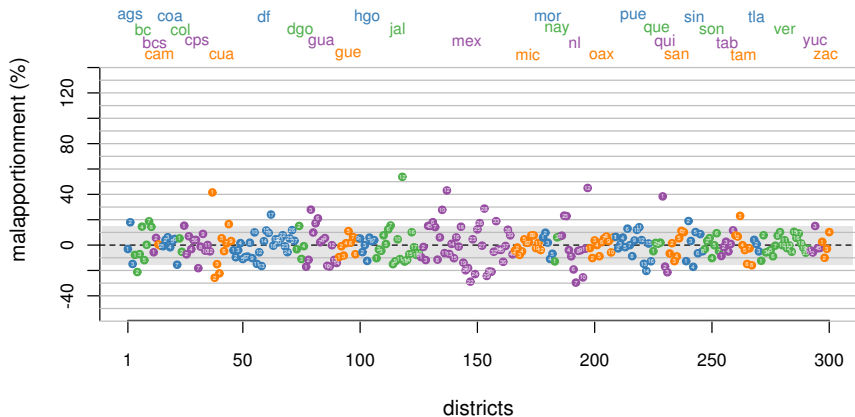


Malapportionment between states



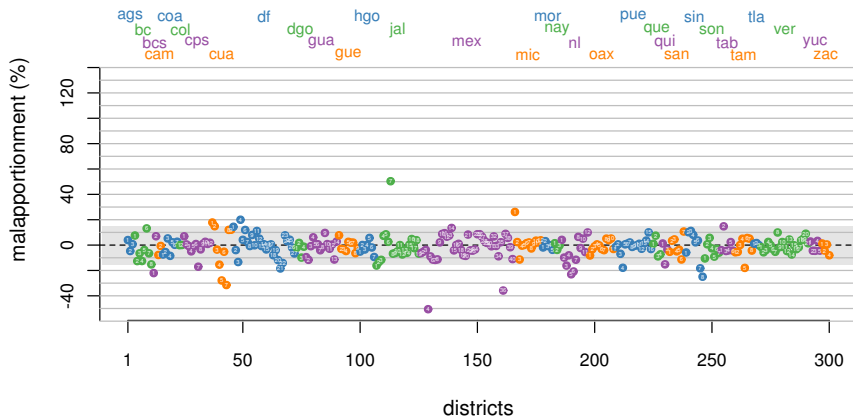
Malapportionment within states

2006 map when inaugurated



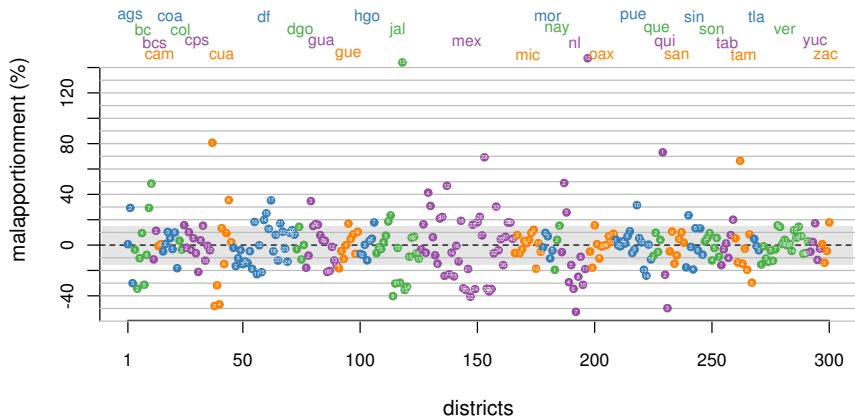
Malapportionment within states

2015 map had it been inaugurated



Malapportionment within states

2006 map in year 2015



Two types of distortion

Focus in the **votes-to-seats** relation

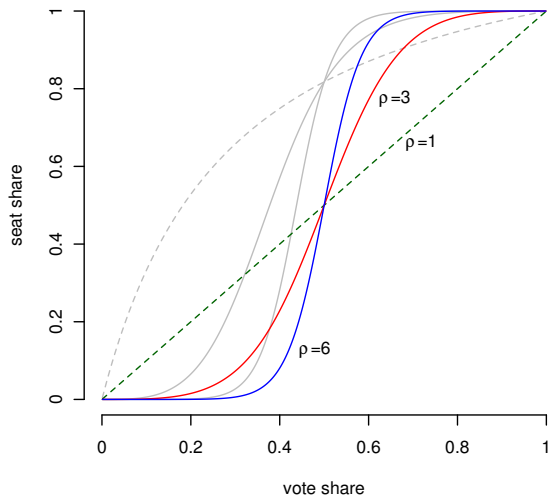
(Rae 1967, Tufte 1973, Lijphart 1994, Taagepera&Shugart 1989)

Two measures of interest:

- ① **Party bias** λ :
helps beneficiary buy seats with fewer votes
("packing")
- ② **Responsiveness** ρ :
seat bonus to large parties
("microcosm strategy")

Two types of distortion

District responsiveness ρ (and party bias $\lambda > 0$ in grey)



Cube Law:

