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ABSTRACT

Electoral College, Popular Vote and Regional Information*

We take up the discussion started by Condorcet on which voting system yields the highest probability that a good decision is taken. When regional information shocks are taken into account, an Electoral College system has advantages over simple majority vote under certain conditions: The probability that the utility-maximizing candidate wins is higher in the Electoral College system if the size of the adverse regional information shock is large.

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Keywords: electoral college, popular vote and regional information

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1 Introduction

In the 2000 American presidential elections, the votes of one single state, Florida, were perceived to determine who would be the new president. In this context, the US electoral system, which is known as "Electoral College System" came under attack. It was blamed to "distort" voters' will, as the outcome that it yields may be different from that obtained by a simple majority vote.

We provide a theoretical reason why the Electoral College system may in some situations be better than its reputation. We build on a setup introduced by Condorcet: A collective decision between two alternatives has to be taken. Condorcet assumed that one of them was objectively better than the other. We translate this into the decision between to presidential candidates, where one would conduct policies that maximize a majority's utilities. Condorcet found that, if each individual had a probability to vote for the "better" alternative that was greater than one half, a simple majority vote would yield the highest probability that the "correct" decision would be taken. In our model, this translates into the problem under which electoral system the candidate that maximizes most people's utilities would win.

We assume that an election between two candidates is conducted in a country that is divided into a number of jurisdictions ("states") of equal size and habitants. In an Electoral College voting system, each of these states would get one vote in the Electoral College that determines by majority vote which candidate is elected. We assume that each Electoral College member will cast her vote according to who the majority of the voters in her state voted for (this is the way Electoral College members in the US usually behave).

We make two additional and crucial assumptions: Firstly, voters are subject to individual mistakes in identifying who their favorite candidate is. This assumption may be justified by a (time) cost that voters incur if they want to be perfectly informed about what kind of policy the candidates promise. Moreover, even if they know what the candidates are likely to do in each policy field, it might still be difficult to calculate the effects on a voter's utility. Secondly, they may be influenced by some state-specific (regional) information shock that distorts their likelihood to identify the candidate that would maximize their utilities.

Under this assumption, we find that the probability that the welfare-maximizing candidate wins is higher in the Electoral College system if the size of the adverse regional information shock is large. If regional information shocks are small, the Popular Vote system is more likely to yield the optimal result.

The following story makes clear how regional shocks may have a different impact on the voting outcome in the two voting systems: Take a situation where candidate A has a slight majority in each state, i.e. the individual probability to vote for candidate A is $p = 0.51$. Without any regional shocks, A would win the majority of votes in each state as well as the overall Popular Vote. In the Electoral College, each representative votes for A, such that A wins the Electoral College vote by one-hundred percent. Now think of an information shock that is rather extreme: If the shock occurs, all voters in one state either turn into B-voters or A-voters. Now, imagine such a shock occurs in one state and turns all its habitants into B-voters. The outcome of the Electoral College vote does not change, as only one representative will now vote for B. Candidate A still takes office as the new president. However, in the Popular Vote system, B may now be the winner: If there are fewer than 100 states, more than 1 percent of the total population live in the state that has experienced the B-shock. Hence, after the shock, less than 50 percent of the population will vote for A, and B wins the election in the Popular Vote system. We can conclude that the Electoral College system is more robust to extreme regional information shocks than the Popular Vote system.

1.1 Related Literature

Criticism of the Electoral College system is widespread and primarily draws on the unequal distribution of voting power per voter. Lizzeri and Persico (2001) claim that the electoral college system is subject to inefficient provision of public goods. Earlier papers e.g. by Blair (1979) or Cebula and Murphy (1980) criticize the Electoral College system as giving too little voting power to US minorities and discouraging voter participation. In a more recent piece of work, Cebula (2001) finds empirical evidence that the Electoral College system discourages voter participation in states that have a history of leaning towards one party. On the other hand, he also finds evidence that the Electoral College system fosters voters' will to participate in states where the two candidates are perceived to have the same chances of winning.

There is also some theoretical work on the issue: Young (1988) finds that the Condorcet voting rule is not only suitable to find the better one of two alternatives, but can also be used to find the most likely ranking of alternatives, thereby reinforcing the statement that a simple majority vote is the best way to make a decision.

The strength of the Condorcet Jury Theorem is further supported by Ladha (1992) , who shows that for weakly correlated votes, the theorem still holds.

However, it is questionable whether these results can be found if regional ideological bias is taken into account: Strumpf and Phillippe (1999) show in an econometric study of presidential election voting outcomes from 1972 to 1992 that they can best be predicted by the partisan predisposition of the states. National and regional economic variables, which are supposedly useful information for determining which candidate is most suitable to govern the country, are less powerful in predicting election outcomes. If we interpret partisan predisposition as an information shock of the non-useful kind, we can get a new perspective on electoral systems, as is shown in our model.

