Extended Condorcet and Experimentalist Models of Epistemic Democracy[1]

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Abstract

This paper constructs two distinct models of epistemic democracy and then uses those models to draw several implications for the design of concrete political institutions. Epistemic democracy provides an attractive normative and descriptive understanding of majority rule institutions as devices of discovery rather than as procedures which aggregate competing individual interests. Most attempts to specify the mechanisms of epistemic democracy employ the Condorcet jury theorem. The first finding of this paper is that when the number of policy options in the Condorcet model is extended from 2 to M, majority-rule in a two-party system yields incorrect decisions. In the second part, I propose a model of epistemic democracy which is based on experimental learning and which does not rely on Condorcet principals. This model offers a more plausible description of democratic assemblies because it includes the important dimensions of time and reflection. Furthermore, it makes a stronger case for supporters of epistemic democracy because its assumptions are less demanding than those of the Condorcet theorem. Compared against Condorcetian conceptions, the experimentalist model offers at least two advantages for the design of democratic institutions: it escapes the problem of Arrowian indeterminacy and it offers a more plausible account of democratic deliberation.

Introduction

In the standard account, voting creates a single social choice from citizens' various individual values by aggregating their preferences. An alternative normative and descriptive account, however, presumes that voters have an interest in common and that an election or referendum reveals the measures which best advance that general will (Coleman and Ferejohn; Cohen 1986; Grofman and Feld 1988; Estlund 1989, 1990; Waldron 1989). Coleman and Ferejohn have dubbed this notion "epistemic democracy" and Joshua Cohen has specified its fundamental features:

> An epistemic conception has three main elements: (1) an *independent standard* of correct decisions—that is, an account of justice or the common good that is independent of current consensus and the outcomes of votes; (2) a *cognitive* account of voting—that it, the view that voting expresses beliefs about what the correct polices are according to the independent standard, not personal preferences for policies; and (3) an account of *decision making* as a process of the adjustment of beliefs, adjustments that are taken in part in light of the evidence about the correct answers that is provided by the beliefs of others. (Cohen 1986, p. 34)

I help myself to the first and second elements by presuming, without argument, that they can be true. One necessary strategy of argument for those

attracted to epistemic democracy is to defend the first two fundamental conditions—that an objective interest common to citizens exists and that it is cognitively possible for citizens to act on that interest rather than their narrow private ends. This paper, however, focuses on a third task, also necessary, of elaborating the details of an epistemic democratic decision making process which depends upon the first two elements. If we presume that there is a range of values and goals that people share which might be called a general will; that people can and should vote according to their opinions about what this general will requires rather than to advance their private ends; that each knows only imperfectly how to advance the general will; and that properly constructed democratic institutions provide a good mechanism for discovering these correct policy instruments, then an important task of political design is to discover the architecture of democratic structures which meet this epistemic task. Furthermore, a plausible *institutional* account elaborates one important aspect of epistemic democracy and provides a necessary plank to support the concept as a whole. This paper embarks on these questions of design by constructing two rather abstract models of epistemic democracy which nevertheless offer specific implications for concrete institutions.

The first model extends the Condorcet Jury Theorem (CJT) theorem to more than two policy options. Most critics have considered only the dichotomous case[2] and have taken the jury theorem to be an argument in favor of democratic majority rule (Grofman and Feld 1986, p. 95; Waldron, p.

1324). However, when the Condorcet Theorem is generalized to more than 2 policy options, it is clear that, under fairly standard assumptions, majority-rule yields incorrect decisions. The correct decision under extended CJT is the modal opinion, while majority-rule selects the median. Consequently, the extended version of CJT provides an argument *against*, not one in favor of, two-party majority-rule.

While this first model is a fairly straightforward mathematical extension of previous work on CJT mechanisms, the second breaks from this tradition and argues that epistemic democracy should not be conceptualized along Condorcetian lines at all. I offer a more normatively and descriptively attractive understanding which is based on improvement through iterated experimentation. While extensions of CJT all have the flavor of a one-shot trial, I propose that epistemic voters will attempt to correct their mistakes through time and thus offer learning by experimentation as a central mechanism of epistemic democracy. The simple model which formally renders this conception is intended to be evocative as well as persuasive; I hope to enrich the concept and open another path in its development by breaking the unitary match between the idea of epistemic democracy and Condorcetian mechanisms.

