Democracy's Denominator

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What would happen if states stopped equalizing districts' total populations and started equalizing their citizen voting-age populations (CVAPs) instead? This is not a fanciful question. Conservative activists have long clamored for states to change their unit of apportionment, and the Trump administration took many steps to facilitate this switch. Yet the question remains largely unanswered. In fact, no published work has yet addressed this issue, though it could be the most important development of the upcoming redistricting cycle. In this Article, we harness the power of randomized redistricting to investigate the representational effects of a different apportionment base. We create two sets of simulated maps—one equalizing districts' total populations, the other equalizing their CVAPs—for ten states with particularly small CVAP shares.

We find that minority representation would decline significantly if states were to equalize CVAP instead of total population. Across the ten states in our data set, the proportion of minority opportunity districts would fall by a median of three percentage points (and by six or more percentage points in Arizona, Florida, New York, and Texas). On the other hand, the partisan impact of changing the unit of apportionment would be more muted. Overall, the share of Republican districts would rise by a median of just one percentage point. This conclusion holds, moreover, whether our algorithm emulates a nonpartisan mapmaker or a gerrymanderer and whether it considers one or many electoral environments. In most states—everywhere except Florida and Texas—switching the apportionment base simply does not cause major partisan repercussions.

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INTRODUCTION

For the last five decades, there has been one constant in the endless flux of redistricting. However district lines have zigged or zagged—whomever they have included or excluded—they have always equalized the same thing: *people*, the number of *persons* in each district. But this half-century-old consensus is now fraying. Conservative activists are now seeking to change the unit of apportionment to *eligible voters*. Under this approach, districts could contain widely varying numbers of people. But they would enclose roughly the same numbers of adult citizens (the population generally eligible to vote).

Advocates of citizen voting-age population (CVAP) equalization sometimes defend their position on theoretical grounds. Districts with equal CVAPs allegedly equalize the influence of voters—give all such persons the same sway over election outcomes, no matter where they happen to live. But another rationale for switching the unit of apportionment is less abstract and more nakedly political. In contemporary America, noncitizens and children tend to be (and to live near) racial minorities and Democrats. Conversely, adult citizens are a Whiter and more Republican group than the American population as a whole. So if districts were to equalize CVAP rather than total population, they might reduce the power of racial minorities and Democrats, cramming them into a smaller number of constituencies. At the same time, the new lines might more efficiently spread, and so boost the representation of, White Republicans.

It is possible, though not certain, that CVAP equalization is lawful. In a 1966 case, the Supreme Court upheld the use of an apportionment base different from total population: registered voters, who, unlike adult citizens, are necessarily (not just generally) eligible to vote.[1] In the 2016 case of *Evenwel v. Abbott*, the Court ruled that the Equal Protection Clause does not *compel* CVAP equalization, while declining to address whether the Clause *permits* jurisdictions to draw districts with equal CVAPs but unequal total populations.[2] And still more recently, the Court objected to the particular manner in which the Trump administration tried to add a citizenship question to the Census: a query that would have enabled the generation of more fine-grained CVAP data.[3] But the Court did not block the administration from pursuing other means to produce this information, and the administration did so with gusto.[4]

In the wake of these developments, it is plausible that certain states will change their unit of apportionment from total population to CVAP when they next redesign their districts. These states will expect their policy choice to reduce the legislative representation of racial minorities and of Democrats. But is this prediction accurate? Will CVAP equalization actually result in smaller shares of minority-preferred and Democratic candidates elected to office? Remarkably, there is no published literature (and barely any unpublished work) on this subject, which is our focus in this Article. Our study is thus the first of its kind: the only piece, to date, to explore the implications of what may be the most dramatic development of the 2020 redistricting cycle.

To analyze the effects of switching the apportionment base, we rely on large numbers of district maps randomly generated by a computer algorithm. We primarily consider states with ratios of CVAP to total population below the national average: Arizona, California, Florida, Georgia, Idaho, Illinois, Nevada, New York, Texas, and Utah. These are the states where equalizing CVAP instead of total population could make the biggest difference. For each state in our data set, we produce two sets of simulated state house maps: one equalizing total population and another equalizing CVAP. The two simulation sets otherwise follow precisely the same parameters: compactness, respect for county boundaries, and compliance with the Voting Rights Act (VRA) (implemented by creating as many reasonably compact districts as possible where minority voters have the opportunity to elect their candidates of choice).

We find a significant—though not overwhelming—decline in minority representation when districts equalize CVAP rather than total population. Specifically, the proportion of minority opportunity districts produced by the algorithm decreases by a median of approximately three percentage points. However, this effect is considerably larger in Arizona, Florida, New York, and Texas, where the share of opportunity districts falls by six or more percentage points between the equal-total-population simulations and the equal-CVAP simulations. On the other hand, the impact is largely or entirely absent in states

1. *See* Burns v. Richardson, 384 U.S. 73 (1966).
2. *See* 136 S. Ct. 1120 (2016).
3. *See* Dep't of Com. v. New York, 139 S. Ct. 2551 (2019).
4. *See, e.g.*, Exec. Order No. 13,880, 84 Fed. Reg. 33,821 (July 11, 2019).

like Georgia and Illinois. In these jurisdictions, minority representation is essentially unaffected by the change in the unit of apportionment.

The story is similar with respect to partisanship: a noticeable, but not enormous, Republican advantage when CVAP is equalized instead of total population. Overall, the fraction of Republican districts yielded by the algorithm increases by a median of about one percentage point. But this Republican boost between the equal-total-population simulations and the equal-CVAP simulations amounts to six percentage points in Texas, enough to turn a slight Republican majority into a comfortable one. Conversely, there is no Republican edge at all in states like Arizona and Georgia. Here, the partisan balance of power is unaltered by switching the apportionment base.

The conservative supporters of CVAP equalization might respond to these mixed results by objecting to our redistricting algorithm. The algorithm mimics a *nonpartisan* mapmaker in our primary analyses, ignoring electoral data altogether as it draws the lines. But perhaps these conservative supporters expect CVAP equalization to dramatically benefit Republicans only when a Republican (not a neutral party) is in charge of the redistricting process. To test this possibility, we rerun the equal-total-population simulations and the equal-CVAP simulations after adjusting the algorithm to behave like a Democratic or a Republican gerrymanderer. The revised algorithm considers electoral data and, indeed, maximizes the numbers of Democratic or Republican districts while still complying to the same extent with all of the nonpartisan criteria.

But this party-conscious algorithm still does not do the trick (for those who back CVAP equalization for partisan reasons). Of course, the party-conscious algorithm creates more seats for the favored party than the original party-blind algorithm, whether the unit of apportionment is total population or CVAP. The *increase* in Republican seat share between the equal-total-population simulations and the equal-CVAP simulations, however, is no larger when the algorithm maximizes the numbers of Republican districts. It stays constant at a median of about one percentage point. Nor does this conclusion depend on the idiosyncrasies of a particular electoral environment. Switching the apportionment base also does not improve Republican fortunes when we model a wide range of potential electoral conditions.

The Article proceeds as follows. In Part I, we provide the necessary background for our empirical analysis. We explain (1) why most observers expect CVAP equalization to disadvantage racial minorities and Democrats, (2) how CVAP equalization reflects a particular democratic theory, (3) what current law suggests about CVAP equalization, and (4) how we evaluate the consequences of CVAP equalization. In Part II, we present the results of our party-blind simulations. To reiterate, we find a significant decline in the volume of minority opportunity districts, and a smaller drop in the volume of Democratic districts, when districts equalize CVAP rather than total population. Lastly, in Part III, we turn to our party-conscious simulations. Again, we determine that

Republicans gain no additional benefit from CVAP equalization when our algorithm maximizes the number of Republican seats.

I.
BACKGROUND

We emphasize at the outset that this piece makes an empirical, not a normative, contribution. The "right" unit of apportionment is a hotly contested topic that raises difficult political, theoretical, and legal questions. To wit: Why do the conservative proponents of CVAP equalization want to disrupt the redistricting status quo? Which democratic theory is more compelling: equality of voters' influence or equality of constituents' representation? Is CVAP equalization lawful under the Equal Protection Clause? What about under the VRA? Both in this introductory Section and throughout the Article, we refrain from tackling these issues. Here, in particular, we describe the predictions of the backers of CVAP equalization as well as the theory and law of CVAP equalization, without passing any judgment on them. We then outline the methods we use in the balance of the Article.

A. Expectations

Among those interested in such arcana as the apportionment base, there is widespread agreement that changing the base from total population to CVAP would shift political power away from younger, more diverse urban areas and toward older, Whiter, less densely populated places. More specifically, there is agreement that equalizing CVAP rather than total population would reduce the legislative representation of minorities and Democrats, while increasing that of Whites and Republicans. Legendary Republican gerrymanderer Tom Hofeller, for instance, once wrote that "[a] switch to the use of citizen voting age population as the redistricting population base for redistricting would be advantageous to Republicans and [n]on-Hispanic Whites."[5] Prominent conservative activist Hans von Spakovsky similarly opined that CVAP equalization would cause "a noticeable shift toward Republicans and away from urban districts" in "parts of the country with large noncitizen populations."[6] Framing the point in expressive terms, the *Evenwel* appellants told the Supreme Court that, if it did not mandate CVAP equalization, it "would send a terrible message to rural Americans about their place in society."[7]

5. Thomas Hofeller, The Use of Citizen Voting Age Population in Redistricting 9 (2015) (unpublished manuscript), https://www.commoncause.org/wp-content/uploads/2019/05/2015-Hofeller-Study.pdf [https://perma.cc/A7BS-E652].

6. Hans A. von Spakovsky, Evenwel v. Abbott*: Destroying Electoral Equality and Eroding "One Person, One Vote*," 2015 CATO SUP. CT. REV. 101, 119 (2016).

7. Reply Brief for Appellants at 18, Evenwel v. Abbott, 136 S. Ct. 1120 (2016) (No. 14-940); *see also, e.g.*, Emily Badger, *People Who Can't Vote Still Count Politically in America. What if That Changes?*, N.Y. TIMES (June 22, 2019), https://www.nytimes.com/2019/06/22/upshot/america-who-deserves-representation.html [https://perma.cc/AQV6-URXY] ("Any future political maps that exclude

Hofeller and von Spakovsky, of course, are rightwing figures. So is the architect of the *Evenwel* litigation: Ed Blum, better known as the instigator of a series of challenges to affirmative action policies and minority-heavy districts.[8] So are essentially all of the amici who assembled in support of the *Evenwel* appellants: conservative think tanks like the Cato Institute, the Immigration Reform Law Institute, and Judicial Watch, and Republican state legislators from Tennessee.[9] So are the "Republican lawmakers in Texas, Arizona, Missouri, and Nebraska" who, since *Evenwel*, have expressed interest in equalizing CVAP instead of total population.[10] And so are the officials in the Trump administration who pushed to add a citizenship question to the Census and then, after that initiative was foiled, pursued other options to enable CVAP equalization.

Again, we ascribe no motives to these actors here. But to the extent they are driven by political self-interest, it is probably because they have something like the following scenario in mind. Imagine two current districts, both of which contain one hundred persons. Also suppose that the first district, a heavily Hispanic and Democratic urban seat, has fifty noncitizens or children, and so fifty adult citizens, while the second district, a heavily White and Republican rural seat, has ten noncitizens or children, and so ninety adult citizens.[11] Assume as well that districts need one hundred persons each under a regime of total population equalization and seventy adult citizens each if CVAP equalization is the rule.

Then if CVAP equalization were indeed adopted, the first district would be much too small. It would require an additional twenty adult citizens to hit its target. These extra twenty adult citizens (along with the noncitizens or children living near them) would have to be drawn from neighboring districts. The heavily Hispanic and Democratic population in this area would therefore be squeezed into fewer districts, each including more people than before. On the other hand,

those children and noncitizens would further depress the power of urban areas that tend to vote Democratic . . . ."); Joseph Fishkin, *Of People, Trees, Acres, Dollars, and Voters*, BALKINIZATION (May 27, 2015), https://balkin.blogspot.com/2015/05/of-people-trees-acres-dollars-and-voters.html [https://perma.cc/7AH2-ZB7X] ("The losers would be urban areas with lots of children and lots of racially diverse immigrants. The winners would be older, whiter, more suburban and rural areas."); Matt Ford, *The War to Empower Rural White Voters Is Bigger Than Trump*, NEW REPUBLIC (July 9, 2019), https://newrepublic.com/article/154437/war-empower-rural-white-voters-bigger-trump [https://perma.cc/UZL6-6F5M] ("[If] maps [were] based on eligible and registered voters alone, large urban areas would see their electoral power diluted in favor of rural regions that trend whiter and more conservative.").

8. *See* Anemona Hartocollis, *A One-Man Legal Factory Fights Harvard over Affirmative Action*, N.Y. TIMES, Nov. 19, 2017, at A1.

9. *See Docket for* Evenwel v. Abbott, SUP. CT. OF THE U.S., https://www.supremecourt.gov/search.aspx?filename=/docketfiles/14-940.htm [https://perma.cc/Y7XC-7KUB].

10. Nick Brown, *Republicans Want Census Data on Citizenship for Redistricting*, REUTERS (Apr. 8, 2019), https://www.reuters.com/article/us-usa-census-redistricting-insight/republicans-want-census-data-on-citizenship-for-redistricting-idUSKCN1RK18D [https://perma.cc/WHA3-KU2X].

11. These are plausible figures given states' actual ratios of CVAP to total population, which range roughly from 65% to 80%. *See infra* Part I.D.

the second district would be much too big in an equal-CVAP world. It would have to *shed* twenty adult citizens (along with the noncitizens or children living near them). These individuals would end up in adjacent districts, adding to these constituencies' CVAPs and influencing their political compositions. The heavily White and Republican population in *this* area would thus be spread more efficiently than before, into more districts with fewer people each.

