Three Tests to Detect Partisan Gerrymandering

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Gov. Elbridge Gerry + Salamander = Gerrymander

- Process existed since 1705
- District resembled Salamander over Federalist Party
- Favors Democrat-Republicans Massachusetts
- Gov. Elbridge Gerry re-drew 1812 by the Boston Gazette

Cartoon of South Essex
<table>
<thead>
<tr>
<th></th>
<th>1812 State-Wide</th>
<th>1812 Seats Won</th>
<th>1812 Support in Winning Districts</th>
<th>1812 State-Wide</th>
<th>1812 Seats Won</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Federalist</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1813 Seats Won</td>
<td>29</td>
<td>11</td>
<td>56%</td>
<td>51%</td>
<td></td>
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<tr>
<td>1813 State-Wide</td>
<td>56%</td>
<td></td>
<td>71%</td>
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<tr>
<td><strong>Democrat-Republican</strong></td>
<td></td>
<td></td>
<td>56%</td>
<td>49%</td>
<td></td>
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<tr>
<td>1813 Seats Won</td>
<td>44%</td>
<td>29</td>
<td></td>
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<tr>
<td>1813 State-Wide</td>
<td></td>
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This paper applies these methods to district seat results between 1812 - 2010.
Violates Spirit of Constitution

"Packing voters into districts based on their partisan affiliation [infringes upon] the right to public self-expression, or freedom of speech.

"Chilling of partisan choice [infringes upon] freedom of association.

"Chilling of freedom of association [infringes upon] right to public self-expression, or freedom of speech.

"Packaging voters into districts based on their partisan affiliation [infringes upon] the right to public self-expression, or freedom of speech.

"GM is not a partisan gerrymandering case since 1986 with Davis and Bandemer.

GM is not exclusive to partisan gerrymandering cases.

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But there hasn't been a way to prove in court that gerrymandering has occurred. (Except in Vieth vs. Jubelnger Supreme Court case 2004, showed GM is not exclusive to partisan gerrymandering cases.)

GM is not exclusive to partisan gerrymandering cases.
Easier than ever to gerrymander because:

- The Big Sort
  - Similar geographic region <=> Similar politics
  - Urban Concentration
    - Similar geographic region => Similar politics

- More detailed data
- Good census data

- Computer-based districting
  - Politicians don't have to do the math
  - Pretty optimal

- Single-party rule
  - Pretty optimal
  - Party in power makes the choices

- Single-party rule

- X-treme Bipartisanship

The Big Sort
Dave’s Redistricting App

Software exists to gerrymander based on your input parameters, with real census data, on your input parameters, with real census data.

For all states but Alaska

(Dave is a Microsoft guy)

Only works with Internet Explorer

Gerrymander (8 - 0)

This is an example Dem.

http://swingstateproject.com/
be based on the general concept of partisan symmetry.

Proposed Minimum Qualities for a Standard to Avoid Crassly Anti-Majoritarian Outcomes

1. NOT be based on the general concept of partisan symmetry
2. NOT lazily use geographic boundaries or distinguishing procedures
3. NOT use election results for offices other than the ones that are in dispute
4. can clearly state without case-specific or mathematics-intensive assumptions, to allow courts to instruct experts on how and where to apply more detailed mathematical analysis or other analyses.
Districts MUST be drawn for minority groups, where they will dominate the vote.

Guarantees minority voices are not suppressed

Other criteria include i.e., compactness

The fraction of such districts does not exceed fraction of minority population

Majority-Minority Districts & Gingles criteria
Packing (Before)

Majority

Minority
Packing (After)

Majority

Minority
Cracking (Before)

Majority

Minority
50 Precincts are to be apportioned into 5 districts, with 60% Yellow and 40% Green.
Each district has 10 precincts. The districts are apportioned among 5 districts.

40% Green
60% Yellow

50 precincts

Fair

Proportional Outcomes

2 Green
3 Yellow
5 Districts

2 Green
3 Yellow
5 Districts
FAIR
Green and yellow win in proportion to their voting
proportion.

UNFAIR
Green wins all majority districts.

