

Analysis of the Geopolitical Landscape for the 2020 North Carolina Congressional Districts

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November 8, 2021

1 Overview

In this analysis of the geopolitical landscape of the North Carolina State using the 2020 Census data, we provide a summary plot derived from a distribution on redistricting plans. The distribution favors plans with compact districts and keeps counties intact. The details of the distributions are given in the accompanying document “Methods used to Analyze 2020 North Carolina State Congressional Redistricting Landscape.”

2 Results

Figure 1 gives the *Collected Seat Histograms* for the ensemble sampled from the distribution. To critique a particular map against the backdrop our non-partisan ensemble, one needs only plot the seat outcome under that map under a given election on our plot for the same election.¹ In addition to looking at a collection of historic votes, it is also useful to examine how the ensemble shifts under changes to the statewide vote fraction on a particular set of votes. This may be accomplished, for example, by using a uniform swing analysis. We omit such investigation in this work, but such studies may be achieved with the provided data and we plan to implement this in future analysis.

Without reference to a particular map, the primary message of these plots is that when maps are drawn only considering only the nonpartisan redistricting criteria the result is a responsive map. By a responsive map, we mean a map whose electoral outcomes change to reasonable degree as the peoples will, expressed in the votes, changes. Our experience with non-partisan map ensembles over the last decade, in North Carolina as well as states such as Maryland and Wisconsin, confirm this observation. Again and again, we see that when political data is not considered the resulting maps are responsive to changes in the voters’s preference. Even when there are swings in public opinion as expressed in the vote, the outcomes of these non-responsive maps do not change commensurately.

In contrast, many of the maps used in North Carolina over the last decade were significantly less responsive. Under the enacted maps, the number of elected officials from each party changes little despite sizable swings in the people’s preferences as expressed at the ballot box.

¹One can find the shapefiles, election data, and the voting data on our ensembles at our online archive: <https://git.math.duke.edu/gitlab/gjh/redistricting2020results.git>

