Do Redistricting Commissions Avoid Partisan Gerrymanders?

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Abstract

As attempts to combat partisan gerrymandering transition from proposals before the Supreme Court to state-based districting commissions, it is time to ask this question. How well did the commissions used in the 2010 round of redistricting for states with three of more congressional districts perform in avoiding partisan gerrymanders of congressional districts? 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.

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The Supreme Court June 2019 decision, holding "partisan gerrymandering claims present political questions beyond the reach of the federal courts" (<u>Rucho v. Common Cause</u> 2019, slip opinion at 30), makes it likely that attempts to curtail partisan gerrymandering will rest on the effectiveness of redistricting commissions. While other possibilities exist,[1] commissions are the most frequently promoted solutions among reformers. Moreover, the people in various states appear to agree with the reformers. Since 2015, citizen initiatives in Colorado, Michigan, Missouri, Ohio, and Utah adopted commissions.

Our question is how well do redistricting commissions work in avoiding partisan gerrymanders. Iowa's advisory commission has long been praised for its evenhandedness. Otherwise, however, preliminary evidence points in two directions. Some studies have found that commissions tend to outperform state legislatures when it comes to the competitiveness, compactness, and partisan bias (McDonald 2004; Litton 2012; Edwards et al.2017; Lindgren and Southwell 2013). Jamie Carson and Michael Crespin, whose analysis covers the 1990 and 2000 rounds of redistricting find commissions created more competitive plans than those created by legislatures (Carson and Crespin 2004), and Laura Royden and Michael Li 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 (Royden and Li 2017). Alex McKenna and his colleagues report that comparisons of the degree of asymmetry (partisan bias) before versus after 2011 show commission plans added less bias than plans drawn in states when one party was in sole control of the process (McKenna et al. 2019; see also McGann et al. 2016).

On the other side of the ledger are those who reach less optimistic conclusions about commissions (Cottrill 2012; Miller and Grofman 2013; Kousseser et al. 2018). For instance, we know that Republicans in Arizona challenged the partisan fairness of its independent commission's plan, which the Supreme Court held, while perhaps suspect,

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[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 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. It's also possible that challenges in state courts, as in Pennsylvania and Florida post-2010, will be a sometime-solution (see Wang et al. 2018).

was not intentionally biased. We also know from Jowei Chen and David Cottrell's analysis of all states' congressional districting plans that California's independent commission produced, more so than any other state, bonus seats for Democrats compared to expectations from computer generated neutral districting. And then there is the essentially ignored advisory commission plan that preceded Virginia's legislature taking over the process or redrawing the State's congressional districts. The result was an unconstitutional racial gerrymander (Page v. Virginia State Board of Elections 2015) with a decidedly pro-Republican bias (Hebert and Lang 2015). In short, commissions probably do a good job relative to having partisan politicians in control, especially partisans of just one stripe, but other evidence leaves one to wonder whether they do a good job by other standards.

In the analyses that follow we assess whether commissions produce district maps that are biased in favor of one party over another. Unlike previous studies that compare maps produced by commissions to those produced by partisan legislatures, we also evaluate commission maps with respect to 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. We evaluate whether congressional district maps produced in the 2010 round of redistricting resulted in gerrymanders of partisan exclusion and entrenchment. 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.

Commission Forms and Procedures[2]

Thirteen states provide for commissions to choose a plan or to advise its legislature on selection of congressional and state legislative districts.[3] Commissions take four forms,

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[2] This section draws on information from on Justin Levitt's "all about redistricting" and *Ballopedia* websites.
[3] Ohio uses an advisory commission for state legislative but not for congressional districts.

Table 1: 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.

[Table 1 about here]

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.

[Table 2 about here]

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 devoid of self-serving partisan intentions. Still, it is useful to keep in mind a few points about the decision making process, see 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, 644-5).

[Table 3 about here]

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. As we've said, our purpose is to check the evidence to see which possibility comes closer to describing the outcomes.

Identifying Gerrymanders

We seek an application of a metric consistent with the aspirations of partisan fairness congruent with American political traditions. Those traditions have spoken in a

similar voice since the U.S. Congress first mandated the use of single-member districts for congressional elections. In the 1842 Apportionment Act debate over whether Congress should outlaw the use of at-large voting in House elections, Representation Thomas Arnold (Whig of Tennessee) made this point: "the majority should govern but the minority should be heard" (quoted in Quitt 2008, 638). Nearly a century and a half later, in <u>Davis v. Bandemer</u> (1986, 125), 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 <u>Reynolds v. Sims</u>" (<u>Davis v. Bandemer</u> 1986, 125).

Gerrymanders, either through delineational manipulations (line-drawing) or choices of institutional arrangements (e.g., at-large voting), potentially 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*. Each form of potential for harm can be detected through observation of one or another rudimentary statistical indicator from the two-party vote percentage distribution. If one or the other indicator is present, the next step is to check whether the potential for harm produced actual harm that, in fairness, is to be avoided.

