Do Redistricting Commissions Avoid Partisan Gerrymanders?

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Abstract

As attempts to combat partisan gerrymandering transition from proposals to the Supreme Court to state-based districting commissions, it is time to ask two questions. First, how well did commissions in the 2010 round of redistricting perform as neutral decision makers? We answer that question with applications to each of the three independent commissions (AZ, CA, and WA) and four other commission forms (IA, NJ, NY, and VA) in place for post-2010. We take as the neutrality criterion the idea that a commission would produce a district plan that comports with a partisan outcome that could be expected from a set of approximately 10,000 computer generated plans adhering to minimalist constraints of contiguity, compactness, and equal populations. Our results indicate three of seven commissions produced suspect results that redounded to the benefit of one party or the other: pro-Democrat in Arizona; pro-Republican in New Jersey and Virginia.

Keywords

redistricting < legislative politics, redistricting commissions, congressional elections

Introduction

Partisan gerrymanders are at odds with principles of democratic fairness and equality. The Supreme Court acknowledged this in its landmark decision in Rucho v. Common Cause (2019), stating that “excessive partisanship in districting leads to results that reasonably seem unjust” and, quoting from the Arizona State Legislature, “incompatible with democratic principles.” Yet, in the next sentence, it concluded that “partisan gerrymandering claims present political questions beyond the reach of the federal courts” (2019, 30). If the Court were to overturn these maps, so the majority’s argument continued, the unelected and politically unaccountable judicial branch would be granting itself widespread and longstanding authority over “one of the most intensely partisan aspects of American political life” (2019, 31). Consequently, the opinion points redistricting reformers to state-level remedies for partisan gerrymanders.

State-level remedies for partisan gerrymanders can take several forms. One option is to proceed through state courts, which may strike down partisan gerrymanders. This approach requires a plaintiff that is actually harmed via the enacted plan vis-à-vis a state constitutional or legislative statute as well as the court’s ability to detect and measure such harm. As such, it can be costly in terms of both time and resources. An alternative strategy has been to attempt to prevent partisan bias from occurring in the first place. One way to do this is through legislation. State legislatures may attempt to mitigate partisan bias before the map is enacted with legislation that, for instance, prohibits undue favoritism of political parties (e.g., Delaware Title 29, § 804).

Perhaps the most notable strategy employed to avoid partisan gerrymanders has been to establish redistricting commissions, which are thought to avoid partisan bias by taking map-making power away from more politically minded state legislators. Redistricting commissions have been particularly popular with reformers since commission-based map-making processes are oft-touted as more impartial, transparent, and accountable than legislative ones. Moreover, the people in various states appear to agree; since 2015, citizens in Colorado, Michigan, Missouri, Ohio, and Utah adopted commissions.

Redistricting commissions are often viewed as a solution to partisan gerrymandering, but how well do they actually perform at reducing partisan gerrymanders? Thus far, the evidence points in two directions. On the one hand, some existing research supports the unbiasedness of redistricting commissions. For instance, Iowa’s advisory commission has long been

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praised for its evenhandedness, and several studies have found that commissions tend to outperform state legislatures when it comes to competitiveness, compactness, and partisan bias (Carson and Crespin, 2004; Edwards et al., 2017; Lindgren and Southwell, 2013; Litton, 2012; McDonald, 2004). Royden and Li, (2017) report the use of commissions, post-2010, produced less biased plans than circumstances where a legislature had control, especially with one party in sole control. Similarly, Alex Keena and his colleagues report that comparisons of the control, especially partisans of just one stripe, but we are still left to wonder whether they do a good job by other standards.

In this paper, we add to the growing literature on the effects of redistricting commissions by assessing whether commissions produce congressional district maps that are biased in favor of one party over another by comparing them to a neutral, map-making standard. Although it is increasingly common to evaluate partisan bias in a given district map by comparing it to a set of computer-generated maps (e.g. Chen & Cottrell, 2016; Cho & Liu, 2016; Henderson et al., 2018; Magleby & Mosesson, 2018), the literature on redistricting commissions has compared districting lines drawn by commissions to those drawn by state legislatures. Indeed, when we look at cross-state comparisons of commission maps to those produced by partisan legislatures, we find that commissions generally produce less bias. However, when making cross-state comparisons, we have to recognize that factors such as the geographic distribution of voters can influence the partisan bias, which limits the usefulness of this type of comparison. Thus, we focus our evaluation on whether commission maps are biased when compared to a neutral standard within their own state. Specifically, we examine how well they comport with an outcome that could be expected from a set of approximately 10,000 computer-generated plans adhering to minimalist constraints of contiguity, compactness, and equal populations. This avoids the problems inherent in comparing states that may differ in ways other than how their maps are produced and provides a better point of comparison for evaluating partisan bias in district maps produced by redistricting commissions.

We evaluate whether congressional district maps produced in the 2010 round of redistricting resulted in gerrymanders of partisan exclusion and entrenchment. When using the neutral maps as our point of comparison, our results indicate three of seven commissions produced suspect results that redounded to the benefit of one party or the other: pro-Democrat in Arizona; pro-Republican in New Jersey and Virginia. While redistricting commissions do seem to generate congressional district maps that contain less partisan bias than those produced by state legislatures, our analyses show that commissions do not always eliminate partisan bias.

**Commission Forms and Procedures**

For the 2010 round of redistricting, 13 states provided for commissions to choose a plan or to advise its legislature on selection of congressional and state legislative districts. Table 1 shows that commissions take four forms: independent, advisory, politician, and backup. Four states have independent commissions, meaning their commission chooses the lines. California’s independent commission members are chosen in a complex sequence, which, in form at least, has minimal input from incumbent politicians. The other three independent commission states—viz., Arizona, Idaho, and Washington—invite bipartisan member selection by sitting politicians. Five states use advisory commissions. Each is akin to legislative leaders putting together a bipartisan conference committee of some active and some not currently active (perhaps never active) politicians. Two states, Hawaii and New Jersey, use political commissions, which similar to advisory commissions, are akin to bipartisan conference committees but in these two states all but the last selected member is likely to be a currently active political actor. Two states provide for backup commissions whose activation depends on failure of the legislature to adopt a plan. Connecticut’s backup commission membership is similar to most states’ advisory commissions. Indiana’s commission, which has a 30-day period to act, has members with substantial knowledge of the plan or plans the legislature considered.

