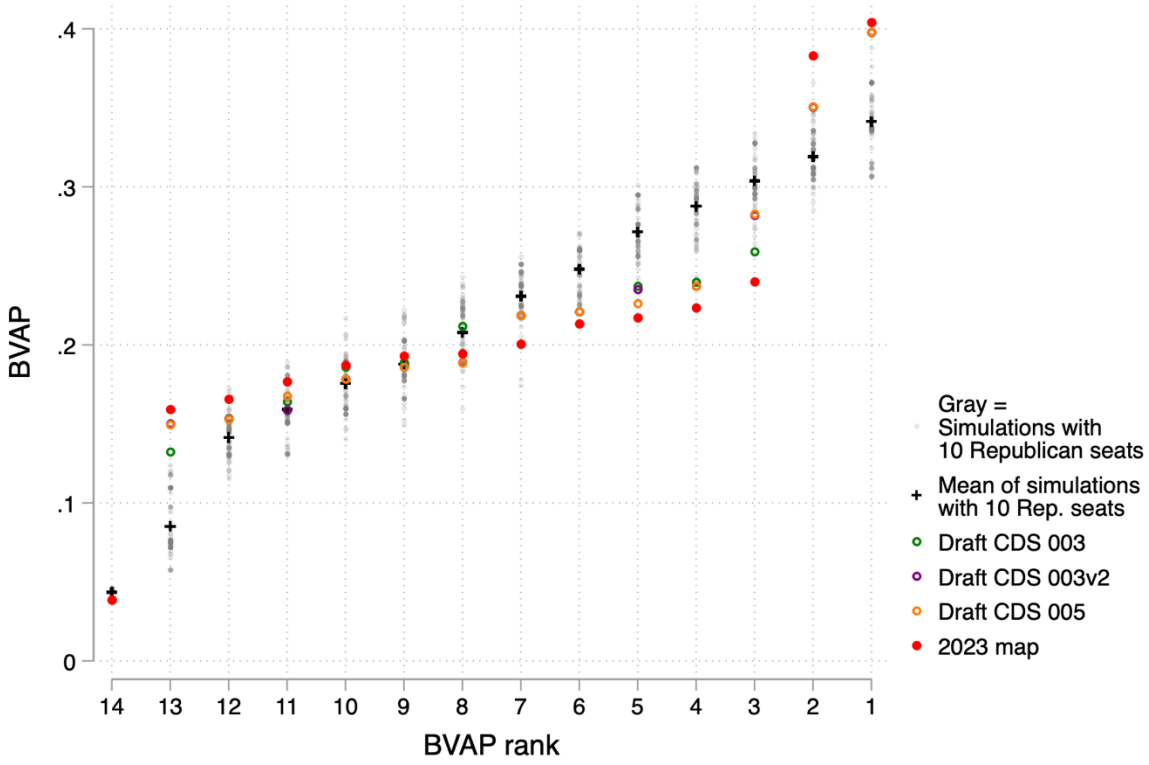
UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF NORTH CAROLINA

SHAUNA WILLIAMS, et al., Plaintiffs, v. REPRESENTATIVE DESTIN HALL, in his official capacity as Chair of the House Standing Committee on Redistricting, et al., Defendants	Civil Action No. 23 CV 1057
NORTH CAROLINA STATE CONFERENCE OF THE NAACP, et al., Plaintiffs, v. PHILIP BERGER, in his official capacity as the President Pro Tempore of the North Carolina Senate, et al., Defendants.	Civil Action No. 23 CV 1104

REPLY TO LEGISLATIVE DEFENDANTS' RESPONSE IN OPPOSITION TO WILLIAMS PLAINTIFFS' MOTION TO STRIKE OUT OF SCOPE CONTENT IN DR. BARBER'S MARCH 17, 2025 REPORT

The red dots in Figure 9 represent the 2023 Plan. Clearly, something changed between September 26 (CBA-2) and October 20 (2023 Plan). In the third- and fourth-ranked districts, the BVAP dropped precipitously, and the BVAP of the fifth-ranked district dropped as well. Meanwhile, on the other side of the graph, the BVAP in all the districts with smaller Black populations was increased, beyond even the most Republican simulations, and beyond even these extremely aggressive pro-Republican draft maps that produced 11 Republican seats. The result, as described above, was an unusually constrained distribution of BVAP relative not only to the simulations, but to this family of draft maps. This is achieved by breaking up urban Black neighborhoods, thus lowering the BVAPs of the districts on the right side of the graph (other than the top two), and combining them with faraway rural places, thereby increasing the BVAP of the districts on the left side of the graph.

Figure 10: BVAP Arrayed by Rank, Pro-Republican Simulated Plans and Draft Springhetti Maps

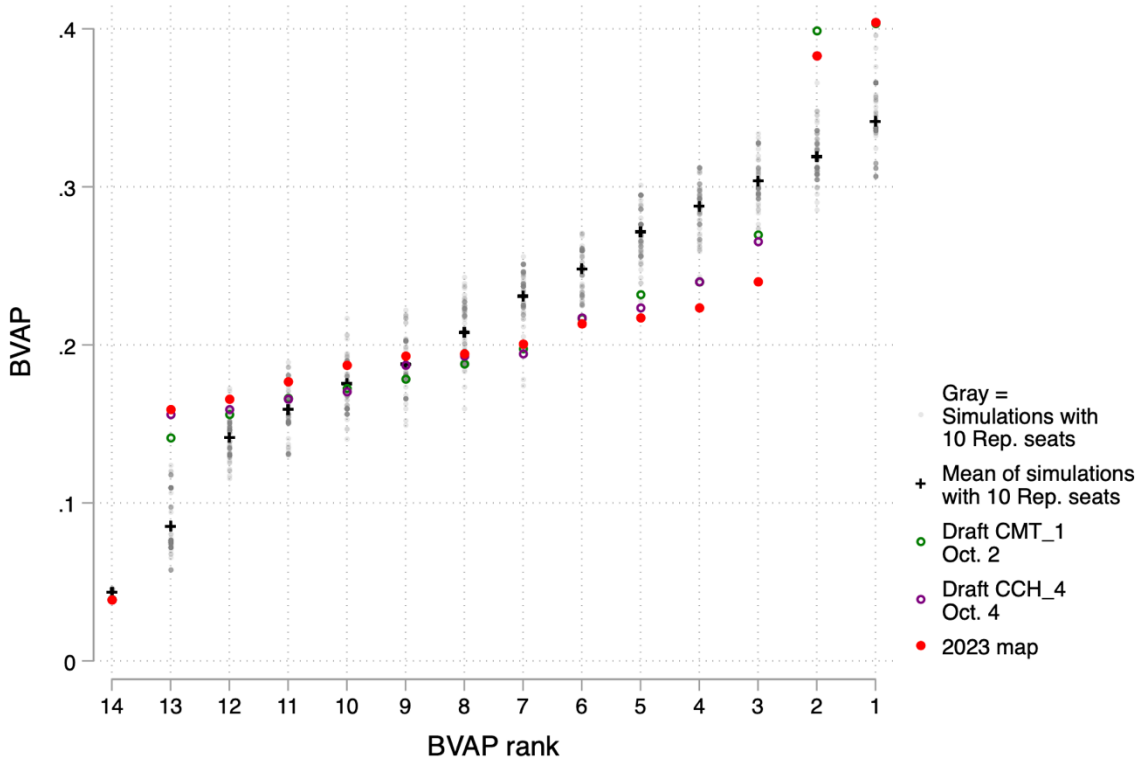


Next, I examine a series of undated maps drawn by Mr. Springhetti, who was drawing maps retained by the North Carolina House of Representatives to draw House and Congressional map drafts. He received instructions and ongoing directions from Committee Chairs, but his plans were ultimately abandoned. These included 10 relatively safe Republican seats. The pattern, displayed in Figure 10, is like that of the previous set of draft maps in the CBP family of maps. The BVAP was in a narrower range in the Springhetti drafts than in the Republican simulations, indicating an unnatural cracking of Black neighborhoods. But again, the 2023 Plan goes much further in its

efforts to achieve a highly unnatural distribution of BVAP across districts than the maps produced by Mr. Springhetti. In sum, Mr. Springhetti's maps achieved similar partisan goals as the 2023 Plan, but with a rather different treatment of Black voters.

Finally, let us examine the final set of draft maps from which the 2023 Plan evolved in October: CMT-1 (dated October 2) and CCH-4 (dated October 4). The evolution of these maps can be visualized in Appendix 2, which contains images of each. These were also extreme pro-Republican gerrymanders that produced 10 safe Republican seats. These plans suppressed BVAP in the districts ranked 3 through 8 relative to the most pro-Republican simulated plans, and even relative to the September plans examined above or the Springhetti plans. It appears that as the process went on, the distribution of BVAP across districts became more and more distinctive in its compression, moving downward in the relatively high BVAP districts and upward in the relatively low BVAP districts. This was true of the move from the September maps to the October maps, and of the move from the early October maps to the final 2023 Plan later in the month.

Figure 11: BVAP Arrayed by Rank, Pro-Republican Simulated Plans and Draft Maps from October



Calculating summed squared deviations from the mean of the race-blind simulations, as introduced above, provides an overall indicator of the extent to which the distribution of BVAP deviates from the race-blind simulations. The average was .11 for the Springhetti maps, .12 for the September draft maps, .14 for the October draft maps, and .16 for the final 2023 Plan. In analyzing the evolution of the draft maps, we see that they became increasingly deviant from the race-blind simulations in terms of BVAP distribution over time.

In sum, the draft maps are helpful for assessing the role of race versus party. First, all of these maps was an extremely effective pro-Republican gerrymander—in some cases perhaps even more effective than the 2023 Plan. Each of these draft maps already demonstrated a very unusual distribution of BVAP relative to a sample of race-blind simulations that produced a similar number of Republican-leaning seats. Second, over time, the distribution of BVAP became more unusual, and the final 2023 Plan was a more extreme outlier on this dimension than any of its predecessors. It was clearly possible to draw an exceptionally strong partisan gerrymander without going to such great lengths to break up urban Black neighborhoods and increase the BVAP of rural districts. In fact, the General Assembly considered but rejected or altered several such maps.

IV. CONCLUSION

In conclusion, none of the critiques offered by Dr. Trende or Dr. Barber undermine the basic descriptive facts offered in my initial report. Even if I take the recommendation of Dr. Trende by focusing only on racial differences across border VTDs or compare the 2023 Plan with the race-neutral computer-generated plans of Dr. Barber, I reach the same conclusions: the 2023 Plan sorted voters by race.

Similarly, Dr. Trende and Dr. Barber make claims about the primacy of politics over race that are inconsistent with the data. First, racial sorting is present within each partisan group. Second, the distribution of race across districts deviates from Dr. Barber's race-blind simulations even in a sample of plans that achieve similar partisan goals to those achieved by the General Assembly. Finally, Black voters are more "packed" and "cracked" in the 2023 Plan than in a series of alternative plans considered by the General Assembly, each of which achieved very similar partisan goals as the 2023 Plan.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on October 17, 2024.

Jonathan Rodden

Appendix 1: BVAP of Cross-Border Pairs in Split Counties of Piedmont Triad and Charlotte

Districts 5 and 9

D5 Border VTD	BVAP D 5	BVAP D 9	Difference
37081000CG1	0.246	0.079	0.168
37081000CG2	0.117	0.079	0.039
37081000G06	0.864	0.354	0.510
37081000G53	0.710	0.478	0.232
37081000G55	0.663	0.527	0.136
37081000G57	0.570	0.527	0.043
37081000G59	0.483	0.527	-0.044
37081000G60	0.410	0.175	0.234
37081000G72	0.754	0.461	0.293
37081000SF1	0.065	0.079	-0.013
37081000SF2	0.042	0.063	-0.021
3708100CG3B	0.183	0.137	0.047
3708100FEN1	0.550	0.302	0.248
3708100JEF3	0.675	0.278	0.398
3708100MON1	0.525	0.314	0.212
370810MON2A	0.631	0.255	0.376
Average			0.179

Districts 6 and 9

D6 Border VTD	BVAP D 6	BVAP D 9	Difference
37081000FR1	0.362	0.182	0.180
37081000FR2	0.139	0.182	-0.043
37081000G61	0.513	0.175	0.337
37081000G65	0.310	0.178	0.132
37081000G66	0.256	0.182	0.075
37081000H04	0.310	0.051	0.259
37081000H05	0.574	0.051	0.523
37081000H06	0.323	0.111	0.211
37081000H10	0.667	0.151	0.516
3708100H19B	0.285	0.151	0.134
Average			0.232

Districts 10 and 6

D10 Border VTD	BVAP D 10	BVAP D 6	Difference
37067000072	0.099	0.075	0.023
37067000073	0.034	0.075	-0.041
37067000082	0.356	0.145	0.210
37067000112	0.150	0.073	0.077
37067000123	0.204	0.108	0.096
37067000401	0.667	0.297	0.371
37067000501	0.668	0.320	0.348
37067000504	0.410	0.221	0.189
37067000505	0.429	0.273	0.156
37067000506	0.275	0.321	-0.046
37067000605	0.370	0.337	0.033
37067000708	0.242	0.108	0.134
37067000709	0.273	0.231	0.042
Average			0.123

Districts 6 and 8

D6 Border VTD	BVAP D 6	BVAP D 8	Difference
12-02	0.281	0.181	0.100
04-01	0.247	0.053	0.194
02-01	0.126	0.083	0.043
02-09	0.191	0.116	0.074
02-08	0.151	0.052	0.099
12-11	0.164	0.224	-0.060
04-02	0.282	0.053	0.229
12-07	0.696	0.419	0.277
12-01	0.182	0.181	0.001
12-03	0.143	0.124	0.019
12-08	0.163	0.109	0.054
Average			0.094

Districts 12 and 8

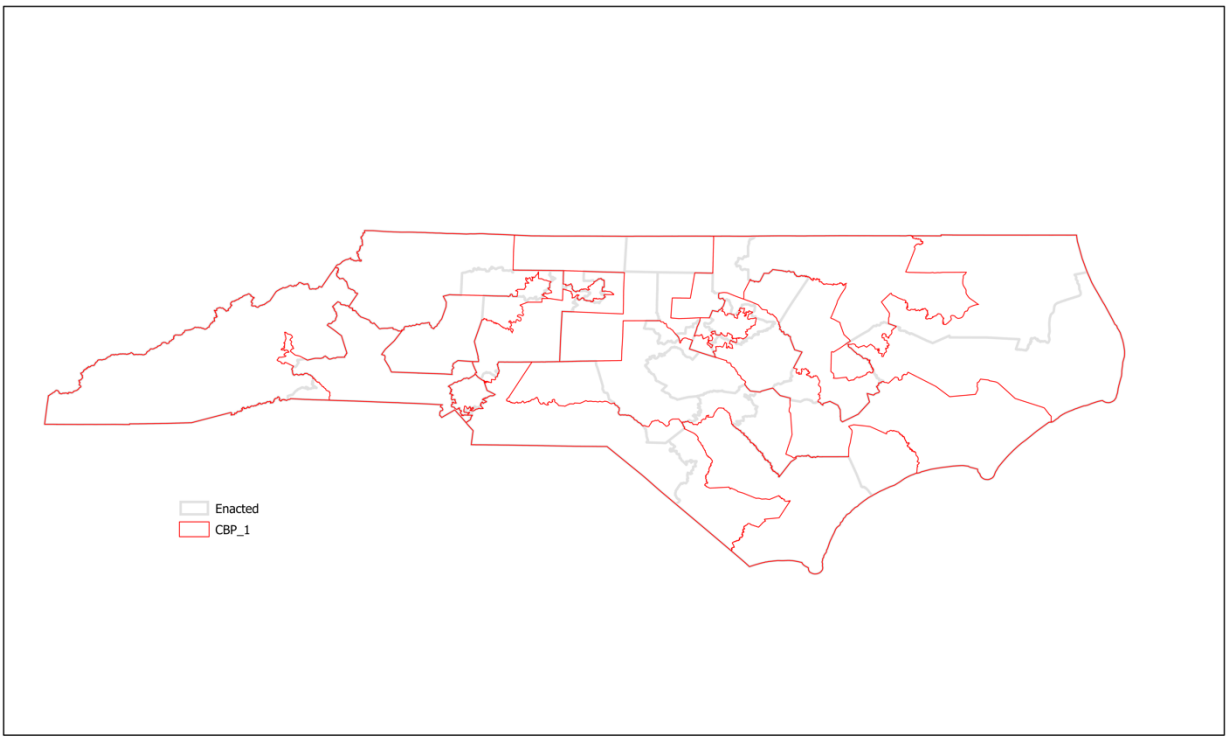
D12 Border VTD	BVAP D 12	BVAP D 8	Difference
37119000068	0.347	0.050	0.296
37119000070	0.020	0.054	-0.035
37119000072	0.058	0.020	0.039
37119000073	0.099	0.149	-0.050
37119000083	0.380	0.202	0.178
37119000085	0.218	0.050	0.168
37119000087	0.143	0.149	-0.006
37119000088	0.144	0.111	0.033
37119000092	0.114	0.149	-0.035
37119000096	0.152	0.050	0.102
37119000099	0.484	0.181	0.303
37119000102	0.339	0.181	0.157
37119000110	0.083	0.020	0.064
37119000115	0.325	0.202	0.123
37119000116	0.478	0.162	0.316
37119000118	0.111	0.056	0.055
37119000119	0.086	0.070	0.016
37119000129	0.285	0.149	0.136
37119000201	0.419	0.138	0.281
37119000217	0.142	0.116	0.025
37119000226	0.134	0.064	0.071
37119000235	0.291	0.174	0.117
Average			0.107

Districts 12 and 14			
D12 Border VTD	BVAP D 12	BVAP D 14	Difference
37119000039	0.756	0.167	0.588
37119000053	0.673	0.167	0.506
37119000077	0.472	0.147	0.326
37119000079	0.431	0.265	0.166
37119000080	0.497	0.350	0.147
37119000087	0.143	0.159	-0.016
37119000088	0.144	0.115	0.029
37119000089	0.460	0.350	0.111
37119000097	0.453	0.147	0.306
37119000114	0.061	0.147	-0.085
37119000129	0.285	0.190	0.096
37119000138	0.416	0.374	0.041
37119000145	0.351	0.199	0.152
37119000147	0.349	0.374	-0.025
37119000150	0.448	0.163	0.285
37119000151	0.486	0.199	0.287
37119000211	0.552	0.186	0.366
37119000226	0.134	0.097	0.037
37119000228	0.366	0.335	0.032
Average			0.176

Appendix 2: Evolution of Draft Maps

September Maps

This is a group of draft maps that resembled the 2023 Plan in the Charlotte area, but not elsewhere. Draft maps are displayed in various colors, and the final 2023 Plan is displayed in gray. These maps produced 11 Republican-leaning districts.



Enacted
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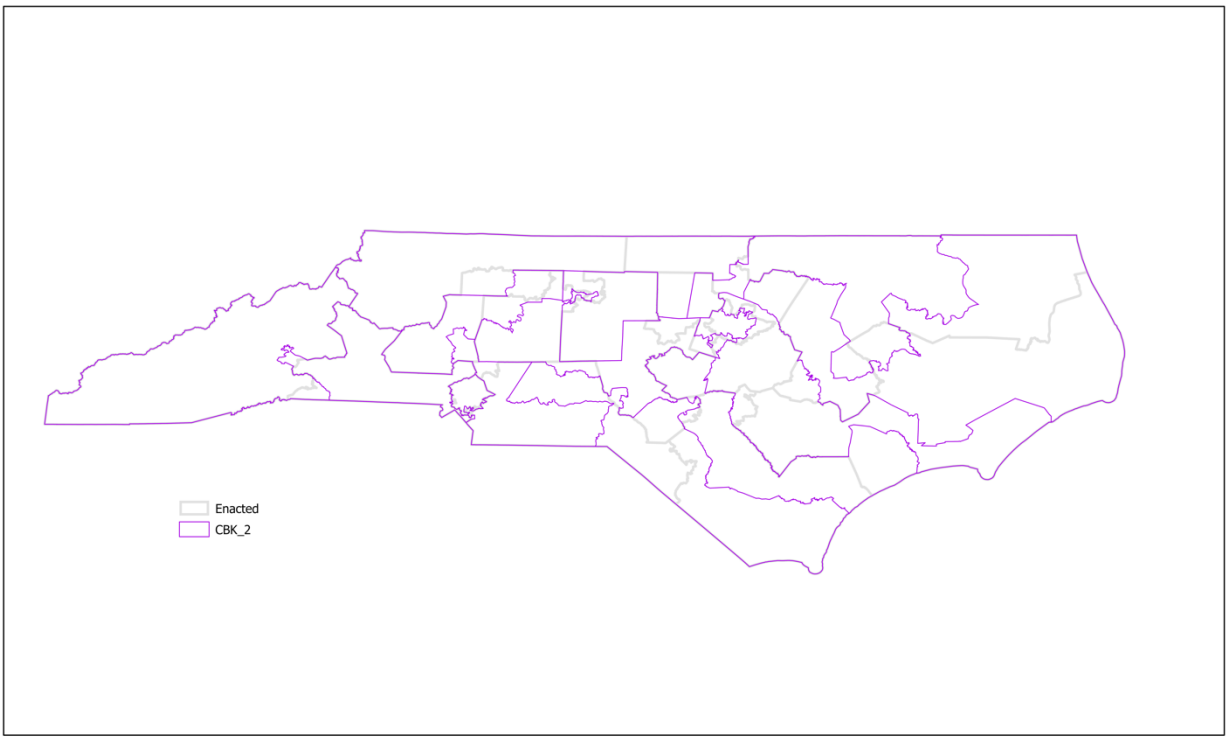
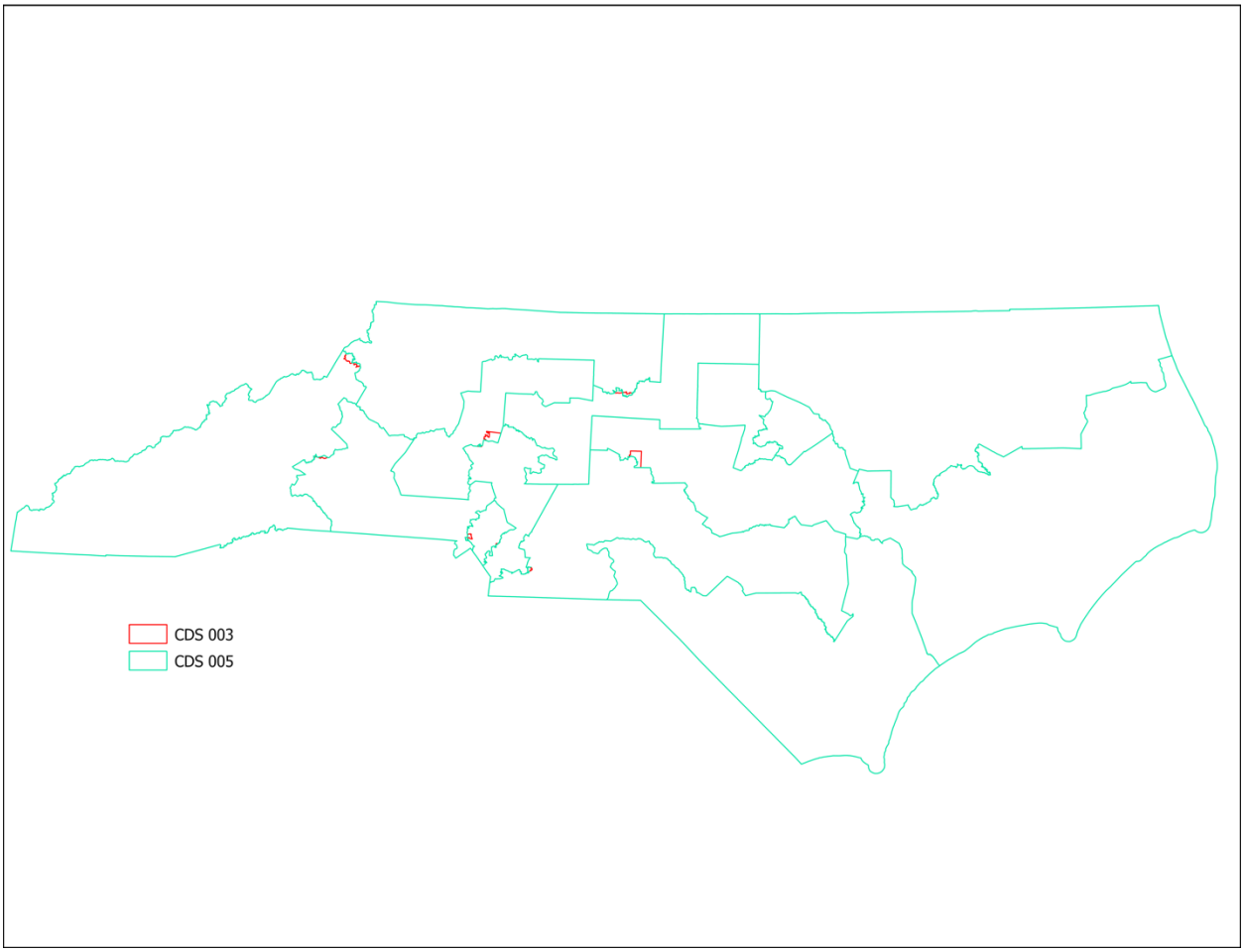

