Evaluating the 2021 Proposed General Assembly Redistricting Plan: Senate

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1 Overview

We compare the proposed SST-13 senate general assembly redistricting plan in North Carolina to two collections of maps that are representative of two types of policies for non-partisan redistricting. Our collections of maps and the criteria used to generate them are presented in our previous analysis [1]. Our distributions favors plans with compact districts and keeps counties intact. One of the distributions prioritizes keeping municipalities whole.

2 Results

Figure 1 gives the *Collected Seat Histograms* for the ensemble sampled from the distribution which does not consider preserving Municipalities (MCDs). Figure 2 gives the *Collected Seat Histograms* but for the ensemble sampled from the distribution which does consider preserving Municipalities (MCDs).[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 set of votes, the primary message of this plot is that the enacted SST-13 plan heavily and consistently favors the Republican party when compared with the ensemble that does not consider municipalities. When comparing the enacted SST-13 plan to the ensemble that does preserve municipalities, many of the historic elections elect a similar number of Democratic candiates. There is, however, extreme discrepancies under the 2020 Leuitenant Governor voting data, the 2020 Presidential voting data, the 2020 Commissioner of Agriculture voting data, and the 2016 Presidential voting data. We note that these voting patterns all have a somewhat similar statewide vote fraction and all are near the location where the ensemble fluctuates between electing a Republican majority and super-majority. We detail these deviations in the following section.

We generated this ensemble of maps from a distribution on redistricting which was set before the General Assembly released its maps. Hence our distribution was informed by the nonpartisan criteria they laid out but not by how those criteria were implemented in the selected maps.

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 50 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 4-6 give the box-plots of the marginal vote fraction distributions under a representative collection of elections. The elections used were chosen the span the range of statewide vote fractions seen in Figures 1-3 and we show both ensembles of plans. Within these figures we also compare the proposed SST-13 redistricting plan. We chose these elections to give some variety in year, type of race and statewide partisen vote fraction.