Epistemic Democracy as a Condorcet Jury

Epistemic democracy is very much a rediscovery of 18th Century political notions. The idea originates in Rousseau's account of voting in his

Social Contract:

> When a law is proposed in the people's assembly, what is asked of
> them is not precisely whether they approve or reject, but whether or
> not it conforms to the general will that is theirs. Each man, in giving
> his vote, states his opinion on the matter, and the declaration of the
> general will is drawn from the counting of votes. (*SC*, IV.2.viii)

Contemporary scholars have used the mathematical tools of Rousseau's
contemporary, the Marquis de Condorcet, to make the idea of the General
Will more precise and to give it force. Specifically, the CJT states that, given
any pair of alternatives and a group of individuals each of whom is
somewhat more likely than not to choose the better alternative, the
probability of a majority-rule vote yielding the correct decision rises rapidly
with the number of voters (Grofman and Feld 1988). This metaphor of the
democratic assembly as jury captures some of the essential aspects of
epistemic democracy: there is an objective, correct answer to the question
before the body, no member of the body has direct access to that truth, and
deliberation between members, each of whom is equal to all the rest, followed
by collective choice is the best method available to determine the truth.

However, all legislatures, even epistemic rather than adversarial
assemblies, are different from juries in two essential ways. Whereas juries
face the binary choice of determining whether a defendant is guilty or

innocent, a legislative assembly must decide between a vast array of options. Furthermore, a jury's verdict is more or less final, whereas legislatures revisit the same issues time after time. Even within the normative parameters of epistemic democracy, these two differences severely limit the ability of the CJT to capture the operations of a legislature.

On the first difference, suppose that some large group of N people must choose between M alternatives. The most straightforward translation of the CJT to the case of multiple alternatives utilizes plurality voting as the social choice function; each voter gives his opinion about which of the M alternatives is the best one, and the option receiving the most votes is the social choice. If each voter has a probability of choosing the correct answer which is greater than his probability of choosing any other option, then the chance of the group choosing the correct answer through plurality voting rises rapidly with N and with his competence. Extended in this fashion, the Condorcetian principle of accuracy through large numbers holds for multiple options.

This phenomena is intuitively clear if we think of the each voter's judgment (we take all voters to be the same) as an underlying probability density function over the choices he faces: $\{A_1, A_2, ..., A_M\}$, where A_1 is the correct policy, and each voter's choice as an independent and unbiased sample of that distribution. We stipulate that each judgment is sufficiently good that his probability p_1 of picking A_1 is greater than his probability of picking any of the other policies ($p_1 > p_2 \geq ... \geq p_M$); this is to say that the highest peak of the

density function lies at A_1. Tallying all of the votes provides an estimation of

the underlying probability density function, and the goal of the vote is to

determine its actual peak. Since each additional vote provides another

sample, the accuracy of the total vote as an estimation of the underlying

probability increases with the number of voters (Young 1988). By the law of

large numbers, the probability of perfect estimation, and therefore the

probability of discerning the density function's real peak, approaches unity as

N grows infinite.

Functionally, the probability of a plurality vote selecting the correct

choice is given by a series of nested summations. Let N be the number of

voters and M be the number of policy options from which they can choose.

Let each voter have a probability p_1 of choosing the correct policy, A_1,

probability p_2 of choosing policy A_2, ..., and probability p_M of choosing A_M.

Furthermore, let $p_1 > p_2 \geq ... \geq p_M$. (Hence $p_1 + p_2 + ... + p_M = 1$). In any vote,

the probability that A_1 occurs k_1, times, A_2 occurs k_2 times, ... A_M occurs k_M

times, is equal to the multinominal expansion term (Lipschutz):

$$\frac{N!}{k_1!k_2!\cdots k_M!}\, p_1^{k_1}\, p_2^{k_2} \cdots p_M^{k_M}, \text{ where } (k_1 + k_2 + \cdots + k_M = N) \qquad (1)$$

The total probability, $P_M(N)$, of the correct choice gaining more votes than any

other choice is obtained by adding all of the multinominal terms for which

$(k_1 > k_2 \geq k_3 \geq ... \geq k_M)$.