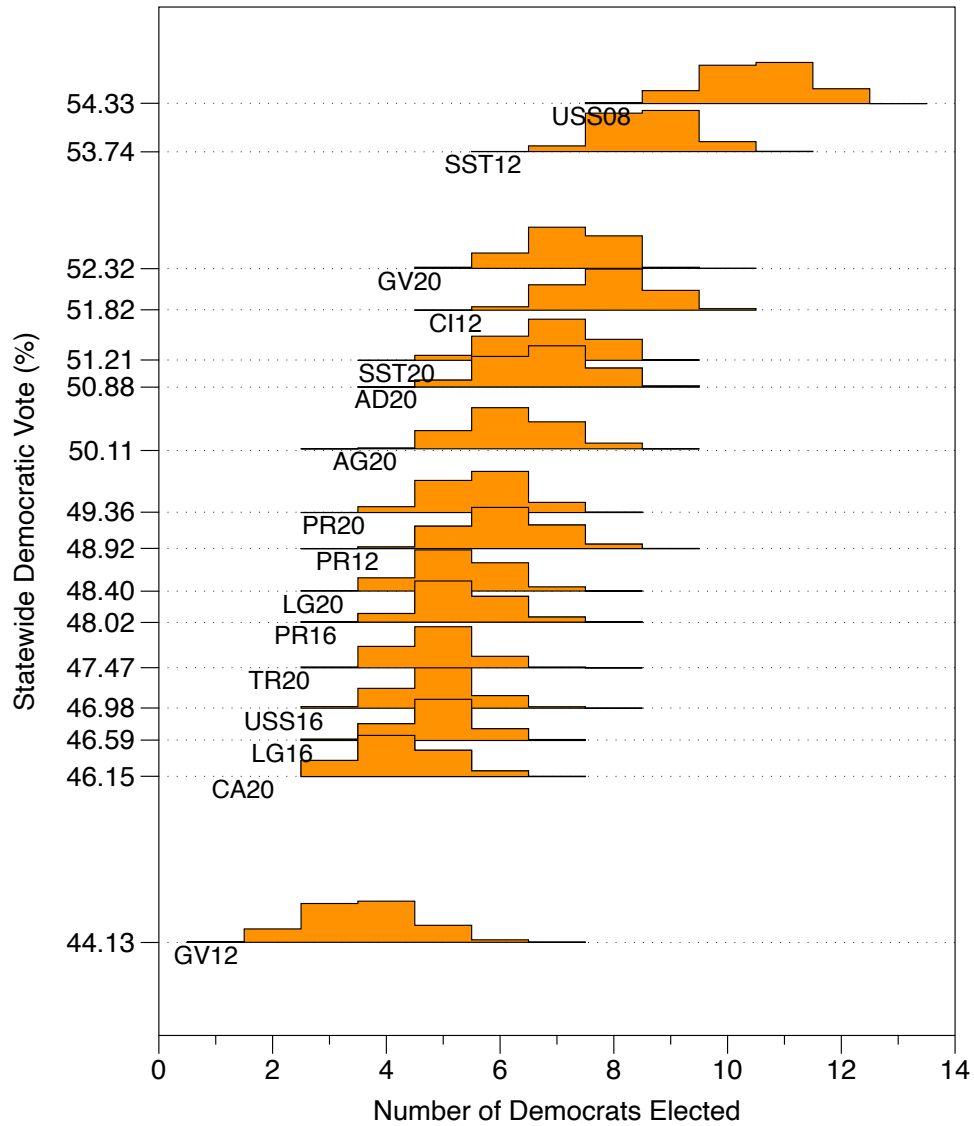


Figure 1: Each histogram represents the range and distribution of possible Democratic seats won in the ensemble of plans; the height is the relative probability of observing the result. We only include a selection of the historic vote counts for clarity. Abbreviations contain the year in the last two characters and the race in the first few characters: AG for Attorney General, USS for United States Senate, CI for Commissioner of Insurance, GV for Governor, LG for Lieutenant Governor, and PR for United States President. On the left axis, we provide selected Democratic statewide vote percentages.

