VANDERBILT LAW REVIEW

VOLUME 59 MARCH 2006 NUMBER 2

Getting the Math Right: Why California Has Too Many Seats in the House of Representatives

*Paul H. Edelman**

* Professor of Mathematics and Law, Vanderbilt University. I have profited from the comments of Robert Bennett, Lisa Bressman, Richard Hasen, Richard Nagareda, Erin O'Hara, Robert Rasmussen, and Suzanna Sherry.

I. INTRODUCTION

"One person, one vote" sounds like a simple mathematical equation. Actually, it isn't quite that easy, but over the last forty years, the Supreme Court has distilled a fairly stable and predictable test for resolving the basic issue of equal representation: how much population difference between districts is permissible?

In one area of representation, however, the Court has gotten the math wrong. In its only opinion on the decennial apportionment of Congress, the 1992 case *U.S. Department of Commerce v. Montana*,[1] the Court punted. Rather than apply its well-established test from the districting cases, the Court deferred to Congress on the ground that different ways of measuring equality of representation produced different apportionments, and thus Congress, rather than the Court, should choose the best measure.[2] Unfortunately, that conclusion was based on a mathematical error.

As an abstract matter, applying the districting test to apportionment makes sense. Apportionment and districting are opposite sides of the same coin. In districting, one has a fixed number of representatives, and the geographic area must be cut into pieces to accommodate them. In apportionment, the geographic area is already divided into states, and the representatives must be parceled out among the divisions. In both instances, the goal is "equal representation for equal numbers of people."[3] In both instances, the same test should apply.

But when the Court tried to apply the districting test to apportionment, it was misled by its mathematical mistake. Relying on numbers provided by the parties, the Court thought it was looking at a calculation of relative deviation—the test used in the districting cases—when it was not.[4] Instead, it was looking at a *different* computation, and, not surprisingly, this alternative computation produced results that conflicted with other indications the Court had.[5] The Court thus concluded that the relative deviation test could not be applied to apportionment because the results that the Court reached

1. 503 U.S. 442, 445 (1992).
2. *Id.* at 464–66.
3. Wesberry v. Sanders, 376 U.S. 1, 18 (1964).
4. U.S. Dep't of Commerce v. Montana, 503 U.S. at 461–62.
5. *Id.* at 462–63.

under the test sent mixed signals about the appropriate measure of representation.[6]

This Article does the mathematics correctly. It provides a unified account of "one person, one vote" for both the districting cases and the apportionment of Congress, explaining why the same measure of "one person, one vote"—relative deviation—should apply to both districting and apportionment. I argue that the Court may be constitutionally required to apply this test in the apportionment context, and I demonstrate the method of finding the apportionment that best satisfies the requirement.

The apportionment method that best satisfies the "one person, one vote" test is unlike any method previously in use. Calculated under this method, the current Congress would have three fewer representatives from California and one more from each of South Dakota, Delaware, and Montana. In general, larger states lose representatives and smaller states gain.

Part II describes the evolution of the "one person, one vote" standard for districting cases. Part III relates the history of apportionment of the House and examines the sole Supreme Court case on the requirements of apportionment. In particular, this Part shows how an arithmetic error caused the Court's confusion about how to measure compliance with "one person, one vote" in the apportionment context. Having established a clear foundation, Part IV sets forth the prima facie case that the current apportionment of the House is out of compliance with the "one person, one vote" test from the districting cases. Part IV also considers possible counterarguments and concludes that they are not persuasive.

This does not end the inquiry, however, since under the "one person, one vote" test, the government has the opportunity to demonstrate that the current apportionment serves a legitimate political interest. Such a defense relies on technical properties of apportionments, and so I begin Part V with a discussion of the various methods of apportionment, including the new method that I propose. After laying the groundwork, I show that the legitimate government interests that support apportionment do not support the use of the current method of apportionment over my proposed method. In Part VI, I outline some of the political consequences that would result from my proposed method of apportionment.

---

6. *Id.*

II. MEASURING REPRESENTATION

A. Developing the Tests

Over time, the Supreme Court settled on two tests for measuring representation: total deviation and average deviation. While average deviation is employed to assess a few types of districting plans, the Court has shown a strong preference for using total deviation, even applying it to circumstances that do not quite fit.

When the Court initiated the reapportionment revolution with its "one person, one vote"[7] pronouncements in *Gray v. Sanders,*[8] *Reynolds v. Sims,*[9] and *Wesberry v. Sanders,*[10] it had little need for a refined statistic to measure the deviation from equal district sizes. The disparities were so egregious that any (and all) measures sufficed to demonstrate the inequities. Thus, in these early cases the Court gave a laundry list of figures and statistics to capture the disparities, including population-variance ratios,[11] percentage of the population residing in a majority of the Senate districts,[12] and specific instances of malapportionment.[13]

As time passed and state and local governments adjusted their districting, this ad hoc approach to measuring adherence to "one person, one vote" proved insufficient. The Court could have required exact equality among the districts, and to some extent this is what it ultimately did in the case of congressional districts.[14] In the case of state and local districting, however, the Court was loathe to require such strict adherence to mathematical equality. Instead, it chose to provide guidance as to the proper measure of "one person, one vote,"

7. Gray v. Sanders, 372 U.S. 368, 384 (1963).

8. *Id.*

9. 377 U.S. 533, 558 (1964).

10. 376 U.S. 1, 18 (1964).

11. *See, e.g., Reynolds*, 377 U.S. at 545 ("Population-variance ratios of up to about 41-to-1 existed in the Senate, and up to about 16-to-1 in the House."); *Wesberry*, 376 U.S. at 7 ("A single Congressman represents from two to three times as many Fifth District voters as are represented by eacb of the Congressmen from each of the other Georgia congressional districts.").

12. *Reynolds*, 377 U.S. at 545.

13. *Id.* at 549 ("Even so, serious disparities from a population-based standard remained. Montgomery County, with 169,210 people, was given only four seats, while Coosa County, with a population of only 10,726, and Cleburne County, witb only 10,911, were each allocated one representative.").

14. Karcher v. Daggett, 462 U.S. 725, 734 (1983) ("We thus reaffirm that there are no *de minimis* population variations, which could practicably be avoided, but which nonetheless meet the standard of Art. I, § 2 without justification."). But, as we will see, even in these cases the Court invoked measures of disparity in its analysis.

and the maximum discrepancies allowed. The Court ultimately adopted the measure of total deviation.

To understand the total deviation measure, consider *Abate v. Mundt*.[15] The Rockland County Board of Supervisors consisted of representatives of the five towns in the county: Stony Point, Haverstraw, Orangetown, Clarkstown, and Ramapo.[16] In order to comply with the "one person, one vote" mandate, the number of representatives elected from each town differed depending on the size of the town.[17] For example, Ramapo, the largest town, was given 6 representatives and Stony Point, the smallest, was given 1. The towns, their populations, and the number of their representatives are shown in the first three columns of Table I.[18]

Table I

Town	**Popu-lation**	**Repre-sentatives**	**People/ Repre-sentative**	**Relative Deviation**	**Total Deviation**
Stony Point	12114	1	12114	-0.34	
Haverstraw	23676	2	11838	-2.61	
Orangetown	52080	4	13020	7.11	
Clarkstown	57883	5	11576.6	-4.76	
Ramapo	73051	6	12175.17	0.16	
Rockland County	218804	18	12155.78		11.88

For each town we compute the number of people per representative by simple division. We also compute the ideal district size (the bottom cell in the fourth column) by dividing the total population of the county by the total number of representatives on the county board. For each city, then, we can compute the relative deviation from the ideal district size (column five) by taking the difference between the city's number of people per representative and the ideal district size, dividing by the ideal district size, and

15. 403 U.S. 182, 184 (1971).
16. *Id.* at 184 n.1.
17. *Id.* at 184.
18. *Id.* at 184 n.1.

multiplying by 100 (to turn it into a percentage).[19] The relative deviation is the difference between the size of the town's average district and the ideal district expressed as a percentage of the ideal district. Finally, we compute the size of the interval between the largest relative deviation and the smallest to get the total deviation.[20]

Abate was not the first case to apply the total deviation measure. Several years earlier, in *Swann v. Adams,* the Court confronted a challenge to a districting of the Florida state legislature.[21] Total deviation appears in the company of other statistics:

> The senate districts range from 87,595 to 114,053 in population per senator, or from 15.09% overrepresented to 10.56% underrepresented. The ratio between the largest and the smallest district is thus 1.30 to 1. The deviation from the average population per senator is greater than 15% in one senatorial district, is greater than 14% in five more districts and is more than 10% in still six other districts.[22]

The Court again utilized the total deviation measure in *Wells v. Rockefeller,*[23] a challenge to a New York state congressional redistricting in which the Appendix computes the relative deviation for each district and lists the maximum and minimum of those numbers.[24] After *Abate,* the Court applied the total deviation measure in *Mahan v. Howell,*[25] a challenge to the reapportionment of the Virginia House of Delegates. In this case, the Court acknowledged total deviation as a primary measure of compliance with "one person, one vote": "In *Kirkpatrick v. Preisler* and *Wells v. Rockefeller*, this Court invalidated state reapportionment statutes for federal

19. So, for instance, Haverstraw has 11,838 people per representative, so its percent deviation from the ideal district size is 100 x (11,838-12,155.78)/12,155.78 = -2.614. The negative sign indicates that the town has a smaller people-to-representative ratio than the ideal, i.e., the citizens of Haverstraw are over-represented.

20. In this case the largest percent deviation is 7.11% for Orangetown, and the smallest is -4.76% for Clarkstown, making the total deviation 7.11% + 4.76% = 11.88%. The Court upheld the constitutionality of the Board in spite of the size of the total deviation based on:

> [The] long tradition of overlapping functions and dual personnel in Rockland County government and on the fact that the plan before us does not contain a built-in bias tending to favor particular political interests or geographic areas. And nothing we say today should be taken to imply that even these factors could justify substantially greater deviations from population equality.

Abate, 403 U.S. at 187.

21. 385 U.S. 440, 441 (1967).

22. *Id.* at 442. The Court struck down this apportionment as being in violation of "one person, one vote." *Id.* at 443–44.

23. 394 U.S. 542, 547 (1969).

24. *Id.* As the Court does not rely on the total deviation test for challenges to congressional districting, it is especially telling that the Court decided to include this calculation in its Appendix.

25. 410 U.S. 315, 320 (1973).

congressional districts having maximum percentage deviations of 5.97% and 13.1% respectively. The express purpose of these cases was to elucidate the standard first announced in the holding of *Wesberry v. Sanders*."[26]

These cases developed a principle of prima facie compliance with "one person, one vote." For congressional districts the rule is that no deviation from absolute equality in district size is considered *de minimis*, and every deviation has to be justified by some legitimate state interest.[27] The Court has yet to find an interest sufficient to justify any deviation.[28]

The Court has distinguished state districting. In *Connor v. Finch*, the Court found that a total deviation of less than 10% would be considered *de minimis* for legislatively enacted apportionments of state legislatures.[29] A larger deviation "could be justified only if it were 'based on legitimate considerations incident to the effectuation of a rational state policy.'"[30] The Court restated this rule in *Brown v. Thompson*.[31]

Occasionally, the Court employs another measure of representation in an auxiliary role to total deviation. The *average deviation* (sometimes known as the mean deviation) is the average of the absolute value of the relative deviation from the ideal district size. For example, in the Rockland County Board of Supervisors discussed earlier, the relative deviations are -0.34, -2.61, 7.11, -4.76, and 0.16[32] and so the average of their absolute values is (0.34+2.61+7.11+4.76+0.16)/5=3.00. The average deviation has never been used as the primary means of deciding compliance with "one person, one vote," but rather as a complementary factor.

The Court used average deviation in two early cases before it settled on the 10% total deviation standard. In *White v. Regester*, a challenge to a redistricting of the Texas House of Representatives, the

26. *Id.*; *see also* Kirkpatrick v. Preisler, 394 U.S. 526, 529–30 (1969) (rejecting a congressional districting plan for Missouri on the basis of "one person, one vote").

27. Karcher v. Daggett, 462 U.S. 725, 740–41 (1983).

28. *Id.* at 734.

29. 431 U.S. 407, 418 (1977).

30. *Id.* (quoting Reynolds v. Sims, 377 U.S. 533, 579 (1964)).

31. 462 U.S. 835, 842 (1983) ("Our decisions have established as a general matter, that an apportionment plan with a maximum population deviation under 10% falls within the category of minor deviations."). *But see* Larios v. Cox, 300 F. Supp. 2d 1320, 1322 (N. D. Ga. 2004), *aff'd*, 542 U.S. 947 (2004) (finding a Georgia districting plan with total deviation of 9.98% in violation of "one person, one vote" because the deviation was due to a partisan gerrymander). What this portends for the 10% safe harbor is unclear. *See, e.g.*, Postings of Richard Hasen and Richard Pildes to Election Law Blog, http://electionlawblog.org/archives/2004_06.html (June 30, 2004) (discussing the possible effects of the *Larios* decision).

32. Abate v. Mundt, 403 U.S. 182, 184 n.1 (1971).

total deviation of the proposed redistricting was 9.9%, but the average deviation was only 1.82%.[33] Because few of the districts had large relative deviations, the Court was "unable to conclude from these deviations alone that appellees satisfied the threshold requirement of proving a prima facie case of invidious discrimination under the Equal Protection Clause."[34] Similarly, in *Gaffney v. Cummings*, the Court rejected a challenge to a districting plan with a total deviation of 7.8% in the House and 1.8% in the Senate, noting that the mean deviations were only 1.9% and 0.45% respectively.[35] However, since the Court later determined that a total deviation of less than 10% was *de minimis*, it is hard to know how important a role average deviation played in these two cases.

