

STATE OF NORTH CAROLINA
COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
21 CVS 015426

NORTH CAROLINA LEAGUE OF
CONSERVATION VOTERS, et al.,

REBECCA HARPER, et al.,

Plaintiffs,

vs.

REPRESENTATIVE DESTIN HALL, in his
official capacity as Chair of the House
Standing Committee on Redistricting, et al.,

Defendants.

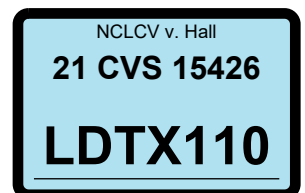
Consolidated with
21 CVS 500085

AFFIDAVIT OF MICHAEL BARBER

Now comes affiant Michael Barber, having been first duly cautioned and sworn, deposes and states as follows:

1. I am over the age of 18 and am competent to testify regarding the matters discussed below.
2. For the purposes of this litigation, I have been asked by counsel for Legislative Defendants to analyze relevant data and provide my expert opinions.
3. To that end, I have personally prepared the rebuttal report attached to this affidavit as Exhibit A, and swear to its authenticity and to the faithfulness of the opinions.

FURTHER THE AFFIANT SAYETH NAUGHT.



Executed on 28 December, 2021.

Michael Barber



Michael Barber

STATE OF FLORIDA

COUNTY OF PINELLAS

Sworn to and subscribed before me by online notarization this 28th day of December, 2021, by MICHAEL BARBER, who appeared by way of two-way audio/video communication technology, and he provided his Utah driver's license as identification.

Cynthia D. Glaros



Cynthia D. Glaros
Notary Public, State of Florida
My Commission Expires: 06/30/2022

Cynthia D. Glaros
Notary Public, State of Florida
Commission # GG228737
My Commission Expires June 30, 2022

Reply Report of Michael Barber, PhD

Dr. Michael Barber
Brigham Young University
724 Spencer W. Kimball Tower
Provo, UT 84604
barber@byu.edu

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1 Introduction and Qualifications

I have been asked by counsel for the Legislative Defendants to analyze and respond to reports submitted by Drs. Magleby, Pegden, Mattingly, and Cooper with regards to their analysis of North Carolina’s recently enacted redistricting plans for the General Assembly (the “Enacted Plans”).¹

I do this in the following ways. First, I provide a summary of their conclusions as well as comparisons between their main results and those I produced in my original report. I also consider the specific analysis they produce for several county groupings that are singled out in their reports for additional scrutiny. I also define a measure of substantive significance to determine the degree to which the Enacted Map differs from Dr. Pegden’s simulations and subsequent expected seats analysis.

The results show that there is often not agreement, even among the plaintiffs’ experts, as to whether or not a county grouping’s districts constitute a partisan outlier. In some cases the simulations produced by different experts come to different conclusions, and in other cases some of the experts assert an extreme partisan gerrymander, but in that same grouping the map proposed by the North Carolina League of Conservation Voters (NCLCV Map) exhibits the same qualities as the Enacted Map.

Based on the evidence and analysis presented below, my opinions regarding these reports studying the North Carolina General Assembly can be summarized as follows:

- There is significant agreement between Dr. Magley’s simulation results and those produced in my original report with regard to the number of seats carried by Democrats in both the simulations and and the Enacted Plan despite some differences in our particular simulation methods.
- However, Dr. Magleby does not present county grouping by county grouping analyses,

¹Due to the incredibly tight time constraints between the submission of reports and the deadline for submission of rebuttal reports, I only analyze Dr. Cooper’s report in the House clusters and not the Senate clusters. My analysis has been provided to the best of my ability given the time constraints.

so it is not possible to compare his results with mine to identify if there are differences at this more granular level.

- In many of the 12 county groupings considered by Drs. Pegden and Mattingly in the House the Enacted Plan is either not a statistical outlier, is not substantively different from the simulations, or is in agreement with the map proposed by the NCLCV plaintiffs in the districts under dispute. Furthermore, in other cases there are reasonable explanations for the boundaries of the map that are separate from partisanship.
- In the 5 county groupings considered by plaintiffs' experts in the Senate, there is also often disagreement on whether the map constitutes a large outlier. In many of the clusters the Enacted Plan is either not a statistical outlier, is not substantively different from the simulations, or is in agreement with the map proposed by the NCLCV plaintiffs in the districts under dispute.

I am an associate professor of political science at Brigham Young University and faculty fellow at the Center for the Study of Elections and Democracy in Provo, Utah. I received my PhD in political science from Princeton University in 2014 with emphases in American politics and quantitative methods/statistical analyses. My dissertation was awarded the 2014 Carl Albert Award for best dissertation in the area of American Politics by the American Political Science Association.

I teach a number of undergraduate courses in American politics and quantitative research methods.² These include classes about political representation, Congressional elections, statistical methods, and research design.

I have worked as an expert witness in a number of cases in which I have been asked to analyze and evaluate various political and elections-related data and statistical methods. Cases in which I have testified at trial or by deposition are listed in my CV, which is attached to the end of this report. I have previously provided expert reports in a number of

²The political science department at Brigham Young University does not offer any graduate degrees.

cases related to voting, redistricting, and election-related issues: *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)*; *Common Cause, et al., Plaintiffs, vs. Lewis, et al., Defendants. Case No. 18-CVS-14001 (Wake County, North Carolina)*; *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)*; *Community Success Initiative, et al., Plaintiffs, v. Timothy K. Moore, et al., Defendants, Case No. 19-cv-15941 (Wake County, North Carolina)*; *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)*; *Georgia Coalition for the People’s Agenda, Inc., et. al., Plaintiffs, v. Brad Raffensperger, Defendant. Civil Action No. 1:18-cv-04727-ELR (U.S. District Court for the Northern District of Georgia)*; *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)*; *League of Women Voters of Ohio, et al., Relators, v. Ohio Redistricting Commission, et al., Respondents. Case No. 2021-1193 (Supreme Court of Ohio)*; *Adams, et al., Relators, v. DeWine, et al., Respondents. Case No. 2021-1428 (Supreme Court of Ohio)*

In my position as a professor of political science, I have conducted research on a variety of election- and voting-related topics in American politics and public opinion. Much of my research uses advanced statistical methods for the analysis of quantitative data. I have worked on a number of research projects that use “big data” that include millions of observations, including a number of state voter files, campaign contribution lists, and data from the US Census. I have also used geographic information systems and other mapping techniques in my work with political data.

Much of this research has been published in peer-reviewed journals. I have published nearly 20 peer-reviewed articles, including in our discipline’s flagship journal, *The American Political Science Review* as well as the inter-disciplinary journal, *Science Advances*. My CV,

which details my complete publication record, is attached to this report as Appendix A.

The analysis and opinions I provide in this report are consistent with my education, training in statistical analysis, and knowledge of the relevant academic literature. These skills are well-suited for this type of analysis in political science and quantitative analysis more generally. My conclusions stated herein are based upon my review of the information available to me at this time. I reserve the right to alter, amend, or supplement these conclusions based upon further study or based upon the availability of additional information. I am being compensated for my time in preparing this report at an hourly rate of \$400/hour. My compensation is in no way contingent on the conclusions reached as a result of my analysis. The opinions in this report are my own, and do not represent the view of Brigham Young University.

2 Review of Dr. Magleby’s Report

My review of Dr. Magleby’s report shows many areas in which our data and methods are similar and a few important areas where we differ in our methods. I begin with areas of similarity. As my report considered only the state legislative districts and not the congressional districts, I focus on that portion of Dr. Magleby’s report as well.

My review of his report over the last several days indicates that our analysis is similar in the following ways:

- We both use a redistricting simulation algorithm to construct hypothetical legislative districts in the NC House and Senate.
- We both use data from historical elections at the level of the VTD to compute the partisan lean of the Enacted Plan as well as the simulated districts.
- We both use statewide election data to compute partisan indices.
- Using the partisan indices, we both compute the number of districts “carried” by

Democrats and Republicans as a measure of the partisan lean of the districts in the Enacted Plan and the set of simulations.

