PHPE 308M/PHIL 209F
Fairness

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Kinds of Gerrymandering

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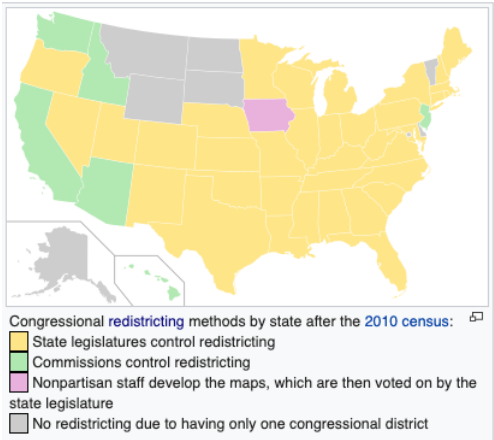
- **Partisan Gerrymandering:** redistricting that favors one political party or disfavors another. What is commonly referred to by 'gerrymandering.' Examples date back to elections for the First US Congress!
- **Bipartisan (Incumbent) Gerrymandering:** drawing politically safe districts that favor incumbents regardless of political affiliation (i.e., packing). Example: 2000's California. Not very common overall.

Non-Partisan Commission



"Ideally, of course, it would be preferable to eliminate gerrymandering entirely by having an independent commission draw the district lines of a state..." (Brams, p. 69)

Moon Duchin, Olivia Walch (eds.). *Political Geometry: Rethinking Redistricting in the US with Math, Law, and Everything In Between*. Birkhäuser, 2022.

Metric Geometry and Gerrymandering Group
https://mggg.org/

Bizarre Shapes

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- If we expect that different kinds of people with shared community interests tend to clump together, then jagged lines may indicate that an unspoken agenda has dominated over the contours of neighborhoods and communities.
- Finally and possibly most persuasively, we may worry that those who draw the lines just have too much detailed control over outcomes. Wildly winding boundaries flaunt the power of the pen.

Bizarre Shapes?

- There can be benign reasons for ugly shapes.
- Even more importantly, districts that are plump and squat and symmetrical to the eye offer no real seal of quality.

Bizarre Shapes: Alabama's 1st District

Figure 3: Alabama's 1st district.

The parts of its boundary that are not dictated by physical geography tend to follow county lines fairly faithfully.

And county lines may be tortuous themselves, but you wouldn't want to punish a district for following them!

Bizarre Shapes: The Twitter Plan

Figure 5: Philadelphia-area inset of the 2011 enacted Congressional plan (left) and the replacement map proposed in 2018 by Republican legislative leaders (the "Twitter plan," right). The replacement *looks* great, but both plans only have 4 out of 18 Democratic-majority districts when laid over the 2016 Senate vote pattern, which was nearly equal between the two major parties. (Compare Figure 12.)

Evaluating Districting Plans

If you want to evaluate whether an election result should make you distrust the districts, *you should really be comparing the plan to other possible ways of districting the same jurisdiction*.

Many people hold the strong intuition that disproportions give prima facie evidence of abuse. That is, **a group with 30% of the votes would have gotten 30% of the seats, if the lines had not been rigged.**

Massachusetts

If you consider the elections for President and U.S. Senate held in MA since the year 2000, the Republican share of the statewide vote is most often between 30 and 40%, averaging over 36%.

Since that's well over a third of the vote and we have nine seats to fill, you might expect a fair map to send three Republicans to the House in each cycle; meanwhile, **the last time a Republican won any MA Congressional district was in 1994.**

Massachusetts

Consider the Bush-Gore election in 2000: There is literally no way to put together a subset of the state's 351 towns making up enough population for a district—no matter how disconnected and scattered—that preferred Bush.

That sounds like a paradox, but it's easily explained. Though Bush won 35.2% of the statewide vote, only 32 towns preferred Bush outright, making up under 3% of the state population.

Preferences were very flat around the average, and there just aren't enough Bush-majority towns to anchor a district, no matter how cleverly you group them.

Massachusetts

The problem is that even though Republican voters are nearly a third of the state, they are also about a third of every town and a third of every precinct so no combination of units can combine to form a Republican majority, even if you throw niceties like compactness and contiguity to the winds.