2 The Model

Consider a country with a continuum of voters with mass 1, that is partitioned into m states of equal size (m is an odd number). There are two candidates running for the presidential election: A and B. Voters have individual utility functions which allow them to compare their expected utility from the policy platforms of each candidate. The probability that a voter's utility is higher in case A wins is $r \leq 1$. Then, we can interpret r as the portion of voters who favor A. We assume that the populations of each state do not differ in their average preferences, such that r is the same in every state. We consider a situation where $r > \frac{1}{2}$, such that A would be the candidate that should be elected if people's utility is to be maximized. Now, voters make individual mistakes in voting: p is assumed to be the result of people's impressions about the candidates' qualities. If r is the "correct" share of voters for A and q is the probability that people identify their favorite candidate correctly, p is given by

$$p = rq + (1 - r)(1 - q). \tag{1}$$

This is the proportion of voters being in favor of A and identifying their preference correctly plus those who should actually vote for B but make a mistake in voting.

Individuals are influenced by regional information shocks affecting the state they live in. If such a shock in favor of candidate A occurs, the probability to vote for that candidate changes from p to x, where $x > p$. A shock in favor of B changes p in the other direction: now, the probability to vote for A is smaller than before: $y < p$ and $y < \frac{1}{2}$. The number of A-shocked (B-shocked) states is denoted by a (b). The shocks are drawn from a joint probability distribution which is given by a density function

$$\begin{aligned} &\phi(a, b) > 0 \text{ if } a + b \leq m \qquad (2) \\ &\phi(a, b) = 0 \text{ if } a + b > m \end{aligned}$$

The timing in this model is as follows: in the first stage, nature chooses each voter's preferred candidate. In the second stage, voters get an impression about who maximizes their utility. In the third stage, the state-wide information shocks occur. Finally the election takes place and either A or B take office and implement their policy platforms.

In this setting, we can compare the probability that the candidate most voters originally preferred, i.e. who would have won if voters did not make mistakes and did not experience a state-specific information shock, under different voting rules.

3 Comparing Electoral College and Proportional Rule

Let us assume that $p > \frac{1}{2}$, i.e. candidate A is the one who would implement a policy platform that yields higher utility to a majority of individuals. We are interested in the probability that A wins under different voting rules.

3.1 Electoral College

What we call "Electoral College System" is a simplified version of the method used in the United States to elect a president. In this system, an institution called Electoral College decides who will be president by majority rule. Each of the m states has one representative in the Electoral College. We assume that the representative will vote for the candidate a majority of people voted for in the election at the state level.

3.2 Popular Vote

What we call "Popular Vote" in this paper is an electoral system where all votes in all states are counted, and the candidate who has managed to get more than half of the votes wins the election.

3.3 Comparison

The condition that candidate A wins is different in the two electoral systems. In the Electoral College system, A wins as long as the number of B-shocked states is smaller than half the total number of states.

In the Popular Vote system, candidate A wins as long as the number of people voting for A is larger than half the population:

$$by + ax + (m - a - b)p > \frac{m}{2} \tag{3}$$

where yb is the number of people voting for A in B-shocked states, ax is the number of A-voters in A-shocked states, and finally, $(m - a - b)p$ are those who vote for A in the states that are not shocked.

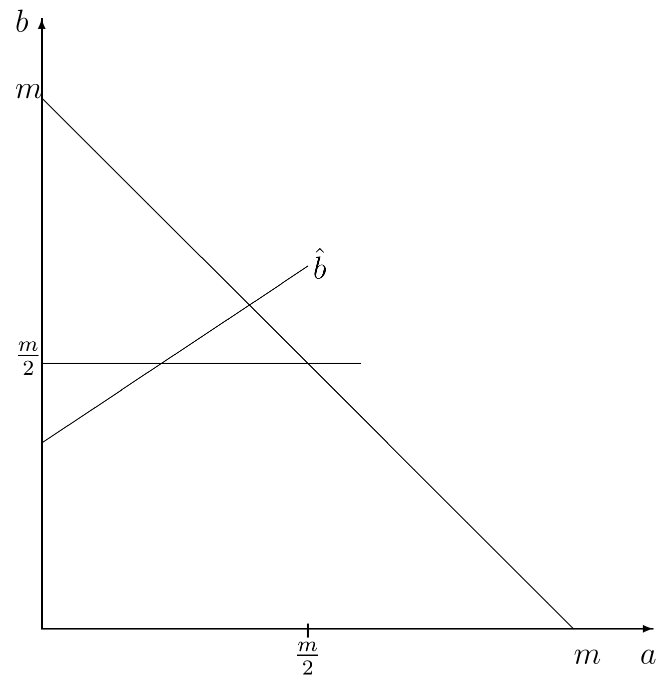
The maximum number of B-shocked states that can be tolerated by a Popular Vote System such that A still wins can be obtained by solving equation (3) for b:

$$\hat{b} = m\frac{p - \frac{1}{2}}{p - y} + a\frac{x - p}{p - y} \tag{4}$$

These findings are illustrated in Figure 1: The combinations of a and b that make candidate A win the election in the Electoral College are those below the $b = \frac{m}{2}$-line. In the Popular Vote System, the winning combinations for candidate A lie below the line labeled $\hat{b}$. Note that the two systems always yield a victory for A if the number of A-shocked states is greater than $\frac{m}{2}$.

We would now like to compare how likely A is to win in the two systems with different regional shock sizes. Our result is given in the following proposition:

Figure 1: Combinations of a and b



Proposition 1 : *If $y \leq 1 - x$ and each combination of a and b has a positive probability, the probability that candidate A wins is higher in the Electoral College system than in the Popular Vote system.*

Proof. We will show that those combinations of a and b that yield a victory for A in the Popular Vote system are a subset of those that make A win in the Electoral College. Then, the probability that A wins must also be higher in the Electoral College System.

We need to show that, for any value that a can take, the number of B-shocked states tolerated by the system is greater in the Electoral College system. The proof is by contradiction: On the left hand side of the first line of (5), we have the maximum number of B-shocked states that yield a victory for A in the Popular Vote system. On the right hand side, we have $\frac{m}{2}$, which is the maximum number of B-shocked states that is tolerated by the Electoral College system such that A still wins.

$$
\begin{aligned}
& & \hat{b} > \tfrac{m}{2} & \qquad (5)\\
\Leftrightarrow & & \tfrac{m(p-\frac{1}{2})+a(x-p)}{p-y} > \tfrac{m}{2} & \\
\Leftrightarrow & & a(x-p) > \tfrac{m}{2}(1-p-y) & \\
\Leftrightarrow & & a > \tfrac{m}{2}\tfrac{(1-p-y)}{(x-p)} &
\end{aligned}
$$

With $y = 1 - x$, we have

$$
\begin{aligned}
& & a > \tfrac{m}{2}\tfrac{(1-p-1+x)}{(x-p)} & \qquad (6)\\
\Leftrightarrow & & a > \tfrac{m}{2} &
\end{aligned}
$$

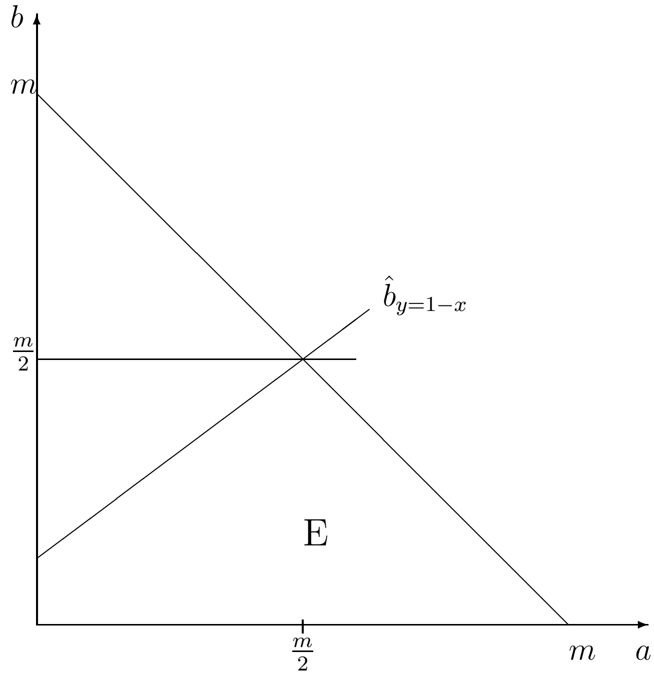
Only if $a > \frac{m}{2}$, the Popular Vote system could tolerate a higher number of B-shocked states than the Electoral College System. However, if this condition is fulfilled, A would win in both systems anyway.

We can easily see that if $y < 1 - x$, condition (6) becomes even stronger: The nominator of the fraction on the right hand side gets bigger, such that the whole fraction is greater than 1, which means that a would have to be even bigger than $\frac{m}{2}$ in order to fulfill the condition. QED.

The finding of proposition 1 is illustrated in figure 2: Area E containing the combinations of a and b that yield a victory for A in the Popular Vote system lies within the area below $b = \frac{m}{2}$, that contains the combinations of a and b that let A win in the Electoral College System.

Note that the Electoral College system is also superior in the case of extreme shocks: If a regional shock converts all habitants of one state to be voters for either A or B ($x = 1$ and $y = 0$), we naturally get the same result as above.