The logic of this example is confirmed by the limited available literature on the effects of CVAP equalization. Hofeller, the Republican gerrymanderer extraordinaire, authored one of these studies: a 2015 report meant to be kept secret but made public by his estranged daughter after his death.[12] Hofeller sorted Texas state house districts along two axes: Hispanic versus non-Hispanic and Democratic versus Republican.[13] He also determined the CVAP of each district as well as the CVAP it would need under an equal-CVAP regime.[14] He then calculated how many equal-CVAP districts the existing Hispanic, non-Hispanic, Democratic, and Republican districts could support. "As a whole, those 35 [Hispanic] districts only contain sufficient [CVAP] populations to comprise 30.1 districts," while "the remaining 115 [non-Hispanic] districts have sufficient [CVAP] populations to comprise 119.6 districts."[15] Likewise, "[t]he 97 GOP districts have sufficient CVAP populations to actually form 103.2 districts, while the 53 Democrat districts only have sufficient CVAP population to comprise 46.8 districts."[16]

In another unpublished, but more comprehensive, paper, Carl Klarner examined state house, state senate, and congressional districts across the country.[17] He re-weighted each district by dividing its CVAP proportion by that of its state.[18] For instance, a district with a CVAP share of 80% located in a state with a CVAP share of 70% would count for 1.14 seats (80% / 70%). He then aggregated these adjusted weights separately for Hispanic and non-Hispanic districts, Democratic and Republican districts, and so on.[19] Nationwide, the fraction of the population represented by Hispanic state house members would decline from 8.4% to 7.4% in an equal CVAP-world, and the fraction represented

12. *See* Michael Wines, *Deceased G.O.P. Strategist's Hard Drives Reveal New Details on the Census Citizenship Question*, N.Y. TIMES (May 30, 2019), https://www.nytimes.com/2019/05/30/us/census-citizenship-question-hofeller.html [https://perma.cc/AK33-KV69] (noting that this report was authorized by a conservative publication backed by a Republican donor).

13. *See* Hofeller, *supra* note 5, at 5–8 (defining Hispanic districts as those with Hispanic CVAPs above 40%).

14. *See id.*

15. *Id.* at 7.

16. *Id.*

17. *See* Carl E. Klarner, Assessing the Potential Impact of *Evenwel v. Abbott* (Dec. 6, 2015) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2699850 [https://perma.cc/GL98-47J8].

18. *See id.* at 5. More specifically, for the state figure, Klarner used "the average proportion . . . across districts in the state for the office in question." *Id.*

19. Klarner also considered other racial categories as well as gender and poverty. *See id.* at 7–9.

by Democratic state house members would fall from 46.4% to 45.0%.[20] These changes would be larger in states with more substantial volumes of noncitizens and children. In Texas, notably, the fraction of the population represented by Democratic state house members would drop from 34.7% to 30.7%—an impact almost identical to that forecasted by Hofeller.[21]

In a final unpublished study, Andrew Beveridge used essentially the same approach as Klarner, but only for congressional districts nationwide and four states' legislatures.[22] At the congressional level, Republicans would control five more seats if districts' CVAPs were equalized rather than their total populations.[23] In Texas (one of the four states analyzed by Beveridge in more detail), Republicans would hold seven more state house seats under an equal-CVAP rule.[24] Again, this estimate is almost the same as Hofeller's and Klarner's predictions.[25]

While this scholarship is useful as a first cut, it is ultimately unsatisfactory. Its drawback is that it uses existing districts as the starting point, calculating based on them how many equal-CVAP districts would be controlled by different groups. As Klarner has acknowledged, "re-weighting by CVAP at the legislative district level favors a story where districts tend to keep their basic structure," "shrink[ing] and expand[ing] somewhat . . . but in a way that is best informed by focusing on districts."[26] In reality, though, switching the unit of apportionment could have such widespread ramifications, especially in states with many noncitizens and children, that existing districts would not be a helpful guide to the future. Current districts might be eliminated wholesale, swept away and replaced by entirely new configurations that shuffle states' populations in unexpected ways. Again per Klarner, "utilizing CVAP instead of total population might radically alter the structure of districts, so that they must be rebuilt from the ground up."[27]

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20. *See id.* at 1–2.

21. *See id.* at 19. This four-percentage-point drop is equivalent to six state house seats (since the Texas House has 150 seats in total). Hofeller similarly predicted a decline of six Democratic state house seats in Texas under an equal-CVAP rule. *See* Hofeller, *supra* note 5, at 7.

22. *See* Andrew A. Beveridge, The Threat to Representation for Children and Non-Citizens: An Analysis of the Potential Impact of *Evenwel v. Abbott* on Redistricting 10, 14 (Apr. 5, 2016) (unpublished manuscript), https://static.socialexplorer.com/evenwel/Evenwell_Impact_Report.pdf [https://perma.cc/BE77-J74L]. Beveridge conducted his analysis in terms of districts, not (like Klarner) the proportion of the population represented by certain kinds of legislators. *See id.* at 5.

23. *See id.* at 9.

24. *See id.* at 14.

25. *See supra* note 21 and accompanying text.

26. Klarner, *supra* note 17, at 11.

27. *Id.* Another way of describing the problem is that existing districts controlled by a certain group (say Democrats) include only a fraction of that group's total statewide membership. So using these current districts to estimate the group's clout in an equal-CVAP world ignores the possibility that equal-CVAP districts might distribute the group's members in different, either more or less advantageous, ways.

While a transformation of this magnitude cannot be modeled using existing districts, it *can* be assessed through our technique of randomized redistricting. As we explain below,[28] the equal-CVAP district maps that our computer algorithm generates bear little resemblance to the equal-total-population plans currently in effect. The simulated maps achieve the same goals as the enacted plans (compactness, respect for county boundaries, and compliance with the VRA) but are otherwise distinct from the status quo. The simulated maps are therefore ideally suited to the exploration of an unfamiliar redistricting landscape. They are unbiased by how contemporary plans happen to be drawn. To quote Klarner once more, "the best way to address these issues [with existing districts] is by doing a simulation of possible different plans."[29] "Such an analysis would have to take into account geographic features, compactness considerations, respect for political subdivisions, etc. . . . which no simulation analysis has successfully taken into account to date."[30] Our approach here indeed incorporates these criteria and thus represents the exact advance that Klarner contemplated.

B. Theory

Returning to the advocates of CVAP equalization, they have another argument, separate from their political self-interest, for their position. It is that a particular democratic value—the equality of voters' electoral influence—is furthered by districts with equal numbers of adult citizens. This argument begins by emphasizing the importance of *voters* in a democracy. Voters, of course, are the individuals who cast ballots, who reward or reject politicians based on their records, and who ultimately determine how a jurisdiction is governed. The argument then stipulates that, given voters' significance, if districts are to promote any kind of equality, it should be voters' equality. Each voter should have the same electoral clout as each other voter. No voter should have more or less sway simply because of where the voter lives. In terms of districts, each voter should share a constituency with the same volume of other voters. No voter's influence should be enhanced by placing her with fewer other voters or diminished by grouping her with more other voters.

This theory of equal voter power has more than intuitive appeal; it has also been repeatedly articulated by courts. In one of the great reapportionment cases of the 1960s, the Warren Court declared that "as nearly as is practicable one man's vote in a congressional election is to be worth as much as another's."[31] In another landmark case, that Court added that "all who participate in the election are to have an equal vote" because "every voter is equal to every other voter in

28. *See infra* Part I.D.
29. Klarner, *supra* note 17, at 11.
30. *Id.*
31. Wesberry v. Sanders, 376 U.S. 1, 7–8 (1964).

his State."[32] More recently, Justice Thomas deemed this theory a "noble" one in his concurring opinion in *Evenwel*,[33] and Judge Kozinski crisply laid out its logic in another solo opinion: "[T]he principle of electoral equality . . . recognizes that electors—persons eligible to vote—are the ones who hold the ultimate political power in our democracy."[34] This principle also "assures that those eligible to vote do not suffer dilution of that important right by having their vote given less weight than that of electors in another location."[35]

But the theory of equal voter power does not occupy the field. Underlying the equalization of districts' total populations is a different democratic value: the equality of *constituents' representation*. The case for this value highlights not the voter but the person, whether qualified and willing to cast a ballot or not. The case also stresses that legislators represent all of their constituents, not just those who vote (let alone just those who vote for them). From this conception of representation, a rule of equally populated districts follows naturally. Constituents are represented equally only if they reside in districts with the same numbers of other constituents. Only in this way do constituents enjoy the same access to their legislators, command the same fraction of their legislators' attention, and receive the same governmental services through their legislators. To countenance unequally populated districts is to permit the quality of representation to vary based on the fortuity of a person's address.[36]

This theory of equal constituent representation has deep jurisprudential roots, too. In the most famous of the 1960s reapportionment cases, *Reynolds v. Sims*, the Court announced that "the fundamental principle of representative government in this country is one of equal representation for equal numbers of people."[37] The Court also decried "state legislative districting schemes which give the same number of representatives to unequal numbers of constituents."[38] In *Evenwel*, similarly, the Court remarked that "representatives serve all residents, not just those eligible or registered to vote."[39] "By ensuring that each representative is subject to requests and suggestions from the same number of

32. Gray v. Sanders, 372 U.S. 368, 379–80 (1963); *see also, e.g.*, Hadley v. Junior Coll. Dist. of Metro. Kan. City, 397 U.S. 50, 54 (1970) ("[E]ach person's vote counts as much, insofar as it is practicable, as any other person's."); Reynolds v. Sims, 377 U.S. 533, 560 (1964) ("[O]ne person's vote must be counted equally with those of all other voters in a State . . . .").

33. 136 S. Ct. 1120, 1136 (2016) (Thomas, J., concurring in the judgment).

34. Garza v. County of Los Angeles, 918 F.2d 763, 781 (9th Cir. 1990) (Kozinski, J., concurring and dissenting in part).

35. *Id.* at 782.

36. For a strong academic defense of this position, see generally Joseph Fishkin, *Weightless Votes*, 121 YALE L.J. 1888 (2012).

37. *Reynolds*, 377 U.S. at 560–61.

38. *Id.* at 563; *see also, e.g.*, Kirkpatrick v. Preisler, 394 U.S. 526, 531 (1969) ("Equal representation for equal numbers of people is a principle designed to prevent . . . diminution of access to elected representatives."); Wesberry v. Sanders, 376 U.S. 1, 14 (1964) (discussing "the principle solemnly embodied in the Great Compromise—equal representation in the House for equal numbers of people").

39. Evenwel v. Abbott, 136 S. Ct. 1120, 1132 (2016).

constituents, total-population apportionment promotes equitable and effective representation."[40] And just before explicating the theory of equal voter power, Judge Kozinski described the "important purposes" served by "[a] principle of equal representation."[41] It guarantees that "constituents have more or less equal access to their elected officials" and that "constituents are not afforded unequal government services depending on the size of the population in their districts."[42]

Again, we do not endorse either theory here. This normative debate is not just beyond this project's scope; it also presents a genuinely difficult problem. Consider the slogan of the 1960s reapportionment cases: one person, one vote. The first half of this phrase—one person—refers to people and so suggests that districts' constituents should be equalized. But the phrase's second half—one vote—applies to voters and so implies that their volumes should be equal across districts. The very mantra of the reapportionment revolution, then, straddles the theories of equal voter power and equal constituent representation. In the same breath, one person, one vote invokes dueling democratic values.

Choosing between the theories is further complicated by the fact that neither approach actually attains its stated goal. Take the theory of equal voter power, which its proponents hope to implement by equalizing districts' CVAPs. Adult citizens are not necessarily voters; they may decline to cast ballots if they wish. Adult citizens do not even have to be eligible voters; they may be mentally disabled[43] or imprisoned,[44] in which case they are disenfranchised in many states. Consequently, equalizing districts' CVAPs is *not* synonymous with equalizing districts' voters. Equal-CVAP districts would still vary widely in their numbers of ballots cast. Moreover, even if districts' voters could somehow be equalized, each voter still would not wield the same electoral influence. Some voters would live in competitive districts where their ballots are more likely to affect election outcomes. But other voters would find themselves in safe seats where their voices are all but irrelevant.[45]

Likewise, the value of equal constituent representation is not, in fact, realized by districts with equal total populations. Each person in such districts

40. *Id.*; *see also id.* at 1136 (Thomas, J., concurring in the judgment) (calling "noble" the theory of equal constituent representation).

41. Garza v. County of Los Angeles, 918 F.2d 763, 781 (9th Cir. 1990) (Kozinski, J., concurring and dissenting in part).

42. *Id.*

43. *See State Laws Affecting the Voting Rights of People with Mental Disabilities*, BAZELON CTR. FOR MENTAL HEALTH L. (2016), http://www.bazelon.org/wp-content/uploads/2017/11/2016_State-Laws-Affecting-Voting-Rights-of-PWD.pdf [https://perma.cc/H4DU-2KAR] (listing states' laws on voting by the mentally disabled).

44. *See Felon Voting Rights*, NAT'L CONF. OF STATE LEGISLATURES (Sept. 3, 2020), https://www.ncsl.org/research/elections-and-campaigns/felon-voting-rights.aspx [https://perma.cc/T6FS-94CA] (listing states' laws on voting by convicted felons).

45. *See* Fishkin, *supra* note 36, at 1895 ("If we wished to increase the probabilistic weight of one vote, the best strategy would not be to make a district less populous, but to make it more competitive.").

comprises the same (tiny) share of the constituency represented by her legislator. But this numerical equivalence in no way assures representational parity. A legislator may be (and usually is) more responsive to donors than non-donors, co-partisans than backers of the opposing party, the wealthy than the poor, and so on. Put differently, equal representation is an ambitious aspiration that is affected not just by apportionment but also by the campaign finance system, political polarization, economic inequality, and many other forces. Districts with equal total populations, then, move the needle in the direction of representational equality, but that is all they do. They do not fully achieve this lofty aim on their own.[46]

C. Law

Turning from the theory to the law of CVAP equalization, it is striking how little relevant doctrine there is. The Supreme Court has never ratified CVAP as a unit of apportionment. Nor has the Court ever condemned it. At present, CVAP thus lingers in a kind of constitutional limbo from which it will emerge only when a state uses it to draw districts, this choice is challenged in litigation, and the Court decides if the choice is acceptable.

The pivotal 1960s reapportionment cases help to explain CVAP's ambiguous legal status. In these cases, the Court never focused its attention on the proper apportionment base (if there even is one). Instead, the Court spoke interchangeably of persons, citizens, and voters as the individuals who must be equalized across districts. In *Wesberry v. Sanders*, for example, the 1964 decision that applied the one person, one vote rule to congressional districts, the Court stated both that malapportionment unlawfully "contracts the value of some *votes* and expands that of others"[47] and that the practice offends "our Constitution's plain objective of making equal representation for equal numbers of *people* the fundamental goal for the House of Representatives."[48] In *Reynolds*, similarly, the decision later in 1964 that extended the one person, one vote rule to state legislative districts, the Court used the following terms for the individuals to be equalized in just two paragraphs: "the State's citizens," "people," "voters," "the people," "otherwise qualified voters," "citizens," "the State's voters," "citizens," "persons," "constituents," "those living here" and "those living there," "voters," and "citizens."[49] A model of clarity this was not.