The statistical indicator for an exclusionary gerrymander is an abnormally small standard deviation of the vote distribution.[4] The small standard deviation signals an

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[4] In a formula the standard deviation is

$$\sqrt{\sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}}$$

where x is the value of interest for observation i, $\bar{x}$ the average value of interest among all observations, n is the total number of observations. To carry out this calculation, you begin by taking the square of the difference between the value of interest, x, for the first observation and the average value of interest, $\bar{x}$, for all observations , and divide that number by the total number of observations minus one, $n-1$. You then repeat this process for every observation, 1 to n. The standard deviation is the square root of the sum of this calculation for every observation. In practice, this calculation is simple for a statistical software package.

homogenization of the two-party vote percentages among districts, similar to what is achieved by using at-large voting where the partisan votes for candidates all tend to split in similar percentages. As applied to delineational gerrymandering the tactic that achieves homogenization is though cracking the minority party vote percentage in as many districts as practicable—i.e., 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. As for entrenchment gerrymanders, the 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).[5] The delineational 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.

These statistics are necessary indicators of whether manipulations have been employed, but standing alone they do not indicate whether gerrymandering harm has been imposed. To check for harm they need to be considered along with other indicators that, taken in conjunction, form the proper set of necessary and sufficient conditions, each being necessary and the totality being sufficient to indicate a harmful gerrymander has been wrought.

The relevant questions to ask of commission plans are these.

Exclusionary gerrymanders:
1. Are voting patterns predictably partisan?
2. Is the standard deviation of the two-party vote percentage distribution smaller than expected due to residential patterns?
3. Are minority party opportunities to win a district minimal?

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[5] See Snedecor and Cochran (1967) for the precise formula for calculating skew. See, e.g., Blalock (1979, 66-7) for a discussion of using the median and mean as a rule of thumb for indicating skewness.

The median is the midpoint score of a set of numbers arranged in order from low to high; the mean is simply the average score. Importantly, as it relates to redistricting partisan politics, having control over the

4. Do the facts of the House elections show minimal inclusion (when, as here, the evaluation takes place post-hoc)?

Entrenchment gerrymanders:

1. Are voting patterns predictably partisan?
2. Does the median versus mean district percentage difference show a gerrymandering bias running persistently against one set of partisan voters?
3. Does the gerrymandering bias go beyond expected median-mean due to residential patterns?
4. Does the bias violate majority rule under reasonably competitive electoral circumstances, without compensation from turnout bias?
5. Do the facts of the House elections show a similar gerrymandering bias with the disadvantaged party persistently holding a minority of seats in a delegation (when, as here, the evaluation takes place post-hoc)?

A first necessary condition for gerrymandering of either sort, exclusionary or entrenchment, 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. While crucially important, partisan predictability turns out to be just a minor matter in contemporary American politics.[6]

For an exclusionary gerrymander to cause harm—i.e., silencing minority party voices—as we have said, the choice of where to place the district lines homogenizes the two-party vote percentages, indicated by a standard deviation smaller than expected compared to a state's underlying residential patterns. If 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—e.g. perhaps residential patterns, perhaps overwhelming support for the majority party, or perhaps something else. In other words, a relatively small standard deviation is the

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[6] Daniel Magleby and his colleagues 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. 2017).[6] Thereafter, deciding whether a state's districts are a gerrymander requires inquiries into multi-layered necessary conditions applied to case specific circumstances.

leading indicator of the choice to crack a minority party's vote; minimal opportunity to elect minority party members is the harm.

Inferring the existence of entrenchment gerrymanders 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,

Total electoral bias = Turnout bias + 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, 536-7; Butler 1951; Erikson 1972, 1236; Gudgin and Taylor 1979, 55-9; Grofman et al. 1997, 461-4)—i.e.,

Turnout bias = Mean district vote% - Statewide vote%,

Gerrymandering bias (asymmetry bias due to skew) is the difference between a party's median district vote percentage, 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, 534-6; Butler 1951, 330; Erikson 1972, 1237; McDonald and Best 2015; Wang 2016a; 2016b)—i.e.,

Gerrymandering bias = Median district vote% - Mean district vote%.

Distinguishing between turnout and gerrymandering bias is but one inferential layer for investigating the possibility of entrenchment gerrymanders. The bias could be natural or chosen, natural in the sense of 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 more often than not, then the bias operating against them cannot be deemed to be structural. Finally, given that we are evaluating commissions when the offices of most interest, those elected through the districts, have actually been contested, it is fair to check whether a 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 <u>Daily Kos</u> (Wolf n.d.) and shapefiles provided by the U.S. Census Bureau.[7] Since U.S. elections at all levels are administered by county or local governments, collecting statewide data is often quite challenging. <u>Daily Kos</u> 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.

$$d_i^t = \delta_i D^t,$$

where d_i^t is the estimated number of votes cast for a Democratic candidate in VTD i in election t, δ_i is the proportion of a county's votes cast in VTD i for the 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

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[7] 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 ten 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 VTDs is accurate.