For $M = 2$, Condorcet's case, this turns out to be (Grofman, Owen, and Feld, 1983):

$$P_2(N) = N! \sum_{k=Floor\,(\frac{N}{2})+1}^{N} \frac{p_1^{k}\, p_2^{(N-k)}}{k!(N-k)!} \qquad (2)$$

For $M = 3$, the the chance of the correct answer winning is:

$$P_3(N) = \left[N! \sum_{k'=Floor\left(\frac{N}{3}\right)+1}^{Floor\left(\frac{N}{2}\right)} \sum_{k''=Floor(N-2k')+1}^{k'-1} \frac{p_1^{k'}\, p_2^{k''}\, p_3^{(N-k'-k'')}}{k'!k''!(N-k'-k'')!} \right] +$$
$$\left[N! \sum_{k'=Floor\left(\frac{N}{2}\right)+1}^{N} \sum_{k''=0}^{N-k'} \frac{p_1^{k'}\, p_2^{k''}\, p_3^{(N-k'-k'')}}{k'!k''!(N-k'-k'')!} \right] \qquad (3)$$

And so on.

Consider the surface formed by plotting the probability of the correct choice winning (an alternative wins just in case it receives at least a plurality of votes) against competence (defined as the probability of choosing the correct policy, p_1, which is equal for all voters) and the number of voters. The figure below shows this surface in the case of three policies ($M = 3$). The probability of picking the correct policy (for each voter, all voters equal) ranges

from 0.3334 to 0.6000, the number of voters ranges from 3 to 100, and each

voter's probability of picking either of the incorrect policies is equal ($p_2 = p_3 =$
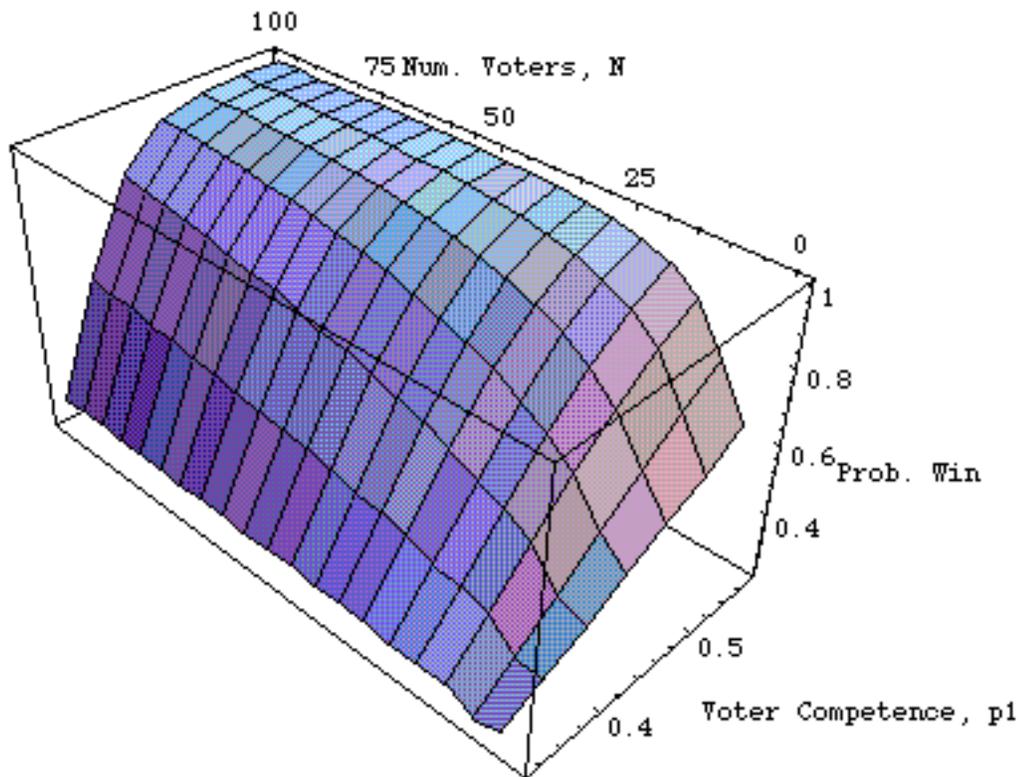
$(1 - p_1)/2$):

Figure 1: Probability of choosing correct policy among three choices.

