How Does Partisan Gerrymandering Affect Voter Participation? Evidence from a Randomized Redistricting Lottery in North Carolina

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Abstract:

In September 2019, the North Carolina General Assembly redrew 57 state house districts in 28 counties by holding several lottery machine drawings that randomly picked from among various computer-simulated districting maps. These randomly chosen districting maps were then combined together and used as base maps for North Carolina's new state House of Representatives districting plan, enacted by the General Assembly on September 17, 2019. In this paper, I analyze these randomly chosen maps from the 2019 lottery to assess the causal effect of districts' partisan composition on voter participation. I find that electorally competitive districts cause an overall increase in voter turnout. However, voters exhibit even higher turnout increases when they are placed into a district that slightly favors their own preferred party. Republican voters are most likely to turn out when their district is electorally competitive but Republican-leaning. Likewise, Democratic voters exhibit the highest turnout rates when they are placed into Democratic-leaning districts that are still competitive. Together, these results illustrate how the partisan gerrymandering of legislative districts can significantly skew the partisan composition of the turnout electorate.

How does the partisan composition of a legislative district affect voter participation in elections? Is a voter more likely to turn out if her district is electorally close, or if her district strongly favors her political party? Since V.O. Key (1949) and Downs (1957), political scientists have long argued that voters are more likely to participate in close elections, in which their votes are more likely to be decisive. However, empirical studies that exploit redistricting changes have found mixed evidence for the hypothesis that voters exhibit higher turnout when they are placed in an electorally competitive district. More importantly, multiple scholars have warned that redistricting changes are not random, and studies that examine redistricting map changes to measure districting effects on voter behavior could produce biased estimates (e.g., Sekhon and Titiunik 2012; Henderson, Sekhon, and Titiunik 2016). Legislatures commonly sort voters into different districts based on the voters' partisanship and past turnout behavior, so redistricting changes are not exogenous to voters' partisanship and past turnout.

To avoid this exogeneity problem, I take advantage of a highly unusual redistricting process during which legislative districting maps were chosen in a random, partisan-blind manner. In September 2019, the North Carolina General Assembly redrew significant portions of the state's House of Representatives district maps using a randomized drawing. To redraw 57 districts in 28 counties, the House Redistricting Committee utilized a lottery machine to randomly pick from among different computer-simulated districting maps. These various lottery-chosen districting maps were then combined together and used as base maps for North Carolina's new state House of Representatives districting plan, enacted by the General Assembly on September 17, 2019. In this paper, I analyze these various redistricting maps from the 2019 lottery to measure the effect of a district's partisan composition on voter turnout.

I find that random assignment to an electorally competitive district causes an overall increase in voter turnout. However, voters exhibit even higher turnout increases when they are randomly placed into a district that slightly favors their own preferred party. Republican voters are most likely to turn out when their district is electorally competitive but Republican-leaning. Likewise, Democratic voters exhibit the highest turnout rates when they are placed into Democratic-leaning districts that are still competitive. Together, these results illustrate how the partisan gerrymandering of legislative districts can significantly skew the partisan composition of the turnout electorate.

District Competitiveness and Voter Participation

Political scientists have long observed that voter turnout is higher in close elections (e.g., Caldeira and Patterson 1982; Crain, Leavens, and Abbot 1987; Dawson and Zinser 1976). But the question of whether electorally competitive legislative districts cause voter turnout has produced mixed findings.

For example, by analyzing cross-sectional data on US congressional districts and voter turnout in the 1982 general election, Cox and Munger (1989) find that closer House elections tend to exhibit higher voter turnout. Similarly, Ainsworth et al. (2024) analyze longitudinal voter turnout data for voters who were assigned to districts of varying electoral competitiveness as a result of redistricting changes. The authors find that being in a competitive district increases voter turnout by 0.6 to 1 percentage point (387).

By contrast, other studies have found nearly zero turnout effect attributable to the competitiveness of voters' legislative districts. For example, Huckfeldt, Carmines, Mondak, and Zeemering (2007) analyze a survey of voters' behavior in the 2002 congressional elections and

find that voters in competitive House districts were not more likely to turn out to vote. The authors find "no discernible effects [on voter turnout] are produced by the perception or the reality of House district competitiveness" (808).

Moskowitz and Schneer (2019) examine US House maps redrawn during the 2012 redistricting cycle and compare the turnout behavior of voters moved into more competitive districts and voters moved into less competitive districts. The authors use matching to correct various covariate imbalances between voters assigned to different districts, and the authors' results suggest that moving voters into an electorally competitive district has a "near zero" effect on their turnout (191). To account for their null finding while other redistricting-based studies had found a positive turnout effect caused by competitive districts, Moskowitz and Schneer (2019) explain that "voters who live in the least competitive districts are fundamentally different from those in more competitive districts in ways that affect turnout" (193).

Other studies have also highlighted this methodological problem encountered when scholars use redistricting changes to study the effect of district characteristics on voter turnout. In particular, Sekhon and Titiunik (2012) demonstrate that congressional redistricting maps in Texas and California do not move voters from one district to another in a random, partisan-blind manner. Instead, voters that are moved to a new district during the redistricting process are politically different from voters that are not moved. Hence, the authors warn, "the evidence in Texas and California shows that redistricting, as it is, cannot be considered as-if random" (40).

In a separate study examining changes made to congressional district boundaries in California, Texas, and Florida during the 2000 redistricting cycle, Henderson, Sekhon, and Titiunik (2016) find that legislative map-drawers sorted voters into different districts on the basis of their previous history of turnout and registration. As the authors explain, "A major finding

uncovered by our empirical analysis is that policymakers are very effective at sorting voters into districts based on their demographic and political factors, most importantly previous Hispanic turnout and registration" (405). As a result, the authors caution against treating redistricting map changes as if they were exogenous to voter turnout behavior.

The random redistricting lottery that I analyze in this paper presents a highly unusual opportunity to avoid this exogeneity problem. Unlike a normal redistricting process in which districting lines are chosen by a human map-drawer with knowledge of voters' demographic and political characteristics, North Carolina's 2019 redistricting lottery began with a number of different computer-simulated maps for each of 14 groups of counties. Each computer-simulated map was drawn by a partisan-blind simulated districting algorithm. The General Assembly then used a lottery machine to randomly pick from among these various computer-simulated maps for each county grouping.

In this paper, I analyze the turnout behavior of North Carolina voters whose placement into either a competitive or an uncompetitive district was determined by one of the random lottery draws. This research design combines the external validity of analyzing real-life voter turnout under actual redistricting maps with the internal validity provided by a randomized redistricting lottery, allowing me to measure voter behavior in response to the characteristics of their legislative districts. These characteristics of a voters' legislative districts are normally impossible to experimentally manipulate and difficult to truly isolate in observational studies.

This paper proceeds as follows. In the following section, I explain how the computer-simulated redistricting maps used in North Carolina's redistricting lottery emerged during a partisan gerrymandering court case, *Common Cause v. Lewis* (2019). Next, I detail the structure and procedures used in the North Carolina General Assembly's 2019 redistricting lottery, and I

explain the legislature's justifications for this highly unusual redistricting process. I also explain how I measure the partisanship composition of legislative districts and identify which voters were subjected to the randomness of the redistricting lottery. I then analyze the voter turnout effects of randomly assigning voters to an electorally competitive district. Finally, I analyze how randomly assigning voters to Democratic-favoring or Republican-favoring districts with various partisan compositions affects their turnout behavior.

Common Cause v. Lewis (2019)

In November 2018, Common Cause filed a lawsuit in state court on behalf of 22 North Carolina voters challenging several of the state's legislative districts as unconstitutional gerrymanders. The Common Cause plaintiffs alleged that the state's partisan gerrymandered districts violated the North Carolina Constitution's Equal Protection Clause (Article I, Section 19) and its Free Elections Clause ("All elections shall be free", Article I, Section 10). The plaintiffs claimed that the North Carolina's Republican- General Assembly intentionally favored the Republican Party in the drawing of its legislative districting maps.

At the time of the lawsuit, North Carolina's legislative districts had been initially drawn in 2011 and later redrawn in 2017 by the General Assembly's redistricting consultant, Dr. Thomas Hofeller. During the 2017 redistricting process, the General Assembly's Joint Select Committee on Redistricting announced its "Adopted Criteria" to be used in the legislative district map-drawing process. Specifically, the General Assembly's Adopted Criteria required legislative districts to be geographically compact, to minimize county splits, to avoid precinct splits, and to follow municipal boundaries, among other non-partisan criteria (North Carolina General Assembly, 2017).

The trial for *Common Cause v. Lewis* took place in July 2019 at the Wake County Superior Court. During the court trial, Dr. Jowei Chen testified as an expert witness regarding the research he performed to evaluate whether partisan goals predominated in North Carolina's legislative districting process (Boughton, 2019a). Specifically, Chen testified that he developed a computer algorithm to randomly generate thousands of computer-simulated districting maps for North Carolina's legislative districts that strictly follow the non-partisan traditional districting criteria mandated by the General Assembly's Adopted Criteria, including equal population, geographic compactness, minimizing county splits, and preserving precincts and municipalities.[1] By comparing the General Assembly's 2017 enacted map to these thousands of non-partisan computer-simulated maps, Chen found that the General Assembly had "created more Republican seats and fewer Democratic seats than what is generally achievable through a map-drawing process that adheres solely to non-partisan, traditional districting criteria" (Chen 2019, 4). Moreover, Chen testified that "partisan considerations predominated over non-partisan districting criteria, particularly geographic compactness and minimizing municipality and precinct splits, in the drawing of the 2017 House Plan" (Chen 2019, 4).

Following the trial, on September 3, 2019, the Wake County Superior Court struck down several of North Carolina's legislative districts as unconstitutional partisan gerrymanders. In reaching its decision, the Superior Court relied upon the expert testimony comparing the 2017 enacted map to the thousands of randomly-drawn, non-partisan, computer-simulated maps. As the Court's ruling explained: "Dr. Chen concluded with over 99% statistical certainty that partisanship predominated in the drawing of the enacted House plan and subordinated the traditional districting criteria of compactness, avoiding splitting municipalities, and avoiding

[1] Online at:
https://www.wral.com/day-2-nc-panel-considers-challenge-to-voting-maps/18513095/
https://www.wral.com/day-2-trial-examining-nc-voting-maps/18513700/

splitting VTDs. The Court adopts these conclusions and finds the current House districts… subordinated these three traditional districting criteria in order to accomplish Legislative Defendants' predominant partisan goals" (*Common Cause v. Lewis* 2019 , 53).

Additionally, the Court's ruling stated that North Carolina's political geography did not cause the partisan bias of the 2017 enacted legislative districts. The Court noted that analyzing computer-simulated districting maps allows one to determine the partisanship of maps that should emerge under a non-gerrymandered map-drawing process, given North Carolina's unique political geography. As the Court's ruling explained:

> "The Court also gives weight to and adopts Dr. Chen's conclusions that the partisan bias of the 2017 House…Plan[s] cannot be explained by North Carolina's political geography, meaning the geographic locations of Republican and Democratic voters. Political geography can create a natural advantage for Republicans in winning seats where, for example, Democratic voters are clustered in urban areas. But Dr. Chen designed his simulations with the specific purpose of accounting for North Carolina's political geography and any other built-in advantages either party may have in redistricting. The simulations build districts using the same Census geographies and population data that existed when the enacted plans were drawn; thus, the simulated plans capture any natural advantage one party may have had based on population patterns when the General Assembly passed the enacted plans" (*Common Cause v. Lewis* 2019 , 64-65).