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 Daniel Magleby and Daniel Mosesson (Magleby and Mosesson 2018). Each map has the requisite number of contiguous districts with a population variance of plus or minus 1 percent. The process itself is blind to partisan considerations; the computer algorithm considers only population and contiguity of VTDs. 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.

Evaluations

Figures 1 and 2 offer overviews of the relationships between the homogenization (Figure 1) and electoral bias (Figure 2) in two-party vote percentages in the 34 states we can evaluate for avoiding partisan gerrymanders.[8] The seven commission states are displayed with red triangles, and all others (district plans chosen by legislatures or courts). One fact is clear. As a generalization, commissions perform relatively better than states that don't use them.

[Figures 1 and 2 about here]

The line at 45 degrees in Figure 1 represents an observed standard deviation corresponding to an outcome that could be expected from the residential pattern of partisan voters. The closer a state is to that line, the closer a choice to let voters fit, generally, into districts with a partisan disposition that their residential location dictates. 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

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[8] The 16 states not included are (1) 12 that have one or two congressional districts and therefore could not have gerrymandered in violation of democratic principles in the American political tradition (2) two states—Kentucky and Oregon—did not provide data at the voter tabulation district level; and (3) two states—Oklahoma and West Virginia—do not display voting patterns with sufficient partisan predictability to think their districts could be gerrymandered.

districts that generally are less competitive (fewer closer to the state average percentage) than expected from residential patterns. Moreover, if the vote distribution take 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 Stephanopolous and McGhee 2015). Many states appear above the 45 degree line, meaning they are choosing plans that have fewer competitive districts than expected.[9] This includes, to varying but noticeable degrees, three commission states—viz., Arizona, Virginia, and New Jersey. The other four commission states are close to the line—viz., Iowa, Washington, California, and New York.

When it comes to adding electoral bias, the 45 degree line in Figure 2, as in Figure 1, records how close the bias comes to expectations based on residential patterns. Three commission states are almost precisely in line with expectations—viz., New York, Washington, and Iowa. The other four—California, Arizona, New Jersey, and Virginia— each introduced bias two to three points away from expectations. In the case of California, it's proper to take notice that no harm was done. That's 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 residential-related bias operating against Democrats. Arizona, New Jersey, and Virginia, on the other hand, 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

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[9] 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 5 and 6).

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 reduce 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 general tendencies, average values; a closer look at the state-by-state details is required to say whether any of the three actually enacted a partisan gerrymander.

Independent Commissions

We have seen that, on average, Arizona's commission biased elections in favor of Democrats and dispersed partisan voters in such a way to create less competitive districts than partisan residential patterns would indicate. California reduced but did not eliminate anti-Democratic electoral bias arising from residential patterns, and in doing so did not have any noticeable effect of competitiveness beyond what partisan-associated residential patterns would indicate. Finally, the State of Washington's commission drew a plan that reflected the essential consequences of partisan residential patterns, with respect to dispersion and bias.

The details underlying the general tendencies for these three independent commission states are reported in Table 4. The Arizona Commission's operation post-2010 was struck with controversy including the ouster of the Commission's nonpartisan arbiter by the Republican Governor and later reinstatement by the State Supreme Court. At issue was the Commission's adopted map, which to Republicans eyes looked like a hit on Republican prospects in the 2012 elections, and likely elections going forward. Republican displeasure was ultimately resolved by the Supreme Court in favor of the Commission's decisions in a two-case sequence, the first was a challenge to the districting process under the Commission; the second was a challenge to the results (Arizona State Legislature v. Arizona Independent Redistricting Commission 2015; Harris v. Arizona Independent Redistricting Commission 2016).

The dispute over the actual results in the districts was whether the desire to gain advantage for one political party by intentionally over-populating voting districts to comply with the Voting Rights Act can justify devaluing individual votes in violation of the one-person, one-vote principle. While the question as put did not claim Arizona's enacted plan was a partisan gerrymander of the cracking or packing variety—as contrasted with malapportionment with partisan effects—the question of Democratic partisan advantage was easy to see ("Appellants' basic claim is that deviations in their apportionment plan from absolute equality of population reflect the Commission's political efforts to help the Democratic Party," <u>Harris v. Arizona Independent Redistricting Commission</u> 2016, slip opinion at 5).

[Table 4 about here]

The numbers in Table 4 bear this out. In all ten statewide elections we analyze Arizona Democrats have about a two-point advantage from favorable turnout bias. In addition, while the Republicans could expect to balance that pro-Democratic turnout bias with a pro-Republican asymmetry bias (gerrymander bias) associated with residential patterns, the Commission's plan erased the residential pattern favorableness and went a step further by adding about a point and a half of pro-Democratic favorableness due to asymmetry. On those two scores Republicans were right to claim mistreatment (in addition to the fact that the Commission plan paired two Republican incumbents, and the pairing was despite the addition of one congressional district after the 2010 Census).