46. For a discussion of the many factors that may prevent the achievement of representational equality, see Nicholas O. Stephanopoulos, *Elections and Alignment*, 114 COLUM. L. REV. 283, 323–65 (2014).

47. 376 U.S. 1, 7 (1964) (emphasis added).

48. *Id.* at 18 (emphasis added).

49. Reynolds v. Sims, 377 U.S. 533, 561–63 (1964); *see also, e.g.*, Evenwel v. Abbott, 136 S. Ct. 1120, 1131 (2016) ("For every sentence appellants quote from the Court's opinions, one could respond with a line casting the one-person, one-vote guarantee in terms of equality of representation, not voter equality.").

To be fair to the 1960s Court, it did grapple with the unit of apportionment in the less prominent 1966 case of *Burns v. Richardson*.[50] In the wake of *Reynolds*, Hawai'i reshaped its state house districts by equalizing their numbers of *registered voters*.[51] The *Burns* Court upheld the State's plan while also sounding several cautionary notes. First, voter registration is a troublesome basis for apportionment because it is subject to manipulation by political actors. It depends on "the extent of political activity of those eligible to register and vote" and so is "susceptible to improper influences by . . . those in political power."[52] Second, voter registration inherently varies from year to year. It goes up and down due to "such fortuitous factors as a peculiarly controversial election issue, a particularly popular candidate, or even weather conditions."[53] Third, because of these drawbacks, Hawai'i would be well advised to replace voter registration with another measure. The Court mentioned the exclusive "[u]se of presidential election year figures" and "a system of permanent personal registration" as possibilities.[54] And fourth, Hawai'i's reliance on voter registration was permissible only because it led to about the same results as other better metrics. "[T]he apportionment achieved by use of a registered voters basis substantially approximated that which would have appeared had state citizen population been the guide."[55]

This reference to "state citizen population" may imply that CVAP is a valid unit of apportionment. CVAP only differs from state citizen population in that CVAP incorporates individuals' age in addition to their citizenship status. In *Burns*, moreover, state citizen population appeared to be the Court's *preferred* measure: the benchmark to which voter registration had to be compared and from which it could not overly deviate.[56] Also probative of CVAP's legality are the *Burns* Court's statements about states' flexibility in choosing their apportionment base. States are not "required to include aliens, transients, short-term or temporary residents, or persons denied the vote for conviction of crime."[57] Rather, "[t]he decision to include or exclude any such group involves choices about the nature of representation with which [courts have] no

50. 384 U.S. 73 (1966).
51. *See id.* at 81–82.
52. *Id.* at 92.
53. *Id.* at 93 (internal quotation marks omitted).
54. *Id.* at 96–97.
55. *Id.* at 96.
56. Indeed, the *Burns* Court seemed to favor state citizen population over *total* population, which incorporated Hawai'i's "large numbers of the military" and "large number of tourists." *Id.* at 94 (internal quotation marks omitted). "If total population were to be the only acceptable criterion upon which legislative representation could be based, in Hawai'i, grossly absurd and disastrous results would flow." *Id.* (internal quotation marks omitted). In construing this passage, though, it should be emphasized just how unusual Hawai'i's demographics are. Most jurisdictions, of course, do not host enough military members and tourists to distort the representation of civilian residents. *See id.* (noting Hawai'i's "special population problems").
57. *Id.* at 92.

constitutionally founded reason to interfere."[58] Accordingly, "[u]nless a choice is one the Constitution forbids," "the resulting apportionment base offends no constitutional bar."[59]

Matters lay as *Burns* left them (at the Supreme Court level[60]) for fully half a century. In *Evenwel*, though, a group of plaintiffs alleged that the Equal Protection Clause not only permits—but actually requires—the use of CVAP for apportionment.[61] A unanimous Court rebuffed this audacious claim. One problem with it was the constitutional text, which provides for congressional seats to be allocated among the states according to their total populations. "It cannot be that the Fourteenth Amendment calls for the apportionment of congressional districts based on total population, but simultaneously prohibits States from apportioning their own legislative districts on the same basis."[62] The Court's precedents also undermined the plaintiffs' case. These decisions repeatedly held that "States and localities may comply with the one-person, one-vote principle by designing districts with equal total populations," and "consistently looked to total-population figures when evaluating whether districting maps violate the Equal Protection Clause."[63] Lastly, the plaintiffs' position would have been hugely disruptive. "Adopting voter-eligible apportionment as constitutional command would upset a well-functioning approach to districting that all 50 States and countless local jurisdictions have followed for decades, even centuries."[64]

Nevertheless, the *Evenwel* Court did not shut the door on CVAP's use for apportionment. In fact, the Court explicitly declined to "resolve whether . . . States *may* draw districts to equalize voter-eligible population rather than total population."[65] In their separate opinions, Justice Alito and Justice Thomas underscored that this question remains open. "Whether a State is permitted to use some measure other than total population is an important and sensitive question that we can consider if and when we have before us a state districting plan that . . . uses something other than total population as the basis for equalizing the size of districts," wrote Justice Alito.[66] Going further, Justice Thomas argued

58. *Id.*

59. *Id.* Of course, this allusion to what the Constitution forbids begs the question of whether CVAP (or any other unit of apportionment) *is* constitutionally prohibited.

60. Between *Burns* and *Evenwel*, a handful of lower courts agreed that CVAP is not the constitutionally compelled unit of apportionment. *See, e.g.*, Chen v. City of Houston, 206 F.3d 502 (5th Cir. 2000); Daly v. Hunt, 93 F.3d 1212 (4th Cir. 1996); Garza v. County of Los Angeles, 918 F.2d 763 (9th Cir. 1990).

61. 136 S. Ct. 1120, 1125 (2016).

62. *Id.* at 1129.

63. *Id.* at 1130–31.

64. *Id.* at 1132.

65. *Id.* at 1133 (emphasis added). As noted earlier, however, the Court did defend the theory of equal constituent representation, which is implemented by equalizing districts' total populations. *See supra* notes 39–40 and accompanying text.

66. *Evenwel*, 136 S. Ct. at 1143–44 (Alito, J., concurring in the judgment).

that states have wide discretion in selecting their unit of apportionment. The Constitution "leaves States significant leeway in apportioning their own districts to equalize total population, to equalize eligible voters, or to promote any other principle consistent with a republican form of government."[67]

The Trump administration plainly grasped that, after *Evenwel*, states could equalize their districts' CVAPs with at least some prospect that courts would uphold this policy choice.[68] The administration also understood (thanks to Hofeller's report,[69] among other sources) that better information would assist interested states in altering their apportionment base. In recent decades, the Census Bureau has not asked all Americans about their citizenship status.[70] As a result, the Bureau has provided states with data for redistricting that does not specify CVAP counts for different geographic areas.[71] For apportionment on the basis of CVAP to be practical (not just permissible), it would be helpful for this situation to change. To create the relevant information, the Trump administration proposed adding a citizenship question to the 2020 Census.[72] This question would have asked each respondent if she is a citizen of the United States. The question would thus have enabled the compilation of the detailed, fine-grained CVAP data that is beneficial for redistricting.

But the Supreme Court thwarted this effort in the 2019 case of *Department of Commerce v. New York*. The Court did not say that including a citizenship question in the Census is inherently illegitimate.[73] The Court objected, however, to the spurious rationale the Secretary of Commerce gave for asking about citizenship: more rigorous enforcement of the VRA thanks to more accurate CVAP data.[74] The Court noted that the Secretary "began taking steps to reinstate a citizenship question about a week into his tenure."[75] Yet it was not until many months later that the Department of Justice (at the Secretary's urging) came up with the VRA enforcement explanation—the "sole stated reason" for asking about citizenship.[76] The Court thus concluded that the Secretary's justification

67. *Id.* at 1133 (Thomas, J., concurring in the judgment).

68. *See, e.g.*, Exec. Order No. 13,880, 84 Fed. Reg. 33,821, 33,823 (July 11, 2019) ("[I]t may be open to States to design State and local legislative districts based on the population of voter-eligible citizens.").

69. *See* Hofeller, *supra* note 5, at 3 (noting that, at present, the only source for CVAP data is "a rolling 5-year survey" whose "accuracy for small units of geography is extremely poor").

70. *See* Dep't of Com. v. New York, 139 S. Ct. 2551, 2561–62 (2019) (discussing the relevant history of the Census).

71. *See Decennial Census P.L. 94-171 Redistricting Data*, U.S. CENSUS BUREAU (May 8, 2017), https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.2010.html [https://perma.cc/JE9F-SEFF].

72. *See Dep't of Com.*, 139 S. Ct. at 2562 (referencing the Secretary of Commerce's decision "to reinstate a question about citizenship on the 2020 decennial census questionnaire").

73. *See id.* at 2576 ("We do not hold that the agency decision here was substantively invalid.").

74. *See id.* at 2575. Not only was this not the true reason, but it also fails on its own terms. Courts have enforced the Voting Rights Act for decades using existing CVAP data.

75. *Id.*

76. *Id.*

was "contrived," "incongruent with what the record reveals about the agency's priorities and decisionmaking process."[77]

Undaunted by this defeat, the Trump administration announced that it would assemble CVAP data for redistricting in another way: not by asking about citizenship on the Census but rather by cross-referencing administrative records listing the citizenship status of most Americans.[78] This approach would have been significantly less precise. It has never been tried before, the relevant records are far from error-free, and most importantly, these records do not contain information about every American.[79] The effort was also terminated before it could bear fruit. In one of his first acts as President, Joe Biden directed the Census Bureau to cease its work on compiling detailed CVAP data.[80]

Nevertheless, as discussed above, it still appears that at least some jurisdictions will switch their apportionment base from total population to CVAP in the 2020 redistricting cycle.[81] They will have to use less accurate information to do so, such as results from the American Community Survey (ACS) or their own state-specific censuses. But concerns about data quality and the litigation that might ensue because of flawed CVAP counts are unlikely to be a complete deterrent. As observed by the executive order unveiled after the Trump administration's loss in *Trump v. New York*, "some State officials are interested in [CVAP] data for districting purposes."[82] So it probably will not be long before "a State actually proposes a districting plan based on the voter-eligible population."[83]

D. Methodology

Having established the political, theoretical, and legal background for our study, we next describe our methodology. To reiterate, unlike all previous scholarship on the effects of changing the unit of apportionment, we do not reweigh existing districts based on their CVAPs.[84] Instead, we exploit the technique of randomized redistricting, which one of us has used in a long string of academic articles and expert witness engagements.[85] This method's hallmark

77. *Id.*

78. *See* Exec. Order No. 13,880, 84 Fed. Reg. 33,821 (July 11, 2019).

79. *See, e.g.*, Trump v. New York, 141 S. Ct. 530, 535 (2020) (noting the uncertainty as to "which (and how many) aliens have administrative records that would allow the Secretary to avoid impermissible estimation, and whether the Census Bureau can even match the records in its possession to census data in a timely manner").

80. *See* Exec. Order No. 13,986, 86 Fed. Reg. 7015, 7016 (Jan. 20, 2021) (announcing the revocation of President Trump's July 11, 2019, executive order).

81. *See supra* note 10 and accompanying text.

82. Exec. Order No. 13,880, 84 Fed. Reg. 33,821, 33,824 (July 11, 2019).

83. *Id.*

84. *See supra* notes 17–30 and accompanying text.

85. *See* Jowei Chen & David Cottrell, *Evaluating Partisan Gains from Congressional Gerrymandering: Using Computer Simulations to Estimate the Effect of Gerrymandering in the U.S. House*, 44 ELECTORAL STUD. 329, 331–32 (2016); Jowei Chen & Jonathan Rodden, *Cutting Through*

is that it produces large numbers of district maps that are unrelated to one another and that satisfy whatever parameters are specified for the computer algorithm. The approach is ideal for investigating a question like what would happen if districts' CVAPs rather than their total populations were equalized. The apportionment base, after all, is simply another parameter that may be entered into the algorithm.

Because it would be unwieldy to simulate (two sets of) district maps for all fifty states, we prioritize states with below-average ratios of CVAP to total population. These are the places where switching from equal-total-population to equal-CVAP districts could make the biggest difference. Nationwide, according to the most recent data from the ACS (covering the 2014-2018 period), adult citizens comprise 70.9% of the total population.[86] Ten states have CVAP shares that are smaller than this national figure: Arizona, California, Georgia, Idaho, Illinois, Nevada, New Jersey, New York, Texas, and Utah.[87] However, we omit New Jersey for technical reasons,[88] and we add Florida because, in our judgment, it is the most important state not already covered.[89] These are the jurisdictions, then, that we include in our study. Interestingly, a few of these states (like Idaho and Utah) do not have especially large noncitizen populations. They make the list, instead, because of their high proportions of individuals under eighteen. Children attract less attention than noncitizens in the apportionment debate, but they are potentially as relevant. They, too, may vary in volume from one location to another, causing equal-total-population districts to differ politically from equal-CVAP districts.

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the Thicket: Redistricting Simulations and the Detection of Partisan Gerrymanders, 14 ELECTION L.J. 331, 332 (2015); Jowei Chen & Jonathan Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Q.J. POL. SCI. 239, 248–49 (2013); Jowei Chen & Nicholas O. Stephanopoulos, *The Race-Blind Future of Voting Rights*, 130 YALE L.J. 862, 881–903 (2021) [hereinafter Chen & Stephanopoulos, *Race-Blind Future*]; *see also, e.g.*, Expert Report of Jowei Chen at 1, Whitford v. Gill, 218 F. Supp. 3d 837 (W.D. Wis. 2018) (No. 15-cv-421-jdp) (listing many of the cases in which Professor Chen has served as an expert).

86. *See ACS Demographic and Housing Estimates*, U.S. CENSUS BUREAU, https://data.census.gov/cedsci/table?d=ACS%205-Year%20Estimates%20Data%20Profiles&tid=ACSDP5Y2018.DP05 [https://perma.cc/EZZ8-EZ2P].

87. *See id.*

88. Unreliable ecological inference estimates for New Jersey prevent us from accurately assessing which districts are and are not minority opportunity districts.

89. Florida is also the state with the highest noncitizen population share (9.2%) but not in the bottom ten states by CVAP share.