The legal charges given to commissions, reflected in Table 2, take as given the federal constitutional requirement of equal populations. They also uniformly specify the often referenced “good government” criteria of contiguous and compact districts that, so far as practicable, do not breach town, city, or county boundaries. With near equal frequency, commissions are told to pay attention to preservation of communities of interest, either in those words or by reference to historic features. Five states expressly forbid using information on incumbent (or, more generally, candidate) residences—viz., Arizona, California, Iowa, Virginia, and
New Jersey. Washington, Rhode Island, and Hawaii expressly call for fairness to groups/parties, while Iowa presumes to do so by ruling out its commission’s reliance on political data.

The district boundary and shape guidelines are forthright constraints on mapmakers, but in most states, not including New York and Rhode Island or, if needed, Indiana, commission membership composition is supposed to do much of the heavy lifting for creating a process of partisan impartiality. Still, it is useful to keep in mind a few points about the decision-making process outlined in Table 3. Advisory commissions are just that, advisory; the legislature, subject to gubernatorial veto, retains final decision-making authority. Independent commissions, except for California’s, operate by majority rule. So, as Peter Miller and Bernard Grofman emphasize, “The first and most obvious point (but still often neglected) is that there are no nonpartisan commissions …; … commissions are bipartisan …” (Miller and Grofman, 2013, 644-645).

The extent of a nonpartisan element is to have one or more nonpartisan members selected by the partisan members (Arizona, Washington, Iowa, New York, Virginia, Hawaii, New Jersey, and Connecticut). Is that enough? Maybe, however, a potential problem is that the sets of equal numbers of partisan members will each promote a degree of partisan advantage in the districting plan favorable to their party, leaving the nonpartisan member(s) to choose between them. One way around this is to require a supermajority vote, effectively requiring cross-party endorsement of a plan, but only California employs such a decision rule.

Taken altogether, then, a reasonable expectation is to see commissions as operating in ways similar to a divided government, with one side gaining some sort of upper hand, perhaps by all but forcing a nonpartisan tie-breaker to choose one or the other party’s desired plan or perhaps by devising a bipartisan plan so that each party has predictable predominance in its “own” set of districts. Perhaps, however, all the doubts we reference are too cynical, and commissions operated with the sort of nonpartisan fairness the proponents of commissions have in mind. Our purpose here is to check the evidence to see whether there is partisan bias in the congressional districting plans produced by commissions.

**Identifying Gerrymanders**

Two principles in the American political tradition of fair and effective districting can be traced back to the original congressional mandate for single-member districts and extended forward through the post-*Baker v. Carr* (1962) jurisprudence. In the 1842 Apportionment Act debate over whether Congress should require single-member districts and outlaw the use of at-large voting in House elections, Representative Thomas Arnold (Whig of Tennessee) made this point: “the

### Table 1. Redistricting Commission Membership Selection.

| Commission Type | Membership |
|-----------------|------------|
| Independent     | Arizona 5 members: not recent politician, 4 political selections and 5th by those 4 |
|                 | California 14 members: not recent politician, pool of 60 names (20R, 20D, 20Indy), political leaders exclude 8 → 8 selected at random and those 8 select 6 |
|                 | Idaho 6 members: not current politician, D&R party leaders selected all 6 |
|                 | Washington 5 members: not recent politician, D&R leaders select 2 each, and those 4 select a nonvoting Chair |
| Advisory        | Iowa Legislative Service Agency (civil servants) guided by 5 member commission with 1 each by the Majority and Minority leaders and those 4 select the 5th |
|                 | Maine 15 members: 6 each by party leaders, the 12 select 2 and those 2 select the 15th |
|                 | New York 6 members: 4 state legislators, 2 not legislators with 1 by Senate leaders and 1 by Assembly leaders |
|                 | Rhode Island 18 members: 8 legislators by Majority leaders, 4 legislators by Minority leaders, and six not legislators by Majority leaders |
|                 | Virginia 11 members: 5D and 5R by the Governor and those 10 select an independent |
| Politician      | Hawaii 9 members: Majority and Minority leaders select 4 each, those 8 select 9th |
|                 | New Jersey 13 members: Majority and Minority leaders each select 4, state party chairs select 2 each, and those 12 select a 13th |
| Backup          | Connecticut 9 members: Majority and minority leaders in each legislative house select 2 each, those 8 select 9th |
|                 | Indiana 5 members: Speaker of the house, president pro tem of the senate, the chairman of the house and senate committees on legislative apportionment, and a fifth member appointed by the governor from the membership of the general assembly |

*Idaho has an Independent Commission but only two House seats.
*Maine and Rhode Island have Advisory Commissions but only two House seats.
*Hawaii has a Politician Commission but only two House seats.
*Florida, Pennsylvania, and Virginia faced legal challenges that resulted in mid-decade court imposed plans.

Best et al. 381
majority should govern but the minority should be heard” (quoted in Quitt, 2008, 638). Those principles were echoed in Davis v. Bandemer when Justice White writing for a Court majority made the same point. A preference “for a level of parity between votes and representation sufficient to ensure that significant minority voices are heard, and that majorities are not consigned to minority status, is hardly an illegitimate extrapolation from our general majoritarian ethic and the objective of fair and adequate representation recognized in Reynolds v. Sims (1964)” (Davis v. Bandemer, 1986, 125, fn. 9). We therefore seek metrics for detecting gerrymanders that are congruent with these two aspects of partisan fairness: minorities should be heard and popular majorities should not hold minority delegation status.

In line with those two principles, we take gerrymandering as having the potential to create two harms: (1) silencing minority voices, exclusionary gerrymanders or (2) entrenching one party in majority status almost regardless of their vote support, entrenchment gerrymanders. A first necessary condition for gerrymandering of either sort is predictable partisan voting patterns. Absent such predictability there can be no way to say whether a precinct, town, or county can be relied on to vote in support of one party or the other.