The function's characteristics are similar to Condorcet's dichotomous case; the

probability of the correct answer being chosen increases with the competence

of each individual voter and with the total number of voters.

One interesting institutional implication of this simple extension is

that a two party, winner-take-all, system does not make correct decisions. On

one parsimonious and trenchant understanding, a social choice rule of

majority rule in a political arena of two parties yields decisions which

conform to the preferences, or in this case the opinions, of the median voter.

Following Duncan Black (Black, p. 4-21), we suppose that a set of M policy

alternatives can be ordered $\{A_1, A_2, ..., A_M\}$ such that the preference (or

opinion) curve of each voter is single-peaked. Black shows that the policy

preferred by the median voter can gain a simple majority over any other

policy, and no other policy can do so. If we imagine, with Downs and

Hotelling, that political parties operate as entrepreneurs who try to capture

the greatest number of votes, then parties will converge upon the median

position in a two party system; if one party begins on the left side of the

political spectrum and the other on the right, each moves toward the center

in order to capture more votes until each reaches the median voter (Downs,

p. 114-141).

The model which translates this framework into the Condorcet model

requires several additional assumptions. First, we retain the simplifying

assumption that all voters are equally competent in the sense that they have

identical probability density functions over the alternatives. Second, we need

to construct a translation of Black's assumption of single-peaked preferences.

Intuitively, this means that there is an ordering of alternatives such that

every voter can tell which alternatives are closer or further from his first, best

guess. More formally, we presume that there is some ordering of alternatives

A = {A_1, A_2, ..., A_M} such that each voter V_i has her best guess A_i about the correct policy such her choice ordering over alternatives is $A_i > A_{i-1} < A_{i-2} < ... < A_1$ and $A_i > A_{i+1} > A_{i+2} > ... > A_M$. and given any two alternatives A_j and A_k, she can rank them (this condition insures comparability of alternatives on either side of her peak). The third assumption specifies how political parties operate, and is a direct translation from Black. Each political party (i) selects one of the alternatives A_i in A as its platform and (ii) it chooses A_i in order to maximize its share of votes. Furthermore, each voter selects that party which is closest to her best guess position. A two party model constructed on these assumptions mirrors Black's specification and exhibits Downs' (and Hotelling's) centripedal dynamic—each party moves toward the median of the distribution in an effort to capture an increasingly greater percentage of the vote until the median opinion is the only one offered by the political system.

However, in the extension of the CJT from 2 to *M* alternatives above, the correct decision is not the median opinion, but the modal one. The two are not equivalent, of course, in the case of some skewed density functions. We conclude, therefore, that majority rule under the two party system selects the incorrect policy just in case the median of the "judgment" probability density function is not equal to its modal value. Consider the following illustration with 16 voters and 8 policy issues:
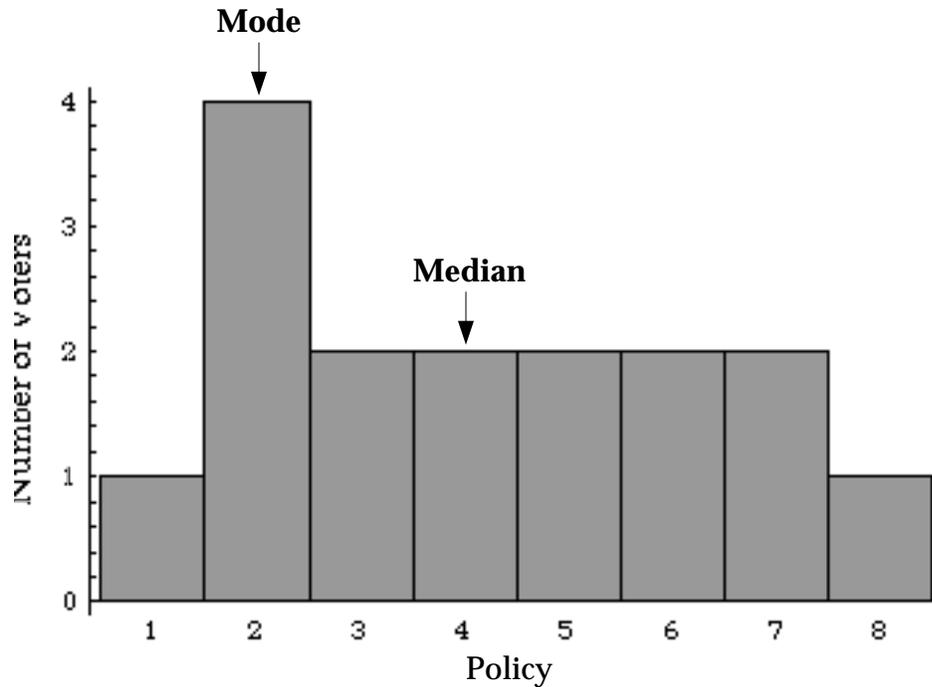
Figure 2: Condorcet versus Majority-Rule Policy Selection