[1] One 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`

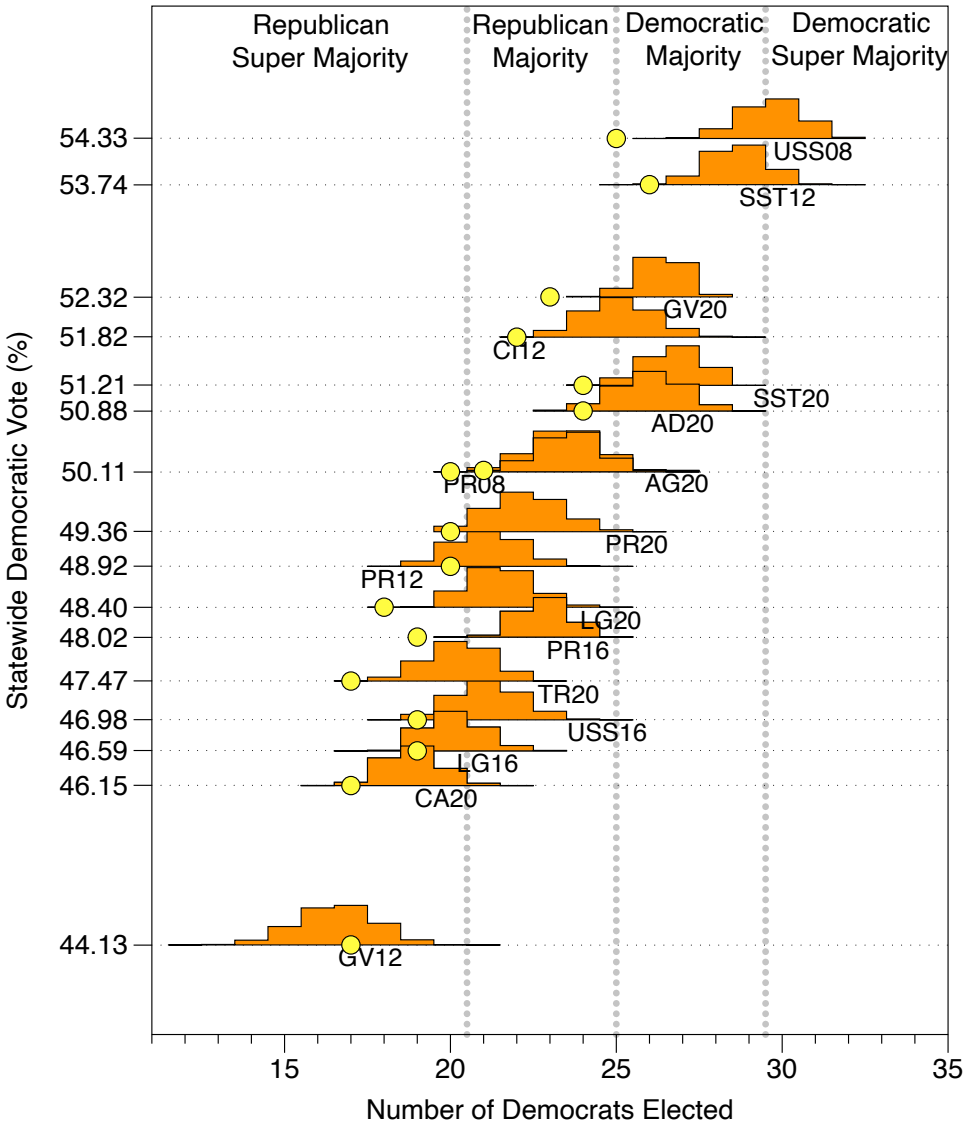

Figure 1: Each orange distribution represents the range of possible Democratic seats won in the ensemble of plans which do not consider Municipalities under a given set of historic votes; the height is the relative probability of observing the result. We only include a selection of the historic vote 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. The yellow dots compare the ensemble with the SST-13 proposed plan.