If elections are predictable, each form of potential harm can be detected through a statistical indicator obtained from the two-party vote percentage distribution. Exclusionary gerrymanders that effectively silence the minority party can be achieved by cracking the minority party vote percentage in as many districts as practicable—that is, dispersing the votes of minority party voters among numerous districts so that the majority party maximizes the number of districts in which it holds a vote majority. This tactic homogenizes the two-party vote percentages and produces a standard deviation smaller

| Commission Type | Charges | Charges |
|-----------------|---------|---------|
| Independent Arizona | Contiguous, compact, preserve communities of interest, use visible geographic features (city, town, county, and undivided census tracts). Competitiveness is secondary. Party registration and voting records may not be used in the initial phase but later to check if goals are achieved. Cannot consider candidate homes | Charges |
| California | Contiguous and preserve communities of interest. Compactness is secondary. Cannot consider candidate homes. Cannot favor or discriminate against incumbents, candidates or parties | Charges |
| Idaho | Contiguous and preserve counties—if a county is split across districts, must be connected by a state or federal highway. Districts should preserve communities of interest and voting precincts | Charges |
| Washington | Contiguous, compact, and convenient. Should follow natural, geographic, artificial, or political subdivision boundaries. Cannot favor or discriminate against any particular party or group. Should preserve communities of interest. | Charges |
| Advisory Iowa | Contiguous and preserve the boundaries of other political subdivisions. Compact as long as consistent with higher order principles—regular polygons, length-width, and perimeter standards. May not use incumbent addresses, previous election results, or demographic data other than population headcount | Charges |
| Maine | Compact and contiguous. Cross fewest political subdivisions as possible | Charges |
| New York | Contiguous and as compact “as practicable” and take into account the “historic and traditional significance of counties.” | Charges |
| Rhode Island | Compact, should reflect natural, historical, geographical, and municipal and other political lines. Fair representation and equal access to the political process. Attempt to avoid dividing state Senate districts into congressional districts if it would result in a voting district of 100 or fewer voters | Charges |
| Virginia | Contiguous and compact (Constitution); communities of interest—economic, social, cultural, geographic features, governmental jurisdictions and service delivery areas, political beliefs, voting trends, and incumbency considerations (commission); protect political subdivisions, counties, cities, and communities of interest as much as possible (governor) | Charges |
| Politician Hawaii | Contiguous, compact, and follow permanent and easily recognized features. Should also preserve communities of interest—defined specifically as socioeconomic. Districts cannot favor persons or political factions | Charges |
| New Jersey | Contiguous and compact. Municipalities must also be kept intact. Conflicting judicial precedent on using incumbent residence | Charges |
| Backup Connecticut | Activates if general assembly fails to adopt a plan by Sept. 15 of year after decennial census. Boundaries must be consistent with federal constitutional standards. State Assembly and Senate districts shall be contiguous; assembly districts should not divide towns | Charges |
| Indiana | Activates if general assembly adjourns without adopting a plan or if the state finds itself without a valid congressional district law. Constitution requires assembly districts are contiguous. No guidelines for Congressional lines, although Indiana code provides specific details for resolution of inconsistent inclusions and geographic slivers in Congressional districts | Charges |

Table 2. Charges Given to Redistricting Commissions.
than expected compared to a state’s underlying residential patterns. If, on the other hand, a minority party’s opportunities to carry a district are de minimis, but the standard deviation is as large or larger than expected, then something other than gerrymandering is responsible for the exclusion—for example, perhaps residential patterns, perhaps overwhelming support for the majority party, or perhaps something else. Thus, a smaller than expected standard deviation is the statistical indicator that denotes an exclusionary gerrymander; minimal opportunity to elect minority party members is the harm.

As for entrenchment gerrymanders, the relevant statistical indicator is the skew in the two-party vote percentage distribution. This could be recorded in its full-fledged formulation for calculating skew (McDonald and Engstrom, 1989) or its simpler median-minus-mean calculation (McDonald and Best, 2015). The tactic for entrenchment is packing—concentrating large numbers of one party’s supporters into a few districts so that the other party can win a large number of districts by reasonably small (but safe) margins.

Inferring the existence of entrenchment, however, requires reasoning through four matters beyond partisan predictability. Entrenchment is produced by electoral bias, which is what creates the potential for violating majority rule. Electoral bias is a two-element concept—turnout bias and gerrymandering bias. To wit,

\[
\text{Total electoral bias} = \text{Turnout bias} + \text{Gerrymandering bias}
\]

Turnout bias is the difference between a party’s statewide vote percentage, which weights each voter equally, and the mean district vote percentage, which weights each district equally (Edgeworth, 1898, 536-537; Butler, 1951; Erikson, 1972, 1236; Gudgin and Taylor, 1979, 55-59; Grofman et al., 1997, 461-464)—that is,

\[
\text{Turnout bias} = \text{Mean district vote}\% - \text{Statewide vote}\%.
\]

Gerrymandering bias (asymmetry bias due to skew) is the difference between partisan predictability.

### Table 3. Decision Procedures of Redistricting Commissions.

| Commission Type | Decision Procedures |
|-----------------|---------------------|
| **Independent** | Draft map advertised for 30 days to the public. Both chambers may make recommendations to the commission during this period. 3/5 commission votes required for final map |
| Arizona         | Open public meetings around state. 9 commission votes—3 Dems, 3 Rep, 3 neither—required. Final map approved by public referendum |
| California      | Open public meetings around state. 2/3 commission votes required for final map within 90 days after commission is formed |
| Idaho           | Open public meetings distributed via interactive webcast. Three voting members of commission required for final map. If commission fails, state supreme court creates plan. Legislature may amend proposed plan by 2/3 majority vote in both chambers within 30 days of submission |
| Washington      | The Legislative Services Agency (LSA) works with commission to advise legislature. Must publicize plan and data and hold three hearings around state. Plan, data, and public feedback presented to legislature to be accepted or rejected without modification. If rejected, second plan presented. If second plan rejected, a third and final set presented, which may be modified at the legislature’s discretion |
| **Advisory**    | The Legislative Services Agency (LSA) works with commission to advise legislature. Must publicize plan and data and hold three hearings around state. Plan, data, and public feedback presented to legislature to be accepted or rejected without modification. If rejected, second plan presented. If second plan rejected, a third and final set presented, which may be modified at the legislature’s discretion |
| Iowa            | Public hearings prior to submission. The legislature shall enact the submitted plan of the commission or a plan of its own by a 2/3 majority vote by June 1. Plan subject to gubernatorial veto. If no plan is approved by June 1, state supreme court shall consider plans and public briefs to create plan |
| Maine           | Legislative task force on demographic research and apportionment, with approval of its co-chairmen, recommends a plan to the state legislature. Legislature may accept, reject, or modify plans, which are subject to gubernatorial veto |
| New York        | Commission sets its own rules of procedure. Must conform to Open Meeting and Access to Public Records laws. Makes recommendation to state legislature, which approves as a regular statute that is subject to gubernatorial veto |
| Rhode Island    | Commission may create own plan or accept one from the public. Submit to both chambers of the legislature, which may accept, reject, or modify plans. Bill subject to gubernatorial veto |
| **Politician**  | Public hearings around state; at least 1 on each island. Majority of commission votes required for final map within 150 days after commission is formed |
| Hawaii          | Three public hearings around state. Should review maps submitted by citizens if time allows. Majority commission votes required for final map in open meeting. Otherwise, two highest voted plans go to state Supreme Court |
| New Jersey      | 5/9 votes for final map by Nov. 13. Upon delivery to Secretary of State, it is published and has the full force of law. If the commission fails to deliver a map by Nov. 13, the state Supreme Court has jurisdiction and ability to file a map |
| **Backup**      | Public hearings around state. Final map approved by 2/3 commission votes required. Final map within 90 days after commission is formed |
| Connecticut     | Final set presented, which may be modified at the legislature’s discretion |
| Indiana         | Majority (3/5) votes for final map within 30 days of assembly adjournment. Upon delivery to Governor, the plan put into effect by executive order |
which marks the vote percentage received in a district when reaching the threshold of majority control of a delegation, and the mean district vote percentage, which, assuming equal turnout, is the level of vote support for a party (Edgeworth, 1898, 534-536; Butler, 1951, 330; Erikson, 1972, 1237; McDonald & Best, 2015; Wang, 2016a, 2016b)—that is,