Our analysis differs in the following ways:

- While we both use a redistricting simulation algorithm to construct hypothetical legislative districts in the NC House and Senate, the exact method and computer programs differ in their construction.
- While we both use data from historical elections at the level of the VTD to compute the partisan lean of the Enacted Plan as well as the simulated districts, we use slightly different elections to generate a partisan index for each district. Professor Magleby uses the following elections in 2016 and 2020 in his index: President, US Senate, Governor, Lieutenant Governor, Attorney General, Treasurer, Secretary of State, Auditor, Agriculture Commissioner, Insurance Commissioner, Labor Commissioner, and Superintendent of Public Instruction. I also use elections for President, US Senate, Governor, Lieutenant Governor, and Attorney General. Due to the very tight time constraints of this case I was unable to obtain data for Treasurer, Secretary of State, Auditor, Agriculture Commissioner, Insurance Commissioner, Labor Commissioner, and Superintendent of Public Instruction. I also include the 2014 Senate race. However, the differences in our indices will not make a large difference given the large number of elections included in either index. Any one election carries very little weight. Finally, if the intention of simulations is to compare the Enacted Plan to a set of simulated districts, the more important factor is that the measure by which the Enacted Plan is evaluated is the same as the measure by which the simulated districts are measured. This is true of both sets of simulations.
- Professor Magleby takes a random sample of 1,000 districting plans from a larger set of simulations to use as his comparison set. From the description in his report, it appears that there is no consideration for whether the simulated districts divide more

counties or are more or less compact than the Enacted Plan. In my report I only include simulations with as many or fewer county traversals and simulations in which the districts comprising the county grouping have an average compactness score that is as large or larger than the Enacted Plan.

- We both conduct simulations separately for each county grouping, however, Professor Magleby's report does not include them in his report. Because of this, I am unable to identify county groupings where the Enacted Map may differ from the simulated districts.

At the statewide level, our results are quite similar. In the State House Dr. Magelby's index predicts the Enacted Plan to have 48 Democratic districts (see Figure 1 of Magleby report). Dr. Magleby's simulations produce a distribution of seats carried by Democrats, with a peak at 52 seats carried by Democrats for a gap of 4 seats between the Enacted Plan and the modal outcome of the simulations.

My index in the House yields 49 seats carried by Democrats (see Tables 1 and 2 in Barber report). Because I consider each county grouping separately, I do not produce a single statewide histogram of seats carried by Democrats statewide, however, Tables 1 and 2 in my report show the middle 50% range of simulations across all House clusters to be 50-55 Democratic seats, which would include the modal outcome in Dr. Magleby's Figure 1. This produces a gap of 1-6 seats between the Enacted Plan and the middle 50% range of simulated plans.

In the State Senate Dr. Magelby's index predicts the Enacted Plan to have 19 Democratic districts (see Figure 3 of Magleby report). Dr. Magleby's simulations produce a distribution of seats carried by Democrats, with a peak at 22 seats carried by Democrats for a gap of 3 seats between the Enacted Plan and the modal outcome of the simulations.

My index yields 20 seats carried by Democrats in the State Senate (see Tables 31 and 32 in Barber report). Because I consider each county grouping separately, I do not produce a single statewide histogram of seats carried by Democrats statewide, however, Tables 31

and 32 in my report show the middle 50% range of simulations across all clusters to be 23 Democratic seats for a gap of 3 seats between the Enacted Plan and the modal outcome of the simulations.

3 Review of Dr. Cooper's Report

Dr. Cooper provides no quantitative analysis of the Enacted Plan aside from computing a few different partisan indices of the Enacted Plan. He does not compare the plan to any other alternative plan or set of plans, simulated or otherwise. While the partisan indices he uses are quantitative in nature, the analysis he conducts is fundamentally qualitative. For his analysis of the State House and Senate he looks at each county grouping and offers opinions and anecdotes about the boundaries of the districts as well as the supposed intentions of the legislature. However, he offers no evidence aside from his own opinion to support his assertions of the intentions of the legislature when drawing the district boundaries.

There is nothing wrong, per se, with a qualitative approach to evaluating a state's map. However, qualitative research requires the same standards and rigor as quantitative research. King, Keohane, and Verba (2021), arguably the most influential recent work on qualitative research, describe the need for rigorously defined standards in qualitative research as the following:

We argue that nonstatistical research will produce more reliable results if researchers pay attention to the rules of scientific inference—rules that are sometimes more clearly stated in the style of quantitative research....Indeed the distinctive characteristic that sets social science apart from casual observation is that social science seeks to arrive at valid inferences by the systematic use of well-established procedures of inquiry (pg. 4).³

³King, Gary., Verba, Sidney., Keohane, Robert O.. *Designing Social Inquiry: Scientific Inference in Qualitative Research*, New Edition. United States: Princeton University Press, 2021.

From my review of Dr. Cooper’s cluster-by-cluster analysis, there is no systematic process by which he determines if a set of districts in a county group constitute a gerrymander or not. Dr. Cooper does not describe any methods or processes that would be consistent with analysis in political science. Instead, I would describe his report as more akin to “casual observation,” rather than rigorous social science. Nevertheless, I consider the particular county groups that he identifies and compare his assessment to that of my report and the other plaintiff expert reports.

4 Review of Dr. Pegden’s Report

Dr. Pegden provides an analysis of the districts in the State House and Senate, as well as the congressional maps. However, I only consider the State House and Senate portion of his report. My understanding of his analysis is that he performs something akin to a simulation analysis, but in a slightly different way. Through a series of very large number of small perturbations to the existing districts that adhere to the redistricting criteria in North Carolina he creates a large set of comparison maps. He then compares the Enacted Map to this set of comparison maps using the 2020 Attorney General election as a “proxy for partisan voting patterns (pg. 9)” in two ways.

Unlike myself, Professor Magleby, and Professor Mattingly, Dr. Pegden only considers one election instead of an index or series of elections. It is unclear to me why he makes this choice since using any individual election as a proxy for future state legislative election results will be subject to the idiosyncrasies (candidate-related factors, issues specific to the office and campaign, campaign spending/advertising, etc) of the particular election chosen. While he provides alternative elections in the Appendix of his report for the 2020 Presidential election, the 2020 Lieutenant Governor election, and the 2020 Governor election, these are only included for the statewide analysis and do not look at specific county groupings in a group-by-group analysis, like is done earlier in his report.

The first analysis Dr. Pegden conducts is to determine the proportion of maps that are more “partisan” than the set of comparison maps. This fraction is treated throughout the report in a similar fashion to a reported p-value in other quantitative research in the social sciences. As Dr. Pegden states: “My method produces a rigorous p-value (statistical significance level) which precisely captures the confidence one can have in the findings of my “second level” analyses. In particular, for my statewide analyses, my second-level claims are all valid at a statistical significance of $p = .002$ (pg. 6).”

He also produces an additional analysis for each county grouping in which he computes the expected seat share for the Enacted Plan and compares this to the expected seat share of the set of comparison maps he produces. As he states: “When I am evaluating the partisanship of a comparison districting (to compare it to the Enacted Plan), I am interested in the number of seats we expect Democrats might win in the districting, given unknown shifts in partisan support. In particular, the metric I use is: How many seats, on average, would Democrats win in the given districting, if a random uniform swing is applied to the historical voting data being used?” This comparison is akin to a measure of substantive significance, as it helps us to understand the substantive difference between the Enacted Map and the set of comparison maps generated by Dr. Pegden’s algorithm.

Substantive significance is a way of measuring the “practical significance” of a statistical finding. Gross (2015) states, “The function of statistical tests is merely to answer: Is the variation great enough for us to place some confidence in the result; or, contrarily, may the latter be merely a happenstance of the specific sample on which the test was made? The question is interesting, but it is surely secondary, auxiliary, to the main question: Does the result show a relationship which is of substantive interest because of its nature and its magnitude? ”⁴ As an example, suppose a drug trial discovers a drug to reduce blood pressure that produces a statistically significant effect in a randomized controlled trial. However,

⁴Gross, Justin H. “Testing What Matters (If You Must Test at All): A Context-Driven Approach to Substantive and Statistical Significance.” *American Journal of Political Science* 59, no. 3 (2015): 775-788. quoting Kish, Leslie. 1959. “Some Statistical Problems in Research Design.” *American Sociological Review* 24(3):328-38.

suppose that the substantive impact of this drug on patients' blood pressure remains very small. Given this, it may not be in the interests of the company to produce the drug given other considerations such as cost, potential side effects, and the opportunity costs of other activities. This would be an example of a difference between statistical and substantive significance.