Enacted
CBK_2

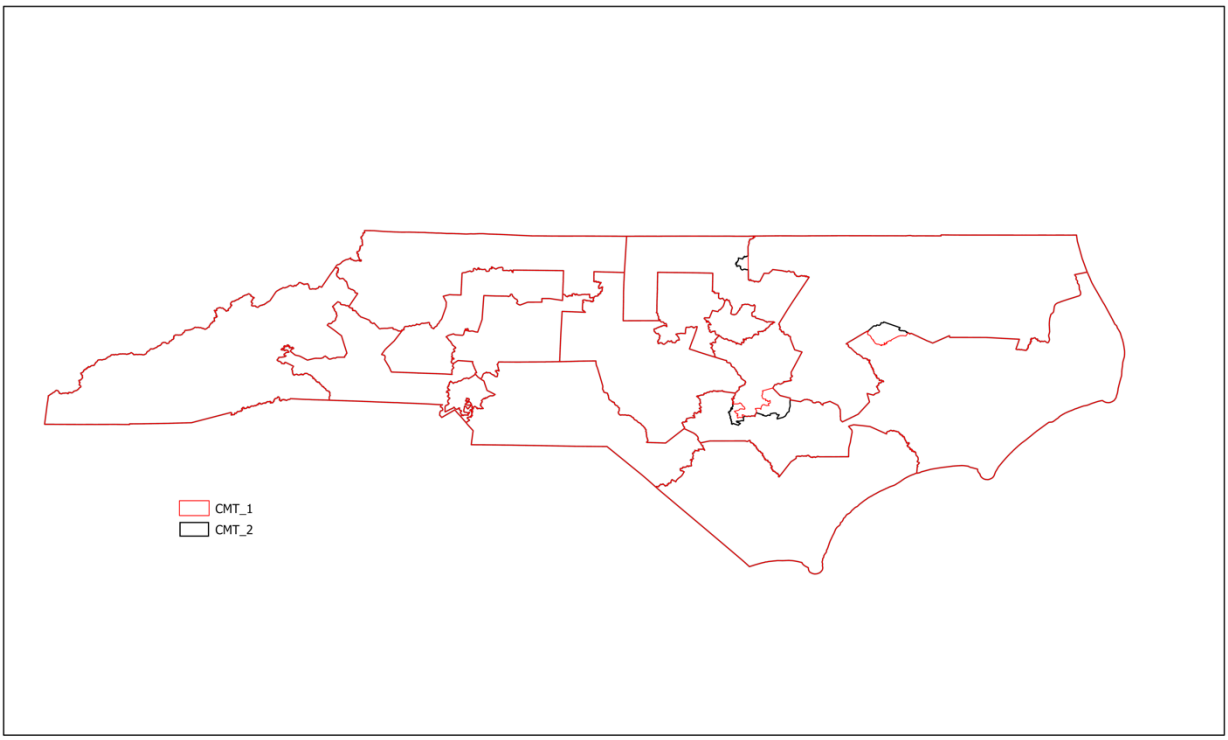
Enacted
CBA_2

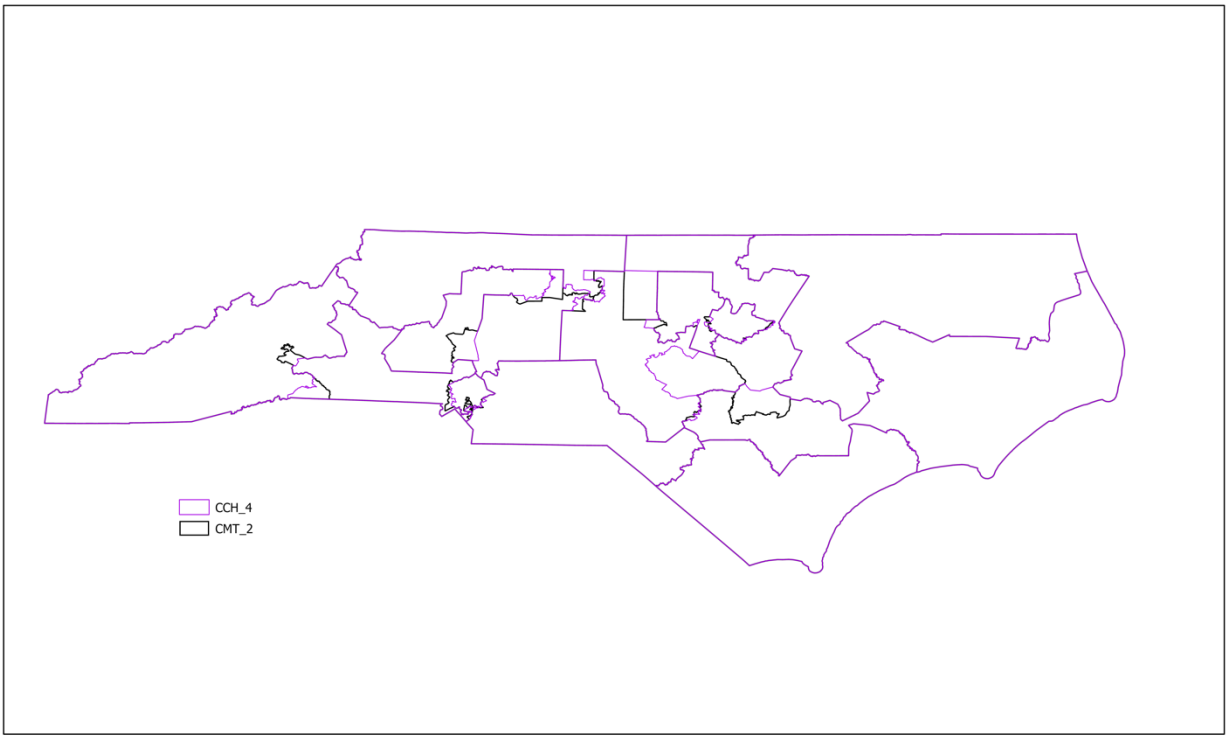
Springhetti Maps

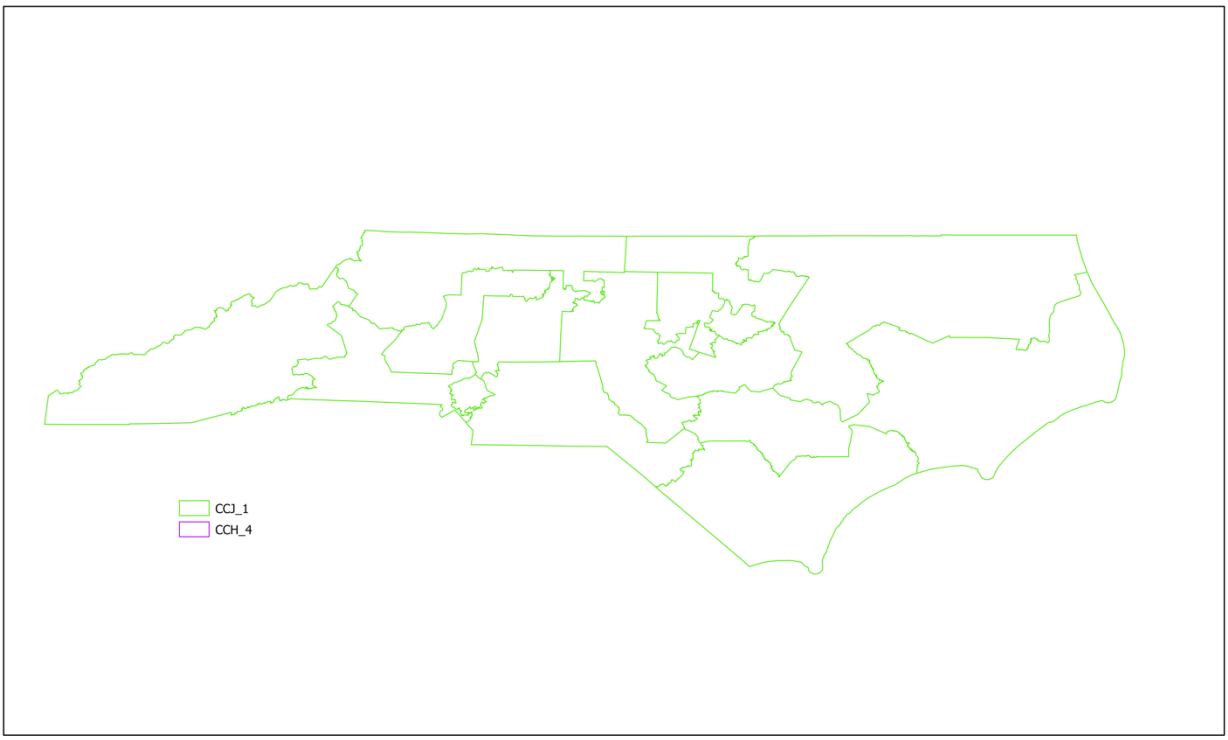


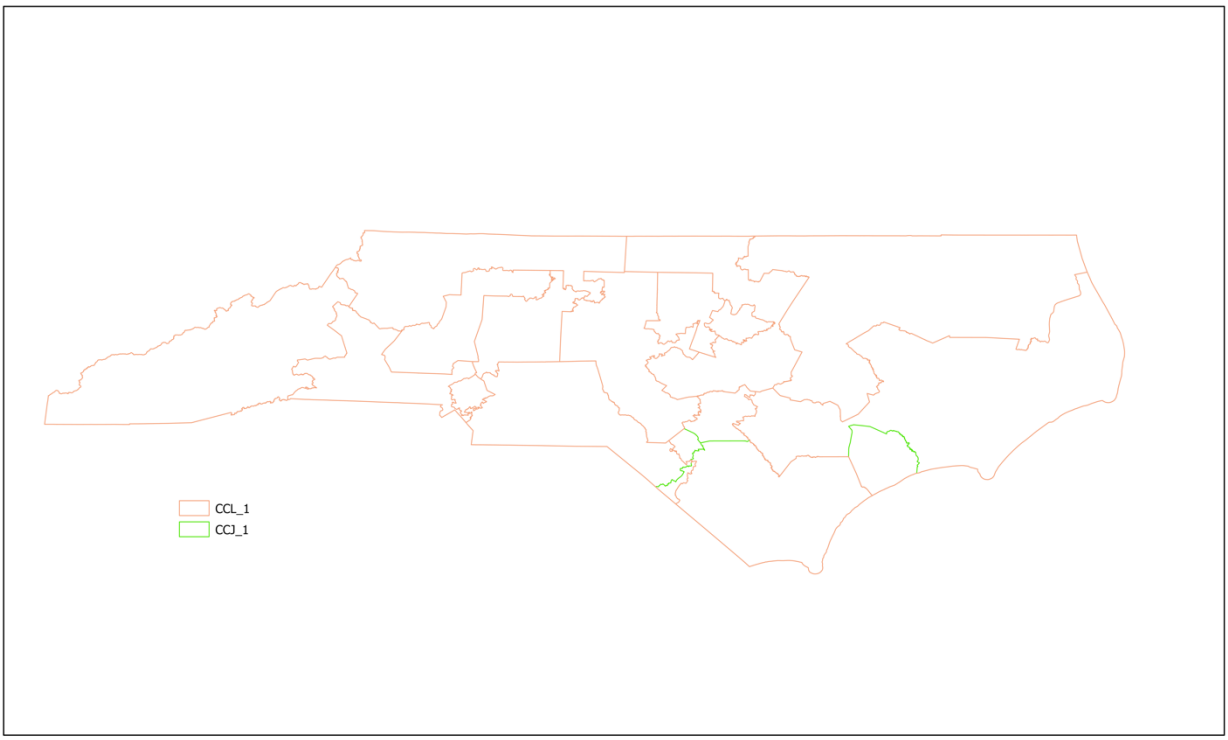
OctoberMaps

Next, I provide images of a group of maps that evolved into the final 2023 Plan. Each map contains the boundaries of one draft map and its immediate successor. Following through the maps allows one to see how the final map emerged. The final shape of District 1 emerges with the transition from CMT-1 to CMT-2. Important changes are made in the Piedmont Triad region from CMT-2 to CCH-4. Some changes are made in the Southern part of the state from CCL-1, which becomes the 2023 Plan.


CMT_1
CMT_2


CCH_4
CMT_2


CCJ_1
CCH_4


CCL_1
CCJ_1

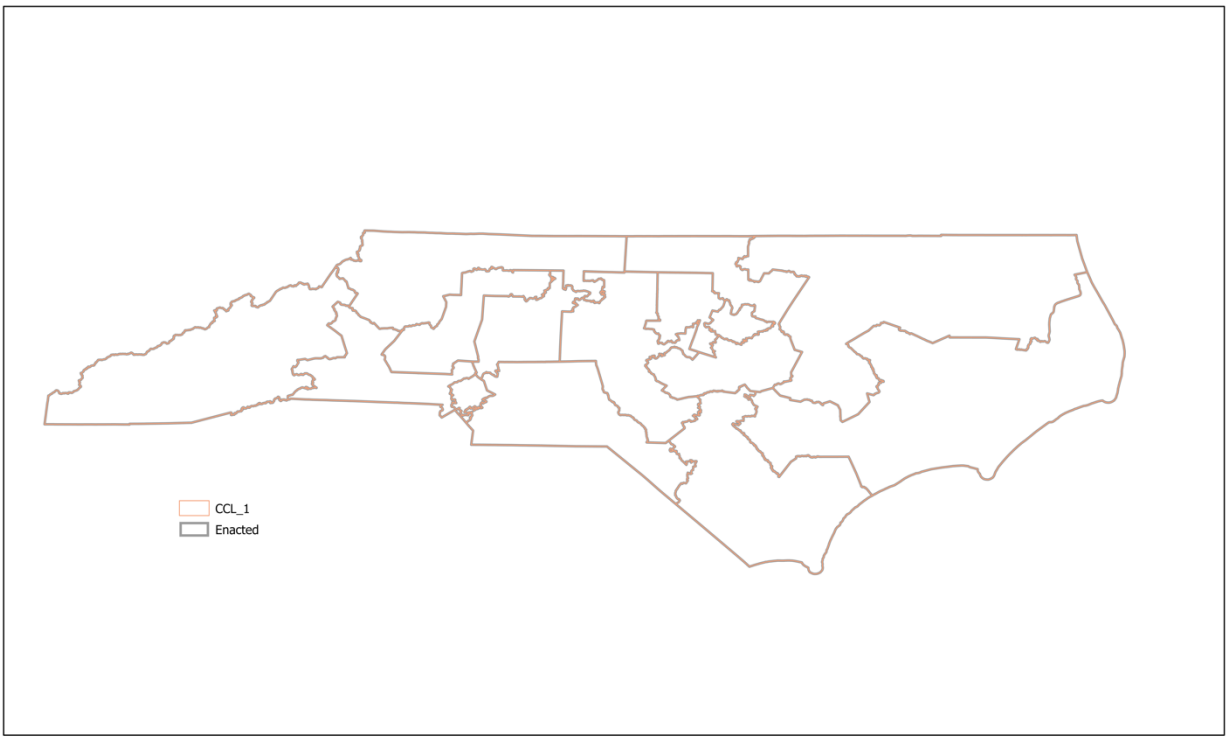

CCL_1
Enacted

Exhibit B

Supplemental Expert Report of Michael Barber, PhD

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1 Introduction and Qualifications

I have been asked by counsel for the Legislative Defendants to supplement my original report in light of the outcome of the 2024 election. I have also been asked to respond to several new analyses that were presented by Dr. Rodden and Mr. Fairfax in their reply reports, as well as supplement my original report in light of questions that I was asked in my deposition.

My qualifications, academic record, and experience are outlined in my original report, filed on September 26, 2024.

2 Summary of Conclusions

- The county envelope method remains an unreliable method for detecting racial predominance.
- The alternative congressional maps that Dr. Rodden analyses have similar racial demographics as the Enacted Map, contrary to the claims of Dr. Rodden.
- However, these alternative maps treat incumbents very differently, making them a poor apples-to-apples comparison with the Enacted Map on political factors, and thus invalidating their usefulness as a comparison by which to measure if race predominated in the drawing of the Enacted Map.
- The alternative district configurations put forward by Mr. Fairfax that reduce population deviations in the state legislative maps are highly partisan and benefit Democratic candidates across the board. In many ways, his alterations do exactly the thing that he claims the legislature did, which is use shifts in population to achieve partisan objectives.
- However, looking across both the House and Senate maps, the population deviations

across districts are not correlated with partisan outcomes or the winners of the 2024 election.

- Finally, I compare the outcome of the 2024 election in the Enacted House and Senate maps to the partisan lean of the Fairfax Illustrative Maps using an updated partisan index of statewide election results from 2024.

3 Congressional Map

3.1 County Envelope Method

In this section I discuss the county envelope method, conduct an additional set of simulations, and run the county envelope regression analysis on these simulations, again using each precinct's racial composition to predict whether or not a precinct in the county envelope is included in the district. I also update the analysis by including (in one of the analyses) the partisanship of each precinct in this analysis. Here I calculate the precinct's partisan lean using an index of 2024 statewide election results to reflect the most recent election.[1]

Dr. Rodden's October 27, 2024 reply report does not address my original critique that the envelope method is not a reliable way to determine if race was the predominant factor (or a factor at all) in the construction of the congressional district boundaries. He agrees "that a statistically significant difference between the racial characteristics of the VTDs kept "in" and "out" of a district within its envelope might emerge purely because racial groups are clustered in space" (Rodden Reply Report, pg. 13). Nowhere in his report does he dispute that the set of simulations that are drawn without race or partisan information nevertheless

[1]The index, which I discuss in more detail below, is an average of all statewide partisan elections held in November 2024. North Carolina held statewide elections for US President, Attorney General, Auditor, Commissioner of Agriculture, Commissioner of Insurance, Commissioner of Labor, Governor, Lieutenant Governor, Secretary of State, Superintendent of Public Instruction, Treasurer, State Supreme Court, and State Appeals Court seats 12, 14, and 15. At the time of my writing this report, the State Supreme Court race was not yet certified. I reserve the right to update my analysis if the certified final result is materially different than the currently reported results.

are flagged in the majority of cases with race as a statistically significant predictor of the district's shape by the county envelope method. The results from these race-blind simulations discredit the county envelope method's ability to shed any light on whether race was the predominant factor in a district's construction.

The simulations in my original report considered contiguity, compactness, county divisions, and equal population. As I noted in my report, the simulations were meant to serve as an example of how these traditional redistricting principles are all correlated with race, and when drawing districts using these variables (while not considering race) the districts drawn by the simulation algorithm are frequently, and falsely, identified by the county envelope method as being drawn with race as a significant factor. Thus, the envelope method generates numerous false positives by flagging districts as having race as a significant predictor in their shape even when we know that race was not considered. The envelope method is therefore not a reliable method for determining if race factored (let alone predominated) into the drawing of congressional districts.

To further illustrate this, I run two additional sets of simulations. In the first set of simulations I use the same variables as in my original report to generate 5,000 simulated maps, each with 14 contiguous districts and roughly equal population that are geographically compact and avoid splitting counties. I then conduct the county envelope regression analysis by predicting whether or not a precinct in the county envelope is included in the district based on each precinct's racial composition, partisan lean, population, distance from the county envelope's center of population, and whether or not the precinct is inside the county envelope's largest city. After conducting each regression (14 regressions for each of the 5,000 maps), I note whether or not the variable measuring the precinct's racial composition is a statistically significant predictor of that precinct being included in the district.

As in my original report, the county envelope method falsely identifies, on average, half of all districts as having race as a statistically significant predictor of precinct inclusion in the district. In my original report I included both the race and partisanship of each

precinct in the regression that predicted precinct inclusion in the district. The results of this analysis are in Figure 1(a). As with the equivalent analysis in my previous report, the county envelope method falsely identifies race as a statistically significant predictor of the district's shape for the majority of these race-blind districts.

In my deposition I was asked if both race and partisanship were included in the original regression analysis and we had a lengthy discussion about the potential for multicollinearity in these type of regressions.[2] Figure 1(b) shows the results of the county envelope analysis when race, but not partisanship, is included in the regression predicting precinct inclusion in each district. This regression more closely resembles Dr. Rodden's original approach. The underlying data are the same 5,000 race-blind simulated maps as in Figure 1(a). In these regressions that do not include the partisanship of the precinct in the model, the county envelope method identifies essentially the same number of districts with race as a significant predictor of precinct inclusion in the district (where, again, we know that race played no part in their construction).

This might lead one to wonder if there is any way that the county envelope method could *not* identify race as a significant factor in a district's shape. There are two ways to approach this. The first would be to construct a county envelope regression model that accounted for *all* factors that are correlated with geography and race. This would include not only the variables that Dr. Rodden included in his regressions (population, distance from the envelope's center of population, and largest city) but also information about partisanship, the location of incumbent legislators, municipal boundaries, or other communities of interest that the mapmaker may have wanted to preserve within a district. This would then remove the potential for bias that is introduced when factors omitted from the regression that are correlated with race cause the race variable to appear statistically significant. However, race is highly correlated with not just geography and partisanship, but with many other

[2]Barber Deposition, pg. 90, lines 20-21. It is still my belief that including both race and partisanship is important and necessary, but to illustrate that in the context of the simulations it is not critical and in either case the county envelope method over-predicts race as a significant factor in district shape I conduct the analysis with race alone and exclude partisanship from the regression.

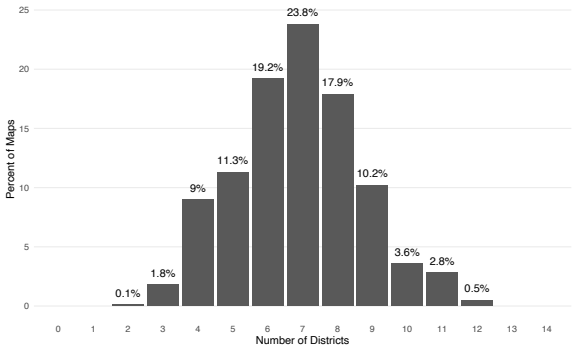
geographic, political, and socio-economic factors. Dr. Rodden's county envelope regressions only account for race, population, distance from the envelope center, and the largest city in the district.

Another way to illustrate this problem is as follows. Suppose we drew districts that truly were uncorrelated with not only race, but also all other factors that are themselves correlated with race. This would include factors such as population density, geographic features, communities of interest, political boundaries (e.g. counties and cities), population trends, partisanship, and other socioeconomic factors. To do this, I conduct 5,000 additional simulations, but in these simulations I randomly assign precincts to one of 14 districts without regard to *any* of the legal or geographic factors that constrain map makers (like population equality, contiguity, compactness, division of political boundaries, etc). These districts would clearly not ever be implemented because they are non-contiguous and do not contain equal population (among other issues). I am using them here only for demonstrative purposes to show that the most basic traditional redistricting criteria, like contiguity and equal population, are also correlated with race in North Carolina.