\[
\text{Gerrymandering bias} = \frac{\text{Median district vote}}{\text{Mean district vote}}.
\]

Distinguishing between turnout and gerrymandering bias is only one element in investigating the possibility of entrenchment gerrymanders. Gerrymandering bias could be natural or chosen, natural in the sense that a median versus mean district percentage difference is attributable to residential patterns or chosen in the sense that a median versus mean difference goes beyond levels attributable to residential patterns. We are interested in choice as a key element in the causal flow, in the sense that the harm would have been reasonably easy to avoid. A median–mean difference is a leading indicator; its persistence above expectations from residential patterns gives rise to the likelihood we are looking at a chosen structural gerrymander.

In addition, the choice of a structural gerrymander must show observable harm, not just potential harm. This requires observing two additional facts, one ex ante and one ex post. We look ex ante to see whether the disfavored partisans have their majority vote persistently turned into a minority of districts carried using statewide election results, which are all the elections results a commission could have in hand at the time they draw districts. If that does not occur, then the bias operating against them cannot be deemed to be structural. Finally, it is fair to check whether the disfavored party based on statewide results overcame their disfavored position by winning a majority of the actual House contests.

**Data**

The data we rely on come from two sources: statewide election returns compiled and disaggregated to voter tabulation districts (VTDs) by Stephen Wolf at Daily Kos (Wolf, n.d.) and shapefiles provided by the U.S. Census Bureau. Since U.S. elections at all levels are administered by county or local governments, collecting statewide data is often quite challenging. Daily Kos publishes statewide election results by congressional and legislative district built from estimates at the level of VTDs. Wolf uses county-level returns to assign votes to VTDs according to votes cast in the VTD in the 2008 presidential election and the proportion of the county’s population living in a VTD. The disaggregation of Democratic votes to VTDs can be characterized by the following equation

\[
d^t_i = \delta_i D^t
\]

where \(d^t_i\) is the estimated number of votes cast for a Democratic candidate in VTD \(i\) in election \(t\), \(\delta_i\) is the proportion of a county’s votes cast in VTD \(i\) for Barack Obama in 2008, and \(D^t\) is the county-level count of Democratic votes for election \(t\). We have tested the accuracy of Wolf’s data in Wisconsin, North Carolina, and Florida where we have state-provided official tallies of VTD-level votes. Correlations of the Daily Kos numbers and official vote totals were high across all races covered by the data, range from 0.87 to 0.97.

The Census Bureau is charged with collecting maps of each state’s VTDs before each census, and it releases this information as shapefiles. We use these VTD shapefiles to generate 10,000 alternative congressional maps for each state using a graph partitioning process proposed by Magleby & Mosesson, (2018). While scholars anticipated the possibility of drawing electoral maps using computers for decades (see Bozkaya et al., 2003; Browdy, 1990; Chou and Li, 2006; Cirincione et al., 2000; Fryer & Holden, 2011; Garfinkel and Nemhauser, 1970; Nagel, 1965; Vickery, 1961; Weaver & Hess, 1963), methodological and computation advances in the last several years have made computer-drawn maps a reality (see, e.g., Chen & Cottrell, 2016; Chen & Rodden, 2013; Cho & Liu, 2016; Henderson et al., 2018).

The neutral map-making process we employ was proposed by Magleby & Mosesson, 2018 and has several advantages over alternatives. First, it draws maps without indication of bias (Magleby & Mosesson, 2018, 148). In its initial stage, without further prompting, the process incorporates

![Figure 1. Actual and simulated district maps for Arizona.](image-url)
information related to geography and population, though we take into account Voting Rights Act requirements as it relates to our analysis in Arizona and we add considerations for attending to compactness (see Appendix for a more detailed explanation). The result of the process is a set of maps that represents the distribution of possible outcomes of a politically neutral redistricting process. Second, the process we use is efficient enough to draw large sets of maps. This allows us to develop counterfactual mapping outcomes that encompass a broad and representative sample of possible outcomes. For each state, we draw 10,000 maps at random. The result is 10,000 counterfactual districting outcomes that were drawn neutrally with no reference to politics. Finally, the maps drawn by the Magleby and Mosesson algorithm produce districts that are more-or-less realistic. Consider the maps in Figure 1. The map in the top left is the commission-drawn map in Arizona used to elect that state’s congressional delegation. Maps A, B, and C are maps drawn by the automated process. All four maps have the same number of majority-Latino districts. A visual inspection of the computer-drawn, hypothetical maps reveals that the district boundaries are roughly compact and similar in appearance to maps drawn by Arizona’s redistricting commission. Without specific knowledge of Arizona’s politics, it would be hard to identify which map was drawn by the redistricting commission and which were simulated.

Each of the alternative maps produced has the requisite number of contiguous districts with a population variance of plus or minus 1%. After the maps have been generated, we merge VTD voting data from Daily Kos to calculate candidate performance in these alternative congressional districts in each statewide election.