The previous paragraph is relevant to Dr. Pegden's analysis because the first and second level analyses he provides are akin to measures of statistical significance while the expected seat share he computes is akin to a measure of substantive significance. Various measures of redistricting have been created and used, but agreement on any one particular measure as the ideal is lacking. Furthermore, even when a particular measure is agreed upon, what constitutes a substantively significant difference using that measure is even rarer.⁵ Cain et al. summarise this issue well when they state, "Any partisan gerrymandering doctrine that the Court adopts will presumably allow states to draw maps that deviate some from the counterfactual plans. Strict adherence is not likely to be required. The critical question in applying this method then becomes: How much deviation is too much?"⁶

Given this, agreement on a strict definition of substantive significance is vanishingly rare. As a guidepost, I look at the expected seat share between the Enacted Plan and the expected seat share of the middle 50% of Dr. Pegden's simulations (in other words, the simulations which constitute the 25th to the 75th percentile). I then calculate how this difference would translate into an expectation for a party to pick up an additional seat over the 5 legislative elections that would take place over the decade in which the plan would be in place.⁷ A redistricting plan is in place for a decade, so it makes sense to consider the

⁵Herschlag, Gregory, Han Sung Kang, Justin Luo, Christy Vaughn Graves, Sachet Bangia, Robert Ravier, and Jonathan C. Mattingly. "Quantifying gerrymandering in North Carolina." *Statistics and Public Policy* 7, no. 1 (2020): 30-38.; Stephanopoulos, Nicholas O., and Eric M. McGhee. "The measure of a metric: The debate over quantifying partisan gerrymandering." *Stan. L. Rev.* 70 (2018): 1503.; Warrington, Gregory S. "A comparison of partisan-gerrymandering measures." *Election Law Journal: Rules, Politics, and Policy* 18, no. 3 (2019): 262-281.

⁶Cain, Bruce E., Wendy K. Tam Cho, Yan Y. Liu, and Emily R. Zhang. "A Reasonable Bias Approach to Gerrymandering: Using Automated Plan Generation to Evaluate Redistricting Proposals." *William & Mary Law Review* 59, no. 5 (2018): 1521.

⁷I also use the middle 50% standard in my own analysis when looking at whether the Enacted Plan is

substantive differences over that time period.

5 Review of Dr. Mattingly’s Report

Dr. Mattingly also produces a set of simulated districting plans and compares the Enacted Plan to this set of comparison maps. Dr. Mattingly does not produce an election index, but instead analyzes separately the results in 12 or 16 different elections in 2016 and 2020. In his statewide analysis he includes 2020: Attorney General, United States Senate, Commissioner of Insurance, Lieutenant Governor, Governor, State Treasurer, Secretary of State, State Auditor, Commissioner of Agriculture, Commissioner of Insurance, and US President; 2016: Commissioner of Agriculture, Governor, Lieutenant Governor, US Senate, and President. In his cluster-by-cluster analysis these elections are 2020: Attorney General, United States Senate, Commissioner of Insurance, Lieutenant Governor, Governor, State Treasurer, Secretary of State, State Auditor, Commissioner of Agriculture, and United States President; 2016: Lieutenant Governor and President. It is unclear to me why he does not include the other 2020 races in the cluster-by-cluster analysis.

In his analysis of the State House Dr. Mattingly produces two different “ensembles” or sets of simulations. The first set he describes as “matched” in that the simulations match the criteria used to draw the Enacted Plan. However, this is often not the case in the cluster-by-cluster analyses where the simulations often do not match the degree to which the Enacted Plan follows these criteria (See, for example, Figures 6.1.3, 6.1.9, 6.1.12, 6.1.21, 6.1.24, 6.1.27, 6.1.30, 6.1.33, 6.1.36 where the Enacted Plan splits fewer municipalities or has fewer ousted voters than a substantial number of the simulations). The simulations are often higher than the Enacted Plan in number of municipalities split, number of voters “ousted” from a district (see pg. 9 of the Mattingly report for a description of ousted voters), and the average compactness of the simulated districts is also often lower than the Enacted Plan (see

an outlier from the simulation results. This interquartile range is a commonly used measure of the central range of expected outcomes in a distribution.

Figure 7.3.1 in Mattingly Report.) Given this, I analyze the results of Dr. Mattingly’s second set of simulations that are more strict regarding municipal splits and district compactness and do not consider the first set of simulations especially helpful in analyzing the Enacted Plan.

In his analysis of the State Senate the opposite is true. As in the House Dr. Mattingly produces two different “ensembles” or sets of simulations. The first set he describes are “matched” in that the simulations match the criteria used to draw the Enacted Plan. Here Dr. Mattingly notes, “We will see that the enacted NC Senate preserves municipalities to a high degree; in a way consistent with the most municipality preserving distributions we could produce. Hence, we also provide a Secondary Ensemble for the NC Senate which does not explicitly preserve municipalities (though compactness and the county preservation lead to a degree of municipality preservation.) It coincides with the primary ensemble properties in other respects” (pg. 6). Given the stated interests of the legislature in keeping municipalities whole, it is unclear to me why it would be useful to produce an analysis that intentionally violates this principle.⁸ As such, I focus my comparisons on the first set of simulations in the Senate.

6 Disagreement Among Plaintiffs’ Experts in House County Groupings

In this section I consider the county groupings that are singled out in the various expert reports submitted by the plaintiffs as being especially egregious examples of gerrymandering. However, as I will show, there is often disagreement even among the plaintiffs’ own experts as to the presence, degree, and extent of the problem.

⁸For example, the committee hearing transcripts state: “We honored municipal boundaries. The chair made every effort to keep municipalities whole throughout the draw.” See 9:43:00-9:45:00 in the committee hearing https://www.youtube.com/watch?v=7pyfVT6V0c4&t=34565s&ab_channel=NCGARedistricting and https://www.youtube.com/watch?v=GOVer0sNMm4&ab_channel=NCGARedistricting in the Senate.

6.1 Pitt House County Grouping

The Pitt county grouping contains two districts. The largest city in the cluster is Greenville, with a population of 87521, or nearly 1 district exactly (the target district population in the House is 208,788). However, creating a district that is entirely Greenville with the second district constituting everything in Pitt County that is not Greenville would create a district that resembles a donut hole (in other words, an embedded district). This type of district is also not proposed in the NCLCV proposed map. Given this, to avoid a “donut hole” scenario requires connecting the district that incorporates the majority of Greenville to the edge of the county so as to make sure this district is no longer embedded in the outer district. Simply adding a VTD to the district is not possible since no single VTD can be added without making the population of the district too large and the district highly non-compact. Thus, extending the boundaries of the district to the edge of the county necessitates splitting Greenville. The legislature chose to do this in a relatively east-west direction with northern Greenville in HD-8 and southern Greenville in HD-9.

Dr. Pegden’s report states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 11% of all alternative districting satisfying my districting criteria (in other words, 89.1% are less optimized-for-partisanship)...(pg. 21)”. 11% would not constitute a statistical outlier in a traditional scientific study.

With regards to substantive significance, Dr. Pegden’s analysis predicts the expected seats from a range of uniform swings in election outcomes in the Enacted Plan in this cluster to be 1.3 Democratic seats. To gauge the substantive significance of this result, I compare it to the 25th percentile outcome of the simulations on the same metric. This yields an expected seats of between 1.45 Democratic districts, for a difference of between .15 districts. In other words, in a series of 5 elections with varying electoral environments (some good for Democrats and some good for Republicans) in each district in the cluster, we would expect the Enacted Map to elect an additional Democrat in the county group less than 1 time, on average, than the simulated maps would do.