Third, the Court stated that in generating computer-simulated districting maps for North Carolina, Chen's algorithm was drawing districts in a manner consistent with the non-partisan criteria that the General Assembly had mandated in its 2017 Adopted Criteria. As the Court explained:

> "Dr. Chen's interpretation and application of the traditional districting principles is fully consistent with the guidance provided by Legislative Defendants at the time of the 2017 redistricting. At the first public hearing after the draft plans were unveiled, Representative Lewis explained the Adopted Criteria meant 'trying to keep towns, cities and precincts whole where possible.' Representative Lewis made similar statements at the committee hearing where the Adopted Criteria were proposed and debated; he asserted, for example, that the criterion regarding municipal splits 'says that the map drawer may and rightfully should consider municipality boundaries when they can'" (*Common Cause v. Lewis* 2019, 65-66).

Finally, the Court ordered that the unconstitutional legislative districts were to be redrawn by adhering to the non-partisan considerations in the General Assembly's 2017 Adopted Criteria, including equal population, geographic compactness, minimizing county splits, and avoiding precinct and municipality splits. The Court allowed the General Assembly two weeks, until September 18, 2019, to enact a new remedial map to redraw the legislative districts that had been struck down as unconstitutional. The Court's order explicitly forbade the General Assembly from considering partisan factors during its remedial mapping process or favoring any political party. The General Assembly was also instructed to conduct its remedial map-drawing process "in full public view," thus allowing the Court to observe the General Assembly's compliance with the prohibition against partisan considerations during the mapping process (*Common Cause v. Lewis* 2019, 347-350).

The North Carolina General Assembly's Redistricting Lottery:

On September 11, 2019, the General Assembly's House Committee on Redistricting announced its process for enacting a new remedial House districting map to comply with the Superior Court's September 3 ruling. The Redistricting Committee planned to redraw each of the unconstitutional legislative districts by using the computer-simulated districting maps that Chen's algorithm had randomly drawn and that Chen had testified about during the July 2019 trial. The Redistricting Committee also announced it would utilize a lottery machine to hold a series of lottery drawings to randomly choose among Chen's various computer-simulated redistricting maps. This section describes the redistricting lottery process in detail, as well as the General Assembly's justification for its unorthodox map-drawing process.

***North Carolina's House County Groupings*:** As a result of the North Carolina Supreme Court's rulings in *Stephenson v. Bartlett*, 355 N.C. 354, 562 S.E. 2d 377 (2002) and *Stephenson v. Bartlett*, 357 N.C. 301, 582 S.E.2d 247 (2003), North Carolina's legislative districting maps must follow the state's "Whole County Rule." For the purpose of drawing the state's House districts, the "Whole County Rule" divides North Carolina's 100 counties into 41 separate county groupings. Each county grouping, which includes from one to seven geographically contiguous counties, is allocated a certain number of House districts, proportional to the total population of the county grouping. For example, the county grouping of Columbus, Pender, and Robeson counties is allocated a total of three House districts because of its total population. Meanwhile, Mecklenburg County is the sole county in its grouping, and this county grouping is allocated 12 House districts because of Mecklenburg's large population. The significance of these county groupings in the House redistricting process is that each county grouping's House districts must remain fully within the geographic boundaries of the county grouping. For example, the 12 House districts allocated to the Mecklenburg County grouping must not cross county boundaries and cannot include portions of any neighboring county.

The Superior Court's September 3 ruling struck down a total of 57 House districts across 14 of the state's county groupings. These 14 county groupings, along with the number of House districts to be redrawn within each grouping, are listed in Table 1. Within 13 of these 14 county groupings, the Court ordered all House districts to be redrawn. The only exception was the county grouping containing Guilford County, which is allocated a total of six House districts. The Court ordered that three of these six Guilford County districts (HD-58, HD-59, and HD-60) were to be redrawn. The remaining three House districts in Guilford County (HD-57, HD-61, and HD-62) were to be frozen and not redrawn in the remedial districting process.

Table 1: County Groupings with House Districts Struck Down in the 2017 House Plan

County Grouping:	**Counties Included:**	**2017 House Plan Districts:**	**Number of House Districts Redrawn in Remedial House Map:**
1	(1) Alamance	HD-63; HD-64	2
2	(2) Anson; Union	HD-55; HD-68; HD-69	3
3	(2) Brunswick; New Hanover	HD-17; HD-18; HD-19; HD-20	4
4	(1) Buncombe	HD-114; HD-115; HD-116	3
5	(6) Cabarrus; Davie; Montgomery; Richmond; Rowan; Stanly	HD-66; HD-67; HD-76; HD-77; HD-82; HD-83	6
6	(2) Cleveland; Gaston	HD-108; HD-109; HD-110; HD-111	4
7	(3) Columbus; Pender; Robeson	HD-16; HD-46; HD-47	3
8	(1) Cumberland	HD-42; HD-43; HD-44; HD-45	4
9	(2) Duplin; Onslow	HD-4; HD-14; HD-15	3
10	(2) Forsyth; Yadkin	HD-71; HD-72; HD-73; HD-74; HD-75	5
11	(2) Franklin; Nash	HD-7; HD-25	2
12	(1) Guilford	HD-57; HD-58; HD-59; HD-60; HD-61; HD-62	3 (HD-57, HD-61, and HD-62 were not struck down and therefore not redrawn)
13	(2) Lenoir; Pitt	HD-8; HD-9; HD-12	3
14	(1) Mecklenburg	HD-88; HD-92; HD-98; HD-99; HD-100; HD-101; HD-102; HD-103; HD-104; HD-105; HD-106; HD-107	12
Total:	28 Counties	60 House Districts (57 districts were struck down)	57 Redrawn House Districts

Note: This Table lists the 14 county groupings containing House Districts that were struck down as unconstitutional partisan gerrymanders on September 3, 2019 by the Wake County Superior Court. In the county grouping containing Guilford County, the Court struck down only three of the six House Districts. In all other county groupings listed in this Table, the Court struck down all House Districts within each grouping.

Therefore, the General Assembly had to draw new, remedial House districting maps within each of the 14 different county groupings. As every single House district must remain fully within the county grouping to which it belongs, each county grouping's House districting map has no geographic overlap with other county groupings. Therefore, the Redistricting Committee was able to draw each of the 14 county groupings' district boundaries separately, without impacting any other county grouping's districts.

The House Redistricting Lottery: On September 11, Representative David Lewis, Chair of the House Redistricting Committee, presented a plan to hold a series of random lottery drawings to select one of Chen's computer-simulated House districting maps for each of the 14 county groupings. For each county grouping, Lewis directed the Redistricting Committee's staff to consider all of the computer-simulated House maps that Chen's algorithm had produced in *Common Cause v. Lewis* (2019). All computer-simulated districting maps for the county grouping would be ranked based on a composite score measuring each map's geographic compactness and preservation of municipal and precinct boundaries. The Redistricting Committee staff would then identify the five best-performing computer-simulated maps for each county grouping, as measured by these composite scores. For each county grouping, a lottery machine would then be used to randomly choose among these five highest-scoring maps.

Representative Lewis described his plan for randomly selecting among the computer-simulated maps produced by Chen's algorithm, and he introduced a motion to the Redistricting Committee to adopt his plan. Representative Lewis' full motion was as follows:

> "I move that the following directions be issued to our central staff. Central staff is directed to identify the top five unique maps from each County grouping, using Dr. Chen's composite scores from his Map Set 1, which have been provided to the Committee and, also, placed upon the Committee's website….If there are fewer than five unique maps in a County group, the central staff will inform the Committee of this and simply use all of the unique maps that they can. In other words, there may only be three.

> If so, they use three. If there's four, they use four. If there's five, they use five…Central staff is then directed to reach out to the Lottery Commission to obtain the method of random selection, ideally a machine. The committee will meet after the maps are identified and a random selection will be held, which will then be used to create the base map" (House Committee on Redistricting, 2019).

Hence, the Redistricting Committee held a total of 14 random lottery drawings in the House remedial districting process, with one lottery drawing for each county grouping. Each of these lottery drawings was conducted by Van Denton, the Director of Communications for the North Carolina Education Lottery. The lottery drawings were live streamed over the internet to comply with the Court's requirement that the General Assembly conduct its remedial map-drawing process in "full public view."

Justification for the Redistricting Lottery: Legislative leaders in the General Assembly offered three reasons for their decision to employ lottery drawings to randomly choose among computer-simulated districting maps generated by Chen's algorithm. These three reasons centered around the Superior Court's strict requirements for the remedial map-drawing process, as detailed in the Court's September 3 ruling.

First, legislators noted that the Court prohibited any partisan considerations from influencing the General Assembly's map-drawing process. Using computer-simulated maps produced by Chen's algorithm would satisfy this requirement, legislators argued, because Chen had testified, and the Court agreed, that his simulation algorithm produced redistricting maps through a partisan-blind process. A second reason was that the Court had identified certain non-partisan districting criteria – including geographic compactness and avoiding municipal and precinct splits – that any remedial map must follow. As the Court had already determined that Chen's computer-simulated maps strictly adhered to these non-partisan districting criteria, legislative leaders argued that using these computer-simulated maps was a safe way to comply

with the Court's requirements. As Senator Paul Newton, Co-chairman of the Redistricting and Elections Committee, explained: "Most importantly, Dr. Chen's modeling runs comply with the Court's order. Dr. Chen did not take into account partisan advantage. If we choose from any of Dr. Chen's modeling runs, we know our base map will be a compliant map — a fair map in the eyes of the court — because Chen's algorithm 'harmonizes' all of the Court's criteria and does not seek majority party advantage" (Boughton, 2019b).

Finally, legislators explained that using randomized lottery drawings to choose from among the computer-simulated maps would insulate the General Assembly from potential accusations that it cherry-picked a computer-simulated map that was favorable to the Republican Party. During the September 11 House Redistricting Committee meeting, Representative Lewis expressed concern that if the Committee used a non-random means of selecting a computer-simulated districting map, legislators could be accused of having made the selection on the basis of partisan considerations, thus violating the Court's mandate to carry out a non-partisan map-drawing process. Thus, in response to a question from Representative Zack Forde-Hawkins regarding the necessity of utilizing a lottery machine in the map-drawing process, Representative Lewis explained:

> "So, as crazy as it sounds to use the Lottery, again, the whole purpose of that is to take the best of the best Chen maps, and, then, randomly pick one of those. So, we've taken the best of the best and the Plaintiff's expert, and then, we've randomly chosen one of those. And there's lots of ways that we can figure out maybe how to randomly choose. I just don't know of any way with the time that we have to be able to do -- to do that, you know, other than maybe drawing from a hat or to do something like that." (House Committee on Redistricting, 2019).

Voters and the Redistricting Lottery

The North Carolina General Assembly's 2019 redistricting lottery drawings randomly selected from among five different maps within each of the 14 county groupings. In doing so, the

lottery introduced a degree of randomness to the partisanship of the district to which each voter was assigned. For some, though not all, voters, the randomness of a redistricting lottery draw determined whether the voter would be placed into a Democratic-favoring district, a Republican-favoring district, or an electorally competitive district.