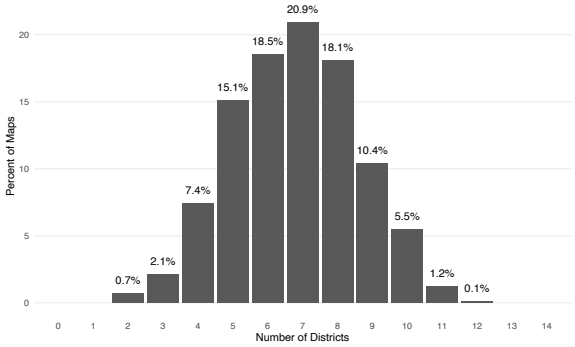
Using these truly random districts I then run the county envelope analysis on each district to predict if race is associated with precinct inclusion in these districts. Here we would not expect race to show up as a significant predictor of the district's shape because the districts were not only drawn without regard to race, but the simulation also disregarded all other factors that are correlated with race. The last panel in Figure 1 (c) shows that here the majority of maps contain no districts where race is a significant predictor of district shape. The difference between panel (c) and panels (a) and (b), where the simulated districts *were* drawn using traditional redistricting criteria (e.g., equal population, contiguity, compactness, and respecting county boundaries), starkly shows how traditional redistricting criteria are correlated with race. And because of this, any county envelope regression that doesn't completely account for *all* of these factors will incorrectly identify race as a significant predictor of the district's shape when in reality race played no role whatsoever.

Figure 1: County Envelope Analysis on 5,000 Simulated Maps

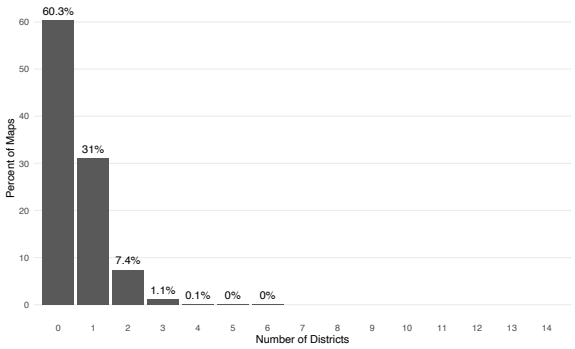
(a) Envelope Method on 5,000 simulations (with traditional redistricting criteria), partisanship in regression



(b) Envelope Method on 5,000 simulations (with traditional redistricting criteria), no partisanship in regression



(c) Envelope Method on 5,000 simulations (with no traditional redistricting criteria)



Note: In simulations that consider traditional redistricting criteria but do not consider race (the top two panels), the majority of districts are incorrectly flagged by the county envelope method with race being a significant predictor of the district's shape. The bottom panel shows the result when district shapes are truly random - they do not consider population equality, contiguity, or any other redistricting criteria. The results illustrate how introducing legally required non-racial redistricting criteria that are nevertheless correlated with race will cause districts to be incorrectly flagged as playing a role in the district's shape by the county envelope method when in fact race was not considered at all.

In a later section of his reply report, Dr. Rodden compares the racial composition of the 5,000 simulation districts to the racial composition of the 2023 Enacted Congressional Map. This comparison is not appropriate because the simulations did not, as I explain above, consider all of the criteria used by the legislature when drafting the 2023 Enacted Map. Thus, it is no surprise that he finds that the racial composition of the Enacted Map differs from the racial composition of the districts in the simulations. Furthermore, when showing the differences between the BVAP of the districts in the simulations and the BVAP of the Enacted Map's districts, he cannot identify if these differences are directly due to considerations of race or if the differences in racial composition between the simulations and the Enacted Map are due to the other legitimate factors that the legislature took into account that the simulations did not, such as partisanship, pairing of incumbents, or retaining communities of interest. Thus, the analysis in this section of Dr. Rodden's reply report suffers from the same problem I identified in his original report, namely that the analysis—and conclusion he draws from that analysis—fails to disentangle the invalid use of race from the valid use of other redistricting criteria that are spatially correlated with race.

Furthermore, Dr. Rodden attempts to account for partisanship when he isolates the simulations that produce at least 10 Republican-leaning districts. Dr. Rodden states, "To see whether extreme racial sorting was required to produce an extreme pro-Republican map, we can simply compare the distribution of BVAP across districts, ranked by BVAP, in these very pro-Republican simulated plans with the distribution of BVAP in the 2023 Plan. If a similar style of racial sorting was necessary to produce 10 (or 11) Republican districts, the observations for the 2023 Plan should fall within the range of the race-blind simulations at each rank" (Rodden reply report, pg. 19-20). However, this fails to consider the degree to which the simulations that contain 10 Republican districts are, in fact, Republican leaning. There is an enormous different between a district that is 50.01% Republican-leaning versus a district that is 55% Republican-leaning. When constructing a district that is safe for one party over the other, mapdrawers often build in some additional cushion to account for the

fact that there will be elections in which a party might not perform as well overall (for example, in a midterm election when their party controls the presidency) and mapmakers will want to avoid creating a "dummymander" that leads to their candidates losing.[3]

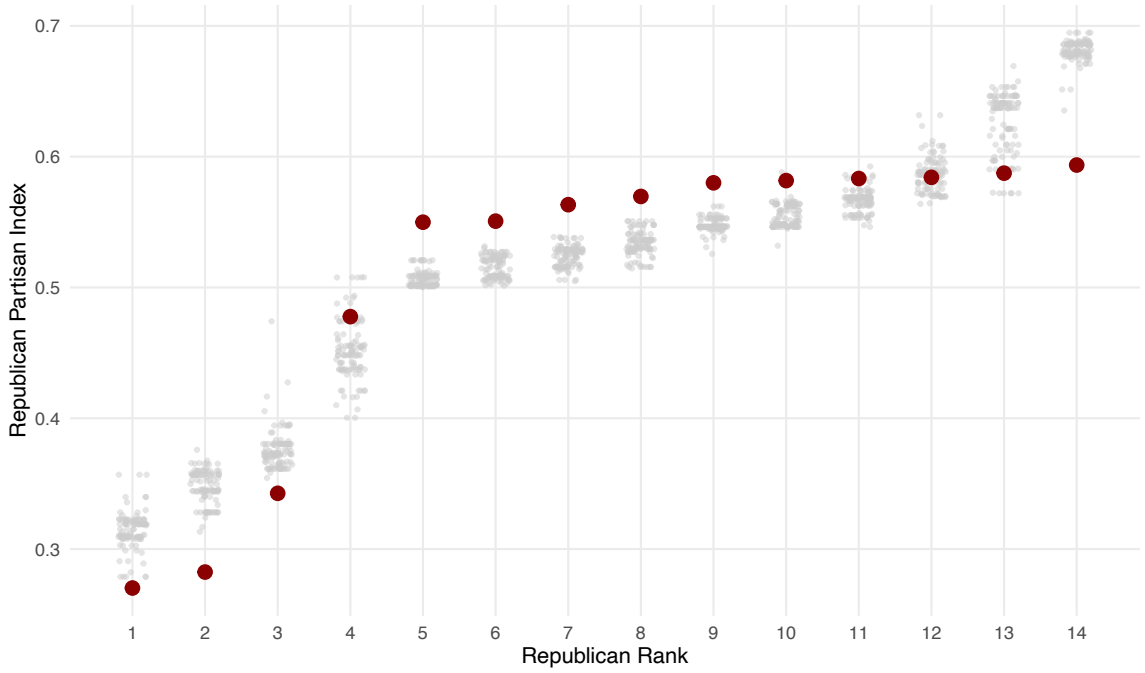
It is notable that the Enacted Map has not only 10 Republican-leaning districts, but 10 safely Republican-leaning districts that have a partisan index at or above 55%. This is not the case in the original simulations, even among those 107 simulations that Dr. Rodden identifies that have at least 10 Republican-leaning districts. This means that even these 107 simulations that Dr. Rodden highlights are not an apples-to-apples comparison to the Enacted Map with regard to their partisan composition.

There are two ways to illustrate this point. First, we can simply look at the number of simulations that contain not just 10 Republican-leaning districts, but 10 or more districts with a Republican partisan index of 55% or more. These simulations would be comparable to the simulations with respect to their partisan lean. There are, however, no such simulations. In fact, the most Republican-leaning simulation contains only 7 of these "safely Republican" districts with an index of 55% or higher. The second way is to look at the partisan index of these 107 simulations that Dr. Rodden identifies and compare them to the partisan index of the 2023 Enacted Map. Figure 2 shows the same type of figure in Dr. Rodden's reply report. However, the vertical axis of the figure now shows the Republican partisan index rather than the BVAP of each district. The simulations are displayed in grey and the 2023 Enacted Map is shown in the red circles. The figure shows that even among these most Republican-leaning simulations, the Enacted Map is more Republican-leaning, thus making these simulations not comparably partisan. Because of this, we cannot know if the racial differences that Dr. Rodden shows between these simulations and the Enacted Map are due to considerations of race or considerations of partisanship.

The results of this figure are important because they show that comparing the Enacted

[3]Rudalevige, Andrew. "Presidents and Midterm Loss." Midterms and Mandates. Electoral Reassessment of Presidents and Parties, Edinburgh University Press, S (2022): 17-53. Goedert, Nicholas. "The pseudoparadox of partisan mapmaking and congressional competition." State Politics & Policy Quarterly 17, no. 1 (2017): 47-75.

Figure 2: Partisan Lean in 2023 Enacted and Simulated North Carolina Congressional Plans, where Simulated Plans Produce at Least 10 Republican-leaning Seats



Note: Even among simulations that produce at least 10 Republican-leaning seats, the enacted map is a partisan outlier by creating districts that are more safely Republican-leaning. This means that these simulations are not a valid comparison to the enacted map on racial metrics because they are not equally partisan in nature.

Map to the simulations on measures of race (as Dr. Rodden does in his reply report) are not appropriate because the simulations (even the 107 most GOP-friendly simulations) are not comparably partisan. This again leads us back to the fundamental problem of Dr. Rodden's analysis, which is that it does not separate race from partisanship and other political considerations when identifying if race was the predominant factor in drawing the congressional map.

3.2 Race versus Partisanship and Multicollinearity

The problem of not disentangling race from other factors that are associated with race is present in other portions of Dr. Rodden's reply report as well. While it is my opinion that

the county envelope method is not an effective tool at all, in my original report I also present a statistical analysis that accounts for partisanship by including both the partisanship and racial composition of precincts in a version of the county envelope analysis conducted by Dr. Rodden. I do this analysis as a way to show that even if we accept the county envelope method as a valid way to determine if race is a significant factor in the drawing of the districts (which I do not believe), the particular way in which Dr. Rodden does so further misses the mark.

Dr. Rodden's reply report does not address the criticism that the analysis he performs fails to account for partisanship when looking at whether or not race was a factor in the drawing of the congressional district boundaries. Instead, Dr. Rodden critiques my approach because of the correlation between partisanship and race. However his concern over multicollinearity is misplaced.[4]

In his reply report Dr. Rodden quotes a statistics textbook that states "the higher the multicollinearity among the regressions, the lower is the reliability of the regression estimate."[5] A look at this sentence reveals that the statement is made in a chapter dealing with statistical models that include "lagged" variables, something that is not present in the regression models I conducted. In fact, in an earlier chapter of the same textbook the authors state that when a regression has high multicollinearity, the regression estimates are still unbiased. Furthermore, the discussion of solutions never mentions removing one of the correlated variables from the model.[6] Some of the confusion appears to be in Dr. Rodden's use of the word "reliability" to imply that the estimated coefficients in the regression model are of no value. This word conflates two parts of a regression, the "estimate" and the "uncertainty" associated with that estimate. Multicollinearity does not bias the estimated relationship between two variables (in this case the relationship between race and precinct assignment in or out of the district). What multicollinearity does affect is our uncertainty

[4]I was asked at length about these critiques in my deposition. See pages 79-86
[5]Badi Baltagi, Econometrics (Springer 2d Rev. ed., 1999), page 134
[6]Badi Baltagi, Econometrics (Springer 2d Rev. ed., 1999), page 75-76.

associated with that estimate. Another statistics textbook explains this principle by saying, "It's really important to understand what multicollinearity does and does not do. It does not cause bias. It doesn't even cause the standard errors...to be incorrect. It simply causes the standard errors to be bigger than they would be if there were no multicollinearity."[7]

Furthermore, Dr. Rodden's proposed solution to the multicollinearity issue introduces more problems than it solves. In response, he drops the "Democratic vote share" variable from the regressions I presented in my report, leaving the variable measuring the race of precincts in the model. However, this solution is no solution at all, and introduces a larger concern, "omitted variable bias," which is bias that results from leaving out a variable that affects the dependent variable and is correlated with the independent variable. This is precisely what Dr. Rodden did in his reply report. By omitting an important independent variable (precinct Democratic vote share) that is correlated with the other variables in the model (precinct Black population percentage), the estimate of how the remaining variable (precinct Black population percentage) in the model is related to the outcome variable (inclusion or exclusion of the precinct from the district) is biased and will be skewed away from the truth.[8]

By extension, I could take the opposite approach of Dr. Rodden and omit the variable that measures the race of the precinct and leave in the variable that measures the partisanship of the precinct. When I do this, all of the partisanship variables are statistically significant. At this point, I could take Dr. Rodden's interpretation of his models that omit partisanship and simply replace "partisanship" with "race" and come to the conclusions that partisanship was the driving force behind the creation of the district.

By omitting partisanship from the regression model, Dr. Rodden introduces two problems that, in my opinion, are much more severe than multicollinearity in a regression

[7]Michael A. Bailey, Real Stats: Using Econometrics for Political Science and Public Policy (New York: Oxford University Press, 2016), page 149

[8]See William H. Greene, Econometric Analysis, 8th ed. (New York: Pearson, 2018), [60-61]., Jeffrey M. Wooldridge, Introductory Econometrics: A Modern Approach, 7th ed. (Boston: Cengage, 2020), [103-104]., Michael A. Bailey, Real Stats: Using Econometrics for Political Science and Public Policy (New York: Oxford University Press, 2016), [148-149].

model. First, the resulting regression is biased because the omission of race or partisanship from the model will confound the impact that either has in these regression models. Second, this omission simply returns us to the problem with Dr. Rodden's original analysis: the movement of precincts into and out of districts must account for both race and partisanship to be able to identify if race, and not partisanship, was the explanatory factor. By removing the partisanship variable from my regression models, Dr. Rodden reintroduces exactly the problem that my regressions were designed to address, and we are again left with the inability to know which of these two factors, or neither, was a significant predictor in the assignment of precincts to districts in the 2023 Congressional map.

3.3 Election Performance of the Enacted Plan

In his reply report, Dr. Rodden claims that Black voters were packed into District 1 (see page 16 of Dr. Rodden's reply report). This is a different argument than what he says about District 1 in his original report, where he notes that "care may have been taken to avoid any major change to the district's racial statistics" (pg. 26 of Dr. Rodden original report). Dr. Rodden appears to now draw the conclusion that District 1 is racially packed by noting that District 1's BVAP is larger than most districts in the set of party-blind and race-blind simulations that I included in my original report. This is an incorrect comparison, as I described in the above section of this report.

Aside from the inapt comparison to the simulations, it is also important to note the outcome of the 2024 election in District 1 and how a hypothetical district with a lower BVAP would have likely fared. In the 2024 election, Democratic incumbent Don Davis prevailed with 186,341 of 376,324 votes cast. However, the margin between him and his Republican challenger, Laurie Buckhout, was a mere 6,307 votes, fewer than the number of votes cast for the Libertarian candidate in the race, Tom Bailey, who received 9,949 votes. Given the relationship between partisanship and race in this region of the state, a district that contained a lower BVAP, as Dr. Rodden suggests would be necessary to "unpack" District

1, would likely have elected a Republican in 2024.

The 2024 election also shows that the partisan index that I used in my original report to describe the partisan lean of districts was predictive, but not perfectly accurate, as no index of statewide elections will be. These indices are good measures of general tendency, but will never perfectly predict how elections will ultimately play out. To show this, Table 1 below presents the partisan index from my original report, an updated index that includes only the 15 partisan statewide elections that were conducted in 2024, the party that won the congressional race in each district, and the two-party vote share from the 2024 congressional election in each district.[9] Comparing the second column of the table to the column labeled "2024 winner" shows that the original partisan index was quite accurate in predicting the party that won the 2024 election in each district. The partisan index that uses only the 2024 statewide races is also quite accurate in its estimation of the partisan tendency of each district and was within a few points of the actual two-party vote margin in each congressional race (the final column of the table).[10] In some cases Republican congressional candidates ran slightly ahead of their statewide co-partisans in their districts in 2024. In others the Republican statewide candidates, on average, out performed their co-partisan congressional candidates.

3.4 Alternative Congressional Maps

In his reply Report, Dr. Rodden presents several maps as alternative congressional plans that, in his words, achieved "similar partisan goals as the 2023 Plan, but with a rather different treatment of Black voters" (Rodden Reply Report, pg. 26). He later states, "It

[9]In November 2024 North Carolina held statewide elections for US President, Attorney General, Auditor, Commissioner of Agriculture, Commissioner of Insurance, Commissioner of Labor, Governor, Lieutenant Governor, Secretary of State, Superintendent of Public Instruction, Treasurer, State Supreme Court, and State Appeals Court seats 12, 14, and 15. At the time of my writing this report, the State Supreme Court race was not yet certified. I reserve the right to update my analysis if the certified final result is materially different than the currently reported results.

[10]The final column of the table displays the two-party Republican vote share. This is calculated by taking the share of the vote won by the Republican candidate divided by the total vote shares won by the Republican and Democratic candidates in the district. This removes the votes of small third-party candidates, and the measure indicates which of the two major party candidates won a majority among the two parties.

Table 1: Partisan Index and 2024 Election Results in NC Congressional Districts

District	Republican Lean, pre-'24	Republican Lean '24	2024 Winner	2024 Dem Vote Share %	2024 Rep Vote Share %	2024 2-Party Republican Vote Share %
1	47.77	50.07	D	49.52	47.84	49.14
2	34.26	32.53	D	66.25	31.61	32.30
3	58.42	59.35	R	0.00	77.38	100.0
4	28.24	26.90	D	71.85	26.14	26.68
5	56.33	57.48	R	40.53	59.47	59.47
6	58.33	57.40	R	0.00	69.16	100.0
7	54.99	55.58	R	41.41	58.59	58.59
8	59.36	58.73	R	40.39	59.61	59.61
9	56.96	56.73	R	37.75	56.30	59.86
10	58.00	57.91	R	38.21	57.49	60.07
11	55.07	53.76	R	43.23	56.77	56.77
12	27.02	26.06	D	74.02	25.98	25.98
13	58.17	56.97	R	41.36	58.64	58.64
14	58.74	56.28	R	41.94	58.06	58.06

Note: The Republican Lean '24 column is calculated as the average of all statewide elections held in North Carolina in November 2024 within each congressional district. Those elections are: US President, Attorney General, Auditor, Commissioner of Agriculture, Commissioner of Insurance, Commissioner of Labor, Governor, Lieutenant Governor, Secretary of State, Superintendent of Public Instruction, Treasurer, State Supreme Court, and State Appeals Court seats 12, 14, and 15. The Republican Lean, pre-'24 column measures the partisan lean I used in my original report that contained statewide election results from 2008-2022.

was clearly possible to draw an exceptionally strong partisan gerrymander without going to such great lengths to break up urban Black neighborhoods and increase the BVAP of rural districts. In fact, the General Assembly considered but rejected or altered several such maps" (Rodden reply report, pg 27). I take this statement to indicate that Dr. Rodden does not believe that these alternative maps qualify as racial gerrymanders in the same way that he believes the 2023 Enacted Map does.[11]

However, this assessment of the alternative maps is incorrect for two reasons. First, the alternative maps do not achieve the same partisan objectives as the Enacted Map does with regard to both the partisan lean of the districts, but also with their treatment of incumbent legislators. Furthermore, the Enacted Map does not have a distribution of BVAP

[11]I was asked in deposition about Dr. Rodden's analysis on this. See pages 109-110.

values that are that different from these alternative maps, despite Dr. Rodden's claims otherwise. To show this, I group the alternative maps in the same way that Dr. Rodden does (September maps, Springhetti maps, October maps) and discuss them by group in comparison to the Enacted Map.

Table 2 shows the partisan lean using the 2024 statewide election index of the districts in the 2023 Enacted Map as well as the four maps that are grouped as the "September Maps" by Dr. Rodden (CBP-1, CBP-5, CBK-2, CBA-2). I have bolded districts that are Republican-leaning in each map and highlighted districts that are safely Republican-leaning by having a partisan index of greater than 55%.

Looking at the table, we see, that the September maps all create 11 Republican-leaning districts, as does the 2023 Enacted Map. However, District 1 in the Enacted Map is hardly Republican-leaning, with a partisan index of 50.12% and a Democratic incumbent. While this might seem to suggest that the September maps were better at achieving the partisan objectives of the legislature, this overlooks how these district boundaries interact with the location of the existing incumbent legislators.

The September maps all treat incumbents in a worse way. Redistricting authorities often want to avoid pairing incumbent legislators in the same district—a term colloquially known as "double bunking"—when configuring districting plans, in order to avoid forcing incumbents to move out of the district or run against each other. The September maps have significantly more double bunking than the Enacted Map. Table 2 shows this for each of the maps, indicating if an incumbent's home precinct is located within the new district and whether or not that incumbent would be double bunked with another incumbent in the 2024 elections.[12]

Representative Dan Bishop announced his intention to run statewide for Attorney General on August 3, 2023 before the Congressional map had been passed. Therefore, I do not consider him when determining if legislators are double bunked because Bishop

[12]I was provided with a list of incumbent addresses and precinct locations by counsel.

had already indicated that he was not running for Congress as the map was being drawn. Representative Jackson announced his candidacy for Attorney General on October 26, 2023 a few days after the legislature enacted the Congressional map, so I do consider him in how each map treats incumbents. Likewise, Representative Manning indicated in the summer of 2023 that she was planning to run for congress again. Only in the winter of 2023 after the maps were passed did she decide not to seek reelection.[13] The same is true of Representatives McHenry and Nickel.[14]

The 2023 Enacted Map double bunks two incumbents. Democratic incumbent Wiley Nickel is drawn into District 2 with fellow Democrat Deborah Ross. No other incumbents are double bunked, including none of the three Black incumbents in the state.

In map CBP-1 Wiley Nickel (D) is drawn into District 2 with fellow Democrat Deborah Ross (D). Moreover, Representatives Foxx (R) and Manning (D) are drawn into the same district (CD-5), something that neither legislator would likely to be happy about. Furthermore, Representative Alma Adams, the Democratic incumbent in District 12 was double bunked with fellow Democrat Jeff Jackson. In total, 6 of the 14 incumbents (including 1 Republican incumbent) are double bunked in this map.

Map CBP-5 is even worse. In addition to those listed in map CBP-1, map CBP-5 also double bunks Democratic incumbent Don Davis from District 1 with Republican incumbent Greg Murphy from District 3.

Map CBK-2 does the inverse and moves Republican incumbent Greg Murphy into District 1 and double bunks him with Democratic incumbent Don Davis. It also combines Republican incumbent Virginia Foxx with Democratic incumbent Valerie Foushee in District 5. In total, 8 different incumbents are double bunked in this map.

In Map CBA-2 two Republican incumbents (Foxx, Murphy) are double bunked with

[13]https://diamondeyecandidatereport.weebly.com/home/we-asked-every-member-of-the-house-if-theyre-running-in-2024-heres-what-they-said, https://rollcall.com/2023/12/07/manning-decides-not-to-run-again-in-north-carolina/

[14]https://www.reuters.com/world/us/us-houses-mchenry-announce-he-wont-seek-re-election-politico-2023-12-05/, https://www.newsobserver.com/news/politics-government/election/article283010413.html

Democrats (Manning, Davis). In total, Map CBA-2 double bunks 6 incumbents. It also moves Representative Foushee into District 1, a district that covers very different territory than her previous district.