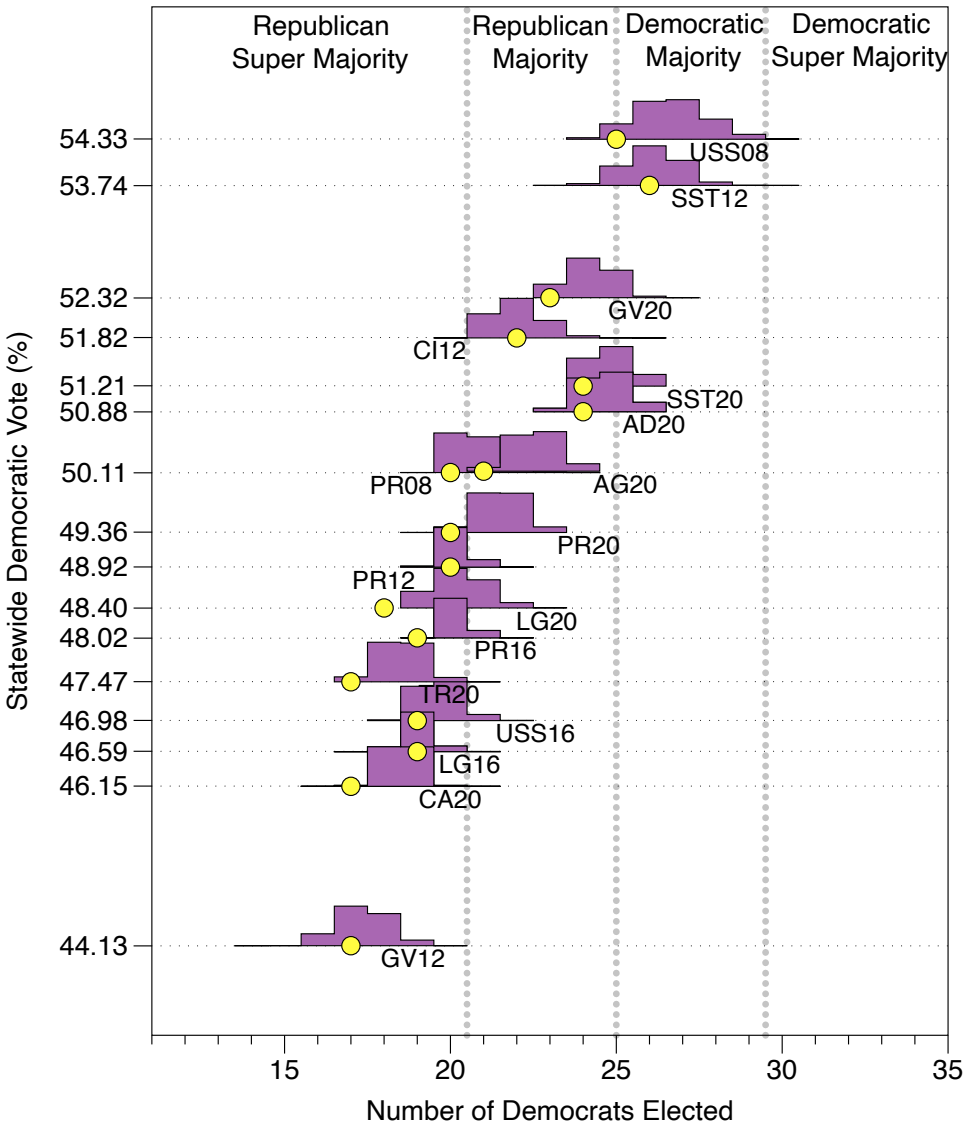

Figure 2: The same as Figure fig:SenateCEAH except the ensemble used is concentrated on plans that also respect the boundaries of municipalities. The yellow dots compare the ensemble with the SST-13 proposed plan.

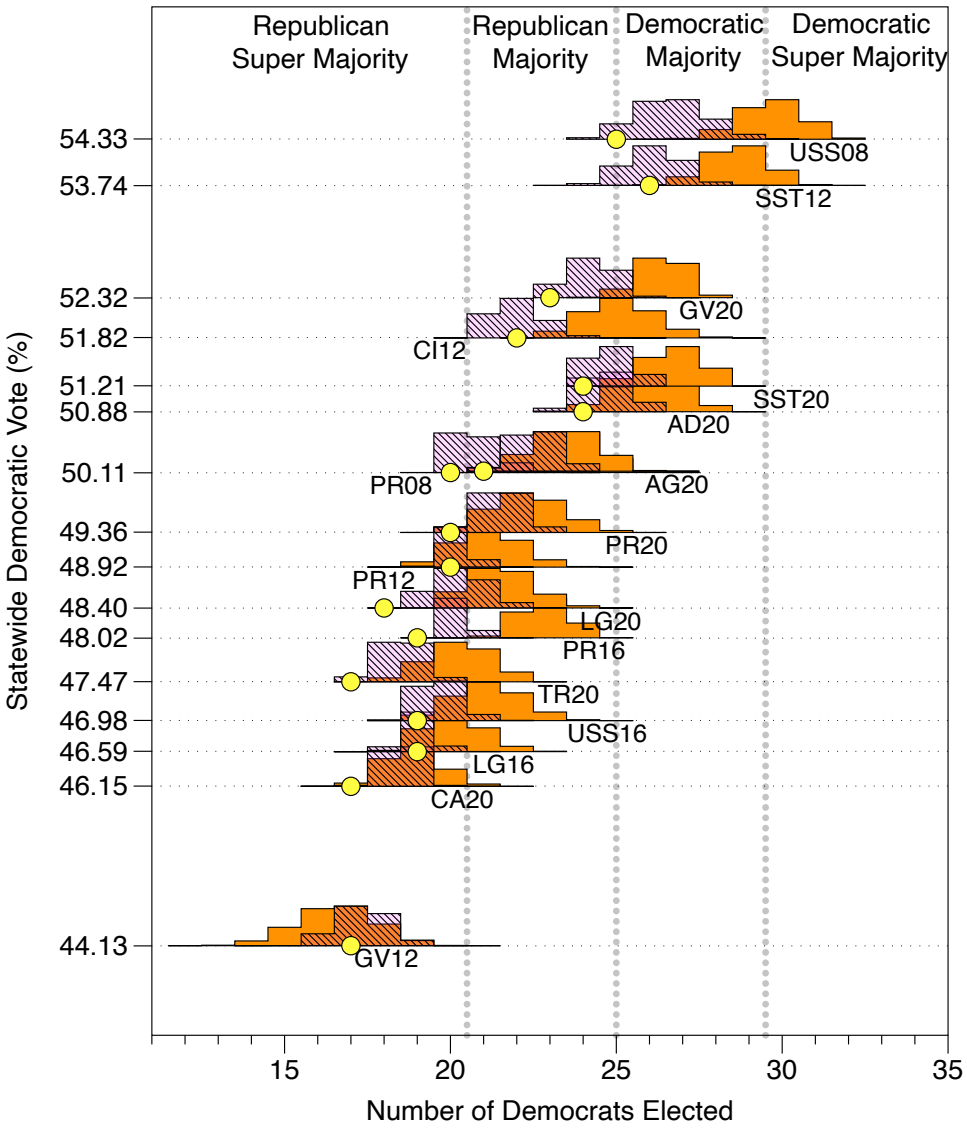

Figure 3: This figure combines Figure 1 and Figure 2 so that they can be compared. The yellow dots compare the ensemble with the SST-13 proposed plan.