If we assume that the each voter has a greater probability of picking the correct choice than an incorrect one, then the inference from the epistemic vote above is that Policy 2 is most likely correct. However, majoritarian voting in a two party system yields Policy 4 as its social choice.

Without offering formal proofs, there are good reasons to think that other institutional forms can better realize the model of epistemic democracy presented above. Since a detailed discussion of these alternatives would lead us too far astray, so I will only catalog some of them here. A more direct democracy, unmediated by parties, based on a winner-take all plurality rule, is the most direct translation of the extended Condorcet model. However, direct

democracy has several obvious defects which might overbalance its epistemic

benefits; critics have argued that there is less deliberation under direct than

representative democracy, that policies are less coherent, and that

information costs are higher. The proliferation of political parties under a

winner take all system is another option; at the limit, a great number of

political parties approximates plural voting. A reasonable number of political

parties which is nevertheless greater than two might offer a wider ranging

discussion of policy options and proposals.[3] Further analysis might reveal

that multi-party systems would settle closer to the modal value than a two-

party system. Finally, proportional representation offers an alternative which

encourages discussion and thus the flow of information by giving those who

would be loosing minorities in a winner take all system a voice. Since there

are many situations in which the modal policy both looses and enjoys

considerable support, proportional representation as a social choice

mechanism might bring the collective choice closer to the "correct" decision.

An Experimentalist Epistemic Conception of Democracy

Having considered the effect of multiple alternatives on epistemic

voting, we now turn to more fundamental considerations of reflection and

time. An epistemic democratic assembly which is true to its principles and

purpose will attempt to correct its mistakes. If we presume that an assembly

has repeated opportunities to correct itself and is reasonably competent to at

doing so, then we can think of epistemic democracy as a *continual process* of

experimental adjustment through time which approaches the correct policy solution. The central mechanism of this model is self correction rather than improvement through large numbers, and so the simplest way to capture this idea is not to modify the model above (though each iteration can certainly be thought of as a Condorcet vote), but to construct a new one from scratch.

The basic steps in this model are straightforward. We assume that voters are the equal in their ability to evaluate the performance of past policy and from this infer the position of the correct policy in relation to the (incorrect) one which they have chosen. On the first round of voting, each voter makes his best guess about the correct policy. These votes are aggregated through some procedure, say majority rule, into a social judgment which is then enacted as policy. Suppose that this policy is not the best possible—the "correct"—policy. After some experience living under their chosen rule, they realize that they can do better, and each of them makes another guess about where the best policy lies, and they vote again to choose what they hope is a superior policy. They iterate this process of self-correction indefinitely.