Table 2: September Alternative Maps Partisanship and Treatment of Incumbents

Enacted Map			**CBP-1**		**CBP-5**		**CBK-2**		**CBA-2**	
District	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**
1	**50.07**	Davis	27.35	Davis	26.85		30.77	**Davis, Murphy**	25.16	Foushee
2	32.53	**Ross, Nickel**	30.25	**Ross, Nickel**	30.28	**Ross, Nickel**	30.28	**Ross, Nickel**	30.25	**Ross, Nickel**
3	**59.35**	Murphy	**54.53**	Murphy	**54.90**	**Murphy, Davis**	**56.44**		**54.41**	**Murphy, Davis**
4	26.90	Foushee	**56.79**	Foushee	**56.82**	Foushee	**55.06**	Hudson	**56.22**	
5	**57.48**	Foxx	**55.37**	**Foxx, Manning**	**56.53**	**Foxx, Manning**	**60.12**	**Foxx, Foushee**	**57.77**	**Foxx, Manning**
6	**57.40**	Manning	**56.98**		**55.94**		**50.46**	Manning	**57.42**	
7	**55.58**	Rouzer	**57.58**	Rouzer	**56.78**	Rouzer	**54.19**		**56.78**	Rouzer
8	**58.73**	Jackson	**55.54**	Hudson	**56.46**	Hudson	**57.11**	Rouzer	**56.99**	Hudson
9	**56.73**	Hudson	**57.60**		**57.59**		**56.98**		**57.66**	Jackson
10	**57.91**	McHenry	**57.09**	McHenry	**56.99**	McHenry	**56.35**	McHenry	**56.24**	McHenry
11	**53.76**	Edwards	**54.12**	Edwards	**54.09**	Edwards	**54.09**	Edwards	**54.09**	Edwards
12	26.06	Adams	26.04	**Adams, Jackson**	26.04	**Adams, Jackson**	26.04	**Adams, Jackson**	24.79	Adams
13	**56.97**		**56.03**		**56.27**		**56.58**		**56.18**	
14	**56.28**		**55.94**		**55.99**		**55.99**		**56.24**	

Note: This table shows the partisanship and treatment of incumbents for the Enacted Map and the five alternative maps that Dr. Rodden calls the "September Maps". Districts with a Republican partisan index of greater than 50% are bolded and districts with a partisan index greater than 55% are highlighted in Red. Incumbents that are "double bunked" are bolded in each map.

The next set of alternative maps presented by Dr. Rodden are the "Springhetti Maps". As with the Enacted Map, the Springhetti Maps, with one exception (CDS 003), create 9 districts with Republican partisan indices above 55% and one additional district with an index of greater than 50% but less than 55%.[15] The Springhetti Map "CDS 003" creates 8 safely republican districts (index >55%) and 2 districts that are Republican leaning but have a partisan index of less than 55%.

The Springhetti maps treat incumbents differently than the Enacted Map, particularly with respect to the incumbent Democrats Foushee and Adams. Whereas the Enacted Map does not double bunk any of these incumbent members of the state delegation, all three Springhetti maps double bunk representatives Foushee and Adams with White Democrats in their respective districts.

[15]These numbers are again based on the average of 2024 statewide election results in the districts.

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Table 3: Springhetti Alternative Maps Partisanship and Treatment of Incumbents

Enacted Map			**CDS 003**		**CDS 003v2**		**CDS 005**	
District	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**
1	**50.07**	Davis	49.30	Davis	49.30	Davis	49.30	Index %
2	32.53	**Ross, Nickel**	34.34	Ross	34.34	Ross	34.34	Ross
3	**59.35**	Murphy	**59.35**	Murphy	**59.35**	Murphy	**59.35**	Murphy
4	26.90	Foushee	26.28	**Foushee, Nickel**	26.28	**Foushee, Nickel**	26.28	**Foushee, Nickel**
5	**57.48**	Foxx	**61.64**	Foxx	**58.72**	Foxx, Manning	**58.61**	Foxx
6	**57.40**	Manning	**53.78**	Manning	**55.52**		**55.64**	Manning
7	**55.58**	Rouzer	**57.27**	Rouzer	**57.27**	Rouzer	**57.27**	Rouzer
8	**58.73**	Jackson	**55.64**	Hudson	**56.68**	Hudson	**56.61**	Hudson
9	**56.73**	Hudson	**57.36**		**56.74**		**56.76**	
10	**57.91**	McHenry	**58.33**	McHenry	**56.20**	McHenry	**56.24**	McHenry
11	**53.76**	Edwards	**53.44**	Edwards	**53.44**	Edwards	**53.45**	Edwards
12	26.06	Adams	28.05	**Adams, Jackson**	28.05	**Adams, Jackson**	28.05	**Adams, Jackson**
13	**56.97**		**55.34**		**58.39**		**58.39**	
14	**56.28**		**55.38**		**55.38**		**55.38**	

Note: This table shows the partisanship and treatment of incumbents for the Enacted Map and the three alternative maps that Dr. Rodden calls the "Springhetti Maps". Districts with a Republican partisan index of greater than 50% are bolded and districts with a partisan index greater than 55% are highlighted in Red. Incumbents that are "double bunked" are bolded in each map.

The final set of maps are the "October maps" presented by Dr. Rodden. These maps, as I understand, are the precursors to the Enacted Map, with each iteration making changes that eventually resulted in the 2023 Enacted Map. In this case, each of the changes that led to each new iteration is consistent with an effort to either reduce incumbent pairings, reduce precinct splits, or reduce county traversals. Because these maps are the ones that eventually became the Enacted Map, I discuss the changes in greater detail below.

CMT-1 to CMT-2: CMT-2 unifies Pitt County, the home county of incumbent representative Greg Murphy in District 3. However, this change overpopulates District 3 and under-populates District 1. To account for this, District 1 extends into eastern Granville County and takes the town of Oxford from District 13. This then requires District 13 to take portions of District 3 in Sampson County. These changes result in the final version of District 1.

CMT-2 to CCH-4: CCH-4 adjusts District 2's boundaries slightly to move incumbent representative Nickel into District 2 and out of District 4. This change double bunks Representative Nickel with fellow Democratic Representative Ross. This leaves District 4 with Representative Foushee as the sole incumbent living in District 4. These changes result in the final version of Districts 2 and 4.

CCH-4 also adjusts the boundaries of Districts 5 and 6 in the Greensboro area to move Representative Manning out of District 5 and into District 6, leaving Republican Virginia Foxx as the only incumbent in District 5. CCH-4 also contains additional alterations in eastern Forsyth County. District 6 takes more of the county from District 10. This allows District 10 to take the entirety of Iredell County. While this change is net-neutral on county splits (additional split of Forsyth County while removing split of Iredell County), it does place more of District 10's population near the residence of its incumbent at the time, Patrick McHenry.

In Mecklenburg County CCH-4 unifies 6 precincts on the western border of District 12 that were split in the previous iteration of the map by placing the entirety of these precincts

in District 14. To make up for this population loss, District 12 takes portions of District 14 in southern Charlotte and moves them into District 12. This change has a net reduction in precinct splits in Districts 12 and 14. It also reduces the BVAP of District 12 from 39.9% to 38.3%, doing the opposite of what Dr. Rodden claims.[16] This change results in the final version of Districts 12 and 14.

There are also several other changes between CMT-2 and CCH-4 in Districts 3, 8, 13 and 11, but these are not districts that are noted in Dr. Rodden's original report or reply Report, so I do not focus on these alterations here.

The purpose of these comparisons is twofold. First, the data and results presented above show that all of these alternative maps are not, in reality, equally partisan, nor do they achieve the same partisan objectives. Each of the alternatives discussed above either create more vulnerable Republican districts, pair more incumbents, or do some combination of all of these things. This makes them invalid as achieving "similar partisan goals," and as a result, the differences between these alternative maps and the 2023 Enacted Map in terms of the racial composition of the districts in these maps is also not especially meaningful, nor instructive.

Furthermore, the differences that emerge between the "October maps," which most closely resemble the Enacted Map, are best explained by changes made to address traditional redistricting criteria (incumbency, split precincts, split counties) and not based on racial considerations. Any racial effects that these changes had appear to be secondary to other objectives. Thus, if the Enacted Map is derived from non-racial adjustments made to the October Maps, and the October Maps themselves are not racial gerrymanders, it would follow that the Enacted Map is also not a racial gerrymander.

[16]Dr. Rodden claims that the Enacted Map, which as the same orientation of District 12 as CCH-4 was a more extreme outlier than any of its predecessors (see page 27 of Rodden Reply Report). However, this example shows the BVAP of District 12 going down compared to its predecessor, not increasing.

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Table 4: October Alternative Maps Partisanship and Treatment of Incumbents

Enacted Map			**CMT-1**		**CMT-2**		**CCH-4**	
District	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**	**Republican Index %**	**Incumbent**
1	**50.07**	Davis	**50.24**	Davis	**50.07**	Davis	**50.07**	Davis
2	32.53	**Ross, Nickel**	32.42	Ross	32.42	Ross	32.53	**Ross, Nickel**
3	**59.35**	Murphy	**55.11**	Murphy	**54.83**	Murphy	**55.77**	Murphy
4	26.90	Foushee	26.91	**Foushee, Nickel**	26.91	**Foushee, Nickel**	26.90	Foushee
5	**57.48**	Foxx	**58.42**	**Foxx, Manning**	**58.42**	**Foxx, Manning**	**57.48**	Foxx
6	**57.40**	Manning	**59.32**		**59.32**		**57.40**	Manning
7	**55.58**	Rouzer	**58.43**	Rouzer	**58.43**	Rouzer	**58.43**	Rouzer
8	**58.73**	Jackson	**57.57**	Hudson	**57.57**	Hudson	**56.73**	Hudson
9	**56.73**	Hudson	**59.03**	Jackson	**59.03**	Jackson	**59.10**	Jackson
10	**57.91**	McHenry	**56.24**	McHenry	**56.24**	McHenry	**57.91**	McHenry
11	**53.76**	Edwards	**54.09**	Edwards	**54.09**	Edwards	**53.76**	Edwards
12	26.06	Adams	24.79	Adams	24.79	Adams	26.06	Adams
13	**56.97**		**55.46**		**55.86**		**56.97**	
14	**56.28**		**56.24**		**56.24**		**56.28**	

Note: This table shows the partisanship and treatment of incumbents for the Enacted Map and the three alternative maps that Dr. Rodden calls the "October Maps". Districts with a Republican partisan index of greater than 50% are bolded and districts with a partisan index greater than 55% are highlighted in Red. Incumbents that are "double bunked" are bolded in each map.

4 District-by-District Racial and Partisan Composition of Alternative Maps

In this section I address the claim that the 2023 Enacted Map had a "rather different treatment of Black voters" (Rodden Reply Report, pg. 26) compared to the alternative maps that Dr. Rodden analyzes. To do this, I look at the three regions of the state that Dr. Rodden focuses on and compare the Black population of the 2023 Enacted Map to the Black population of the districts in the alternative maps that cover the same region. I also look at the partisan differences between the alternative maps in these regions compared to the Enacted Map in the same regions of the state using the 2024 election index

Northeastern Counties - District 1

The left panel of Figure 3 shows the Black population share of District 1 in the 2023 Enacted Map as well as the Black population of the districts in each of the alternative maps that covers the same region.[17] The right panel shows the 2024 partisan lean of District 1 in the Enacted Map compared to the 2024 partisan lean of the district in each of the alternative maps that covers the same area.[18] The figure illustrates that the Enacted Map is not an outlier in District 1 with respect to either race or partisanship and is similar to many of the alternative maps.

[17] While the orientation of the districts is not always the same, all of the alternative maps, as well as the 2023 Enacted Map place a district in the northeast of the state that includes most of the majority Black counties in the state: Bertie, Hertford, Edgecombe, Halifax, Northampton, Vance, Warren, and Washington.

[18] All calculations of the partisan lean in this section use the same partisan index that I described above using the average of 2024 statewide elections.

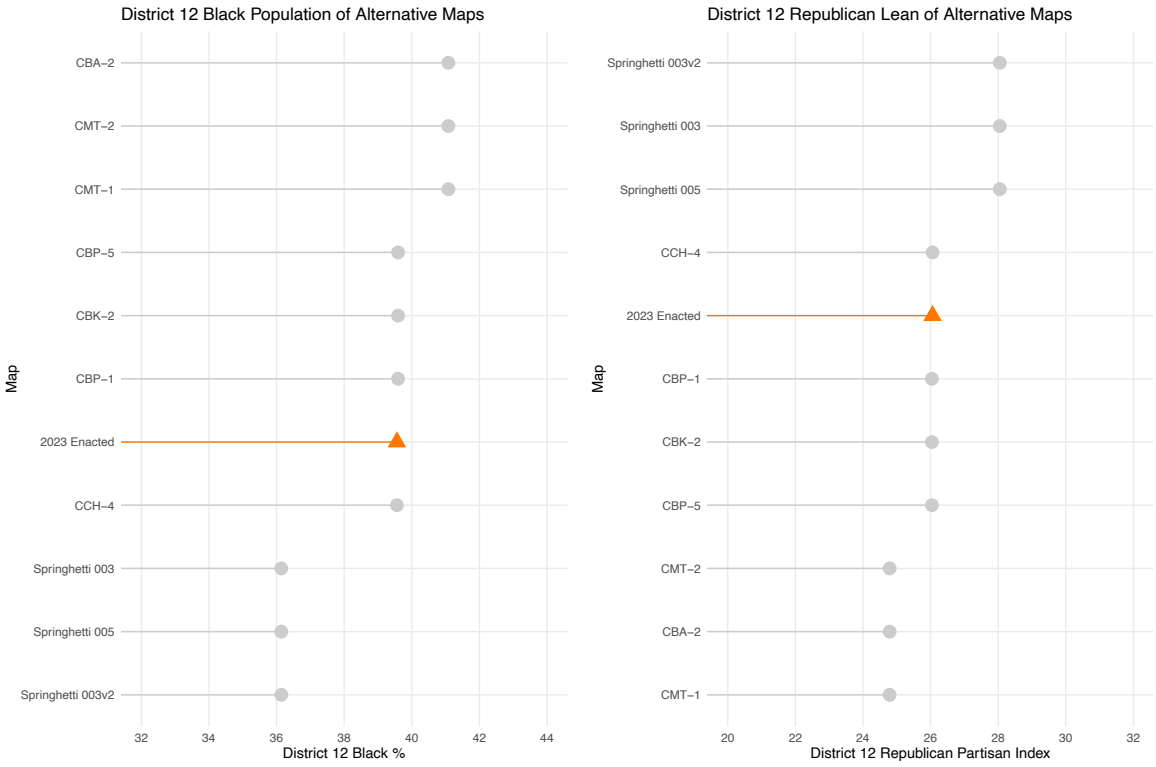
Figure 3: Congressional District 1 Race and Partisanship

Note: Congressional District 1 in northeastern NC in the Enacted Map has a similar Black population and partisan lean to each of the alternative maps considered by Dr. Rodden.

Charlotte - Districts 12 and 14

The left panel of Figure 4 shows the Black population of District 12 in the 2023 Enacted Map (the districts that covers most of Mecklenburg County) as well as the Black population of the district in each of the alternative maps that covers the same region. The right panel then shows the partisan lean of these districts. The figures immediately show that District 12 in the Enacted Map is not an outlier on either race or partisanship and is similar to (and in many cases identical to) many of the alternative maps.

Figure 4: Congressional District 12 Race and Partisanship

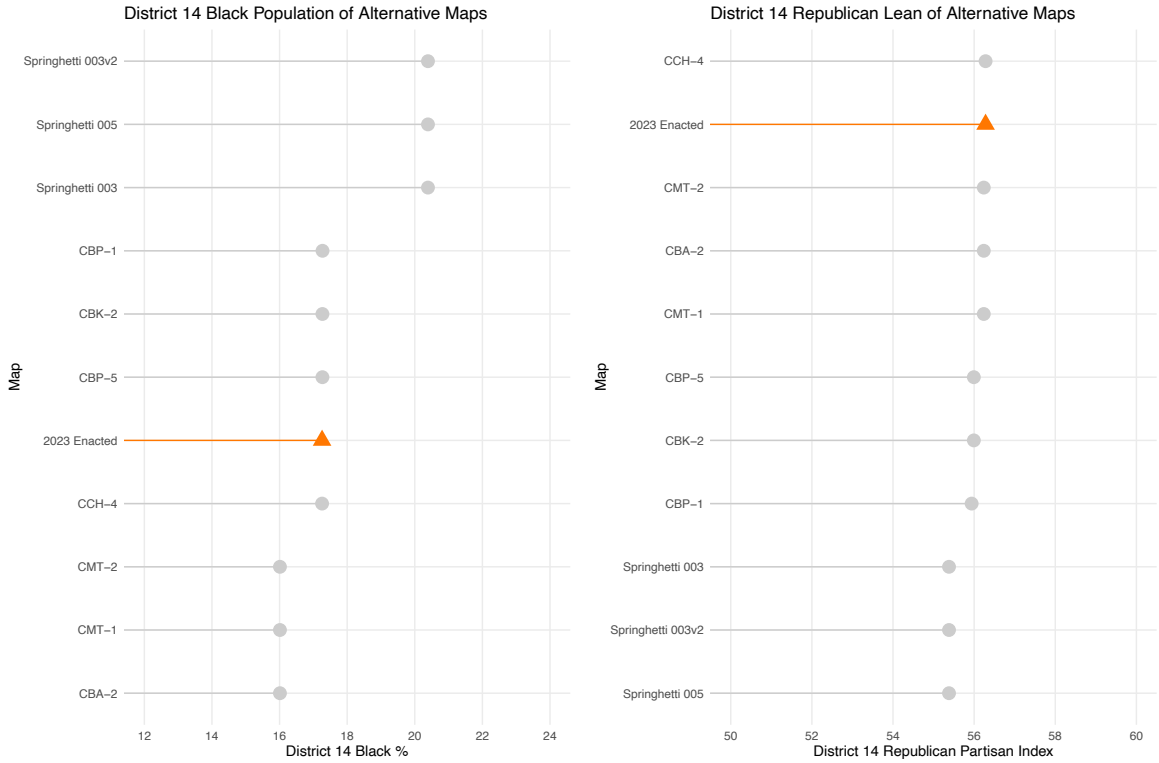


Note: Congressional District 12 in Mecklenburg County in the Enacted Map has a similar Black population and partisan lean to each of the alternative maps considered by Dr. Rodden.

The left panel of Figure 5 shows the Black population of District 14 in the 2023 Enacted Map (the district that covers western Mecklenburg County and counties to the west) as well as the Black population of the district in each of the alternative maps that

covers the same region. The right panel then shows the partisan lean of these districts. The figures immediately show that District 14 in the Enacted Map is not an outlier on either race or partisanship and is similar to (and in many cases identical to) many of the alternative maps.

Figure 5: Congressional District 14 Race and Partisanship



Note: Congressional District 14 in Mecklenburg County in the Enacted Map has a similar Black population and Republican lean to many of the alternative maps considered by Dr. Rodden.

Triad - Districts 5, 6, 9, and 10

Figure 6 shows the Black population (left panel) and partisan lean (right panel) of Districts 5, 6, 9, and 10 in the 2023 Enacted Map (the districts that cover Guilford and Forsyth Counties) as well as the Black population and partisanship of the districts in each of the alternative maps that cover the same region. In some maps there are three districts that cover these two counties and in other maps there are four districts. In this case, because the numbering and orientation of the districts is not always the same, I plot all of the districts in this region together for each map, sorted from lowest Black population to highest Black population. The same is true on the right panel that displays the partisan lean of the districts for each map. The figures immediately show that the Enacted Map is not an outlier on the Black population of these districts when compared to the districts in the alternative maps that cover the same counties. The Enacted Map has neither the lowest Black population district nor the highest Black population district among the comparator maps.

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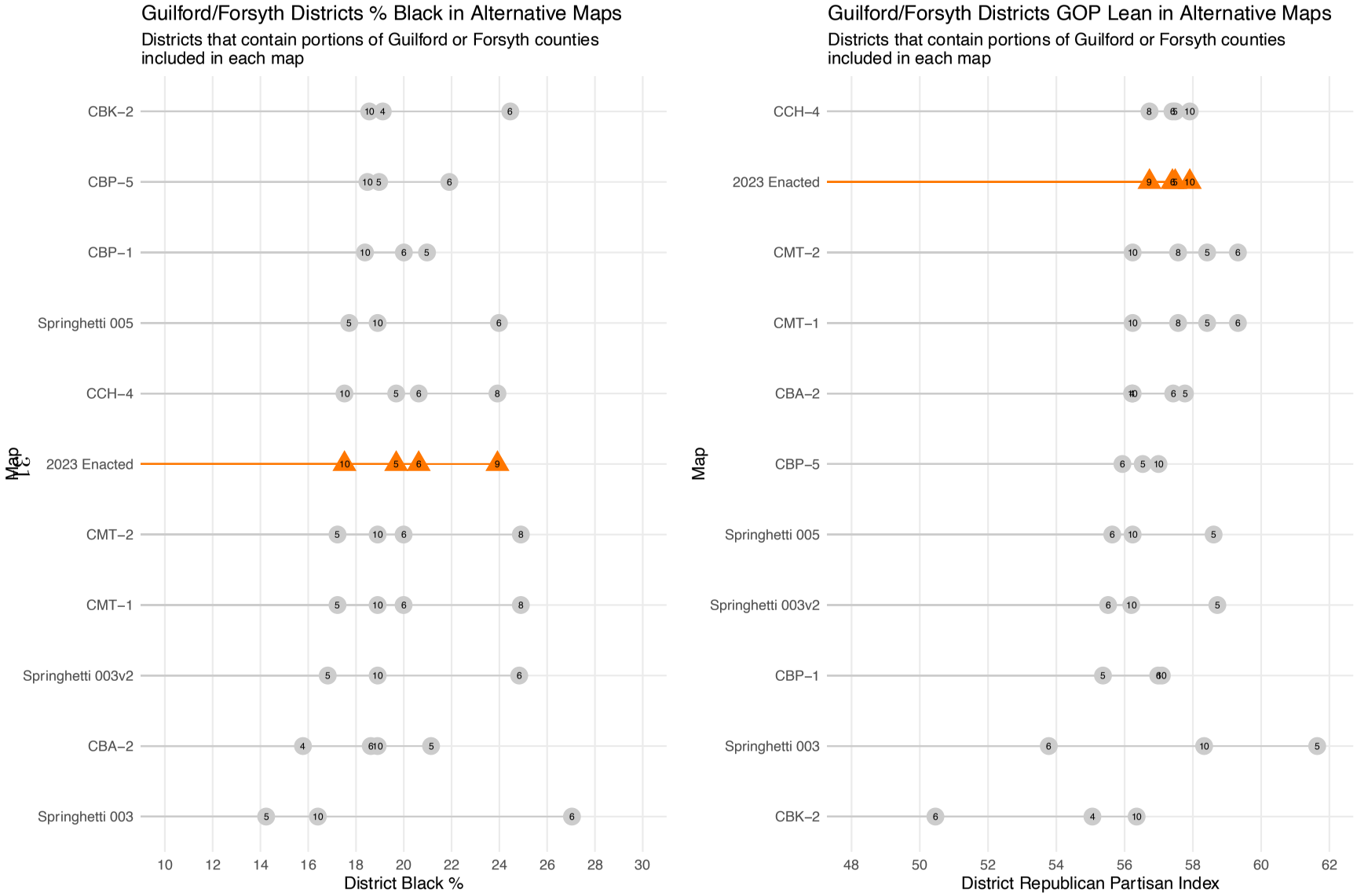
Figure 6: Triad Region Congressional Districts Race and Partisanship



Note: The districts in the Triad region in the 2023 Enacted Map have a similar BVAP and partisan lean to many of the alternative maps considered by Dr. Rodden. Each point is labelled with the corresponding district number.

5 Apportionment Analysis

In his reply report, Mr. Fairfax misstates my original critique and claims that I was suggesting that there are no alternative ways to configure districts in the county groupings he identified that would reduce population deviations. That is incorrect. My original critique was that while he claimed that there were "several options that would allow me to shift one or two VTDs that would bring the district population closer to the ideal population and the overall population deviation closer to zero" (Fairfax Report, pg. 68), he chose not to provide any examples that would illustrate this point. This made it impossible for me to evaluate any alternative configurations and whether such alternatives would be able to accomplish the same non-population objectives while reducing population deviations across districts within county groupings.[19]

In his reply report, Mr. Fairfax produces an alternative configuration of district boundaries that reduce population deviations in the county clusters he identifies as problematic. These changes, he states, "result in similar or better redistricting criteria metrics" (Fairfax Reply Report, pg. 6). However, Mr. Fairfax fails to consider the partisan implications of these changes, and these alternative district alignments universally reduce the Republican lean of swing districts throughout the state. Therefore, these alternatives do not accomplish the objective of reducing population deviations while maintaining the status quo on other valid redistricting criteria, and in fact, Mr. Fairfax's changes in population appear to universally benefit the Democratic Party in districts that will likely be competitive in future elections. I will consider them one at a time and show, using the 2024 partisan index of statewide elections, that Mr. Fairfax's alternative district configurations are worse for Republican candidates across the board.

