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Fair Representation: Meeting the Ideal of One Man, One Vote

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FAIR REPRESENTATION: MEETING THE IDEAL OF ONE MAN, ONE VOTE. By *Michel L. Balinski* and *H. Peyton Young*. New Haven and London: Yale University Press. 1982. Pp. xi, 191. $27.50.

The United States Constitution provides that congressional representatives should be distributed among the states in proportion to each states' share of the national population, with each state receiving at least one representative.[1] This provision embodies a basic ideal of democracy — that each citizen's vote should be worth as much as another's.[2] A state's fair share of representatives rarely will be a whole number, so Congress must decide how to treat the fractional components whenever it reapportions congressional seats based on new census data. This decision affects the distribution of only a few seats in Congress and the electoral college,[3] but in closely contested matters, such as the presidential election of 1876, those few seats may mean the difference between victory and defeat.[4]

In *Fair Representation*, Michel L. Balinski and H. Peyton Young chronicle the apportionment debates that have recurred in Congress since the early days of the republic. Drawing lessons from history and mathematics, the authors provide an insightful analysis of the various apportionment methods that have been proposed, and they conclude that Daniel Webster's method, which Congress discarded in 1941, is the fairest. Although the analysis rests ultimately on complex mathematical proofs, which are presented in a lengthy appendix, the authors' textual argument is based on simple arithmetic and empirical data that are readily accessible to the layperson.

The first congressional apportionment debate took place in 1791,[5] pitting the "Jeffersonian Republicans against the Federalist forces led by Hamilton" (p. 10). Following a House-Senate deadlock, Congress initially passed an apportionment bill employing a method that Alexander Hamilton devised. Hamilton's method as-

1. U.S. CONST. art. 1, § 2, cl. 3.

2. "[T]he command of Art. 1, § 2 . . . means that as nearly as is practicable one man's vote in a congressional election is to be worth as much as another's." Wesberry v. Sanders, 376 U.S. 1, 7-8 (1964) (footnote omitted).

3. The number of presidential electors from each state is "equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress . . . ." U.S. CONST. art. II, § 1, cl. 2.

4. In the election of 1876, Rutherford B. Hayes was elected president over Samuel J. Tilden by a vote of 185 to 184 in the electoral college, even though Tilden received a majority of the popular vote. *See* 2 BUREAU OF CENSUS, U.S. DEPT. OF COMMERCE, HISTORICAL STATISTICS OF THE UNITED STATES, H.R. Doc. No. 78, 93d Cong., 1st Sess. 1073 (1975). A different method of apportionment would have tipped the balance in favor of Tilden. *See* text following note 15 *infra*.

5. The Constitution provided the initial allotment of representatives to each state, pending the outcome of the first census. *See* U.S. CONST. art. I, § 2, cl. 3.

signs each state its "quota" or fair share of seats based on its percentage of the national population.[6] Most seats are allocated by giving each state the whole number portion of its quota. Thus, a state with a quota of 19 2/3 would receive at least 19 representatives. The remaining seats are then distributed to the states with the largest leftover fractions. If four seats remained to be apportioned, the four states with the largest fractions would each receive an additional seat (pp. 13-17).[7]

At the urging of Thomas Jefferson and others, President Washington vetoed the Hamiltonian apportionment bill and later signed a bill employing a method that Jefferson conceived. Jefferson's method distributes all seats based on a calculation that permits fractions to be disregarded. The method divides the population of each state by a common divisor, which represents a hypothetical constituency size (*e.g.*, 30,000 people per representative). It then gives each state the number of representatives equal to the whole number portion of the quotient that the division produces. Thus, if a state has a population of 107,000 and the divisor is 10,000, the former is divided by the latter, producing a quotient of 10.7, and the state receives ten representatives. Any number may be chosen as a divisor as long as it produces a set of state quotients whose whole numbers add up to the total number of seats to be apportioned (pp. 18-19).[8]

Congress employed Jefferson's method in succeeding decades, but experience began to show that the method was systematically biased in favor of the larger states (p. 23). In the five censuses from 1790 to 1830, Delaware, which was the smallest state, had a total fair share of 8.54 seats, but received only six. New York, which was among the population leaders, received 128 seats with a total fair share of only 123.58 (p. 23).[9] The method's bias is easily explained. Dropping fractions effects a much greater loss of representation in the small states than in the large. For example, a state with a quotient of 1.5 realizes a thirty-three percent loss when the fraction is

6. A state's quota "is found by dividing the state's population by the total population [of the nation] and then multiplying by the total number of representatives to be apportioned." P. 14.