The potential for harm to Republicans, and at least in one sense observable harm, can been seen in the facts that in the two closest elections of our ten—Attorney General in 2010 and U.S. Senate in 2012—the Democratic candidates won just over 48 percent of the two-party vote and carried 5 of 9 congressional districts. Nevertheless, the contra-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 5 of 9, a majority, congressional seats in both 2014 and 2016.

Both the California and Washington commissions operate as one would expect from a process with no partisan tilt one way or the other. As was clear from Figure 1, the observed and expected standard deviations closely match in both states. The observed gerrymandering bias (i.e., asymmetry) leans in both directions, usually with slight favoritism toward Republicans but in a few elections with slight favoritism toward Democrats. In both states 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.

Advisory and Politician Commissions

As is apparent from the data in Figures 1 and 2, there is not much to say about dubious districting results in Iowa. From the details in Table 5, there is but 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 percent of the vote both parties win all four of the State's congressional districts. Someone might want to argue about whether such strong responsiveness is desirable, but any such argument is not about whether the district plan is more favorable to one party and less favorable to 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 with the assistance of a special master, did little or nothing to reduce the bias associate 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 New York 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 percent of the vote but carries just 11 of 27 districts. Still, such an argument is asking for a great deal of fine turning to account for an unusual results, inasmuch as most statewide races have

Democrats winning 55 to 65 percent of the vote and its congressional delegation split about two-to-one in favor of Democrats.

[Table 5 about here]

New Jersey's results in Table 5 bear a similarity to New York's, with several of the statewide races being 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. 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 gerrymander bias (asymmetry 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 percent of the vote in the 2013 special election for U.S. Senate, the Democrat carried just 6 or 12 districts—not a full-fledged undermining of majority rule, but a dubious result nonetheless.

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 State Legislature had plans before it and advisory commission advice in April 2011, the divided Legislature (State House under Republican control and State Senate under Democratic control), it wasn't 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 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 eleven House races in 2012 and 2014 (and four of eleven after the map was redrawn for the 2016 election). Notable, too, under Virginia's pro-Republican congressional district lines enacted in 2012 and used in 2012 and 2014, Barack Obama won 52 percent of the two-

party vote and carried just four of eleven districts. His was not the only statewide election in violation of majority rule. Table 5 shows that in seven of the ten 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 to 4.0 asymmetry biases operating to the detriment of Democrats (see the median-mean gerrymandering bias numbers in Table 5). The bias is persistent; it occurs in all ten elections we observe.   What is more, except in Mark Warner's abnormally lopsided 2008 U.S. Senate victory, less than 1 percent 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 2012-14 congressional districts 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 a Democrat won a vote majority with percentages between 50 and 54, the candidate failed to carry a majority of districts. The bias and majority rule failing are certainly not attributable to residential patterns, as ascertainable by comparison to the computer generated 10,000 partisan blind maps. And, finally, in the 2012-14 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 wasn't chosen or even suggested by the State's advisory committee, but the existence of the committee did nothing to help ward off the enactment.[10]

Conclusion

Substantial evidence suggests redistricting commissions do a good job delivering on the charges they have been given—e.g., meeting population equality, drawing

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[10] 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 will need to be approved by the Legislature again in 2020 and then go on the November 2020 ballot for voter approval (see, Lau 2019).

contiguous and reasonably compact districts, preserving jurisdictional boundaries, and creating competitive districts. The same cannot be said, at least uniformly, about how well commissions avoid partisan gerrymanders.

Adopting a bipartisan, independent commission with an inclusive decision rule (California) can work to avoid a gerrymander; so, too, does one with a majority decision rule (Washington), but not always (e.g., Arizona). Having an advisory commission can also avoid partisan gerrymanders, as in Iowa. But, the advice has to be heeded not ignored, as in Virginia. And, 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.

Aside from the glaring problem, apparent in Virginia, that advisory commissions can be ignored, 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.