For example, consider the town of Forest Oaks, a relatively Republican suburb about 10 miles southeast of downtown Greensboro in Guilford County. One of the five maps in the redistricting lottery for Guilford County would have placed Forest Oaks in a House district with heavily Black portions of Southern Greensboro, thus resulting in a safe Democratic district. However, a different redistricting lottery map would have instead combined Forest Oaks with other Republican suburbs in Eastern and Northern Guilford County, resulting in an electorally competitive, Republican-leaning district. Therefore, for residents of Forest Oaks, the partisan leaning of their House district depended on the randomness of a lottery draw.

By contrast, other voters in North Carolina were not subjected to as much potential variation in lottery draw outcomes. For example, consider the town of Davidson, a suburb of Charlotte located at the northern tip of Mecklenburg County. The entire northern portion of Mecklenburg County consists of mostly Republican suburbs. Every one of the five lottery maps for Mecklenburg County would have placed Davidson in the same House district as these other suburbs in Northern Mecklenburg, thus resulting in a moderately safe Republican district in each of the five possible lottery maps. Therefore, voters in Davidson experienced very little partisan randomness in the redistricting lottery. Under any randomly chosen lottery map, Davidson was guaranteed to have been drawn into a Republican House district. The political geography of Northern Mecklenburg County largely dictated the partisan composition of any House district to which Davidson could have been assigned.

As the above two examples – Davidson and Forest Oaks – illustrate, the redistricting lottery draws do not subject all voters to the same random variation in terms of the partisanship of the House districts in which they are placed. Voters in Forest Oaks are subject to a high degree of variance in possible lottery outcomes, while voters in Davidson are subject to low variance. Therefore, in terms of measuring the turnout effects of random assignment to districts with different partisan compositions, analyzing voters in Forest Oaks is potentially useful. But analyzing voters in Davidson will not be useful because there was no significant partisan variation in the possible districts to which Davidson voters were randomly assigned in the various redistricting lottery maps. Hence, throughout this paper, I focus only on analyzing voters who were subjected to some degree of variation in the partisanship of their district across the five redistricting lottery maps for their respective county groupings.

In the remainder of this section, I next explain how and why I measure the partisanship of each district in the redistricting lottery maps using recent past election results. Finally, I explain how I define competitive districts for the purpose of the empirical analysis presented later.

Measuring the Partisanship of Districts: In this paper, I measure the partisanship of each House district in the redistricting lottery maps using the results of recent statewide elections, including North Carolina's Presidential, Gubernatorial, Attorney General, and US Senate elections. I use this same election-based formula for three reasons: First, this same formula was used by Dr. Thomas Hofeller, the redistricting consultant that the North Carolina General Assembly hired to draw the 2017 House Plan. Therefore, this measure reflects the perception of district partisanship held by the General Assembly's own map-drawer. Second, Dr. Hofeller's election-based formula is a reasonable measure of district partisanship and is fundamentally similar to and consistent with measures of partisanship employed by other legislative districting

map-drawers employed by other state legislatures. Finally, using the results of previous statewide elections to measure the partisanship of legislative districts is consistent with prior research by scholars of legislative districting. Recent statewide elections provide the most reliable bases for comparisons of different precincts' partisan tendencies because in any statewide election, the anomalous candidate-specific effects that shape the election outcome are equally present in all precincts across the state. Statewide elections are thus a better basis for comparison than the results of legislative elections because the particular outcome of any legislative election may deviate from the long-term partisan voting trends of that precinct, due to factors idiosyncratic to the legislative district as currently constructed. Such factors can include the presence or absence of a quality challenger, anomalous difference between the candidates in campaign efforts or campaign finances, incumbency advantage, candidate scandals, and coattail effects (e.g., Abramowitz et al. 2006).

During the *Common Cause v. Lewis* litigation, the plaintiffs subpoenaed several hard drives from Dr. Hofeller's work computer. These subpoenaed hard drives contained maps of various draft House districting plans that Dr. Hofeller had drawn and considered before producing the final 2017 House Plan. The hard drives also considered various Microsoft Excel files documenting how Dr. Hofeller had evaluated the partisan characteristics of these various drafts of the House districting plan (Williams, 2019).

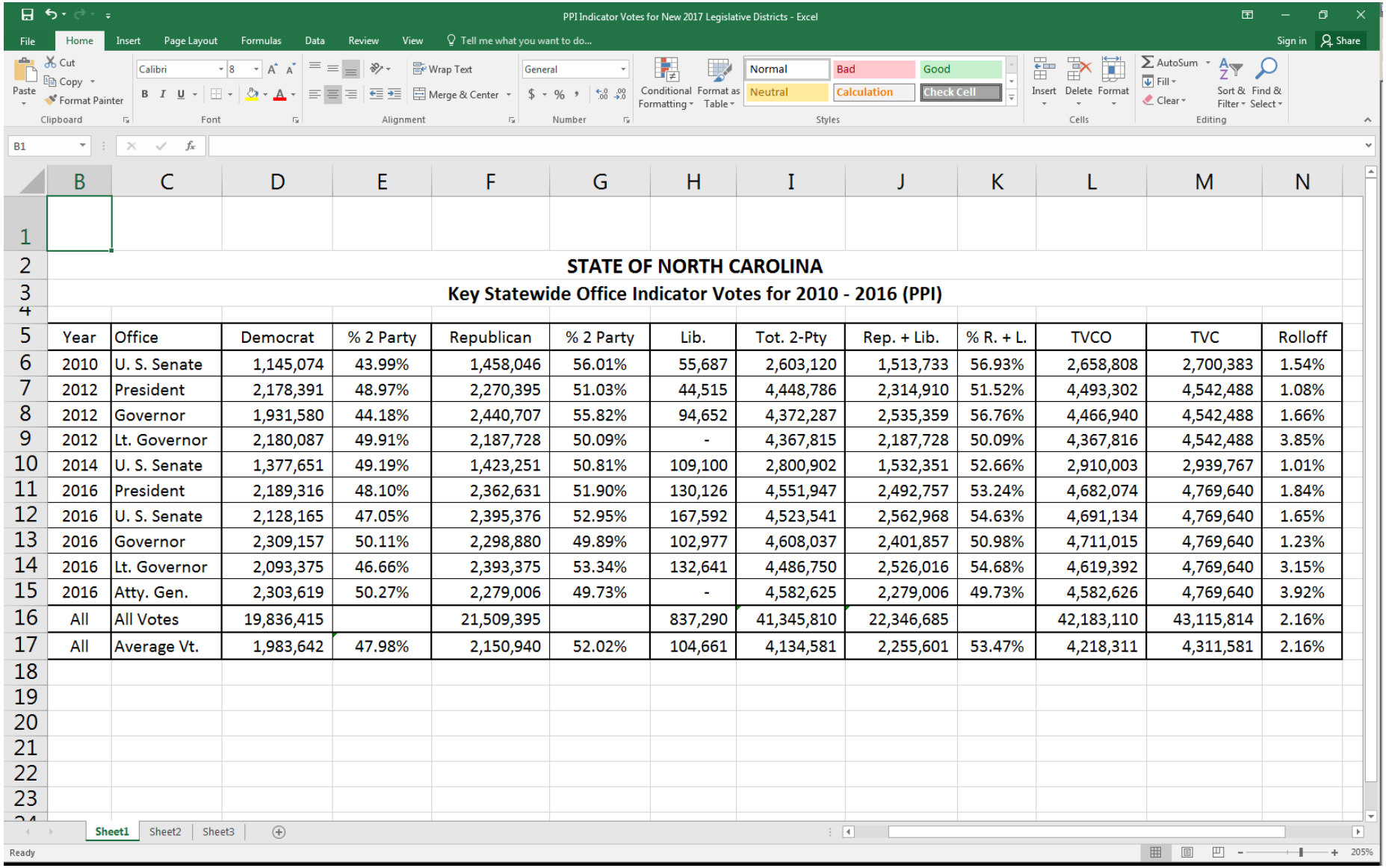
For virtually every draft House plan that he drew and considered, Dr. Hofeller measured and tracked the partisan composition of each House district. One Microsoft Excel sheet from his hard drive revealed Dr. Hofeller's precise formula for measuring the partisanship of each district, and he referred to this partisan measure as "PPI." Dr. Hofeller's PPI measure was described in detail in his Excel spreadsheet named "PPI Indicator Votes for New 2017 Legislative

Districts.xlsx," which he saved on his hard drive on June 24, 2017. Figure 1 displays a screenshot of this spreadsheet from Dr. Hofeller's hard drive. This partisan measure aggregates together the results of ten statewide elections in North Carolina during 2010-2016. As detailed in Dr. Hofeller's Excel spreadsheet, votes from these ten elections are weighted equally, and Dr. Hofeller's formula calculates the Republican share of the total two-party votes summed across the ten elections. These ten statewide elections contests are: The 2010 US Senate election, the 2012 US President, Governor, and Lieutenant Governor elections, the 2014 US Senate election, and the 2016 US President, US Senate, Governor, Lieutenant Governor, and Attorney General elections.

Throughout this paper, I use this same set of ten statewide election results to measure the partisanship of each House district in the redistricting lottery maps. Table 2 illustrates an example of how the results of these elections used to measure the partisanship of individual districts throughout this paper. This Table reports the number of votes for the Democratic and Republican candidates in each of the ten statewide elections for HD-1 and HD-5 in the 2017 House Plan. Tallying the results of the ten statewide elections in HD-1, Democrats received a total of 164,682 votes, while Republicans received 165,368 total votes. Thus, Republicans' share of the two-party vote in HD-1 across these ten elections was 50.10%, so it is a competitive, slightly Republican-leaning district. On the other hand, voters in HD-5 cast a total of 174,448 Democratic votes and 122,275 Republican votes across the ten elections, giving Republicans a two-party vote share of 41.21%. Hence, HD-5 is clearly a safe Democratic district.

Electorally Competitive Districts in the North Carolina House Plan: Using the election-based formula described above, I measure the partisanship of each 2017 House Plan district that was struck down in *Common Cause v. Lewis*, as well as each 2019 House Plan district that

Figure 1:
File from Dr. Thomas Hofeller's Hard Drive: "PPI Indicator Votes for New 2017 Legislative Districts.xlsx" (June 24, 2017).