Under both of the 2020 voting data there is a significant increase in the Democratic vote fractions in the 35th through 40th most Democratic districts, and in the two most Democratic districts. In contrast, the 20th through 34th most Democratic districts show a consistent depletion of Democrats relative to the ensemble. This effect remains under the 2016 Lieutenant Governor votes but begins to fade under the visualized 2012 and 2008 voting data.

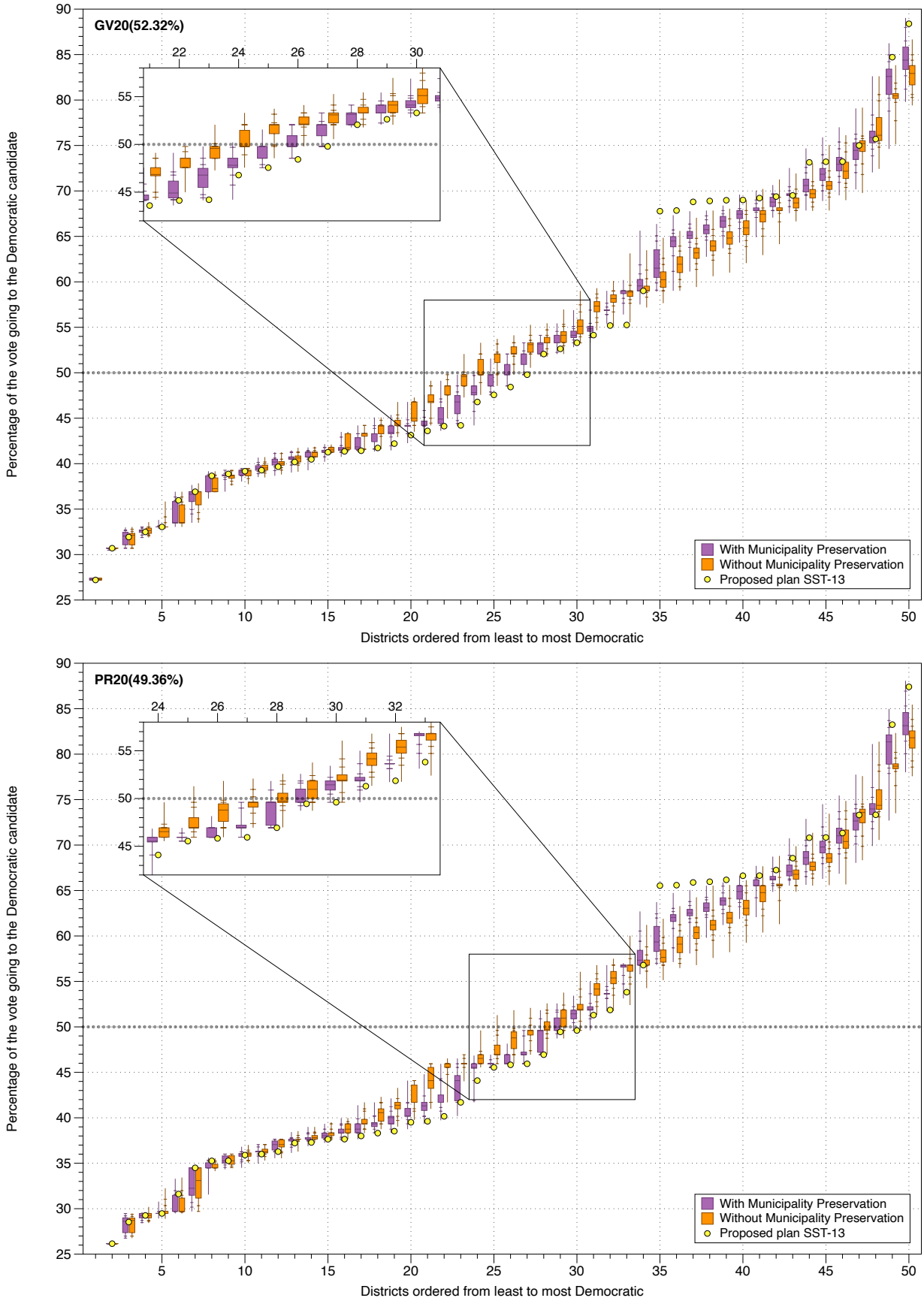

Figure 4: Ranked Ordered Marginal Boxplots considering MCD and using Governor 2020 votes and President 2020 votes.

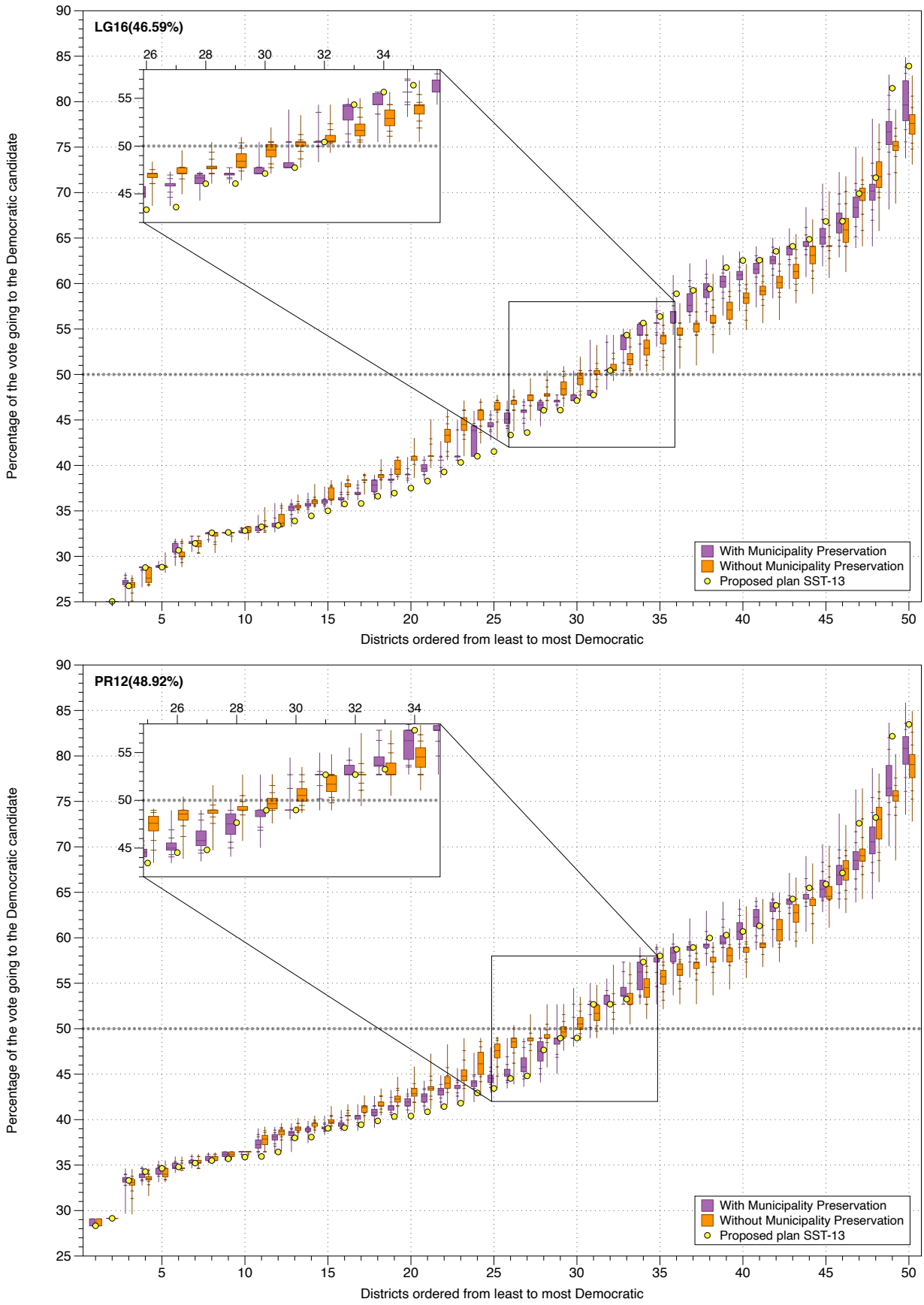

Figure 5: Ranked Ordered Marginal Boxplot distribution considering MCD and using Secretary of State 2012 votes an President 2008 Votes.