7. At this point, it is natural to ask: why not simply allot to each state its quota rounded off? The answer is that simply rounding

> does not necessarily give a result that sums to the required number of seats. For example, if there are too many fractions that are less than .5 then simple rounding will result in too few seats, whereas if too many fractions are above .5 then simple rounding will give out too many seats.

P. 17.

8. For example, any divisor between 28,356 and 28,511 would have worked under the 1791 census with a House size of 120. P. 19 n.*.

9. The authors derive a state's total fair share by adding its quotas for each of the five censuses in question. *See* p. 23.

dropped, while a state with a quotient of 10.5 loses less than five percent (p. 13).

During the 1820's and 1830's, opponents of Jefferson's method proposed alternative methods in an effort to cure the prevailing large state bias (pp. 23-33). The most noteworthy alternative sprang from the mind of Daniel Webster during the 1832 apportionment debate.[10] Webster's method, like Jefferson's, divides the population of each state by a common divisor. However, unlike Jefferson's method, it then rounds off the resulting quotient to the nearest whole number and gives the state that number of representatives.[11] Thus, if the division produces a quotient of 10.7, the state receives 11 representatives (pp. 30-33). Although the large states are advantaged whenever a quotient is rounded down,[12] the small states realize a disproportionate gain whenever a quotient is rounded up.[13] "Since the Webster method rounds fractions above one-half up and below one-half down, each state will be advantaged or disadvantaged the same number of times on average" (p. 76).

Congress abandoned Jefferson's method in favor of Webster's, following the 1840 census (pp. 34-35). However, Webster's method remained in use for only a decade. In 1850, Congress adopted Hamilton's method as part of a "permanent" apportionment act. Although the act was on the books for more than fifty years, it was never strictly observed. The act specified a fixed House size of 233, but Congress always allocated more than that number of seats.[14] In the 1860's and 1870's, Congress parcelled out a small number of seats based on purely political considerations and without regard for Hamilton's method.[15] If Hamilton's method had been followed, Rutherford B. Hayes' one vote margin of victory in the electoral col-

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10. Congress also considered, but failed to adopt, three other proposals during this period. A representative named William Lowndes suggested a variation on Hamilton's method, while John Quincy Adams and a professor named James Dean suggested variations on Jefferson's method. Pp. 23-30.

11. Where Jefferson's method employs a divisor that produces a set of quotients that sum to the required total when all fractions are dropped, *see* text accompanying note 8 *supra*, Webster's method uses a divisor producing quotients that sum to the desired total when all fractions are rounded off. *See* p. 32.

12. *See* text following note 9 *supra*.

13. For example, a state with a quotient of 1.6 realizes a 25 percent gain in representation when the quotient is rounded to 2. However, a state with a quotient of 10.6 gains less than 4 percent under the same rounding process.

14. While the act was in effect, House sizes ranged from a low of 234 during the 1850's to a high of 356 during the 1890's. *See* App. B, pp. 161-66.

15.
> In the 1860s, 233 seats were first meted out in accordance with the [Hamilton] method, and then a pretext was found to give out 8 more seats — all of them to Northern states. A similar process was resorted to in the 1870s . . . . A first apportionment of 283 seats . . . was supplemented by 9 additional seats several months later, and this definitive apportionment agreed with neither a Hamilton nor a Webster apportionment of 292 seats.

P. 37 (footnote omitted).

lege in 1876 would have been reversed, and Samuel J. Tilden would have been elected President (p. 37).