In Dr. Mattingly's report, all 12 elections he considers generate a strongly Democratic district (HD-8). In only 3 of the 12 elections he considers a majority of the simulations create a second Democratic district while in 9 of the 12 elections the majority of the simulations generate a Republican district. In Figure 6.1.23 the Enacted Plan agrees with the majority outcome of the simulations in 10 of the 12 elections he considers.

These results are similar to those contained in my original report. In 10 of the 11 elections I include a majority of simulations generate one Democratic District and one Republican leaning district. In 10 of the 11 elections, the Enacted Plan agrees with the majority outcome of the simulated maps.

The overall picture here is one of agreement that in the majority of cases the Enacted Plan and the simulations generate one Democratic-leaning district and one Republican-leaning district.

Dr. Cooper does not provide any analysis of the Enacted Plan aside from calculating a partisan index of the districts. However, Dr. Cooper notes that Pitt County is currently represented by two Democrats, Kandie Smith and Brian Farkas. Dr. Cooper fails to note the old (2020) districting arrangement had 3 districts in Pitt County with the third district (District 12) extending into Lenoir County and being represented by Republican Chris Humphrey.

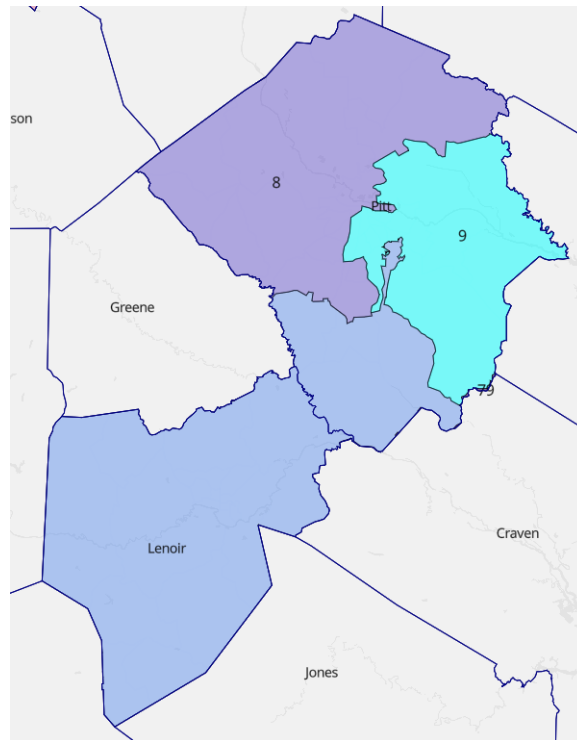


Figure 1: **2020 Districts in Pitt County**

6.2 Alamance House County Grouping

The Alamance County grouping contains two districts, HD-63 and HD-64. In this county there is disagreement between plaintiffs' experts as to whether or not the Enacted Map constitutes a gerrymander. Drs. Pegden and Mattingly do not find the map to be a partisan outlier, while Dr. Cooper objects to the particular shape of the districts.

Dr. Pegden's analysis places the Alamance County plan among the lowest quarter of districtings. He states, "In every run, the districting was in the most partisan 74% of districtings (in other words, 26.3% were less partisan, in every run) (pg. 23)." Because of this, he further states, "The Enacted Map is not unusual enough in the first-level analysis to enable a statistically significant second-level analysis of this cluster (pg. 23)." Looking at the range of expected Democratic seats in this county, the Enacted Plan is actually *more* Democratic than the median simulation in Dr. Pegden's report.

Dr. Mattingly also agrees that this plan is not an outlier. He states, "From Figure 6.1.25, we see that thought [sic] the Enacted Map tends have more Democrats in the more Democratic district and less in the less democratic [sic] district it not [sic] an outlier on its own (pg. 46)."

The simulations in my initial report also agree with this assessment. In 10 of 11 elections I analyze, the partisan lean of the districts in the Enacted Plan agree with the partisan lean of the majority of the simulations run. In 6 of the 11 elections a Democrat won a majority of the two-party vote in District 63 while in 5 of the elections the Republican candidate won the majority of the votes.

However, Dr. Cooper notes the unusual shape of the district but does not mention that this shape is largely the same (different by only 2.5 precincts) as the 2019 court-approved maps.

6.3 Duplin-Wayne House County Grouping

The Duplin-Wayne County grouping contains two districts, HD-4 and HD-10.

Dr. Pegden does not provide an analysis of this county. He states, “For this cluster, my conservative approach (as discussed in Section 4.3.2) does not allow my algorithm to generate any comparison maps other than the map itself.” This is interesting as it aligns with my simulations in which I found no alternative maps that had an equal (or fewer) number of county traversals and were as compact or more compact than the Enacted Plan (see pg. 58 of Barber original report).

Dr. Mattingly does not find the map to be a partisan outlier in his analysis. He states, “In the Duplin-Wayne county cluster the two districts are safely Republican under the elections considered. The Enacted Map is typical, falling in the middle of the observed democratic [sic] fraction on the Histograms (pg. 42).”

However, the proposed NCLCV Map generates one consistently Democratic-leaning district across all 11 election that I analyze. This constitutes a partisan outlier in all 11 elections I consider and would also fall outside the majority of the simulation results in all comparable elections in Dr. Mattingly’s simulations as well.⁹

⁹While we do not use the same elections Dr. Mattingly and I both use the 2016 Lieutenant Governor, 2016 President, 2020 Lieutenant Governor, 2020 US Senate, 2020 President, 2020 Attorney General, and 2020 Governor races.

6.4 Buncombe House County Grouping

The Buncombe County grouping contains three districts, HD-114, HD-115, and HD-116. In this county there is agreement among experts that the Enacted Map in this county grouping generally creates two Democratic seats and 1 Republican-leaning seat. The degree to which this is a partisan outlier is less certain.

Dr. Pegden reports that the Enacted Map in this county “was in the most partisan 0.020% of districtings (in other words, 99.979% were less partisan, in every run) (pg. 16).” This is a statistically significant result. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 2.26 seats while the 25th percentile plan has an expected Democratic seats of 2.85. This leads to a substantive difference of 0.59 expected Democratic seats. Put another way, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 2 rather than 3 in this cluster) than the 25th percentile simulation roughly 3 additional times.

Dr. Mattingly’s presents simulations in which the Enacted Map and the simulations agree on the creation of 2 Democratic districts in the cluster (HD-114 and HD-115). In all 12 elections considered the Enacted Map and the simulations are in agreement on the partisan lean of these two districts. The third district, HD-116, is the source of the disagreement. In 10 of the 12 simulations HD-116 in the Enacted Plan does not agree with the majority of the simulations in Dr. Mattingly’s report (see Figure 6.1.14).

Dr. Cooper offers his assessment by saying “By shifting the current district lines where the districts meet in Asheville, however, the Enacted Map packs as many Democrats as possible into HD-114, while HD-115 stays relatively constant in terms of predicted vote share. The C-shaped HD-116 now includes most of the Republican-leaning VTDs in Buncombe...” Dr. Cooper appears to imply that a more appropriate orientation of the district lines would be to place a substantial portion of Asheville into each of the three districts.

In other words, across all three experts, the disagreement with the Enacted Plan centers on district HD-116. The “C” shape in District HD-116, as noted by Dr. Cooper, is

the result of a decision to minimize the division of the city of Asheville. With a population of 94,589, the city will need to be split into two different districts, but not necessarily three. The Enacted Plan does this by placing approximately 87 percent of the city population in two districts, HD-114 and HD-115, leaving HD-116 to wrap around the the city and largely avoid its boundaries. This, however, creates the “C” shape of the district.

Finally, Dr. Cooper states, “Soon after the maps were passed, all three Democratic incumbents announced that they would be retiring and not running for office in these newly drawn districts.” It is unclear to me how this fact is relevant to the shape of the new districts. If the Enacted Map create two strong Democratic districts, how is the announced retirement of all three Democratic incumbents in any way a result of the districting process, as Dr. Cooper implies? Dr. Cooper does not offer any other evidence that something else related to the new districts may have been the cause, such as double bunking, or a dramatic shift in the composition of each district from the old (2020) districts.

6.5 Cumberland House County Grouping

The Cumberland County group contains four districts, HD-42, HD-43, HD-44, and HD-45. In this cluster there is disagreement between the experts as to whether this county constitutes an extreme gerrymander.