Figure 1: Relationship between Observed and Expected Standard Deviation in Congressional Districts of 34 States[a] that Could Have Homogenized Two-party Vote percentages, by whether They Used Redistricting Commissions
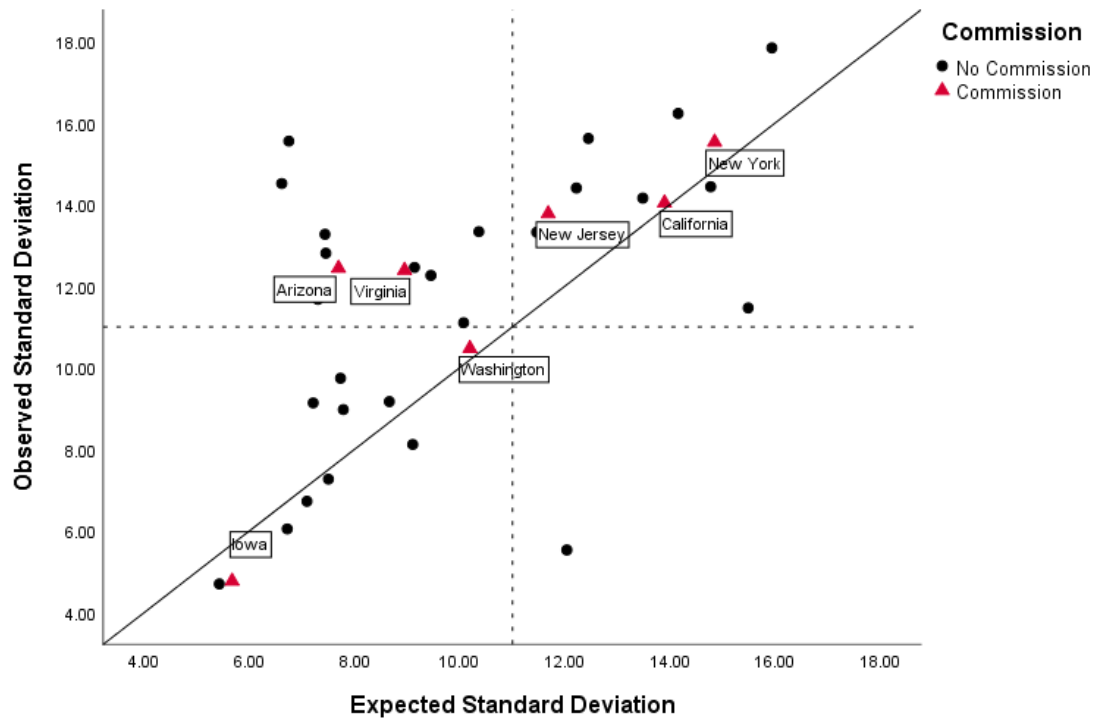
[a]The 16 states not included are (1) 12 that have one or two congressional districts and therefore could not have gerrymandered in violation of democratic principles in the American political tradition (2) two states—Kentucky and Oregon—did not provide data at the voter tabulation district level; and (3) two states—Oklahoma and West Virginia—do not display voting patterns with sufficient partisan predictability to think their districts could be gerrymandered.

Figure 2: Relationship between Observed and Expected Skew (Median – Mean Difference) in Congressional Districts of 34 States[a] that Could Have Biased Electoral Outcomes, by whether They Used Redistricting Commissions
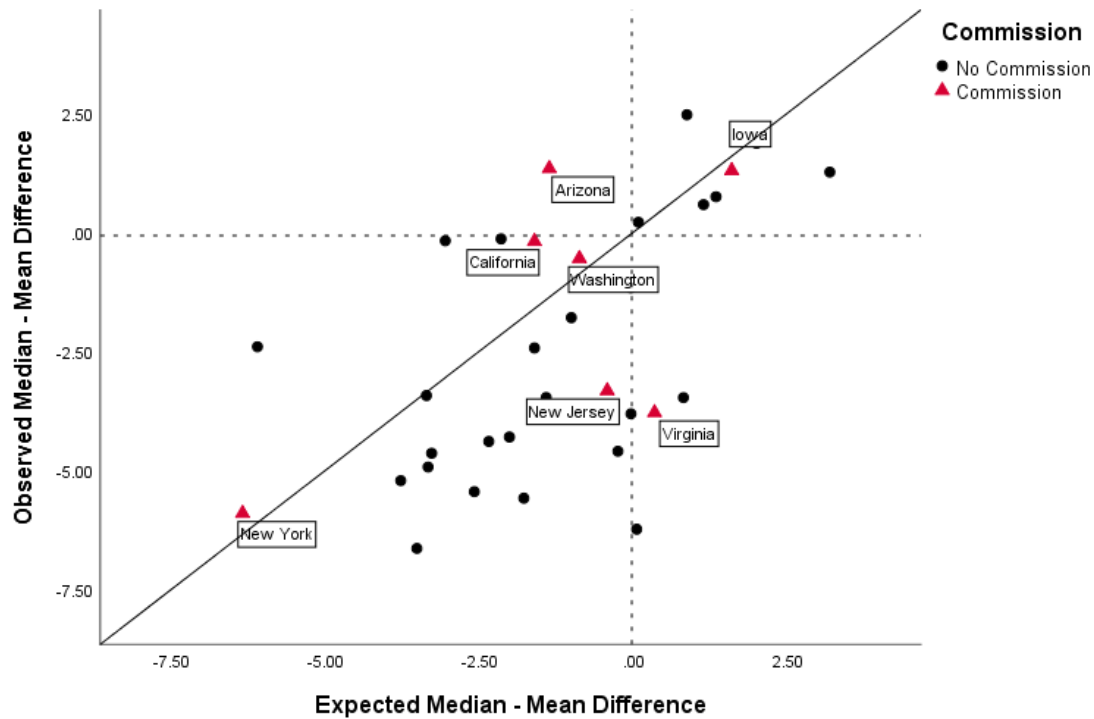
[a]The 16 states not included are (1) 12 that have one or two congressional districts and therefore could not have gerrymandered in violation of democratic principles in the American political tradition (2) two states—Kentucky and Oregon—did not provide data at the voter tabulation district level; and (3) two states—Oklahoma and West Virginia—do not display voting patterns with sufficient partisan predictability to think their districts could be gerrymandered.