STATE OF NORTH CAROLINA

Key Statewide Office Indicator Votes for 2010 - 2016 (PPI)

Year	Office	Democrat	% 2 Party	Republican	% 2 Party	Lib.	Tot. 2-Pty	Rep. + Lib.	% R. + L.	TVCO	TVC	Rolloff
2010	U. S. Senate	1,145,074	43.99%	1,458,046	56.01%	55,687	2,603,120	1,513,733	56.93%	2,658,808	2,700,383	1.54%
2012	President	2,178,391	48.97%	2,270,395	51.03%	44,515	4,448,786	2,314,910	51.52%	4,493,302	4,542,488	1.08%
2012	Governor	1,931,580	44.18%	2,440,707	55.82%	94,652	4,372,287	2,535,359	56.76%	4,466,940	4,542,488	1.66%
2012	Lt. Governor	2,180,087	49.91%	2,187,728	50.09%	-	4,367,815	2,187,728	50.09%	4,367,816	4,542,488	3.85%
2014	U. S. Senate	1,377,651	49.19%	1,423,251	50.81%	109,100	2,800,902	1,532,351	52.66%	2,910,003	2,939,767	1.01%
2016	President	2,189,316	48.10%	2,362,631	51.90%	130,126	4,551,947	2,492,757	53.24%	4,682,074	4,769,640	1.84%
2016	U. S. Senate	2,128,165	47.05%	2,395,376	52.95%	167,592	4,523,541	2,562,968	54.63%	4,691,134	4,769,640	1.65%
2016	Governor	2,309,157	50.11%	2,298,880	49.89%	102,977	4,608,037	2,401,857	50.98%	4,711,015	4,769,640	1.23%
2016	Lt. Governor	2,093,375	46.66%	2,393,375	53.34%	132,641	4,486,750	2,526,016	54.68%	4,619,392	4,769,640	3.15%
2016	Atty. Gen.	2,303,619	50.27%	2,279,006	49.73%	-	4,582,625	2,279,006	49.73%	4,582,626	4,769,640	3.92%
All	All Votes	19,836,415		21,509,395		837,290	41,345,810	22,346,685		42,183,110	43,115,814	2.16%
All	Average Vt.	1,983,642	47.98%	2,150,940	52.02%	104,661	4,134,581	2,255,601	53.47%	4,218,311	4,311,581	2.16%

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Table 2:
The Calculation of District-Level Partisanship Using 2010-2016 Statewide Election Results:

	House District 1 (2017 House Plan):		House District 5 (2017 House Plan):	
Election Contest:	**Democratic Votes**	**Republican Votes**	**Democratic Votes**	**Republican Votes**
2010 US Senate	11,572	12,798	10,791	8,307
2012 US President	19,188	17,761	20,871	13,179
2012 Governor	19,104	16,908	20,700	12,290
2012 Lieutenant Governor	20,570	15,314	21,685	11,591
2014 US Senate	12,208	11,858	11,521	7,987
2016 US President	16,455	18,589	17,840	14,071
2016 US Senate	16,040	18,358	17,542	13,942
2016 Governor	16,170	18,855	17,723	14,115
2016 Lieutenant Governor	16,328	17,778	17,580	13,598
2016 Attorney General	17,047	17,149	18,195	13,195
Total Votes:	**164,682**	**165,368**	**174,448**	**122,275**
Republican Vote Share, measured using 2010-2016 Statewide Election Results:	**50.10%**		**41.21%**	

replaced these unconstitutional districts. Figure 2 displays the partisanship of each of these districts. Figure 2 contains 57 red circles, denoting the 57 districts from the 2017 House Plan that were struck down by the Court's ruling. Similarly, the 57 blue stars denote the 57 new districts in the 2019 House Plan that replaced the districts struck down by the Court. For each of these two House plans, the 57 districts are vertically aligned from most Republican to most Democratic. The horizontal axis measures the Republican vote share of each district in each plan. The gray, dashed vertical line in Figure 2 denotes a 50% Republican vote share, where a district would have equal numbers of Republican and Democratic votes across the 2010-2016 statewide elections.

By comparing the 57 districts in the 2017 House Plan (red circles) with the 57 new, remedial districts in the 2019 House Plan (blue stars), Figure 2 illustrates how the 2019 House Plan created significantly more electorally competitive districts with Republican vote shares closer to 50%. From the 17th row to the 35th row in Figure 2, the 2017 House Plan districts (red circles) and the 2019 House Plan districts are all Republican-favoring, but within each row, the 2019 House Plan district is closer to 50% Republican vote share when compared to its corresponding district in the 2017 House Plan. And similarly, from the 40th row to the 56th row in Figure 2, the 2017 House Plan districts (red circles) and the 2019 House Plan districts are all Democratic-favoring, but within each row, the 2019 House Plan district is closer to 50% Republican vote share when compared to its corresponding district in the 2017 House Plan. In general, the 2019 House Plan districts are less extreme in partisanship when compared to the districts they replaced in the 2017 House Plan.

In this paper, I primarily analyze the effect on voter turnout of being assigned to an electorally competitive House district with a 45% to 55% Republican vote share. Table 3 reports

Figure 2:
Comparison of Partisanship of Districts in the 2017 House Plan and the 2019 House Plan

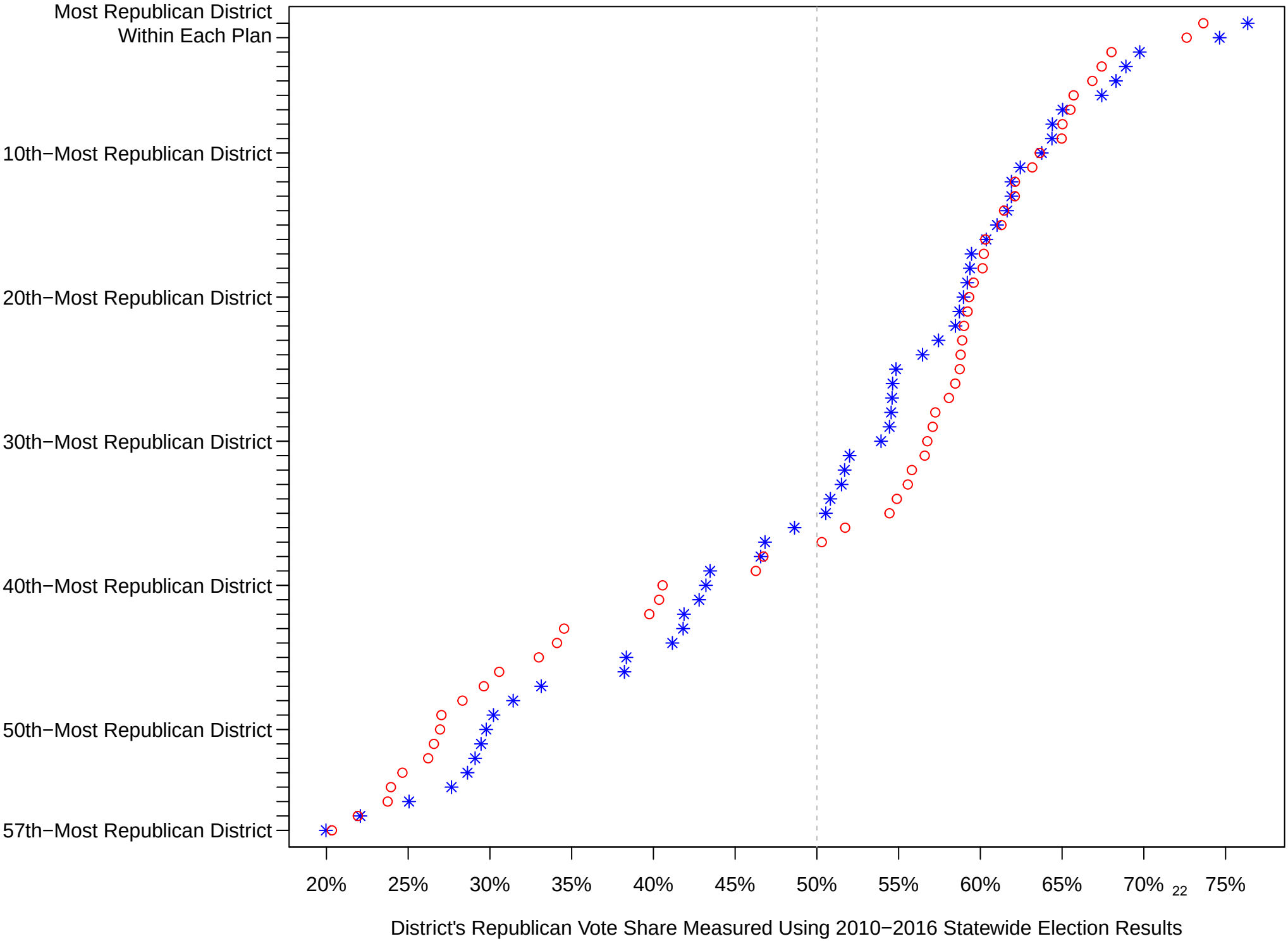


Table 3: Partisanship of Districts in the 2017 House Plan and the 2019 House Plan

	2017 House Plan:	**2019 House Plan:**
Safe Democratic Districts (Under 45% Republican Vote Share):	18 Districts (31.6%)	19 Districts (33.3%)
Competitive Districts (45% to 55% Republican Vote Share):	6 Districts (10.5%)	14 Districts (24.6%)
Safe Republican Districts (Over 55% Republican Vote Share):	33 Districts (57.9%)	24 Districts (42.1%)

Note: This Table includes only the 57 House districts that the Superior Court struck down in *Common Cause v. Lewis* as partisan gerrymanders in the 2017 House Plan and ordered to be redrawn in the 2019 House Plan. These 57 House districts from the 2017 Plan are also listed in Table 1.

the number of competitive districts within this partisan range in each of the two House plans, considering only the 57 districts that were struck down and redrawn in *Common Cause v. Lewis*. As reported in this Table, the number of electorally competitive districts dramatically increased from 6 districts in the 2017 House Plan to 14 in the 2019 House Plan. These new competitive districts replaced safe Republican districts with over 55% Republican vote share, which decreased from 33 in the 2017 House Plan down to 24 in the 2019 House Plan.

Later in this paper, I additionally analyze the turnout effect of being assigned to House districts within alternative ranges of partisanship as well. Specifically, in Figure 5, I consider every possible 10% range from as low as 30-40% Republican vote share to as high as 60-70% Republican vote share.

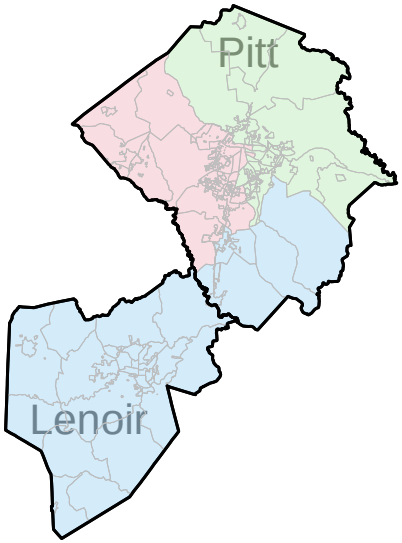
The Effect of Electorally Competitive Districts on Voter Turnout

To measure the turnout effect of randomly assigning a voter to an electorally competitive district, I focus only on voters who have both a non-zero probability of assignment to a competitive district as well as a non-zero probability of assignment to a non-competitive district in the redistricting lottery. As noted in the previous section, not all voters affected by the redistricting lottery draws satisfy this condition. Due to the political geography of where they reside, some voters are always placed into a safe Democratic district, and other voters are always placed into a safe Republican district in the redistricting lottery maps.