Dr. Pegden's analysis contend that the Enacted Plan is neither a statistically significant nor substantively significant outlier. He states, "In every run, the districting was in the most partisan 16% of districtings (in other words, 83.5% were less partisan, in every run)...The Enacted Map is not unusual enough in the first-level analysis to enable a statistically significant second-level analysis of this cluster (pg. 27)."

Beyond not being statistically unique, the substantive difference in the number of expected Democratic seats is very small. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 3.21 seats while the 25th percentile plan has an expected Democratic seats of 3.25. This leads to a substantive difference of between 0.04 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 3 rather than 4 in this cluster) than the 25th percentile simulation less than 1 additional time.

Dr. Mattingly's presents analysis in which the simulations generate two solidly Democratic districts (HD-44 and HD-42) and two districts that are closer to the .50 line with HD-43 being Democratic-leaning and HD-45 being Republican-leaning (see Figure 6.1.29 in Mattingly Report). Regarding this outcome he states, "In an ensemble that better preserves municipalities, the most Republican district is typically more republican [sic] and the second most Republican district more Democratic. This makes the Enacted Plan which squeezes the two together with an [sic] large outlier."

A closer look at Figure 6.1.29 shows that the Enacted Plan is an outlier not because it favors one party over the other, but rather because it creates more competitive races than the majority of Dr. Mattingly's simulations. While Dr. Mattingly's simulations produce

a reliably Republican district in HD-45 and a reliably Democratic district in HD-43, the Enacted Plan creates neither and instead generates two very competitive districts. This produces a responsive map in which the partisanship of legislators elected to these two districts will likely shift frequently with shifting electoral preferences, something Dr. Mattingly notes is a desirable feature of a districting plan in other portions of his report (see pg. 3 and 4 of Mattingly Report).

Dr. Cooper agrees with this this when he states, “The Enacted Map creates two extremely competitive districts, HD-43 and HD-45 (with CCSC scores of D+1,334 and D+663, respectively) by splitting the Democratic-leaning City of Fayetteville into all four districts in the cluster.” While his assessment of the competitiveness of these two districts is correct, he is incorrect as to the reason. Fayetteville has a population of 208,501 and as such is required to be divided into at least three districts, but not four. And while the Enacted Plan does draw parts of Fayetteville into all four districts, only 7.3 % of Fayetteville’s population is placed in District 45.

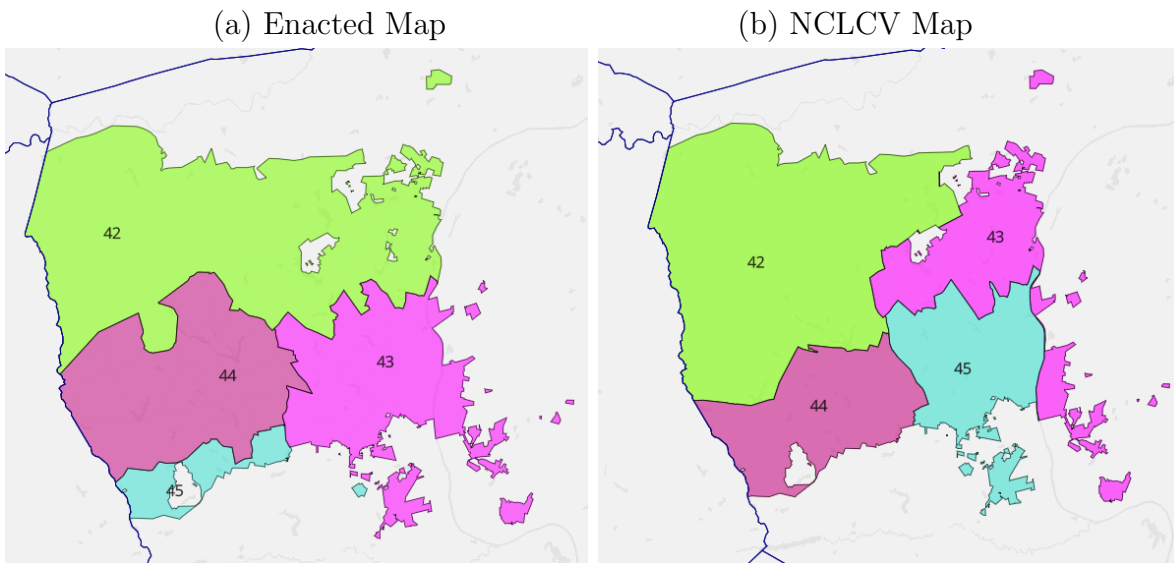
Furthermore, the Enacted Plan places a much smaller proportion of Fayetteville in to the 45th district than NCLCV plaintiff’s proposed map does. If Dr. Cooper’s objections to dividing municipalities more than necessary is applied to this map, then plaintiff’s map fares much worse than the Enacted Map. The table and figure below shows the comparison of how Fayetteville is divided in the two plans, which is also shown as Table 18 and Figure 54 in my original report.

Table 1: Division of Fayetteville in Enacted Plan and NCLCV Plan

District:	Percent of Fayetteville in district	
	Enacted Plan	NCLCV Plan
42	31.4	33.4
43	21.4	21.5
44	39.9	26.8
45	7.3	18.3
Total:	100%	100%

Note: Population number for city by district for Enacted Plan from: https://ncleg.gov/Files/GIS/Plans_Main/Senate_2021/SL%202021-173%20Senate%20-%20StatPack%20Report.pdf Population numbers for city by district for NCLCV Plan from Dave's Redistricting online. <https://davesredistricting.org/>

Figure 2: Map of Fayetteville Divisions in Cumberland County Cluster



6.6 Durham-Person House County Grouping

The Durham-Person County grouping contains 4 districts, HD-2, HD-29, HD-30 and HD-31. In this cluster there is disagreement with one district in particular, HD-2, which takes in the entirety of Person County to the north and the northern and eastern portions of Durham county.

Dr. Pegden’s analysis of this county cluster yields the following results. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.20% of all alternative districtings satisfying my districting criteria (in other words, 99.79% are less optimized-for-partisanship)” (pg. 25).

However, the substantive effect of this difference is very small. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 3.87 seats while the 25th percentile plan has an expected Democratic seats of 3.95. This leads to a substantive difference of between 0.08 expected Democratic seats. Put another way, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 3 rather than 4 in this cluster) than the 25th percentile simulation less than 1 additional time.

Dr. Mattingly’s simulations reveal three highly Democratic districts and one district that is more competitive. In the three highly Democratic district (HD-31, HD-29, and HD-30), the Enacted Plan and the simulations are in agreement in all 12 of the 12 elections considered. In 10 of the 12 elections he considers the Enacted Plan agrees with the majority of simulations on the partisanship of the more competitive district, HD-2 (see Figure 6.1.23 of Mattingly Report).

Dr. Cooper simultaneously criticizes the map for dividing Durham across all four district while also packing Democratic into three of the four districts. He states, “The Enacted Map splits the City of Durham across all four districts but packs Democratic voters in HDs 29, 30, and 31; there is not a single Republican or competitive VTD in those districts (pg. 84).” This is a confusing complaint to offer since there are nearly no Republican VTDs

in Durham County (if any at all when looking at Map 40 in Dr. Cooper's report), so it comes as no surprise that the three districts that are entirely contained in Durham County would contain no Republican-leaning VTDs. Furthermore, Dr. Cooper notes that the city of Durham is included in all four districts. However, remedying this by making sure District 2 contained no portion of Durham would only further make District 2 more Republican as the most Democratic VTDs in District 2 are those within the Durham city limits. Furthermore, the population of Durham is 283,506, which means it is large enough that it is absolutely necessary to include parts of Durham in all four districts.

6.7 Brunswick-New Hanover House County Grouping

The Brunswick-New Hanover County grouping contains 4 districts, HD-17, HD-18, HD-19, and HD-20. In this case, there is disagreement between experts as to whether this cluster constitutes an extreme gerrymander.