Table 1: Redistricting Commission Membership Selection

Commission Type	Membership
Independent	
Arizona	5 members: not recent politician, 4 political selections & 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 & 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

[1] Idaho has an Independent Commission but only two House seats.

[2] Maine and Rhode Islands have Advisory Commissions but only two House seats.

[3] Hawaii has a Politician Commission but only two House seats.

[4] Florida, Pennsylvania, and Virginia faced legal challenges that resulted in mid-decade court imposed plans.

Table 2: Charges Given to Redistricting Commissions

Commission Type	Charges
Independent	
Arizona[6]	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.
California	Contiguous and preserve communities of interest. Compactness is secondary. Cannot consider candidate homes.
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.
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. Commission should "provide fair and effective representation and encourage electoral competition."
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.
Maine	Compact and contiguous. Cross fewest political subdivisions as possible.
New York	Contiguous and as compact "as practicable" and take into account the "historic and traditional significance of counties."
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.
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)
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.
New Jersey	Contiguous and compact. Municipalities must also be kept intact. Conflicting judicial precedent on using incumbent residence.
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.
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.

Table 2: Decision Procedures of Redistricting Commissions

Commission Type	Decision Procedures
Independent	
Arizona	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.
California	Open public meetings around state. 9 commission votes – 3 Dems, 3 Rep, 3 neither – required. Final map approved by public referendum.
Idaho	Open public meetings around state. 2/3 commission votes required for final map within 90 days after commission is formed.
Washington	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.
Advisory	
Iowa	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.
Maine	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 11. Plan subject to gubernatorial veto. If no plan is approved by June 11, state supreme court shall consider plans and public briefs to create plan.
New York	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.
Rhode Island	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.
Virginia	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	
Hawaii	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.
New Jersey	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.
Backup	
Connecticut	5/9 votes for final map by Nov. 13. Upon delivery to Secretary of State, it is published and have 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.
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.

Table 4: Evidence of Skew and Reduced Variation in Two-party Vote Percentages under Independent Redistricting Commissions