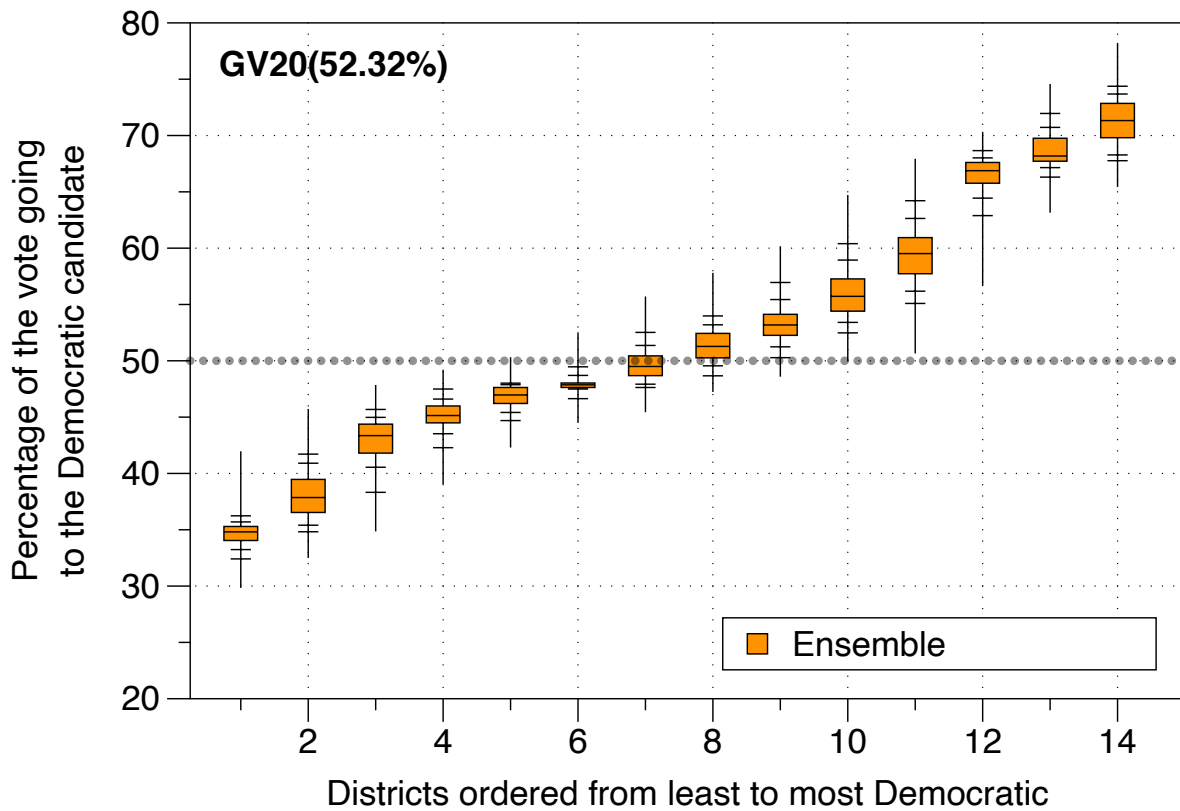


Figure 2: Ranked Ordered Marginal Boxplots using Governor 2020 votes.

3 Ranked Ordered Marginal Boxplots

The following figures plot the typical range of the most Republican district to most Democratic district. Ranges are represented by box-plots. In these box-plots, 50% of all plans have corresponding ranked district that lies within the box; the median is given by the line within the box; the ticks mark the 2.5%, 10%, 90% and 97.5% quartiles; the extent of the lines outside of the boxes represent the range of results observed in the ensemble. There are 14 seats; any box that lies above the 50% line on the vertical axis will elect (or typically elect) a Democrat; any box that lies below the 50% line will elect (or typically elect) a Republican.

Figures 2-4 give the box-plots of the marginal vote fraction distribution under a representative collection of elections. The elections used were chosen the span the range of statewide vote fractions seen in Figure 1.

We take the CST-13 enacted plan with each set of votes and plot the ordered district returns over the box plots. If the districts of an enacted plan lie either far above or far below the ensemble at a particular ranking, this can indicate that the district was either packed or cracked to provide an atypical result.