Figure 1: States included in analysis

State	**Noncitizen %**	**Children %**	**CVAP %**
Arizona	7.7%	23.5%	69.3%
California	13.2%	23.2%	64.5%
Florida	9.2%	20.1%	71.5%
Georgia	5.7%	24.3%	70.5%
Idaho	3.6%	26.0%	70.7%
Illinois	7.0%	22.8%	70.6%
Nevada	10.0%	23.1%	67.5%
New York	9.9%	21.1%	69.8%
Texas	10.8%	26.2%	64.0%
Utah	5.2%	30.2%	65.1%

For each state in our data set, we randomly generate one thousand equal-total-population and one thousand equal-CVAP state house maps. We conduct our analysis at the state house level because these districts are so much more numerous than their congressional (or state senate) counterparts. This greater quantity of districts enables a more fine-grained examination, in which each seat makes up a smaller fraction of the overall district universe.[90]

Our redistricting algorithm, in turn, involves two stages.[91] In the first stage, the goal is to create a suitable starting point (or seed map) for the mass production of district maps that follows in the second stage. The algorithm takes a randomly selected base map and then proposes a series of random alterations to it. These proposals are accepted unless they would violate any of the following conditions: (1) increasing the total deviation of either total population or CVAP (depending on the simulation set) beyond 10%; (2) increasing the number of split counties; (3) reducing the number of minority opportunity districts; or (4) including a less compact opportunity district than the least compact opportunity district in the enacted state house plan. The algorithm continues to run until no further decreases in split counties or gains in sufficiently compact opportunity districts occur for several thousand iterations.[92] The algorithm then adds one more

90. *See, e.g.*, Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 888 (also "examin[ing] state house plans rather than congressional plans for the simple reason that the former are comprised of many more districts"). However, we simulate state *senate* maps for Arizona and Idaho because their state house districts each elect multiple members. *See State Legislative Chambers That Use Multi-Member Districts*, BALLOTPEDIA, https://ballotpedia.org/State_legislative_chambers_that_use_multi-member_districts [https://perma.cc/C8DZ-NZA5]. All of our analysis is more straightforward for single-member districts.

91. For a discussion of a similar two-stage algorithm, see Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 890–98.

92. Specifically, the algorithm always runs for at least ten thousand iterations. The algorithm continues to run for twice as many iterations as the last point at which an additional county was kept whole or an additional, sufficiently compact opportunity district was created. For example, if either of these events last occurs after twenty-five thousand iterations, the algorithm runs for fifty thousand iterations.

condition, (5) attaining at least the average district compactness of the enacted state house plan, and runs until it is satisfied as well.

After it has been identified, this seed map launches the algorithm's second stage. A "burn-in" period of one hundred thousand iterations initially takes place, during which no simulated maps are saved. The reason for performing, but not saving, these preliminary burn-in iterations is to ensure that the subsequently saved maps are not dependent on the choice of seed map.[93] All of the iterations in the algorithm's second stage follow the same five parameters as before, except that the number of minority opportunity districts is now frozen. In other words, any proposal that would change the volume of opportunity districts is now rejected.[94] Upon the conclusion of the burn-in period, the algorithm begins to save maps after each ten thousand iterations. The algorithm continues to do so for ten million iterations—that is, until one thousand simulated maps have been saved.

To be more specific about these iterations, or changes proposed by the algorithm, they rely on the "Recombination" Markov chain Monte Carlo (MCMC) method pioneered by Daryl DeFord, Moon Duchin, and Justin Solomon.[95] In each iteration, the algorithm randomly selects two adjacent districts in the map. The areas and populations of these two districts are then merged, and a random new repartitioning of the combined entity is suggested. This repartitioning is adopted as long as it would not violate any of the rules set forth above. Overall, across all of the states in our data set, the acceptance rate for these proposed changes is roughly 30%.

To elaborate on the conditions we set for the algorithm, the total deviation threshold is derived from Supreme Court precedents holding that state legislative plans with a total deviation below 10% are presumptively constitutional.[96] This threshold thus ensures that the maps generated by the algorithm are lawful, at least in this regard. Total deviation is calculated based on total population in one simulation set and CVAP in the other simulation set.[97] Next, the split county and

93. For another use of a burn-in period, see Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 895.

94. In addition, maps are permitted to split as many or fewer counties as the seed map.

95. *See* Daryl DeFord, Moon Duchin & Justin Solomon, *Recombination: A Family of Markov Chains for Redistricting*, HARV. DATA SCI. REV., Winter 2021, at 1, 23–39 (2021); *see also* Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 893–94 (also using the Recombination MCMC method).

96. *See, e.g.*, Brown v. Thomson, 462 U.S. 835, 842–43 (1983) ("[A]n apportionment plan with a maximum population deviation under 10% falls within this category of minor deviations. A plan with larger disparities in population, however, creates a prima facie case of discrimination and therefore must be justified by the State." (internal citations omitted)).

97. Because CVAP data comes from the ACS (not the Census itself), it is less accurate, unavailable for all geographic units, and subject to a margin of error. It is precisely to overcome these drawbacks that the Trump administration sought to add a citizenship question to the Census, and thus to produce higher-quality CVAP data. *See supra* notes 68–72 and accompanying text. We use the most recent ACS data, covering the 2014-2018 period, for both total population and CVAP. *See ACS Demographic and Housing Estimates*, *supra* note 86.

average compactness parameters reflect the requirements in many states (and discretionary choices in even more jurisdictions) that districts respect county boundaries and be compact in shape.[98] The split county parameter is operationalized by counting the number of counties divided among more than one district. The average compactness parameter uses the mean Polsby-Popper compactness of all districts in a map.[99]

The two rules about minority opportunity districts then implement section 2 of the VRA[100] (now the law's only provision applicable to redistricting[101]). Opportunity districts are ones in which minority voters are able to elect their candidates of choice.[102] Drawing on prior work of ours, we identify these districts based on three criteria: (1) the minority-preferred candidate wins the general election; (2) minority voters who support the minority-preferred candidate outnumber White voters backing that candidate; and (3) minority voters of different racial groups are aggregated only if each group favors the same candidate.[103] These criteria avoid any kind of racial quota—an approach the Supreme Court has condemned[104]—while still guaranteeing that opportunity districts are genuinely controlled by minority voters. To apply the criteria, we employ a technique known as ecological inference to estimate the voting behavior of minority and nonminority citizens alike.[105] After gauging their voter

98. *See* NAT'L CONF. OF STATE LEGISLATURES, REDISTRICTING LAW 2010, at 201–53 (2009), https://www.ncsl.org/Portals/1/Documents/Redistricting/Redistricting_2010.pdf [https://perma.cc/25FL-BJFB] (listing state redistricting requirements).

99. *See, e.g.*, Daniel D. Polsby & Robert D. Popper, *The Third Criterion: Compactness as a Procedural Safeguard Against Partisan Gerrymandering*, 9 YALE L. & POL'Y REV. 301, 339–51 (1991) (discussing various compactness measures). The average compactness parameter is also pegged to the enacted state house plan. We use state house plans in effect in 2016, the most recent date the Census collected them. *See TIGER/Line Shapefile, 2016, State, Illinois, Current State Legislative District (SLD) Upper Chamber State-Based*, DATA.GOV (Sept. 6, 2019), https://catalog.data.gov/dataset/tiger-line-shapefile-2016-state-illinois-current-state-legislative-district-sld-upper-chamber-s [https://perma.cc/Z5LQ-4ARB]. In contrast, the split county parameter is pegged to the seed map (in the second stage of the algorithm). It is infeasible to link this condition to the enacted plan because the number of counties that may be kept whole using CVAP as an apportionment base may vary from that number using total population.

100. 52 U.S.C. § 10301.

101. Shelby County v. Holder, 570 U.S. 529 (2013), neutered section 5 of the VRA, which had previously required certain jurisdictions to receive federal permission before changing their district plans.

102. *See, e.g.*, League of United Latin Am. Citizens v. Perry, 548 U.S. 399, 428–32, 435–39, 441–42 (2006) (repeatedly referring to opportunity districts).

103. *See* Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 900–01.

104. *See, e.g.*, Cooper v. Harris, 137 S. Ct. 1455, 1469 (2017) (holding that use of an "announced racial target" is presumptively unconstitutional).

105. For more information, see Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 898–99 & n.167. The dependent variables for the ecological inference models are results from the 2012 presidential election (the most recent race for which precinct-level data is universally available). The key independent variables are precincts' racial compositions, which are obtained from the 2010 Census. Each model is a hierarchical Multinomial-Dirichlet model for ecological inference in R × C tables, as developed by Ori Rosen, Wenxin Jiang, Gary King & Martin A. Tanner, *Bayesian and Frequentist*

turnout and voter partisan preference, it is simply a matter of arithmetic to determine which districts qualify as opportunity districts.

In combination, the two rules about opportunity districts require the creation of as many reasonably compact opportunity districts as possible. With some caveats, this is what section 2 of the VRA demands as well. In its seminal 1986 case construing section 2, *Thornburg v. Gingles*, the Supreme Court held that a new opportunity district must generally be drawn if minority and nonminority voters are racially polarized and if the minority population is "sufficiently large and geographically compact" to support an additional opportunity district.[106] Note the reference to sufficient compactness: this is why we instruct the algorithm to produce only opportunity districts that are at least as compact as the least compact opportunity district in each enacted plan. These simulated opportunity districts presumably satisfy *Gingles*'s compactness criterion (at least to the same extent as existing opportunity districts).

As for the caveats, one is that section 2 litigation also involves the consideration of a host of factors relating to ongoing and historical racial discrimination.[107] We make no attempt here to incorporate these factors into our analysis. The other proviso is that section 2 typically does not compel *super*proportional representation for minority voters: a share of opportunity districts that exceeds their fraction of the population.[108] The algorithm usually does not yield superproportional minority representation anyway, but when it does, we do not artificially cap the number of opportunity districts. We are interested in learning how many opportunity districts emerge when total population and CVAP are the units of apportionment, respectively, and this inquiry would not be served by imposing ex ante limits on the volume of opportunity districts.[109]

Lastly, none of our five conditions for the algorithm pertains to partisanship. The algorithm thus designs districts much as a nonpartisan mapmaker might, without taking into account their potential electoral consequences.[110] These consequences, however, are highly relevant to our study.

Inference for Ecological Inference: The R × C *Case*, 55 STATISTICA NEERLANDICA 134, 136–42 (2001), and implemented using the eiPack (version 0.1-7) in R.

106. 478 U.S. 30, 48–51 (1986) (setting forth the so-called *Gingles* factors).

107. *See id.* at 36–37, 44–46 (discussing the factors identified by the crucial Senate report on section 2).

108. *See* Johnson v. De Grandy, 512 U.S. 997, 1017 (1994) ("One may suspect vote dilution from political famine, but one is not entitled to suspect (much less infer) dilution from mere failure to guarantee a political feast.").

109. We also cannot instruct the algorithm to match the existing number of opportunity districts for two reasons. First, most of these districts were drawn using data available in 2011, while we rely on more recent ACS data, which could legally require more or fewer opportunity districts than the older data. Second, because all existing opportunity districts were designed on an equal-total-population basis, it is entirely unclear what matching would mean for districts that equalize CVAP instead.

110. For now. In Part III, *infra*, we instruct the algorithm to emulate the behavior of a Democratic or Republican gerrymanderer.

We want to know how Democrats and Republicans would be affected by changing the apportionment base from total population to CVAP. To find out, after the algorithm finishes running, we evaluate districts using the results of the 2012 presidential election. That is, we classify districts as Democratic (Republican) if Barack Obama (Mitt Romney) received more votes in them. The 2012 presidential election is the most recent one for which precinct-level data is universally available. It was also a closely contested race, with a nationwide margin of victory of less than four points, making it a reasonable measure of districts' partisan leanings.[111]

One final note before proceeding to our findings. While our methods may seem complex, they bring about a number of substantive advantages. First, our five parameters for the algorithm mean that all of the district maps they generate are plausibly lawful. They comply with the one person, one vote rule; they adhere to state county splitting and compactness requirements; and unlike most previous districting simulations, they abide by the VRA, too.[112] Second, because these five parameters are the *same* for both the equal-total-population and the equal-CVAP simulation sets, they enable a true apples-to-apples comparison. The only difference between the two simulation sets is their unit of apportionment. All other variables are held constant.

And third, scholars have shown that the Recombination MCMC technique used by the algorithm efficiently produces district maps that are representative of the universe of maps that satisfy the specified criteria.[113] A corollary of this representativeness property is that each map saved by the algorithm should be unrelated to the prior saved map. The below chart demonstrates this absence of

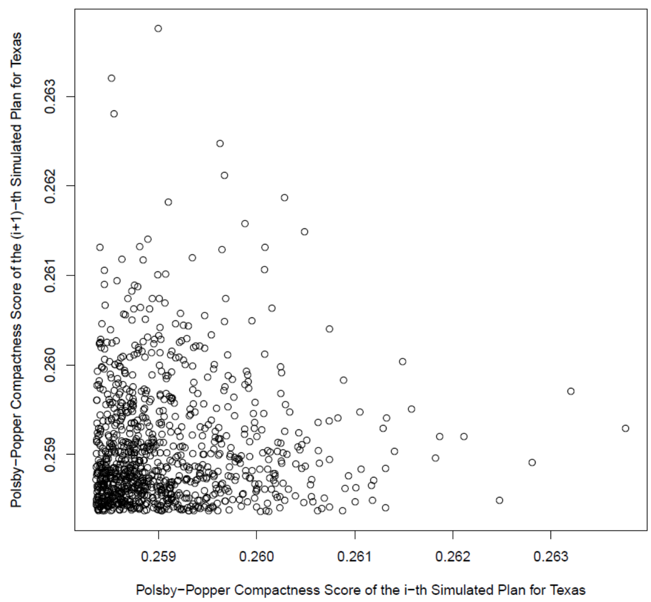
111. *See 2012 Presidential General Election Results*, FED. ELECTION COMM'N, https://www.fec.gov/resources/cms-content/documents/2012pres.pdf [https://perma.cc/75MK-KJSW]. Of course, our results could (and likely would) vary if we analyzed districts' partisanship using more or other elections. The same is true for our designations of districts as minority opportunity districts, which also depend on 2012 data. *See supra* note 105.

112. *See* Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 940 ("To date, almost all such [studies] in the academic literature have ignored race."). However, because we analyze ten different states in this project, we rely on a number of shortcuts that may be inadvisable in a detailed study of a single state. We use one election to implement the VRA, for example, not a range of exogenous and endogenous races (including primary and general elections). We also use the same redistricting parameters for all states, as opposed to their individual constitutional and statutory criteria. These choices are reasonable for a broad multistate survey, but a more thorough examination of a single state could proceed differently. *See, e.g.*, Amariah Becker, Moon Duchin, Dara Gold & Sam Hirsch, Computational Redistricting and the Voting Rights Act 22–39 (2020) (unpublished manuscript), https://mggg.org/uploads/VRA-Ensembles.pdf [https://perma.cc/SLS6-W8PV] (using randomized redistricting to examine VRA compliance in Texas in depth).