As an illustrative example, Figure 3 displays the five computer-simulated maps used in the redistricting lottery draw for the Lenoir-Pitt county grouping. As detailed in Table 1, the Court's ruling in *Common Cause v. Lewis* ordered all three of the House districts in Lenoir and Pitt Counties (HD-8, HD-9, and HD-12) to be redrawn. Figure 3 displays the five computer-

Figure 3: Lenoir−Pitt County Grouping Lottery Maps

Lottery Map 1:
Lenoir and Pitt Counties

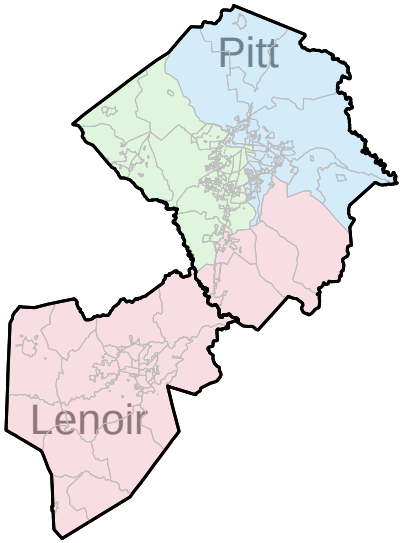


Computer−Simulated District 1 (40.8% Republican Vote Share)

Computer−Simulated District 2 (50.8% Republican Vote Share)

Computer−Simulated District 3 (53.5% Republican Vote Share)

Lottery Map 2:
Lenoir and Pitt Counties

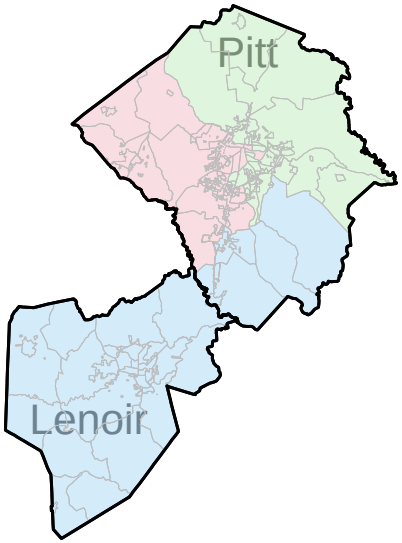


Computer−Simulated District 1 (53.5% Republican Vote Share)

Computer−Simulated District 2 (43.5% Republican Vote Share)

Computer−Simulated District 3 (47.9% Republican Vote Share)

Lottery Map 3:
Lenoir and Pitt Counties

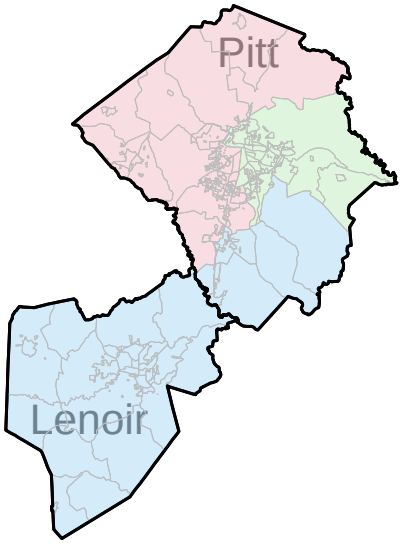


Computer−Simulated District 1 (40.9% Republican Vote Share)

Computer−Simulated District 2 (50.5% Republican Vote Share)

Computer−Simulated District 3 (53.5% Republican Vote Share)

Lottery Map 4:
Lenoir and Pitt Counties

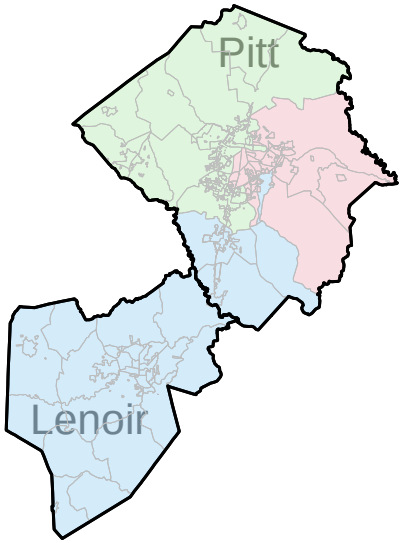


Computer−Simulated District 1 (42% Republican Vote Share)

Computer−Simulated District 2 (49.4% Republican Vote Share)

Computer−Simulated District 3 (53.5% Republican Vote Share)

Lottery Map 5:
Lenoir and Pitt Counties



Computer−Simulated District 1 (51.5% Republican Vote Share)

Computer−Simulated District 2 (41.2% Republican Vote Share)

Computer−Simulated District 3 (52% Republican Vote Share)

simulated maps from which the redistricting lottery randomly chose for the Lenoir-Pitt county grouping. In Figure 3, the Republican vote share of each district is reported at the bottom of each of the five redistricting lottery maps. The five redistricting lottery maps illustrate that only certain portions of Pitt County have both a non-zero probability of assignment to a competitive district and a non-zero probability of assignment to a non-competitive district.

For example, consider the town of Bethel, which is located at the northern tip of Pitt County. In three of the five redistricting lottery maps in Figure 3 (Lottery Maps 1, 2, and 3), Bethel is combined with the eastern portion of Pitt County, thus resulting in an electorally competitive House district with a Republican vote share of 47.9% to 50.8%. However, in the remaining two redistricting lottery maps (Lottery Maps 4 and 5), Bethel is instead combined with the western portion of Pitt County, thus resulting in a safe Democrat House district with a Republican vote share of 41.2% to 42%. Therefore, in the House redistricting lottery, voters in the town of Bethel have a 3/5 probability of being assigned to a competitive district and a 2/5 probability of being assigned to a safe Democratic district.

By contrast, the entirety of Lenoir County is assigned to an electorally competitive district in each of the five redistricting lottery maps, as displayed in Figure 3. In all five lottery maps, Lenoir County is always combined with a southern portion of Pitt County to form an electorally competitive district with a Republican vote share of 52% to 53.5%. Therefore, in the House redistricting lottery, voters in the Lenoir County have a 5/5 probability of being assigned to a competitive district. Because they have no possibility of random assignment to a non-competitive district in the redistricting lottery, the turnout behavior of voters in Lenoir County is not useful in measuring the turnout effects of competitive districts.

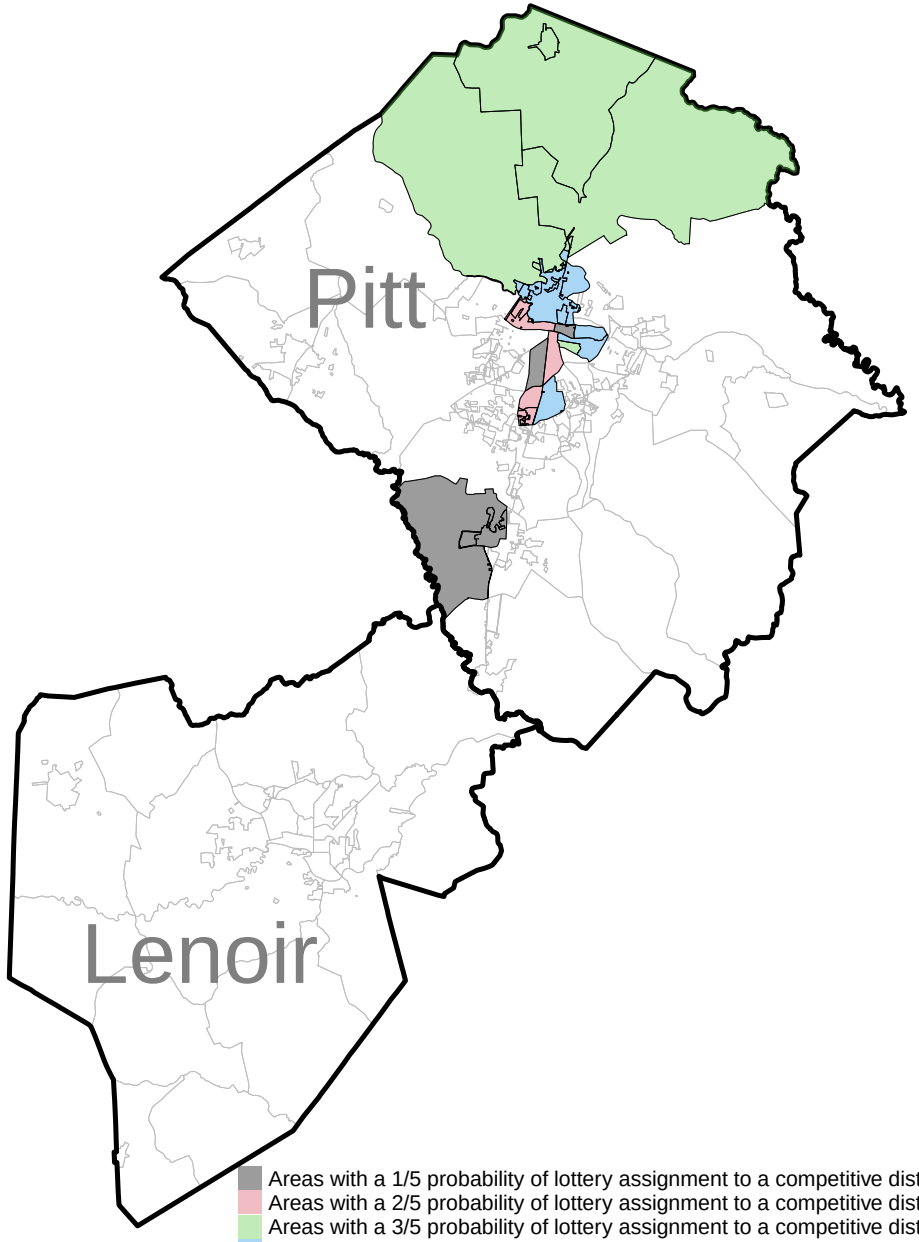
In Figure 4, the left map identifies the specific areas in Pitt County that have both a non-zero probability of assignment to a competitive district and a non-zero probability of assignment to a non-competitive district. In the left map, areas are shaded in color according to the specific probability that the area is assigned to a competitive district in the Lenoir-Pitt redistricting lottery drawing. For example, areas with exactly a 1/5 probability of assignment to a competitive district are shaded in gray, while areas with a 4/5 probability are shaded blue. All of Lenoir County and most areas of Pitt County are either guaranteed to be assigned to a non-competitive district or guaranteed to be assigned to a competitive district in the lottery-chosen redistricting map. These areas are therefore not shaded. Only a relatively small number of areas in Pitt County have a chance of assignment to a competitive district as well as a chance of assignment to a non-competitive district. I focus exclusively on these areas when measuring the turnout effects of assigning voters to a competitive district.

The right map in Figure 4 identifies the areas in the Lenoir-Pitt county grouping that were ultimately assigned to a competitive district in the 2019 House Plan, as a result of the redistricting lottery drawing. In the redistricting lottery, Map 5 (the fifth map shown in Figure 3) was randomly chosen in the lottery drawing. This lottery-chosen map placed all of Lenoir County and the southern and eastern portions of Pitt County into two electorally competitive districts. Meanwhile, the northern and western portions of Pitt County were placed into one safe Democratic district.