5 Districts
3 Yellow
2 Green

Proportionate Outcomes

50 Precincts
60% Yellow
40% Green

Disproportionate Outcomes
“Gerrymandering”

5 Districts
5 Yellow
0 Green

5 Districts
0 Yellow
5 Green

5 Districts
3 Green
2 Yellow
Michigan

Rep: 5D, 9R

<50% D

Continuons(ish)

Michigan

"Packing" Required

Districts

Majority-Minority

Voting Rights Act

Packing vs. Crackting

Districts

"Correct"
Results

- Non proportional representation
- Maryland is one of worst in nation
- Maryland is gerrymandered, result of paper
- Maryland 1973 - 82
Non proportional representation

Maryland is one of worst in nation

Maryland is gerrymandered, result of paper.

Maryland 2013 - today

Results
Arizona is not gerrymandered.

Even though the LESS POPULAR party held more seats (2012)...

...by statistical review.
Court Request

1986 -- Supreme Court:

"a test for gerrymandering should demonstrate both intents and effects"

"(1) intent—an established purpose to create a legislative districting map to disempower the voters of one party; and

(2) effect—proof that an election based on the contested districting scheme led to a distorted outcome"

Court Request:
Spirit of the Three Statistical Tests

(1) Compare number of seats won vs. district expectations -- WITH COMPUTER SIMULATION
but Rep. districts won by landslides?

Are Dem. districts won consistently close

(2) a discrepancy in winning vote margins between the two parties

-- WITH COMPUTER SIMULATION

(1) Compare number of seats won vs. district expectations

Spirit of the Three Statistical Tests
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(1) Compare number of seats won vs. district expectations
   -- WITH COMPUTER SIMULATION

(2) a discrepancy in winning vote margins between the two parties
   -- WITH SIMPLE STATISTICS

(3) the construction of reliable wins for the party in charge of redistricting, as measured by either the difference between mean and median vote share, or an unusually even distribution of votes across districts.
   -- WITH SIMPLE STATISTICS
Compare: outcome of an election after redistricting and simulated seats/votes curve. Does that outcome favor the redistricting party?

For a state containing N districts, calculate the difference between the actual seats and the simulated expected number and divide by the standard deviation to obtain the difference, Delta:

\[
T \text{ Score} = \frac{0.5 \times \sqrt{20}}{18 - 10} = 0.97577
\]

P Value = 0.001005

**Test 1: Excess Seats Test -- Analyses of Effects**
95% Range

Simulation results curve based on 95% probable range over区间的概率

Dys- bad, abnormal
Dis- reversal/negation

Zone of Chance
Compare the proportion of votes in the districts that Democrats win, with proportion in Republican wins. In GM, the opposition party wins landslide victories in few districts, but incumbents narrowly win in many. Use grouped t-test

Test 2: Lopsided Outcomes Test - Analysis of Intents
GMing offers secure wins for the incumbents with narrow, but reliable victories.

State's partisan vote:

Closely divided state, reliable wins occur when the average and median vote differ from one another.

Test 3: Reliable Wins Test - Analysis of Intents of Intents
GMing offers secure wins for the incumbents with narrow, but reliable victories.

State's partisan vote:

- Closely divided state,
  - Reliable wins occur when the average and median vote differ from one another.
  - Party's strength is spread high evenly across districts.

One Party dominated state,

- Reliable wins occur when that party's districts differ from one another.

Compare δ ofWinner's districts in state vs. out of state/nationwide + Chi-squared test

Test 3: Reliable Wins Test - Analysis of Intents
Table 2

<table>
<thead>
<tr>
<th>Test 1 (Simulation)</th>
<th>Test 2 (Logistic Regression)</th>
<th>Test 3 (Skewed Distribs)</th>
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<tbody>
<tr>
<td>Democratic Median</td>
<td>Republican Median</td>
<td>Difference</td>
</tr>
<tr>
<td>Democratic Average</td>
<td>Republican Average</td>
<td>Difference</td>
</tr>
<tr>
<td>Test 2</td>
<td>Test 3</td>
<td>Test 1</td>
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Results of Three Tests for Partisan Gerrymandering for the Congressional Elections of 2012
Don't use any maps

- Combines with other (geographic) state-mandated requirements
- Can be used separately or combined to reduce false positives and negatives
  - "can be applied independently of evaluation of intent"

3 Tests but 4 Good Things