Metrics – UPDATE: Do I need this?

This study compares ten measures of partisan bias for the two approaches.

## Measures of Seats–Votes Partisan Advantage

The first three are measures of partisan advantage with a seats–votes benchmark.[[1]](#footnote-1) Each is a function of the statewide vote share () and the likely seat share (). All incorporate the actual or an idealized value of responsiveness ().

The efficiency gap () embodies a constant responsiveness of two.

(1)

Proportional () measures the difference between the likely seat share and an ideal seat share that matches the statewide vote share, i.e., a responsiveness of one:

(2)

Gamma () uses responsiveness measured at the statewide vote share:

(3)

## Measures of Partisan Symmetry

The next four metrics measure some aspect of a seats-votes curve: seat bias (), vote bias (), geometric seat bias (), and global symmetry (). Neither vote bias nor global symmetry measures a difference in seat shares; therefore, they are not measures of .

Seats bias () measures a difference in seat shares:

(4)

Vote bias () also measures a difference in vote shares: the vote share required to win 50% of the seats implied by the inferred seats–vote curve.

Geometric seat bias () measures a difference in seat shares at statewide vote share:

(5)

Global symmetry () measures the area of asymmetry between the Democratic and Republican seats–votes curves – basically the geometric seat bias summed over the entire range of vote shares, normalized by the total seats–votes unit square.

HERE

(5)

## Measures of Partisan Gerrymandering

The first three metrics measure partisan gerrymandering via packing and cracking: declination (), lopsided outcomes (), and mean–median () (Warrington 2019). While packing and cracking is an interesting quantity, none of these metrics measures the difference in seat shares. Hence, they are not measures of as I have defined it.[[2]](#footnote-2)

These are their detailed definitions.

Given vote shares by district , declination () measures a difference in angles:

(6)

where:

the fractional seat probability for vote share

Lopsided outcomes () measures a difference in *vote* shares:

(7)

Mean–median () also measures a difference in vote shares:

(8)

These measure partisan gerrymandering via packing & cracking but not .

1. Jon Eguia’s partisan advantage with a jurisdictional baseline is not included. It requires county-level information which is available in DRA proper. This analysis used the standalone analytics functionality (dra2020/dra-analytics) which does not have that information. [↑](#footnote-ref-1)
2. Even though their units of measure invalidate them as measures of , their measurements sometimes also violate the constraint that super-proportional outcomes can’t favor the minority party, e.g., suggesting that the IL 2012 plan favors Republicans. [↑](#footnote-ref-2)