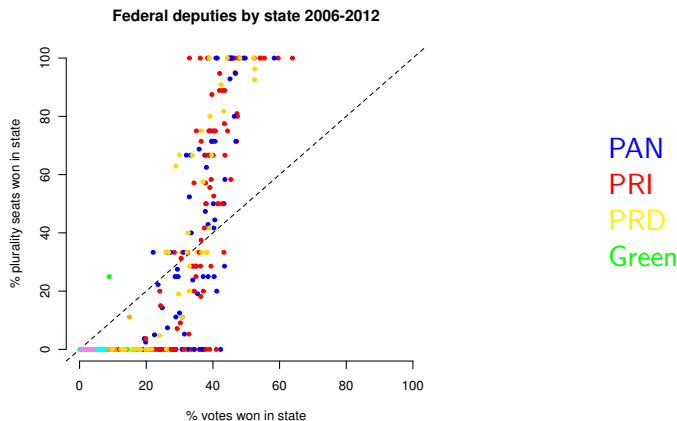
$$\frac{s}{1-s} = \left(\frac{v}{1-v} \right)^3$$

Generalization (King&Browning 1987):

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

Multiparty (King 1990, Calvo&Micozzi 2005):

$$E(s_j) = \frac{e^{\lambda_j} * v_j^{\rho}}{\sum_{m=1}^J e^{\lambda_m} * v_m^{\rho}}$$



- State-level aggregates (average = 9.4 districts, but $\Delta^+ N$)
- 2006–2012 districts constant
- MCMC (3×10^4 iter., every 100^{th} for post. sample)

```

for (i in 1:I){      # loop over state-years
  for (j in 1:J){ # loop over parties (dummy selects those who ran that year)
    S[i,j] ~ dbin(pi[i,j], D[i]) # D is number SMD seats in obs. i's state
  }
  numerator[i,1] <- dummy[i,1] * exp( lambda[1] + rho * log(v[i,1]) )
  numerator[i,2] <- dummy[i,2] * exp(          rho * log(v[i,2]) )
  for (j in 3:J){
    numerator[i,j] <- dummy[i,j] * exp( lambda[j-1] ) * v[i,j]^rho
  }
  for (j in 1:J){ # loop over parties (dummy selects those who ran that year)
    d1[i,j] <- dummy[i,1] * exp( lambda[1] ) * v[i,1]^rho
    d2[i,j] <- dummy[i,2]          * v[i,2]^rho
    d3[i,j] <- dummy[i,3] * exp( lambda[2] ) * v[i,3]^rho
    d4[i,j] <- dummy[i,4] * exp( lambda[3] ) * v[i,4]^rho
    d5[i,j] <- dummy[i,5] * exp( lambda[4] ) * v[i,5]^rho
    d6[i,j] <- dummy[i,6] * exp( lambda[5] ) * v[i,6]^rho
    d7[i,j] <- dummy[i,7] * exp( lambda[6] ) * v[i,7]^rho
    denominator[i,j] <- d1[i,j]+d2[i,j]+d3[i,j]+d4[i,j]+d5[i,j]+d6[i,j]+d7[i,j]
    pi[i,j] <- numerator[i,j] / denominator[i,j]
  }
}
}

### priors
for (p in 1:6){ # there are 7 party labels in the 3-election data, PRI is reference
  lambda[p] ~ dnorm( 0, tau.lambda )
}
tau.lambda <- pow(.25, -2)
rho ~ dexp(.75) # this has positive range, median close to 1, mean 1.25, max 4.5

```

- PRI has strong bases of support in rural districts
- rural districts under-populated
- State-years above 45° line (2006–12):

PRI 3/5

PAN 2/5

PRD 1/4

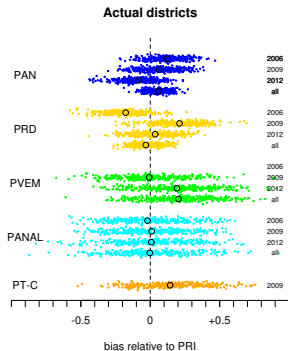
Johnston-like hypothesis:

Might malapportionment → bias in favor of PRI?

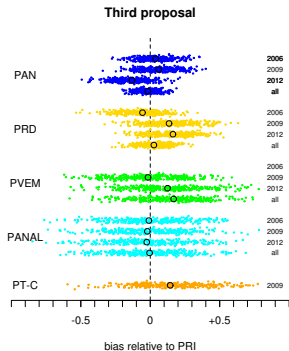
Against PAN? PRD?

Results: party bias

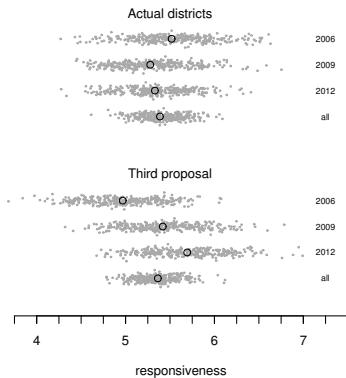
2006 map



2015 map



District responsiveness in three elections



Preliminary analysis reveals that:

- ① Substantial malapportionment
- ② No evidence of systematic party bias
- ③ Huge large-party bonus (PRI is small in few states)
- ④ Are effects of malapp. eclipsed by inter-election volatility?
- ⑤ Study residuals from estimation: relation to malapp.? turnout diff.? geography of support?
- ⑥ Larger project [▶ Link](#)

Thank you!

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