To illustrate, suppose that there is a one dimensional policy space over which there is a normal distribution of opinions about the correct policy, but the median of the distribution is not "correct." A majority rule process selects the wrong policy:
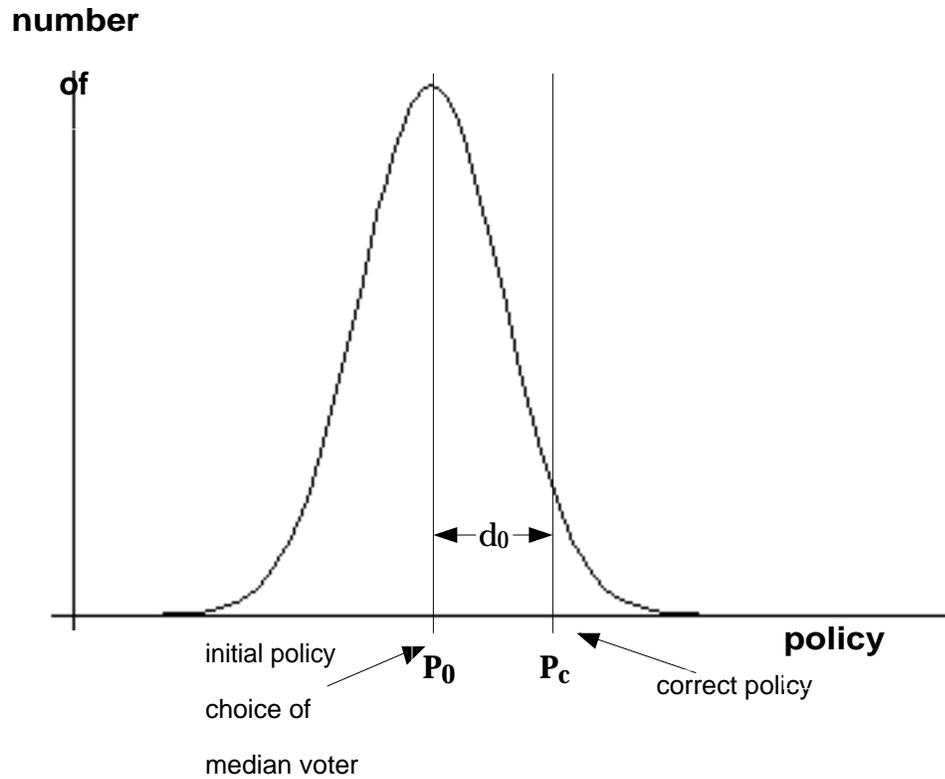
number

of

policy

initial policy P_0 P_c

d_0

correct policy

choice of

median voter

Figure 3: An Initial Guess in Epistemic Voting

In Figure 1 above, P_0 is the policy which results from the initial round of epistemic voting, P_c gives the position of the correct policy choice, and the distance between the two, which is the error, is given by[4]

$$d_0 = P_c - P_0 \qquad\qquad\qquad (4)$$

Suppose further, that voters learn that the policy which they enacted is incorrect, and that they have some knowledge of the relationship between the

chosen policy and the correct one. Furthermore, we presume that their

estimation is imperfect. To simplify, we presume that all voters are identical

in their ability to evaluate the results of policy, and the estimation of the error

of policy for each is given by a Voter Error Evaluation function, $\mathbf{E}(d, c)$

$$\mathbf{E}(d,\ c) = d\ (1 +\ c), \tag{5}$$

where d is the distance to the correct policy, and c is the competence of the

voter, with $c = 0$ representing perfect competence (so $c > 0$ represents an

activist tendency to overshoot policy and $c < 0$ is a conservative tendency to

change policy by less than the optimal amount).

Now it may be objected that the error evaluation function in eq. (5) is

unrealistically optimistic about the capacities of voters. One response to this

objection is that eq. (5) is substantially less demanding than the Condorcet

model. On that mechanism, voters must have a probability of picking the

best policy which is greater than the probability of picking any of the others.

This experimentalist model, however, is more forgiving; it does not require

voters to have a high probability of picking the correct policy, but only

requires voters to have a high probability of picking policies which are better,

in the sense of lying closer to the correct policy, than their current position.

Furthermore, the experimentalist model explicitly incorporates experience of

past policies into its understanding of judgmental competence. While one of

the sources of judgmental competence on the Condorcet model must

certainly be experience, its one-shot character offers no way to characterize learning.

