

Stepwise Presidential Election Reform: The Biased Proportional Plan and its Implementation

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Abstract

There are numerous problems with the current method of electing the President of the United States; many of them stem from the phenomenon of swing states. Our goal in this paper is to find *pragmatic* reform that addresses this issue. Looking at presidential elections through a game-theoretic lens, we treat the states as strategic agents and design a system that keeps the Electoral College, requires no constitutional amendment, and can be implemented gradually—only two states change their method of allocating electoral votes at each step. The transitions from the current to the new system are compatible with the incentives of both Republican- and Democratic- leaning states.

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“Each generation is as independent as the one preceding, as that was of all which had gone before. It has then, like them, a right to choose for itself the form of government it believes most promotive of its own happiness; consequently, to accommodate to the circumstances in which it finds itself, that received from its predecessors; and it is for the peace and good of mankind, that ... it may be handed on, with periodical repairs, from generation to generation.”

Thomas Jefferson, *Letter to Samuel Kercheval*, June 12, 1816. [19]

1 Introduction

The system for electing the President of the United States has seen little change in the past two hundred years. This is not for lack of trying: over 700 resolutions have been proposed—by both parties—to change or abolish the Electoral College in the past two centuries; none have passed. One of the main problems with the current system is the large discrepancy between the influence that voters in different states have on presidential elections. This is mostly due to the winner-take-all method of allocating electoral votes, where the winner of the plurality of the popular vote of a state is allocated all of the state’s electoral votes. The constitution gives states the right to choose their method of allocating their electoral votes; all of the states use winner-take all, except Maine and Nebraska, which use the District method (outlined below). In *safe* states—ones that strongly lean either Republican or Democrat—the outcome of the election is all but certain. The voters in these states have, for all practical purposes, no influence on the winner of the presidential election, e.g., [4,31,36]. Indeed, voter turnout is lower in safe states, at least in part due to many voters feeling that their vote would not make a difference, e.g., [12,27]. The remaining states are called *battleground* or *swing* states, and there are typically only a handful of these in each election.

It is not surprising that presidential candidates devote very little time and resources, if any, to safe states, e.g., [5,13,14,18]. For example, in 2012, Obama and Romney spent \$173 million on TV ads in Florida and over \$150 million in both Ohio and Virginia; in forty other states combined, the total expenditure for TV ads was \$30 million (see Table 1.1 for a breakdown of spending vs. number of electoral votes). In 2004, Florida, Ohio, Pennsylvania and Iowa received 66 percent of the total funds allocated by the candidates for ads, and 58 percent of campaign visits [7]. These gains are amplified by collateral effects; for example, comparable TV stations are sold at a much higher price in swing states due to advertising revenue from presidential campaigns [35].

State	Electoral votes	Total Spending	Spending per vote
Florida	29	173	5.9655
Virginia	13	151	11.615
Ohio	18	150	8.333
North Carolina	15	97	6.4667
Colorado	9	73	8.1111
Iowa	6	57	9.5
Nevada	6	55	9.1667
Wisconsin	10	39	3.9
New Hampshire	4	34	8.4
Michigan	16	33	2.0625
Other states	412	30	0.073
Total	538	892	

Table 1.1: Estimate of total spending on TV ads in April-November 2012, in millions of dollars (compiled from [37]).

The benefits that swing states reap are not restricted to the campaigns. Research shows that incumbent presidents target federal dollars to swing states during the presidency, and in particular, in the immediate lead-up to an election, e.g., [17, 23, 32]. Studies also show that presidents use the power of the office in order to influence voters in swing states in other ways, such as signing statements and constantly campaigning [6, 8], pressuring government agencies to shorten processing time for awards [1, 16], and even engaging in strategic trade protectionism [26]. Any of these effects should on its own be sufficient argument against the perpetuation of swing states; securing the electoral votes of a handful of states should indisputably not be a driving factor in policies that affect the entire nation.

2 The path to reform

Many plans have been proposed as alternatives to the current system; notably Direct Election, the National Popular Vote Interstate Compact, the District Plan and the Proportional Plan.

