**APPENDIX: Formal Definition of the Ten Electoral College Variants Being Compared**

**JONATHAN THIS WILL NEED TO BE REWRITTEN TO MAKE SURE THAT IT FOLLOWS THE SAME ORDER AS IN THE PRESENT TABLE 1.**

**We begin with some notation to elucidate how we will measure these Electoral College alternatives. We are interested in all elections since 1868, *Y{1868, 1869, …y, 2016}.* In each year, there is a set of states, *S{Alabamay, Alaskay, …, sy}*, which all receive a proportion of the EC, *electorssys*, as determined by the US Constitution. Equations are numbers in the form (A or B, I or II or III) where A is *unit-rule* and B is *proportional* allocation, and I maintains the decade’s apportionment and two-state bonus while II eliminates just the two-seat bonus and III eliminates both the apportionment and two-seat bonus.**

**The equation for the *Popular Vote (BIII)* is simply,**

**(B, III)[[1]](#footnote-1)**

**which translates into the national summed percentage of votes for the Democratic candidate, with the two-party vote total in the denominator and third-party votes excluded. This is, of course, the most proportional to the voters, but not necessarily to the population since turnout rates might vary by state (Grofman, Koetzle, and Brunell 1997). It also happens to be the reform that has generated the most demand since it’s the *only* system that can guarantee a plurality winner takes the office (I BELIEVE THIS IS TRUE, DO YOU HAVE REASON TO BELIEVE OTHERWISE?).**

**The actual Electoral College, assuming unit-rule for all states, is determined by the following equation,**

**(A, I)**

**<< Table 1 about here >>**

**Delete this old version. Use my new Table 1 instead**

**Table 1. Electoral College Options**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***[State-Unit Rule]***  ***(A)***  keep winner-take-all state-level allocations | ***[Proportional]***  ***(B)***  eliminate state-level winner-take-all | | |
| ***[Electoral College]***  ***(I)***  keep two-seat “bonus” and House-size-based seat allocations | *Electoral College*  *(District-allocation State-Unit Rule*  *with 2 seat-bonus)* | *Whole-Number Proportionality with 2 seat-bonus*  *(a)* | | ***More Proportional 🡪*** |
| *Fractional Proportionality with 2 seat-bonus*  *(b)* | *District-Rule with 2 seat-bonus*  *(c)* |
| ***[District]***  ***(II)***  eliminate two-seat “bonus” but keep House-size-based allocations | *District-allocation State-Unit Rule*  *without 2 seat-bonus* | *Whole-Number Proportionality without 2 seat-bonus*  *(a)* | |
| *Fractional Proportionality without 2 seat-bonus*  *(b)* | *District-Rule without 2 seat-bonus*  *(c)* |
| ***[Population]***  ***(III)***  eliminate both two-seat “bonus” and House-size-based allocations and replace with population allocation. **There is no apportionment rule.** | *Population State-Unit* | *Popular Vote* | |
|  | ***More Proportional 🡪*** | | | |

The first of the alternatives we consider sets an electoral college vote share equal to the size of the state’s delegation in the U.S. House divided by the total number of seats in the House, i.e., an electoral college with the two seat Senate bonus removed.[[2]](#footnote-2) We refer to it as a *District-allocation State-Unit Rule without 2-seat bonus (AII).* **The equation is the same as the Electoral College (2), except every *electorsys* is first subtracted by two (A, II).**

The second sets the electoral college vote share as identical to the state’s share of the national population, with fractional allocations to allow for (nearly) perfect proportionality, i.e., an electoral college that corrects for both House malapportionment and malapportionment due to the two seat Senate bonus.We refer to the second as a *Population-Weighted State-Unit Rule (AIII)*. **Here, instead of the total electors equaling 538, it is set to 1, or 100%, and each state gets exactly the percentage of this EC as their census year population, and the winning candidate is the one that wins enough states such that their share of the states’ allocations surpasses 50% of the population.**

**(A, III)**

**In the same way that one might expect campaigns to employ a different strategy then with the Electoral College, a proportionality rule such as a state population allocation might encourage regional candidates or smaller parties to run because it would not be necessary to win a majority of states or votes, since the winner would be the candidate who can attract enough support in a subset of states that is greater than any other candidate. Essentially, even though seats are awarded nearly proportionately, this rule would change the nature of campaigns for the highest office. Any increase in the number of viable candidates who go on to win electoral college seats would result in the winner of an election winning smaller pluralities. With the winner-take-all feature maintained, which results in an unbalanced distribution of votes in some states, we would expect to result in *more* frequently split popular and electoral votes. For the purposes of this essay, we treat the actual results as if they happened under the alternative rules.**

