

CORRECTING BIAS IN MEASURES OF PARTISAN AND RACIAL GERRYMANDERING

Sanford Gordon[†] and Sidak Yntiso^{*}

Wilf Department of Politics, New York University

[†]<https://sanfordgordon.com/> ^{*}sidakyntiso.github.io

How should we measure partisan and/or racial gerrymandering?

- Substantive: implications for representation
- Legal: Are justiciable standards possible?
- Challenges to existing methods
 - “Partisan bias” measures rely on unrealistic counterfactuals
 - Compactness/contiguity measures ignore spatial distribution of voters
 - Partisanship not immutable/suspect classification

Popular Approach: Efficiency Gap (EG)

Proposed by Stephanopoulos and McGhee (2015)

- Relies on distribution of party’s wasted votes w_p (votes for losing party + votes for winning party in excess of 50%)

Then

$$EG \equiv \frac{\sum_{i=1}^N (w_D - w_R)}{\sum_{i=1}^N v_i} = \widehat{\Pr}(wasted \cap D) - \widehat{\Pr}(wasted \cap R)$$

Proposed standard: $EG \in [-0.08, 0.08]$

Challenge: Base Rate Neglect

What we want is not

$$\widehat{\Pr}(wasted \cap D) - \widehat{\Pr}(wasted \cap R)$$

But

$$\begin{aligned} & \widehat{\Pr}(wasted|D) - \widehat{\Pr}(wasted|R) \\ &= \frac{\sum_{i=1}^N (w_D)}{\sum_{i=1}^N v_i^D} - \frac{\sum_{i=1}^N (w_R)}{\sum_{i=1}^N (1 - v_i^D)} \end{aligned}$$

- This is the voter-centric measure proposed by Cover (2018) and Nagle (2017)
- More generally, it is a measure of the attributable risk (of partisanship)

Features of Attributable Risk Approach

1. Preserves proportionality (by contrast, EG has rejected “double-proportionality” feature) (Warrington 2019);
2. Allows one to weight different types of wasted votes (Bernstein and Duchin 2018);
3. Does not break down in states with few districts (cf., Cho 2017);
4. Accounts for spatial distribution of voters;