Under *Direct Election*, the Electoral College would be abolished and the winner of the plurality of the popular vote would be appointed president. 66% of Democrats and 61% of Republicans support replacing the Electoral College with Direct Election [11]. Two of this plan's biggest problems are that (i) it requires a constitutional amendment, and (ii) Direct Election appears to favor Democrats, in the sense that every time (since the formation of

the two major parties) that the winner of the popular vote was different from the winner of the Electoral College, the Democratic candidate won the popular vote and the Republican candidate won the presidency. Note that this is a counterfactual deduction: it assumes that the voting would have been the same even though the method of deciding the winner had been different. Nevertheless, most scholars agree this type of speculative reasoning plays a large role in lawmakers' (and people's in general) feelings about voting systems, e.g., [9, 20, 22, 25, 33].

The *Interstate Compact* is an agreement in which states commit to pledge all of their electoral votes to the winner of the popular vote, once states with a total of 270 or more electoral votes have joined. While it sidesteps the Constitutional amendment problem of Direct Election, it still appears to favor Democrats, for the same reason as above. Indeed, only 10 states and the District of Columbia have joined the compact since Maryland became the first state to join in 2007; all are safe Democratic states. Many scholars agree that it is highly unlikely to collect a total of 270 electoral votes, as it is unappealing to both Republican states and swing states, e.g., [4, 33].

Under the *District Plan*, the winner of the plurality of the popular vote in each congressional district is allocated the vote of one elector; the winner of the plurality in the state is allocated the two remaining electoral votes. Maine and Nebraska have both adopted this system. Two main criticisms of the District Plan are that (i) it is susceptible to gerrymandering, and (ii) it simply shifts the problem of swing states to swing districts: candidates would only campaign in competitive districts, e.g., [2, 24]. This is backed by empirical data; for example, Trump and Clinton both campaigned in Nebraska's second district, which is competitive, and neither visited the other two, which are not.

Under the *Proportional Plan*, each candidate is awarded electoral votes in proportion to their share of the state's popular vote. Scholars agree that the proportional system would lead to more spread out campaigns, e.g., [24]. The main criticism of the Proportional Plan is that it makes it easier for third party candidates to win votes, e.g., [2, 30]. This has two main effects: (i) it weakens the two-party system and (ii) it results in elections being more likely to go to the House for a decision, as it is more difficult to win a majority of electoral votes when some votes go to third parties.

While all four of these plans would make safe states more competitive than they currently are, the Proportional Plan seems the most appealing from this perspective: under Direct Election and the Interstate Compact, small states like Wyoming would probably be ignored by the candidates, and under the District Plan, uncompetitive districts (and therefore sometimes entire states) would most likely be ignored. Nevertheless, the Proportional Plan has objectionable flaws. None of the four is likely to gain widespread bipartisan support.

The first challenge in reforming the current system is to design a new one. It is clear that we cannot hope for a system that everyone agrees is the best, because there is no consensus on what the ‘best’ is. One can only hope to design a system that (almost) everyone agrees is better than the current one. In particular, we would like a system that does not favor either party, offers better representation than the winner-takes-all system and eliminates or at least greatly reduces the effects of swing states. In addition, the new system should keep most—if not all—of the important features of the Electoral College, as many lawmakers and psephologists feel they are sacrosanct hallmarks of the U.S. Democracy, e.g., [3, 28]. In particular, it should (i) contribute to the cohesiveness of the country by requiring a distribution of popular support to be elected president (ii) enhance the status of minority interests, (iii) contribute to the political stability of the nation by encouraging a two party system, and (iv) maintain a federal system of government and representation, e.g., [2, 21]. Note that Direct Election violates all four and the Proportional Plan violates (iii).

The second challenge is to motivate the nation to transition to the new system. As this does not appear to be currently possible via congressional reform, we aim for change at the state level.

3 The Biased Proportional Plan

We address the main weakness of the Proportional Plan by setting a threshold: in order to obtain any electoral votes, a candidate must receive a sufficiently large fraction of the popular vote. We call this plan the Biased Proportional Plan (BPP); its essence can be summarized as follows.

The Biased Proportional Plan

Each state assigns its electoral votes in proportion to the statewide popular vote; votes of candidates who do not pass a threshold go to the winner of the plurality of the statewide popular vote.