In the Brunswick-New Hanover Senate cluster, Mr. Fairfax moves one precinct (W15 in Wilmington) from SD-8 to SD-7. Table 8 below shows the population and partisan

[19] I was asked about this critique and Mr. Fairfax's alternatives in his reply report in my deposition at pages 206-215

implications of this change. District 7 is slightly less Republican leaning (by approximately 0.74%). While this might seem like a small difference, the district is already very competitive and will likely be decided by small margins in future elections. In 2024, the incumbent Republican candidate, Michael Lee, won the district with 52.21% of the vote. A shift of between half and 1 percentage point in a Democratic direction is a sizable shift in this type of district.

In the Iredell-Mecklenburg Senate cluster, Mr. Fairfax moves one precinct from SD-39 to SD-42 and then moves another precinct from SD-40 to SD-42. He does not alter the other three senate districts in the cluster, indicating to me that he does not find these districts to be problematic. The movement of two precincts into SD-42, however, has the partisan effect of making SD-42 more Democratic leaning. Table 8 below shows the population and partisan implications of this change. District 42 is slightly less Republican leaning (approximately 0.13%). While this might seem like a small difference, the district is also very competitive and will likely be decided by small margins in future elections. In 2024, the incumbent Democratic candidate, Woodson Bradley, won the district with 50.08% of the vote, beating her Republican challenger by just 209 votes. A shift of even one tenth of one percentage point in a Democratic direction is a sizable shift in this type of district.

In the Wake County House cluster, Mr. Fairfax moves one precinct (19-11) from HD-66 to HD-35 and another precinct (13-2) from HD-34 to HD-66. Table 6 below shows the population and partisan implications of this change. District 35 is slightly less Republican leaning (by approximately 0.32%). While this might seem like a small difference, the district is very competitive and will likely be decided by small margins in future elections. In 2024, the Republican candidate, Mike Schietzelt, won the district with 50.27% of the vote. A shift of one third of a percentage point in a Democratic direction is a sizable shift in this type of district. Mr. Fairfax makes no other changes to the 10 other house districts in the county cluster, including HD-37, the most overpopulated district in the cluster. I take this to indicate that he does not find these districts to be apportioned problematically.

Table 5: Population and Partisan Differences between Enacted Senate Districts and Fairfax Alternatives

District	2020 Population Deviation %	2024 Republican Partisan Lean %	2024 Republican Vote Share %
SD-7	-4.96	51.62	52.21
SD-7 Altered	-0.68	50.88	—
SD-8	2.76	58.23	59.9
SD-8 Altered	-1.5	59.02	—
SD-42	0.28	47.40	49.92
SD-42 Altered	2.44	47.27	—
SD-39	4.95	32.64	0
SD-39 Altered	3.97	32.53	—
SD-40	4.83	23.74	0
SD-40 Altered	3.65	23.47	—

Note: In SD-39 and SD-40 the 2024 Republican vote share is zero because no Republican candidates ran in those districts. However, the partisan lean shows the performance of statewide Republican candidates in those districts in 2024.

Table 6: Population and Partisan Differences between Enacted House Districts and Fairfax Alternatives

District	2020 Population Deviation %	2024 Republican Partisan Lean %	2024 Republican Vote Share %
HD-35	-4.48	50.56	50.27
HD-35 Altered	1.76	50.24	—
HD-66	1.98	35.11	0
HD-66 Altered	-0.97	34.73	—
HD-34	3.23	34.68	0
HD-34 Altered	-0.07	34.45	—
HD-75	0.44	54.70	56.95
HD-75 Altered	-1.49	51.87	—
HD-71	2.1	29.72	0
HD-71 Altered	-1.55	30.34	—
HD-91	-4.68	65.33	67.16
HD-91 Altered	0.90	65.99	—

Note: In HD-66, 34, and 71 the 2024 Republican vote share is zero because no Republican candidates ran in those districts. However, the partisan lean shows the performance of statewide Republican candidates in those districts in 2024.

In the Fosyth-Stokes House cluster, Mr. Fairfax moves one precinct from HD-75 to HD-91 and then moves another precinct from HD-71 to HD-75. He does not alter the other two house districts in the cluster, indicating to me that he does not find these districts to be problematic. The swapping of one precinct out of HD-75 with a different precinct into HD-75, however, has the partisan effect of making HD-75 more Democratic leaning. Table 6 below shows the population and partisan implications of this change. District 75 is less Republican leaning (approximately 2.8%). This is a sizable shift in the partisan composition of the district. In 2024, the Republican candidate, Donny Lambeth, won the district with 56.95% of the vote. A shift of more than two and a half percentage points in a Democratic direction would be a sizable partisan shift in this district.

The figures below also show that the apportionment in each of the clusters is not systematically associated with one party or the other. For example, in the Wake County House Cluster (Figure 7), the least populated and most populated districts are both represented by Republican legislators. In the Forsyth-Stokes House Cluster (Figure 8) there is also no association between the difference in apportionment and the party representing the district.

Similar figures for the Mecklenburg Senate Cluster (Figure 9) and the Brunswick-New Hanover Senate cluster (Figure 10) show no association between apportionment and partisanship. Tables 8-9 in the next section show the population deviation for all 50 Senate and 120 House districts, the party that won the seat, the 2024 election result in the district, and the racial composition of each district. Looking across the entire plan, there is also no association between partisanship or race and the degree to which a district is over or under-populated within the 5% allowable threshold.

5.1 House Clusters Population Deviation

Figure 7: Apportionment in Wake County House Districts and Incumbent Party in Each District

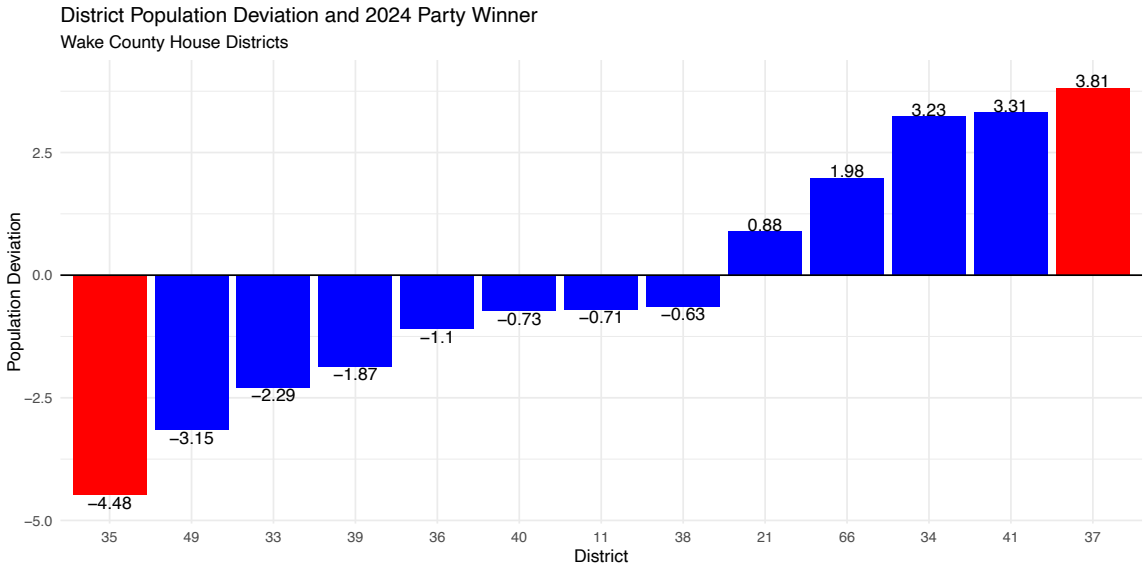
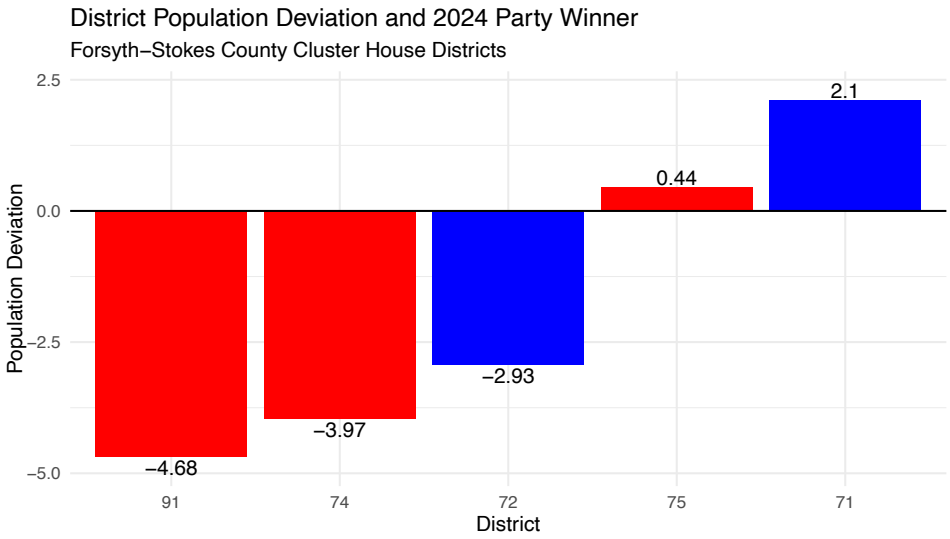


Figure 8: Apportionment in Forsyth-Stokes County House Districts and Incumbent Party in Each District



5.2 Senate Clusters Population Deviation

Figure 9: Apportionment in Iredell-Mecklenburg County Senate Districts and Incumbent Party in Each District

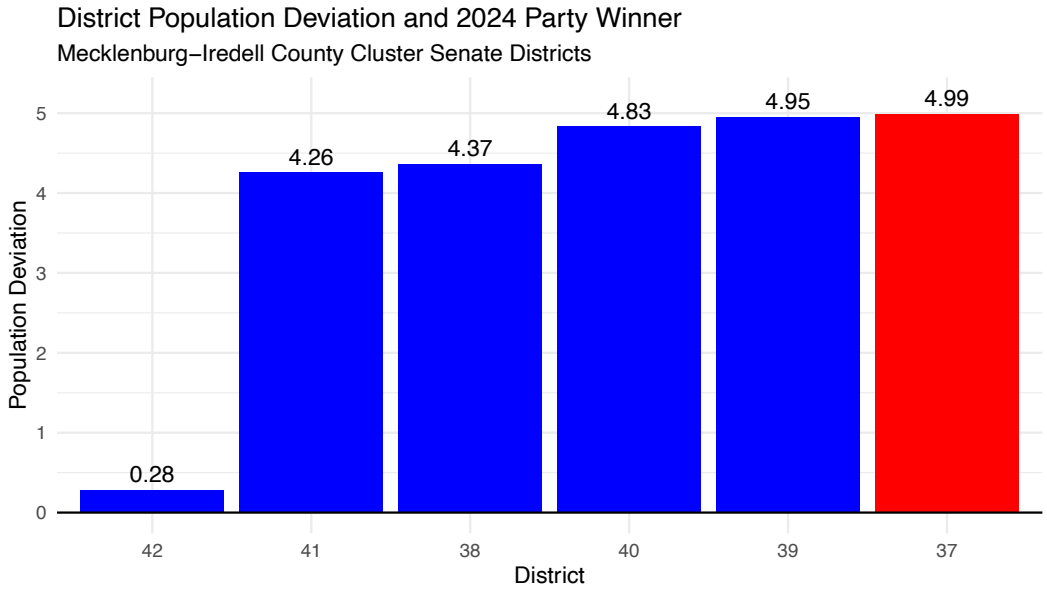
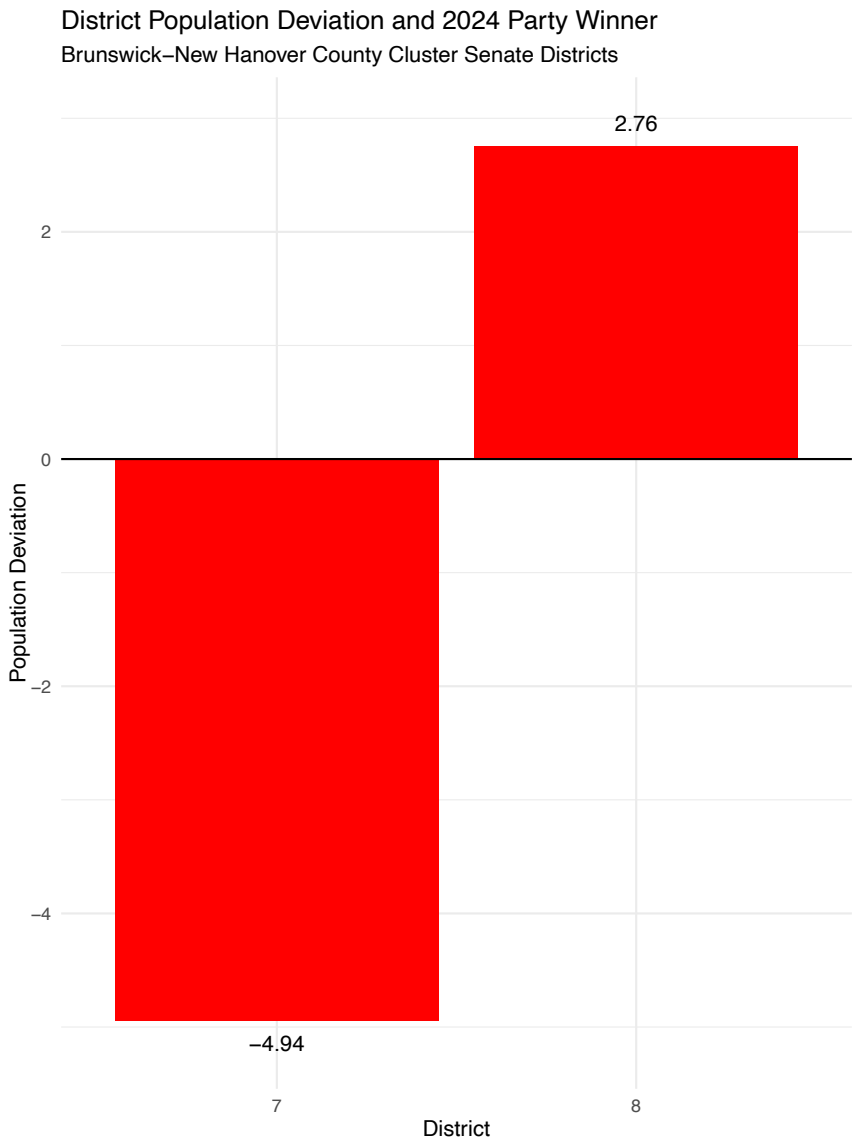


Figure 10: Apportionment in Brunswick-New Hanover County Senate Districts and Incumbent Party in Each District



6 Statewide Apportionment Tables

The tables below show population deviations for every district in both the Enacted Senate and House plans. The tables also indicate the Democratic vote share in the 2024 legislative elections in each district as well as the Black Voting Age Population in each district using the 2020 US Census data. Finally, the tables also show the population deviation of each district. Finally, each table shows the county cluster's average population deviation and the district's deviation from that average since some county clusters are already over or under-populated more than others.

Looking at each table, it is clear that there is no systematic association between the population deviation of the districts challenged by Mr. Fairfax and their partisan lean or racial composition. The challenged districts are all scattered across the tables. Some are over-populated and some are under-populated.[20]

In the Senate, it may appear that the challenged districts are mostly over-populated (SDs 41, 38, 40, 39, and 37). However, it is important to note that these districts are all in the Wake County cluster and that cluster started out overpopulated by 3.95% to begin with.

I also conduct a more systematic multiple regression analysis to see if partisanship, race, or the particular districts that are challenged by Mr. Fairfax are statistically associated with the population deviation of the district. To do this, I regress the population deviation of each district on variables measuring the vote share of the Democratic candidate in the 2024 election in each district, the 2020 BVAP of each district, and a variable indicating if Mr. Fairfax mentioned the district in his Apportionment Analysis section of his report. Finally, to account for the fact that the county groupings that constrain the map-drawing process do not all have equal population, I also include a variable measuring the average population deviation of each cluster.[21] The results of the regression analysis in both the House and

[20] Of course, all of the districts are within the acceptable 5% range. When I say over- or under-populated, I mean over- or under-populated, but within the accepted 5% range.

[21] The average population deviation of the cluster is calculated by taking the total population of the cluster, dividing by the number of districts in that cluster, and then calculating the deviation of this number from the ideal district size.

Senate show that across each map the district's population deviation is not associated with partisanship, race, or Mr. Fairfax's choice of districts to discuss in his report. The only variable that is statistically significant (denoted by the '***' next to each coefficient) is the variable measuring the county cluster average population deviation. This makes sense given that districts that are drawn from county clusters that start out over (or under) populated are much more likely to themselves also be over (or under) populated.

Table 7: Regression Results

	Dependent variable:	
	2020 Population Deviation	
	(House)	(Senate)
2024 Democratic Vote Share	0.001	−0.004
	(0.009)	(0.012)
2020 BVAP	0.0004	0.013
	(0.017)	(0.020)
County Cluster Avg. Pop. Deviation	1.000***	0.993***
	(0.074)	(0.063)
Fairfax Challenged	−0.028	0.049
	(0.558)	(0.635)
Constant	−0.068	−0.092
	(0.421)	(0.521)
Observations	120	50
R^2	0.624	0.872
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 8: Senate District Population and Partisan Details

District	2024 Democratic Vote Share %	2020 BVAP %	2020 Population Deviation %	Single District Grouping	Cluster Avg. Population Deviation %	Deviation from Cluster Average %
18	48.47	20.18	-5		-4.98	-0.02
13	50.21	12.56	-4.99		-4.98	-0.01
15	65.95	20.83	-4.99		-4.98	-0.01
16	100	13.88	-4.98		-4.98	0
17	74.38	10.51	-4.97		-4.98	0.01
7	43.74	9.05	-4.94		-1.09	-3.85
14	73.46	44.18	-4.92		-4.98	0.06
2	41.81	30.01	-4.9	Yes	-4.9	0
1	42.79	29.49	-4.39	Yes	-4.39	0
22	85.98	34.77	-4.3		-3.94	-0.36
46	34.77	4.75	-4.28		-3.83	-0.45
48	36.07	5.51	-4.18	Yes	-4.18	0
3	40.01	26.66	-3.97	Yes	-3.97	0
12	38.39	20.61	-3.83		-3.35	-0.48
20	72.28	27.1	-3.58		-3.94	0.36
49	69.07	7.36	-3.38		-3.83	0.45
9	34.97	23.92	-2.87		-3.35	0.48
24	41.26	29.63	-2.87	Yes	-2.87	0
44	27.5	13.14	-2.75		-0.79	-1.96
6	30.37	15.33	-2.02	Yes	-2.02	0
47	35.85	3.01	-1.97		2.56	-4.53
11	48.71	36.65	-1.28	Yes	-1.28	0
42	50.08	9.86	0.28		3.95	-3.67
33	29.01	14.88	0.28	Yes	0.28	0
28	100	51.42	0.6		0.96	-0.36
23	65.85	16.73	0.83	Yes	0.83	0
27	60.79	26.01	0.85		0.96	-0.11
36	21.02	4.48	1.05	Yes	1.05	0
43	38.22	18.57	1.17		-0.79	1.96
30	24.69	9.21	1.37	Yes	1.37	0
32	68.97	35.3	1.42		2.28	-0.86
26	41.1	19.6	1.44		0.96	0.48
8	40.1	17.08	2.76		-1.09	3.85
34	44.19	19.76	2.97		4.22	-1.25
31	37.43	12.34	3.15		2.28	0.87
10	37.64	16.73	3.45	Yes	3.45	0
19	62.87	48.07	3.68		4.04	-0.36
4	44.88	35.02	3.73	Yes	3.73	0
25	39.75	17.77	4.15		4.22	-0.07
41	100	43.04	4.26		3.95	0.31
38	100	37.28	4.37		3.95	0.42
21	37.24	19.56	4.4		4.04	0.36
50	33.47	2.03	4.76		2.56	2.2
29	31.45	19.11	4.81		4.22	0.59
40	79.38	41.08	4.83		3.95	0.88
45	29.72	7.92	4.89		2.56	2.33
39	100	25.89	4.95		3.95	1
35	36.66	10.94	4.96		4.22	0.74
5	55.08	40.35	4.96	Yes	4.96	0
37	35.27	11.08	4.99		3.95	1.04

Note: Districts are colored green if they are identified in the "Apportionment Analysis" section of Mr. Fairfax's report. Districts are colored Red/Blue based on party that won the 2024 election. Districts are colored orange if BVAP is greater than 35% using 2020 US Census Data.

Table 9: House District Population and Partisan Details

District	2024 Democratic Vote Share %	2020 BVAP %	2020 Population Deviation %	Single District Grouping	Cluster Avg. Population Deviation %	Deviation from Cluster Average %
44	62.28	44.36	-4.96		-3.81	-1.15
98	52.2	7.91	-4.83		-1.37	-3.46
1	34.94	18.46	-4.81		-3.73	-1.08
91	32.84	16.07	-4.68		-1.81	-2.87
55	37	26.75	-4.68		-0.25	-4.43
5	45.84	38.59	-4.65	Yes	-4.65	0
42	74.29	46.6	-4.63		-3.81	-0.82
10	39.21	32.4	-4.58		-4.56	-0.02
4	36.97	27.49	-4.55		-4.56	0.01
51	35.7	16.73	-4.51		-1.97	-2.54
35	47.08	12.7	-4.48		-0.13	-4.35
118	38.74	1.54	-4.27	Yes	-4.27	0
80	24.3	9.93	-4.26		-2.91	-1.35
53	37.07	16.75	-4.23		0.46	-4.69
24	51.1	38.5	-4.22		-0.14	-4.08
47	35.37	25.17	-4.07		-3.93	-0.14
54	54.76	11.6	-4.05		-1.97	-2.08
13	30.11	8.91	-4.02		-3.21	-0.81
74	48.18	10.18	-3.97		-1.81	-2.16
7	42.17	26.8	-3.97		-1.06	-2.91
104	55.96	12.31	-3.96		-1.37	-2.59
8	64.03	45.34	-3.95		-2.15	-1.8
46	0	26.83	-3.79		-3.93	0.14
45	100	40.34	-3.74		-3.81	0.07
63	44.97	20.69	-3.62		-1.48	-2.14
102	100	25.22	-3.21		-1.37	-1.84
49	100	13.34	-3.15		-0.13	-3.02
101	100	41.16	-3.02		-1.37	-1.65
52	38.93	23.07	-3		-1.97	-1.03
99	86.4	47.59	-2.98		-1.37	-1.61
72	100	40.12	-2.93		-1.81	-1.12
111	26.11	14.03	-2.86		2.35	-5.21
88	100	23.61	-2.86		-1.37	-1.49
79	36.76	17.08	-2.66		-3.73	1.07
27	100	51.88	-2.6	Yes	-2.6	0
12	41.37	38.48	-2.59	Yes	-2.59	0
120	24.84	1.31	-2.4	Yes	-2.4	0
3	38.32	20.2	-2.4		-3.21	0.81
33	80.19	41.21	-2.29		-0.13	-2.16
87	24.58	5.26	-2.28		-1.03	-1.25
16	29.16	11.72	-2.18		1.45	-3.63
56	86.29	11.25	-2.13		-1.47	-0.66
43	42.67	30.85	-1.91		-3.81	1.9
95	35.53	8.11	-1.87		-0.19	-1.68
39	100	34.22	-1.87		-0.13	-1.74
28	31.12	16.99	-1.85		0.46	-2.31
94	23.03	5.79	-1.64		-0.13	-1.51
89	24.01	7.02	-1.63		-0.19	-1.44
81	28.13	9.91	-1.56		-2.91	1.35
105	49.8	9	-1.52		-1.37	-0.15
36	54.52	9.37	-1.1		-0.13	-0.97
48	51.92	37.09	-0.85	Yes	-0.85	0
50	100	18.06	-0.81		-1.47	0.66
40	62.32	13.88	-0.73		-0.13	-0.6
78	23.54	5.77	-0.72		-1.97	1.25
11	64.65	11.36	-0.71		-0.13	-0.58
38	100	40.89	-0.63		-0.13	-0.5
9	44.05	26.25	-0.36		-2.15	1.79
106	100	45.99	-0.32		-1.37	1.05
100	100	27.85	-0.27		-1.37	1.1

Note: Districts are colored green if they are identified in the "Apportionment Analysis" section of Mr. Fairfax's report. Districts are colored Red/Blue based on party that won the 2024 election. Districts are colored orange if BVAP is greater than 35% using 2020 US Census Data.