113. On the benefits of the Recombination method, see DeFord et al., *supra* note 95. On the representativeness of map ensembles produced using MCMC, see Sachet Banghia, Christy Vaughn Graves, Gregory Herschlag, Han Sung Kang, Justin Luo, Jonathan C. Mattingly & Robert Ravier, Redistricting: Drawing the Line 27 (May 8, 2017) (unpublished manuscript), https://arxiv.org/pdf/1704.03360.pdf [https://perma.cc/39KP-8KB8], and Benjamin Fifield, Michael Higgins, Kosuke Imai & Alexander Tarr, *Automated Redistricting Simulator Using Markov Chain Monte Carlo*, 29 J. COMPUTATIONAL & GRAPHICAL STAT. 715, 717 (2020).

a relationship by plotting the average Polsby-Popper compactness of each simulated Texas map (on the vertical axis) against the average Polsby-Popper compactness of the simulated Texas map saved immediately before (on the horizontal axis).[114] Overall, the correlation is only 0.01, indicating that the successive maps in each pairing are almost entirely distinct from each other. This distinctness, of course, is exactly why the maps in each simulation set comprise a representative sample.

Figure 2: Average Polsby-Popper compactness of successive simulated Texas state house maps



II.
PARTY-BLIND ANALYSIS

Shifting gears from approaches to outcomes, we begin this Part where we ended the last one: with Texas, the state with the country's lowest CVAP share (64.0%)[115] and the site of the *Evenwel* litigation. Changing Texas's apportionment base from total population to CVAP sharply reduces the number of minority opportunity districts that emerge from the computer simulations. Doing so also significantly increases the number of Republican districts. But Texas is somewhat aberrational. The effects of switching from equal-total-population to equal-CVAP districts are more muted in most other states in our

114. We use Texas (from the equal-total-population simulation set) as an example because of its high profile in the apportionment debate. For a similar demonstration to this one, see Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 895–96.

115. *See ACS Demographic and Housing Estimates*, *supra* note 86.

data set. Occasionally, minority voters and Democrats even control *more* districts when they are drawn using CVAP rather than total population.

A. Texas

Recall that the first stage of our redistricting algorithm aims (among other things) to create as many reasonably compact opportunity districts as possible, while the second stage holds this number constant.[116] In the Texas simulation set using total population as the unit of apportionment, the algorithm produces sixty-five state house districts in which minority voters are able to elect their preferred candidates. In contrast, in the Texas simulation set using CVAP as the apportionment base, the algorithm yields only fifty-four opportunity districts. This is obviously a sizable difference. Fully eleven fewer opportunity districts may feasibly be constructed when districts equalize CVAP instead of total population.

Also observe that, while the algorithm freezes the *total* volume of opportunity districts, it permits the numbers of African American and Hispanic opportunity districts to vary somewhat.[117] In particular, a proposed change is accepted if it would simultaneously eliminate an existing Black (or Hispanic) opportunity district but generate an additional Hispanic (or Black) opportunity district. In that case, the total volume of opportunity districts would be unaffected. Figures 3 and 4, then, display the distributions of Black and Hispanic opportunity districts, respectively, in the two Texas simulation sets. There are anywhere from thirty-four to thirty-nine Black opportunity districts (with a median of thirty-seven) when total population is the unit of apportionment, compared to twenty-eight to thirty Black opportunity districts (with a median of twenty-nine) when CVAP is the apportionment base. Similarly, there are anywhere from twenty-six to thirty-one Hispanic opportunity districts (with a median of twenty-eight) when total population is the unit of apportionment, versus twenty-four to twenty-six Hispanic opportunity districts (with a median of twenty-five) when CVAP is the apportionment base. Several more Black opportunity districts (eight) than Hispanic opportunity districts (three) thus generally disappear when equal-CVAP districts rather than equal-total-population districts are formed.

116. *See supra* notes 91–94 and accompanying text.

117. An "African American" (or "Hispanic") opportunity district is one where Black (or Hispanic) voters comprise the largest racial minority group.

Figure 3: African American opportunity districts in the Texas equal-total-population and equal-CVAP simulation sets

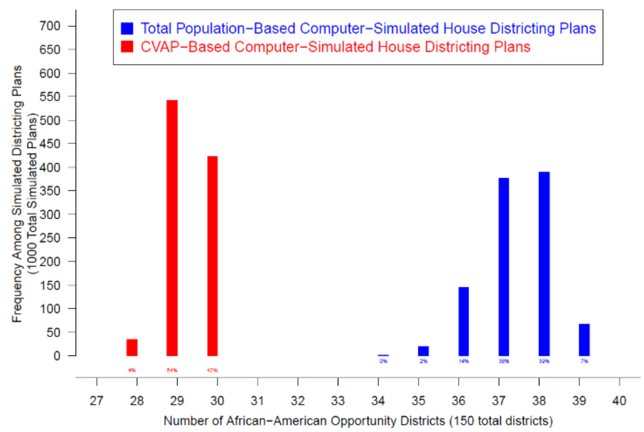
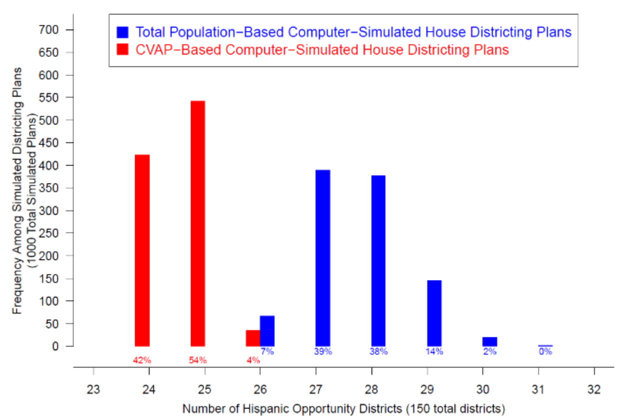


Figure 4: Hispanic opportunity districts in the Texas equal-total-population and equal-CVAP simulation sets



The partisan implications of switching the unit of apportionment in Texas are significant as well. In both of its stages, the algorithm operates without consulting electoral data and so allows the numbers of Democratic and Republican districts to fluctuate freely. As shown in Figure 5, in the Texas simulation set using total population as the apportionment base, there are anywhere from seventy-seven to eighty-one Republican districts (with a median of eighty). But in the Texas simulation set using CVAP as the unit of apportionment, there are anywhere from eighty-six to ninety-one Republican districts (with a median of eighty-nine). Accordingly, nine more Republican districts typically emerge when districts equalize CVAP instead of total population.

These effects are comparable to those found by the small existing literature on changing the apportionment base. As noted earlier, Hofeller calculated that Texas's state house map would include five fewer Hispanic opportunity districts under an equal-CVAP rule than under an equal-total-population rule.[118] We identify a smaller decline of three Hispanic opportunity districts between the median equal-total-population simulation and the median equal-CVAP simulation. Hofeller,[119] Klarner,[120] and Beveridge[121] also estimated that switching the unit of apportionment would result in six, six, and seven more Republican state house districts in Texas, respectively. Our partisan result is even starker: nine additional Republican districts in the median equal-CVAP simulation than in the median equal-total-population simulation.

It is worth emphasizing the magnitude of these findings. The eleven opportunity districts that vanish between the equal-total-population and the equal-CVAP simulations represent a decline in minority representation of more than seven percentage points. It took roughly two decades for the Texas House of Representatives to add eleven more minority members, but this diversification could be reversed overnight by changing the apportionment base.[122] Likewise, the nine extra Republican districts in the median equal-CVAP simulation compared to the median equal-total-population simulation amount to a boost in Republican representation of six percentage points. Even aggressive partisan gerrymanders rarely enable such large partisan gains.[123] The enacted Texas state house plan, for instance, contains only *one* percentage point more Republican seats than the median simulation produced without consulting electoral data.[124]

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118. *See supra* note 15 and accompanying text. Hofeller did not separately analyze Black opportunity districts.

119. *See supra* note 21 and accompanying text.

120. *See supra* note 21 and accompanying text.

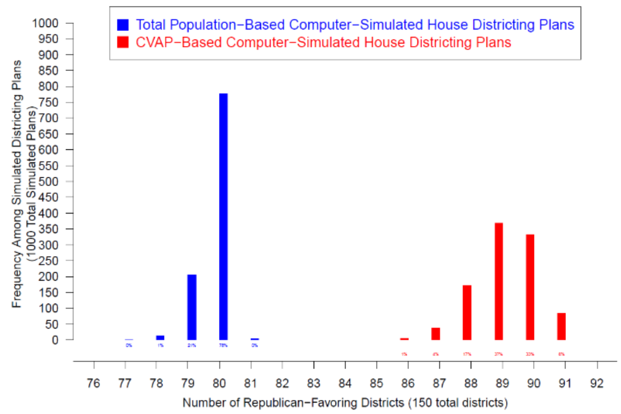
121. *See supra* note 24 and accompanying text.

122. One of us compiled data on minority representation at the state house level as part of a previous project. *See* Nicholas O. Stephanopoulos, *Race, Place, and Power*, 68 STAN. L. REV. 1323, 1367 (2016). This data is on file with the authors.

123. Of the nineteen states we examined in a previous project, the enacted plans of only two diverged from the median simulation by more than six percentage points: Arizona in a Democratic direction and North Carolina in a Republican direction. *See* Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 935.

124. *See id.*

Figure 5: Republican districts in the Texas equal-total-population and equal-CVAP simulation sets



B. All States

Texas may be an outlier, though, thanks to its very low share of adult citizens. To see if the results for Texas are generalizable, we now extend our analysis to all of the states in our data set, starting with the impact of switching the unit of apportionment on minority representation. Figure 6 denotes the total proportions of opportunity districts (combining African American and Hispanic opportunity districts) in the equal-total-population and equal-CVAP simulations for each state. Figure 6 also displays the distributions of Black and Hispanic opportunity districts in each simulation set and for each state. (Again, the numbers of Black and Hispanic opportunity districts may vary from one map to another within the same simulation set, but their combined volume is fixed.)

As we suspected, Texas is indeed exceptional. No state exceeds its seven-percentage-point decline in the share of opportunity districts from the equal-total-population simulations to the equal-CVAP simulations. Several more states, though, exhibit substantial drops in minority representation when the apportionment base is changed. In Arizona, California, Florida, and New York, the fraction of opportunity districts falls by four to seven percentage points between the equal-total-population simulations and the equal-CVAP simulations. In Idaho, Illinois, and Utah, on the other hand, there is no shift in minority representation. The same proportions of opportunity districts emerge whether districts equalize total population or CVAP. And interestingly, minority representation slightly increases in Georgia when the unit of apportionment is altered. The share of opportunity districts goes up by one percentage point from the equal-total-population simulations to the equal-CVAP simulations.

Also notably, there is a modest difference in how African American and Hispanic representation are affected. Across all of the states in our data set, the median change in Black opportunity districts between the equal-total-population simulations and the equal-CVAP simulations (0.0 percentage points) is somewhat smaller than the corresponding figure for Hispanic opportunity districts (-1.7 percentage points).[125] This difference is presumably attributable to Hispanic people's lower likelihood, compared to that of Black people, of being adult citizens. However, the overall figures mask some state-specific contrasts in how Black and Hispanic opportunity districts respond to a switch in the apportionment base. In New York, for example, Black representation drops substantially more than Hispanic representation (5.3 percentage points versus 1.3 percentage points) from the equal-total-population simulations to the equal-CVAP simulations. But in California, the share of Hispanic opportunity districts falls (by 3.8 percentage points) while the share of Black opportunity districts stays the same.[126]

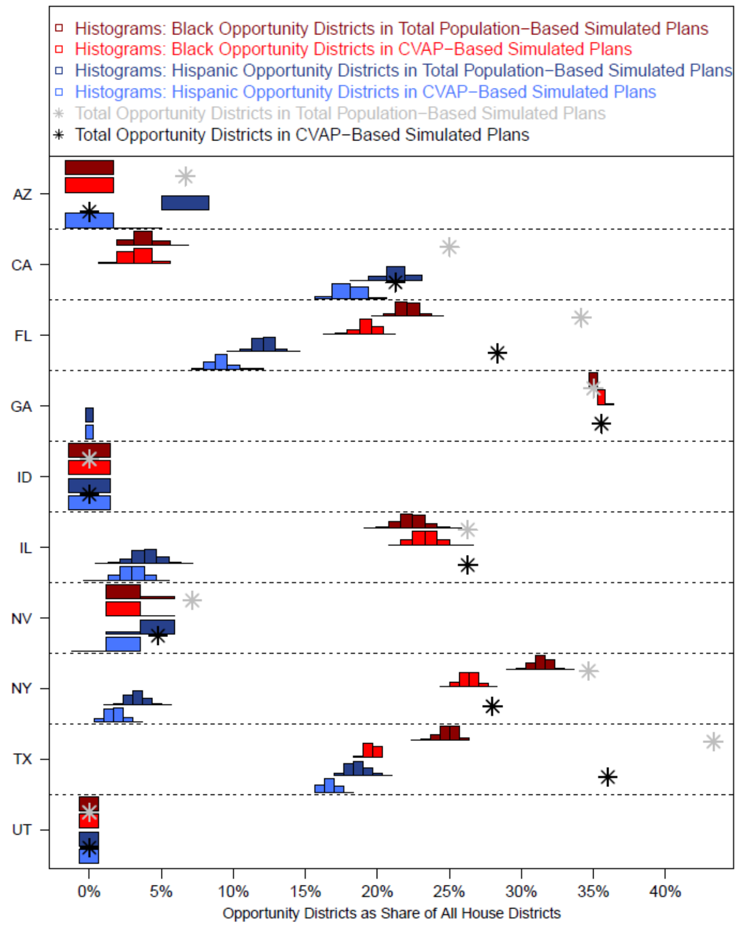
Stepping back from these details, our conclusion is that, if states were to change their unit of apportionment in the 2020 redistricting cycle, the implications for minority representation would be significant if not quite overwhelming. These effects would indeed be large (and negative) in Arizona, California, Florida, New York, and Texas. But this impact could be partly offset by an increase in opportunity districts in Georgia. And in several states, minority representation would shift by no more than a few percentage points. While undeniably important, then, the debate over the apportionment base does not appear to have transformative potential for minority voters akin to the enactment of the VRA, the law's interpretation in *Gingles*,[127] or the diversification of American society in recent years. Compared to these monumental events, switching from equal-total-population to equal-CVAP districts would be more of a second-order development.

125. To reiterate, there are different numbers of Black and Hispanic opportunity districts in the simulated maps within each simulation set. The differences reported here are, therefore, between the *median* maps in the equal-total-population simulations and the equal-CVAP simulations.