The third proposal is to create an electoral college that allocates its votes in a proportional or more proportional way to the state’s share of the present EC, rather than in terms of winner-take-all. Here there are **two** main variants, **each of which have two minor distinctions**. **The first major variant uses the current allocation of EC seats, the second allocates electors based on representation in the House of Representatives, I,e, with the two-seat bonus eliminated*.* For the minor variations,**

***Whole-Number Proportionality (BIa & BIIa)* for both the Electoral College and House delegation sizes are given by the following series of equations:**

**Where the products in set *State\_allocation* are ordered and the number of seats, *n*-top *priority numbers* are allocated seats accordingly.**

**(B, Ia & IIa)**

**The second minor variation is the *Fractional Proportionality (BIb & BIIb)*, which electors are abolished, and candidates receive their share of the state-wide vote rounded to the third decimal. This variant has been proposed numerous times and was actually passed by the US Senate in 1950 under what was known as the Lodge-Gossett amendment (S.J. Res. 2 of the 81st Congress). The *Fractional Proportionality* alternative results in an increase in proportionality from *Whole-Number Proportionality* but yet is less proportional then *Popular Vote,* because it sets the number of Electors each state gets but relaxes the unit-rule nature of the election. It failed ratification in the House of Representatives (Koza et al 2013). The equation is as follows,**

**(B, Ib & IIb)**

The other **frequently proposed** variant is one in which EC votes are allocated by giving one seat for each House district won, and a two-seat bonus for the candidate who wins the popular vote in the state. **This variation emulates the rules** presently **practiced** in the states of Maine and Nebraska**.** [[3]](#footnote-3) We refer to this as the *District Rule.* **It has two minor variations,** *with* and *without 2 seat-bonus.*[[4]](#footnote-4) **It is akin to a plan advocated by Senator Karl E. Mundt (R-SD), which was opposed by then Senator John F. Kennedy (D-MA).[[5]](#footnote-5)**

(B, Ib & IIb)

***District Rule with 2-seat bonus* sets to 2 while the *District Rule without 2-seat bonus* instead sets it to zero.**

In addition, in the subsequent section, we **briefly** consider an **additional** type of change, one based on the suggestion in Ladewig and Jasinski (2008) that the House size be decennially **adjusted** to reflect the cube root of U.S. population. The idea is that increasing the size of the House should increase the proportionality of EC outcomes, and hence make the EC vote look more like the popular vote. [[6]](#footnote-6)

**Instead of locking the size of the US House at 435, this rule would apportion seats using method of equal proportions (as described in equation (B, Ia), and we replace electorsy with the *Cube Root House Size* rounded down to the nearest integer. We can then use the new apportionment to apply to all the alternative electoral college rules.**

**In *toto*, we offer three alternatives where the state-level unit-rule is maintained and seven alternatives where the unit-rule is eliminated. These ten total alternates include five which keep the state-wide two-seat bonus, five that eliminate the bonus, and two that eliminate electors altogether. We offer another section which reallocates the number of Electors based on the *ideal* size of the US House, namely one based on the cube root of the population.**

1. This can be found in **<< Table 1** where the first in the set is the column and the second is the row. [↑](#footnote-ref-1)
2. For the purposes of this calculation, Washington D.C. will still be counted for one house vote in periods after 1960 despite not having a voting member of the House of Representatives. As per the twenty-third amendment, adopted in 1961, D.C. is allocated 3 Electoral College votes regardless of its population. [↑](#footnote-ref-2)
3. Maine adapted this rule in advance of the 1972 presidential election, while Nebraska enacted it starting with the 1992 election. A split has occurred once in each of these states. In 2008, Barack Obama won Nebraska's 2nd Congressional District, picking up a Democratic electoral vote in that state for the first time since 1964. In 2016, Donald Trump won Maine's 2nd Congressional District. [↑](#footnote-ref-3)
4. **Although this plan is more proportional then the state-unit rule plans including the current Electoral College, it is not a proportional plan since it still awards electors on a winner-take-all basis, except now at the Congressional District level. Given the potential for partisan gerrymanders, this plan may end up being *less* proportional then a winner-take-all state rule.** [↑](#footnote-ref-4)
5. S.J.Res. 12, 90th Cong., first sess. [↑](#footnote-ref-5)
6. This proposal can be seen as an attempt to avoid change in the present Electoral College that would be impossible to achieve without a Constitutional amendment while still assuring concordance with popular vote outcomes by creating a compact of all the states such that they would report Electoral College results as if the national popular vote winner was the winner in the state. **This proposal would only take an act a Congress, since it sets the size of the US House and thus the percentage of Electors that are allocated via population.** [↑](#footnote-ref-6)