November 2020 Voter Turnout: I analyze the voter turnout effects of random assignment to a competitive district by comparing the November 2020 voter turnout of registered voters assigned to a competitive district to the turnout of registered voters assigned to a non-competitive district. I first begin with a January 2021 North Carolina voter history file, obtained from L2, a

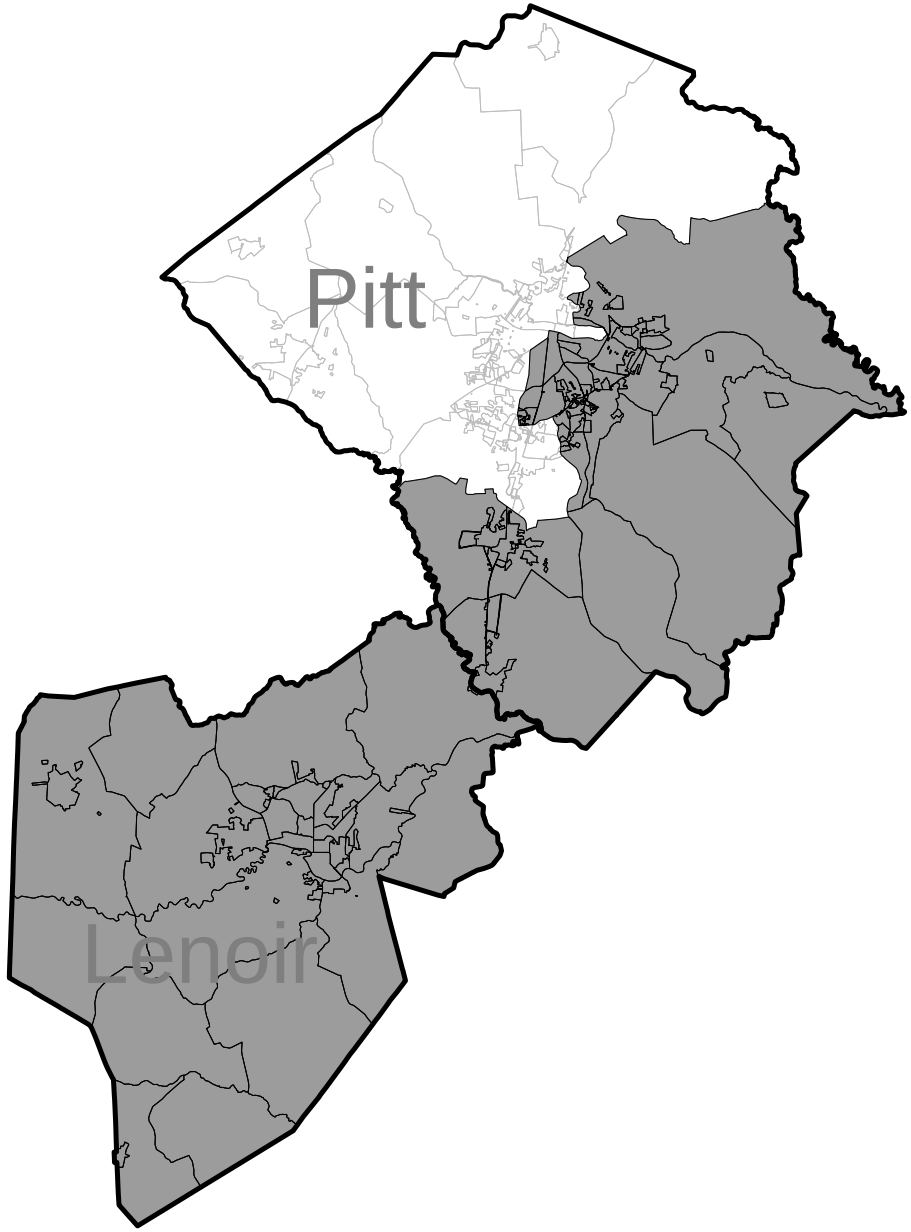
Figure 4: Lenoir−Pitt County Grouping

Probability of Lottery Assignment to an Electorally Competitive District:



Areas with a 1/5 probability of lottery assignment to a competitive district
Areas with a 2/5 probability of lottery assignment to a competitive district
Areas with a 3/5 probability of lottery assignment to a competitive district
Areas with a 4/5 probability of lottery assignment to a competitive district

Areas Assigned to an Electorally Competitive District In the 2019 House Plan (Lottery Map #5):



Areas assigned to a competitive district in the 2019 House Plan (Lottery Map #5)

private vendor of state voter data files. I use the January 2021 file because this is the earliest monthly voter history file that reflects each registered voter's turnout behavior in the November 2020 election. For all of my analyses, I exclude all registrants who have "inactive" voter status, as well as any registrant whose residential address could not be accurately geocoded by L2.[2]

Overall, North Carolina had 2,907,282 active registered voters residing in the districts struck down as partisan gerrymanders in *Common Cause v. Rucho*. These voters' House districts were therefore affected by the new 2019 House Plan. Among these voters, however, only 612,247 registered voters resided in areas that had both a non-zero chance of assignment to a competitive district as well as a non-zero chance of assignment to a non-competitive district. Hence, I focus exclusively on these voters whose placement into a competitive district hinged on the random lottery. Overall, among these 612,247 active registered voters, 85.6% turned out to vote in November 2020, which was the first general election with state legislative contests held using the new 2019 House Plan districts. This overall turnout rate was quite high for two reasons: The November 2020 election generally featured historically high turnout rates across the entire country, and the exclusion of "inactive" registrants from my analysis also significantly increases the overall turnout rate. Below, I analyze this November 2020 turnout rate separately among voters who were assigned to a competitive district and those who were not.

Differences in Turnout in Competitive and Non-Competitive Districts: Table 4 presents the main results comparing the November 2020 turnout rate for voters assigned to a competitive district and those assigned to a non-competitive district. Overall, among the 612,247 registered

[2] The North Carolina State Board of Elections marks a registered voter as "inactive" after all three of the following have occurred: 1) The voter has not voted during the previous two federal election cycles; 2) The voter has had no other contact with the county board of elections; and 3) The voter fails to respond within 30 days to an address confirmation mailing. Many voters marked as "inactive" have simply moved away. As my analyses critically relies on accurate geolocation of each voter's residence within each of the lottery redistricting maps, I exclude all voters marked as "inactive."

Table 4:
Effect of Random Assignment to a Competitive District on Voter Turnout

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Registered voters with a 1 in 5 probability of assignment to a competitive district	246,165	87.8% (33,371 of 38,023)	84% (174,755 of 208,142)	+3.8%
Registered voters with a 2 in 5 probability of assignment to a competitive district	64,756	84.8% (26,929 of 31,745)	84% (27,724 of 33,011)	+0.8%
Registered voters with a 3 in 5 probability of assignment to a competitive district	161,438	87.6% (90,731 of 103,620)	85.7% (49,537 of 57,818)	+1.9%
Registered voters with a 4 in 5 probability of assignment to a competitive district	139,888	87.2% (61,464 of 70,514)	85.6% (59,417 of 69,374)	+1.5%
Total:	612,247	87.1% (212,495 of 243,902)	84.5% (311,433 of 368,345)	+2.6%

voters, the effect of random assignment to a competitive district was +2.6%. Voters assigned to a competitive district turned out at an 87.1% rate, while 84.5% turned out among those assigned to a non-competitive district.

Furthermore, Table 4 directly compares only voters who had the identical probability of being assigned to a competitive district. For example, the top row of Table 4 compares the difference in turnout among voters who had exactly a 1 in 5 probability of assignment to a competitive district. For these voters, only one of their five redistricting lottery maps placed the voter into a competitive district. Among these voters, those assigned to a competitive district had a +3.8% higher turnout rate, compared to those assigned to a non-competitive district.

For each possible probability of assignment to a competitive district (i.e., 1/5, 2/5, 3/5, and 4/5), the subset who were randomly assigned to a competitive district always had a higher turnout rate than the subset randomly assigned to a non-competitive district. The observed effect of random assignment to a competitive district ranged from +0.8% to +3.8%.

Robustness of Turnout Effect Across Subgroups: I additionally examine the robustness of this main finding by analyzing the turnout effect of random assignment to a competitive district across various subgroups of the 612,247 registered voters. Specifically, I analyze the turnout effect within individual counties, by party affiliation, by age, by gender, and by racial and ethnic identification.

Table 5 presents individual county-level calculations of the voter turnout effect among sub-groups of voters who had the identical probability of assignment to a competitive district in the redistricting lottery. For example, the first row of Table 5 analyzes voters in Alamance County who had exactly a 1 in 5 probability of assignment to a competitive district – that is, only one of the five redistricting lottery maps for Alamance County placed the voter into a

Table 5:
Effect of Random Assignment to a Competitive District on Voter Turnout by County

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Alamance County:				
Registered voters with a 1 in 5 probability of assignment to a competitive district	4,639	86.4% (1,575 of 1,822)	86.2% (2,428 of 2,817)	+0.3%
Registered voters with a 3 in 5 probability of assignment to a competitive district	6,866	89.6% (2,887 of 3,222)	76.6% (2,792 of 3,644)	+13%
Cumberland County:				
Registered voters with a 2 in 5 probability of assignment to a competitive district	4,621	76.3% (1,300 of 1,704)	77.1% (2,250 of 2,917)	-0.8%
Guilford County:				
Registered voters with a 3 in 5 probability of assignment to a competitive district	23,090	87.8% (18,729 of 21,333)	83.3% (1,464 of 1,757)	+4.5%
Mecklenburg County:				
Registered voters with a 1 in 5 probability of assignment to a competitive district	117,476	89.4% (28,053 of 31,387)	85.3% (73,403 of 86,089)	+4.1%
Registered voters with a 2 in 5 probability of assignment to a competitive district	35,503	89.7% (15,607 of 17,393)	88.1% (15,955 of 18,110)	+1.6%
Nash County:				
Registered voters with a 4 in 5 probability of assignment to a competitive district	10,924	83.3% (1,366 of 1,639)	86.1% (7,993 of 9,285)	-2.7%
Pitt County:				
Registered voters with a 1 in 5 probability of assignment to a competitive district	6,493	77.8% (3,743 of 4,814)	64.6% (1,085 of 1,679)	+13.1%
Registered voters with a 2 in 5 probability of assignment to a competitive district	6,568	77.1% (3,201 of 4,153)	70.6% (1,706 of 2,415)	+6.4%
Registered voters with a 4 in 5 probability of assignment to a competitive district	8,593	81.2% (4,860 of 5,982)	71.5% (1,866 of 2,611)	+9.8%

competitive district. There were exactly 4,639 registered voters within Alamance County who had exactly a 1 in 5 probability, and among these registered voters, the turnout rate of those randomly assigned to a competitive district was +0.3% higher than those not assigned to a competitive district.

The rows of Table 5 present similar comparisons for every subgroup of voters who reside within the same county and who also had exactly the same probability of random assignment to a competitive district. Note that Table 5 only includes such subgroups when at least some members of the subgroup were ultimately assigned to a competitive district in the 2019 House Plan and at least some members who were not assigned to a competitive district. Without having some members of the subgroup assigned to a competitive district and others not assigned to a competitive district, there would be no basis for calculating a within-subgroup turnout effect.

Overall, the Table 5 results reveal that the main turnout effect calculated in Table 4 is robust across counties and when isolating voters with the probability of assignment to a competitive district. Among the ten subgroups listed in Table 5, within eight subgroups, voters exhibited a positive turnout effect from being randomly assigned to a competitive district. The remaining two subgroups that did not exhibit a positive turnout effect had very small numbers of voters assigned to a competitive district: Cumberland County had only 1,704 voters assigned to a competitive district, while Nash County had only 1,639 such voters. The eight subgroups in which assignment to competitive districts caused an increase in voter turnout all had larger numbers of voters assigned to a competitive district.