Dr. Pegden’s analysis contends that the Enacted Plan is not a significant outlier, statistically or substantively. He states, “In every run, the districting was in the most partisan 11% of districtings (in other words, 89.4% were less partisan, in every run). The Enacted Map is not unusual enough in the first-level analysis to enable a statistically significant second-level analysis of this cluster (pg. 24).”

Beyond not being unusual in comparison to the simulations to perform a statistically significant second-level analysis, the substantive difference in the expected Democratic seat share is also very small. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 1.25 seats while the 25th percentile plan has an expected Democratic seats of 1.25. This leads to a substantive difference of between 0.00 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would not expect the Enacted Map to differ from the 25th percentile simulation at all, on average.

Dr. Mattingly argues on the other hand that the cluster is problematic. Specifically, he locates the problem in District 20. He states of this district, “The Republican party typically wins the second most democratic [sic] district [HD-20] in the Enacted Plan even though it would go to the Democrats under a number of elections when the neutral maps in the primary ensemble are used.” Looking at Figure 6.1.35 in Dr. Mattingly’s report we see that in 5 of the 12 elections the Enacted Plan agrees with the majority of simulations on the partisan lean of HD-20.

Dr. Cooper does not offer much by way of exposition in this cluster other than to claim that District 18 is packing Democratic voters “in and around Wilmington” and that “[t]he heavily Republican HD-19 also ensnares a Democratic-leaning VTD south of Wilmington,

which keeps that VTD out of competitive HD-20 (pg. 95).” Another way to consider the “packing” referred to by Dr. Cooper is to note that District 18 keeps the communities of Hightsville, Wrightsboro, Skippers Corner, Castle Hayne, Blue Clay Farms, Northchase, Murraysville, and Kings Grant — all municipalities in and around Wilmington — together. Secondly, the “ensnared” VTD that Dr. Cooper refers to is only moderately Democratic (.56 in the 2020 Presidential election) and would make only the slightest difference in the overall partisan lean of HD-20 were it to somehow capture it from HD-19.

6.8 Forsyth-Stokes House County Grouping

The Forsyth-Stokes County grouping contains 5 districts, HD-91, HD-71, HD-72, HD-74, and HD-75. In this county there is agreement among experts that the Enacted Map in this county grouping generally creates two Democratic seats and 2 Republican-leaning seats. The partisan lean of the middle district in the Enacted Plan, HD-74, is in dispute.

Dr. Pegden’s analysis contends that the Enacted Plan is a significant outlier, statistically and substantively. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.26% of all alternative districtings satisfying my districting criteria (in other words, 99.73% are less optimized-for-partisanship) (pg. 18).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 2.18 seats while the 25th percentile plan has an expected Democratic seats of 2.85. This leads to a substantive difference of 0.67 expected Democratic seats. Stated differently, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 2 rather than 3 in this cluster) than the 25th percentile simulation roughly 3 additional times.

Dr. Mattingly’s presents simulations that contain two districts that are consistently Democratic leaning (HD-71 and HD-72) and two districts in which the distribution of simulation results are nearly always Republican leaning (HD-91 and HD-75). Thus, the outlier in his analysis lies with HD-74 where the simulations often generate both Republican and Democratic leaning districts and the Enacted Plan is more consistently Republican leaning.

However, the Enacted Plan’s District 74 is very similar in shape and partisan lean to the NCLCV “optimized map.” A map of the similarities in these districts is presented in Figure 69 of my original report. The partisan lean of District 74 using the election index in my original report is 0.45 while the partisan lean of District 74 in the NCLCV map is 0.46. Thus, if the Enacted Map is an extreme gerrymander due to the boundaries and partisan lean of District 74, then this criticism would also apply to the proposed NCLCV map as

well.

Finally, Dr. Cooper notes of this district, “The splits of Winston-Salem do not make sense without reference to the anticipated voting behavior of the VTDs arranged into each district.” However, this is not the case. The splits of Winston-Salem are largely the same as the 2020 maps, which were approved by a court in 2019. To a large degree the legislature appears to have chosen to leave the district boundaries much the same as the previous court-approved maps. Figure 69 in my original report presents this comparison between the current maps and the old maps in this cluster.

6.9 Cabarrus-Davie-Rowan-Yadkin House County Grouping

The Cabarrus County grouping contains 5 districts, HD-73, HD-76, HD-77, HD-82, and HD-83.

The layout of districts in this cluster is largely determined by the geography of the four counties in the cluster. Yadkin and Davie are sparsely populated and as such must constitute a portion of a single district (HD-77). This district then extends south into northern Rowan County, where it borders Davie County. Rowan County has a larger population - enough to sustain 1.68 districts. To minimize county traversals in the group, this implies creating a single district that is entirely contained within Rowan county and then another district that spans Rowan County and extends into northern Cabarrus County. Finally, Cabarrus County is the most populated county of the group (population = 225,804) with a population large enough to support 2.6 districts. This means that there will be two districts entirely contained in Cabarrus County with a partial district that spans Rowan and Cabarrus Counties. Because the county grouping is arranged in a linear North/South axis, this layout of districts - 1 in Yadkin and Davie, and partially in Rowan, 1 in Rowan, 1 spanning Rowan/Cabarrus, and 2 entirely in Cabarrus is the only arrangement that complies with the rules requiring the minimization of county traversals.

Thus, complaints of the districts are limited to the particular boundaries of the two and a half districts in Cabarrus county (HD-73, HD-82 and HD-83).

Dr. Pegden does not find the Enacted Plan to be a significant outlier. He states, “In every run, the districting was in the most partisan 12% of districtings (in other words, 87.7% were less partisan, in every run). The Enacted Map is not unusual enough in the first-level analysis to enable a statistically significant second-level analysis of this cluster (pg. 26).”

Beyond not being unusual in comparison to the simulations to perform a statistically significant second-level analysis, the substantive difference in the expected Democratic seat share is also very small. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 0.33 seats while the 25th percentile plan has an expected

Democratic seats of 0.45. This leads to a substantive difference of 0.12 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 0 rather than 1 in this cluster) than the 25th percentile simulation less than 1 additional time.

Dr. Mattingly's simulations produce 4 very Republican districts and one district that generates both Republican and Democratic outcomes (HD-82), depending on the election one uses to measure partisanship. He states, "In the Cabarrus-Davie-Rowan-Yadkin county cluster, there are abnormally few Democrats in the most Democratic district (district 82)." In 4 of the 12 elections he considers the Enacted Plan agrees with the majority of the simulations on the partisanship of this swing district.

One important thing to note is that the proposed NCLCV map performs worse than the Enacted Plan by this metric described by Dr. Mattingly. The most Democratic district in this plan is actually *less* Democratic than the Enacted Plan (0.43 in the NCLCV plan compared to 0.41 in the Enacted Plan using the partisan index in my original report). Thus, by Dr. Mattingly's argument, this would place the NCLCV map as more of a partisan outlier than the Enacted Plan in this county cluster.

6.10 Guilford County House County Grouping

The Guilford County grouping contains 6 districts, HD-57, HD-58, HD-59, HD-60, HD-61, and HD-62.

Dr. Pegden’s analysis contends that the Enacted Plan is a significant outlier. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.000089% of all alternative districtings satisfying my districting criteria (pg. 19).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 4.46 seats while the 25th percentile plan has an expected Democratic seats of 5.45. This leads to a substantive difference of 0.99 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 4-5 rather than 5-6 in this cluster) than the 25th percentile simulation every time, on average.

Dr. Mattingly states of his simulations in this county: “The ensemble reliably has four democratic districts and a 5th which typically leans Republican but sometimes is competitive. Yet, the Enacted Plan gives one clearly Republican district and one which is often safely Republican and at times competitive (pg. 36).” District 59 is the district in question. Excluding HD-59, in 12 of the 12 elections the Enacted Plan agrees with the majority of Dr. Mattingly’s simulations on the partisanship of the remaining 5 districts in the cluster. Thus the discussion of a potential gerrymander is focused on the composition of HD-59.

This also conforms with the simulation results in my original report. In 11 of the 11 elections I consider, the partisan lean of the districts in the Enacted Plan is one Democratic district short of the outcome in the majority of the simulations run.