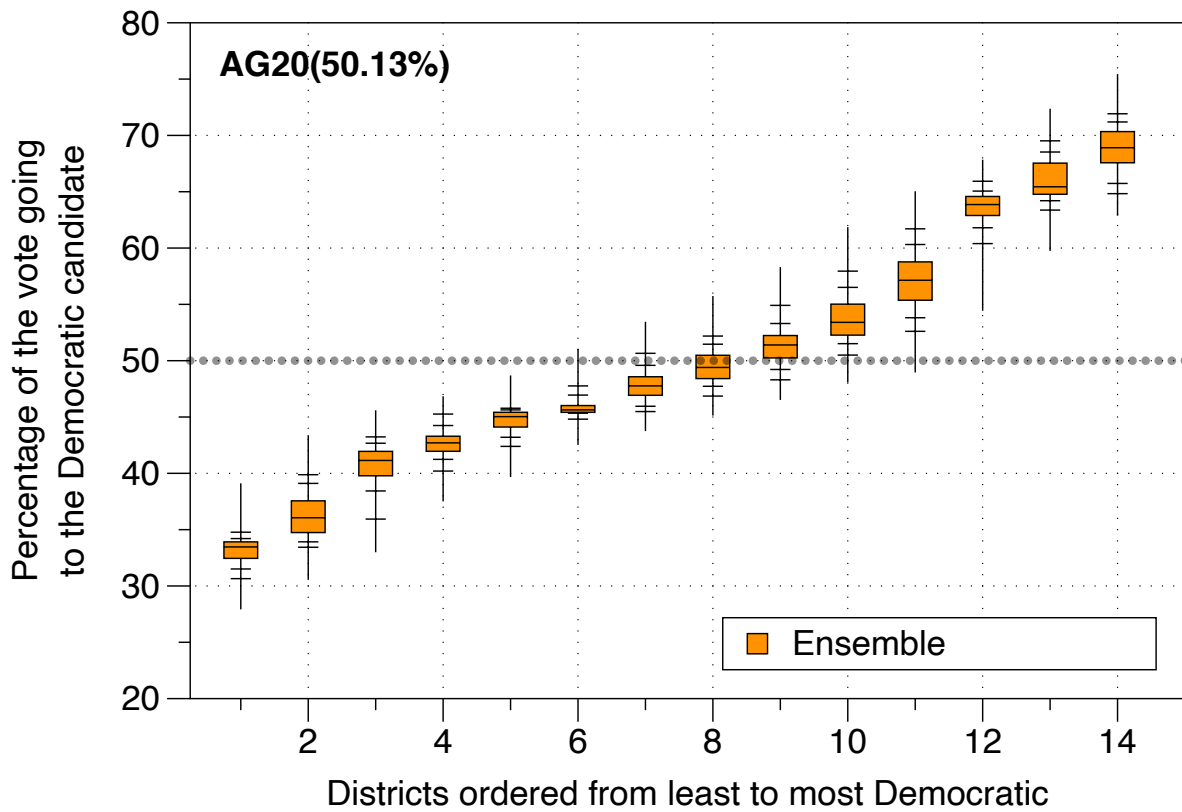
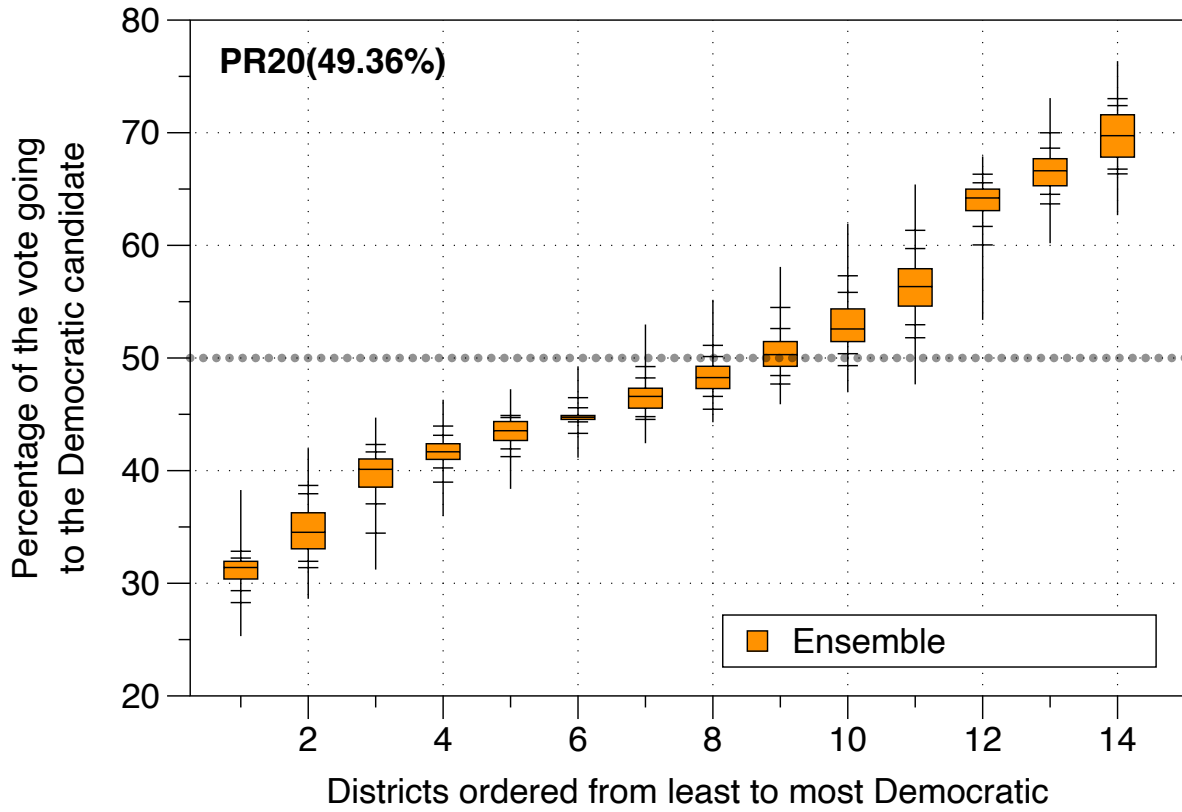


Figure 3: Ranked Ordered Marginal Boxplots using President and Attorney General 2020 votes.