In 1881, Congress discovered a flaw in Hamilton's method that eventually caused its repeal. Under the 1880 census, Hamilton's method gave Alabama eight seats in a House of 299, but only seven seats in a House of 300. In a letter to Congress, the chief clerk of the Census Office pointed out the so-called "Alabama Paradox" and urged the adoption of a different method. Congress responded by choosing a House size that produced the same results under Webster's and Hamilton's methods. This compromise survived the 1890 census, but died in 1901, when Congress deliberately chose Webster's method over Hamilton's (pp. 38-42).

Following the 1910 census, Congress again used Webster's method of apportionment, but a new method surfaced during the debate. Joseph A. Hill, a statistician with the Bureau of the Census, offered a proposal that distributed seats in such a way that no transfer of any one seat could reduce the percentage disparity in constituency size between the affected states (pp. 47-48). In practice, Hill's method is simply another variation of the divisor concept employed in Jefferson's and Webster's methods. Hill's method gives each state "either its quotient rounded up or rounded down, depending on whether or not the quotient exceeds the 'geometric mean' of these two choices" (p. 62). The geometric mean is calculated by multiplying the two numbers and finding the square root of their product. Thus, a quotient of 1.45 would entitle a state to 2 seats, because 1.45 is greater than the geometric mean of 1 and 2, which is approximately 1.41.

Hill's method eventually replaced Webster's. In the face of rising urban populations, congressmen from agricultural states sought to minimize "the inevitable erosion in their power" (p. 51), and Hill's method helped them to do so. Because the geometric mean always falls less than half way between two numbers (pp. 62-63), Hill's method rounds quotients up more often than it rounds down, and rounding up favors smaller states.[16] Congress failed to pass an apportionment plan following the 1920 census, and it avoided dispute a decade later because Webster's and Hill's methods happened to produce the same distribution of seats. However, under the 1940 census, Webster's method allocated a seat to Michigan that Hill's method gave to Arkansas. Since Arkansas was safely Democratic, the Democratic Congress opted for Hill's method, which came to be used in each succeeding apportionment through the present (pp. 51-59).

From their review of the apportionment debates, Balinski and Young derive a set of principles for judging the fairness of the vari-

16. *See* note 13 *supra* and accompanying text.

ous apportionment methods. First, the authors contend that no method is fair which suffers from the "Alabama Paradox" or related paradoxes that they discuss (p. 68). Second, they suggest that the method should be as free as possible from any systematic bias in favor of large or small states (p. 71). Third, the method should minimize the possibility that a given state will receive more than its quota rounded up or less than its quota rounded down (p. 79).

Although *no* method can conform perfectly to the authors' principles (p. 81),[17] Webster's method comes closest. Webster's method and the other divisor methods completely avoid the paradoxes inherent in the Hamiltonian scheme (pp. 67-70). But unlike other divisor methods, Webster's method is free of systematic bias (pp. 76-77). And of all divisor methods, Webster's is least likely to deviate unacceptably from quota. Under present conditions, Webster's method would violate quota approximately once in every 1,600 apportionments, or once in every 16,000 years (p. 81).[18]

Fair Representation is a significant book. The authors lucidly dissect a complex issue that has plagued Congress for almost 200 years, and they offer a solution that is both intuitively appealing and mathematically sound. The current method of apportionment, as *Fair Representation* demonstrates, is not the fairest. Congress would do well to take note.[19]

17. The authors offer a so-called "impossibility theorem" to prove this point mathematically. App. A, pp. 129-34.

18. Although Hamilton's method does not violate quota, it produces the paradox problem much more often (approximately once in every 18 apportionments) than Webster's method violates quota. P. 82.

19. Following the 1980 census, Representative Fithian introduced a bill that would have changed the method of apportionments. *See* H.R. 1990, 97th Cong., 1st Sess. (1981). However, the bill employed Hamilton's method rather than Webster's, and Peyton Young, one of the authors of *Fair Representation*, warned the committee considering the bill about problems such as the Alabama Paradox. *See Hearings on Census Activities and the Decennial Census Before the Subcomm. on Census and Population of the House Comm. on Post Office and Civil Service,* 97th Cong., 1st Sess. 42-43 (1981). No action was taken on the bill.