A situation in which average deviation may take precedence over total deviation is when a court is choosing among districting plans that all have small total deviations. In this circumstance, a court is not bound to choose the one with the smallest total deviation, but can consider the average deviation as well. For example, in *Fletcher v. Golder*, the Court was deciding among four districting plans for St. Louis County.[36] The four plans had total deviations of 1.12, 1.15, 1.15, and 1.13%, with average deviations of 0.42, 0.29, 0.32, and 0.31% respectively.[37] The Court ruled that it was not obligated to choose the plan with the smallest total deviation (1.12%), but could choose the one with a slightly higher total deviation but smaller average deviation (1.13% and 0.31%).[38] So, at least for small levels and small differences in total deviation, average deviation may be a deciding factor. Nevertheless, the cases make clear that the most important statistic in measuring "one person, one vote" is total deviation.[39]

33. 412 U.S. 755, 763–64 (1973).

34. *Id.* at 764.

35. 412 U.S. 735, 737 (1973).

36. 959 F.2d 106, 107–08 (8th Cir. 1992).

37. *Id.*

38. *Id.* at 109.

39. That total deviation and average deviation are the only measures of significance is widely accepted. Bernard Grofman notes that "[t]he most common measures of population equality are the total deviation (also known as the overall population range) and the average deviation (also known a mean deviation)." Bernard Grofman, *Criteria for Districting: A Social Science Perspective*, 33 UCLA L. REV. 77, 81–82 (1985). He only goes on to cite two cases in which average deviation played a role: *White v. Regester*, 412 U.S. 755 (1973), discussed *supra* in text accompanying notes 33-34, and *Holmes v. Farmer*, 475 A.2d 976 (R.I. 1984). In *Holmes*, a Rhode Island House districting plan had a total deviation of 11.5% but an average deviation of only 1.9%. 475 A.2d at 979. The total deviation was significantly increased by two outlier districts, and if those districts were taken out of the calculation the total deviation of tbe plan was only 5.4%. *Id.* The aberrant two districts were found to have such a large deviation because of a

That the Court prefers the total deviation measure is evident from its application of that measure even in situations where it does not quite fit. Consider *Board of Estimate v. Morris*.[40] The New York City Board of Estimate was composed of three officials who were elected at-large (the mayor, the comptroller, and the city council president) as well as the presidents of each of the five boroughs of New York City.[41] The three at-large members of the Board each cast two votes, and the presidents of the boroughs each cast one vote.[42] Six votes were needed to pass a resolution.[43] Registered voters from Brooklyn (the most populous borough with 2,230,936 residents) filed suit, claiming that the structure of the Board violated the "one person, one vote" requirement because they had the same representation as the borough of Staten Island (with a population of 352,151).[44]

After rejecting a more technical game-theoretic analysis,[45] the Court decided to apply the total deviation measure. For the purpose of its analysis, the Court viewed the Board of Estimate as consisting of 11 representatives, 6 elected at-large (corresponding to the 6 votes distributed among the 3 at-large representatives) and 5 elected from the boroughs.[46] To measure the amount of representation provided to each citizen, the Court allocated the six votes associated with the at-large representatives to the various boroughs on a proportional basis.[47] That is, since Brooklyn represented 31% of the population of

---

"mathematical error" of an unspecified nature. *Id.* The court found that the two anomalous districts had to be redistricted but upheld the rest of the plan. *Id.* at 988. The average deviation statistic seems to have played no role in the decision.

The National Council of State Legislatures provides a primer on election law in which they discuss measuring "one person, one vote." *See* Ellen Tewes & Paige Seals, *Equal Population, in* REDISTRICTING LAW 2000 (1999), *available at* http://www.senate.leg.state.mn.us/departments/scr/redist/red2000/ch2equal.htm. According to their survey, the total deviation is "the most commonly used measure of population equality," but they, too, discuss the average deviation. *Id.* They cite only *Gaffney* and *White* as examples in which the average deviation played a role. *Id.*

40. 489 U.S. 688 (1989).

41. *Id.* at 694.

42. *Id.*

43. The voting rule was somewhat different for budgetary matters. In those cases the mayor did not participate in the vote. The Court did not worry about the difference in the two types of votes, focusing on the more general structure described above. *Id.* at 698.

44. *Id.* at 700 n.7.

45. *See* Paul H. Edelman, *Making Votes Count in Local Elections: A Mathematical Appraisal of At-Large Representation*, 4 ELECTION L. J. 258, 273 (2005) (discussing how Justice Harlan dismissed the game theoretic analysis as too sensitive to slight shifts in the political situation); DAN S. FELSENTHAL & MOSHÉ MACHOVER, THE MEASUREMENT OF VOTING POWER, THEORY AND PRACTICE, PROBLEMS AND PARADOXES 114 (1998) (discussing Justice Harlan's dismissal of the Banzhaf theory in *Morris* and the broader issue of the Court's continued dismissal of the game theoretic proposal).

46. *Morris*, 489 U.S. at 694.

47. *Id.* at 700–02.

New York, the citizens of Brooklyn were thought to have 31% of the 6 at-large votes (1.89) as part of their representation.[48] Thus, Brooklyn was considered to have 2.89 representatives. In a similar fashion, Staten Island (with 4.9% of the population)[49] was thought to have an extra 0.29 share of a representative above its own single representative. For each borough, the Court computed the quotient of population to total representatives and then looked for the total deviation from an apportionment in which all the boroughs were of equal size.[50] It calculated the total deviation as 78%.[51] This total deviation was well beyond what had been previously considered acceptable, so the Court found the Board in violation of the "one person, one vote" criterion.[52]

The difficulty with the Court's analysis is that it is not consistent with the weighted voting nature of the Board. To see this most clearly, imagine a different board in which there is a single at-large representative with a weighted vote of 6 and one representative from each borough with a weighted vote of 1. Since 6 votes will carry a resolution, the only vote that matters is the at-large representative. Should we conclude that "one person, one vote" is satisfied since the at-large representative was representing all the citizens of New York equally? It would seem so, yet the Court's analysis would still lead to the conclusion that the citizens of Brooklyn are underrepresented. A single at-large voter with a weighted vote of 6 would have his 6 votes allocated proportionally to the various boroughs in the exact same proportions as the 3 at-large voters who had weighted votes of 2.[53] The resulting total deviation is the exact same 78%. Whether or not one finds the Court's analysis persuasive, its application of the total deviation yardstick is significant. When faced with an unusual, difficult to analyze voting scheme, the Court continued to reach for its

---

48. *Id.* at 700 n.7.

49. *Id.*

50. *Id.* at 702 n.9.

51. For example, Brooklyn had 2,230,936/2.89 = 771,143 people per representative. Since the total population of New York was 7,071,030, the average number of people per representative overall is 7,071,030/11 = 642,820. The relative deviation of Brooklyn from this average is 19.96%. A similar calculation shows that Staten Island deviates from this average by -57.82%; therefore, the total deviation of the plan is 77.8%. These calculations are not explicit in the opinion. Apparently the idea of measuring representation in this fashion was raised in the district court but not on appeal. Note, however, that the Justices raised it during oral argument before the Court. *Id.*

52. *Id.* at 702.

53. This is because the Court allocated the total number of at-large *votes* among the boroughs and was unconcerned as to how those votes were distributed among the at-large representatives.

tried-and-true measure of total deviation, even if it had to stretch the concepts to make it fit.

A somewhat less dramatic but equally important example of the Court's eagerness to apply the total deviation measure is *Karcher v. Daggett*.[54] In *Karcher*, the Court held that there was no *de minimis* level of deviation from strict numeric equality in congressional districting.[55] Any deviation from perfect equality of district size (within a state) had to be justified.[56] Given the rigor of this holding, there would seem to be little reason to choose any particular measure of disparity: unequal districts are unequal no matter how they are measured.

Nevertheless, the Court decided the case in the language of total deviation. "The largest district, the Fourth District, which includes Trenton, had a population of 527,472 and the smallest, the Sixth District, embracing most of Middlesex County, a population of 523,798. The difference between them was 3,674 people, or 0.6984% of the average district."[57] The challenged plan was contrasted with one which "had a maximum population difference of 2,375 or 0.4514% of the average figure."[58] Finally, in explaining why it did not want to start down a slippery slope by allowing some *de minimis* deviation, the Court observed, "In this case, appellants argue that a maximum deviation of approximately 0.7% should be considered *de minimis*. If we accept that argument, how are we to regard deviations of 0.8%, 0.95%, 1% or 1.1%?"[59] Thus, even in a situation in which the Court could avoid choosing a particular standard, it effectively chose total deviation.[60]

B. Evaluating the Tests

It would have been nice if somewhere along its jurisprudential path the Court had forthrightly considered whether total deviation is the most appropriate measure of deviation from perfect districting. It resisted doing so even in the face of dissents criticizing the majority on

54. 462 U.S. 725, 728 (1983).

55. *Id.* at 734.

56. *Id.*

57. *Id.* at 728. It may not be immediately clear but a simple algebraic computation will show that, in the case of single-member districts, total deviation can be calculated by taking the difference between the most populous and the least populous districts and dividing by the size of the ideal district. So the Court is asserting here that the total deviation is 0.6984%.

58. *Id.* at 729.

59. *Id.* at 732.

60. To be fair, the Court does mention the average district size once, *id.* at 728, but that is its only acknowledgement of the concept.

exactly this point.[61] Measures other than total deviation are certainly plausible; the standard deviation of the district sizes is a natural measure that apparently was never considered. There has been, over the years, a lively discussion in political science literature about what the best measure of "one person, one vote" is.[62] But the Court has never commented on its choice. This Section speculates on why the Court may have chosen total deviation as the appropriate measure.

First, it is helpful to clarify the two distinct choices the Court has made in deciding how to measure "one person, one vote." The first is the quantity that should be equal across districts. Even in this most basic decision, the Court has been less than forthright. Although there is little doubt that total population per representative is the correct measure for congressional districts, the Court has never quite held as such.[63] Nevertheless, it rejected every attempt to use something other than pure total population.

At the state and local level, the Court has been similarly vague about what the acceptable basis for districting should be. The Court has used total population per representative as the basis for all of its decisions, with one exception. In *Burns v. Richardson*, Hawaii argued for the use of registered voter population as the basis for its state districting.[64] The State argued that the large number of transient military personnel made the total population an inaccurate reflection of the political realities of Hawaii.[65] The Court accepted this argument, largely because "the apportionment achieved by use of a

---

61. Justice Harlan, in his dissent, stated:

> The Court's "as nearly as is practicable" formula sweeps a host of questions under the rug. How great a difference between the populations of various districts within a State is tolerable? Is the standard an absolute or relative one, and if the latter to what is the difference in population to be related? Does the number of districts within the State have any relevance? Is the number of voters or the number of inhabitants controlling? Is the relevant statistic the greatest disparity between any two districts in the State or the average departure from the average population per district, or a little of both?

Wesberry v. Sanders, 376 U.S. 1, 21 n.4 (1964) (Harlan, J., dissenting).

62. For discussions of the best meaning of "one person, one vote," see, for example, Glendon Schubert & Charles Press, *Measuring Malapportionment*, 58 AM. POL. SCI. REV. 302, 319–27 (1964); Henry F. Kaiser, *A Measure of the Population Quality of Legislative Apportionment*, 62 AM. POL. SCI. REV. 208, 208–13 (1968); Bernard N. Grofman & Howard Scarrow, *The Riddle of Apportionment: Equality of What?*, 70 NAT'L CIVIC REV. 242, 245–53 (1981); Gary Moncrief & Robert Juola, *When the Courts Don't Compute: Mathematics and Floterial Districts in Legislative Reapportionment Cases*, 4 J.L. & POL'Y 737, 741–50 (1988); Gary F. Moncrief, *Floterial Districts, Reapportionment, and the Puzzle of Representation*, 14 LEGIS. STUD. Q. 251, 253–62 (1989).

63. The closest the Court got to such a holding is in *Kirkpatrick v. Preisler*, 394 U.S. 526, 534 (1969) ("There may be a question whether distribution of congressional seats except according to total population can ever be permissible under Art. I, § 2.").

64. 384 U.S. 73, 81 (1966).

65. *Id.* at 94.

registered voters basis substantially approximated that which would have appeared had state citizen population been the guide."[66]

The *Burns* decision seems to be unique to Hawaii. The Court noted that "[w]e are not to be understood as deciding that the validity of the registered voters basis as a measure has been established for all time or circumstances, in Hawaii or elsewhere."[67] The Ninth Circuit rejected a similar argument in *Garza v. County of Los Angeles*,[68] arguing that, in fact, the Supreme Court requires total population to be the basis of districting.[69] So, even if it is not literally mandated, total population per representative is the generally accepted measure of representation for districting purposes.[70]

Even though the Court has settled on total population per representative, it is certainly clear that it might have chosen voters per representative, citizens per representative, or voting age citizens per representative.[71] It might have chosen to use the quantity of each constituent's share of a representative, the reciprocal of constituents per representative, or the reciprocal of any of the others. Its decision was not foreordained.