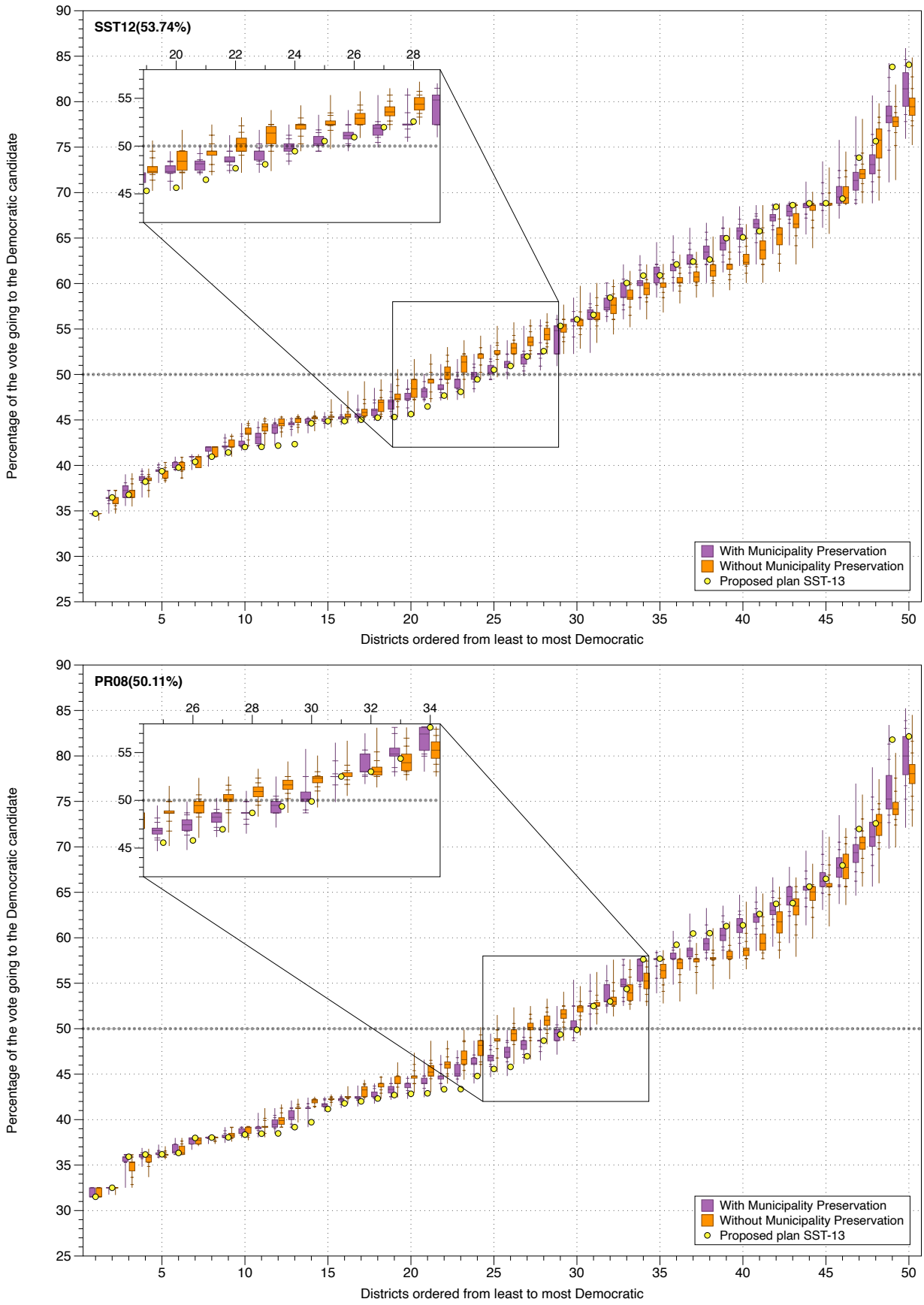

Figure 6: Ranked Ordered Marginal Boxplot distribution considering MCD and using Secretary of State 2012 votes an President 2008 Votes.