State	Year	Office	Total Vote%	Mean District Vote%	Median District Vote%	Turnout Bias	Obs Gerry-mander Bias	Exp Gerry-mander Bias	Obs Std Dev	Exp Std Dev	Obs Wins	Exp Wins
AZ	2008	President	45.69	47.36	48.40	1.67	1.04	-1.27	10.39	6.96	3	2.55
	2010	Atty General	48.11	50.06	50.29	1.95	.23	-1.52	11.12	7.15	5	3.47
		Governor	43.87	46.09	46.59	2.22	.50	-1.47	12.88	8.42	3	2.24
		Mine Insp	42.87	45.11	47.19	2.25	2.07	-1.55	13.02	8.22	2	1.95
9 Districts		US Senate	37.06	39.13	40.49	2.08	1.36	-1.35	11.97	7.65	2	.64
		Sec of State	41.79	44.00	46.66	2.21	2.65	-1.09	12.86	8.16	2	1.69
		Supt Ed	44.67	46.82	48.66	2.15	1.85	-1.15	12.21	7.67	3	2.40
		Treasurer	44.38	46.61	49.16	2.24	2.54	-1.64	12.83	8.15	2	2.49
	2012	President	45.39	47.70	48.72	2.31	1.01	-1.37	13.57	7.22	3	2.56
		US Senate	48.41	50.69	51.46	2.28	.77	-1.39	13.51	7.34	5	3.67
CA	2008	President	62.12	62.36	62.46	.24	.10	-1.40	12.91	13.03	43	41.56
	2010	Atty General	50.39	51.11	49.37	.72	-1.74	-2.67	14.25	14.39	25	24.55
		Comp	60.41	61.16	61.18	.75	.01	-1.26	13.49	13.35	41	40.60
		Governor	56.72	57.50	56.51	.78	-.98	-1.85	14.01	13.87	37	33.21
		Ins Comm	57.36	58.32	58.80	.96	.47	-1.31	14.11	13.95	36	34.61
53 Districts		LT GOV	56.25	56.37	56.40	.12	.03	-1.65	13.79	14.50	34	32.11
		US Senate	55.30	56.16	55.81	.86	-.36	-1.73	15.73	15.17	32	29.96
		Sec of State	58.18	59.08	58.93	.89	-.15	-1.75	14.42	14.12	38	34.93
		Treasurer	60.93	61.77	61.61	.84	-.16	-1.57	13.42	13.38	41	39.91
	2012	President	61.87	62.47	62.88	.60	.41	-1.20	14.27	13.51	41	40.44
		US Senate	62.52	63.00	63.33	.48	.33	-1.42	14.00	13.54	41	41.22
WA	2008	Atty General	40.54	40.32	41.21	-.22	.89	-1.29	8.65	8.46	1	1.13
		Auditor	63.54	62.85	62.48	-.68	-.37	.02	10.04	9.73	9	9.08
		Governor	53.24	52.40	51.58	-.84	-.81	-.76	11.19	10.58	5	6.39
		Ins Comm	61.38	60.68	60.45	-.71	-.23	-.12	10.38	10.02	9	8.96
		Land Comm	50.55	50.03	46.75	-.52	-3.28	-2.61	10.23	10.03	3	3.18
		Lt Gov	60.80	60.24	59.87	-.56	-.37	-.81	8.72	8.82	9	8.23
		President	58.75	57.85	57.78	-.90	-.07	-.76	11.62	11.14	8	7.96
		Sec of State	41.67	41.44	39.92	-.23	-1.52	-1.31	8.69	8.54	1	1.20
		Treasurer	51.08	50.65	49.77	-.43	-.89	-1.35	9.02	8.76	5	4.17
10 Districts	2010	US Senate	52.37	51.61	50.85	-.76	-.76	-.82	11.90	11.22	5	5.80
	2012	Atty Gen	53.48	52.60	52.11	-.88	-.48	-.29	11.77	11.23	6	5.60
		Auditor	52.95	52.22	51.42	-.73	-.81	-.95	11.04	10.77	5	6.17
		Governor	51.54	50.75	49.51	-.79	-1.23	-1.25	10.62	10.28	5	4.57
		Ins Comm	58.30	57.51	57.05	-.79	-.46	-.28	11.69	11.09	7	7.33
		Land Comm	58.74	57.92	57.36	-.82	-.56	-.82	12.05	11.33	8	7.87
		Lt Gov	53.68	53.30	53.60	-.38	.30	-1.12	7.03	8.59	6	6.01
		President	57.63	56.69	56.62	-.94	-.07	-.51	12.26	11.67	7	7.06
		US Senate	60.45	59.67	59.14	-.78	-.53	-.49	10.99	10.56	8	8.00
		Sec of State	49.62	48.87	46.01	-.76	-2.86	-1.40	10.60	10.61	4	3.25
		Treasurer	58.71	57.98	57.28	-.73	-.70	-.89	10.91	10.42	8	7.99
		US Senate	52.85	53.05	48.85	.19	-4.19	-1.65	14.07	8.46	3	4.68

Total vote%—Democratic candidate percentage of the statewide two-party vote

Mean District Vote%—Democratic candidate average district percentage of the two-party vote

Median District Vote%—Democratic candidate median district percentage of the two-party vote.

Turnout Bias—the difference in weight given to Democratic or Republican voters as a consequence of differential turnout rates among districts. Positive values show pro-Democratic turnout advantage; negative values show pro-Republican turnout advantage.

Obs Gerrymander Bias—observed gerrymander bias indicates a vote weight advantage for Democratic or Republican voters as a consequence of the disadvantaged partisans residing in districts relatively more packed with co-partisans.

Exp Gerrymander Bias—expected gerrymander bias based on 10,000 maps drawn by a computer program in a partisan blind manner, where gerrymander bias is defined above.

Obs Std Dev—observed standard deviation of Democratic two-party vote percentage among districts.

Exp Std Dev—expected standard deviation of Democratic two-party vote percentage among districts based on 10,000 maps drawn by a computer program in a partisan blind manner.

Obs Wins—observed number of districts carried (i.e., wins) by the Democratic statewide candidate

Exp Wins— expected number of districts carried (i.e., average number of wins) by the Democratic statewide candidate based on 10,000 maps drawn by a computer program in a partisan blind manner.