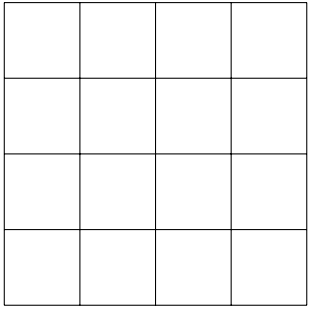
And this phenomenon carries over to any group in the numerical minority. **You need a certain level of nonuniformity in the distribution for districting to offer even a theoretical opportunity to elect.**

The takeaway is that districts are ineffective if a minority is dispersed.

Counting District Plans: 4×4 Grid

Suppose you want to divide a 4×4 grid it into four "districts" of equal size, 4 units each. The only requirement is that the districts should be contiguous.

How many ways districting plans are there?



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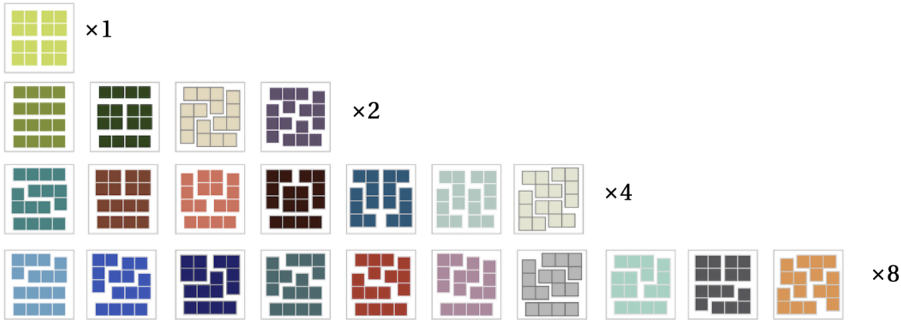

Figure 6: The 4×4 grid has 117 four-district plans—start with the 22 types shown here and apply rotations and reflections to get the full list. Try for yourself! No matter how you rotate or reflect the first plan, it looks the same (so it only contributes $\times 1$ to the ultimate list), but each plan on the next row is one of a pair of variants (so they contribute $\times 2$).

Counting District Plans

At the time of writing, the best methods can handle 7×7 grids in seconds and 8×8 grids in minutes, but the 9×9 is a much more formidable computing task and the 10×10 is out of reach.

Now try 18 districts built from Pennsylvania precincts!...Forget about getting an answer during a 10-year census cycle; **this complete enumeration calculation almost certainly can't be done before the heat death of the universe.**

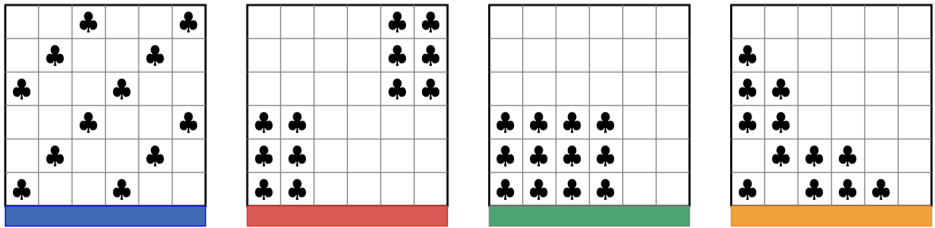

Figure 7: Spatiality matters! For each of these different ways of arranging 12 clubs voters, I've used a "same/different" count to measure clustering. by noting how many pairs of neighbors have matching or different symbols; for instance, 44 pairs of neighbors in the orange grid have the same marking (club-club or blank-blank) while 16 neighbor pairs are different (club-blank). In network science, this kind of same/different statistic is called *assortativity*. This captures something (but not everything) about the geometry of the configuration.