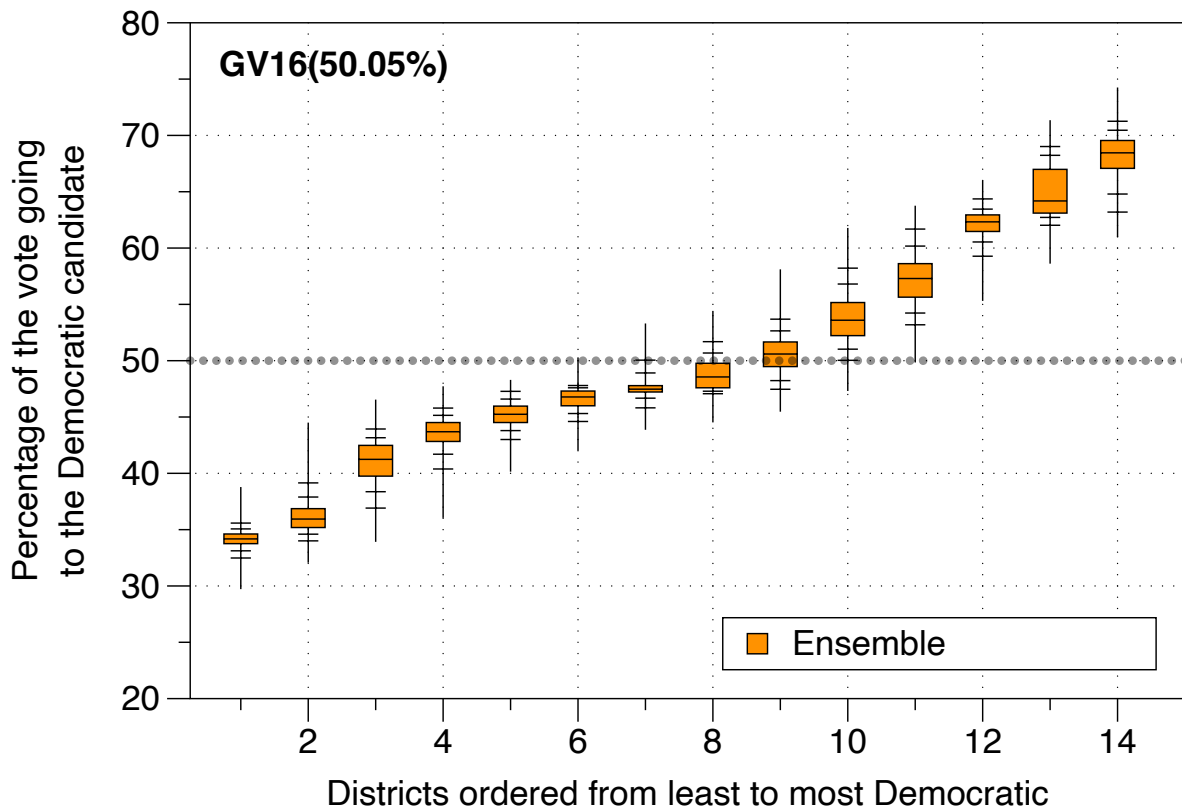
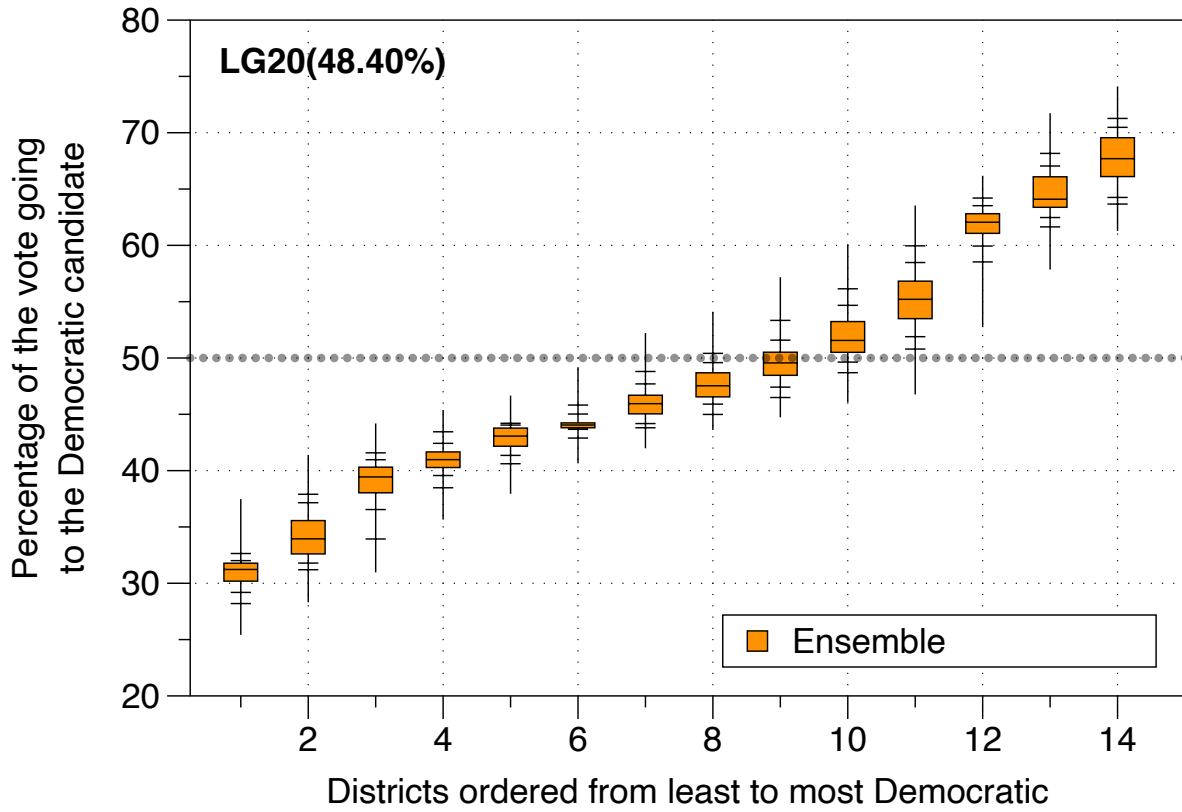