After the voting is over, the unrounded electoral votes are computed for each candidate in each state:

$$\text{unrounded electoral votes} = \# \text{ of electorates} \times \frac{\# \text{ of popular votes for the candidate}}{\text{total } \# \text{ of popular votes}} .$$

For each candidate, if they received either (a) less than 1 full unrounded electoral vote or (b) less than 20 percent of the popular statewide vote, their electoral votes are reduced

to 0. Then, if the fractional part of their unrounded electoral vote is at least 0.84 (see below for the reasons for this choice), their number of electoral votes is rounded up; otherwise it is rounded down. The candidate that won the plurality of the statewide popular vote receives any remaining electoral votes.¹

Example There are three candidates: *A*, *B*, and *C*. They receive 40%, 36% and 24% of the statewide popular vote in Idaho, which has 4 electoral votes. The unrounded electoral votes are 1.6, 1.44 and 0.96 respectively. Candidate *C* did not obtain a full electoral vote, and so receives none; Candidate *B* has $1.44 < 1.84$ electoral votes, which is rounded down to 1. Candidate *A* receives the 3 remaining electoral votes.

The goal of the threshold is to strike a balance between discouraging weak third-party candidates and ensuring that votes for one of the two main parties will rarely be wasted. The combination of the two thresholds (requiring a full electoral vote as well as setting a percentage threshold) is important given the large variance in number of electors between large and small states—it ensures that in states with many electors, a small percentage of the popular vote will not translate to any electoral votes, and in small states with three or four electors, a partial electoral vote will not be rounded up. Thus a third-party candidate should only receive electoral votes if they are comparable in popularity to one of the two main parties. Of course, no system can completely discourage third party candidates from running, and none should—even proponents of the two-party system typically agree that strong third-party candidates can be important, e.g., [28].

The reason we do not advocate using standard rounding (where 0.5 and above is rounded up) can be summarized by the following example: Suppose two candidates receive 62.3% and 37.7% of the popular votes in a state with four electors. The unrounded electoral votes are 2.49 and 1.51 respectively. Using standard rounding, both candidates would receive two electoral votes, which seems far from agreement with the will of the people. A similar argument shows that the rounding parameter should not be set too high. While there is clearly no ‘correct’ way to set it, we use the number of tied states² as a proxy. The average number of tied states per election—if the BPP had been used and the voting had been the same—decreases as the rounding parameter increases (see Figure 3.1). We feel it would be unappealing to the American voter if too many states were tied, and hence set the parameter at 0.84, which would have resulted in two tied states per election on average.

¹In the extremely unlikely (but hypothetically possible) event that more electoral votes are allocated than there are electors, votes are reduced from the candidate that received the fewest votes; see the full version for details.

²Tied states are ones in which the Republican and Democratic candidates receive the same number of electoral votes.

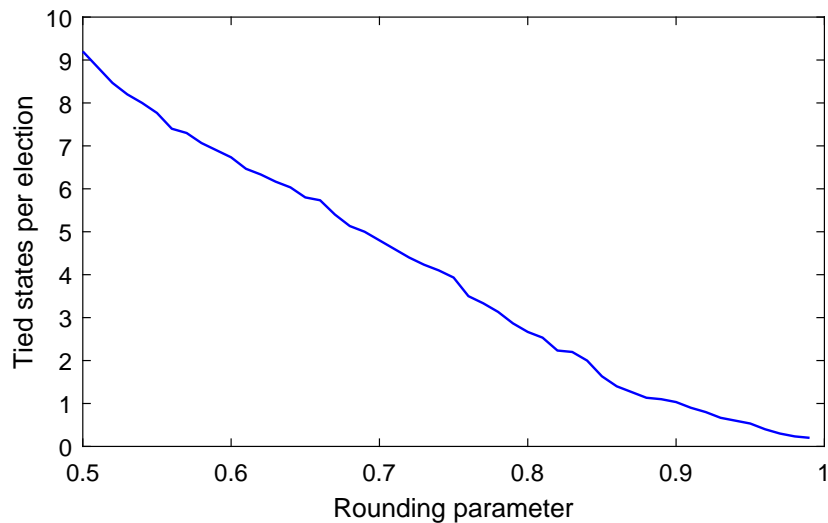


Figure 3.1: The average number of tied states in the 30 elections of 1900-2016 as a function of the rounding parameter of the BPP (using actual voting data).