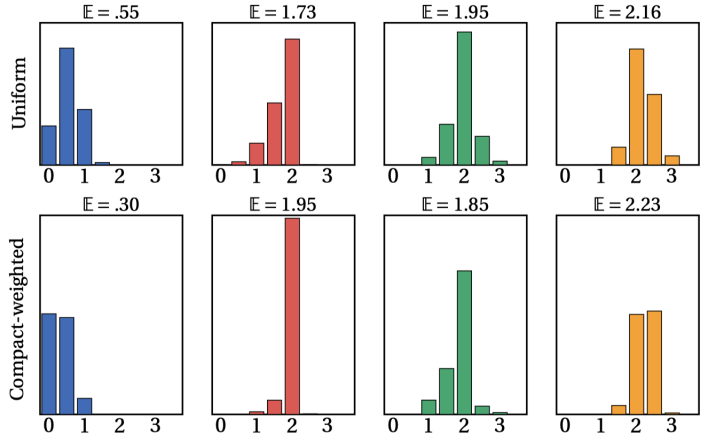

Figure 8: How much can I gerrymander? This plot shows how many seats would be won by the clubs party for every single way of districting the grid—there are 451,206 contiguous plans in all. (I gave clubs credit for .5 of a district if it got three out of six votes.) The top row is uniform: all plans are weighted equally, so for instance the most common outcome on the red grid is that two out of six seats are held by the clubs party. The bottom row shows the exact same set of possibilities, but where plans are weighted according to compactness—plump plans get heavier weight and snakey plans contribute more lightly to their histogram bars. (To be precise, this uses *spanning tree weighting*, which will be explained a bit further below.) So if there's a preference for choosing compact plans, the two-seats outcome becomes overwhelmingly likely on the red grid.

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- **Compact**: The districts should be reasonably shaped. ...Whatever that means! Language varies on this one, but for the most part it's a matter of the eyeball test. At least 37 states reference this principle.

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- **Communities of interest**: Groups with significant shared interests should be strategically placed in order to boost their voice in government. While it's one of the most conceptually important, this principle is especially open-ended. Shared interests could be about industry, environment, or culture, and groups are sometimes better served by being kept together and sometimes by forming a significant part of multiple districts.

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- **Nesting**: Eight states currently require the state House districts to nest inside the state Senate districts two-to-one, and two additional states require three-to-one nesting.

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- **Partisan properties**: A handful of states have rules indicating that there is a priority on the creation of competitive districts or districts that react responsively to changes in voter opinion, and numerous states have considered adopting language of that kind. Several other states forbid considering partisan data in the redistricting process.

Solutions

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- does the solution have its own adverse side-effects?

S. Brams (2020). *Making Partisan Gerrymandering Fair: One Old and Two New Methods*. Social Science Quarterly, 101(1), pp. 68 - 72.

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For example, if a state has 10 congressional districts and the Democratic Party candidates won 60 percent of the statewide vote in the previous congressional elections, it would receive a part that comprises 60 percent of the population (and six seats) and the Republican Party a part that contains 40 percent of the population (and four seats).

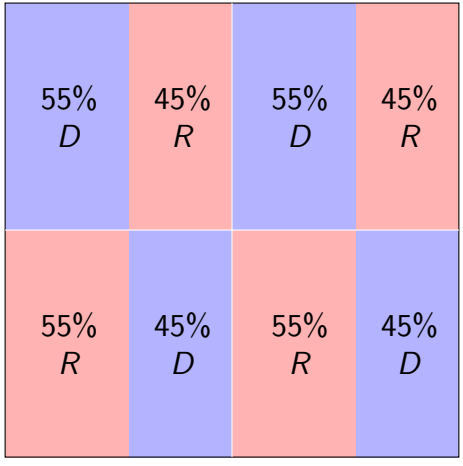
Dividing the State

1. Draw a line through the state creating a partisan replica of the entire state, insofar as possible, in each of the two parts. In the preceding example, each part would be 60 percent Democratic and 40 percent Republican, duplicating the partisan makeup of the entire state.

2. "Divide-and-choose": Give the majority party the right to proportionally divide the state into the two parts. The minority party would then choose whether its part is clockwise or counterclockwise of the radius of a circle that encompasses the state and be able to gerrymander this part unilaterally.

For this purpose, embed a state in a circle whose center is the population center of mass of the state. This is the physical point in a state about which the population is evenly distributed.