Having made the choice of the value to be equated, the Court still had to decide how to measure the distance from perfect equality. As discussed above, the Court focuses on the total deviation, but it could have chosen the average deviation, the standard deviation, the standard deviation of the percent deviation, and so on.[72] Again, none

---

66. *Id.* at 96.

67. *Id.*

68. 918 F.2d 763 (9th Cir. 1990), *cert. denied*, 498 U.S. 1028 (1991).

69.

> Although we are, of course, constrained by the supremacy clause . . . to follow decisions of the Supreme Court on matters of constitutional interpretation, we emphasize that we do so here not only from constitutional compulsion but also as a matter of conviction. Adherence to a population standard, rather than one based on registered voters, is more likely to guarantee that those who cannot or do not cast a ballot may still have some voice in government.

Id. at 775. *But cf. id.* at 779 (Kozinski, J., concurring and dissenting in part) ("I cannot agree with the majority's conclusion . . . that the district court's reapportionment plan complies with the one person one vote principle announced by the Supreme Court in *Reynolds v. Sims*.").

70. One explanation for the (near) uniform use of total population is that the data is easily available to the state and local governments. To use a different basis for local districting would entail considerable time and effort, and so the local authorities have little incentive to do it. If the districting is done with respect to total population, it is natural for the Court to work with that data rather than move to a different standard.

71. *See, e.g.*, Robert W. Bennett, *Should Parents be Given Extra Votes On Account of Their Children?: Toward a Conversational Understanding of American Democracy*, 94 NW. U. L. REV. 503, 536–65 (2000) (discussing the possibility of giving extra votes to parents on account of their children); Sanford Levinson, *One Person, One Vote: A Mantra in Need of Meaning*, 80 N.C. L. REV. 1269, 1271–97 (2004) (discussing alternate means of deciding vote distribution).

72. Karcher v. Daggett, 462 U.S. 725, 728 (1983).

of these choices are foreordained although they each reflect a different notion of the harm produced by unequal districts.

One explanation for the choice of total deviation is the Court's predominant view that the right to vote is an individual right, as opposed to a group or systemic one.[73] If the harm done by having districts of different sizes is that a voter in the larger district has less influence than one in a smaller district, then the citizen of the larger district can point to the citizen in the smaller district as having undue influence. If the ideal district serves as the baseline for the "correct" amount of representation, then those citizens in a district with more persons per representative have too little representation and those in a district with fewer persons per representative have too much. The magnitude of the difference is plausibly captured by the percent deviation between the two. No average measure is representative of this individual harm since by definition an average measure takes into account all of the voters, not just those at the extremes.

In sum, the Court has chosen the total deviation and this choice is both defensible and consistent with the individualized view of "one person, one vote."[74] That is not to say that the total deviation measure is the only constitutionally acceptable measure of "one person, one vote." The Court has toyed with a number of different measures, and they could all be defended as reasonable. But in order to provide guidance to state and local governments, the Court had to choose.[75] And having chosen the measure that it thinks captures the harm done by having voting districts of differing sizes, the Court should apply that measure consistently. The next Part examines an area of representation to which the Court has *not* applied the total deviation measure.

---

73. For a discussion of the Court's approach to "one person, one vote" cases as individual rights cases and the tension between this view and a systemic one, see Heather Gerken, *The Costs and Causes of Minimalism in Voting Cases:* Baker v. Carr *and its Progeny,* 80 N.C. L. REV. 1411, 1443–66 (2004), and Richard H. Pildes, *Foreward: The Constitutionalization of Democratic Politics,* 118 HARV. L. REV. 29, 101–17 (2004). I will not digress further into a full-fledged justification of total percent deviation as a measure of some individual right.

74. *Karcher*, 462 U.S. at 728.

75. The Court might have pursued a different path and given the states a number of different measures from which to choose. To do this, though, would be to lay bare the fact that the Court is not sure what it is trying to accomplish with its "one person, one vote" requirement.

III. APPORTIONMENT

A. The Historical Development

Although Congress has been reapportioning itself every ten years since its founding,[76] the Supreme Court has considered the mechanisms of apportionment only once.[77] Before discussing the Court's treatment, some general background on apportionment is appropriate.[78]

After each decennial census, Congress must reapportion the seats of the House of Representatives "among the several States . . . according to their respective Numbers."[79] The Constitution is silent on how to do this, requiring only that "[t]he Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative."[80]

The problem of apportionment amounts to a problem of rounding. If each state is supposed to get a number of representatives commensurate with its population, one way to start would be to give each state the same percentage of representatives in the House as its population in the United States, i.e., if the state is 10% of the U.S. population then it should receive 10% of the seats in the House. This number, referred to as the state's *quota,* is calculated using the formula (*state population* ÷ *total population*) x *total House size.* But the quota is never an integer, and it is impossible to assign a fractional number of seats. Thus, some states will have to receive

---

76. Well, not quite. *See* MICHEL BALINSKI & H. PEYTON YOUNG, FAIR REPRESENTATION, MEETING THE IDEAL OF ONE PERSON ONE VOTE 51 (2d ed. 2001) (discussing Congress's inability to come to an agreement on how to apportion itself after the 1920 census. As a result, it kept the 1911 apportionment until 1932).

77. The Court has considered a number of questions related to how the population is enumerated for the purposes of apportionment. *See, e.g.*, Franklin v. Massachusetts, 505 U.S. 788, 803–06 (1992) (concerning the allocation of overseas federal employees to the states); Dep't of Commerce v. U.S. House of Representatives, 525 U.S. 316, 334–44 (1992) (disallowing statistical sampling for the purposes of apportioning congressional seats); Utah v. Evans, 536 U.S. 452, 473–79 (2002) (allowing the Census Bureaus to use "hot-deck" imputation in its enumeration for the purposes of apportionment).

78. The history and theory of apportionment is too long and intricate to detail in this Article. There are a number of sources available for the interested reader to investigate. The most comprehensive is BALINSKI & YOUNG, *supra* note 76. Shorter discussions can be found in H. PEYTON YOUNG, EQUITY: IN THEORY AND PRACTICE 42–63 (1994); Paul H. Edelman & Suzanna Sherry, *Pick a Number, Any Number: State Representation in Congress after the 2000 Census,* 90 CAL. L. REV. 211, 212–16 (2002); U.S. Dep't of Commerce v. Montana, 503 U.S. 442, 448–56 (1992); and Massachusetts v. Mosbacher, 785 F. Supp. 230, 245–50 (D. Mass. 1992).

79. U.S. CONST. art. I, § 2, cl. 3.

80. *Id.*

fewer seats than their quota, and some will receive more. The problem of apportionment is deciding how to allocate them in some principled manner.

Alexander Hamilton proposed the first method for apportioning the House after the 1790 census.[81] His method begins by rounding each state's quota down to the nearest whole number.[82] This results in too few seats being assigned.[83] The additional seats are assigned to states in the order of the size of the fractional part of the quota.[84] In other words, after the initial downward rounding, the missing representatives are added back in, starting with the states whose rounded number is the furthest from their quota.[85] Thus, a state entitled to 6.9 representatives would originally be assigned 6 seats and would receive another seat before any state whose quota had a fractional part less than 0.9. Although Congress adopted Hamilton's method, George Washington vetoed it.[86] Washington believed that the process of rounding some of the states' quotas up resulted in their representation exceeding the one for every 30,000 limit.[87]

Congress next turned to a method proposed by Thomas Jefferson.[88] Jefferson's method also begins, in essence, by rounding down the "perfect" number of representatives, but uses a different method of adding the missing representatives back in.[89] Instead of adding them back in directly, according to the size of the fraction that had been rounded off, Jefferson's method changes the calculation bit by bit until it yields the desired total number of representatives.[90] Here's how it works: the quota of a state can be calculated by the alternative formula *state population* ÷ *average district size* since the average district size is equal to *total population* ÷ *total House size*.[91] Jefferson's method was to choose an average district size directly so that when the resulting quotient *state population* ÷ *average district size* was rounded down for each state, the resulting whole numbers

81. BALINSKI & YOUNG, *supra* note 76, at 16–17.
82. *Id.*
83. *Id.*
84. *Id.*
85. *Id.*
86. *Id.* at 20–21
87. *Id.* at 21.
88. *Id.*
89. *Id.* at 18–19.
90. *Id.*
91. *Id.*

completely apportioned the House.[92] Jefferson's method was used by Congress until 1842.[93]

From Jefferson's method grew a number of variations. John Quincy Adams's method, instead of choosing the average district size so that rounding *down* allocates all of the seats, chooses the size so that rounding *up* allocates the right number of seats.[94] Daniel Webster's method uses the standard method of rounding, going up if the fractional part is above .5 and down if it is below.[95] There are two more variations of rounding, one based on the geometric mean, the Hill method, and one based on the harmonic mean, the Dean method.[96] Jefferson's method and its variations are generally referred to as "divisor" methods, because they are based on choosing an appropriate average district size as a divisor so that the chosen rounding method fully apportions the House.[97] Together with Hamilton's method, they are referred to as the standard methods of apportionment.

At various times, four of the six standard methods have been employed to apportion the House: the Hamilton, Jefferson, Webster, and Hill methods.[98] Since the 1930 apportionment, the Hill method[99] has been consistently used. In 1941, Congress designated this method as the one for all future apportionments.[100]

In 1992, Montana challenged the use of the Hill method.[101] Montana argued that the Hill method did not achieve the goal of Article I, §2, which the Court had interpreted to mean that "as nearly as is practicable one man's vote in a congressional election is to be

92. *Id.*

93. *Id.* at 34.

94. *Id.* at 28.

95. *Id.* at 32.

96. Given two numbers, a and b, their geometric mean is equal to $\sqrt{ab}$ and their harmonic mean is $2ab/(a+b)$. The Hill method works in the following way: if the quota is between the whole numbers a and a+1, then round it up if it is above $\sqrt{a(a+1)}$ and down otherwise. The Dean method rounds up if the quota is above $2a(a+1)/(2a+1)$ and down otherwise.

97. BALINSKI & YOUNG, *supra* note 76, at 61.

98. Massachusetts v. Mosbacher, 785 F. Supp. 230, 246–48 (D. Mass. 1992).

99. Named after the chief statistician at the Census Bureau at the time, who, along with Edward Huntington, a professor of mathematics at Harvard, championed the method. BALINSKI & YOUNG, *supra* note 76, at 47. This method is also referred to as the method of equal proportions. *Id.* at 157.

100. *See* 2 U.S.C. § 2a (2006).

101. U.S. Dep't of Commerce v. Montana, 503 U.S. 442, 446 (1992).

worth as much as another's."[102] Instead of the Hill method, Montana said, the Court should order the use of the Dean method.[103] That method, never before used, assigned Montana 2 representatives instead of 1 (at the expense of the state of Washington, which would have gone from 9 to 8 representatives).[104] Montana claimed that the Dean method minimizes the absolute deviations from the ideal district size.[105] By absolute deviation, Montana meant the sum over each state of the difference between the average district size of the state and the ideal district size.[106] That is, Montana claimed that if for each state one took the difference between the average district size and the ideal district, and then added all 50 of the numbers together, the result would be smaller when using the Dean apportionment[107] than when using any other apportionment.[108] Since the Dean and Hill

---

102. Wesberry v. Sanders, 376 U.S. 1, 7–8 (1964).

103. James Dean was a professor of astronomy and mathematics at the University of Vermont. He proposed this method in a letter to Daniel Webster in 1832. BALINSKI & YOUNG, *supra* note 76, at 29.

104. *Id.* There were two other questions involved in this litigation. The government argued that the choice of method was a political question and could not be challenged. *Id.* at 459. The Court found this unpersuasive. *Id.* Montana also argued that Congress could not delegate to the Census Bureau the power to reapportion and had to revisit the question itself every ten years. *Id.* at 464. This argument was also rejected by the Court. *Id.* at 465.

105. *Id.* at 461.

106. *Id.*

107. I am going to abuse terminology somewhat by referring to the "Dean apportionment" when I mean the apportionment resulting from the application of the Dean method. Hill apportionment, Webster apportionment, etc., are similarly defined.

108. *Id.* This assertion is, in fact, false. It is based on a misunderstanding by both the litigants and the Court about what the Dean method does. The correct assertion is that the Dean method produces an apportionment with the property that any transfer of a seat from one state to another will increase the difference between the average district size of the two states. That, however, is fundamentally different from being the apportionment that minimizes the absolute deviation. One can shrink the absolute deviation from the ideal district size while still increasing the difference between two states.

A small example illustrates that the Dean method may not minimize the overall deviation. Suppose we have six states, 4 of size 501, 1 of size 2000 and 1 of size 4000, and the size of our House is 8 seats. The average district size is 1000.5. The Dean method allocates 1 seat to every state except the one of size 4000 which gets 3. Four of the states have an average district size of 501, one of the states has an average district size of 2000, and the largest state has an average district size of 1333.3. Overall deviation from the average is 4 x (1000.5 - 501) + (2000 - 1000.5) + (1333.3 - 1000.5) = 3330.3. It is easy to check that any transfer of a seat from one state to another will increase the difference between their average district sizes, e.g., if we were to transfer a seat from the largest state to the next largest, the average district sizes would change to 2000 and 1000 respectively and the difference would increase to 1000 from 666.7. On the other hand, the apportionment that assigns 2 seats each to the largest states and 1 to the rest has a lower overall deviation than the Dean method: 4 x (1000.5 - 501) + (1000.5 - 1000) + (2000 - 1000.5) = 2998.