However, one factor to consider is that District 59’s boundaries are identical to the court-approved 2019 map’s boundaries, but for one precinct, G53 (See Figure 78 in my original report for a map of the district under the two plans). District 59’s population would

be is too large if the map were to use the exact boundaries from 2019 based on the updated 2020 census population numbers. At the same time, District 61 and 58 are within the new population thresholds based on the new census numbers. Thus, it makes perfect sense to move one precinct from 57 into either 61 or 58 to equalize the population of these districts. Precinct G53 may have been chosen because it contains the right population size and is nearly entirely within the city of Greensboro, allowing a larger share of Greensboro to be contained within fewer districts.

6.11 Mecklenburg County House County Grouping

The Mecklenburg County cluster contains 13 districts, HD-88, HD-92, HD-98, HD-99, HD-100, HD-101, HD-102, HD-103, HD-104, HD-105, HD-106, HD-107, and HD-112.

Dr. Pegden’s analysis contends that the Enacted Plan is a outlier, but not to the degree of other clusters discussed above. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 5.0% of all alternative districtings satisfying my districting criteria (in other words, 95.0% are less optimized-for-partisanship) (pg. 20).” In a traditional scientific study, the 5% boundary represents the line of a statistically significant outlier.

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 11.56 seats while the 25th percentile plan has an expected Democratic seats of 11.95. This leads to a substantive difference of 0.39 expected Democratic seats. Put another way, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 11-12 rather than 12-13 in this cluster) than the 25th percentile simulation in approximately 2 of these 5 elections, on average. In other words, the difference across this range of electoral environments is Republicans picking up an additional seat about 2 in 5 times.

Dr. Mattingly’s presents simulation analysis that present the partisan distributions of the different districts and where, specifically, an outlier might occur. Figure 6.1.2 of Dr. Mattingly’s report shows that in the 10 most Democratic districts in the cluster, the Enacted Plan agrees with the majority of simulations in 12 of the 12 elections considered. Both the simulations and the Enacted Plan contain 9 comfortably Democratic districts and a 10th district that is Democratic in 11 of the 12 elections considered. In the 2 most Republican districts (HD-98 and HD-103), the Enacted Plan agrees with the majority of simulations in 12 of the 12 elections considered. These two districts occasionally lean Democratic and occasionally lean Republican, but in all 12 elections the Enacted Plan’s partisan lean aligns

with the partisan lean of the majority of the simulations. This leaves one districts in dispute - HD-104. In District 104, the Enacted Plan agrees with the majority of the simulations in 11 of the 12 elections considered. Thus, across the 13 different districts in 12 different elections, the Enacted Plan is in alignment with the majority of the simulation results in all but 1 election (Figure 6.1.2 shows a misalignment of HD-104 with the majority of the simulations in the 2020 Commissioner of Agriculture election).

Dr. Cooper states that, “[t]he Enacted Map places no Republican VTDs in HDs 92, 99, 100, 101, 102, 106, 107, and 112, leaving every Republican-leaning VTD in HDs 88, 103, 104, and 105.” Dr. Cooper omits here that there are very few Republican leaning VTDs at all on his map to begin with, they tend to be close to one another, and are concentrated in northern and southeastern Mecklenburg County. Thus it is not surprising that they are placed in relatively few of the districts given the desire for geographically compact districts. He notes the partisan composition of HDs 98 and 103 as being “carved out of the pockets of Republican voters in the north and southeast portions of the county... (pg. 68).” However, this assessment ignores the partisan geography of the cluster. District 98 is geographically compact and avoids traversing into the Charlotte city limits. Furthermore, District 103 in the southeast of the county keeps the cities of Mint Hill (there are 6 voters from this city not in District 103) and Matthews whole and together in one district.

6.12 Wake County House County Grouping

The Wake County cluster contains 13 districts, HD-11, HD-21, HD-33, HD-34, HD-35, HD-36, HD-37, HD-38, HD-39, HD-40, HD-41, HD-49, and HD-66.

Dr. Pegden’s analysis contends that the Enacted Plan is a statistical outlier. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 2.2% of all alternative districtings satisfying my districting criteria (in other words, 97.8% are less optimized-for-partisanship) (pg. 22).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 11.62 seats while the 25th percentile plan has an expected Democratic seats of 11.85. This leads to a substantive difference of 0.23 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 11-12 rather than 12-13 in this cluster) than the 25th percentile simulation in approximately 1 of these 5 elections, on average.

Dr. Mattingly’s simulation analysis presents the partisan distributions of the different districts and where specifically an outlier might occur. Figure 6.1.5 of Dr. Mattingly’s report shows that in the 10 most Democratic districts in the cluster, the Enacted Plan agrees with the majority of simulations in 12 of the 12 elections considered. In the most Republican district (HD-37), the Enacted Plan agrees with the majority of simulations in 9 of the 12 elections considered. This leaves two districts - HD-35 and HD-21. In District 35, the Enacted Plan agrees with the majority of the simulations in 7 of the 12 elections considered, and in HD-21 the Enacted Plan agrees with the majority of the simulations in 10 of the 12 elections considered. However, in the 2 elections where it is in disagreement, the Enacted Plan actually creates a *Democratic* leaning district where the majority of simulations create a Republican leaning district. Thus, the results in this cluster are mixed. Some of the Enacted Plan’s districts are more Republican, on average, than the simulations and in other cases the Enacted Plan’s districts are more Democratic. And in most cases there is agreement.

7 Disagreement Among Plaintiff Experts in Senate County Groupings

7.1 Cumberland and Moore Senate County Grouping

The Cumberland and Moore Senate county grouping contains two districts, SD-19 and SD-21.

Dr. Pegden’s analysis contend that the Enacted Plan is a statistical outlier. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.000015% of all alternative districtings satisfying my districting criteria (in other words, 99.999984% are less optimized-for-partisanship) (pg. 28).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 1.01 seats while the 25th percentile plan has an expected Democratic seats of 1.35. This leads to a substantive difference of 0.34 expected Democratic seats. Put differently, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 1 rather than 2 in this cluster) than the 25th percentile simulation in approximately 1-2 of these 10 elections, on average. In other words, the difference across this range of electoral environments is Republicans picking up an additional seat less than 2 in 5 times.

Dr. Mattingly states of the result of the simulations in this cluster, “The districts in the enacted are chosen to maximize the number of Democrats in the more democratic district and the number of republicans in the most Republican district. The map is an extreme outlier in both of these regards. The effect is a maximally non-responsive map.” It is noteworthy that in other clusters Dr. Mattingly criticizes the map for being overly responsive (see Cumberland House grouping discussion). Despite this critique, from Figure 6.2.10 we see that in all 12 elections the Enacted Map agrees with the majority of the simulations in all districts. In not a single election do a majority of the simulations produce

two Democratic seats.

It is also noteworthy that the NCLCV plaintiff's proposed plan is identical to Enacted Plan in this cluster.

7.2 Fosyth-Stokes Senate County Grouping

The Forsyth and Stokes Senate county grouping contains two districts, SD-31 and SD-32.

Dr. Pegden's analysis contend that the Enacted Plan is a statistical outlier. He states, "My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.0051% of all alternative districtings satisfying my districting criteria (in other words, 99.9947% are less optimized-for-partisanship) (pg. 29)."

However, in this cluster the substantive difference in the expected Democratic seat share is nearly zero. This is a particularly good example of the importance of distinguishing between statistical and substantive significance. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 1.00 seats while the 25th percentile plan has an expected Democratic seats of 1.05. This leads to a substantive difference of 0.05 expected Democratic seats. Put another way, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 1 rather than 2 in this cluster) than the 25th percentile simulation in approximately 0 of these 5 elections, on average. In other words, the difference between the Enacted Plan and the simulations results across this range of electoral environments is effectively zero in this cluster.

Dr. Mattingly states of the result of the simulations in this cluster, "The districts in the enacted are chosen to maximize the number of Democrats in the more democratic district and the number of republicans [sic] in the most Republican district. The map is an extreme outlier in both of these regards. The effect is a maximally non-responsive map (pg. 61)." This is similar to his objection to the Cumberland-Moore cluster above, and is again

noteworthy that in other clusters Dr. Mattingly criticizes the map for being overly responsive (see Cumberland House grouping discussion). Despite this critique, from Figure 6.2.7 we see that in all 12 elections the Enacted Map agrees with the majority of the simulations in all districts. In not a single election do the simulations produce two Democratic seats.