Evalulations

We show the relationships between the homogenization (Figure 2) and electoral bias (Figure 3) in two-party vote percentages in the 34 states we can evaluate for partisan gerrymanders. The seven commission states are displayed with triangles, and all others (district plans chosen by legislatures or courts) are represented by circles. One fact is clear: as a generalization, maps enacted by states with commissions perform relatively better than maps enacted by states without commissions.

The line at 45° in Figure 2 represents the standard deviation we would expect to observe given the residential pattern of partisan voters. The closer a state is to that line, the closer district lines generally fit the residential location of voters.

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**Figure 2.** Relationship between observed and expected standard deviation in congressional districts of 34 States that could have homogenized two-party vote percentages, by whether they used redistricting commissions.
Outcomes above the line are choices to disperse partisans more widely than would come from their residences. In meaningful political terms, states above the line have created districts that generally are less competitive (fewer closer to the state average percentage) than expected from residential patterns. Moreover, if the vote distribution takes the normal form, a state with a standard deviation around 13.6 has an expected swing ratio (degree of responsiveness) of 3, as in the once touted cube “law” (see Gudgin and Taylor, 1979, 26); and, as Graham Gudgin and Peter Taylor also report, a standard deviation of 20 has an expected swing ratio of 2 (as prescribed by the efficiency gap—see Stephanopoulos & McGhee, 2015). Many states appear above the 45° line, meaning they are choosing plans that have fewer competitive districts than expected. \(^{13}\) This includes, to varying but noticeable degrees, three commission states—viz., Arizona, New Jersey, and Virginia. The other four commission states are close to the line—viz., California, Iowa, New York, and Washington.

When it comes to adding electoral bias, the 45-degree line in Figure 3 records how close the bias comes to expectations based on residential patterns. Three commission states are almost precisely in line with expectations—viz., Iowa, New York, and Washington. The other four—viz., Arizona, California, New Jersey, and Virginia—each introduced bias two to three points away from expectations. In the case of California, it is proper to take notice that no harm was done. That is because, while the expected bias operating against Democrats was reduced, the enacted plan continues to have, on average, a modest degree of anti-Democratic bias. In other words, the California commission chose to reduce, but not eliminate, the bias operating against Democrats. On the other hand, Arizona, New Jersey, and Virginia each introduced bias that holds the potential to do gerrymandering harm by turning vote majorities into minority congressional delegations. Arizona’s enacted plan has an anti-Republican bias; New Jersey and Virginia’s have anti-Democratic biases.

The commentary in the previous three paragraphs tells us this much: commissions tend to do a relatively good job at avoiding partisan gerrymandering, where the baseline for relative comparisons is states not using commissions. Still, it is too much to say that commissions do a uniformly good job. Three of seven commission states—Arizona, New Jersey, and Virginia—enacted plans that packed voters in some districts in ways that both reduced the seat-to-vote responsiveness compared to expectations from residential patterns and introduced bias that has the potential to have their election
results violate majority rule. Of course, all these preliminary evaluations are based on observing average values; a closer look at the state-by-state details is required to say whether any of the three suspect states actually enacted a partisan gerrymander.

**Suspect 1: Arizona’s Independent Commission**

As shown in Figures 2 and 3, Arizona’s commission created a biased congressional plan favoring Democrats while also dispersing partisan voters in such a way as to create less competitive districts than partisan residential patterns would indicate. Of course, this did not go unnoticed. Indeed, the commission’s work was struck with controversy early in the process, and the controversy continued for 3 years. It started with the November 2011 ouster of the commission’s chair (Colleen Coyle Mathis) by the Republican Governor, only to see her reinstated within weeks by the State Supreme Court.
Figure 4. Traces of observed and expected Democratic vote percentages from lowest to highest for President and U.S. Senate in 2012.
Republicans charged were more competitive than would be expected. Both elections have the fifth, sixth, and seventh ranking districts running at Democratic percentage above expectations. When, as in the 2012 presidential election Obama wins 45.4% of the vote, the boost to Democratic prospects helps Obama carry CD 9, but not so much as to push five districts into the majority-Democratic territory. With 48.4% of the statewide vote for the 2012 Senate Democratic candidate (Richard Carmona), however, the boost to Democratic prospects pushes all three “more competitive” districts (CDs 1, 2, and 9) over the 50% mark and, in doing so, violates the majority rule principle.

The potential for harm to Republicans can been seen in the facts that in both of the two closest elections of our ten—Attorney General in 2010 and U.S. Senate in 2012—the Democratic candidates won just over 48% of the two-party vote and carried five of nine congressional districts. Democrats winning five of nine districts held true for the actual House elections in 2012 and 2018. Nevertheless, the con-majoritarian nature of Arizona’s districts did not treat Republicans so harshly as to allow Democrats to entrench themselves in majority status of the State’s congressional delegation throughout the decade. Republicans were able to win five of nine House seats, a majority, in 2014 and 2016. The districting plan is skewed in favor of Democrats but not so skewed as to persistently disadvantage Republicans.

Suspect 2: New Jersey’s Political Commission

Turning to New Jersey, Figure 3 indicates a noticeable anti-Democratic bias, but several of the statewide races were lopsided Democratic candidate wins. That makes it difficult to reach a firmly stated evaluation. Nevertheless, the district lines show signs that districts have been drawn in ways that typically are less competitive than a partisan blind process would produce. Turning again to Table 4, that reading comes from the uniformly larger standard deviations compared to the average in the set of 10,000 computer-generated maps. In addition, the lines added asymmetry and gerrymander bias of between 1.7 and 3.7 points operating against Democrats. Some, but not all of that gerrymander bias, is offset by the 1.3 to 2.5 points of favorable turnout bias to Democrats. Even though, as we remarked, the lopsided outcomes make firm statements difficult, it is remarkable that even with 55.5% of the vote in the 2013 special election for U.S. Senate, the Democrat carried just six of 12 districts—not a full-fledged undermining of majority rule, but a dubious result nonetheless.

Suspect 3: Virginia’s Advisory Commission

The most important point to make about Virginia’s advisory commission is that it had little to do with the congressional district plan the State adopted. While the divided State Legislature (State House under Republican control and State Senate under Democratic control) had plans before it and advisory commission advice in April 2011, it was not until
after the November elections, in which the Senate split 20-20 and the Republican Lieutenant Governor could cast a tie-breaking vote, that Virginia settled on a congressional plan. It was, unsurprisingly, the one State Republicans preferred, and it was a pro-Republican gerrymander.