126. The impact on Black versus Hispanic representation also varies significantly in states with only a single large minority population, such as Arizona and Nevada.

127. For an in-depth examination of *Gingles*'s impact on minority representation, see generally Stephanopoulos, *Race, Place, and Power supra* note 122, at 1367–70.

Figure 6: Minority opportunity districts in the equal-total-population and equal-CVAP simulation sets for all states



Does this nuanced appraisal hold for *partisan* representation as well? Figure 7 shows the distributions of Republican districts in the equal-total-population and equal-CVAP simulations for each state in our data set. To reiterate, the proportions of Democratic and Republican districts are allowed to fluctuate freely by the algorithm, which runs without consulting electoral data.

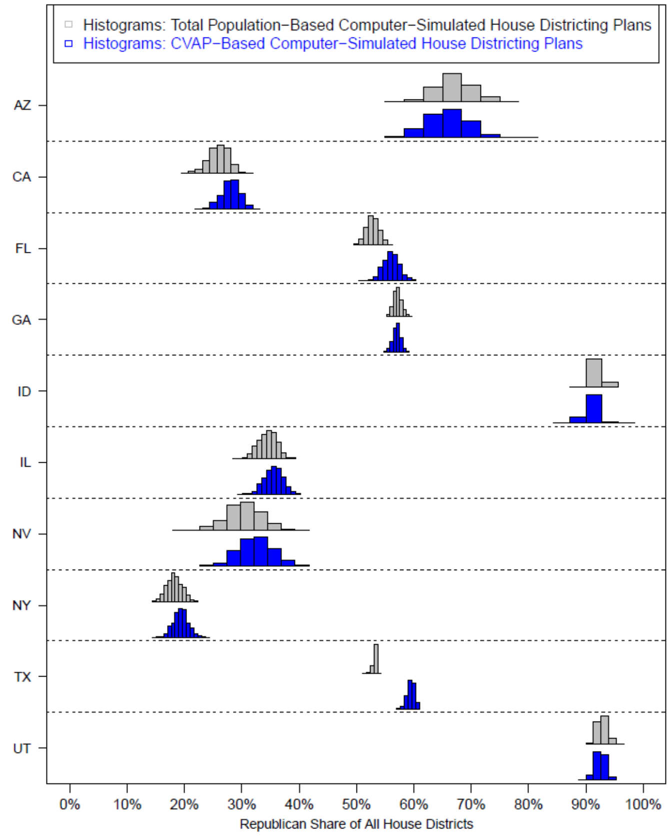
The sizeable advantage that Republicans gain in Texas from changing the unit of apportionment is immediately apparent. As noted above, the median equal-CVAP simulation has six percentage points more Republican districts than the median equal-total-population simulation.[128] Also evident is the edge that Republicans obtain in Florida and Nevada. In these states, the median equal-

128. *See supra* Part II.A.

CVAP simulation has two to three percentage points more Republican districts than the median equal-total-population simulation. In a majority of states, though, there is little partisan difference between the two simulation sets. In Arizona, California, Georgia, Idaho, Illinois, New York, and Utah, the median equal-CVAP simulation diverges in partisan composition from the median equal-total-population simulation by no more than one percentage point.

Our findings for partisan representation, then, are less dramatic than those for minority representation. In most states in our data set, neither party would gain a major advantage from switching the apportionment base. In fact, the median shift between the median equal-total-population simulation and the median equal-CVAP simulation is just 1.0 percentage points in a Republican direction. In no state does this shift cause a change in the party expected to control the state house. To be sure, the partisan effects in Florida and (especially) Texas are noteworthy. In an equal-CVAP world, both of these states' lower chambers would be comfortably Republican, not close to flipping to the Democrats. But Florida and Texas are unusual. Everywhere else, the partisan consequences of equalizing CVAP rather than total population are minor or nonexistent.

Figure 7: Republican districts in the equal-total-population and equal-CVAP simulation sets for all states



C. Drivers

A logical question, at this point, is *why* the implications of changing the unit of apportionment vary from state to state. Why, that is, do the shares of opportunity districts and Democratic districts go down in certain states when districts equalize CVAP instead of total population, but stay the same or even increase in others? Unfortunately, with data for just ten states at a single moment in time, we have little ability to test the many hypotheses that come to mind: the residential patterns of minority and nonminority voters, these individuals' partisan preferences and turnout, the particular redistricting criteria used by different states, and so on. However, one potential explanation is so salient that we would be remiss if we did not at least tentatively explore it: the composition of states' populations, specifically, their proportions of adult citizens and of all citizens.

This composition, of course, is how we selected the states in our dataset. With just one exception (Florida), we included states with CVAP shares below the national average.[129] One might reasonably predict that states with larger fractions of persons who are not adult citizens would see greater declines in the fractions of opportunity districts and Democratic districts when the apportionment base is switched. These persons tend to be, and to live near other, minority members and Democrats. So if these persons no longer count towards districts' populations for one person, one vote purposes, then more of them might be squeezed into a smaller number of districts. The result could be fewer opportunity districts and Democratic districts—especially in the states with the lowest CVAP shares and hence the highest proportions of people to be reallocated between equal-total-population and equal-CVAP districts.[130]

To test this prediction,[131] Figure 8 plots the changes in states' fractions of opportunity districts, from the equal-total-population simulations to the equal-CVAP simulations, versus states' CVAP shares. Figure 9 is analogous except that the vertical axis captures the changes in states' median fractions of Republican districts between the equal-total-population simulations and the equal-CVAP simulations. Each scatter plot also includes a best fit line indicating the overall relationship between the impact on minority or partisan representation and population composition.

Both charts reveal links in the expected direction. In Figure 8, states with lower CVAP shares have relatively fewer opportunity districts in their equal-CVAP simulations than in their equal-total-population simulations. In Figure 9, similarly, states with lower CVAP shares have relatively more Republican districts in their median equal-CVAP simulations than in their median equal-total-population simulations. However, these connections are not especially strong, with correlations of 0.2 and 0.3, respectively, that fail to achieve statistical significance. At most, the scatter plots are suggestive that minority and Democratic representation may suffer more when states with higher proportions of adult citizens change their unit of apportionment.

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129. *See supra* notes 87–89 and accompanying text.

130. This is unlikely to be a monocausal story, however. The political effects of low CVAP shares could be modulated by all kinds of other factors, like the greater residential integration of minority voters or the greater liberalism of nonminority voters. Again, we do not test these other factors here.

131. Albeit not as rigorously as we might like. A scatter plot can only reveal a correlation, of course.

Figure 8: Change in opportunity districts from equal-total-population to equal-CVAP simulation sets versus state CVAP

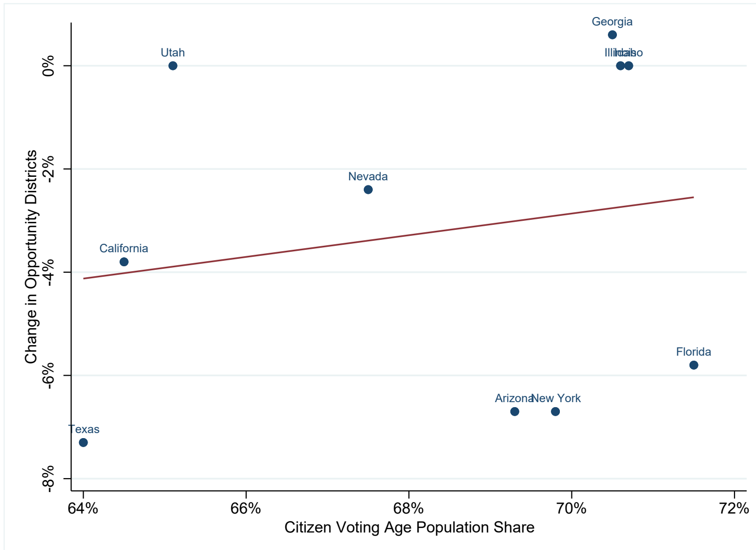
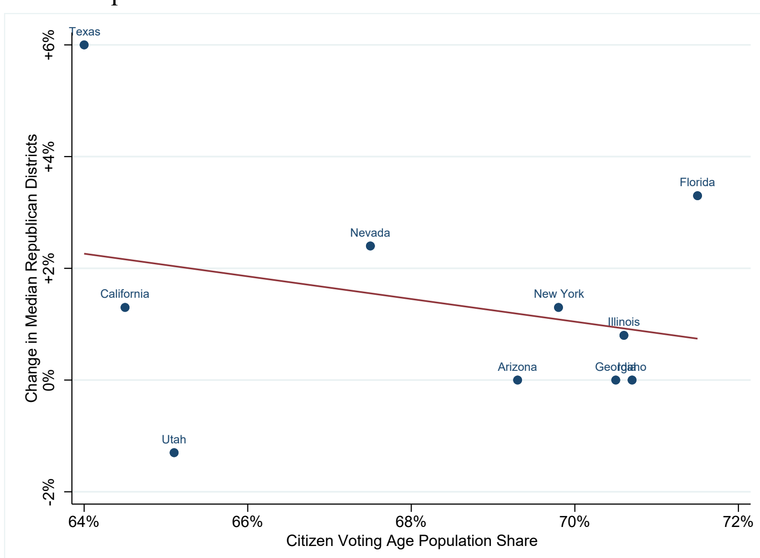


Figure 9: Change in median Republican districts from equal-total-population to equal-CVAP simulation sets versus state CVAP



But perhaps the proportion of adult citizens in each state is not the most relevant metric. This figure obviously has two components: the fraction of people who are citizens *and* the fraction of people who are adults. In theory, both components could modulate how switching the apportionment base affects minority and partisan representation. In practice, though, the fraction of people who are citizens is more likely to be influential. Noncitizens are more unevenly distributed than are children, clustering more in certain areas while less often residing in others. By the same token, the voting-eligible neighbors of noncitizens are more distinctive than those of children: more apt to be minority members and Democrats.[132] Consequently, the relationship between population composition and the impact of changing the unit of apportionment might be clearer if population composition is measured using the proportion of *all* citizens—not *adult* citizens—in each state.

To investigate this refined hypothesis,[133] Figures 10 and 11 replicate Figures 8 and 9 except that the horizontal axis now denotes the share of each state's population that is comprised of citizens (of any age). As a result of this revision, the links between the variables markedly strengthen. In Figure 10, states with lower fractions of citizens plainly see larger reductions in their fractions of opportunity districts from their equal-total-population simulations to their equal-CVAP simulations. The correlation here also jumps to 0.7, statistically significant at the 5% level. In Figure 11, likewise, states with lower proportions of citizens see sharper increases in their proportions of Republican districts between their median equal-total-population simulations and their median equal-CVAP simulations. The correlation here rises to 0.6, statistically significant at the 10% level.

We may cautiously conclude, then, that states' population compositions help determine the effects of switching the apportionment base. States' shares of *all* citizens also appear to be more potent drivers than their shares of *adult* citizens. We hasten to add, though, that this is certainly not the whole causal story. Some states (like Texas) exhibit bigger declines in opportunity districts and bigger gains in Republican districts, from the equal-total-population simulation set to the equal-CVAP simulation set, than one would predict given their citizenship rates. Other states (like California) evince the opposite pattern, subtracting fewer opportunity districts and adding fewer Republican districts than might be expected, based on their citizenship rates, when the unit of apportionment changes. To fully understand these results, it would be necessary to examine the spatial distributions of citizens and noncitizens in different states as well as eligible voters' partisan preferences and turnout. These factors are beyond this study's scope, but they are plainly fruitful subjects for future scholarship.

132. These patterns are clear in our data, though we are unaware of any literature making these specific points.

133. Again cross-sectionally and so with a method that cannot establish causation.

Figure 10: Change in opportunity districts from equal-total-population to equal-CVAP simulation sets versus state citizenship rate

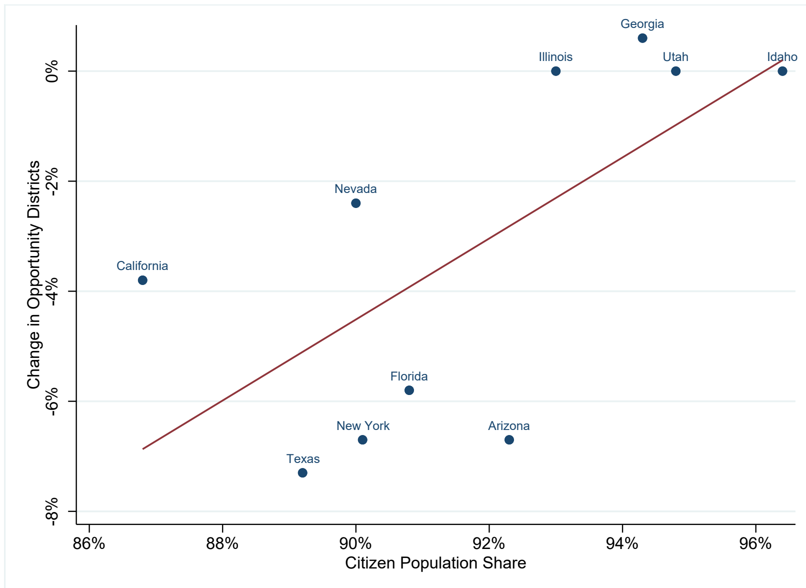
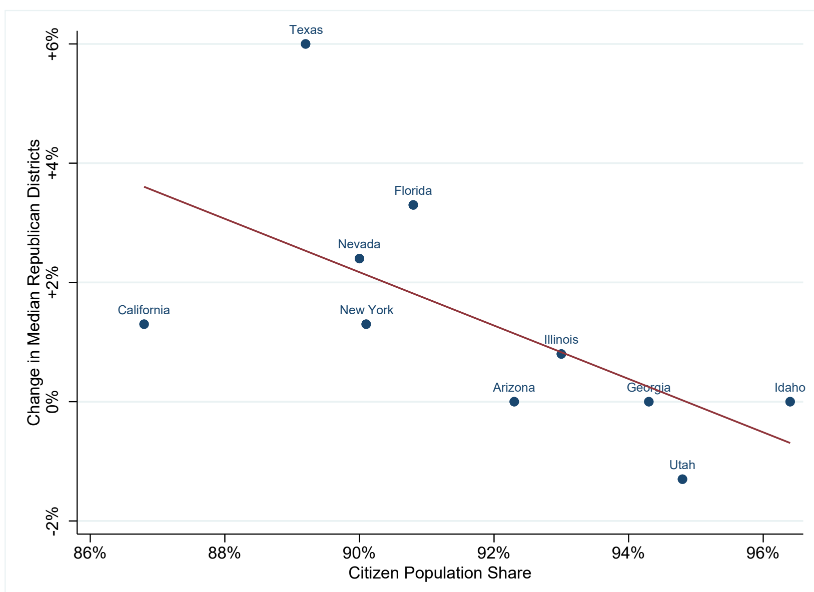


Figure 11: Change in median Republican districts from equal-total-population to equal-CVAP simulation sets versus state citizenship rate



III.
PARTY-CONSCIOUS ANALYSIS

Our analysis to this point has arguably been unrealistic because it has relied on a *nonpartisan* algorithm that designs districts *without* considering their electoral consequences. In contrast, most actual district plans are enacted by incumbent politicians who are highly aware of the partisan effects of different line-drawing choices. To see if CVAP equalization affects the parties differently when it is implemented by a partisan mapmaker, we adjust our algorithm in one crucial way in this Part. We now instruct it to incorporate electoral data and to maximize the numbers of Democratic or Republican districts while still complying to the same extent with all of the nonpartisan criteria specified previously. We find that this change to the algorithm—simulating gerrymandering rather than nonpartisan redistricting—makes little substantive difference. On the whole, Republicans still fail to benefit significantly when districts equalize CVAP instead of total population. We also determine that, regardless of the unit of apportionment, aggressive gerrymanders in both parties' favor are feasible. This conclusion refutes the common claim that Republicans are able to craft more successful gerrymanders because of their voters' more efficient geographic distribution.