Table 9, Continued: House District Population and Partisan Details

District	2024 Democratic Vote Share %	2020 BVAP %	2020 Population Deviation %	Single District Grouping	Cluster Avg. Population Deviation %	Deviation from Cluster Average %
84	29.35	16.59	-0.26		-0.19	-0.07
97	0	5.81	-0.21	Yes	-0.21	0
92	100	37.63	0.1		-1.37	1.47
93	43.17	3.52	0.23		-1.03	1.26
112	100	46.97	0.26		-1.37	1.63
75	43.05	18.89	0.44		-1.81	2.25
86	27.95	6.41	0.66	Yes	0.66	0
64	45.16	20.93	0.66		-1.48	2.14
21	62.75	9	0.88		-0.13	1.01
90	22.1	3.68	1.39		-0.13	1.52
68	37.51	9.22	1.4		-0.25	1.65
67	24.97	13.37	1.45	Yes	1.45	0
14	33.88	14.64	1.7		1.45	0.25
32	48.95	39.64	1.85		-1.06	2.91
22	38.99	28.47	1.89	Yes	1.89	0
66	74.85	28.71	1.98		-0.13	2.11
71	100	32.41	2.1		-1.81	3.91
107	100	60.95	2.14		-1.37	3.51
23	56.46	53.41	2.15	Yes	2.15	0
115	51.46	2.74	2.16		3.24	-1.08
109	41.97	18.18	2.17		2.35	-0.18
70	23.83	7.38	2.44		-1.97	4.41
113	33.32	7.2	2.48		2.35	0.13
69	36.79	10.32	2.52		-0.25	2.77
103	58.07	13.21	2.71		-1.37	4.08
18	82.66	20.58	2.78		4.14	-1.36
116	100	10.64	2.83		3.24	-0.41
110	33.43	21.64	2.83		2.35	0.48
108	35.41	16.39	2.84		2.35	0.49
96	35.79	10.47	2.98		-0.19	3.17
62	46.55	14.93	3.04		3.7	-0.66
34	75.79	16.87	3.23		-0.13	3.36
76	37.63	20.99	3.24		4.05	-0.81
41	76.58	11.55	3.31		-0.13	3.44
26	41.72	17.78	3.39		0.46	2.93
73	46.79	21.31	3.5		4.05	-0.55
58	100	52.69	3.51		3.7	-0.19
61	78.87	43.82	3.66		3.7	-0.04
119	44.61	2.95	3.7	Yes	3.7	0
57	68.14	37.1	3.75		3.7	0.05
37	45.32	13.38	3.81		-0.13	3.94
60	63.18	35.22	3.85		3.7	0.15
25	47.86	39.97	3.95		-0.14	4.09
17	37.73	10.81	4.05		4.14	-0.09
77	20.92	5.8	4.18		4.05	0.13
2	57.58	30.69	4.32		4.58	-0.26
85	25.81	3.45	4.34		2.35	1.99
59	44.82	22.56	4.41		3.7	0.71
83	34.32	14.55	4.49		4.05	0.44
29	100	31.03	4.49		4.58	-0.09
6	39.36	23.49	4.51		0.46	4.05
117	42.25	3.77	4.64		2.35	2.29
30	100	30.75	4.65		4.58	0.07
65	0	19.45	4.71	Yes	4.71	0
114	59.69	5.14	4.74		3.24	1.5
20	44.2	8.29	4.81		4.14	0.67
15	31.15	18.76	4.85		1.45	3.4
82	45.65	17.13	4.86		4.05	0.81
31	100	45.63	4.88		4.58	0.3
19	38.54	4.53	4.93		4.14	0.79

Note: Districts are colored green if they are identified in the "Apportionment Analysis" section of Mr. Fairfax's report. Districts are colored Red/Blue based on party that won the 2024 election. Districts are colored orange if BVAP is greater than 35% using 2020 US Census Data.

7 State Legislative Illustrative Districts

In this section I calculate the same 2024 partisan index for each of the state legislative districts in the two illustrative Maps put forward by Mr. Fairfax as well as for the Enacted House and Senate maps. I also show which party won in each seat in the Enacted House and Senate maps in the eastern portion of the state where the challenged districts are located.

Table 10 displays the partisan index and election results for the 16 state house districts in the eastern region of the state. These are the districts that are altered in some way in the Fairfax Illustrative House maps (either A or B). For each map I show the Democratic partisan index using the 15 statewide elections that occurred in 2024. Each district is colored based on the value of the partisan index. Districts where the partisan index is Democratic-leaning (greater than 50%) are colored blue and those that are Republican-leaning (less than 50%) are colored red. Because the index is the average of 15 statewide races, I also show the number of statewide races where the Democratic candidate won a majority of the two-party vote share. For the Enacted Map, in addition to the partisan index, I also show the actual outcome of the 2024 election in that district by displaying the party that won the seat as well as the vote share for the Democratic and Republican candidates.

The results in Table 10 show that in the Enacted House Map there are six Democratic-leaning districts (37.5% of the 16 considered here in the eastern third of the state). These are House districts 8, 23, 24, 25, 27, and 32. Of those six Democratic-leaning districts, Democratic candidates won the legislative seat in five of the six districts. The one exception is HD-25 where the Republican candidate (Allen Chesser) defeated the Democratic candidate (Lorenza Wilkins) by a mere 461 votes. However, it should be noted that of the 15 statewide races that were also held at the same time in the district, Democratic candidates won a majority of the votes in 11 of those 15 contests. In other words, there were a number of voters who decided to split their tickets and either vote for the Republican candidate for state legislature and the Democratic candidate for other statewide offices, or vice versa for

Table 10: Partisan Lean and 2024 Election Results in State House Districts

	Fairfax House Map A		Fairfax House Map B		Enacted House Map				
District	Democratic Index	Statewide Democratic Wins (of 15)	Democratic Index	Statewide Democratic Wins (of 15)	Democratic Index	Statewide Democratic Wins (of 15)	2024 Winning Party	2024 Democratic Vote Share	2024 Republican Vote Share
1	34.43%	0	41.41%	0	35.83%	0	R	34.94%	65.06%
3	42.52%	1	39.24%	0	40.90%	0	R	38.32%	61.68%
4	36.71%	0	39.18%	0	39.18%	0	R	36.97%	63.03%
5	56.79%	15	56.28%	15	47.57%	0	R	45.84%	54.16%
7	37.19%	0	37.41%	0	45.36%	1	R	42.17%	55.32%
8	54.63%	15	64.02%	15	65.08%	15	D	64.03%	35.97%
9	42.55%	0	47.52%	2	46.68%	1	R	44.05%	55.95%
10	33.35%	0	42.99%	0	42.99%	0	R	39.21%	60.79%
12	60.33%	15	37.29%	0	46.11%	1	R	41.37%	57.28%
13	31.20%	0	31.20%	0	30.50%	0	R	30.11%	69.89%
23	56.61%	15	56.79%	15	58.20%	15	D	56.46%	43.54%
24	62.99%	15	60.47%	15	50.92%	8	D	51.10%	48.90%
25	60.44%	15	60.44%	15	51.49%	11	R	47.86%	48.80%
27	60.86%	15	60.86%	15	60.32%	15	D	100.00%	0.00%
32	48.02%	2	48.02%	2	51.81%	13	D	48.95%	48.42%
79	38.71%	0	34.37%	0	37.75%	0	R	36.76%	63.24%

Note: Districts included in the table are those that are impacted by altered district boundaries in either the Fairfax House Map A or Fairfax House Map B.

reasons related to candidate quality or other campaign-related reasons.[22]

The 2024 partisan index applied to the Fairfax House Map A shows that this map contains seven Democratic-leaning districts in this region of the state. The 2024 partisan index applied to the Fairfax House Map B shows that this map contains six Democratic-leaning districts in this region of the state. If the objective of the illustrative maps is to increase the representation of Black-preferred candidates (who are nearly always Democrats in partisan elections), then Illustrative Map B appears to be equivalent in such representation compared to the Enacted Map. However, Map B decreases the competitiveness of those districts, making it more likely that they will consistently elect Democrats.

Table 11 displays the partisan index and election results for the six state senate districts in the eastern region of the state. These are the districts that are altered in some way in the Fairfax Illustrative Senate maps (either A or B). For each map I show the democratic

[22]One might wonder if the outcome in HD-25 was driven by race. However, voters in the district voted in 6 statewide elections where a Black Democratic candidate ran against a White Republican and the Black candidate won a majority of the votes in the district in 4 of those elections, showing that race is not a good explanation for Wilkins underperformance in the district compared to statewide Democrats' performance in the district.

partisan index using the 15 statewide elections that occurred in 2024. Each district is colored based on the value of the partisan index. Districts where the partisan index is Democratic-leaning (greater than 50%) are colored blue and those that are Republican-leaning (less than 50%) are colored red. Because the index is the average of 15 statewide races, I also show the number of statewide races where the Democratic candidate won a majority of the two-party vote share. For the Enacted Map, in addition to the partisan index, I also show the actual outcome of the 2024 election in that district by displaying the party that won the seat as well as the vote share for the Democratic and Republican candidates.

The results in Table 11 show that in the Enacted Senate Map there is one Democratic-leaning district, SD-5, which has a Democratic partisan index of 56.4%. In this district the Democratic senate candidate won and all 15 of the statewide Democratic candidates won a majority of the vote in the district.

Of the remaining five Republican-leaning districts, one is quite competitive. In SD-11 the Republican state senate candidate and longtime incumbent, Lisa Barnes, won with 51.3% of the vote. However, across the 15 statewide elections, six Democratic candidates won a majority of the vote in the districts, indicating that the right Democratic candidate with the right message can win in the district.

The 2024 partisan index applied to the Fairfax Senate Map A shows that this map contains two Democratic-leaning districts in this region of the state (SD-2 and SD-5, both of which are majority BVAP). The 2024 partisan index applied to the Fairfax Senate Map B shows that this map contains two Democratic-leaning districts in this region of the state (SD-2 and SD-5, with SD-2 being majority BVAP) and another very competitive Republican-leaning district (SD-11).

Outside of these six senate districts, it is also informative to note that SD-18, which borders SD-11 and takes in portions of Wake County and all of Granville County, has a partisan index similar to SD-11 but elected a Democrat in the state senate race (Terence Everitt) unlike SD-11, which elected a Republican. The point of noting this is to say that

Table 11: Partisan Lean and 2024 Election Results in State Senate Districts

	Fairfax Senate Map A		Fairfax Senate Map B		Enacted Senate Map				
District	Democratic Index	Statewide Democratic Wins (of 15)	Democratic Index	Statewide Democratic Wins (of 15)	Democratic Index	Statewide Democratic Wins (of 15)	2024 Winning Party	2024 Democratic Vote Share	2024 Republican Vote Share
1	34.81%	0	34.77%	0	43.50%	0	R	42.79%	57.21%
2	57.24%	15	57.24%	15	43.29%	1	R	41.81%	56.05%
3	41.81%	1	42.23%	0	41.66%	0	R	40.01%	59.99%
4	45.55%	1	42.38%	0	46.46%	1	R	44.88%	55.12%
5	60.73%	15	56.39%	15	56.39%	15	D	55.08%	44.92%
11	45.86%	1	49.93%	6	49.82%	6	R	48.71%	51.29%

Note: Districts included in the table are those that are impacted by altered district boundaries in either the Fairfax Senate Map A or Fairfax Senate Map B.

there are always partisan swings in election results. Even neighboring districts with similar partisan leans may occasionally elect members of different parties. Both SD-11 and SD-18 are swing districts, which indicates that they will occasionally swing from one party to the other. In fact, in both districts statewide Democrats won 6 of the 15 statewide races in each district in 2024. In 2026, which will be a midterm election with a Republican president, it is possible that both of these districts will swing toward Democrats as is often the case in midterm elections where the incumbent president's party suffers losses at both the federal and state level.[23]

[23]Rogers, Steven. "Electoral accountability for state legislative roll calls and ideological representation." American political science review 111, no. 3 (2017): 555-571.

Dated: March 17, 2025

Michael Barber

Signed:

Michael Jay Barber

CONTACT INFORMATION

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ACADEMIC APPOINTMENTS

Brigham Young University, Provo, UT

August 2020 - present Associate Professor, Department of Political Science
Jan 2023 - present Director, Center for the Study of Elections and Democracy
2014 - July 2020 Assistant Professor, Department of Political Science
2014 - Jan 2023 Faculty Scholar, Center for the Study of Elections and Democracy

EDUCATION

Princeton University Department of Politics, Princeton, NJ

Ph.D., Politics, July 2014

- Advisors: Brandice Canes-Wrone, Nolan McCarty, and Kosuke Imai
- Dissertation: "Buying Representation: the Incentives, Ideology, and Influence of Campaign Contributions on American Politics"
- 2015 Carl Albert Award for Best Dissertation, Legislative Studies Section, American Political Science Association (APSA)

M.A., Politics, December 2011

Brigham Young University, Provo, UT

B.A., International Relations - Political Economy Focus, April, 2008

- *Cum Laude*

RESEARCH INTERESTS

American politics, congressional polarization, political ideology, campaign finance, survey research

PUBLICATIONS

28. **"Illiberalism among American State Legislative Candidates"** with Hans Hassell and Michael Miller, Forthcoming at *Nature Humanities and Social Science Communications*
27. **"Which Republican Constituencies Support Restrictive Abortion Laws? Comparisons among donors, wealthy, and mass publics**, with Brandice Canes-Wrone, Joshua Clinton, and Greg Huber Forthcoming at *Public Opinion Quarterly*
26. **"The Crucial Role of Race in 21st Century U.S. Political Realignment**, with Jeremy Pope, *Public Opinion Quarterly* (2024): 1-10.
25. **"Misclassification and Bias in Predictions of Individual Ethnicity from Administrative Records"**, with Lisa Argyle, *American Political Science Review* (2023): 1-9.

24. **"Partisanship and Trolleyology"**, with Ryan Davis
Research & Politics

23. **"Does Issue Importance Attenuate Partisan Cue-Taking"**, with Jeremy Pope, *Political Science Research and Methods* (2024): 1-9.

22. **"A Revolution of Rights in American Founding Documents"**, with Scott Abramson and Jeremy Pope
Journal of Political Institutions and Political Economy

21. **"Groups, Behaviors, and Issues as Cues of Partisan Attachments in the Public"**, with Jeremy Pope
American Politics Research

20. **"Ideological Disagreement and Pre-emption in Municipal Policymaking"**, with Adam Dynes, *American Journal of Political Science*, no. 1 (2023): 119-136.

19. **"400 million voting records show profound racial and geographic disparities in voter turnout in the United States"**, with John Holbein
PloS One, 2022, Vol. 17, no. 6: e0268134

18. **"Comparing Campaign Finance and Vote Based Measures of Ideology"**
Journal of Politics, 2022. Vol. 84, no. 1 (2022): 613-619.

17. **"The Participatory and Partisan Impacts of Mandatory Vote-by-Mail"**, with John Holbein
Science Advances, 2020. Vol. 6, no. 35, DOI: 10.1126/sciadv.abc7685

16. **"Issue Politicization and Interest Group Campaign Contribution Strategies"**, with Mandi Eatough
Journal of Politics, 2020. Vol. 82: No. 3, pp. 1008-1025

15. **"Campaign Contributions and Donors' Policy Agreement with Presidential Candidates"**, with Brandice Canes-Wrone and Sharece Thrower
Presidential Studies Quarterly, 2019, 49 (4) 770–797

14. **"Conservatism in the Era of Trump"**, with Jeremy Pope
Perspectives on Politics, 2019, 17 (3) 719–736

13. **"Legislative Constraints on Executive Unilateralism in Separation of Powers Systems"**, with Alex Bolton and Sharece Thrower
Legislative Studies Quarterly, 2019, 44 (3) 515–548
Awarded the Jewell-Loewenberg Award for best article in the area of subnational politics published in *Legislative Studies Quarterly* in 2019

12. **"Electoral Competitiveness and Legislative Productivity"**, with Soren Schmidt
American Politics Research, 2019, 47 (4) 683–708

11. **"Does Party Trump Ideology? Disentangling Party and Ideology in America"**, with Jeremy Pope
American Political Science Review, 2019, 113 (1) 38–54

10. **"The Evolution of National Constitutions"**, with Scott Abramson
Quarterly Journal of Political Science, 2019, 14 (1) 89–114

9. **"Who is Ideological? Measuring Ideological Responses to Policy Questions in the American Public"**, with Jeremy Pope
The Forum: A Journal of Applied Research in Contemporary Politics, 2018, 16 (1) 97–122

8. **"Status Quo Bias in Ballot Wording"**, with David Gordon, Ryan Hill, and Joe Price
The Journal of Experimental Political Science, 2017, 4 (2) 151–160.

7. **"Ideologically Sophisticated Donors: Which Candidates Do Individual Contributors Finance?"**, with Brandice Canes-Wrone and Sharece Thrower
American Journal of Political Science, 2017, 61 (2) 271–288.

6. **"Gender Inequalities in Campaign Finance: A Regression Discontinuity Design"**, with Daniel Butler and Jessica Preece
Quarterly Journal of Political Science, 2016, Vol. 11, No. 2: 219–248.
5. **"Representing the Preferences of Donors, Partisans, and Voters in the U.S. Senate"**
Public Opinion Quarterly, 2016, 80: 225–249.
4. **"Donation Motivations: Testing Theories of Access and Ideology"**
Political Research Quarterly, 2016, 69 (1) 148–160.
3. **"Ideological Donors, Contribution Limits, and the Polarization of State Legislatures"**
Journal of Politics, 2016, 78 (1) 296–310.
2. **"Online Polls and Registration Based Sampling: A New Method for Pre-Election Polling"** with Quin Monson, Kelly Patterson and Chris Mann.
Political Analysis 2014, 22 (3) 321–335.
1. **"Causes and Consequences of Political Polarization"** In *Negotiating Agreement in Politics*. Jane Mansbridge and Cathie Jo Martin, eds., Washington, DC: American Political Science Association: 19–53. with Nolan McCarty. 2013.

- Reprinted in *Solutions to Political Polarization in America*, Cambridge University Press. Nate Persily, eds. 2015
- Reprinted in *Political Negotiation: A Handbook*, Brookings Institution Press. Jane Mansbridge and Cathie Jo Martin, eds. 2015

Available Working Papers/Ongoing Projects

"Donations and Dollars: Characterizing the Policy Views of Donors and the Affluent"
with Brandice Canes-Wrone, Gregory Huber, and Joshua Clinton (Revise and Resubmit at *Journal of Politics*)

"Preferences for Representational Styles in the American Public"
with Ryan Davis and Adam Dynes *(under review)*

"Illiberalism among American State Legislative Candidates'
with Hans Hassell and Michael Miller *(under review)*

Invited Presentations

"Are Mormons Breaking Up with Republicanism? The Unique Political Behavior of Mormons in the 2016 Presidential Election"

- Ivy League LDS Student Association Conference - Princeton University, November 2018, Princeton, NJ

"Issue Politicization and Access-Oriented Giving: A Theory of PAC Contribution Behavior"

- Vanderbilt University, May 2017, Nashville, TN

"Lost in Issue Space? Measuring Levels of Ideology in the American Public"

- Yale University, April 2016, New Haven, CT

"The Incentives, Ideology, and Influence of Campaign Donors in American Politics"

- University of Oklahoma, April 2016, Norman, OK

"Lost in Issue Space? Measuring Levels of Ideology in the American Public"

- University of Wisconsin - Madison, February 2016, Madison, WI

"Polarization and Campaign Contributors: Motivations, Ideology, and Policy"

- Hewlett Foundation Conference on Lobbying and Campaign Finance, October 2014, Palo Alto, CA

"Ideological Donors, Contribution Limits, and the Polarization of State Legislatures"

- Bipartisan Policy Center Meeting on Party Polarization and Campaign Finance, September 2014, Washington, DC

"Representing the Preferences of Donors, Partisans, and Voters in the U.S. Senate"

- Yale Center for the Study of American Politics Conference, May 2014, New Haven, CT

Conference Presentations

Money in Politics APSA Pre-Conference:

- Founder (2020) and organizing committee (2020, 2021, 2022, 2023)

Washington D.C. Political Economy Conference (PECO):

- 2017 discussant

American Political Science Association (APSA) Annual Meeting:

- 2014 participant and discussant, 2015 participant, 2016 participant, 2017 participant, 2018 participant

Midwest Political Science Association (MPSA) Annual Meeting:

- 2015 participant and discussant, 2016 participant and discussant, 2018 participant

Southern Political Science Association (SPSA) Annual Meeting:

- 2015 participant and discussant, 2016 participant and discussant, 2017 participant

Teaching Experience

Poli 301: Data Visualization

- Summer 2022, Fall 2022, Winter 2023, Winter 2024

Poli 315: Congress and the Legislative Process

- Fall 2014, Winter 2015, Fall 2015, Winter 2016, Summer 2017, Fall 2018, Spring 2019, Fall 2022

Poli 328: Quantitative Analysis

- Winter 2017, Fall 2017, Fall 2019, Winter 2020, Fall 2020, Winter 2021, Fall 2023

Poli 410: Undergraduate Research Seminar in American Politics

- Fall 2014, Winter 2015, Fall 2015, Winter 2016,Summer 2017, Fall 2018, Winter 2024

Awards and Grants

2024 BYU Early Career Scholarship Award

2021 BYU FHSS Research Grant, $6,500

2020 BYU FHSS Young Scholar Award

2019 BYU Mentored Environment Grant (MEG), Ideology in America Project, $35,000

2017 BYU Political Science Teacher of the Year Award

2017 BYU Mentored Environment Grant (MEG), Funding American Democracy Project, $20,000

2016 BYU Political Science Department, Political Ideology and President Trump (with Jeremy Pope), $7,500

2016 BYU Office of Research and Creative Activities (ORCA) Student Mentored Grant x 3

- Hayden Galloway, Jennica Peterson, Rebecca Shuel

2015 BYU Office of Research and Creative Activities (ORCA) Student Mentored Grant x 3

- Michael-Sean Covey, Hayden Galloway, Sean Stephenson

2015 BYU Student Experiential Learning Grant, American Founding Comparative Constitutions Project (with Jeremy Pope), $9,000

2015 BYU FHSS Research Grant, $5,000

2014 BYU Political Science Department, 2014 Washington DC Mayoral Pre-Election Poll (with Quin Monson and Kelly Patterson), $3,000

2014 BYU FHSS Award, 2014 Washington DC Mayoral Pre-Election Poll (with Quin Monson and Kelly Patterson), $3,000

2014 BYU Center for the Study of Elections and Democracy, 2014 Washington DC Mayoral Pre-Election Poll (with Quin Monson and Kelly Patterson), $2,000

2012 Princeton Center for the Study of Democratic Politics Dissertation Improvement Grant, $5,000

2011 Princeton Mamdouha S. Bobst Center for Peace and Justice Dissertation Research Grant, $5,000

2011 Princeton Political Economy Research Grant, $1,500

Other Scholarly Activities

Expert Witness in Nancy Carola Jacobson, et al., Plaintiffs, vs. Laurel M. Lee, et al., Defendants. Case No. 4:18-cv-00262 MW-CAS (U.S. District Court for the Northern District of Florida)

Expert Witness in Common Cause, et al., Plaintiffs, vs. Lewis, et al., Defendants. Case No. 18-CVS-14001 (Wake County, North Carolina)

Expert Witness in Kelvin Jones, et al., Plaintiffs, v. Ron DeSantis, et al., Defendants, Consolidated Case No. 4:19-cv-300 (U.S. District Court for the Northern District of Florida)

Expert Witness in Community Success Initiative, et al., Plaintiffs, v. Timothy K. Moore, et al., Defendants, Case No. 19-cv-15941 (Wake County, North Carolina)

Expert Witness in Richard Rose et al., Plaintiffs, v. Brad Raffensperger, Defendant, Civil Action No. 1:20-cv-02921-SDG (U.S. District Court for the Northern District of Georgia)

Expert Witness in Georgia Coalition for the People's Agenda, Inc., et. al., Plaintiffs, v. Brad Raffensberger, Defendant. Civil Action No. 1:18-cv-04727-ELR (U.S. District Court for the Northern District of Georgia)