Virginia has become a closely competitive state with predictable partisan voting patterns. Despite its competitiveness, Democrats were able to win just three of 11 House races in 2012 and 2014 (and after the map was redrawn in 2016, Democrats won four and five of 11 in 2018 and 2020, respectively). Notable, too, under Virginia’s pro-Republican congressional district lines enacted in 2012 and used in 2012 and 2014, Barack Obama won 52% of the two-party vote and carried just four of 11 districts. His was not the only statewide election in violation of majority rule. Table 4 shows that in seven of the 10 elections the Democrat won a two-party vote majority. Five of those times their majority vote percentage was between 50 and 53.2. Nevertheless, the majority preferred Democrat failed to carry a majority of districts in four of those five elections. This occurred as a consequence of 2.7–4.0 asymmetry biases operating to the detriment of Democrats (see the median–mean gerrymandering bias numbers in Table 4). The bias is persistent; it occurs in all 10 elections we observe. What is more, except in Mark Warner’s abnormally lopsided 2008 U.S. Senate victory, less than 1% of all the partisan blind plans have asymmetry values (median–mean differences) with magnitudes larger than those observed based on the district lines chosen by the State.

The evidence points strongly and convincingly to the fact that Virginia’s 2012–2014 congressional districting plan was a partisan gerrymander. The plan was persistently biased against Democrats in all elections that were anything within earshot of being competitive. Four of five times when statewide Democratic candidates won statewide percentages between 50 and 54, the candidates failed to carry a majority of districts. The biases and majority rule violations are certainly not attributable to residential patterns, as ascertainable by comparison to the computer-generated 10,000 partisan blind maps. And, finally, in the 2012–2014 House elections Democrats won just three House seats, telling us that they did not possess resources necessary to overcome the disadvantage imposed by the district lines.

The short version of the Virginia story is that the State enacted a Republican gerrymander. It was not chosen or even suggested by the State’s advisory committee, but the existence of the committee did nothing to help ward off the enactment.18

Conclusion

Substantial evidence suggests redistricting commissions do a good job delivering on the charges they have been given—for example, meeting population equality, drawing contiguous and reasonably compact districts, preserving jurisdictional boundaries, and creating competitive districts. It also deserves emphasis that compared to line drawing by state legislatures, commissions create district plans generally closer to a partisan blind standard of line drawing. Those positive conclusions duly noted, the same sort of positive remarks cannot be said, at least uniformly, about how well commissions avoid partisan gerrymanders.

Turning to independent commissions, we found no evidence of gerrymandering in the maps enacted in California and Washington. Observed and expected standard deviations closely match in both states. Similarly, the observed gerrymandering bias runs in both directions, for and against Democrats and Republicans depending on the election (see Table A in the Appendix for detailed results). Compared to expected gerrymandering bias, California’s commission slightly reduced but did not eliminate anti-Democratic bias arising from residential patterns, while Washington’s commission drew a plan that allowed the essential consequences of partisan residential patterns to stand. In short, there is nothing to see in terms of a tilted playing field one way or another and, from that, no harm that could have been produced through the chosen district plans. The same, however, cannot be said for the work of the independent commission in Arizona. Chairperson Coyle Mathis joined the Democrats on every decision, which were consistently opposed by the commission’s Republican members. The final map was a pro-Democratic gerrymander largely resulting from overly competitive districts that erased the Republicans advantage from the residential distribution of voters. This produced contra-majoritarian results, but not to the extent that Democrats were consistently entrenched as the majority party. Having an advisory commission may also avoid partisan gerrymanders, but the advice has to be heeded not ignored, as in Virginia. In Iowa and New York, the enacted maps fall in line with our neutral map-making standard. There is a mild suggestion that Iowa’s districting process created more highly competitive districts than residential patterns alone would suggest. A consequence is that with 55% of the vote both parties win all four of the State’s congressional districts, but this strong responsiveness does not favor one party over the other. The most noticeable characteristic for New York is that the role of an advisory commission and subsequent choice, actually made by a court, did little or nothing to reduce the bias associated with the downstate-upstate concentrations of Democratic and Republican voters. Here, again, one might want to argue that it would be proper, and surely not objectionable, for the choice of districts lines to reduce the built-in residential bias operating against Democrats. Reducing that built-in bias could help to eliminate a contra-majoritarian result where, as in the Comptroller race in 2010, the Democratic candidate wins 52% of the vote but carries just 11 of 27 districts. Still, such an argument is asking for a great deal of fine tuning to account for unusual results, inasmuch as most statewide races have Democrats winning 55 to 65% of the vote and its congressional delegation split about two-to-one in favor of Democrats.
Last, where the bipartisanship offers little more than to have a nonpartisan choose between competing party desires to promote their partisan interests it is possible that a fait accompli gerrymander will follow, as in New Jersey. The commission’s 7-6 vote, split down party lines, favored the Republican’s plan, so it is perhaps unsurprising that the map produced a detectable anti-Democratic bias.

From these findings, two points seem clear. First, commissions are decidedly bipartisan, and the maps they create are influenced by politics and their partisan skew. In some instances (e.g., California, Washington), bipartisan collaboration produces plans endorsed by both parties; these maps reduce partisan bias to little more than what one would expect from underlying residential patterns. On the other hand, when bipartisanship fails to materialize (e.g., Arizona, New Jersey), commissions create maps that add partisan bias in favor of the voting majority.

Second, and perhaps more importantly, a fundamental problem for any and all commissions is their adoption focuses on form and not substance. Commissions are given no charge, or at most a vague charge, to avoid partisan gerrymanders. The missing, meaningful charge likely reflects the same problem the Supreme Court sees for itself, a fatalist resignation that no discernable and manageable standard exists. A starting point is to acknowledge some sort of standard is needed. One that recognizes a minimalist adherence to American political traditions that sizable partisan minorities are to have some voice and that no party is to be able to entrench itself in power regardless of its level of vote support is one possibility.

**Appendix**

*Neutral Map Map-making Process*

The process we use to develop a large set of neutral counterfactuals draws maps in a four-step process. For a more technical representation along with evaluations of the authors’ claims of neutrality, see Magleby & Mosesson, (2018).

1. We reduce the map to a connected graph where each geographic unit, a VTD in this setting, is a vertex of the graph. Two vertices are connected by edges if the units of geography share more than a single point of their boundary (thus, the resulting districts will be “rook” contiguous).