Another objection to eq. (5) is that the functional form is arbitrary and ought to be further specified. My response to this objection is that it could certainly be further specified, but that this level of abstraction is optimal for our purposes because it makes the fewest assumptions while still capturing the essential elements of experimental epistemic democracy. So one obvious path to further development would be to specify a functional form which maps policy choice onto policy output, and then determine the voter error evaluation function which reaches the optimal policy choice in the fewest iterations. This extension would bring this paper into a well traveled ground of computational search algorithms.[5] This further specification of the model, however, would detract from its realism because it would force the modeler to stipulate something which can be learned only through social experience: the function which maps policy onto policy output. As eq. (5) stands, accurate knowledge of this function and of the proper search algorithm is captured by the voter competence term *c*.

On the next iteration, voters compare notes and make a judgment about how far their policy differs from the actual policy, and then vote again by adjusting their initial vote P_0 according to the error function (5) above. The position of a policy chosen in any round *n*, then, is given by the function,

$$P_n = P_{n-1} + \mathbf{E}(d_{n-1}, c) \tag{6}$$

Substituting equation (5) for the error function in (6) yields

$$P_n = P_{n-1} + d_{n-1} + cd_{n-1} \qquad (7)$$

Further substituting the definition of d in equation (4) for the second term on the right hand side of equation (7) yields,

$$P_n = P_c + cd_{n-1} \qquad (8)$$

Subtracting P_c from both sides and then applying the definition in (4) yields a recursive form of the equation for the error after the nth vote as a function of the $(n - 1)^{th}$ vote:

$$d_n = -cd_{n-1} \qquad (9)$$

This equation can also be written non-recursively, in terms of the first error term in the sequence, d_0,

$$d_n = (-c)^n d_0 \qquad (10)$$

All this is to say that if voters have perfect competence, defined as $c = 0$, then

they reach the correct policy on the next iteration. If $|c| < 1$, then successive rounds of voting generate results which become asymptotically close to the correct policy. If $|c| > 1$, then future rounds of voting yield results which grow more distant from the correct policy. After the nth round of voting (not including the initial vote), the distance to the correct policy decision is given by equation (7) above.

If $|c| < 1$ then after ($n > n_{threshold}$) iterations of voting, the distance between the chosen policy and the correct one will be less than some epsilon, ε, where

$$n_{threshold} = \frac{\log \frac{\varepsilon}{d_0}}{\log |c|} \tag{11}$$

So, the number of rounds of voting, as a function of competence level, required to come within $\varepsilon = d_0/10$, is given by the inverse log function $n = -1 / \log |c|$:
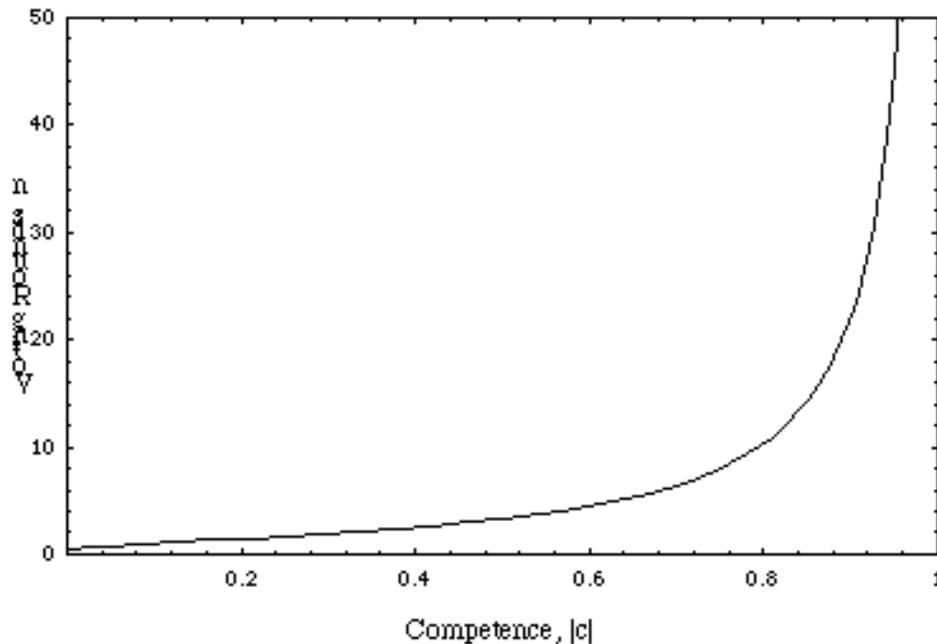
Figure 4: Rounds to Asymptotic Convergence (defined as $d_0/10$). Greater voter competence is given by lower values of $|c|$.