Table 5: Evidence of Skew and Reduced Variation in Two-party Vote Percentage under
Advisory and Politician Redistricting Commissions

State	Year	Office	Total Vote%	Mean District Vote%	Median District Vote%	Turnout Bias	Obs Gerry- mander Bias	Exp Gerry- mander Bias	Obs Std Dev	Exp Std Dev	Obs Wins	Exp Wins
IA	2008	President	54.85	54.81	55.49	-.03	.67	1.39	4.59	5.48	3	3.01
	2010	Agri Comm	37.13	37.15	38.18	.02	1.02	.85	5.54	5.95	0	.00
		Atty General	55.56	55.55	56.09	-.01	.54	1.86	3.78	5.22	4	3.16
4 Districts		Auditor	43.52	43.51	44.72	.00	1.21	1.41	5.18	5.84	0	.14
		Governor	45.00	44.99	46.39	-.01	1.40	1.99	4.90	6.14	0	.31
		US Senate	34.10	34.12	34.89	.02	.77	1.11	4.76	5.49	0	.00
		Treasurer	52.93	52.92	54.14	-.01	1.22	2.13	4.24	5.19	3	3.00
	2012	President	52.96	52.89	54.40	-.07	1.50	1.92	5.16	6.07	3	3.00
NJ	2008	President	57.86	59.17	56.47	1.31	-2.70	-.16	12.26	10.42	8	9.35
		US Senate	57.18	58.86	56.66	1.68	-2.21	-.50	12.78	10.77	9	9.29
	2009	Governor	48.08	50.40	45.83	2.32	-4.57	-.71	14.93	13.08	5	5.39
12 Districts	2012	President	58.98	60.47	58.14	1.48	-2.33	-.25	13.89	11.36	8	9.40
		US Senate	59.89	61.61	58.83	1.72	-2.79	-.13	14.24	11.84	9	9.45
	2013	Governor	38.78	41.23	36.33	2.46	-4.90	-1.15	13.95	11.52	2	2.03
		US Senate Sp	55.51	57.45	52.81	1.94	-4.64	-.17	14.34	12.78	6	8.40
NY	2008	President	63.57	65.47	59.41	1.90	-6.07	-6.34	15.50	15.05	24	24.77
	2010	Atty General	56.52	60.41	53.28	3.89	-7.13	-7.41	17.59	16.62	16	16.66
		Comptroller	52.35	56.68	48.65	4.33	-8.02	-8.36	18.23	17.31	11	12.13
		Governor	65.68	69.33	65.14	3.65	-4.20	-5.13	15.90	15.83	24	24.91
27 Districts		US Senate	67.32	70.50	64.14	3.18	-6.86	-5.89	13.66	13.01	27	27.00
		US Senate Sp	64.21	67.44	60.44	3.23	-6.99	-6.12	14.27	13.63	27	27.00
	2012	President	64.27	66.33	59.86	2.06	-6.47	-6.80	16.62	15.59	24	25.11
		US Senate	73.28	74.93	69.29	1.66	-5.65	-4.81	12.46	11.70	27	27.00
VA	2008	President	53.18	53.20	49.24	.02	-3.96	.21	12.03	8.38	5	6.71
		US Senate	65.85	65.18	63.50	-.67	1.68	-.68	7.78	4.68	11	11.00
	2009	Atty General	42.44	43.39	38.00	.96	-5.39	-.76	12.54	9.46	3	2.94
		Governor	41.31	42.19	37.50	.88	-4.69	-1.20	12.31	7.86	3	1.36
		LtGovernor	43.44	44.37	39.70	.93	-4.67	.09	12.39	8.38	3	2.09
11 Districts	2012	President	51.97	52.00	49.31	.04	-2.70	1.02	13.25	9.57	4	6.47
		US Senate	52.96	53.04	50.08	.08	-2.95	1.08	12.64	9.29	6	6.71
	2013	Atty General	50.02	50.30	46.87	.27	-3.42	.56	14.11	10.95	4	5.57
		Governor	51.35	51.56	48.52	.21	-3.05	1.40	14.25	10.92	4	6.22
		Lt Gov	55.31	55.54	52.21	.23	-3.32	1.60	12.54	10.02	7	7.33

Total vote%—Democratic candidate percentage of the statewide two-party vote

Mean District Vote%—Democratic candidate average district percentage of the two-party vote

Median District Vote%—Democratic candidate median district percentage of the two-party vote.

Turnout Bias—the difference in weight given to Democratic or Republican voters as a consequence of differential turnout rates among districts. Positive values show pro-Democratic turnout advantage; negative values show pro-Republican turnout advantage.

Obs Gerrymander Bias—observed gerrymander bias indicates a vote weight advantage for Democratic or Republican voters as a consequence of the disadvantaged partisans residing in districts relatively more packed with co-partisans.

Exp Gerrymander Bias—expected gerrymander bias based on 10,000 maps drawn by a computer program in a partisan blind manner, where gerrymander bias is defined above.

Obs Std Dev—observed standard deviation of Democratic two-party vote percentage among districts.

Exp Std Dev—expected standard deviation of Democratic two-party vote percentage among districts based on 10,000 maps drawn by a computer program in a partisan blind manner.

Obs Wins—observed number of districts carried (i.e., wins) by the Democratic statewide candidate

Exp Wins— expected number of districts carried (i.e., average number of wins) by the Democratic statewide candidate based on 10,000 maps drawn by a computer program in a partisan blind manner.

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