The fact that in this Supreme Court case the transfer of a seat from Washington to Montana both decreases the difference between the average district sizes of the states and also decreases the overall difference from the ideal district size is just a coincidence. Montana was thus correctly arguing that a method other than the Hill method produced an apportionment *in this* apportionments agree for every state except Montana and Washington, the Court focused on computing the differences only for those two states:

> Under the apportionment undertaken according to the Hill Method, the absolute difference between the population of Montana's single district (803,655) and the ideal (572,466) is 231,189; the difference between the average Washington district (543,105) and the ideal is 29,361. Hence, the sum of the differences between the average and the ideal district size in the two States is 260,550. Under the Dean Method, Montana would have two districts with an average population of 401,838, representing a deviation from the ideal of 170,638; Washington would then have eight districts averaging 610,993, which is a deviation of 38,527 from the ideal district size. The sum of the deviations from the ideal in the two States would thus be 209,165 under the Dean Method (harmonic mean) while it is 260,550 under the Hill Method (equal proportions). More generally, Montana emphasizes that the Dean Method is the best method for minimizing the absolute deviations from ideal district size.[109]

Because the Dean method minimized the absolute deviation from the ideal district size, Montana argued that it better approximated "one person, one vote" than did the Hill apportionment.[110]

In response to this claim, the Court reached for its old friend, the relative deviation from the ideal district size:[111]

> There is some force to the argument that the same historical insights that informed our construction of Article I, §2, in the context of intrastate districting should apply here as well. . . . Yet it is by no means clear that the facts here establish a violation of the *Wesberry* standard. . . . In this case, in contrast [to intrastate districting] the reduction in the absolute difference between the size of Montana's district and the size of the ideal district has the effect of increasing the variance in the *relative* difference between the ideal and the size of the districts in both Montana and Washington.[112]

In support of this claim the Court provided the following tables:[113]

---

instance with a smaller absolute deviation from the ideal district size, but incorrectly suggesting that the Dean method would *always* do so.

109. U.S. Dep't of Commerce v. Montana, 503 U.S. 442, 460 (1992).

110. *Id.* at 461.

111. The Court uses the term "relative difference" rather than relative deviation. *Id.* If there is any distinction between the two terms it seems to be that when discussing relative difference the Court does not pay attention to the sign of the deviation, i.e., whether the district is over or under-represented relative to the ideal district.

112. *Id.* The Court is mistaken in its last remark. If the absolute difference between Montana's average district size and the ideal district decreases, then the relative difference between the average district size and the ideal district size *as a percentage of the ideal district size* will necessarily also decrease. The perceptive reader who has caught this will not be surprised by what is to follow.

113. *Id.* at 462 n.40.

Hill Apportionment	Average District Size	Absolute Difference From Ideal	Relative Difference From Ideal
Montana (1 representative)	803,655	231,189	40.4%
Washington (9 representatives)	543,105	29,361	5.4%
Total Absolute Difference		260,550	

Dean Apportionment	Average District Size	Absolute Difference From Ideal	Relative Difference From Ideal
Montana (2 representatives)	401,828	170,638	42.5%
Washington (8 representatives)	610,993	38,527	6.7%
Total Absolute Difference		209,165	

The Court noted that even though the total absolute difference was smaller for the Dean apportionment than for the Hill apportionment,[114] the relative difference from the ideal was larger for both states in the Dean apportionment than in Hill's.[115] That is, the tried-and-true method of looking at relative deviation from the ideal district indicated that the Hill apportionment was superior. The Court, then, threw up its hands, proclaiming that "the polestar of equal representation does not provide sufficient guidance to allow us to discern a single constitutionally permissible course."[116] It could not choose between relative difference and the Hill method, on the one hand, and absolute difference and the Dean method, on the other.

The Court's analysis is significant in two respects. First, it again shows that relative deviation is the measure that the Court believes best captures the harm of malapportionment. Second, it injected more uncertainty than necessary. The Court could have chosen measures of disparity that are provably smaller in Hill apportionments than in Dean apportionments. That is, the Court could have chosen a different measure of disparity that would have

114. 209,165 versus 260,550. *Id.* at 461.
115. *Id.* at 461–62.
116. *Id.* at 463.

been guaranteed to make the Hill apportionment look better than the Dean apportionment.[117] Thus, the Court seemed intent on using relative deviation even if it unsettled the selection of an apportionment method. The Court may have even applied relative deviation precisely because it precluded the selection of any one apportionment method.

B. The Mathematical Mistake

Either the Court could not select an apportionment method because it relied on relative deviation, or it relied on relative deviation because it did not want to select an apportionment method. Whatever the explanation, the Court's analysis cannot stand. As this Section demonstrates, the relative deviation analysis contains a mathematical error. Once corrected, the better apportionment method becomes clear. Thus, the Court need not avoid the choice nor hide any reluctance to change behind the analysis.

The values for the relative deviation from the ideal district are miscalculated. Here are the true values:

	Dean Apportionment Relative Difference from Ideal	**Hill Apportionment Relative Difference from Ideal**
Montana	29.8%	40.4%
Washington	6.7%	5.1%
Total Deviation	36.5%	45.5%

That is, if calculated correctly, the total deviation is much smaller for the Dean apportionment than for the Hill apportionment (about 30% smaller, in fact). The relative deviation for Montana drops from 40.4% to 29.8% under the Dean method, a 25% reduction,[118]

117. Associated with the standard methods of apportionment are statistics of deviation which they minimize. In the case of the Hill method, had the Court looked at the relative disparity between the population per representative, where the relative measure is from the smaller of the two values (as opposed to the ideal district), then the Hill method produces an apportionment that is always better than the one produced by the Dean method, unless they happen to coincide. Or they could have computed the sum over all congressional districts of the square of the difference between the district size and the ideal district. That the latter is also minimized by the Hill method was noted by Ernst in his affidavit. *See infra* note 124; *see also* BALINSKI & YOUNG, *supra* note 76, at 104. So the Court knew that there were ways of ensuring that the Hill method would look better.

118. Which belies the statement of the Court that "[i]n this case, however, whether Montana has one district or two, its variance from the ideal will exceed 40%." Dep't of Commerce v. Montana, 503 U.S. 442, 463 (1992).

although the deviation for Washington increases slightly from 5.1% to 6.7%.

The reader will note that two of these numbers are the same as those computed by the Court,[119] but two are quite different. The differences occur when the average district size of the state is smaller than the ideal district. The average district size of Montana under the Dean apportionment is 401,828,[120] which is less than the ideal district size of 572,466. Washington's average district size under the Hill apportionment is 543,105,[121] again less than the ideal. Thus, when Washington has 9 representatives and Montana only 1, Washington's average district size is smaller than the ideal and Montana's is larger. Transferring one representative from Washington to Montana reverses that property.

But why do the deviations turn out to be different in these cases? It is because of the way the calculation was performed for just these two numbers. The Court's numbers give the deviation as a percentage of the *state's average district size*, while the correct calculation expresses the deviation as a percentage of the *ideal district size.*

As an example of the correct calculation, consider the relative deviation from the ideal district in the case of Montana under the Dean apportionment. The average district size for Montana with two representatives is 401,828.[122] The ideal district size is 572,466; thus, the relative deviation from the ideal district size is (401,828 – 572,466)/572,466=-0.298, or 29.8%, below the average district size. The number that the Court obtained, 42.5%,[123] is the relative difference of *the ideal district size from the average district size.* The Court computed the difference as a percentage of Montana's average district size, not as a percentage of the ideal district size. Algebraically the computation is (572,466-401,828)/401,828 = .425. Thus, the Court used the wrong baseline against which to measure the change. The same thing happened when the Court computed the relative difference of Washington's average district size under the Hill apportionment.

One might ask how such a significant mathematical error could have made it into an opinion that is, after all, largely about numbers. It seems to have been caused by a misunderstanding between one of the expert witnesses and the Court. Lawrence Ernst, the Assistant Division Chief of the Statistical Research Division of the Bureau of the

119. *See supra* table accompanying note 113.

120. Dep't of Commerce v. Montana, 503 U.S. at 462 n.40.

121. *Id.*

122. *Id.*

123. *Id.*

Census, submitted an affidavit on behalf of the government.[124] In his affidavit he is careful to indicate that his computation of percentage differences was *always* with respect to the smaller quantity.[125] That is, he always computed the percentage of the smaller quantity by which the larger quantity exceeded it. To put it differently, Ernst always chose the smaller number as the baseline and computed the percentage change from it. So if the state's average district size was smaller than the ideal size (as Montana's was under Dean and Washington's was under Hill), his computation was done relative to the state's average district size rather than relative to the ideal district. When analyzing the deviation of Montana under the Dean apportionment, he computed the relative deviation of the ideal district from the average district size of Montana, not the relative deviation of the average district size of Montana from the ideal district size.[126] Similarly, under the Hill apportionment, he calculated the relative deviation of the ideal district size from Washington's average district size.

The Court somehow assumed that all of the computations of relative deviation were done relative to the ideal district, which is to say that the difference between the average district size and the ideal district was expressed as a percentage of the ideal district size. That, after all, is how *it* had always done the computations for evaluating "one person, one vote," and so it might naturally have assumed that the expert witness had done the computations that way as well.[127] The numbers that Ernst computed were just transcribed and mislabeled as being "Relative difference from Ideal."[128] This resulted in making the Dean method look much less persuasive than it might have been.

Had the Court computed the numbers correctly, what would it have done? Although the Court was justified in throwing up its hands when its favorite method of analysis contradicted the claims of Montana, it would not have had this easy option had it done the mathematics correctly. Both absolute deviation (Montana's test) and total deviation (the Court's usual test) are smaller under the Dean

124. Declaration of Lawrence R. Ernst, Joint Appendix Vol. 1 at 20, U.S. Dep't of Commerce v. Montana, 503 U.S. 442 (1992).

125. "The relative difference between two numbers consists of subtracting the smaller number from the large number and then dividing the result by the smaller number." *Id.* at 24.

126. "However, if Montana were to receive a second seat (as it would, for example, using Dean's method) then the average United States district size would be 42.5% greater than Montana's average district size of 401,828." *Id.* at 27.

127. This is further indication that the Court was viewing the apportionment problem as a variation on "one person, one vote."

128. Dep't of Commerce v. Montana, 503 U.S. at 462 n.40.

apportionment than under the Hill apportionment. The Court might still have deferred to Congress, but it would have had to justify that deference.

There is another option, a "polestar of equal representation"[129] that can guide the Court through the apportionment dilemma.[130] That polestar is minimum total deviation. In the next two Parts, I consider two sets of objections to using minimum total deviation. In the next Part, I look at three legal arguments against applying minimum total deviation in the apportionment context. In Part V, I turn to specific government interests that might justify using the Hill method despite its failure to satisfy the minimum total deviation criterion.

IV. MINIMUM TOTAL DEVIATION APPORTIONMENT

As demonstrated above, the Court's apportionment precedent is flawed mathematically. This raises questions about the depth of the Court's commitment to its current approach. If the Court takes the time to correct prior errors, it also should reconsider the broader issue that Montana fairly raised but that bad math obscured: how best to approximate "one person, one vote." This Part takes a fresh approach to resolving that question.

Now that we have cleared away the mistakes, we can think more clearly about how to unify the districting cases with the apportionment of Congress. The logic is clear: the line of congressional districting cases from *Wesberry* to *Karcher* demonstrates that Article I, §2 requires congressional district sizes that are "as nearly as practicable" equal in size.[131] The Court has established total deviation as the measure of disparity from equal district sizes. The inescapable conclusion is that Article I, §2 requires the apportionment of Congress be one that achieves the minimum total deviation, what I will call a minimum total deviation ("MTD") apportionment.

The beauty of this argument is that it forestalls all of the haggling about method and replaces it with a test of the apportionment itself. And that test, the total deviation from the ideal

129. *Id.* at 463.

130. Again, none of this is to say that the Dean method is the constitutionally required one. The focus on the method is probably misguided. Instead of picking a method and asking how well it comports with "one person, one vote," perhaps the Court should start with how it measures "one person, one vote" and use that to assess the best apportionment. "One person, one vote" doesn't care about method; it cares about outcomes. Of course, I am assuming that there are no claims of vote dilution to be made in context of apportionment. If there were, then method might be considered important.

131. *See* Karcher v. Daggett, 462 U.S. 725, 730 (1983); Wesberry v. Sanders, 376 U.S. 1, 7–8 (1964).

district,[132] is the one that the Court has established for districting cases and the one that it reflexively turns to when measuring "one person, one vote." Minimizing total deviation is the "polestar" for which the Court should have been searching in *Department of Commerce.*

There are a number of objections that might be raised to my proposal. One might argue that apportionment is not governed by the *Wesberry* standard of "as nearly as practicable" equal districts, and so no particular measure of inequality is mandated. Another counter-argument might be that because of the nature of apportionment there will necessarily be large deviations, and hence the difference among possible apportionments will always be *de minimis.* Finally, one might think that the issue of apportionment is of sufficient importance and technical difficulty that Congress should be given deference in choosing a way to proceed. I will deal with each of these objections in turn.