2. The algorithm randomly collects connected vertices into groups and joins them into a new vertex that aggregates the demography of each of its constituent vertices and preserves the connectedness with any vertex with which a constituent vertex was adjacent. It continues to randomly join groups of vertices until the number of groups is equal to the number of districts in the state.

3. In order to achieve balance (population parity between districts), Magleby and Mosesson use an algorithm proposed by Kernigan and Lin to switch constituent vertices between groups of vertices. If it is not possible to achieve balance with a moderate number of switches, then we discard the map and start over. If balance is possible after a fixed number of switches, then we record the map for future analysis.

4. Repeat steps 1, 2, and 3 until we find 10,000 maps that contain equal district populations.

**VRA and Majority–Minority Districts in Arizona**

We adhered to the VRA requirement for Arizona by essentially accepting and holding constant the state’s two majority-minority districts (Chen & Rodden, 2013). To accomplish this, we identified all VTDs with a centroid that falls inside the commission-drawn majority-Latino districts. We combine all VTDs that do not share a boundary with an adjacent district into a single pseudo-VTD. The political and demographic characteristics of the pseudo-VTD are the aggregated characteristics of its constituent VTDs. The remaining VTDs are treated as geographic units that may be (but not necessarily) joined with the pseudo-VTDs. The algorithm joins adjacent VTDs to the pseudo-VTDs randomly, so the resulting hypothetical districts are very similar, but not exactly the same as the commission-drawn maps.

**Compactness**

Compactness is an oft-used criterion to draw and assess fair maps, and 18 states explicitly require compact districts in their congressional redistricting statutes. Even so, it is unclear what compactness means—is it meant to minimize the geographic distance between residents of a district or is it an effort to avoid bizarrely shaped districts? This ambiguity contributes to the controversy over how to best measure compactness. Here, we focus on the two prime measurements of shape compactness: the dispersion and perimeter of a map’s districts. We measure dispersion as the ratio of the district area to the area of the minimum circumscribing circle and perimeter as the ratio of the district area to a circle with the same perimeter (Niemi et al., 1990).

As an example of how the Magleby & Mosesson, 2018 algorithm performs vis-a-vis human mapmakers, we compare the compactness of 1,000 algorithm-drawn maps with two majority-minority districts in Arizona to the map produced by the state’s redistricting commission. In terms of dispersion, the median district in the commission-drawn map had a ratio of district area to smallest possible circumscribing circle of 0.4797. That was higher than the median district in 95.8% of the maps drawn by the algorithm. The ensemble of maps drawn by the algorithm had an average median district of 0.421. However, the difference in median districts tells an
Table A. Evidence of Skew and Reduced Variation in Two-Party Vote Percentage in California, Iowa, New York, and Washington.\(^a\)

| State | Year | Office   | Total Vote% | Mean District Vote% | Median District Vote% | Turnout | Obs Gerrymander Bias | Exp Gerrymander Bias | Obs Std Dev | Exp Std Dev | Obs Wins | Exp Wins |
|-------|------|----------|-------------|---------------------|-----------------------|---------|----------------------|---------------------|-------------|------------|---------|---------|
| CA    | 2008 | President | 62.12       | 62.36               | 62.46                 | .24     | .10                  | -.14                 | 1.40        | 12.91      | 13.03    | 43       | 41.56    |
|       | 53   | Atty     | 50.39       | 51.11               | 49.37                 | .72     | 1.74                 | -.26                 | 2.67        | 14.25      | 14.39    | 25       | 24.55    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| IA    | 2008 | President | 54.85       | 54.81               | 55.49                 | .03     | .67                  | 1.39                 | 4.59        | 5.49       | 3        | 3.01     |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| NY    | 2008 | President | 63.57       | 65.47               | 59.41                 | 1.90    | -.60                 | 6.34                 | 15.50       | 15.05      | 24       | 24.77    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| WA    | 2008 | Atty     | 56.52       | 60.41               | 53.28                 | 3.89    | -.73                 | 7.13                 | 17.59       | 16.62      | 16       | 16.66    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| IA    | 2010 | Atty     | 55.56       | 55.55               | 56.09                 | .01     | .54                  | 1.86                 | 3.78        | 5.22       | 4        | 3.16     |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| NY    | 2010 | Atty     | 56.52       | 60.41               | 53.28                 | 3.89    | -.73                 | 7.13                 | 17.59       | 16.62      | 16       | 16.66    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| WA    | 2010 | Atty     | 40.54       | 40.32               | 41.21                 | .22     | .89                  | -.12                 | 8.65        | 8.46       | 1        | 1.13     |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| IA    | 2012 | Atty     | 56.52       | 55.56               | 56.09                 | .01     | .54                  | 1.86                 | 3.78        | 5.22       | 4        | 3.16     |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| NY    | 2012 | Atty     | 63.57       | 65.47               | 59.41                 | 1.90    | -.60                 | 6.34                 | 15.50       | 15.05      | 24       | 24.77    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| WA    | 2012 | Atty     | 56.52       | 60.41               | 53.28                 | 3.89    | -.73                 | 7.13                 | 17.59       | 16.62      | 16       | 16.66    |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| CA    | 53   |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| IA    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| NY    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |
| WA    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| CA    | 53   |          |             |                     |                       |         |                      |                     |             |            |          |         |
|       |      |          |             |                     |                       |         |                      |                     |             |            |          |         |
| IA    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |
| NY    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |
| WA    | 2010 |          |             |                     |                       |         |                      |                     |             |            |          |         |

\(^a\) See Table 4 for column descriptions.
incomplete story. In particular, the variance in compactness for the algorithm-drawn maps was lower than in the commission-drawn maps. Among the algorithm-drawn maps, 86.95% of the maps exhibited a standard deviation of dispersion scores lower than what we observe in the commission-drawn map. In other words, the shapes of the algorithm-drawn districts were more similar than the shapes of the commission-drawn districts. Turning to perimeter, the median district in 89.5% of the algorithm-drawn maps has a lower ratio of the district area to the area of a circle with the same perimeter as the district. As with the dispersion measure, the standard deviation in the perimeter measure across districts in algorithm-drawn maps tends to be lower than the standard deviation of the same measure in the commission-drawn map. More particularly, the standard deviation of the perimeter measure is lower in 99.8% of the algorithm-drawn maps compared to the commission-drawn maps. We also looked at the least compact districts. In those comparisons, just 7.25% of the algorithm-drawn maps have a ratio that is smaller than the ratio in the least compact district of the commission-drawn map. When we consider the dispersion measure, 89.0% of the hypothetical maps have a least compact district that is less compact than the least compact district in the enacted map. These estimates are all based on maps with at least two majority-Latino districts. As with the other metric, the algorithm-drawn maps show more consistent patterns in compactness than we observe in the commission-drawn map.