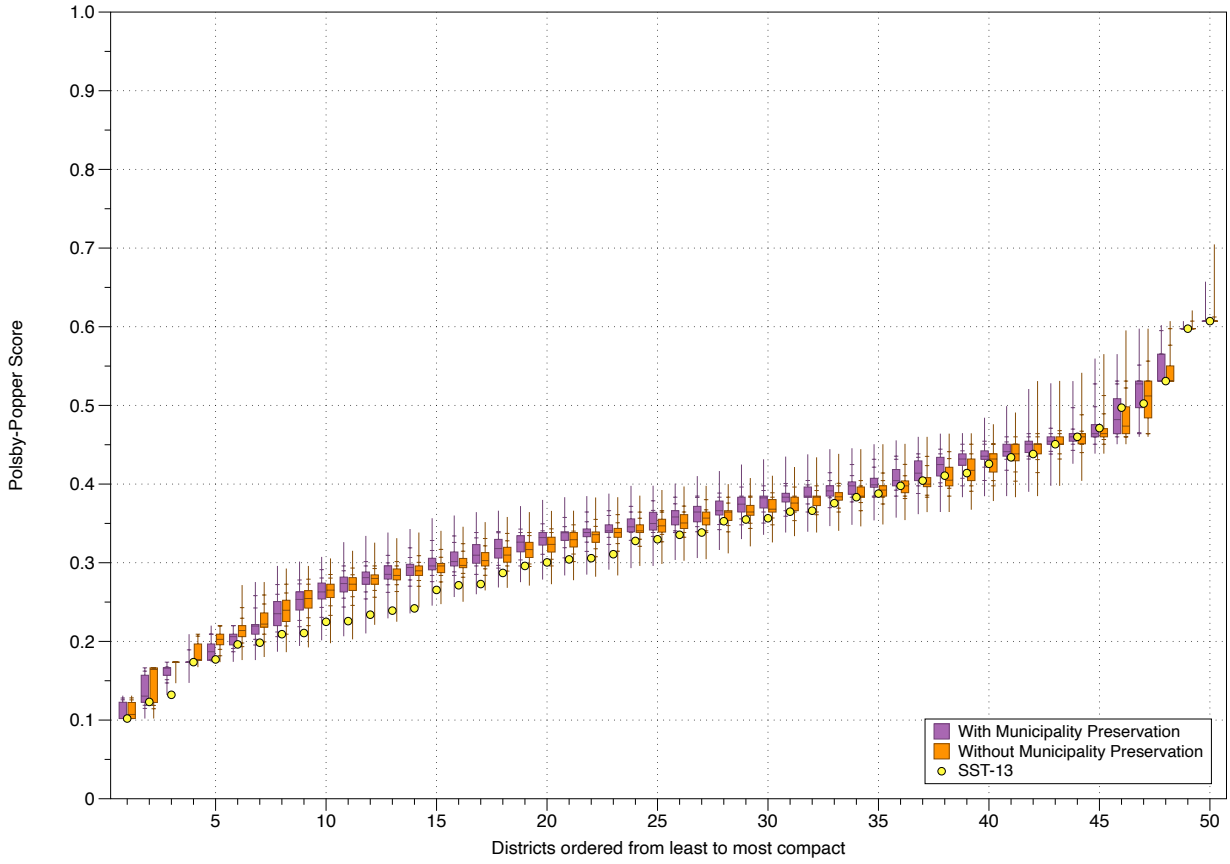

Figure 7: The ranked compactness score of each district for the distribution both considering municipalities and not considering municipalities along with the proposed SST-13 redistricting plan.

4 Distribution of Compactness

In Figure 7, we give the box-plots for the ranked ordered marginal distribution for the compactness score, namely the isoperimetric ratio (see companion methods document), for both the distribution with and with out municipality consideration.

References

[1] The geopolitical landscape of the north carolina general assembly. [Online]. Available: https://sites.duke.edu/quantifyinggerrymandering/2021/10/26/the-geopolitical-landscape-of-the-north-carolina-general-assembly/