A. Wesberry Doesn't Apply to Congressional Apportionment

In *Wesberry v. Sanders,*[133] the Court ruled that congressional districts *within a state* must have "as nearly as practicable" the same population.[134] It based this conclusion on its interpretation of Article I, §2 of the Constitution. In *Department of Commerce,* the Court acknowledged that "[t]here is some force to the argument that the same historical insights that informed our construction of Article I, §2 in the context of intrastate districting should apply here as well,"[135] although it stopped short of explicitly saying that it does.[136] Even though split on the outcome, the district court panel hearing the case unanimously agreed that the analysis developed in *Wesberry* and *Karcher* applies to nationwide apportionment.[137]

---

132. Recall that the total deviation is the difference between the largest and smallest percent deviation from the ideal district size. *See supra* note 57 and accompanying text. Because congressional districts are single member districts, the apportionment that minimizes total deviation also minimizes the difference between the largest and smallest districts in absolute size. As it turns out, the MTD apportionments for both 1990 and 2000 allocate 2 representatives to Montana.

133. 376 U.S. 1 (1964).

134. *Id.* at 7.

135. U.S. Dep't of Commerce v. Montana, 503 U.S. 442, 461 (1992).

136. Nevertheless, the Court went on to say, "[y]et it is by no means clear that the facts here establish a violation of the *Wesberry* standard." *Id.*

137. Montana v. U.S. Dep't of Commerce, 775 F. Supp. 1358, 1368 (D. Mont. 1991) (O'Scannlain, J., concurring in part and dissenting in part), *rev'd*, 503 U.S. 442 (1992).

One might try to argue that the *Wesberry* standard does not apply to congressional apportionment, despite the fact that *Wesberry* is based on the only clause in the Constitution that speaks to the apportionment of the House.[138] While such a position is possible, it is highly implausible. It is inescapable that applying Article I, §2 to *intrastate* districting, as was done in *Wesberry*, is far more of a stretch than applying it to congressional apportionment. Justice Harlan observed this in his dissent:

> The Court purports to find support for its position in the third paragraph of Art. I, §2, which provides for the apportionment of Representatives among the States. The appearance of support in that section derives from the Court's confusion of two issues: direct election of Representatives within the States and the apportionment of Representatives among the States. Those issues are distinct, and were separately treated in the Constitution. The fallacy of the Court's reasoning in this regard is illustrated by its slide, obscured by intervening discussion . . ., from the intention of the delegates at the Philadelphia Convention "that in allocating Congressmen the number assigned to each State should be determined solely by the number of the State's inhabitants," . . . to a "principle solemnly embodied in the Great Compromise—equal representation in the House for equal numbers of people." [139]

So if the Court was willing to stretch Article I, §2 to apply to *intrastate* districting, it surely should apply similar reasoning to *interstate* districting.

Moreover, the standard set in *Wesberry* is never directly confined to intrastate districting.

> While it may not be possible to draw congressional districts with mathematical precision, that is no excuse for ignoring our Constitution's plain objective of making equal representation for equal numbers of people the fundamental goal for the House of Representatives. That is the high standard of justice and common sense which the Founders set for us.[140]

It is difficult to believe that this "fundamental goal" applies within a state but not between states.

B. De Minimis

Another argument against my proposed unification of districting and apportionment is that the constitutional requirement that (1) each state must receive at least one representative and (2) that all congressional districts must stay within state boundaries, forces such a large departure from "one person, one vote" that any additional deviations resulting from the method of apportionment are

138. The clause in question states: "Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers . . . ." U.S. CONST. art. I, § 2.

139. Wesberry v. Sanders, 376 U.S. 1, 26 (1964) (Harlan, J., dissenting).

140. *Id.* at 18 (majority opinion).

de minimis. For example, consider the state of Wyoming, with a 2000 census population of 495,304.[141] Since it must have at least one representative, its relative deviation from the ideal district size of 646,952 will be 23.4% under any method of apportionment. Once the deviation is this large why worry about any additional variation? "[A]lthough 'common sense' supports a test requiring 'a good faith effort to achieve precise mathematical equality' *within* each State . . ., the constraints imposed by Article I, §2, itself make that goal illusory for the Nation as a whole."[142] Since no apportionment can ever be close to perfect, Congress should be allowed to choose whichever it sees fit.

This argument is not sufficient for a number of reasons. First, it is important to note that *Wesberry* requires that the districts be "as nearly as practicable" of equal size—not precisely equal.[143] As noted subsequently in *Kirkpatrick*, "[t]he extent to which equality may practicably be achieved may differ from State to State and from district to district."[144] So the fact that some deviation is unavoidable in no way vitiates that Article I, §2 permits "only the limited population variances which are unavoidable despite a good-faith effort to achieve absolute equality, or for which justification is shown."[145]

And while it is true that no apportionment will ever be perfect, it is nevertheless the case that the difference in the total deviation can be considerable. Table II shows different possible apportionments for the House based on the 2000 census. The total deviation for these apportionments varies from a high of 111.5% for the Jefferson apportionment to a low of 46.4% for the Adams apportionment (which produces, in this case, the MTD apportionment). In particular, the Hill apportionment, which is the one that is actually used for the House, has a total deviation of 63.4%. That is, the current apportionment's total deviation is over a third bigger than the minimum. If the Court takes the measure of total deviation seriously, then surely the difference between 63.4% and 46.4% should matter.

141. KAREN M. MILLS, U.S. CENSUS BUREAU, CONGRESSIONAL APPORTIONMENT: CENSUS 2000 BRIEF 2 (2001), *available at* http://www.census.gov/prod/2001pubs/c2kbr01-7.pdf.

142. Dep't of Commerce v. Montana, 503 U.S. 442, 463 (1992).

143. 376 U.S. at 7.

144. Kirkpatrick v. Preisler, 394 U.S. 526, 530 (1969).

145. *Id.* at 531.

Table II[146]

State	Apportionment Population	Pereent Deviation from the ideal district size				
		Webster/Hill147	Jefferson	Adams	Dean	Hamilton
California	33,930,798	-1.04	-4.64	4.89	0.86	0.86
Texas	20,903,994	0.97	-2.09	4.23	0.97	0.97
New York	19,004,973	1.30	-2.08	4.91	1.30	1.30
Florida	16,028,890	-0.90	-4.71	3.23	-0.90	-0.90
Illinois	12,439,042	1.20	-3.86	1.20	1.20	1.20
Pennsylvania	12,300,670	0.07	-4.93	0.07	0.07	0.07
Ohio	11,374,540	-2.32	-2.32	3.42	-2.32	-2.32
Michigan	9,955,829	2.59	-3.82	2.59	2.59	2.59
New Jcrsey	8,424,354	0.17	0.17	0.17	0.17	0.17
Georgia	8,206,975	-2.42	-2.42	-2.42	-2.42	-2.42
North Carolina	8,067,673	-4.07	-4.07	3.92	3.92	-4.07
Virginia	7,100,702	-0.22	-0.22	-0.22	-0.22	-0.22
Massachusetts	6,355,568	-1.76	-1.76	-1.76	-1.76	-1.76
Indiana	6,090,782	4.61	4.61	4.61	4.61	4.61
Washington	5,908,684	1.48	1.48	1.48	1.48	1.48
Tennessee	5,700,037	-2.10	-2.10	-2.10	-2.10	-2.10
Missouri	5,606,260	-3.72	-3.72	-3.72	-3.72	-3.72
Wisconsin	5,371,210	3.78	3.78	3.78	3.78	3.78
Maryland	5,307,886	2.56	2.56	2.56	2.56	2.56
Arizona	5,140,683	-0.67	-0.67	-0.67	-0.67	-0.67
Minnesota	4,925,670	-4.83	-4.83	-4.83	-4.83	-4.83
Louisiana	4,480,271	-1.07	-1.07	-1.07	-1.07	-1.07
Alabama	4,461,130	-1.49	-1.49	-1.49	-1.49	-1.49
Colorado	4,311,882	-4.79	-4.79	-4.79	-4.79	-4.79
Kentueky	4,049,431	4.32	4.32	4.32	4.32	4.32
South Carolina	4,025,061	3.69	3.69	3.69	3.69	3.69
Oklahoma	3,458,819	6.93	6.93	-10.89	6.93	6.93
Oregon	3,428,543	5.99	5.99	-11.67	5.99	5.99
Connecticut	3,409,535	5.40	5.40	-12.16	5.40	5.40
Iowa	2,931,923	-9.36	13.30	-9.36	-9.36	-9.36
Mississippi	2,852,927	10.24	10.24	-11.80	10.24	10.24
Kansas	2,693,824	4.10	4.10	4.10	4.10	4.10
Arkansas	2,679,733	3.55	3.55	3.55	3.55	3.55
Utah	2,236,714	15.24	15.24	-13.57	-13.57	-13.57
Nevada	2,002,032	3.15	3.15	3.15	3.15	3.15
New Mexico	1,823,821	-6.03	40.95	-6.03	-6.03	-6.03
West Virginia	1,813,077	-6.58	40.12	-6.58	-6.58	-6.58
Nebraska	1,715,369	-11.62	32.57	-11.62	-11.62	-11.62
Idaho	1,297,274	0.26	0.26	0.26	0.26	0.26
Maine	1,277,731	-1.25	-1.25	-1.25	-1.25	-1.25
New Hampshire	1,238,415	-4.29	-4.29	-4.29	-4.29	-4.29
Hawaii	1,216,642	-5.97	88.06	-5.97	-5.97	-5.97
Rhode Island	1,049,662	-18.88	62.25	-18.88	-18.88	-18.88
Montana	905,316	39.94	39.94	-30.03	-30.03	39.94
Delaware	785,068	21.35	21.35	-39.33	21.35	21.35
South Dakota	756,874	16.99	16.99	-41.50	16.99	16.99
North Dakota	643,756	-0.49	-0.49	-0.49	-0.49	-0.49
Alaska	628,933	-2.79	-2.79	-2.79	-2.79	-2.79
Vermont	609,890	-5.73	-5.73	-5.73	-5.73	-5.73
Wyoming	495,304	-23.44	-23.44	-23.44	-23.44	-23.44
Total Deviation		63.38	111.50	46.42	51.38	63.38

146. MILLS, *supra* note 141, at 2.

147. For the 2000 census the Webster and Hill methods produce the same apportionment.

Under *Wesberry*'s reading of Article I, §2, the districts should have "as nearly as practicable" the same populations.[148] While one can argue that some deviation is inevitable, it is not clear how to justify the additional deviation that results from using the Hill method. Lower courts, when evaluating proposed remedies for unconstitutional districts, have "often . . . rejected the plan with the lowest population deviation in favor of plans with slightly higher deviations that reflected consistent state policies."[149] But it is unclear what "state policies" are advanced by choosing an apportionment with a larger total deviation.

C. Deference to Congress

Perhaps the greatest hurdle that my proposal faces is the inclination to defer to Congress's choice of the Hill method. This issue was squarely before the Court in *Department of Commerce*.

> The constitutional framework that generated the need for compromise in the apportionment process must also delegate to Congress a measure of discretion that is broader than that accorded to the States in the much easier task of determining district sizes with state borders. . . . Its apparently good-faith choice of a method of apportionment of Representatives among the several States "according to their respective Numbers" commands far more deference than a state districting decision that is capable of being reviewed under a relatively rigid mathematical standard.[150]

In *Department of Commerce*, the Court does not directly address the standard of review that is appropriate for evaluating Congress's method of apportionment choice. Rather than specify a particular test, it deferred to Congress on the basis of two related arguments.[151] The first is that the different measures of deviation pointed to different choices of method, and so it was not possible to decide among them.[152] In a later case, the Court described its dilemma in this way: "Finding that Montana demanded that we choose between several measures of inequality in order to hold the *Wesberry* standard applicable to congressional apportionment decisions, we concluded

---

148. 376 U.S. at 7.

149. Karcher v. Daggett, 462 U.S. 725, 741 n.11 (1983).

150. Dep't of Commerce v. Montana, 503 U.S. 442, 464 (1992). The Court was forced to acknowledge in a footnote that the "apparently good-faith choice" was greatly influenced by partisan political concerns. *Id.* at 464 n.42. In 1941, Congress was confronted by the choice between two different apportionments which differed only on whether the last representative was to go to Arkansas (a Democratic state) or Michigan (a Republican state). *Id.* They chose the apportionment that favored Arkansas in a party line vote (with the exception of the Democratic representatives from Michigan). *Id.* They then enshrined the Hill method—the one that assigned the representative to Arkansas—as the official method of apportionment. *Id.*

151. *Id.* at 463–66.

152. *Id.* at 463.

that '[n]either mathematical analysis nor constitutional interpretation provide[d] a conclusive answer' upon which to base that choice."[153] But, as shown in the previous Part, the Court's confusion was due to a faulty calculation; there was, in fact, more consistency in the measures than the Court acknowledged.

The other argument that the Court mustered for deferring to Congress is that Congress had, over a period of many years, studied the question diligently, and the results of that deliberation were stable for many years.[154] Thus, there was no reason to reconsider Congress's work in this area.