Figure 4: Ranked Ordered Marginal Boxplots using the 2020 Lieutenant Governor and 2016 Governor votes.

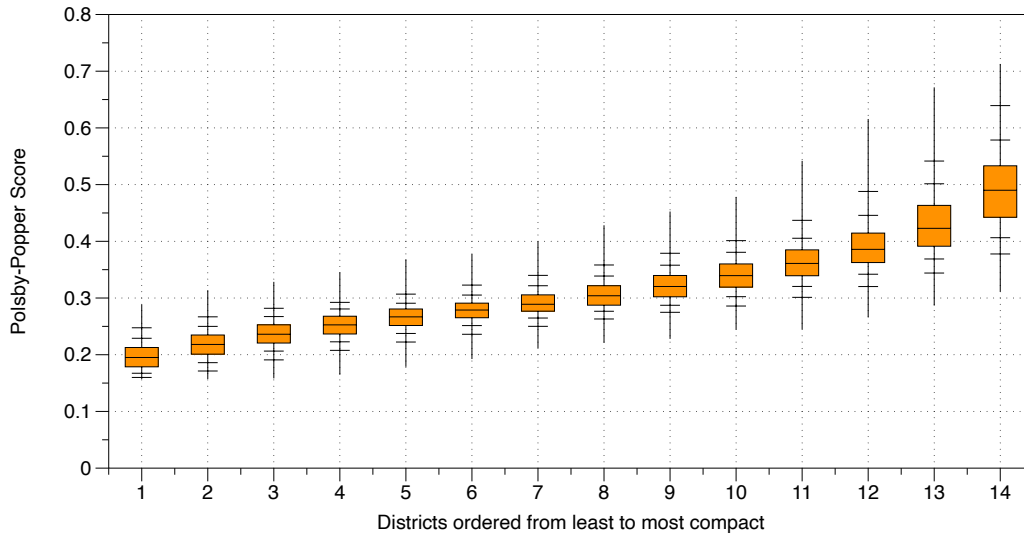


Figure 5:

4 Distribution of Compactness

In Figure 5, we give the box-plots for the ranked ordered marginal distribution for the compactness score, namely the Polsby-Popper score (see companion methods document). We compare the compactness of the CST-13 enacted plan with the ensemble and find similar levels of