Table 6 breaks down the turnout effect of random assignment to a competitive district by voters' partisan affiliation. This breakdown reveals that the turnout effect from random assignment to a competitive district is generally consistent across party affiliations. Democrats

Table 6:
Effect of Random Assignment to a Competitive District on Voter Turnout by Partisan Affiliation

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Democratic Party Registered Voters	226,308	87.3% (72,930 of 83,500)	85.3% (121,794 of 142,808)	+2.1%
Non-Partisan Registered Voters	207,674	83.8% (69,324 of 82,755)	80.7% (100,828 of 124,919)	+3.1%
Republican Party Registered Voters	173,436	90.8% (68,914 of 75,893)	88.8% (86,579 of 97,543)	+2%
Libertarian Party Registered Voters	3,963	76.7% (1,128 of 1,470)	74.5% (1,858 of 2,493)	+2.2%
Constitutional Party Registered Voters	445	71.4% (115 of 161)	63% (179 of 284)	+8.4%
Green Party Registered Voters	421	68.3% (84 of 123)	65.4% (195 of 298)	+2.9%
Total:	612,247	87.1% (212,495 of 243,902)	84.5% (311,433 of 368,345)	+2.6%

exhibit a +2.1% turnout increase, while Republicans exhibit a +2.0% increase as a result of assignment to a competitive district. Meanwhile, approximately one-third of the registered voters have no partisan affiliation, and these non-partisan voters exhibit an even larger +3.1% turnout increase when they are randomly placed into a competitive district. In general, non-partisan voters in North Carolina exhibit an overall turnout rate that is measurably lower than voters affiliated with one of the two major political parties. Therefore, it is not surprising that, due to their lower baseline turnout rate, non-partisan voters' exhibit a greater turnout increase when they are given the opportunity to participate in a potentially closer election contest.

Table 7 breaks down the turnout effect of random assignment to a competitive district both by voters' partisan affiliation and by voters' specific probability of assignment to a competitive district in the redistricting lottery. For example, the first row of Table 7 focuses on Democrats who have exactly a 1 in 5 probability of assignment to a competitive district, while the second row analyzes Republicans with a 1 in 5 probability of assignment. Overall, Table 7 reveals that within each of these subgroups for each major political party, voters exhibit a positive turnout increase when they are randomly assigned to a competitive district.

Table 8 breaks down the turnout effect of random assignment to a competitive district by voters' age range. The results in this Table reveal that the effect of random assignment to a competitive district causes a positive turnout increase for every single age range. However, the turnout effect is largest for the youngest voters under the age of 20 and relatively smaller for the oldest voters aged 60 and above. The youngest voters tend to exhibit a significantly lower overall baseline turnout rate than older voters. Therefore, it is not surprising that younger voters also exhibit the greatest increase in turnout when randomly assigned to a competitive district.

Table 7:
Effect of Random Assignment to a Competitive District on Voter Turnout
By Partisan Affiliation and by Probability of Assignment to Competitive District

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Registered voters with a 1 in 5 probability of assignment to a competitive district:				
Registered Democrats:	95,125	86% (11,081 of 12,886)	84.8% (69,730 of 82,239)	+1.2%
Registered Republicans:	64,346	92% (10,777 of 11,708)	88.4% (46,537 of 52,638)	+3.6%
Registered Non-Partisans:	84,645	86% (11,310 of 13,151)	80% (57,200 of 71,494)	+6%
Registered voters with a 2 in 5 probability of assignment to a competitive district:				
Registered Democrats:	23,886	84.5% (9,258 of 10,958)	84% (10,859 of 12,928)	+0.5%
Registered Republicans:	17,711	88.7% (8,407 of 9,481)	88.6% (7,295 of 8,230)	+0%
Registered Non-Partisans:	22,670	82.1% (9,104 of 11,086)	80.9% (9,370 of 11,584)	+1.2%
Registered voters with a 3 in 5 probability of assignment to a competitive district:				
Registered Democrats:	57,834	88.3% (30,167 of 34,179)	87% (20,572 of 23,655)	+1.3%
Registered Republicans:	45,552	90.8% (28,892 of 31,829)	87.9% (12,063 of 13,723)	+2.9%
Registered Non-Partisans:	56,780	84.4% (31,067 of 36,817)	83% (16,565 of 19,963)	+1.4%
Registered voters with a 4 in 5 probability of assignment to a competitive district:				
Registered Democrats:	49,463	88% (22,424 of 25,477)	86% (20,633 of 23,986)	+2%
Registered Republicans:	45,827	91.1% (20,838 of 22,875)	90.1% (20,684 of 22,952)	+1%
Registered Non-Partisans:	43,579	82.2% (17,843 of 21,701)	80.9% (17,693 of 21,878)	+1.4%

Table 8:
Effect of Random Assignment to a Competitive District on Voter Turnout by Age

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Ages under 20	9,512	68.7% (2,945 of 4,287)	63.6% (3,321 of 5,225)	+5.1%
Ages 20-29	104,270	72% (27,757 of 38,576)	69.4% (45,618 of 65,694)	+2.5%
Ages 30-39	100,886	82.8% (30,618 of 36,988)	80.8% (51,621 of 63,898)	+2%
Ages 40-49	95,296	90.1% (36,263 of 40,228)	87.1% (47,955 of 55,068)	+3.1%
Ages 50-59	105,202	92.3% (41,352 of 44,788)	90.1% (54,414 of 60,414)	+2.3%
Ages 60-69	96,182	93.7% (35,828 of 38,232)	92.3% (53,475 of 57,950)	+1.4%
Ages 70-79	67,245	94.2% (25,237 of 26,801)	93.4% (37,764 of 40,444)	+0.8%
Ages 80-89	27,307	91% (10,330 of 11,354)	89.9% (14,335 of 15,953)	+1.1%
Ages 90 and over	6,191	82.1% (2,121 of 2,583)	79.6% (2,873 of 3,608)	+2.5%
Total:	612,247	87.1% (212,495 of 243,902)	84.5% (311,433 of 368,345)	+2.6%

Table 9 breaks down the turnout effect of random assignment to a competitive district by gender, while Table 10 breaks down the turnout effect by race and ethnic groups. Overall, these results show that men exhibit a slightly higher turnout effect than women, while all racial and ethnic minority groups exhibit a significantly higher turnout effect than White voters. In general, every racial minority group exhibits a lower turnout rate than White voters' baseline turnout rate. It is therefore not surprising that minority voters exhibit a stronger turnout boost when they are placed into competitive districts.

The Effects of Republican-Leaning and Democratic-Leaning Districts on Voter Turnout

All of the analyses in the previous section focused solely on the turnout effect of placing voters into electorally competitive districts, defined as districts with a Republican vote share of 45% to 55%. This turnout effect was measured as the difference in turnout rate among voters assigned to competitive districts and voters assigned to non-competitive districts. Hence, the previous section's results imply that voters in non-competitive districts – defined as districts with a Republican vote share under 45% or over 55% – exhibit a lower turnout rate than voters in competitive districts.

Of course, these results do not imply that competitive districts within the 45% to 55% range optimize voter turnout. It is possible that districts within other partisan ranges could cause even higher turnout. Moreover, if turnout is increased by assigning a voter to a district that favors her preferred political party, then it is likely that the partisan range of districts that optimizes Democratic voters' turnout is different from the partisan range that optimizes Republican voters' turnout.

Table 9:
Effect of Random Assignment to a Competitive District on Voter Turnout by Gender

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
Female	331,648	88.2% (116,752 of 132,409)	85.9% (171,188 of 199,239)	+2.3%
Male	279,956	85.9% (95,539 of 111,209)	83% (140,042 of 168,747)	+2.9%
No Gender Selected	643	71.8% (204 of 284)	56.5% (203 of 359)	+15.3%
Total:	612,247	87.1% (212,495 of 243,902)	84.5% (311,433 of 368,345)	+2.6%

Table 10:
Effect of Random Assignment to a Competitive District on Voter Turnout by Race and Ethnicity

	Registered voters	Nov. 2020 Turnout Rate of Registered voters assigned to a competitive district	Nov. 2020 Turnout Rate of Registered voters assigned to a non-competitive district	Competitive district turnout rate minus non-competitive district turnout rate
White	387,163	90.3% (139,971 of 154,969)	88.8% (206,199 of 232,194)	+1.5%
African-American/Black	119,915	82.8% (38,391 of 46,388)	78% (57,351 of 73,527)	+4.8%
Hispanic/Latino	20,576	75.8% (6,220 of 8,208)	69.3% (8,576 of 12,368)	+6.4%
Asian	9,804	87.1% (5,196 of 5,966)	82.1% (3,150 of 3,838)	+5%
Native American	1,607	82.8% (603 of 728)	77.6% (682 of 879)	+5.2%
Other	9,875	80.4% (3,777 of 4,697)	77.5% (4,013 of 5,178)	+2.9%
None Selected	63,307	79.9% (18,337 of 22,946)	78% (31,462 of 40,361)	+2%
Total:	612,247	87.1% (212,495 of 243,902)	84.5% (311,433 of 368,345)	+2.6%

To test this theory, I employ a fundamentally similar research design as was used in the previous section, but with a number of changes. Instead of only measuring the turnout effect of randomly assigning voters to a competitive district with a 45% to 55% Republican vote share, I now analyze the effect of districts across a large number of different partisan ranges. Specifically, I conduct the same analysis for every possible ten-percentage-point partisan range from 30%-40% to 60%-70%. For each partisan range, I employ fundamentally the same research design as before.

For example, to measure the turnout effect of randomly assigning a voter to a district with a Republican vote share of 30%-40%, I use the following steps. First, I isolate and focus only on voters who have a non-zero probability of assignment to a district in this 30%-40% range in the redistricting lottery, as well as a non-zero probability of assignment to a district outside of this 30%-40% range. I calculate the difference in turnout rate for voters randomly assigned to districts within this range and for voters assigned to districts outside of this range in the redistricting lottery. I calculate this turnout effect separately for Democratic voters and for Republican voters.