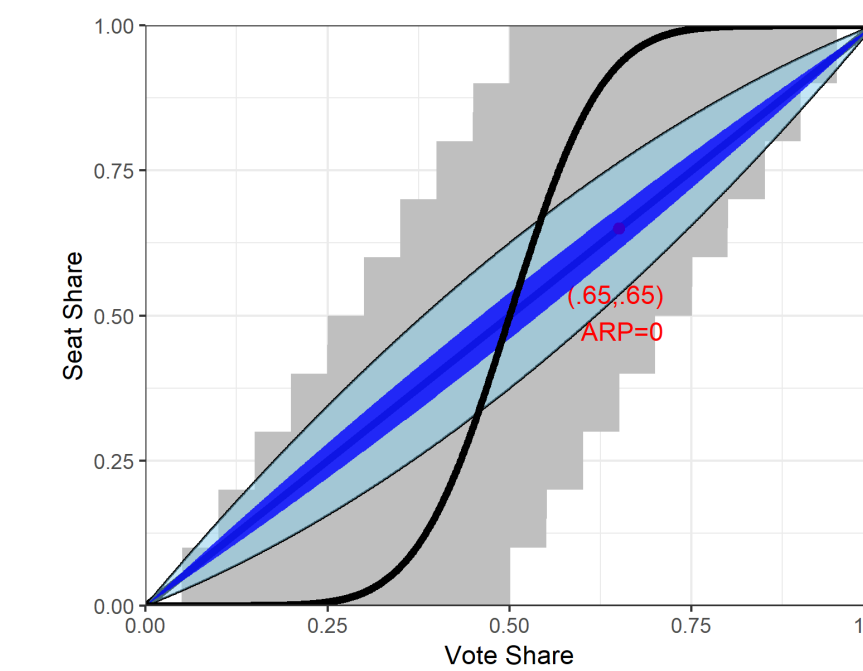


Fig. 1: EG Violates Proportionality

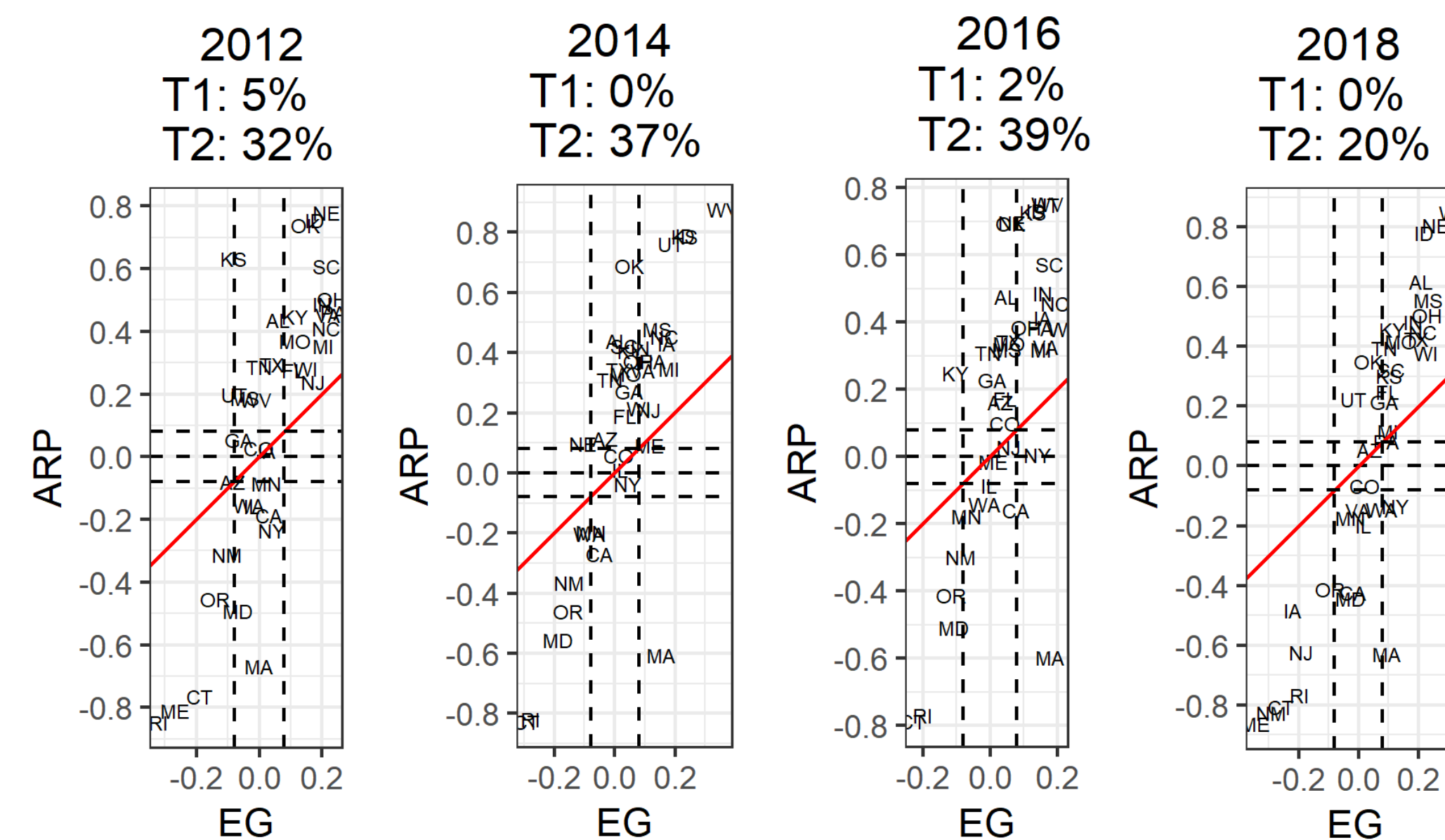


Fig. 2: 2012-2018 Congressional Districts

The Attributable Risk of Race (ARR)