> The decision to adopt the method of equal proportions was made by Congress after decades of experience, experimentation, and debate about the substance of the constitutional requirement. Independent scholars supported both the basic decision to adopt a regular procedure to be followed after each census and the particular decision to use the method of equal proportions. For a half century, the results of that method have been accepted by the States and the Nation. That history supports our conclusion that Congress had ample power to enact the statutory procedure in 1941 and to apply the method of equal proportions after the 1990 census.[155]

The fact that this issue lay dormant for half a century is irrelevant. The Court's "one person, one vote" jurisprudence began in the mid-1960s and did not mature until the 1980s. Thus, it is not surprising the 1990 apportionment was the first one challenged.[156]

The relevance of Congress's diligence in evaluating the methods of apportionment is also questionable. Consider how little deference the Court gave to the actions of Congress in its decision in *Wesberry*. Congress considered requiring equal size congressional districts beginning in 1842.[157] The requirement was implemented in 1872[158] and existed until 1911. The requirement of equal districts was dropped in 1929[159] and never revived. The congressional choice to drop the equipopulous district requirement was deliberate, as Justice Harlan noted in his dissent:

> Although there is little discussion of the reasons for omitting the requirement of equally populated districts, the fact that such a provision was included in the bill as it was presented to the House, and was deleted by the House after debate and notice of intention to do so, leaves no doubt that the omission was deliberate. The likely explanation for the omission is suggested by a remark on the floor of the House that "the

153. Wisconsin v. City of New York, 517 U.S. 1, 14 (1996).

154. Dep't of Commerce v. Montana, 503 U.S. at 465–66.

155. *Id.* at 465.

156. The situation in 1990 was unique in U.S. history, in that every standard method of apportionment produced a different result, providing numerous incentives to challenge the Hill method.

157. Wesberry v. Sanders, 376 U.S. 1, 42 (1964) (Harlan, J., dissenting).

158. *Id.* at 42–43.

159. *Id.* at 43.

> States ought to have their own way of making up their apportionment when they know the number of Congressmen they are going to have."[160]

Thereafter, there were repeated attempts to reimpose the requirement, but none were successful.[161] Harlan summarizes the history:

> For a period of about 50 years, therefore, Congress, by repeated legislative act, imposed on the States the requirement that congressional districts be equal in population. (This, of course, is the very requirement which the Court now declares to have been constitutionally required of the States all along without implementing legislation.) Subsequently, after giving express attention to the problem, Congress eliminated that requirement, with the intention of permitting the States to find their own solutions. Since then, despite repeated efforts to obtain congressional action again, Congress has continued to leave the problem and its solution to the States. It cannot be contended, therefore, that the Court's decision today fills a gap left by the Congress. On the contrary, the Court substitutes its own judgment for that of the Congress.[162]

The majority opinion in *Wesberry* cites none of this history and completely ignores Congress's role in legislating requirements for congressional districts. Not only is there no consideration of the amount of deference due Congress on this subject, there is no acknowledgement that Congress has any role at all.

The parallel between *Wesberry* and *Department of Commerce* is not perfect, but it is persuasive. They both involve interpreting Article I, §2 in the light of "one person, one vote."[163] They both involve deliberate congressional choices (and, indeed, the suspicion of improper congressional motive is stronger in *Department of Commerce*). Further, both cases ultimately revolve around the question of the meaning of representation. As such, it is hard to reconcile the deference given to Congress in *Department of Commerce* with the complete disregard for Congress in *Wesberry*.[164] This at least suggests that a more stringent standard of review is appropriate when evaluating Congress's decisions on apportionment.

The source of much of the confusion for the Court, and hence the inclination to defer to Congress on the matter, is that the Court viewed the question before it as, "What is the best method of apportionment?" If instead of focusing on the method, the Court evaluates the apportionment itself, as it does in all of the other "one person, one vote" cases, then the matter is conceptually much cleaner. Evaluating the apportionment rather than the method is also more easily justified. As one lower court confronting the same issue noted,

160. *Id.* at 43–44 (footnotes omitted).

161. *Id.* at 44.

162. *Id.* at 45.

163. *Id.* at 7–8; U.S. Dep't of Commerce v. Montana, 503 U.S. 442, 457 (1992).

164. U.S. Dep't of Commerce v. Montana, 503 U.S. at 463–66.

"[W]e can find nothing in the Constitution mandating that a particular mathematical formula be employed to the exclusion of others. . . . [W]e find it difficult to believe that Article I, Section 2 enacted a particular mathematical formula to the exclusion of other approaches for obtaining equality 'as nearly as is practicable.'"[165]

Does the apportionment resulting from the use of the Hill method in any given decade withstand scrutiny in the light of an alternative apportionment with a much lower total deviation? Phrased in this fashion, the Hill method will not withstand even a lower level of scrutiny. That is, the apportionment resulting from the Hill method in 1990 or 2000 is not constitutional because it fails to be "as near as practicable" to equal, and thus, the choice of the method is not "plainly adapted to [a legitimate] end."[166] Even if on its face the Hill method seems reasonable, it is the apportionment that it produces which is the measure of its constitutionality. The goal is to produce an apportionment that is as close to equal as possible, and the Hill method does not accomplish that.

None of the objections outlined here are sufficient to derail my proposal that apportionment should be governed by the same principles as congressional districting. That is, choosing an apportionment other than the MTD apportionment should be enough to produce a prima facie case for a violation of the "one person, one vote" standard. That is not the end of the matter, however. The government has the opportunity to justify its choice of the Hill method as "necessary to achieve some legitimate state objective."[167] What legitimate governmental objectives might warrant the choice of the Hill method in spite of its larger total deviation? I consider that question in the next Part.

165. Massachusetts v. Mosbacher, 785 F. Supp. 230, 254 (D. Mass. 1992), *rev'd on other grounds sub nom*, Franklin v. Massachusetts, 505 U.S. 788 (1992). In this case, Massachusetts argued that the Webster method of apportionment was the constitutionally mandated one. *Mosbacher*, 785 F. Supp. at 253. The Webster method gave one more representative to Massachusetts and one fewer to Oklahoma. *Id.* at 234. The lower court found in favor of the government on the question of the method of apportionment. *Id.* at 267. However, Massachusetts prevailed on another issue having to do with how the Census Bureau counted citizens overseas. *Id.* That decision was reversed on appeal. *Franklin*, 505 U.S. at 806. Note, too, that the *Mosbacher* court appears to agree that the *Wesberry* standard of "as nearly as is practicable" applies to apportionment as well. *Mosbacher*, 785 F. Supp. at 249.

166. McCulloch v. Maryland, 4 Wheat. 316, 421 (1819) (describing the rational basis standard of review).

167. Karcher v. Daggett, 462 U.S. 725, 740 (1983).

V. TECHNICAL CONSIDERATIONS AND STATE INTERESTS

The best arguments for the Hill method depend on technical considerations of the method itself, as well as on a better understanding of the behavior of the MTD apportionments. I therefore begin this Part with an explanation of how to find an MTD apportionment and some of the properties of such apportionments. Then, I will contrast the MTD apportionments with other methods, including the Hill method, in an effort to see if the Hill method can be justified as "necessary to achieve some legitimate state objective."[168]

A. The Theory of Minimum Total Deviation Apportionments

I begin by briefly describing how the algorithm that produces an MTD apportionment works and the circumstances under which that apportionment is not unique. I will also discuss how to choose among the MTD apportionments when they are not unique.

Before considering this question, I should note that MTD apportionment was previously debated. In 1963, before any of the Court's "one person, one vote" cases, Oscar Burt and Curtis Harris Jr. argued that a total deviation apportionment would be the fairest way to allocate seats in the House.[169] They gave an algorithm for such an apportionment and computed it using the 1960 census data.[170]

Very shortly thereafter, E. J. Gilbert and J. A. Schatz responded to Burt and Harris's proposal, attacking it on three fronts.[171] First, they argued that this method of apportionment was no more fair than any other.[172] Second, they gave an example showing that there may be many different apportionments with the same minimum total deviation.[173] Third, they complained that the algorithm presented by Burt and Harris was overly complicated, and they provided a simpler one.[174] Although the first criticism might have been legitimate at the time, the evolution of the Court's "one person, one vote" jurisprudence makes it incorrect now. Their third

---

168. *Id.*

169. Oscar R. Burt & Curtis C. Harris Jr., *Apportionment of the U.S. House of Representatives: A Minimum Range, Integer Solution, Allocation Problem,* 11 OPERATIONS RES. 648, 648 (1963).

170. *Id.* at 649–52.

171. E. J. Gilbert & J. A. Schatz, *An Ill-Conceived Proposal for Apportionment of the U. S. House of Representatives*, 12 OPERATIONS RES. 768, 768–69 (1964).

172. *Id.* at 768.

173. *Id.* at 769.

174. *Id.* at 769–70. Somehow this last complaint smacks of "[t]he food is lousy and the portions are too small."

critique is valid, and I, in fact, used Gilbert and Schatz's algorithm to perform the calculations for this Article. The second criticism is the most troubling from a practical stand point, and I will return to it later in this Part.

Before turning to the algorithm, it is necessary to clarify how apportionment works. One way to describe an apportionment is sequentially, assigning seats one at a time to whichever state is most deserving.[175] The key is how one decides what "deserving" means.

Suppose we proceed as follows: first assign every state a representative. Then compute the average district size of each state, and assign the next representative to the state with the largest average district size. Recompute the average district size and repeat this procedure until all of the representatives are assigned. For example, if we have three states **A, B,** and **C**, with populations 50,000, 27,000, and 5,000, then we would begin by assigning one representative to each state; the resulting average district size for each state would be 50,000, 27,000, and 5,000 respectively. Now **A** has the largest average district size and hence gets the next representative. With two representatives, **A** now has an average district size of 25,000, so the average district sizes are 25,000, 27,000, and 5,000 respectively. Since **B** now has the largest average district size, it would get the next representative, and so on. The resulting apportionment is the one produced by the Adams method.[176]

We could measure "deserving" in a different way, however. Suppose we began not by allocating a representative to each state, but instead by asking which state would have the largest district size if given the next representative. In our previous example, we would assign the first representative to **A** because if given the first representative, its average district size is 50,000 and the other two would have been 27,000 and 5,000 respectively.[177] The second representative would go to **B,** since that would make **B**'s average district size 27,000 and giving it to **A** or **C** would have resulted in average district sizes of 25,000 and 5,000 respectively. The third

175. Each of the divisor methods of apportionment has a description of this form. The Hamilton method can not be so described. *See supra* text accompanying notes 81-100 (discussing the history of apportionment methods).

176. Why this sequential method produces the same result as the rounding method previously described is complicated. For an explanation, see BALINSKI & YOUNG, *supra* note 76, at 142.

177. Note that I am starting from having assigned no representatives to any state as opposed to the previous paragraph in which I started by assigning one representative to every state. That is, in the previous example the first three representatives were allocated one each to the states. In this example, of the first three representatives, two go to A and one goes to B. It is now easier to see why Jefferson's method favors large states.

representative would go to **A**, since **A**'s average district size would be 25,000 and giving it to **B** or **C** would have resulted in average district sizes of 13,500 or 5,000 respectively. This way of assigning representatives results in the Jefferson apportionment.

The key idea here is that we can describe these apportionments as a sequential process in which, at each stage, we assess which state is most "deserving" of the next representative, and the only difference is in how we define "deserving." We could, in principle, change the definition in mid-apportionment. The possibility of changing the meaning of "deserving" is the key to the Gilbert and Schatz method for computing an MTD apportionment.

The algorithm that Gilbert and Schatz propose[178] is essentially a blending of the Adams and Jefferson methods. I'll describe how it works for assigning the 435 seats in the contemporary House of Representatives; for earlier apportionments, some modifications have to be made.[179] To assign 435 seats to 50 states, we start with the Adams method, assigning one representative to each of the states. We then perform the Adams method 385 times, adding representatives one at a time to the state with the highest average district size.

For each of those 385 iterations, (except the last one, which needs no further representatives to be allocated) we stop and change the method.[180] For each iteration, we change to the following: find the state with the largest average district size and fix its number of representatives at its current number. The representatives that are left to be distributed should be distributed to the other 49 states (other than the state with the current largest average district size) according to the Jefferson method of assessing "deserving" i.e., the seats are to be assigned to the state which will have the largest district size if given the seat.

For example, suppose that after the first 100 seats have been allocated by the Adams method, New York has the largest average district size and has been allocated 5 seats. The new apportionment I produce will permanently fix New York with 5 seats and will allocate the remaining 335 seats (100 of the 435 seats have already been distributed) to the states other than New York by following the Jefferson rule for "deserving."

178. Gilbert & Schatz, *supra* note 171, at 770–73.

179. In earlier apportionments the size of the House and the number of states differed from the current numbers of 435 and 50. That affects how the algorithm is described.

180. That is, we allocate the first 51 representatives under the Adams method and then change methods; then we allocate the first 52 representatives using the Adams method and then change methods; and so on.

At the end of this process we will have 385 separate apportionments—one for each iteration of the Adams method. Many of them will be the same, but Gilbert and Schatz show that the apportionment in this list with the smallest total deviation is, in fact, the apportionment with the smallest total deviation among all apportionments.[181]

Given the close relationship between the MTD apportionment and the Adams method, it should not be surprising that often the MTD apportionment is identical to the Adams apportionment. In fact, the MTD apportionment for 20 of the 22 different apportionments in American history coincides with the Adams apportionment. The exceptions are the apportionments from 1810 and 1840.[182]

These two years are interesting for another reason. Gilbert and Schatz noticed that the MTD apportionment need not be unique, and they created an example to demonstrate this by slightly modifying the data from the 1960 census.[183] In fact, the MTD apportionments for 1810 and 1840 are not unique either. In Table III, I have listed all 14 apportionments for the census of 1810 that achieve the smallest total deviation. For Gilbert and Schatz, the fact that there could be multiple apportionments with the same minimum total deviation represents a "major defect,"[184] but I do not believe that it is an insuperable problem.

181. Gilbert & Schatz, *supra* note 171, at 772.

182. This claim is based on my computations of the apportionments. All the computations of MTD apportionments were done using scripts written for the software package Mathematica. They are available upon request.