We contend that the BPP should be an appealing alternative to the winner-take-all system for all safe states. First and foremost, safe states that transition to the BPP become competitive, and therefore reap the benefits currently restricted to swing states.

Second, if the voting had been the same, the outcome of all thirty elections between 1900 and 2016 would have been identical, except 1968, when the decision would have gone to the House. It seems highly probable that the House would have elected Nixon president, and so the result would have probably also been the same; the 1968 election was highly contentious as it was, sparking an outcry for electoral reform. Table 3.1 shows the actual electoral votes and the BPP votes in all elections since 1928. We contrast this with Direct Election, with which the outcome would have changed twice in the last thirty elections (2000 and 2016), and with the District Plan, with which the outcome would have been different twice out of the ten elections (1960–1996) analyzed in [20].

Third, unlike Direct Election and the Proportional Plan, the BPP upholds all of the main arguments for the Electoral College.

4 Stepwise implementation

There are two naïve ways by which the states could transition to the BPP. The first is for all of the states to transition at once. It is highly unlikely that this would happen, as the swing states would probably not comply. Even if we only consider safe states, convincing more than thirty states to change their election laws at the same time seems like a Sisyphean

Year	Candidate	Actual*	BPP	Year	Candidate	Actual*	BPP
2016	Clinton	232	268	1952	Stevenson	89	227
	Trump	306	270		Eisenhower	442	304
	Johnson	0	0	1948	Truman	304	282
2012	Obama	332	279		Dewey	189	214
	Romney	206	259		Thurmond	38	35
2008	Obama	365	289		Wallace	0	0
	McCain	173	249	1944	Roosevelt	432	323
2004	Kerry	252	256		Dewey	99	208
	Bush	286	282	1940	Roosevelt	449	334
2000	Gore	267	266		Wilkie	82	197
	Bush	271	272	1936	Roosevelt	523	377
	Nader	0	0		Landon	8	154
1996	Clinton	379	312	1932	Roosevelt	472	358
	Dole	159	226		Hoover	59	173
	Perot	0	0		Thomas	0	0
1992	Clinton	370	277	1928	Smith	87	225
	Bush	168	215		Hoover	444	306
	Perot	0	46	1924	Davis	136	182
1988	Dukakis	112	233		Coolidge	382	316
	Bush	426	305		LaFollette	13	33
1984	Mondale	13	199	1920	Cox	127	197
	Reagan	525	339		Harding	404	334
1980	Carter	49	213		Debs	0	0
	Reagan	489	325	1916	Wilson	276	305
	Anderson	0	0		Hughes	255	226
Benson	0	0					
1976	Carter	297	276	1912	Wilson	433	321
	Ford	241	262		Taft	8	95
1972	McGovern	17	179		Roosevelt	90	115
	Nixon	521	359	Debs	0	0	
1968	Humphrey	191	230	1908	Bryan	156	230
	Nixon	302	261		Taft	327	253
	Wallace	45	47		Debs	0	0
1964	Johnson	486	337	1904	Parker	133	201
	Goldwater	52	201		Roosevelt	343	275
1960 [†]	Kennedy	303	271		Debs	0	0
	Nixon	219	267	1900	Bryan	155	217
	Byrd	15	0		McKinley	292	230
1956	Stevenson	74	214				
	Eisenhower	457	315				
	Other	0	2				

Table 3.1: Electoral votes according to the current system and according to the proposed BPP system. * To discount the effect of faithless electors, the “Actual” votes are computed if there were none, with the exception of 1960[†]: The results of the 1960s election are ambiguous; the actual votes reflect the actual votes cast, and we chose the widely accepted method of White [38] to determine the outcome of the BPP vote.