7.3 Guilford-Rockingham Senate County Grouping

The Guilford and Rockingham Senate county grouping contains 3 districts, SD-26, SD-27, and SD-28.

Dr. Pegden’s analysis contend that the Enacted Plan is a statistical outlier. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.00012% of all alternative districtings satisfying my districting criteria (in other words, 99.99987% are less optimized-for-partisanship) (pg. 31).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 2 seats while the 25th percentile plan has an expected Democratic seats of 2.25. This leads to a substantive difference of 0.25 expected Democratic seats. Put differently, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 2 rather than 3 in this cluster) than the 25th percentile simulation in approximately 1-2 of these 10 elections, on average. In other words, the difference across this range of electoral environments is Republicans picking up an additional seat less than 2 in 5 times.

Dr. Mattingly’s summary of the simulations results in this cluster are as follows: “The three districts in the Guilford-Rockingham cluster are constructed to pack an exceptional number of democrats [sic] in the most democratic [sic] district (district 28) and exceptionally few Democrats in the most Republican district (district 26). The effect is to ensure a Republican victory in the district 26, when in some elections the most republican [sic] district would be at risk of going to the Democratic Party (pg. 63).” However, in 11 of the 12

elections the Enacted Map’s least Democratic district (SD-26) agrees with the majority of the simulations by electing a Republican. In only 1 of the 12 elections do the majority of his simulations produce 3 Democratic districts while the Enacted Plan produces only 2. SD-26 is less competitive (i.e. more Republican leaning) than the majority of simulations, but the inverse is also true of SD-27, which is competitive in many of the simulations and in a few rare cases elects a Republican but is more Democratic and always elects a Democrat in the Enacted Plan.

7.4 Granville-Wake Senate County Grouping

The Granville and Wake Senate county cluster contains 6 districts, SD-13, SD-14, SD-15, SD-16, SD-17, and SD-18.

Dr. Pegden’s analysis contend that the Enacted Plan is a statistical outlier. He states, “My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.000030% of all alternative districtings satisfying my districting criteria (in other words, 99.999969% are less optimized-for-partisanship) (pg. 30).”

The substantive difference in the expected Democratic seat share is as follows: The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 5.13 seats while the 25th percentile plan has an expected Democratic seats of 5.75. This leads to a substantive difference of 0.62 expected Democratic seats. Put another way, across 6 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 5 rather than 6 in this cluster) than the 25th percentile simulation in approximately 3 of these 5 elections, on average. In other words, the difference across this range of electoral environments is Republicans picking up an additional seat roughly 3 in 5 times.

Dr. Mattingly’s presents simulations that contain four districts that are solidly Democratic in which no simulation nor the Enacted Plan produce a Republican-leaning seat (see Figure 6.2.4 in Dr. Mattingly’s report). The simulations also contain two seats (SD-13 and

SD-17) in which a majority of the simulations produce a Republican-leaning seat (4 of the 12 elections considered) and in other elections produce a Democratic-leaning seat (5 of the 12 elections considered). In some cases the majority of simulations in SD-13 and SD-17 diverge with one district being majority Republican and the other producing a majority of the simulations generating a Democratic district (3 of the 12 elections). In the most Republican district the Enacted Plan agrees with the majority of the simulations in 10 of the 12 elections considered and in the second most Republican district there is agreement in 9 of the 12 elections considered.

7.5 Iredell-Mecklenburg Senate County Grouping

The Iredell and Mecklenburg Senate county cluster contains 6 districts, SD-37, SD-38, SD-39, SD-40, SD-41, and SD-42.

Dr. Pegden’s analysis contend that the Enacted Plan is a statistical outlier. He states, ‘My theorems imply that the enacted districting is among the most optimized-for-partisanship 0.0057% of all alternative districtings satisfying my districting criteria (in other words, 99.9943% are less optimized-for-partisanship) (pg. 32).’

However, the substantive difference in the expected Democratic seat share is much smaller. The Enacted Map has an expected Democratic seats generated from the uniform swing analysis of 4.67 seats while the 25th percentile plan has an expected number of Democratic seats of 4.85. This leads to a substantive difference of 0.18 expected Democratic seats. In other words, across 5 hypothetical elections of each district in the cluster, we would expect the Enacted Map to elect one fewer Democrat (meaning 4 rather than 5 in this cluster) than the 25th percentile simulation in approximately 1 of these 5 elections, on average. Put another way, the difference across this range of electoral environments is Republicans picking up an additional seat roughly 1 in 5 times.

Dr. Mattingly’s simulations in this cluster contain four districts that are solidly Democratic in which no majority of his simulations nor the Enacted Plan produce a Republican-

leaning seat (see Figure 6.2.1 in Dr. Mattingly's report). The simulations also contain one seat (SD-37) in which a majority of the simulations produce a heavily Republican-leaning seat in all 12 elections. The Enacted Plan is in total agreement with the majority of simulations in these districts. This leaves SD-41, which is a more competitive seat in the simulations. In 9 of the 12 elections considered the partisan outcome in the Enacted Plan matches the partisan outcome in the majority of the simulations by producing a majority of the two-party vote share for the Democratic candidate.

Appendix A: Curriculum Vitae

Michael Jay Barber

CONTACT INFORMATION

Brigham Young University
Department of Political Science
724 KMBL
Provo, UT 84602

barber@byu.edu
<http://michaeljaybarber.com>
Ph: (801) 422-7492

ACADEMIC APPOINTMENTS

Brigham Young University, Provo, UT

August 2020 - present Associate Professor, Department of Political Science
2014 - July 2020 Assistant Professor, Department of Political Science
2014 - present 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

19. **“Ideological Disagreement and Pre-emption in Municipal Policymaking”**
with Adam Dynes
Forthcoming at *American Journal of Political Science*
18. **“Comparing Campaign Finance and Vote Based Measures of Ideology”**
Forthcoming at *Journal of Politics*
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

“Misclassification and Bias in Predictions of Individual Ethnicity from Administrative Records” (Revise and Resubmit at *American Political Science Review*)

“Taking Cues When You Don’t Care: Issue Importance and Partisan Cue Taking”
with Jeremy Pope (Revise and Resubmit)

“A Revolution of Rights in American Founding Documents”
with Scott Abramson and Jeremy Pope (Conditionally Accepted)

“410 Million Voting Records Show the Distribution of Turnout in America Today”
with John Holbein (Revise and Resubmit)

“Partisanship and Trolleyology”
with Ryan Davis (Under Review)

“Who’s the Partisan: Are Issues or Groups More Important to Partisanship?”
with Jeremy Pope (Revise and Resubmit)

“Race and Realignment in American Politics”
with Jeremy Pope (Revise and Resubmit)

“The Policy Preferences of Donors and Voters”

“Estimating Neighborhood Effects on Turnout from Geocoded Voter Registration Records.”
with Kosuke Imai

“Super PAC Contributions in Congressional Elections”

WORKS IN
PROGRESS

“Collaborative Study of Democracy and Politics”
with Brandice Canes-Wrone, Gregory Huber, and Joshua Clinton

“Preferences for Representational Styles in the American Public”
with Ryan Davis and Adam Dynes

“Representation and Issue Congruence in Congress”
with Taylor Petersen

“Education, Income, and the Vote for Trump”
with Edie Ellison

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

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 315: Congress and the Legislative Process

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

Poli 328: Quantitative Analysis

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

Poli 410: Undergraduate Research Seminar in American Politics

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

AWARDS AND
GRANTS

2019 BYU Mentored Environment Grant (MEG), American Ideology Project, \$30,000

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 Social Science College 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 Social Science College 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)

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)

ADDITIONAL
TRAINING

EITM 2012 at Princeton University - Participant and Graduate Student Coordinator

COMPUTER
SKILLS

Statistical Programs: R, Stata, SPSS, parallel computing

Updated December 22, 2021