Expert Witness in Alabama, et al., Plaintiffs, v. United States Department of Commerce; Gina Raimondo, et al., Defendants. Case No. CASE No. 3:21-cv-00211-RAH-ECM-KCN (U.S. District Court for the Middle District of Alabama Eastern Division)

Expert Witness in League of Women Voters of Ohio, et al., Relators, v. Ohio Redistricting Commission, et al., Respondents. Case No. 2021-1193 (Supreme Court of Ohio)

Expert Witness in Regina Adams, et al., Relators, v. Governor Mike DeWine, et al., Respondents. Case No. 2021-1428 (Supreme Court of Ohio)

Expert Witness in Rebecca Harper, et al., Plaintiffs, v. Representative Destin Hall, et al., Defendants (Consolidated Case). Case No. 21 CVS 500085 (Wake County, North Carolina)

Expert Witness in Carter, et al., Petitioners, v. Degraffenreid et al., Respondents (Consolidated Case). Case No. 464 M.D. 2021 (Commonwealth Court of Pennsylvania)

Expert Witness in Harkenrider, et al., Petitioners, v. Hochel et al., Respondents. Case No. E2022-0116CV (State of New York Supreme Court: County of Steuben)

Expert Witness in Our City Action Buffalo, Inc., et al., v. Common Council of the City of Buffalo (State of New York Supreme Court: County of Erie)

Expert Witness in Citizens Project, et al., v. City of Colorado Springs, et al. Case No. 22-cv-1365-CNS-MDB (U.S. District Court for the District of Colorado)

Expert report filed in League of Women Voters of Ohio v. Ohio Redistricting Comm., 172 Ohio St.3d 597, 2023-Ohio-4271 (Supreme Court of Ohio)

Expert Witness in Dr. Dorothy Nairne, et al., Plaintiffs, v. R. Yle Ardoin, Defendant, Case No. 3:22-cv-00178 (U.S. District Court for the Middle District of Louisiana)

Court Appointed Mapping Special Master in Donald Agee, et al., Plaintiffs, v. Jocelyn Benson, in her official capacity as the Secretary of State of Michigan, et al., Defendants., No. 1:22-cv-272 Three-Judge Court (U.S. District Court for the Western District of Michigan)

Expert report filed in remedial phase in Alpha Phi Alpha, et al., Plaintiffs, v. Brad Raffensperger, in his official capacity as the Secretary of State of Georgia, et al., Defendants., Case No. 1:21-cv-5337 (U.S. District Court for the Northern District of Georgia)

Expert Witness in McClure, et al. and Addoh-Kondi, et al., Plaintiffs, v. Jefferson County Commission, et al., Defendant, Case No. Case No.: 2:23-cv-00503-MHH (U.S. District Court

for the Northern District of Alabama)

Additional Training	EITM 2012 at Princeton University - Participant and Graduate Student Coordinator
Computer Skills	Statistical Programs: R, Stata, SPSS, parallel computing

Updated September 25, 2024

Exhibit C

UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF NORTH CAROLINA

SHAUNA WILLIAMS, et al., *Plaintiffs*, v. REPRESENTATIVE DESTIN HALL, in his official capacity as Chair of the House Standing Committee on Redistricting, et al., *Defendants*.	Civil Action No. 23 CV 1057
NORTH CAROLINA STATE CONFERENCE OF THE NAACP, et al., *Plaintiffs*, v. PHILIP BERGER, in his official capacity as the President Pro Tempore of the North Carolina Senate, et al., *Defendants.*	Civil Action No. 23 CV 1104

SUPPLEMENTAL REBUTTAL REPORT OF DR. JONATHAN RODDEN

March 31, 2025

I. INTRODUCTION AND SUMMARY OF FINDINGS

I submitted my expert report in this case on August 1, 2024, and a reply report on October 17, 2024. My understanding is that experts in this case had the opportunity to update figures, tables, analyses, and conclusions from their initial reports based on 2024 election results. Dr. Michael Barber submitted a supplemental expert report on March 17, 2025. He considered 2024 election results in the three paragraphs in Section 3.3 of his new report (pages 14-15). However, he has also submitted an additional 29 pages of entirely new material in response to my reply report and deposition questions, including new redistricting simulations and statistical analyses. Although I had insufficient time to fully analyze his new statistical approaches and respond with my own follow-up statistical analysis, I provide a brief initial response to his main claims that relate to my earlier reports in this case.

First, Dr. Barber provides additional critiques of the "envelope analysis," which is an analysis that the Supreme Court has accepted and reaffirmed in racial gerrymandering cases as one part of a holistic approach that provides descriptive measurements of the racial differences between precincts that are included and excluded from the challenged districts within a so-called "county envelope." Dr. Barber's analysis seems to misinterpret this "envelope analysis" as a statistical test of racial predominance, rather than as a largely descriptive enterprise that courts consider along with other intensely local features of the way the challenged map interacts with local racial geography, demographics, and administrative boundaries.

Second, Dr. Barber responds to an observation in my reply report in which I use Dr. Barber's race-blind redistricting simulations to confirm that the distribution of race across districts in the Enacted Plan makes it an extreme outlier relative to those plans. Dr. Barber claims that this can be explained by the fact that his simulations were insufficiently respectful of the criteria that he suspects were considered by the legislature when drawing the districts, and above all, insufficiently gerrymandered in favor of Republican candidates. Dr. Barber could have taken simple steps to account for these conjectures when conducting his additional analysis but declined to do so.

Third, Dr. Barber returns to his earlier claim that he can demonstrate that race played no role in North Carolina's redistricting plan simply by running precinct-level regressions that include both race and party and noting that the coefficients for race are extremely unstable when partisanship is included in the regression. On the contrary, this instability is driven by the high correlation between race and party, which renders Dr. Barber's regressions useless in attempting to disentangle the role of race and party.

Finally, in my previous report, I analyzed some draft Congressional maps that had been considered by the Legislature before deciding upon the Enacted Map and demonstrated that the distribution of Black voting-age population across districts in the Enacted Plan was anomalous, even among the pro-Republican plans considered by the Legislature. In his supplemental report, Dr. Barber attributes this phenomenon to improvements in the partisan performance of the Enacted Plan for Republican candidates and efforts to avoid pairing incumbents. In this report, I respond that the partisan performance of these comparison maps is as good or better in these earlier maps than in the Enacted Plan, and incumbent protection cannot explain the differences. I also take a

closer look at these alternative maps and demonstrate that it is possible to achieve similar partisan goals while drawing district boundaries that correspond less clearly to race.

II. COUNTY ENVELOPE ANALYSIS

A large section of Dr. Barber's supplemental report is critical of the "county envelope" analysis. This analysis is part of a holistic approach that was accepted by the Supreme Court in *Cooper v. Harris*, 581 U.S. 285 (2017), and reaffirmed in *Alexander v. South Carolina State Conference of the NAACP*, 602 U.S. 1 (2024). As part of a series of analyses, the "county envelope" analysis focuses on the set of counties that contain a challenged district and compares the racial characteristics of the precincts that have been placed within, and drawn out of, the district in question. When individual-level data on partisanship are available, as in this case, it is also possible to examine whether any racial differences are also present *within* each partisan group. This is primarily a measurement exercise that is only one component of a holistic approach that also includes analysis of local racial demographics, the geographic arrangement of groups and in relation to city, municipal, and county boundaries, and localized violations of traditional redistricting criteria like compactness and respect for county and municipal boundaries.

Dr. Barber seems to reject the value of localized analysis, and it is absent from his reports. Rather, he suggests that we should interpret the envelope analysis as a simple, stand-alone statistical test of racial predominance, and as such, he finds it wanting. His reasoning is that if he generates thousands of alternative North Carolina maps via a simulation procedure, many will produce districts for which within the county envelope, the precincts placed in the district have different racial characteristics than those outside the district. This can happen because of, say, the specific clustering of Black or White voters in the corner of a county, along a river, or in a city center, when the computer algorithm is assembling precincts and trying to generate compact, contiguous districts that observe administrative boundaries. Thus, as a rudimentary, stand-alone test of racial gerrymandering, shorn of all context and deeper analysis of location-specific applications of traditional redistricting criteria, Dr. Barber argues that a statistically significant difference between the racial characteristics of precincts within and outside of a district is, by itself, not dispositive. He reasons that when such differences emerged in his simulations, it was purely because of the spatial arrangement of racial groups vis-à-vis administrative boundaries, and not because of any intentional efforts. If a correlation between race and a precinct's inclusion in a district is uninformative in his simulations, he reasons, it must be uninformative in a challenged district in the real world.

However, it is not my understanding that courts use the "envelope analysis" as an isolated, stand-alone test. On the contrary, once racial differences are observed within the envelope of a challenged district, it is necessary to conduct a careful local analysis of the racial geography in relation to municipal and county boundaries, bodies of water, neighborhoods, and other features of natural and human geography to ascertain whether, in fact, this is an instance of a racial difference that emerges purely from the geographic arrangement of groups and local boundaries, as is the case in Dr. Barber's simulations, or a case where such explanations fall woefully short.

Notably, Dr. Barber skips the local analysis. He does not offer any explanation rooted in traditional redistricting principles for the striking correspondence between race and district boundaries in the Piedmont or Charlotte areas. Rather, he uses a great deal of unnecessary

computational technique, including the generation of thousands of implausible non-contiguous districts that seem to have very little relevance to this case, to make the obvious point that racial differences sometimes emerge by accident when districts must be drawn according to traditional criteria. Indeed so. The crucial question is whether the Enacted Map can be characterized in this way, or whether it follows racial lines and violates traditional redistricting criteria. On this question he provides no guidance, let alone refutation of my analysis.

III. THE ENACTED PLAN AS A RACIAL OUTLIER

Dr. Barber conducted simulations in both of his reports largely as a way of making the simple point described above. While it is not clear that thousands of alternative computer-generated plans were necessary to make this point, the simulations do offer an analytical opportunity that is more relevant for this case. We can ask whether, when drawing districts without regard to race while trying to abide by traditional redistricting criteria, the algorithm would produce anything resembling the distribution of race across districts found in the Enacted Plan. The answer is an unambiguous "no," and Dr. Barber does not dispute this. Dr. Barber also does not dispute that the distribution of race in the Enacted Plan is completely different than even the simulated plans that produced 10 Republican seats.

Instead, Dr. Barber raises a critique of his own simulations. Although these simulations were explicitly crafted to mimic the constraints faced by the Legislature with respect to county boundaries and compactness, he introduces a new concern in his second report: the simulations did not capture every possible consideration that legislators *might* have considered. For instance, Dr. Barber hypothesizes that it is possible that some of the simulations "double-bunked" Republican incumbents (that is, they might have created districts in which Republican incumbents would have faced one another), and the Legislature would have presumably avoided this.

Dr. Barber does not explain why he believes the introduction of this additional constraint in the simulations would have changed the distribution of race across districts in a direction that resembles the Enacted Plan, or in any direction at all. In fact, the Republican incumbents from the 2022 election were mostly rural, with residential addresses that were quite far from one another, and it is quite improbable that the introduction of a constraint to prevent incumbent pairings would have had any impact at all on the simulations. Dr. Barber states in footnote 12 that he had access to the addresses of incumbents, yet here, he fails to build incumbent protection constraints into his simulations or simply extract the plans from his existing simulations where incumbents were not paired. If for some reason an effort to pair incumbents was responsible for the extremely unusual distribution of race across North Carolina Congressional districts, Dr. Barber could have easily demonstrated this, but he did not.

Dr. Barber's simulations show very clearly that it is possible to produce 10 Republican seats without extreme packing and cracking of Black voters or drawing districts that closely follow racial lines. He does not dispute this, but rather, argues that some of the districts in the enacted plan were somewhat safer for Republican candidates than those emerging in the simulations. On page 10 if his supplemental report, Dr. Barber states: "It is notable that the Enacted Map has not only 10 Republican-leaning districts, but 10 safely Republican-leaning districts that have a partisan index at or above 55 percent." He contrasts this with a claim that the simulations produced only 7 "safe" Republican districts along with three Republican districts that were somewhat more

competitive. However, this characterization of the Enacted Plan is contradicted elsewhere in his report. In the first column of Tables 2, 3, and 4, there are only 9 "safe" Republican seats in the Enacted Plan. The same is true in the first two columns of Table 1, which presents some alternative partisan data.

Dr. Barber's claim seems to be that to go from a merely good pro-Republican gerrymander to a truly excellent gerrymander, it was necessary to pack and crack Black voters in a way that never emerged in his simulations. He merely asserts this but does not demonstrate it. To do so, he would need to instruct the algorithm to optimize the number of Republican seats above 55 percent or whatever partisan goal he believes the Legislature was seeking, and demonstrate that in this set of plans, Black voters were packed and cracked to a similar extent as in the Enacted Plan. As it stands, we have no way of knowing if the extreme cracking of Black voters in the Piedmont Triad, for instance, was truly necessary to produce seats that Dr. Barber would deem sufficiently safe for risk-averse Republican incumbents.

IV. RACE AND PARTY

In both his initial report and in his new report, Dr. Barber argues that race played no role in the construction of the Legislature's plan. His technique is to run precinct-level regressions within county envelopes, where the dependent variable is a binary indicator for whether the precinct is in or out of the challenged district, and the independent variables include the district's partisanship as well as its Black voting-age population share (BVAP). My reply report demonstrated that when these regressions include *only* the race variable, Black voters were less likely to be placed in District 6, more likely to be placed in District 12, and less likely to be placed in District 14. My earlier reports reached a similar conclusion using individual-level data and explained in detail how this was achieved, often by drawing district boundaries along lines of racial segregation.

However, Dr. Barber argues that any other variable that might be a significant predictor of a precinct's inclusion in the district *must* be included in the regression, even if that variable is highly correlated with Black voting-age population. He includes a measure of precinct partisanship in the regression and observes that the coefficient for BVAP changes dramatically. But these regressions do not lead to the conclusion that race was insignificant. Rather, the sign of the coefficient changes, and it becomes highly statistically significant. If Dr. Barber's regressions are meant to capture something about the legislature's intent—which seems to be his claim—we are now to believe that Black voters were intentionally placed *in* Districts 6 and 14, and *out* of District 6, even though we can see with our eyes—by looking at maps or calculating simple descriptive statistics— that this is not true. Dr. Barber's regressions deliver patently nonsensical results, which is a classic sign of multicollinearity in a regression.

As I described in my report, multicollinearity occurs when two or more independent variables are highly correlated, which makes it difficult to determine the independent effect of each variable on the outcome. The problem of multicollinearity is covered in almost every basic statistics textbook.[1] Dr. Barber claims that multicollinearity only affects estimates of uncertainty,

[1] Consider the undergraduate textbook of N.H. Bingham and John Fry, *Regression: Linear Models in Statistics* (Springer, 2010): "The problem of multicollinearity in fact bedevils the whole subject of Multiple Regression, and is surprisingly common" (page 175).

but not coefficients (or their interpretation). This is not the case. Multicollinearity creates "imprecise estimates of regression coefficients with wrong signs and an implausible magnitude for some regressors because the effects of these variables are all mixed together."[2] This is especially problematic when the number of observations is relatively small, as is the case with the number of precincts in a county envelope. The coefficients become unstable, so that when a new, highly correlated variable is added to the model, the coefficient on the initial independent variable can become large and statistically significant in the opposite direction. For instance, in regressions on a sample of patients where hypertension is the dependent variable, if one adds several highly correlated independent variables, e.g. obesity, physical activity, and diet, one can obtain absurd results, such as that obesity leads to a lower risk of heart disease. These variables are simply too highly correlated to meaningfully include in the same regression.[3] Dr. Barber insists, based on precinct-level regressions including party and race, that party is the driving force in the creation of the Enacted Plan, and hence that race could not have played a role. This is a bit like running a regression to predict hypertension with highly correlated independent variables and concluding that physical activity is the only driver of heart disease and diet plays no role.

Dr. Barber seems to be making the claim that multicollinearity does not affect the size or direction of coefficients, and hence the inferences one might draw from a regression model plagued by multicollinearity.[4] This is simply not true, as can be ascertained from a simple example. Let us estimate a regression model in which the study area is the envelope of District 6 and the research question is whether precincts were placed in and out of District 6 based on the precinct's average partisanship in all state elections in 2020 (governor, lieutenant governor, attorney general, secretary of state, treasurer, auditor). The result of this model is presented in the first column of Table 1. The negative coefficient of -2.317, which is highly statistically significant, indicates that as a precinct becomes more Democratic in state elections, it is less likely to be included in District 6.

[2] Yoo et al., "A Study of Effects of Multicollinearity in Multivariable Analysis," *International Journal of Applied Science and Technology*, 4(5): 9-19. 2014.

[3] For a discussion of the problem of multicollinearity in epidemiology, see Vatcheva, KP, Lee M, McCormick JB, and Rahbar MH. "Multicollinearity in Regression Analyses Conducted in Epidemiologic Studies," *Epidemiology* 6(2): 227. 2016

[4] If our goal is to come up with the best possible model to *predict* whether precincts are included or excluded from a district, there is little concern with including highly correlated independent variables in the model. The best predictive model may very well include some highly correlated covariates. The issue here, however, is substantive interpretation of the coefficients, which is undermined by multicollinearity.

Table 1: "Envelope" Regressions for District 6, Demonstrating Multicollinearity

	Inclusion in CD 6 with state partisanship index			Inclusion in CD 6 with state partisanship index + Dem. Pres. vote share		
	Coefficient	Standard error		Coefficient	Standard error	
State partisanship index	-2.317	0.307	***	29.493	6.012	***
Dem. Pres. vote share				-30.742	5.814	***
Constant	1.150	0.175	***	0.446	0.221	*

*** P value < .001

But it might also be the case that district-drawers considered not only state-level elections, but also presidential elections. Dr. Barber's view is that if an additional variable might potentially be statistically significant in a model, it *must* be included to avoid the problem of omitted variables. The second regression in Table 1 simply adds the precinct-level presidential vote share to the model. We can see that the coefficients are now wildly different. Moreover, the sign for the coefficient on state partisanship has changed direction and is highly statistically significant. Dr. Barber would have us believe that, in contrast to what we learned from the initial regression, the legislature was trying to *increase* Democratic vote share in District 6 in statewide elections but *decrease* it in presidential elections. But this is an absurd conclusion. The coefficients are unstable and uninformative because we included two highly correlated variables in the same regression.

The same thing is happening with race in Dr. Barber's analysis. The coefficient in a simple precinct-level regression with BVAP alone indicates that indeed, the larger the Black share of voting-age population in a precinct, the less likely that it is included in District 6. However, when he adds the highly correlated partisanship variable, the coefficient is similar in size but in the opposite direction, and highly statistically significant. This happens with his regressions in Districts 12 and 14 as well. This is not an indication that race "played no role," but rather, an indication that this regression is just as meaningless as the second model in Table 1 above. One simply cannot disentangle the role of race and party by running precinct-level regressions of the kind Dr. Barber recommends. By themselves, these precinct-level regressions cannot be interpreted as statistical tests of the intentions of those drawing the districts. Whether one examines raw differences in the data or runs regressions, it is clear as a descriptive matter that there are differences between the racial composition of the districts included and excluded from the districts, just as there are differences in partisanship, but precinct regressions in isolation do not allow us to say much more.

To avoid the need to run precinct-level regressions including highly correlated independent variables, I used individual-level data on party registration in my initial report. With this type of data, one can conduct the same types of analysis courts have relied on in the past. One need not

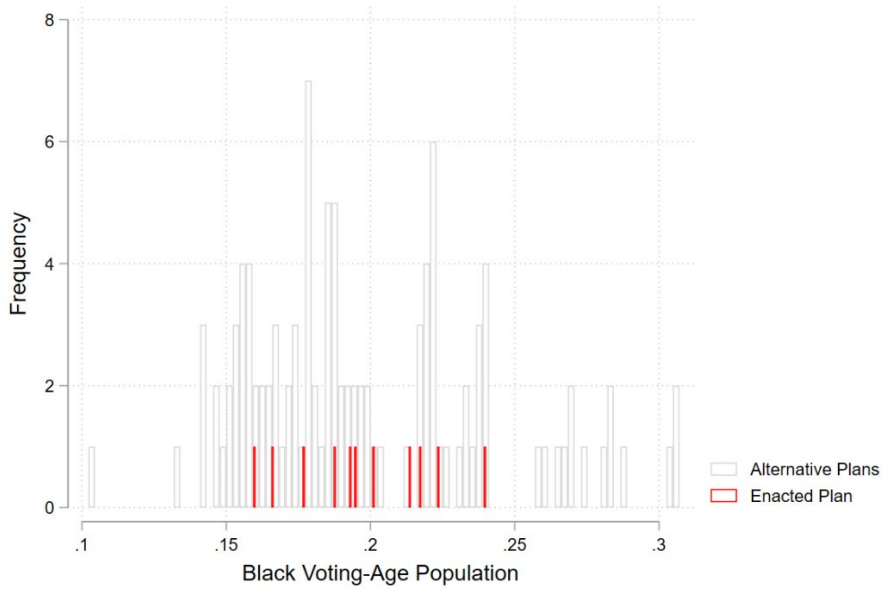
run regressions at all. I showed that the differences in BVAP between those included and excluded from the challenged districts hold up within partisan groups, which suggests that the racial differences are not a mere artifact of partisanship.

V. ALTERNATIVE REDISTRICTING PLANS CONSIDERED BY THE LEGISLATURE

In my reply report, I examined several alternative redistricting plans that had been considered by the Legislature before they settled on the Enacted Plan. I demonstrated that relative to Dr. Barber's race-blind simulations, those plans produced a distribution of Black voting-age population across districts that was very unusual, and that the distribution was even more unusual in the Enacted Plan. As can be seen in Figures 9 through 11 of my reply report, all the maps considered by the legislature, including the Enacted Plan, created very high Black voting-age population shares relative to Dr. Barber's ensemble of simulated plans in District 1 (in the Northeast) and District 12 (Charlotte), and the BVAP shares of these districts are in a very narrow range in all the alternative maps considered by the Legislature—something that also comes through in Dr. Barber's supplemental report. Due to the constraints of geography, District 11 in the far West has a very similar BVAP share in Dr. Barber's simulations, each of the alternative plans, and in the Enacted Plan.

However, if we focus on the other 11 districts, we can see that the distribution of BVAP is far more condensed in the Enacted Plan than in the alternative plans. In addition to Figure 9 through 11 of my reply report, this can be appreciated in Figure 1 below, which is a histogram of BVAP across all the alternative plans (in gray) and in the Enacted Plan (in red), leaving out districts 1, 12, and 11. The BVAP of the districts of the Enacted Plan are in a narrow range from 16% to 24%, whereas the distribution is wider in each of these alternative plans.

Figure 1: Histogram of Black Voting-Age Population (BVAP) in Alternative Plans and Enacted Plan (Excluding Districts 1, 11, and 12)



In both the ensemble of race-blind simulations and in this smaller group of alternative proposals, some rural districts emerged with relatively few Black voters, while other districts emerged with relatively higher BVAP shares. However, it appears that in the Enacted Plan, outside of Districts 1 and 12 (where BVAP was especially high), special care was taken to draw districts that would split Black communities apart and spread them evenly across majority-White districts.

Dr. Barber does not dispute either that the distribution of BVAP in the group of plans considered by the legislature was quite unusual relative to that of his race-blind simulations, or that the distribution of BVAP was more condensed in the Enacted Plan than the alternative plans. Rather, he responds in two ways. First, as with the simulations, he claims that the Enacted Plan might have deviated from the alternative plans because of efforts to protect incumbents and produce safe Republican districts. Second, he provides some descriptive statistics on BVAP in three specific regions, where he argues that the distribution of BVAP appears to be similar in the alternative and Enacted plans. I take up each of these issues in turn.

Partisanship and incumbent protection

Dr. Barber suggests that differences in the racial characteristics of the districts in the Enacted Plan and the alternative plans are likely due to superior efforts of authors of the Enacted Plan to create safe Republican districts and protect incumbents. Throughout his report, Dr. Barber considers a district to be "safe" if its Republican vote share, using his partisan index, is above 55 percent. But many plans, including the Enacted Plan, include other slightly less safe Republican-leaning districts where the Republican index is above 53 percent but less than 55 percent. According to his data, the Enacted Plan included 9 safe Republican districts and one less-safe district just below the 55% threshold (53.76%).[5] Of the 10 alternative plans for which he provides data in Tables 2 through 4 of his supplemental report, seven similarly have 9 districts with a Republican vote share above 55 percent and at least one additional district above 53 percent, and several of these seven even had an additional district above 53 percent (for a total of 11 Republican districts).