task. The other obvious choice is unilateral transition. This is not unheard of—Maine and Nebraska both converted to the District Plan. Nevertheless, such unilateral transitions are rare. Swing states would not want to transition unilaterally as they would be giving up influence and revenue. Safe states would not want to due to partisan considerations—they would essentially be giving away votes to the candidate of the opposite party. Our solution is to couple states to counterbalance their partisan effect, and to defer swing states to the end. In order to ensure that we do not treat any swing state as safe, we define the swing states to be the union of the swing states as currently defined by leading pundits, e.g., [29,34]. We feel that it is safe to say that any state that is not included in any of these lists probably does not consider itself a battleground state. The following states are therefore classified as swing states: Arizona, Colorado, Florida, Iowa, Michigan, Minnesota, Nevada, New Hampshire, North Carolina, Ohio, Pennsylvania, Virginia, and Wisconsin.

In order to quantify the effect of a state transitioning to the BPP, we define its IMPACT during any year to be the change in the difference between the winner and loser that the transition would have caused, if the voting had been the same. As an example, consider the impact in 2016 of Florida unilaterally transitioning from the current system. Without faithless electors, Trump would have won by 74 electoral votes (306–232).³ Under the current system, Florida gave Clinton 0 electoral votes; under the BPP, Florida would have given Clinton 13 (she received 47.4% of the votes, giving 13.75 electoral votes, which is rounded down to 13); therefore Florida’s 2016 IMPACT is $\frac{26}{74}$ (the factor of two comes from the fact that Clinton would have gained 13 votes and Trump would have lost 13, hence the difference would have been reduced by 26). Rhode Island’s IMPACT for 2016 is $-\frac{2}{74}$, as it would have allocated Trump an additional electoral vote. An IMPACT of 1 or greater means that the winner would have changed. The IMPACT of a pair of states for some year is the sum of their IMPACTS; 0 means they perfectly balance each other out. We are interested in the maximal joint IMPACT of pairs of states over the previous five elections (approximately the length of a generation), and over the previous thirty elections (since 1900, slightly before the invention of the radio). We denote these two values by 5-IMPACT and 30-IMPACT respectively. Intuitively, if a pair of states have a 5-IMPACT close to zero, it means that their joint transition to BPP likely has a very small current effect. In this case, transition to the BPP is clearly beneficial to both states; it is unlikely to have a net effect on the outcome of the presidential elections (at least in the near future), and they both gain from becoming competitive. If their 30-IMPACT is small, this further strengthens the hypothesis that they counterbalance each other well.

³The actual tally was 304–227.

#	States		5-Impact	Year	30-Impact	Year
1	Hawaii	South Dakota	0	2000	0.01626	1924
2	Vermont	Wyoming	0	2008	0.036036	1968
3	Connecticut	Oklahoma	0.015873	2012	0.043321	1920
4	Delaware	Montana	0	2000	0.037037	1968
5	Alaska	Rhode Island	0	2004	0.016807	1948
6	Mississippi	Oregon	0.016129	2012	0.038462	1968
7	New Mexico	Utah	0.15	2004	0.15	2004
8	Indiana	Washington	0.094737	2008	0.130081	1900
9	Maryland	South Carolina	0	2008	0.162162	1916
10	Massachusetts	Tennessee	0.166667	2000	0.209302	1976
11	Idaho	Maine	0.025	2016	0.044444	1908
12	Georgia	New Jersey	0.051282	2016	0.226415	1960
13	Kentucky	North Dakota	0.5	2000	0.5	2000
14	Illinois	West Virginia	0.106061	2012	0.347826	1960
15	Louisiana	Nebraska	0.7	2000	0.7	2000
16	California	Texas	0.078125	2012	0.347826	1948
17	Arkansas	Kansas	0.266667	2000	0.266667	2000
18	Alabama	New York	0.111111	2012	0.757576	1960
19	Iowa	Nevada	0.142857	2004	0.150943	1900
20	Arizona	Colorado	0.285714	2000	0.285714	2000
21	New Hampshire	Wisconsin	0.113208	2012	0.212766	1900
22	Michigan	Virginia	0.276596	2012	0.276596	2012
23	Minnesota	North Carolina	0.192982	2008	0.647059	1960
24	Missouri	Ohio	0.736842	2000	0.736842	2000
25	Florida	Pennsylvania	0.956522	2016	0.956522	2016

Table 4.1: The proposed transition order, with the 5-IMPACT and 30-IMPACT of every transition and years when they are maximized.