$$ARR \equiv \frac{\sum_{i=1}^N (w_B)}{\sum_{i=1}^N v_i^B} - \frac{\sum_{i=1}^N (w_W)}{\sum_{i=1}^N v_i^W} = \widehat{\Pr}(wasted|B) - \widehat{\Pr}(wasted|W)$$

$$\begin{aligned} w^B &= \sum_{i \in SD} (V_i^{RB}) + \frac{V_i^{DB}}{V_i^{DB} + V_i^{DW}} (V_i^D - \frac{V_i}{2}) \\ &= \sum_{i \notin SD} (V_i^{DB}) + \frac{V_i^{RB}}{V_i^{RB} + V_i^{RW}} (V_i^R - \frac{V_i}{2}) \end{aligned}$$

V_i^{jk} is votes by individuals of party j and race k , available from voter registration files or estimated with Duncan-Davis Bounds.

$$ARPR = ARR - ARP$$

Next Steps: Isolating Racially Disparate Impact

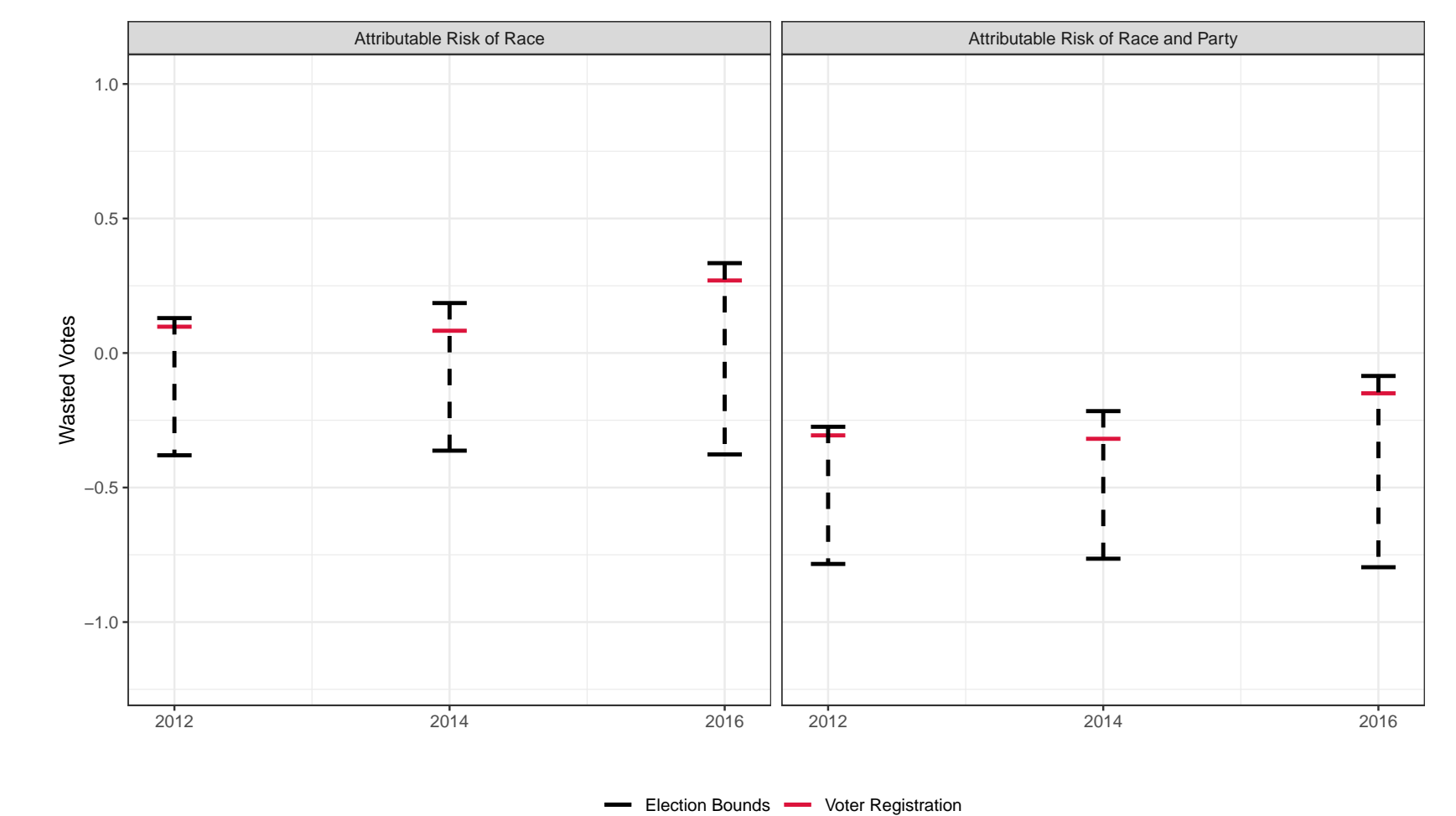


Fig. 3: North Carolina 2012-2016

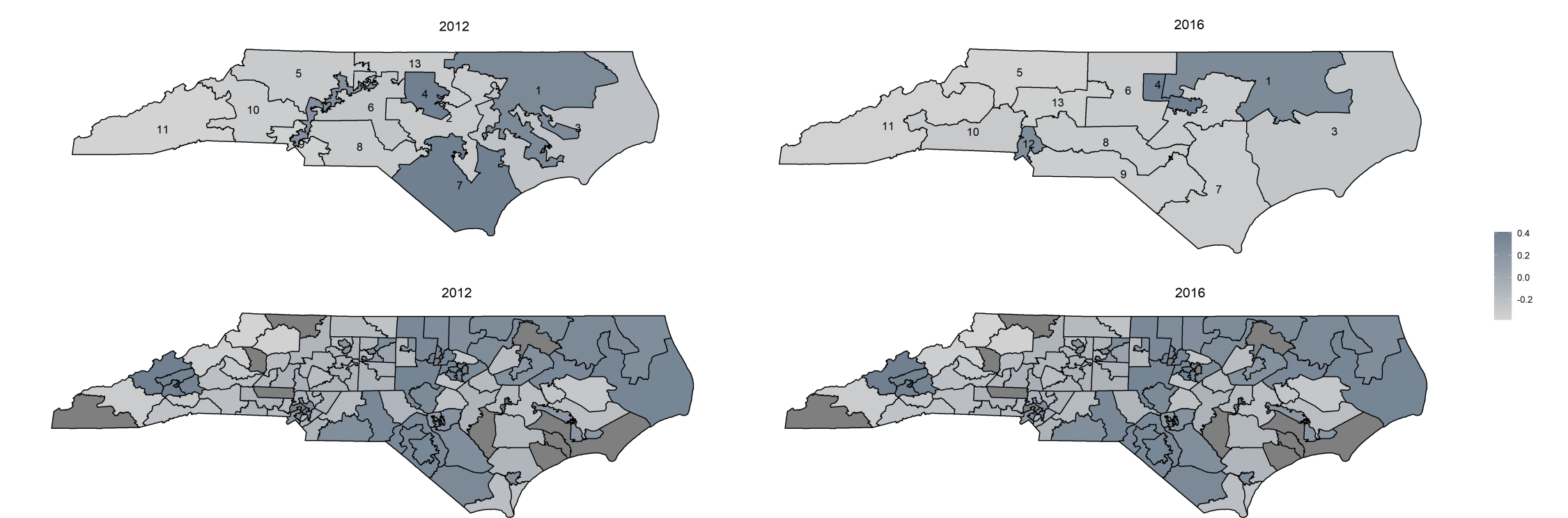


Fig. 4: North Carolina ARPR

Conclusion

- Not esoteric, but standard measure
- Survives logical concerns: directionality; perfect proportionality
- Adjusts for base rate by construction