183. Gilhert & Schatz, *supra* note 171, at 769–70.

184. *Id.* at 769.

Table III[185]

State	Population	1	2	3	4	5	6	7	8	9	10	11	12	13	14
New York	953043	26	26	26	26	26	26	27	27	27	27	25	25	25	25
Virginia	817615	22	22	22	23	23	23	22	22	22	23	22	23	23	23
Pennsylvania	809773	22	23	23	22	22	23	22	22	23	22	23	22	23	23
Massachusetts	700745	20	19	20	19	20	19	19	20	19	19	20	20	19	20
North Carolina	487971	14	14	13	14	13	13	14	13	13	13	14	14	14	13
Kentucky	374287	10	10	10	10	10	10	10	10	10	10	10	10	10	10
South Carolina	336569	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Maryland	335946	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Connecticut	261818	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tennessee	243913	7	7	7	7	7	7	7	7	7	7	7	7	7	7
New Jersey	241222	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Ohio	230760	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Vermont	217895	6	6	6	6	6	6	6	6	6	6	6	6	6	6
New Hampshire	214460	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Georgia	210346	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Rhode Island	76888	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Delaware	71004	2	2	2	2	2	2	2	2	2	2	2	2	2	2

If there is more than one total deviation apportionment, how should one choose among them? One easy way would be to choose the apportionment with the smallest standard deviation from the ideal district size. This is easy to implement and would be unique. For the year 1810, the apportionment with the smallest total deviation and the minimum standard deviation is the fourth one in Table III. This happens to coincide with the Hill apportionment for 1810.[186] While easy to implement, there is no jurisprudential justification for this way of singling out one MTD apportionment over another.

Another way to select a particular apportionment from among a large number of MTD apportionments is by a method known as lexicographic ordering.[187] The MTD apportionments all have the smallest gap possible between their most over-represented district and their most under-represented districts. To choose among them, we could look at the second largest gap between over-represented and

185. The population figures in this table are taken from BALINSKI & YOUNG, *supra* note 76, at 159.

186. That this is the Hill apportionment is not so surprising since, in general, tbe Hill apportionment minimizes the standard deviation of the size of the districts.

187. GUILLERMO OWEN, GAME THEORY 322 (3d ed. 1995).

under-represented districts and choose the apportionment that makes that as small as possible. If more than one MTD apportionment has the same second smallest gap, we move on to the third, and so on. In this way, ultimately, we can always pick a unique MTD apportionment. It is the tenth apportionment in Table III that is the best apportionment for 1810 under this measure, although one must check through the seven largest gaps before a unique one is identified.

The idea of ordering the gaps in this way is common in game theory.[188] It is also the method that is most fitting, given the motivation behind the choice of an MTD apportionment in the first place. The MTD apportionment is meant to minimize the gap between the district that is most over-represented and the one that is most under-represented. If two apportionments have that same total deviation, it is natural to choose between them by looking at the next largest gap between over- and under-represented districts. This is what the lexicographic method does.

Yet a third way to choose among MTD apportionments is to choose the one with the smallest average deviation. This is very much in the spirit of how average deviation is used in the Court's districting cases where it can be a supplementary consideration in choosing among districting plans which all have very small total deviations.[189] In the case of the 1810 apportionment, the MTD apportionment with the smallest average deviation is the fourth apportionment in Table III. This coincides with the Hamilton apportionment for that year.[190]

B. Legitimate State Interests in Apportionment

Having an understanding of how MTD apportionment is computed and what it might look like, I return to the question of what legitimate state interests might be furthered by the use of the Hill method. That is, if Congress were forced to justify its use of a method that produced a total deviation significantly larger than that of the MTD apportionment, what justifications could it muster?

Historically, Congress has argued in favor of one method over another on the basis of the properties of the *method* rather than on the

---

188. *See id.* (using the idea of ordering the gaps to define the nucleolus in a cooperative game); Gianfranco Gambarelli, *Minimax Apportionments*, 8 GROUP DECISION & NEGOTIATION 441, 444–59 (1999) (suggesting an application similar to mine, although he focuses on a somewhat different measure than percent deviation).

189. *See supra* text accompanying notes 27-35 (discussing *de minimis* total deviation).

190. This is not a surprise since the Hamilton apportionment always minimizes the average deviation of an apportionment. It turns out that in 1810, the Hill and the Hamilton apportionments are identical. *See supra* note 186 (discussing the Hill apportionment).

nature of the resulting apportionment.[191] This is in contrast to the courts which, in "one person, one vote" cases, are mostly concerned with the districting itself and not the way in which it was produced. Congress has adopted this stance in large part because it is the way that experts analyze apportionment. Those who study apportionment are loathe to choose among methods on the basis of which produces an apportionment that is closest to "perfect," i.e., the measure of discrepancy (the so-called objective function) they minimize. Balinski and Young's comment in this regard is typical: "The choice of an objective function is, by and large an *ad hoc* affair. . . Why choose one objective function rather than another? Of much deeper significance than the formulas that are used are the *properties* they enjoy."[192] Of course, in our case, the objective function is not ad hoc: it is the one specified by the Supreme Court's jurisprudence.

Nevertheless, because apportionment methods are generally studied by identifying certain desirable properties for apportionment methods, I consider the Hill method in light of these properties.[193] The relevance of inquiring into the properties of apportionment methods is that the best case that can be made for endorsing the Hill method for congressional apportionment is based on the properties that it exhibits. There are three properties that most practitioners consider important when evaluating an apportionment method: preserving quota, bias, and susceptibility to the Alabama paradox. I discuss each in turn.

1. Preserving Quota

In a perfect apportionment, each state would have the same percentage of the seats in the House as its percentage of the population. For example, California's population in 2000 was 33,930,798 out of a total U.S. population of 281,424,177,[194] or 12.06% of the national population. A perfect apportionment of a 435 seat house, then, would have California receiving 12.06% of the seats, or 52.45 seats. This number of seats is referred to as California's quota. Table IV lists the quota for each state according to the 2000 census.

An apportionment method is said to *satisfy quota* if every state is assigned a number of seats corresponding to its quota rounded up or

191. *See supra* note 78.

192. BALINSKI & YOUNG, *supra* note 76, at 104.

193. *See* DENNIS C. MUELLER, PUBLIC CHOICE III 582 (2003) (discussing a very similar approach taken by Arrow in evaluating which method of social choice was the best).

194. See MILLS, *supra* note 141, at 2 for census data from 2000.

down to the nearest integer.[195] Checking Table IV reveals that the current apportionment does satisfy quota, but that the MTD apportionment (which in this instance corresponds to the Adams apportionment) does not. California is allotted only 50 seats even though its quota is 52.45. The allocations for Texas and New York also break quota, always in a downward direction.

Table IV

State	Quota	Webster/ Hill	Jefferson	Adams (MTD)	Dean	Hamilton
California	52.44715	53	55	50	52	52
Texas	32.3115	32	33	31	32	32
New York	29.37617	29	30	28	29	29
Florida	24.77601	25	26	24	25	25
Illinois	19.22714	19	20	19	19	19
Pennsylvania	19.01326	19	19	19	19	19
Ohio	17.58173	18	18	17	18	18
Michigan	15.38882	15	16	15	15	15
New Jersey	13.0216	13	13	13	13	13
Georgia	12.6856	13	13	13	13	13
North Carolina	12.47028	13	13	12	12	13
Virginia	10.97562	11	11	11	11	11
Massachusetts	9.823861	10	10	10	10	10
Indiana	9.414579	9	9	9	9	9
Washington	9.133108	9	9	9	9	9
Tennessee	8.810601	9	9	9	9	9
Missouri	8.665649	9	9	9	9	9
Wisconsin	8.30233	8	8	8	8	8
Maryland	8.204449	8	8	8	8	8
Arizona	7.946002	8	8	8	8	8
Minnesota	7.613654	8	7	8	8	8
Louisiana	6.925197	7	7	7	7	7
Alabama	6.895611	7	7	7	7	7
Colorado	6.664917	7	7	7	7	7
Kentucky	6.259244	6	6	6	6	6
South Carolina	6.221575	6	6	6	6	6
Oklahoma	5.346329	5	5	6	5	5
Oregon	5.299531	5	5	6	5	5

195. BALINSKI & YOUNG, *supra* note 76, at 134.

Connecticut	5.27015	5	5	6	5	5
Iowa	4.531901	5	4	5	5	5
Mississippi	4.409796	4	4	5	4	4
Kansas	4.163869	4	4	4	4	4
Arkansas	4.142089	4	4	4	4	4
Utah	3.45731	3	3	4	4	4
Nevada	3.09456	3	3	3	3	3
New Mexico	2.819097	3	2	3	3	3
West Virginia	2.80249	3	2	3	3	3
Nebraska	2.651462	3	2	3	3	3
Idaho	2.005209	2	2	2	2	2
Maine	1.975001	2	2	2	2	2
New Hampshire	1.91423	2	2	2	2	2
Hawaii	1.880575	2	1	2	2	2
Rhode Island	1.622472	2	1	2	2	2
Montana	1.399355	1	1	2	2	1
Delaware	1.213487	1	1	2	1	1
South Dakota	1.169907	1	1	2	1	1
North Dakota	0.99506	1	1	1	1	1
Alaska	0.972148	1	1	1	1	1
Vermont	0.942713	1	1	1	1	1
Wyoming	0.765596	1	1	1	1	1

How important is it that an apportionment method satisfy quota? In the 1820 apportionment, New York's quota was 32.503, but it was assigned 34 seats. In the same year, Pennsylvania's quota was 24.917, but it received 26 seats. In the 1830 apportionment, New York again violated quota receiving 40 seats even though its quota was only 38.593. So, as a matter of history, the methods employed to apportion Congress have not always satisfied quota.

On the other hand, these were the only times in history in which quota was not satisfied. Moreover, the violating of quota in these two apportionments, a consequence of using the Jefferson method, probably contributed to the rejection of that method and its replacement by Hamilton's method, which is known to always satisfy quota.[196]

If an MTD apportionment may not satisfy quota, should we disqualify its use? The answer is no, for several reasons. First, as just

196. Actually the method was proposed by Vinton, but it was identical to that proposed by Hamilton for the original apportionment of Congress in 1798. BALINSKI & YOUNG, *supra* note 76, at 37.

discussed, the historical evidence suggests that violating quota is not a legal impediment. Second, every standard method of apportionment, other than Hamilton's method, is known to violate quota under some circumstances. It is true that the Webster and Hill methods rarely do so,[197] but the possibility exists nevertheless.

There is a more fundamental issue related to quota, though. Should we really be concerned with how close a state is to its quota? If the Court's concern is adherence to "one person, one vote," then the relevant unit of analysis is the representation of the citizens, not the total representation of the state. Under this inquiry, then, the state has no real claim at all.

Further buttressing this argument is the federal statute requiring states to elect their representatives by single-member districts.[198] This not only removes from the states the decision of how to elect the representatives, but ties each representative to a sub-population of the state, rather than to the state itself. This makes it difficult to view the representatives as being representative of the state *qua* state, rather than as representative of those people within the district.[199]

One could argue that a state does have a claim to general representation under Article I, §2. The requirement that "[r]epresentatives . . . shall be apportioned among the several States which may be included within this Union, according to their respective numbers,"[200] might be interpreted to mean that the apportionment must satisfy quota. But there is no "one state, one vote" jurisprudence, so any rational assignment of seats "according to their respective numbers"[201] should be sufficient. Violating quota, then, should not be a constitutional bar.

It might, however, be a political one. One could envision considerable political fall-out from states receiving less than their

197. In Monte Carlo simulations, the Webster method violates quota about 0.06% of the time and the Hill method violates quota about 0.3% of the time. In contrast, the Adams and Jefferson methods almost always violate quota. BALINSKI & YOUNG, *supra* note 76, at 81, tbl. 10.3). Since the MTD apportionment is often identical to the Adams apportionment, it is highly likely to violate quota as well.

198. 2 U.S.C. § 2c (2006).

199. After the passage of the Seventeenth Amendment mandating the popular election of senators, one might view senators as representing the people of the state rather than the state itself. U.S. CONST. amend. XVII. Thus, even the institution that was designed to represent states *qua* states has moved in the direction of populism. This is not to say that there are no situations in which states have a role distinct from their inhabitants. Should a presidential election be thrown into the House of Representatives, the voting is done by state delegation, with each state getting one vote. U.S. CONST. art. II, § 1.

200. U.S. CONST. art. I, § 2, cl. 3.

201. *Id.*

quota. Is satisfying quota a "legitimate state interest"? And, if so, is the choice of the Hill method "necessary to achieve" it?

The answer to the second question is certainly, "No." Hamilton's method always satisfies quota, and Webster's method is less likely to violate quota than Hill's method.[202] Even Dean's method rarely breaks quota. In the 22 apportionments in U.S. history, none of these methods has ever violated quota.[203] Thus, one need not pick Hill to assure that the quota is satisfied. Moreover, these other methods will often have less total deviation than a Hill apportionment (as was the case in 1990).

The answer to the first question is certainly more difficult. It is hard to know how much political turmoil there would be if an apportionment violated quota or if it regularly did so. The methods of apportionment are suitably arcane[204] that few people are likely to understand the significance of the quota. On the other hand, if California were suddenly to lose 3 seats it would be difficult not to notice. A court could go either way on this question. But even if a court were to find that satisfying quota is a legitimate state interest, the Hill method is not necessary to achieve this interest. Rather, there is an intermediate position requiring the apportionment with the smallest total deviation that also satisfies quota.