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**Notes**

1. It is possible that for congressional districts Congress could step in under its Article I, section 4 powers, but 220 years of history, where its only meaningful and lasting attempt to set a standard was a requirement to use single-member districts (5 Stat.491 [1842] and 2 USC § 29c [1967]), suggests its intervention is highly unlikely.

2. This is an outcome that occurred twice in the post-2010 round of redistricting. In Florida, the State Supreme Court found that portions of the legislature-drawn Congressional map violated the 2010 Fair Districts Amendments to the state Constitution (League of Women Voters of Florida v. Detzner, 2015). Similarly, in Pennsylvania, its high court held that the Congressional plan violated the Free and Equal Elections Clause of the Pennsylvania Constitution (League of Women Voters of Pennsylvania v. The Commonwealth of Pennsylvania, 2018). In one of their two forms of analysis, Henderson et al. (2018) use a set of computer-generated maps to evaluate commission maps, but their focus is on competition and margin of victory, whereas our focus is on partisan entrenchment through undue packing and partisan exclusion through excessive cracking.

3. This section draws on information from on Justin Levitt’s “all about redistricting” and Ballopedia websites.

4. Ohio uses an advisory commission for state legislative but not for congressional districts.

5. Additionally, all states must comply with section 2 of the Voting Rights Act. Arizona, Virginia, and parts of California and New York were required to submit district plans for pre-clearance with the Department of Justice under section 5 of the Voting Rights Act prior to the Supreme Court’s decision in Shelby County v. Holder (2013).

6. Greeymanders may create these harms either through delineational manipulations (line drawing) or choices of institutional arrangements (e.g., at-large voting). Here, we focus only on the delineational forms of gerrymanders.

7. While crucially important, partisan predictability turns out to be just a minor matter in contemporary American politics. Daniel Magleby and his colleagues, for instance, have looked at the correlations between votes in congressional districts for statewide offices in each of the 38 states with three or more congressional districts. They found high levels of partisan predictability everywhere but Oklahoma and West Virginia (Magleby et al., 2019, 90). We repeated the same correlational analysis and found the same results: in most states all the dozens of correlations are above .9, while in Oklahoma 70 of 91 are below .9 (nearly half below .8) and in West Virginia 68 of 171 are below .9 (with nearly a third below .8). Without a consistent reading of partisan support from people in particular geographical location, it is not plausible to think a persistent partisan bias could emerge from the placement of district lines.

8. See Snedecor et al. (1967) for the precise formula for calculating skew. See, e.g., Blalock (1979, 66-67) for a discussion of using the median and mean as a rule of thumb for indicating skewness.

9. By focusing on statewide election returns, we can be sure that the same candidates’ names appear on the ballot in each precinct in the state. VTDs roughly correspond to state designated voting precincts; however, the correspondence to actual voting precincts is not precise. In practice, states re-precinct more frequently than they redistrict. States share their precinct boundaries with the Census Bureau once every 10 years, so the VTDs we use to develop our neutral maps are almost certainly out of date by the 2012 and 2014 elections, requiring us to rely on estimated vote totals by VTD. On the other hand, the Census Bureau does ensure that the population reported for VTD, VTDs we use to develop our neutral maps are almost certainly out of date by the 2012 and 2014 elections, requiring us to rely on estimated vote totals by VTD. On the other hand, the Census Bureau does ensure that the population reported for VTDs is accurate.
gerrymandered in violation of our standard of abiding by democratic principles in the American political tradition. In these states, there could not be a strict violation of majority rule given that the vote majority party must always win at least one of two seats and any exclusion via a 2-to-0 seat outcome is the one and only result that provides strict adherence to majority rule. Two states—Kentucky and Oregon—did not provide data at the voter tabulation district level. Last, two states—Oklahoma and West Virginia—were excluded because they do not display voting patterns with sufficient partisan predictability to think their districts could be gerrymandered (see fn3).

13. The two states appearing as outliers because they have considerably homogenized the district percentages are Maryland (expected just below 16 and observed just above 11) and Utah (expected just above 12 and observed between five and six), which present as possible exclusionary gerrymanders created by vote cracking (Magleby et al., 2019). For states above the line, a larger than expected standard deviation denotes that the map clusters like-minded partisans more than we would expect from residential patterns alone. This metric, however, is insufficient to identify a partisan gerrymander since entrenchment requires a combination of both packing and cracking the disadvantaged party’s vote (Best et al., 2018).

14. Failing to achieve what they wanted through the chairperson’s ouster, the majority Republican State Legislature challenged the constitutionality of the Commission’s map having been produced by a process contrary to the expressed words in the U.S. Constitution’s Election Clause: “The Times, Places and Manner of holding Elections for Senators and Representatives shall be prescribed in each State by the Legislature thereof; but the Congress may at any time by Law make or alter such Regulations.” In other words, the Legislature argued that a commission created through a citizen initiative is a workaround in contravention of the clear meaning that the function of drawing congressional districts resides with the Arizona State Legislature, unless Congress takes it upon itself to reassign the responsibility. The district court ruled in favor of the Commission and, upon appeal, the Supreme Court affirmed, finding that, while the Framers likely did not envision a lawmaking process through initiative, the process is in “harmony with the Constitution’s conception of the people as the font of governmental power” (Arizona State Legislature v. Arizona Independent Redistricting Commission, 2015, slip opinion at 30).

15. Arizona’s Commission drew two Hispanic majority-minority districts. As such, our 10,000 computer-drawn plans also included two majority-minority districts.

16. The probability that the expectations for fifth, sixth, and seventh districts exceed the observed Democratic percentages in the presidential election are, respectively, .0009, .0170, and .0005. For the Senate election, they are, respectively, .0014, .0160, and .0554.

17. Democrats won five of nine House seats in 2012 with just 45.6% of the major two-party vote statewide. In 2018, the five of nine Democratic wins came with a statewide majority of the major two-party vote, 50.9%.

18. In February 2019, Virginia lawmakers approved a constitutional amendment to create a new bipartisan commission to be used in the 2020 redistricting cycle. To win final approval, the proposal needed to be approved by the Legislature again in 2020 (it was) and win approval from voters in November 2020 (it did).

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