Each of the three plans that fell short of 9 "safe" districts did so in a trivial way. The map marked as CBK-2 (in the September grouping in my reply report) had 8 safe districts, but two additional districts with a Republican vote share of 54 percent. The map marked as CDS-3 (in the Springhetti maps) had 8 safe districts but one at 54 percent and another at 53 percent. The map marked CMT-2 (in the October group of maps) had 8 safe districts, but one with 54.8 percent and another with 54 percent. It is simply not the case that these maps are substantially worse in their anticipated performance for Republican candidates than the Enacted Map.

Next, Dr. Barber suggests that these earlier maps were left behind in favor of the Enacted Plan because they "double-bunked" incumbents. This is a very odd claim. First, the seventh-ranked entry at the bottom of the list in the "2023 Congressional Plan Criteria" used by the Legislature states that the Legislation "may consider… incumbency protection."[6] This is not a required task, and in any case, there is no residency requirement for Congressional candidates, as the "2023

[5] See, for example, Tables 2, 3, and 4 in Dr. Barber's report.
[6] LD0004145.

Congressional Plan Criteria" notes, so it is not clear why "double bunking" would have any material impact on any candidate's ability to run in the district of their choice.

However, what is especially difficult to comprehend is that, after arguing throughout his reports that the Legislature was aiming to maximize Republican advantage in every choice it made, here Dr. Barber implies that the Legislature was acting to help *Democratic* candidates. He provides a list of 25 instances of double-bunking among the alternative plans and claims that the Enacted Plan was an improvement over those plans because it did not double-bunk the same candidates. He neglects to mention that in two-thirds of these instances, the plans double-bunked Democrats. Not a single plan double-bunked Republicans. Typically, when crafting a partisan gerrymander, a mapdrawer would seek to double-bunk one's opponents. Thus, several of these alternative plans, by double-bunking and encouraging Democratic incumbents to run against one another would have helped Republicans. Dr. Barber does not explain how the Legislature was somehow acting politically by rejecting the double-bunking of Democrats in the alternative maps.

In fact, the Enacted Plan did double-bunk two Democrats in the Raleigh-Durham area, so it was clearly not the case that the Legislature was trying to eliminate this phenomenon. In any case, Dr. Barber does not explain how any efforts to diminish incumbent pairings could have possibly led the Legislature to creates such a condensed distribution of BVAP, or to hew so closely to lines of racial segregation when drawing districts.

After making his observations about partisanship and incumbency, Dr. Barber provides some statistics about race and partisanship in each of three regions in Figures 3 through 5 of his supplemental report. One must read these graphs with care, because within specific regions, many of these alternative maps are identical because their authors made their alterations—sometimes quite small in scale—in a different region, so the graphs do not provide nearly as many independent data points as may appear to be the case. The appendix of my reply report provides maps of each plan, allowing the reader to track the regions where there are differences across alternative plans.

Moreover, Dr. Barber's Figures 3 through 5 are selective in presenting data on the BVAP and partisanship of specific districts rather than for an entire region. This is important because every choice has knock-on effects for the distribution of racial groups and partisan votes in other surrounding districts—an issue that is especially important in the Piedmont Triad, where the Enacted Plan, as well as the alternative plans, involve a complex confluence of districts that carve up the cities of the Triad in ways that have implications for other surrounding districts, ultimately creating the condensed distribution of BVAP displayed in Figure 1 above.

Northeast North Carolina

In Figure 3 of his supplemental report, Dr. Barber demonstrates that the Black Voting-Age population of Congressional District 1 is higher in the Enacted Plan than in any of the alternative plans with one exception—CBK-2—where it was higher by less than one percentage point.[7] One can see the same thing in Figures 9 through 11 of my reply report, where the red dot on the far right of each graph is above all the other data markers, with the exception of CBK-2 in Figure 9.

[7] CMT-2 had exactly the same District 1 configuration as the Enacted Plan.

Those figures also reveal that the BVAP of District 1 is also high relative to any of Dr. Barber's simulations, for which Dr. Barber offers no explanation.

Charlotte Area

In Figures 4 and 5 of his supplemental report, Dr. Barber demonstrates that most of the maps considered by the Legislature divided the Charlotte Area in a similar way. In fact, four of the maps were identical to the enacted map (see the appendix of my reply report), and the others contained only small differences. However, these figures indicate that the Springhetti maps did take a somewhat different approach in Charlotte and surroundings. Specifically, we can see from Figures 4 and 5 in Dr. Barber's report that Black voters were substantially less packed in District 12 in the Springhetti maps, where according to Dr. Barber's calculations, the District 12 BVAP was 36 percent rather than around 39.5 percent, with a configuration that still created a safe District 14 with a Republican partisan index above 55 percent and had the added bonus of placing the two Charlotte-area incumbents in District 12, while also creating a more compact District 14 than in the Legislature's plan.[8] In sum, the Springhetti maps demonstrate that the extreme packing of Black voters into District 12 was not necessary to achieve the same partisan goals as the Legislature's map.

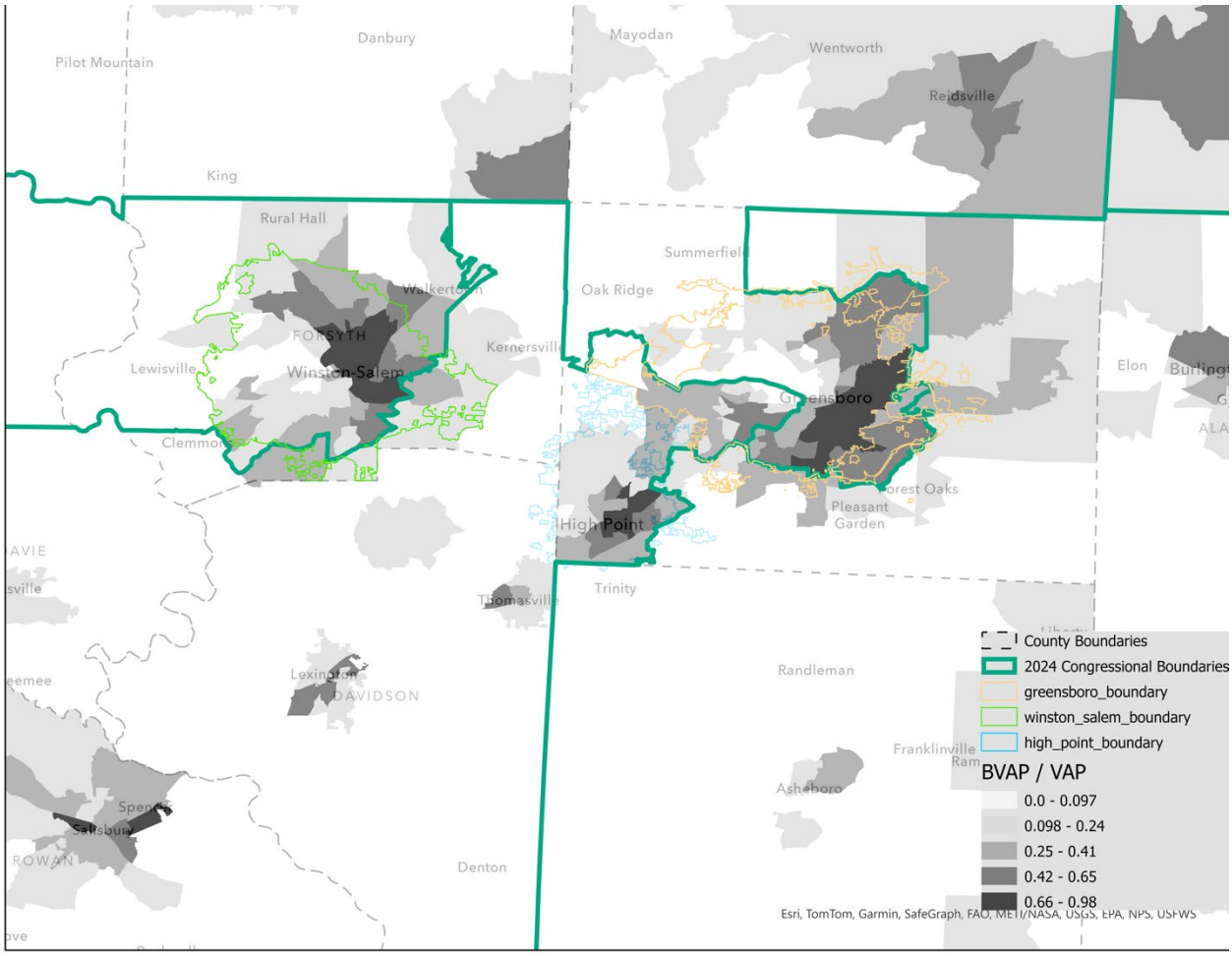
Piedmont Triad

In Figure 6 of his supplemental report, Dr. Barber provides information about some but not all of the relevant districts in the Piedmont Triad area for the alternative maps. Note that he plots BVAP and partisanship only of districts that are contained in Guilford and Forsyth counties, which in many cases misses at least one Piedmont-area district. Each of these alternative maps is also an extreme outlier relative to Dr. Barber's simulations, as these maps also carve up the Piedmont Triad cities and split Black voters across districts in unusual ways that contradict traditional redistricting criteria. As in the Legislature's map, these alternative maps also extract urban voters and combine them with far-flung rural areas.

However, there are still variations in these "cracking" experiments that are worthy of closer consideration. Of the 10 maps Dr. Barber considers, only 3 have a lower maximum BVAP in the Triad Area than the Enacted Map. Each of these—CBP-1, CBP-5, and CBA-2—was one of the group of maps produced in September. These maps were also quite aggressive in the efforts to split Black communities. However, it is useful to take a closer look at some of the plans that were at least somewhat less aggressive.

[8] The Reock score for District 14 in the Enacted Plan was .29, and .32 for the Springhetti Plans. The Polsby-Popper score was .16 for the Enacted Plan, and .21 for the Springhetti Plan.

Figure 2: The Enacted Plan in the Piedmont Triad



First, Figure 2 is a choropleth map of precinct-level BVAP and provides the boundaries of the Enacted Plan and the boundaries of Winston-Salem, High Point, and Greensboro. One can see how the map splits Winston-Salem across two districts and Greensboro across three districts, while also slicing off a piece of High Point, usually drawing district boundaries directly along the lines of racial segregation and keeping the Black voting-age population artificially low in all four districts.

Figure 3: Alternative Plan "CMT-1" in the Piedmont Triad

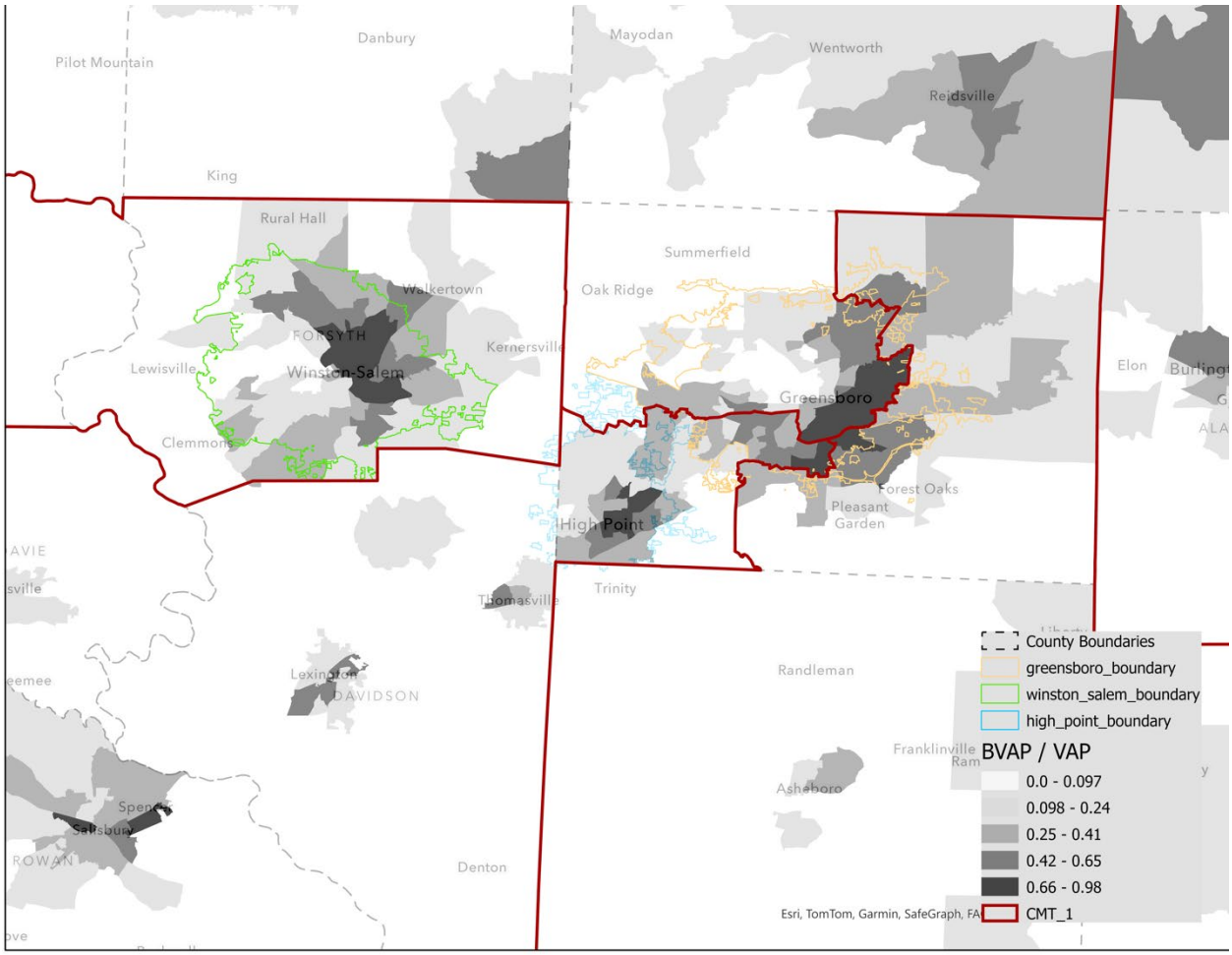
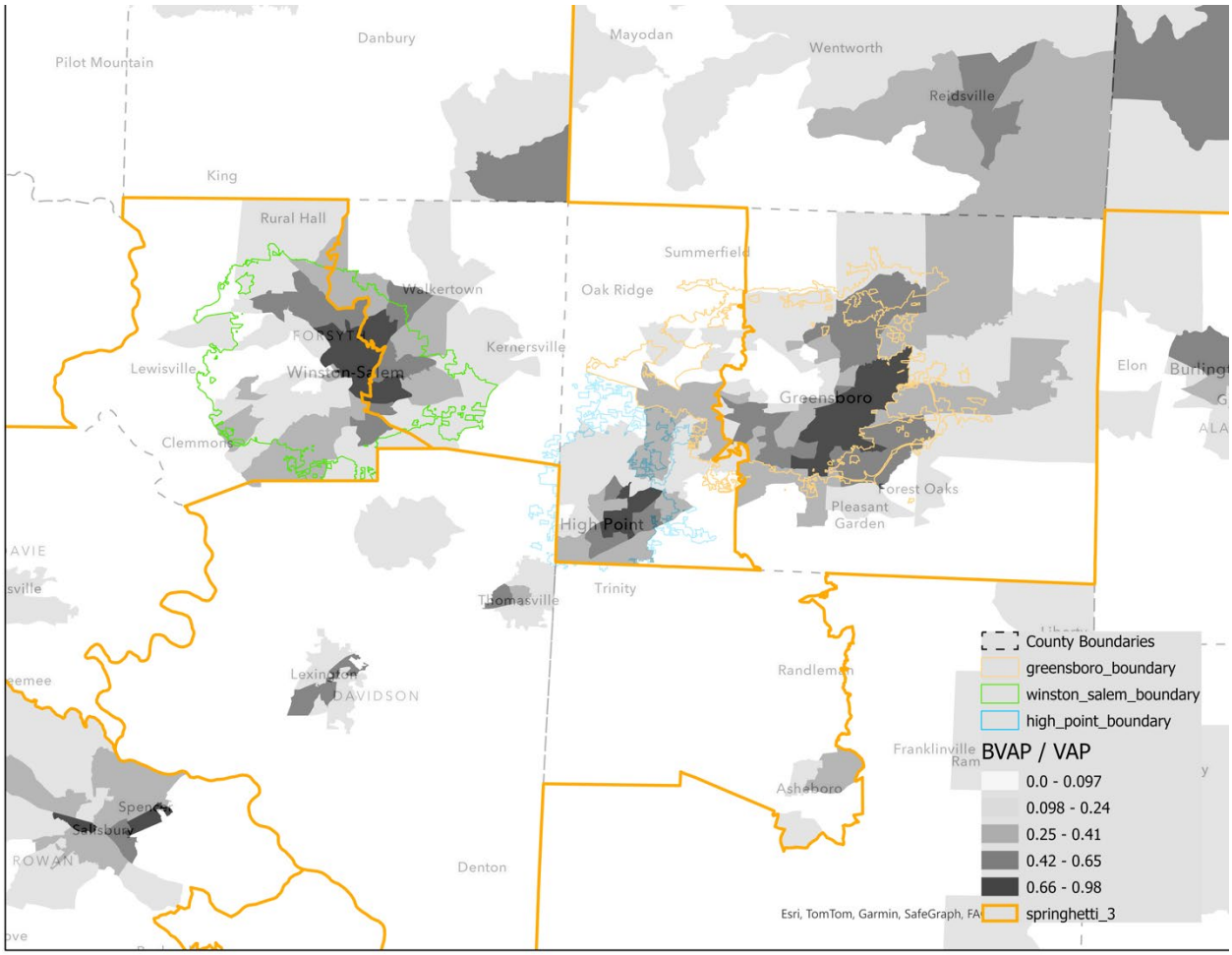


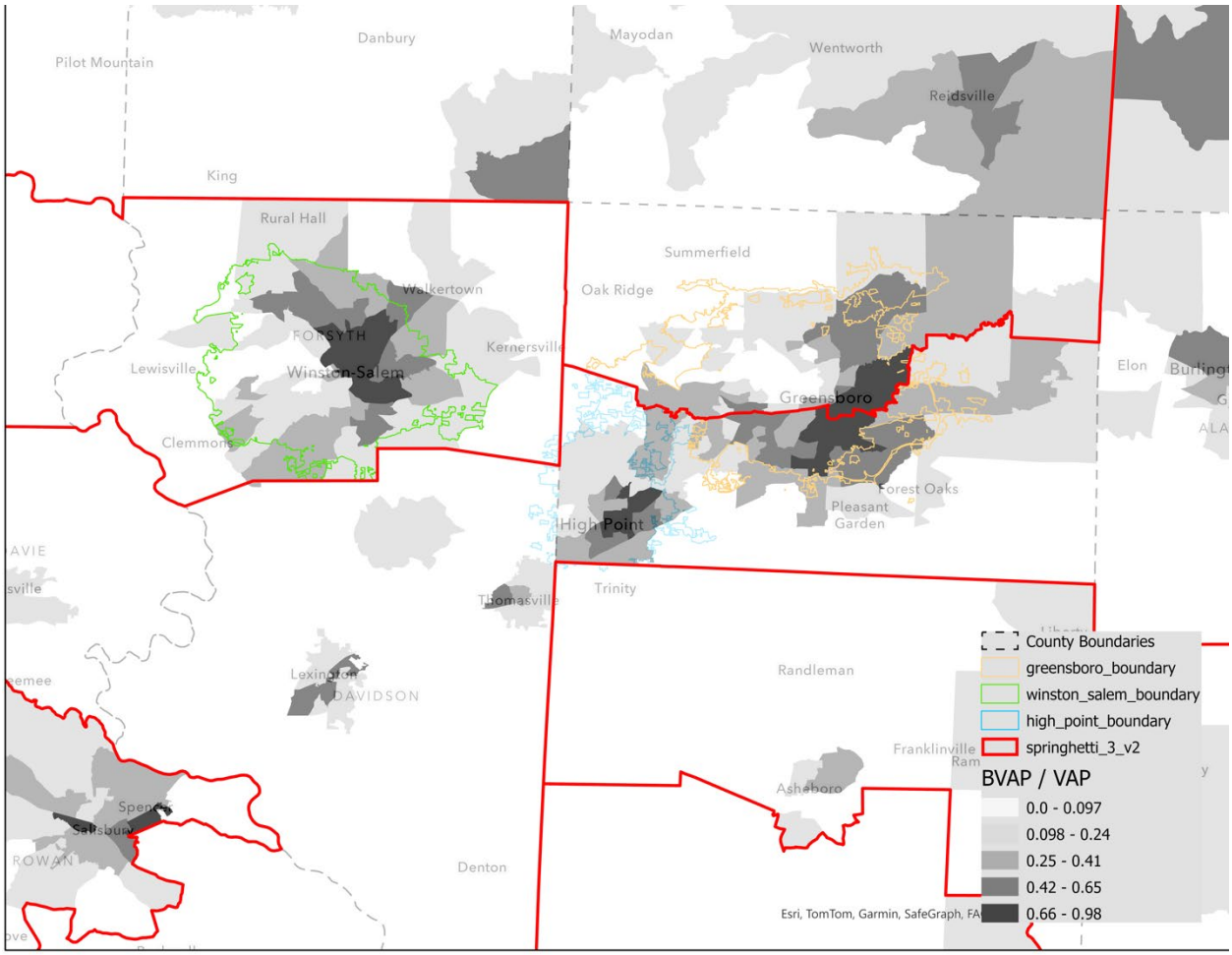
Figure 3 provides the boundaries of the plan "CMT-1," which was one of the alternative maps produced in October, shortly before the adoption of the final map. This map is identical in the Piedmont Triad to "CMT-2." While not a paragon of traditional redistricting principles, this map manages to keep Forsyth County and the city of Winston-Salem whole, and while it extracts High Point and part of the Black community of Greensboro, it relies less on boundaries that follow lines of residential segregation. As Dr. Barber's Figure 6 demonstrates, it produces a clean sweep of districts with a Republican partisan index above 56 percent.

Figure 4: Alternative Plan "Springhetti 3" in the Piedmont Triad



Next, Figure 4 examines the alternative map "Springhetti 3," and Figure 5 displays "Springhetti 3, Version 2." Springhetti 3 splits Winston-Salem once, whereas version 2 keeps Forsyth County and Winston-Salem whole. Both plans keep High Point together and split Greensboro only once. These plans rely on relatively straight lines and somewhat more compact arrangements rather than careful extractions drawn along lines of racial segregation. In my reply report, I compared the BVAP of adjoining precincts on either side of the district boundaries in the Piedmont Triad districts, showing that they were consistently large (see the tables in Appendix 1). Figures 4 and 5 convey that this was not the case with the Springhetti maps. The Springhetti maps also each produce a District 6 with higher BVAP than in the Enacted Plan—reaching 27 percent in Springhetti 3—while also creating solidly Republican districts throughout the region.

Figure 5: Alternative Plan "Springhetti 3, v2" in the Piedmont Triad



In sum, these alternative plans demonstrate that it is possible to create a similar level of partisan advantage for Republicans without working quite so assiduously to split cities with large Black populations and draw districts that follow lines of racial segregation.

VI. CONCLUSIONS

Dr. Barber's supplemental report does not cause me to alter any of the conclusions from my previous reports. First, comparisons of Black voting-age population share in areas placed into and drawn out of the challenged districts provide useful information when they are combined with analysis of traditional redistricting criteria and visualization of maps. The fact that such differences also sometimes emerge in race-blind simulations does not detract from their usefulness as part of a holistic analysis.

Second, the distribution of race across districts in the Enacted Plan is very unusual relative to Dr. Barber's ensembles of simulated plans—even the most extremely pro-Republican plans—and he has not demonstrated that this is due to efforts of the Legislature to protect incumbents or draw safer Republican seats.

Third, precinct-level regressions including racial and partisan variables cannot prove that race played no role in the redistricting process.

Finally, examination of some alternative plans considered by the Legislature demonstrates that it was possible to achieve the same extreme partisan goals as those achieved in the Enacted Plan without the same treatment of Black neighborhoods.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on March 31, 2025.

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Jonathan Rodden