2. Bias

Another property that concerns experts is bias. Suppose we fix a method of apportionment and look at the resulting seat assignments over the history of the United States. If we used the Adams method, we would see that over the course of the 22 apportionments, states with small populations tended to do better than their quota, and states with large populations tended to do worse. That is, the Adams method has a bias toward small states.[205] If the Jefferson method were employed, one would see just the opposite: large states would routinely do better than their quota and small states worse, i.e., a bias

202. *See supra* note 197 (discussing preservation of quota in different methods).

203. *See* BALINSKI & YOUNG, *supra* note 76, at 158–180 for a complete table of apportionments.

204. Something that should be amply clear to tbe reader who has made it this far.

205. The Adams method is named after its proposer, John Quincy Adams. The bias toward small states is deliberate since Adams feared the waning power of New England after the 1830 census. He proposed his method as a substitute for one proposed by James Polk, which would have cost Massachusetts (and New England as a whole) a representative even though the House was to be increased by 27 members. For more details, see BALINSKI & YOUNG, *supra* note 76, at 25.

toward large states. Of the standard methods, only two are without bias: Webster's method and Hamilton's method.[206]

Using a method of apportionment that is systematically biased is problematic. Jefferson's method, which had been used from the founding of the nation until 1840, was replaced by Webster's method largely because of the former's bias toward large states.[207] The choice of the Hill method in 1929 was largely based on the (false) assertion that it was the only method that was unbiased.[208] Historically, then, Congress has been sensitive to bias in apportionment.

Since the MTD apportionment is closely related to the Adams apportionment, one would suspect that it would be biased toward small states and that is indeed the case. For this reason, it might be politically difficult to mandate it as a method of apportionment. However, two factors suggest that choosing a biased method might be less politically awkward now than in the past.

The first is that for the last 60 years, the method used has been biased in favor of small states, and there has been little clamor about it. The size of the bias in the Hill method is about a third that of the MTD apportionment[209] and so is less noticeable than the MTD apportionment would be. Nevertheless, there has been little complaint on this point.

The second factor is that the political situation with respect to the distribution of population is not as threatening now as it was in either the 1830s or 1910s. In the 1830s, one saw a dilution of the traditional political powers in New England;[210] the early 1900s saw a movement away from rural areas and toward the cities.[211] Thus, at both times, the bias against small states was perceived as exacerbating an already disturbing trend. It is not a coincidence that Congress was unable to reapportion itself at all after the 1920 census given the demographic disruptions and their likely consequences for reapportionment.[212] It is hard to argue that current demographic trends are as dislocating as at either of those times, and so a biased method of apportionment may be of less concern.

206. For a detailed discussion of bias, see *id.* at Ch. 9.

207. *Id.* at 34.

208. This was in fact false. As noted earlier, the Hill method is biased towards small states whereas it is Webster's method which is unbiased. The arguments over this point were quite vituperative in the 1920s. *See id.* at 54.

209. *Id.* at 75, fig. 9.1. I am assuming here that the bias of the MTD apportionment is essentially the same as the Adams method.

210. BALINSKI & YOUNG, *supra* note 76, at 25.

211. *Id.* at 51.

212. *Id.* at 56.

Indeed, there is some reason to believe that a bias in the direction of the small states may even be appropriate. With four states (California, Florida, New York, and Texas) accounting for 32% of the seats in the House,[213] one might be concerned about *too much* concentration of power in the large states. If a small number of states continue to accumulate seats, and their delegations vote as a bloc, then the states with large delegations may have too much power in Congress.[214]

But even if having a non-biased apportionment is a legitimate political goal, the Hill method is not necessary to achieve it. The Hill method is itself biased. The only unbiased methods are Webster and Hamilton. Hence, the government cannot justify the use of Hill on this basis. And again, the intermediate position would be to adopt whichever method achieves the minimum bias together with the minimum total deviation.

3. Alabama Paradox

As the House of Representatives increased in size, a strange phenomenon was observed: it was possible that the size of the House might be increased, but in the process an individual state might lose a representative solely because of a change in the total size of the House. For example, after the 1880 census, Congress considered increasing the size of the House. The Chief Clerk of the Census Office, using Hamilton's method, computed the apportionment for all sizes of the House between 275 and 350 seats. He reported to Congress that

> [w]hile making these calculations I met with the so-called "Alabama" paradox where Alabama was allotted 8 Representatives out of a total of 299, receiving but 7 when the total became 300. Such a result as this is to me conclusive proof that the process employed in obtaining it is defective, and that it does not in fact "apportion Representatives among the States according to their respective numbers."[215]

This problem was even more evident in 1900, when Maine would have been allocated 3 seats if the House was between 350 and 382, 4 seats if the size was between 383 and 385, back to 3 for House size 386, up again to 4 for House sizes 387 and 388, back to 3 for sizes 389 and 390, and finally back to 4 for sizes 391 through 400.[216]

---

213. See MILLS, *supra* note 141, at 2 for census data from 2000.

214. Having control of a large bloc of votes may mean disproportionate ability to affect the outcome of a vote. *See* Edelman, *supra* note 45, at 266 (providing an example of one such scenario); Felsenthal & Machover, *supra* note 45, § 7.8 (discussing the bloc paradox).

215. BALINSKI & YOUNG, *supra* note 76, at 38 (quoting a letter written by C.W. Seaton).

216. *Id.* at 40. A representative from Maine bemoaned these results on the floor of the House crying, "[i]n Maine comes and out Maine goes . . . God help the State of Maine when mathematics reach for her and undertake to strike her down." *Id.* at 41.

All of the divisor methods avoid the Alabama Paradox; so, among the standard methods, it afflicts only Hamilton's. At this time, I have no conclusive proof as to whether an MTD apportionment could be subject to the paradox. To my knowledge, the paradox only manifests itself when the MTD apportionment is not unique. In those cases, there always seems to be a way to choose among the many MTD apportionments so as to avoid the paradox. But no mathematical proof of this assertion is available.[217]

Frankly, it is no longer clear how significant the Alabama Paradox is. The House of Representatives has not changed size since 1911,[218] and there seems no real pressure to do so. The most likely scenario in which the House would increase in size would be the addition of either Washington, D.C. or Puerto Rico as a state; then, perhaps, the House would add 2 seats to accommodate them. Using data from the 2000 census, I have verified that the MTD apportionment would not exhibit the Alabama Paradox if Congress were to add as many as 10 seats to the House.

Choosing a method to avoid the Alabama Paradox might be a legitimate political goal, although it seems irrelevant for the foreseeable future. But, again, even if it is legitimate, the choice of the Hill method is unnecessary to achieve it. Any method other than Hamilton's will suffice. Other solutions present themselves as well. For example, one solution would be ensuring by statute that if the House is to be increased in size that no state would have fewer representatives than it currently has.

In short, the government cannot muster a strong claim that the choice of the Hill method is necessary to further some legitimate political goal. There are numerous alternatives to Hill that would further the same goals, and many of them would result in smaller total deviations.

On the other hand, the result might not be the triumph of the MTD apportionment. The Court might accept preservation of quota or lack of bias as legitimate political goals. If so, the MTD apportionment would not be appropriate, and some mixed regime of

217. For a more detailed technical discussion of this issue, see Paul H. Edelman, *Minimum Total Deviation Apportionments* (forthcoming 2006).

218. This is not quite true. When Alaska and Hawaii were admitted to the union in 1959, the House increased to 437 seats by adding one each for the new states. After the 1960 reapportionment, however, it returned to its original 435. U.S. Census Bureau, Congressional Apportionment—Historical Perspective, http://www.census.gov/population/www/censusdata/apportionment/history.html (last visited Mar. 20, 2006).

choosing the standard apportionment with the smallest total deviation might be substituted in its stead.[219]

VI. CONSEQUENCES

If the Court were to hold that an MTD apportionment was constitutionally mandated, what difference would it make? Table V shows what the 2002 Congress would look like under such an apportionment:[220]

Table V

State	Apportionment Population	Minimum Total Deviation	Current Apportionment
California	33,930,798	50	53
Texas	20,903,994	31	32
New York	19,004,973	28	29
Florida	16,028,890	24	25
Illinois	12,439,042	19	19
Pennsylvania	12,300,670	19	19
Ohio	11,374,540	17	18
Michigan	9,955,829	15	15
New Jersey	8,424,354	13	13
Georgia	8,206,975	13	13
North Carolina	8,067,673	12	13
Virginia	7,100,702	11	11
Massachusetts	6,355,568	10	10
Indiana	6,090,782	9	9
Washington	5,908,684	9	9
Tennessee	5,700,037	9	9
Missouri	5,606,260	9	9
Wisconsin	5,371,210	8	8
Maryland	5,307,886	8	8
Arizona	5,140,683	8	8
Minnesota	4,925,670	8	8
Louisiana	4,480,271	7	7
Alabama	4,461,130	7	7
Colorado	4,311,882	7	7

219. There is some precedent for choosing among a number of different methods. In 1941, Congress ordered the Census Bureau to compute the apportionment for the 1940 census using both Webster's method and Hill's method. BALINSKI & YOUNG, *supra* note 76, at 57–58.

220. See MILLS, *supra* note 141, at 2 for 2000 census data on apportionment populations.

Kentucky	4,049,431	6	6
South Carolina	4,025,061	6	6
Oklahoma	3,458,819	6	5
Oregon	3,428,543	6	5
Connecticut	3,409,535	6	5
Iowa	2,931,923	5	5
Mississippi	2,852,927	5	4
Kansas	2,693,824	4	4
Arkansas	2,679,733	4	4
Utah	2,236,714	4	3
Nevada	2,002,032	3	3
New Mexico	1,823,821	3	3
West Virginia	1,813,077	3	3
Nebraska	1,715,369	3	3
Idaho	1,297,274	2	2
Maine	1,277,731	2	2
New Hampshire	1,238,415	2	2
Hawaii	1,216,642	2	2
Rhode Island	1,049,662	2	2
Montana	905,316	2	1
Delaware	785,068	2	1
South Dakota	756,874	2	1
North Dakota	643,756	1	1
Alaska	628,933	1	1
Vermont	609,890	1	1
Wyoming	495,304	1	1
Total Population	247,493,379	435	435

As is readily apparent, the largest states lose the most under an MTD apportionment. California loses 3 representatives, while Texas, New York, and Florida lose 1 each. The two other states losing representation are Ohio and North Carolina. The states that gain a representative are Oklahoma, Oregon, Connecticut, Mississippi, Utah, Montana, Delaware, and South Dakota. Overall, there is a transfer of representation from larger states to smaller ones.

This transfer of representatives from big to small states is not surprising given the fact that, in this instance, the MTD apportionment is equivalent to the Adams apportionment. As previously discussed, it is well-known that the Adams apportionment has a bias in favor of small states. On the other hand, not all MTD apportionments agree with Adams. The Adams apportionment for the 1810 Congress has a total deviation three times that of the MTD apportionments. The nature of the overall bias of an MTD apportionment remains an open problem.

One might wonder what effect a change in apportionment would have had on the two most recent presidential elections. Since the electoral vote of a state is two more than its congressional delegation, a change in the apportionment would likely change the electoral vote totals. If the MTD apportionment had been used in 2000, then the 2004 presidential race would have resulted with Bush receiving 1 more electoral vote. The 2000 election (which depended on the 1990 census) would have resulted in Bush gaining 3 electoral votes. In other words, it would not have changed the outcome in either election.

Similar results follow from other close presidential elections in American history: 1876,[221] 1888,[222] and 1960.[223] The change to an MTD apportionment would not have affected the outcome in any of these elections. At most, 4 electoral votes would have changed sides in any of these elections.[224] Evidently, the proposed change to an MTD apportionment would make little difference on presidential outcomes.

VII. CONCLUSION

I have argued in this Article that the Court's "one person, one vote" jurisprudence has implications for the method by which the House of Representatives is apportioned. If the Court were to reason consistently about measuring deviations in representation, then it would be forced to throw out the current method of apportionment. The Court itself had a sense that this was true when deciding *Department of Commerce v. Montana*, but it was diverted by, of all things, an arithmetic mistake.

In 2010, the House will again be reapportioned, and possibly, the Court will have a chance to review its earlier decision. Perhaps it

221. Hayes beat Tilden in this election after a special commission allocated disputed electoral votes, despite the fact that Tilden won the popular vote. WILLIAM H. REHNQUIST, CENTENNIAL CRISIS: THE DISPUTED ELECTION OF 1876 at 99–105 (Alfred A. Knopf ed., 2004).

222. Harrison beat Cleveland in one of the three elections in history for which the popular vote gave a different outcome than the electoral vote. JAMES T. HAVEL, U.S. PRESIDENTIAL CANDIDATES AND THE ELECTIONS: A BIOGRAPHICAL AND HISTORICAL GUIDE 64 (1996).

223. Kennedy beat Nixon in another close popular election. *See* Robert S. Erikson, *The 2000 Presidential Election in Historical Perspective*, 116 POL. SCI. Q. 29, 31–32 (2001) (comparing the 1960 election to the 2000 presidential election).

224. Nixon would have received four more electoral votes and Kennedy four fewer in the 1960 election, making the election somewhat closer. In 1876, Hayes would have gotten two more electoral votes, and Harrison, in 1888, would have gotten one more, in both cases extending their leads.

will take the opportunity to reconcile its measure of representation and its treatment of apportionment. This Article has shown the Court how to do so.