Our suggested transition order is presented in Table 4.1. The order was generated by a non-trivial yet simple algorithm that chooses pairs of states at random out of those with a low 5-IMPACT. (We note that the orders generated by many ‘obvious’ algorithms—for example, ones that simply choose the pair with the lowest 5-IMPACT or 30-IMPACT at every stage—are not satisfactory, i.e., somewhere along the transition path, a different president would have been elected in at least one of the thirty elections. This is not surprising, as shortsighted choices early on may not leave any good options for later.) The 30-IMPACT (and consequently the 5-IMPACT) of every transition in the suggested order is less than 1. This implies that whenever it is a pair of states’ turn to transition, they can do so knowing that it is unlikely (in the sense we have described) to affect the final results of an election: it would have had no effect on the final outcomes of any of the previous thirty elections. Note that this holds even if the process were to halt at some point. For example, in the suggested transition order, Vermont and Wyoming should transition even if they predict that the process will stop after Idaho and Maine. In game-theoretic terms, it is a *dominant strategy* for pairs of states to transition at the recommended time. It is possible that if a state could transition back to winner-take-all by itself it would prefer to do so, as it might value its partisan influence more than the benefits it reaps from the candidates’ attention. This is not possible, however, as the other states offer a *credible threat* of reverting as well; hence reverting will not give the state the partisan advantage it would reap if it could revert alone.

With regard to the swing states, we expect that as more states transition, the public pressure will increase on remaining states to do likewise. By the time all of the safe states have transitioned, the public pressure should be sufficiently strong to motivate the swing states to transition as well. In addition, as more safe states transition, the swing states’ influence decreases.

It is nevertheless possible that a swing (or even a safe) state will still refuse to transition. In this case, we believe there are two main possible courses of action: the first is to accept that some states will not transition, and then the system will be in a somewhat unsatisfactory equilibrium—but an equilibrium nonetheless—and the overall situation will be much better than it is now, with the swing state effects reduced. The second (and in our opinion more likely) is that once a large majority—in particular, more than three quarters—of the states will have transitioned, the ground will be set for a constitutional amendment, to force the dissenting states to transition.⁴ We do not believe that will be necessary, but argue that even

⁴A constitutional amendment needs to pass by a 2/3 majority in both houses and to be ratified by 3/4 of the states in order to be enacted.

if the BPP is enforced by law, it would not be a large deviation (if any) from the Framers' intentions.

5 Conclusion

The Biased Proportional Plan circumvents the weaknesses of previous proposals. Unlike Direct Election, the Interstate Compact and the District Plan, the results of the previous thirty elections would have been identical if the BPP was used to determine the winner (and the voting had been the same); unlike the Proportional Plan, it discourages third-party candidates.

Our simulations show that the algorithm we used to compute the order is highly resilient to perturbations in states' behavior. In over one thousand randomized simulations, when some states deviate from the suggested behavior (barring them not agreeing to transition even after they have been moved to the end of the queue), our algorithm has always managed to find a transition order that preserves the required qualities. If a safe state refuses to transition, it is possible to move that state to the end of the queue and continue from there. If one or two safe states transition too early or a swing state agrees to 'join' the safe states (i.e., to be included in the algorithm as a safe state), it is possible to compute a continuation of the transition order from that point.

Economists agree that there is no perfect voting system. That is, no voting system can ensure that the winner will be the person who best represents voters wishes, including how intensely they favor or disfavor each candidate [10]. The BPP is not, and indeed cannot be, everyone's ideal system. It should be, however, appealing to both Democrats and Republicans as it is both closer to the 'one person, one vote' doctrine than the current system, and more in concordance with the founding fathers' original intentions,

“...to establish him in the esteem and confidence of the whole Union, or of so considerable a portion of it as would be necessary to make him a successful candidate for the distinguished office of President of the United States.”

Alexander Hamilton, *The Mode of Electing the President*, March 14, 1788. [15]

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