Put another way, this center equalizes the "pull" of the population in all directions. It may be in a big city, or it may be between two or more cities in an underpopulated part of the state. It is the point at which the entire population of the state can be concentrated that balances its pull in all directions.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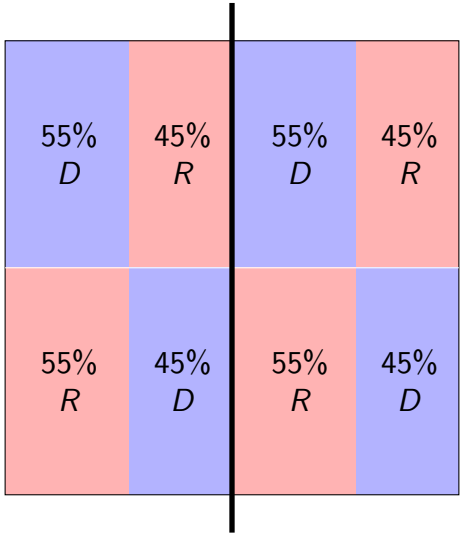

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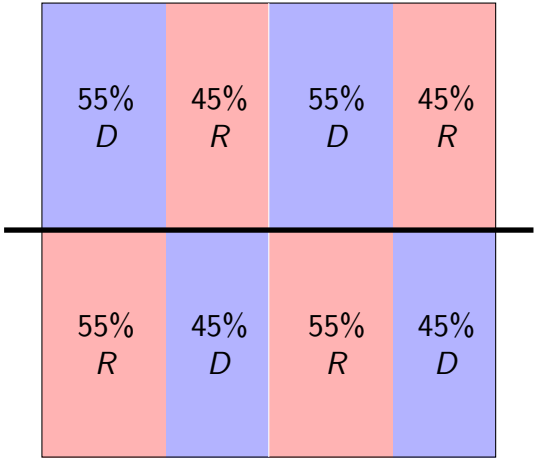
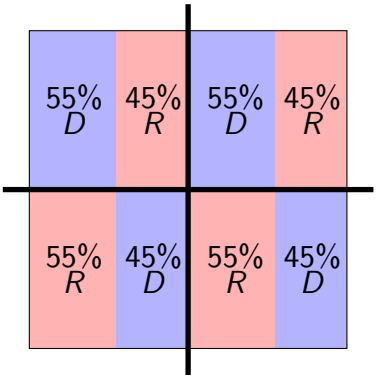


55%, 45%



If the parties are risk averse, it seems likely that they would choose the horizontal division, ensuring each of one district.

If they are risk prone, they would choose the vertical division, giving each a *chance* of winning both districts.

Thus, the two methods may lead to very different outcomes, with the first giving the parties no leeway in choosing a division and the second allowing them some choice.

Neither method is a panacea in making gerrymandering fair by ensuring that each party can obtain a number of districts approximately proportional to its vote share in the last congressional elections. But each should facilitate the parties' ability to prevent extreme gerrymanders, whereby the party in control of a state is able to gerrymander the entire state and thereby win a disproportionate number of districts.

Try districting yourself

https://districtr.org/

Fair Representation Act

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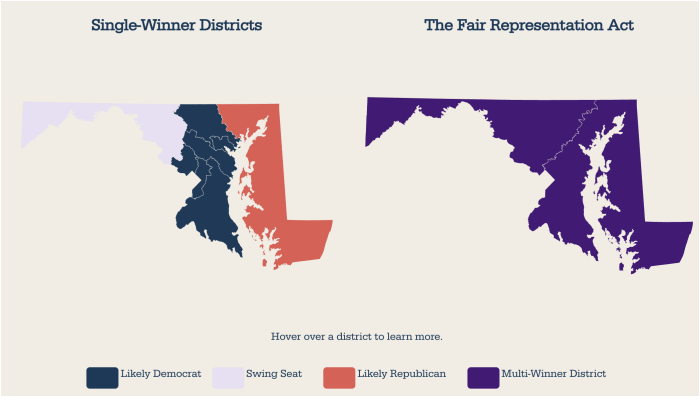
The bill requires (1) that ranked choice voting be used for all elections for Senators and Members of the House of Representatives, (2) that states entitled to six or more Representatives establish districts such that three to five Representatives are elected from each district, and (3) that states entitled to fewer than six Representatives elect all Representatives on an at-large basis.

https://fairvote.org/our-reforms/fair-representation-act/

Fair Representation Act in Maryland



https://fairvote.org/the-fair-representation-act-in-maryland/

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2. Use Single Transferable Vote (STV) to select the multiple winners giving the rankings of the voters.

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Is this a good idea?

MGGG Lab (2022). *Modeling the Fair Representation Act*. https://mggg.org/FRA-Report.

Gerdus Benade, Ruth Buck, Moon Duchin, Dara Gold, and Thomas Weighill (2021). *Ranked Choice Voting and Proportional Representation*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3778021.