I perform this analysis separately for each ten-percentage point partisan range. The results for Democratic voters appear in Figure 5, while the results for Republican voters appear in Figure 6. Each of these two Figures contains 31 rows, with each row reporting the turnout effect of districts within a different ten-percentage-point partisan range. For example, the bottom row of Figure 5 reports the turnout effect of assigning voters to a district with a 30%-40% Republican vote share. The turnout effect is -5.7%, indicating that the turnout rate of voters assigned to district within this range is 5.7% lower than the turnout of voters assigned to a

Figure 5:
The Effect of District Partisanship on November 2020 Democratic Voter Turnout

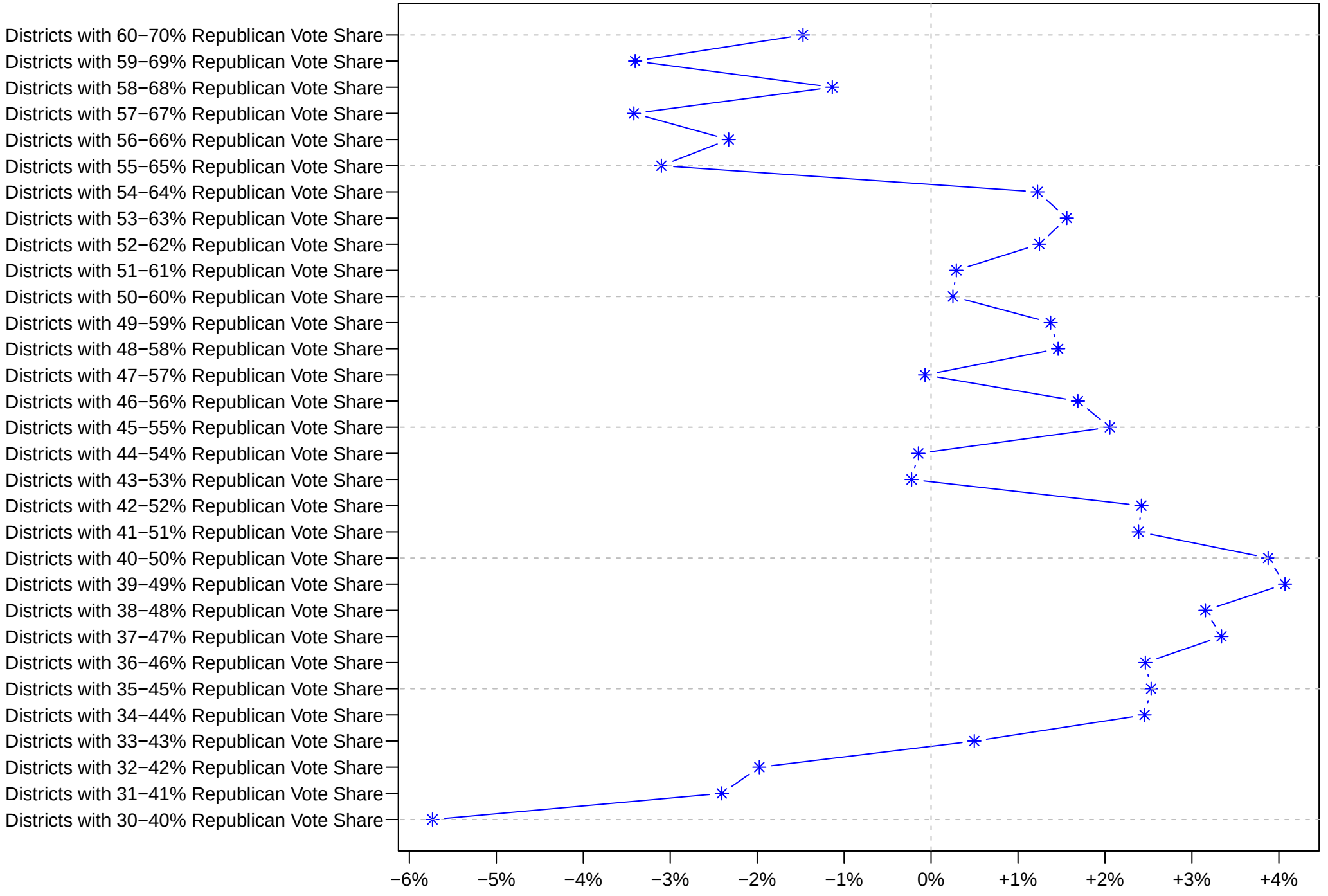
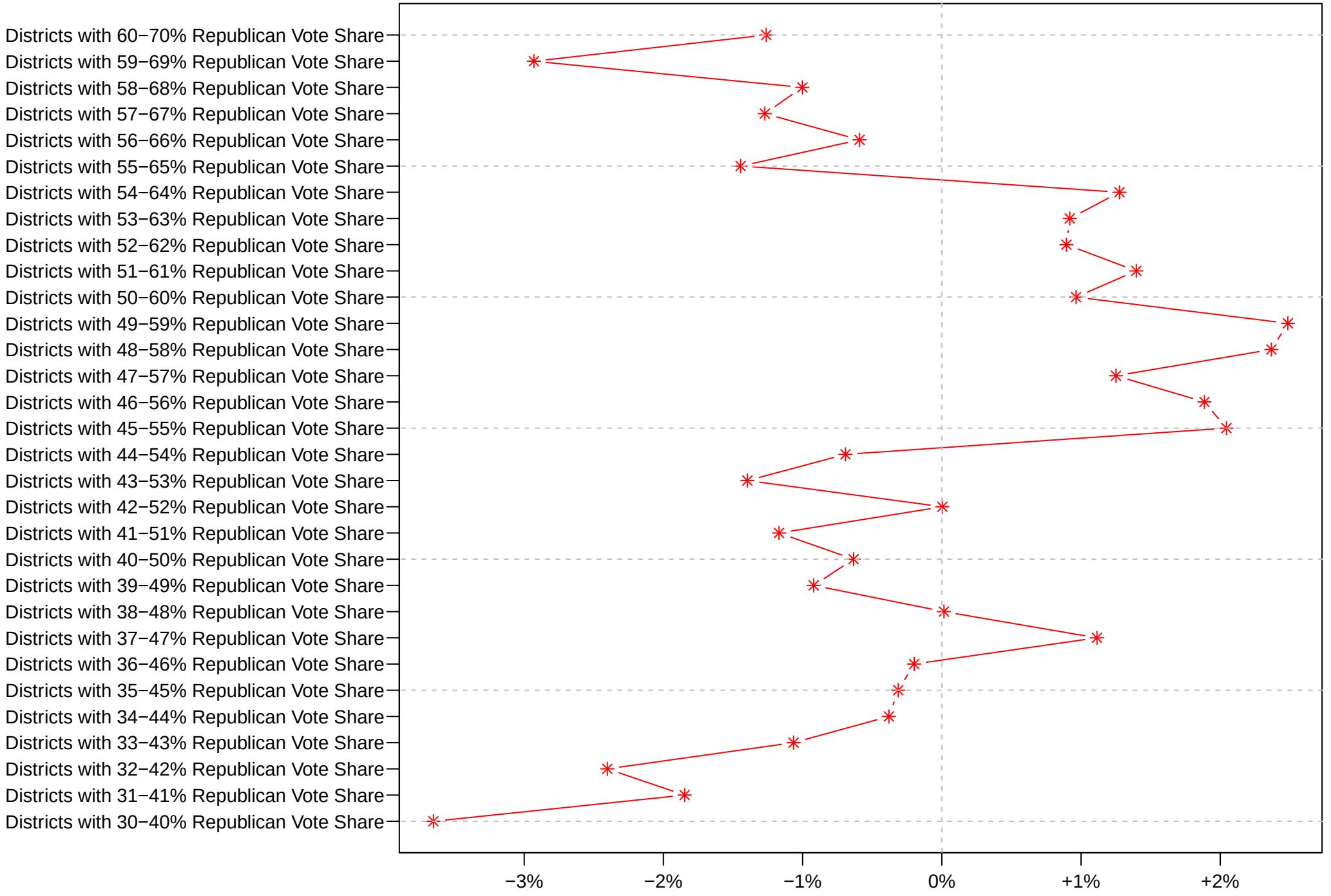


Figure 6:
The Effect of District Partisanship on November 2020 Republican Voter Turnout



Effect of Random Assignment to a District Within Each Partisanship Range (labeled on horizontal axis)
On November 2020 Republican Voter Turnout

district outside of this range. In other words, randomly assigning Democratic voters to an extremely lopsided Democratic-favoring district significantly lowers their turnout rate.

Overall, Figure 5 reveals that although Democratic turnout is increased by assignment to districts with a 45-55% Republican vote share, this is not the most optimal partisan range for maximizing Democratic turnout. Instead, Democratic voter turnout is optimized by assigning voters to districts with a 39%-49% Republican vote share. Figure 5 reports that Democratic voters randomly assigned to a district with a 39%-49% Republican vote share exhibit a +4.0% higher turnout rate compared to voters assigned to a district outside this range. This turnout effect is the highest of all the partisan ranges analyzed in Figure 5. Districts with a 39%-49% Republican vote share are Democratic-leaning, but they are not overwhelmingly lopsided in favor of Democrats. Overall, these results demonstrate that electorally competitive districts certainly increase Democratic voter turnout, but Democrats exhibit the highest turnout rates when they are assigned to more Democratic-leaning districts that are not too lopsided.

Figure 6 reveals a nearly symmetrical result for Republican voters. As with Democratic voters, Republicans assigned to competitive districts with a 45%-55% Republican vote share exhibit a higher turnout rate than Republicans assigned to non-competitive districts. However, competitive districts in the 45%-55% Republican vote share range are not the most optimal for Republican voter turnout. Instead, Republican voter turnout is optimized by assigning voters to districts with a 49%-59% Republican vote share. Figure 6 reports that Republican voters randomly assigned to districts in this range exhibit a +2.5% higher turnout rate compared to voters assigned to a district outside this range. This turnout effect is the highest of all the partisan ranges analyzed in Figure 6. Districts with a 49%-59% Republican vote share are either electorally competitive or Republican-leaning, but they are not overwhelmingly lopsided in favor

of Republican. Overall, these results demonstrate that Republican voters exhibit the highest turnout rates when they are assigned to either electorally tied or Republican-leaning districts that are not too lopsided.

Note that the optimal partisan range of districts for Democratic voters (39%-49%) does not overlap with the optimal range for Republican voters (49%-59%). Instead, these optimal ranges for each party's voters collectively suggest that a voter is most likely to turn out when her district leans slightly toward her own party, but the district is still relatively electorally competitive and not lopsided.

Discussion

In recent decades, a central argument among advocates of redistricting reform has been that uncompetitive districts drawn by partisan gerrymanderers result in low voter turnout, thus weakening democracy. For example the League of Women Voters recently asserted that "Gerrymandering often protects incumbents and reduces the competitiveness of districts which can lead to depressed voter turnout when voters lose faith in their ability to effect change" (League of Women Voters, 2020).

The findings in this paper certainly confirm that electorally competitive districts cause an increase in voter turnout. However, focusing solely on overall turnout ignores a larger asymmetric partisan dynamic in the turnout effects of gerrymandering. Although competitive districts cause higher turnout than uncompetitive districts, the partisan lean of a competitive district matters as well. A relatively competitive but Republican-leaning district causes the largest possible boost to Republican voters' turnout, while a competitive but Democratic-leaning district causes the largest possible boost to Democratic turnout.

The partisan asymmetry of these turnout effects is important in the context of partisan gerrymandering. A gerrymandered districting plan that creates a disproportionate number of Republican-leaning competitive districts can optimally boost Republican voters' turnout without also triggering a corresponding boost in Democratic turnout. Thus, if the gerrymandered districting map intentionally avoids creating a comparable number of Democratic-leaning districts, the overall effect of gerrymandering can be a partisan skew in the turnout electorate. This partisan skew in turnout may also affect the results of other election contests on the ballot, not just the legislative contest directly affected by the gerrymandered districting plan. Hence, redistricting reformers are accurate in arguing that competitive districts increase turnout, but the precise partisan breakdown of this increased turnout is another important dynamic in the turnout effects of the partisan composition of legislative districts.

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