Figure 2: $y = 1 - x$: Electoral College is superior



Proposition 2 : *If $y \geq 1 - p$ and each combination of a and b has a positive probability, the probability that candidate A wins is higher in the Popular Vote system than in the Electoral College system.*

Proof. Here, we have to show that the combinations of a and b yielding a victory for A in the Electoral College system is a subset of those that do the same in the Popular Vote system. If we substitute $y \geq 1 - p$ into (5), which is given by

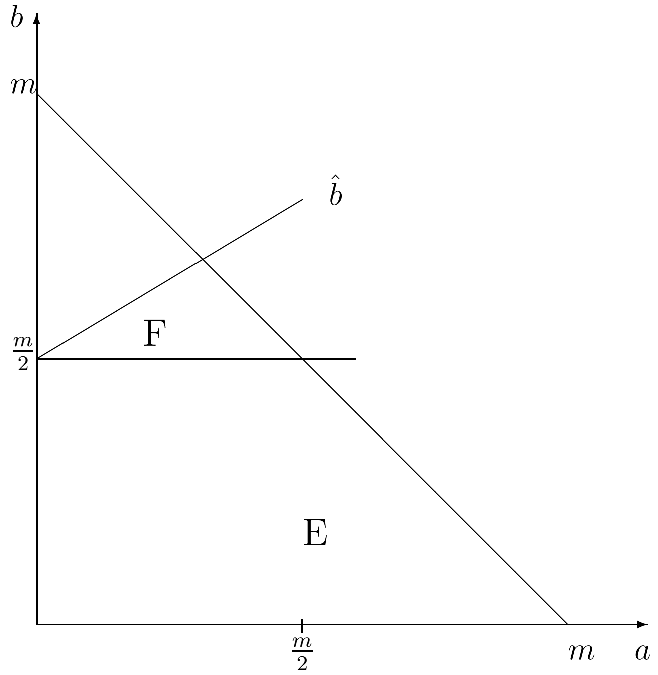
$$a > \frac{m}{2} \frac{(1 - p - y)}{(x - p)}$$

we get

$$a > 0 \tag{7}$$

That means that $\hat{b}$ is greater than $\frac{m}{2}$ for any value a can take. QED.

Figure 3: $y = 1 - p$: Popular Vote is superior



This finding is illustrated in figure 3: Area E containing the combinations of a and b that yield a victory for A in the Electoral College system lies within the corresponding area for the Popular Vote, which consists of areas E and F. If every combination is assigned a positive probability, we can infer that the probability that A wins is higher in the Popular Vote System.

Proposition 3 *: For each combination of m, p and x and a density function $\phi(a, b)$, there exists an interval (y^*, y^{**}) with y^*, y^{**} with $(1-x) \leq y^* \leq y^{**} \leq (1-p)$ such that*

i) For values of y above y^{**}, Popular Vote yields a higher probability that candidate A wins than Electoral College.

ii) Below y^*, Electoral College yields a higher probability that A wins than Popular

Vote. In the case that $y^* < y^{**}$, the two systems are equivalent in the interval between y^* and y^{**}.

Proof. The smaller the number of combinations of a and b providing a victory for candidate A is, the smaller is the probability that A wins in that system. Due to the discrete nature of these A-combinations, their number is weakly monotonically increasing in y. This means that A's probability to win is increasing stepwise in y.

We have already shown that the number of A-combinations is larger in the Popular Vote system than in the Electoral College if $y \geq 1 - p$. And we have shown that this number is smaller in the Popular Vote system if $y \leq 1 - x$. The proposition follows immediately. QED.

As an overall result we can state that if region-specific information shocks are large, the Electoral College system is preferable if we want to maximize A's probability to be elected. If shocks are small, Popular Vote is more likely to yield the desired result.

4 Concluding Remarks

Our model implies that an Electoral College system has the advantage over a Popular Vote that it is more robust towards large regional information shocks. The candidate who maximizes the utilities of a majority of people is more likely to win despite state-specific ideological bias if he is not elected directly. The policy implication of our result might be that a country should elect its president using an Electoral College system with proportional state representation rather than Popular Vote if there are states showing heavy exposure to information shocks.

We have derived these results from a very simple model. In particular, we have assumed that regional information may only occur in form of two signals which either increase or reduce the number of voters in favor of a candidate by a given amount. It would be useful to see whether our results hold in a more general setting where regional information may be more diverse. It would also be useful to studycases in which states may differ in size and initial preferences.

Moreover, it might be interesting to extend our framework by including strategic voting, which means that people do only vote if they feel that their vote might alter the result of the election. One could also try to find the optimal mechanism, i.e. the electoral system that maximizes the probability to be elected for the welfare-maximizing candidate.

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