A. Methodology

To conservatives who back CVAP equalization for partisan reasons, the results in Part II may seem underwhelming. A median of around a one-percentage-point increase in the share of Republican districts between the equal-total-population simulations and the equal-CVAP simulations is quite small: just an extra Republican seat or two, in most cases, changing the partisan composition of state houses only at the margins. But these advocates may reasonably believe that these findings understate the scale of the Republican advantage that would follow from CVAP equalization because they are based on a nonpartisan redistricting algorithm. It is possible that Republicans would gain more of an edge from changing the apportionment base if the lines were drawn to maximize Republican seats. Compared to a neutral mapmaker, a Republican gerrymanderer might be better able to exploit the opportunities presented by no longer having to count noncitizens and children for apportionment purposes.

Interestingly, no prior work on randomized redistricting has tried to emulate party-conscious rather than party-blind line-drawing.[134] Our effort here to mimic intentional gerrymandering is thus the first of its kind. To test the proposition that CVAP equalization could make more of a difference when adopted by a partisan mapmaker, we add one last parameter to the first stage of

134. This is because most prior work has sought to *detect*—not to *conduct*—extreme partisan gerrymandering. *See, e.g.*, Chen & Stephanopoulos, *Race-Blind Future*, *supra* note 85, at 885–86 nn. 116–26 (citing most of the relevant literature).

our redistricting algorithm: (6) rejecting any proposed change that would reduce the number of Democratic (Republican) districts when simulating a Democratic (Republican) gerrymander. The earlier components of the algorithm's first stage operate exactly as before.[135] So the algorithm initially produces a map with (1) a total deviation of either total population or CVAP below 10%; (2) as few split counties as possible; and (3) as many minority opportunity districts as possible that (4) are at least as compact as the least compact existing opportunity district. The algorithm then revises this map until (5) its districts are at least as compact, on average, as those of the enacted state house plan. Finally, instead of stopping there, the algorithm continues to edit the map until (6) it contains as many Democratic (Republican) districts as possible.

We again define Democratic (Republican) districts as ones in which Barack Obama (Mitt Romney) received more votes in the 2012 presidential election.[136] Of course, the 2012 presidential election represents a particular electoral environment: one in which Democrats enjoy a modest nationwide advantage. Because this environment could plausibly shift in either party's favor, we repeat the above procedure using other definitions of Democratic (Republican) districts: ones in which Obama (Romney) received 51%, 52%, 53%, 54%, or 55% of the two-party vote. This approach captures a variety of electoral conditions ranging from a good Republican year (like 2004) to an excellent Democratic year (like 2008). It thus reveals how a gerrymanderer would maximize her party's seats not just in 2012 but across a broader swath of American political history.[137]

With respect to the nonpartisan parameters for the algorithm's first stage, they are unchanged from the previous Part. In fact, we reuse the seed maps from that Part, which incorporate all of those parameters, as the starting points for the additional iterations maximizing each party's seats. This method holds constant every criterion—total deviation, compactness, respect for county boundaries, and compliance with the VRA—except the one of interest, whether redistricting is party-blind or party-conscious. With respect to the gerrymandering parameter, we implement it much like the split county and opportunity district conditions.[138] That is, the algorithm always runs for at least one million iterations in which proposed changes are accepted only if they do not reduce the number of Democratic (Republican) districts. The algorithm continues to run for twice as many iterations as the last point at which an additional Democratic (Republican) district was created. For example, if an extra Democratic (Republican) district

135. *See supra* Part I.D.

136. *See supra* note 111 and accompanying text.

137. However, this approach assumes that all areas swing uniformly from their 2012 results. This is a reasonable assumption in contemporary American politics, *see, e.g.*, Simon Jackman, *The Predictive Power of Uniform Swing*, 47 PS: POL. SCI. & POL. 317 (2014), but it is never perfectly accurate.

138. *See supra* note 92 and accompanying text.

last emerges after 750,000 iterations, the algorithm runs for 1.5 million iterations.[139]

Lastly, we now omit the algorithm's second stage: the one that generates a large ensemble of saved maps. This stage was necessary before because we wanted to determine the *distributions* of Democratic and Republican districts that arise when the unit of apportionment is total population or CVAP.[140] Now, however, we are interested in *maximizing* the volumes of Democratic or Republican districts given different apportionment bases. The first stage of the algorithm (as amended here) does exactly that. There is thus no reason to proceed to the algorithm's second stage, which would simply create more maps with the same maximized volumes of Democratic or Republican districts. These maps would serve no purpose except to show that optimal gerrymanders can be executed in multiple ways.

B. Results

Figure 12 illustrates the results of our party-conscious algorithm. For each state, the red and blue "x" markers indicate the shares of Republican state house seats that arise when Republican districts and Democratic districts are maximized, respectively, with *total population* as the unit of apportionment. Similarly, the red and blue "o" markers denote the shares of Republican seats under Republican and Democratic gerrymanders, respectively, with *CVAP* as the apportionment base. Lastly, the black "x" and "o" markers repeat information that was presented in the previous Part: the median Republican seat shares when total population and CVAP are the units of apportionment, respectively, and the algorithm *ignores* electoral data.

While Figure 12 is interesting in many respects, its most relevant feature, for present purposes, is the horizontal distance between each "x" and each "o" marker of the same color. This distance represents the change in Republican seat share when the apportionment base shifts from total population to CVAP and every other parameter is held constant. Most importantly, this change in Republican seat share is generally no larger when Republican seats are maximized than when electoral data is omitted from the algorithm. In fact, the median increase in Republican seat share when the unit of apportionment switches under Republican gerrymandering (1.1 percentage points) is virtually identical to when it switches under nonpartisan redistricting (1.0 percentage points).

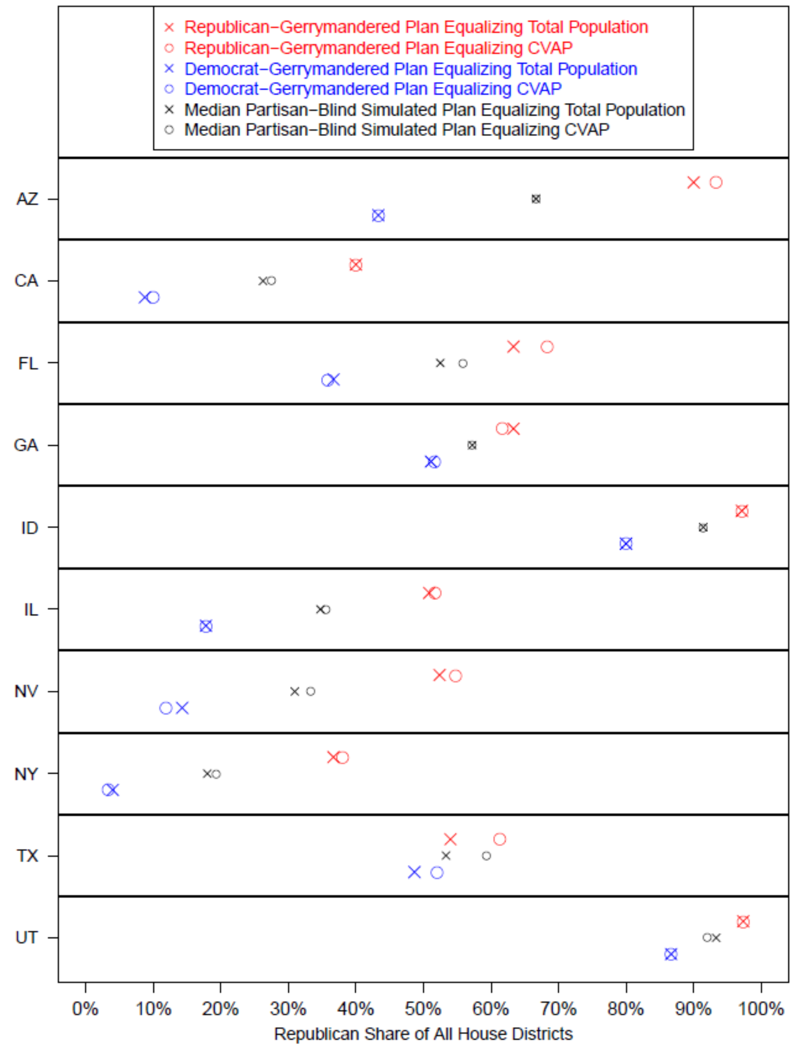
139. The gerrymander parameter also forbids any changes that would increase the total deviation beyond 10%, increase the number of split counties, reduce the number of reasonably compact opportunity districts, or render districts less compact, on average, than the enacted plan's districts.

140. *See supra* notes 92–93 and accompanying text. Note that, even before, the numbers of *minority opportunity* districts were fixed in the algorithm's second stage. Only the numbers of Democratic and Republican districts varied at that stage.

To be sure, there are some states where Republicans fare better under a changed apportionment base with Republican gerrymandering rather than nonpartisan redistricting. In Arizona, for example, Republican seat share goes up by about three percentage points between the equal-total-population simulations and the equal-CVAP simulations when Republican seats are maximized. But when electoral data is ignored, Republican seat share does not rise at all from one simulation set to the other. There are other states, though, where the opposite pattern holds. In Georgia, notably, Republican seat share *declines* by roughly two percentage points between the equal-total-population simulations and the equal-CVAP simulations when Republican seats are maximized. In contrast, when electoral data is ignored, Republican seat share stays constant from one simulation set to the other.

Interestingly, Republicans benefit less from switching the unit of apportionment under Democratic gerrymanders. The median change in Republican seat share between the equal-total-population simulations and the equal-CVAP simulations is 0.0 percentage points when Democratic seats are maximized—1.0 percentage points less than when electoral data is omitted from the algorithm and 1.1 percentage points less than when Republican seats are maximized. In states like Florida, Nevada, and New York, Republican seat share actually goes down by one to two percentage points from one simulation set to the other under Democratic gerrymanders—a sharply different outcome than under nonpartisan redistricting or Republican gerrymanders. (Though in states like California and Georgia, Republican seat share increases by about one percentage point from one simulation set to the other under Democratic gerrymanders, a better showing than under Republican gerrymanders.)

Figure 12: Republican seat share in the party-conscious and median party-blind simulations



On the whole, these results are disappointing for the conservative proponents of CVAP equalization. These activists may expect that changing the apportionment base would yield a significant advantage for Republicans, at least when Republicans are responsible for redistricting. Yet the typical boost in Republican seat share between the equal-total-population simulations and the equal-CVAP simulations is quite limited when Republicans gerrymander. This boost was marginal when the algorithm ignored electoral data, and it remains unimpressive when the algorithm maximizes Republican seats. True, Republicans enjoy a slightly larger edge when the unit of apportionment switches under Republican as opposed to Democratic gerrymanders. But this gain is still far from dramatic—and also far from the scenarios presumably contemplated by the backers of CVAP equalization. They likely want many more Republican seats when Republicans draw equal-CVAP districts. But all they get are a few more seats in this scenario then when Democrats equalize CVAP instead of total population.

Our key finding, then, is that changing the apportionment base usually makes little partisan difference, both when redistricting is party-blind (as in the last Part) and when it is party-conscious (as in this one). But we also want to flag some further insights produced by our party-conscious algorithm—which, again, is the first of its kind in the academic literature. One point is that Democratic and Republican gerrymanders are both quite potent. With total population as the unit of apportionment, the median Republican gerrymander includes 12.3 percentage points more Republican seats than the median party-blind simulation. Similarly, the median Democratic gerrymander includes 14.9 percentage points more Democratic seats. With CVAP as the apportionment base, the median Republican gerrymander includes 12.5 percentage points more Republican seats than the median party-blind simulation. Likewise, the median Democratic gerrymander includes 16.8 percentage points more Democratic seats. These results rebut the common argument that it is easier for Republicans to gerrymander because of the more efficient distribution of Republican voters.[141] To the contrary, our party-conscious algorithm is able to design Democratic gerrymanders that are somewhat *more* aggressive than their Republican counterparts no matter which unit of apportionment is used.

Second, these results show how difficult it is to constrain gerrymandering through nonpartisan criteria. All of our simulations, whether party-blind or party-conscious, implement the same very strict parameters: total deviation below 10%, as few split counties as possible, as many reasonably compact minority opportunity districts as possible, and districts at least as compact, on average, as the enacted plan's districts.[142] Yet even while complying with these criteria, the Democratic and Republican gerrymanders manage to create many more Democratic and Republican districts, respectively, than the median party-blind simulations. In other words, requirements like population equality, respect for county boundaries, adherence to the VRA, and compactness do not prevent the successful pursuit of partisan advantage. To actually curb gerrymandering, it seems, either a nonpartisan redistricting process or *partisan* criteria insisting that both parties be treated fairly are necessary. Nonpartisan criteria are simply not up to the task.[143]

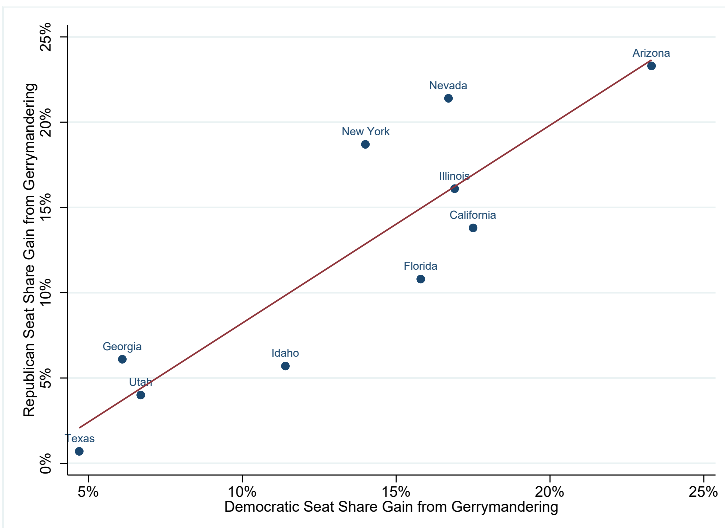
141. One of us has contributed to the acceptance of this argument in prior work. *See generally* Chen & Rodden, *Unintentional Gerrymandering*, *supra* note 85 (finding a Republican redistricting advantage in certain states due to Republican voters' more efficient geographic distribution).

142. *See supra* Part I.D.

143. As a federal court recently put it, "[h]ighly sophisticated mapping software now allows lawmakers to pursue partisan advantage without sacrificing compliance with traditional districting criteria. A map that appears congruent and compact to the naked eye may in fact be an intentional and

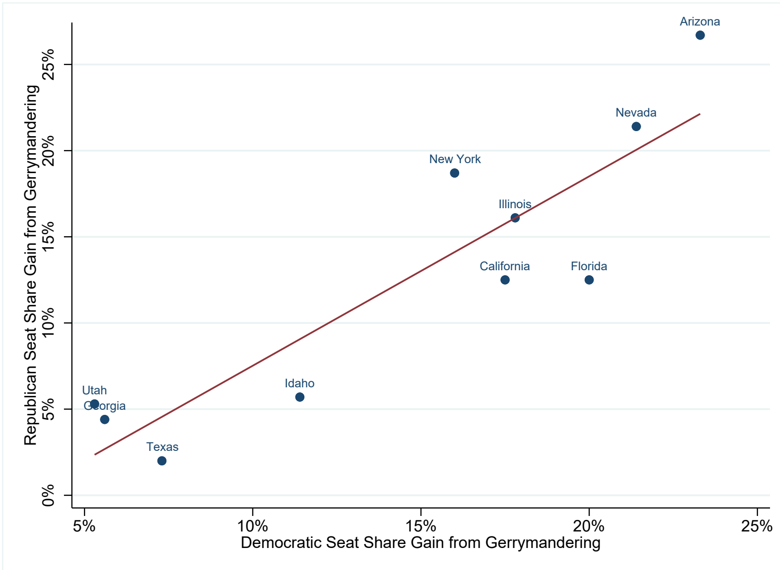
And third, some states are easier to gerrymander while other states are harder. Moreover, the states that are easy (or hard) for one party to gerrymander also tend to be the states that are easy (or hard) for the other party to gerrymander. Figure 13 plots the Republican gain in seat share between the median party-blind simulation and the Republican gerrymandering simulation versus the Democratic gain in seat share between the median party-blind simulation and the Democratic gerrymandering simulation, when total population is the apportionment base. Figure 14 is an analogous scatter plot except that it reports the results when CVAP is the unit of apportionment. In both charts, there is a very strong correlation (around 0.9) between Republican seat share gain and Democratic seat share gain. Apparently, both parties are able to enact effective gerrymanders in states like Arizona, California, Florida, Illinois, New York, and Nevada. But perhaps because of their political geographies or our choice of redistricting parameters, neither party can muster as big an edge in states like Georgia, Idaho, Texas, and Utah. Future scholarship should certainly probe why states vary in their susceptibility to gerrymandering—and why this vulnerability is so similar to both Democratic and Republican gerrymanders.

Figure 13: Republican versus Democratic gain in seat share from gerrymandering with total population as the unit of apportionment



highly effective partisan gerrymander." Whitford v. Gill, 218 F. Supp. 3d 837, 889 (W.D. Wis. 2016), *vacated*, 138 S. Ct. 1916 (2018).

Figure 14: Republican versus Democratic gain in seat share from gerrymandering with CVAP as the unit of apportionment



C. Other Conditions

As noted above,[144] a potential critique of the analysis so far is that it is based on the results of a single election: the 2012 presidential election. That race was fairly typical of recent American political history in that Democrats enjoyed a modest nationwide advantage. But it was still just one race. So one might reasonably speculate that our conclusions would be different if we examined other elections, held in other political environments. In particular, perhaps Republicans *would* benefit from switching the apportionment base in conditions unlike 2012, such as good Republican years or excellent Democratic ones.

To address this concern, we cannot simply substitute other actual elections for the 2012 race. Earlier presidential elections reflect different political cleavages and geographic patterns, while the necessary precinct-level data is not universally available for later presidential races. Instead, our strategy is repeatedly to vary our definition of Democratic (Republican) districts so that they are ones won or lost by Barack Obama (Mitt Romney) in 2012 by one, two, three, four, or five percentage points. For example, when we shift the 2012 results by three percentage points in a Republican direction, Democratic districts are ones in which Obama received at least 53% of the two-party vote, while Republican districts are ones in which Romney received at least 47% of the two-

144. *See supra* note 136 and accompanying text.

party vote.[145] Armed with these changing definitions, we then rerun our party-conscious algorithm a total of two hundred times: ten states multiplied by two units of apportionment multiplied by ten electoral environments. The algorithm continues to operate exactly as before, maximizing the numbers of Democratic or Republican districts (however defined) while satisfying all of the nonpartisan criteria that we previously selected.

Figure 15 displays the results of these additional runs of the party-conscious algorithm. Again, the red and blue "x" markers indicate the Republican fractions of state house districts when Republican and Democratic seats are maximized, respectively, and total population is the apportionment base. And once more, the red and blue "o" markers denote Republican seat shares under Republican and Democratic gerrymanders, respectively, when CVAP is the unit of apportionment. Now, however, eleven pairs of red and blue "x" and "o" markers are shown—not just one. Each of these represents a different electoral environment ranging from five points more favorable to Republicans than the 2012 presidential election to five points less favorable. Pro-Republican shifts appear below the 50% line, with Romney needing at least 45% to 49% of the two-party vote for a district to be labeled Republican. And pro-Democratic shifts lie above the 50% threshold, with a district deemed Democratic if Romney received no more than 51% to 55% of the two-party vote.

While Figure 15 may be confusing because of its mass of data points, its upshot is quite simple: overall, Republicans do *not* fare better when the apportionment base switches under electoral conditions different from the 2012 presidential election. In fact, the median increase in Republican seat share between the equal-total-population simulations and the equal-CVAP simulations, across all of the different electoral environments that we examine, is 1.2 percentage points when Republican seats are maximized. This is almost exactly the same median that we found earlier for Republican gerrymanders using the unadjusted 2012 results (1.1 percentage points).[146] Similarly, the median change in Republican seat share from one simulation set to the other, under the entire array of electoral conditions, is 0.0 percentage points when Democratic seats are maximized. This figure is identical to the one we noted previously for Democratic gerrymanders using the raw 2012 results.[147]

Unsurprisingly, there are certain scenarios under which Republicans benefit somewhat more from changing the unit of apportionment. When Republicans gerrymander and the electoral environment is four percentage points more Democratic than in 2012, one percentage point more Republican, four percentage points more Republican, or five percentage points more Republican, the median increase in Republican seat share between the equal-

145. As observed earlier, the uniform swing assumption on which this analysis relies is reasonably, though not perfectly, accurate. *See* Jackman, *supra* note 137.

146. *See supra* Part III.B.

147. *See id.*

total-population simulations and the equal-CVAP simulations is close to two percentage points. Likewise, when Democrats gerrymander and the electoral environment is four percentage points more Republican than in 2012, the median increase in Republican seat share from one simulation set to the other is again almost two percentage points. But these minor variations in Republican performance are neither unexpected nor indicative of any larger trend. They do not complicate the central message of Figure 15, which is that switching the apportionment base does not materially advantage Republicans under most electoral conditions. In other words, our earlier findings for the 2012 presidential election are not driven by any oddities of that particular race.

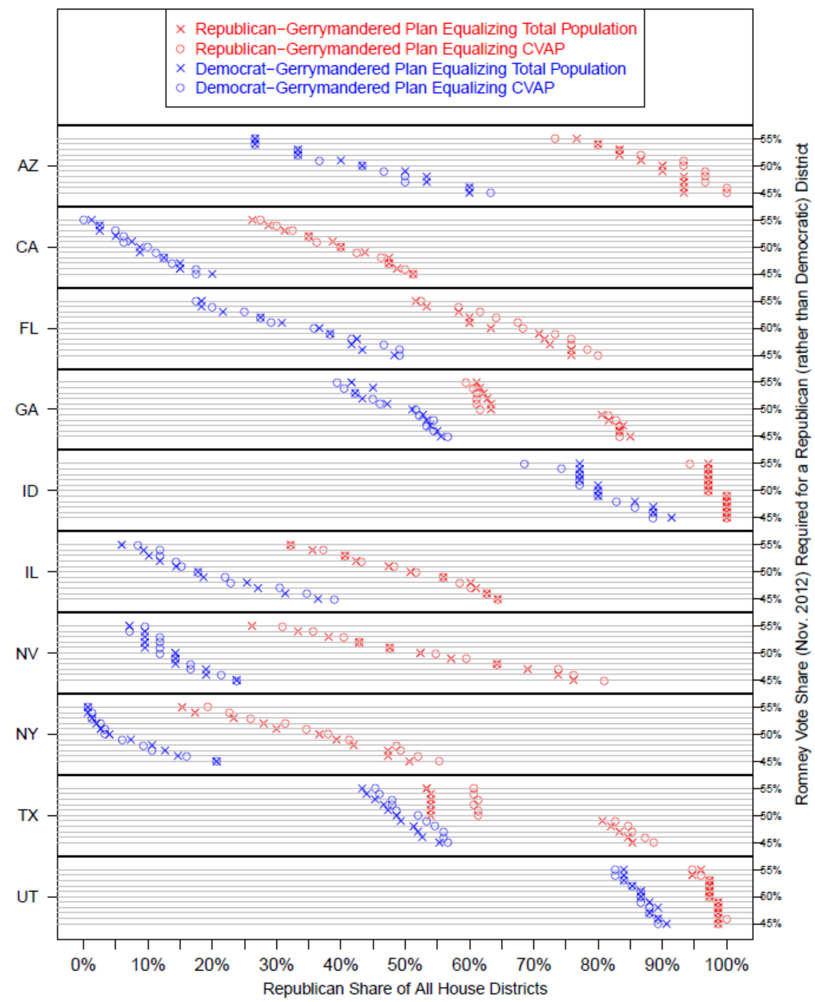
Given the novelty of our party-conscious algorithm, we also want to make two points unrelated to the implications of changing the unit of apportionment. The first is that Democratic and Republican gerrymanders vary in interesting ways in their responsiveness to shifting electoral environments. In Arizona, California, Florida, Illinois, Nevada, and New York, Democratic and Republican maps alike include many more Democratic seats when the vote swings in a Democratic direction and many more Republican seats when the vote swings in Republicans' favor. These maps, that is, are highly responsive to changing electoral conditions. In Idaho and Utah, in contrast, both Democratic and Republican gerrymanders are quite *un*responsive. Probably because these states are Republican bastions, Republicans win similarly sized (and huge) majorities whether Democratic or Republican seats are maximized and whether the electoral environment is pro-Democratic or pro-Republican. In Georgia and Texas, lastly, Democratic gerrymanders are relatively unresponsive to changing electoral conditions, while Republican gerrymanders exhibit jumps when the vote shifts slightly in a Republican direction. There seem to be many districts that the party-conscious algorithm cannot quite claim for Republicans using 2012 results—but that *can* be flipped in a marginally better Republican year.

The second point is an amplification of one we made above: the overwhelming impact of gerrymandering on the major parties' legislative representation.[148] We have no party-blind simulations with which to compare Democratic and Republican gerrymanders when the vote shifts away from the 2012 outcome. But we can still compare Democratic and Republican gerrymanders to each other, and their differences are staggering. Across all of the electoral environments that we examine, Republican seat share varies by a median of more than twenty-nine percentage points between Democratic and Republican gerrymanders when total population is the apportionment base. When CVAP is the unit of apportionment, Republican seat share again varies by a median of over twenty-nine percentage points between Democratic and Republican gerrymanders. To understand what this means in practice, suppose that a state's legislature would be evenly split in the absence of gerrymandering.

148. *See supra* note 140 and accompanying text.

Then a party could typically expect to win 64% to 65% of the districts if its seats were maximized, compared to just 35% to 36% of the districts if its opponent's seats were maximized. And to reiterate, this enormous partisan gulf would arise even though the maps equally satisfied the nonpartisan criteria of total deviation, compactness, respect for county boundaries, and compliance with the VRA. The satisfaction of these nonpartisan criteria, in other words, would give no clue whether the plan at issue was a Democratic gerrymander, a Republican gerrymander, or a map devised without partisan inputs.

Figure 15: Republican seat share in the party-conscious simulations across different electoral environments



CONCLUSION

The 2020 redistricting cycle may be unlike any that has come before. For the first time, certain states may choose to equalize their districts' citizen voting-age populations instead of their total populations. In this Article, we have explored the implications of switching the apportionment base for minority and partisan representation. Minority representation would likely decline significantly in states such as Arizona, Florida, New York, and Texas. If these states changed their unit of apportionment from total population to CVAP, their shares of minority opportunity districts could be expected to fall by six or more percentage points. On the other hand, the partisan impact of a different apportionment base would probably be more muted. Overall, Republicans would win more seats in plans that equalized districts' CVAPs—but only slightly more seats, generally not enough to disturb the partisan balance of power. This conclusion holds, moreover, whether districts are drawn by a nonpartisan mapmaker or a gerrymanderer and whether one or many electoral environments are analyzed.

Beyond these substantive contributions, this Article highlights the flexibility and power of randomized redistricting. To date, this method has mostly been used to identify partisan gerrymanders by comparing enacted plans to ensembles of maps generated without considering electoral data. But as we have shown here, randomized redistricting has many more useful applications. It can shed light on the effects of changing the unit of apportionment—or any other line-drawing parameter. It can also model party-conscious redistricting as easily as party-blind redistricting. Going forward, we hope scholars will extend randomized redistricting in still other directions. The technique is already revolutionizing our understanding of mapmaking choices, tradeoffs, and consequences, but many important insights remain to be gleaned.