Institutional Implications of the Experimentalist Model

This experimentalist model of epistemic democracy, though constructed at an extremely skeletal and abstract level, nevertheless offers some implications for institutional analysis and design. The model allows us to address, tentatively, four aspects of democratic institutions: the indeterminacy of outcomes, the proper size of political and decision-making units, political deliberation, and the frequency of political activity.

Indeterminacy and Instability

One persistent problem of democratic social choice stems from

Kenneth Arrow's impossibility theorem. Roughly, Arrow shows that under

quite reasonable assumptions about the requirements of a democratic system,

there is no social choice function which yields a unique social ordering of

alternatives over unconstrained individual preferences. Since there is no

determinant social choice, the decisions which result from democratic

processes are arbitrary because they result from institutional constraints

which are "exogenous to the world of values and tastes" (Riker 1982, see

discussion in Coleman and Ferejohn at p. 11-15 and Cohen 1989 at p. 28).

Hence these outcomes cannot be said to embody or approximate a popular

will, and the coherence of the notion of popular sovereignty itself is called

into question.

Epistemic democracy avoids half of this social choice objection to

democracy by simply stipulating that there is a coherent general will which

exists quite separate from collective choice procedures or existing opinions;

the object of popular sovereignty is simply not procedural. The other half of

the dilemma, however, is to design democratic procedures which

determinately reveal this objective general will (Coleman and Ferejohn, p.

16-17). The goal of institutional design, then, is to make the results of popular

sovereignty, the outcomes of democratic processes, match this "independent

standard of correct decisions" (Cohen 1986, p. 34) which is the objective

general will. Condorcet models of epistemic democracy fail to achieve this

desiderata because they fall prey to Arrowian indeterminacy. Absent further

specification of the domain of individuals' opinion functions, we can simply

substitute those rankings of individuals' guesses about the best decision for Arrow's individual rankings of values and obtain his impossibility result (Estlund 1989, p. 1320-1).

Does the experimentalist conception of epistemic democracy escape the problems of cyclicity and indeterminacy? Without offering formal proof, I argue that it does. The impossibility theorem and its related consequence of cyclical majorities depends upon particular individual choice rankings which are stable and lead to incongruous results. Formally speaking, one way to escape this dilemma is to rule out those orderings which have problematic consequences. So, for example, Joshua Cohen proposes the autonomous transformation of individual preferences through deliberation as one strategy which weakens the strength of objections based upon indeterminacy (Cohen 1989, p. 28). The model of experimental epistemic democracy elaborated above incorporates a similar, though far less Kantian because it relies upon practical rather than pure reason,[6] mechanism of opinion transformation which rules out indeterminacy and cyclicity. Between each iteration of social choice, individuals in the experimentalist conception update their opinions about the correct policy alternative. Because they are reasonably competent, their opinions come to more accurately reflect the true state of the world. Thus each iteration of democratic social choice yields a decision somewhat better than the previous one. Individual opinions, taken through time, converge toward the truth and therefore toward one another. In this way, problems of cyclicity and indeterminacy are dampened out and eventually eliminated.

Though the model presented above presents a one dimensional policy space, this escape from cyclicity is generalizable to multidimensional spaces because its central mechanism, the reduction of error, is insensitive to such considerations.

Size of Political and Decision Making Units

One significant difference between the extended Condorcet model and the experimentalist model is that the scale of political units does not figure directly into the later. The central Condorcet mechanism is the law of large numbers—accuracy increases with the number of voters—and therefore the model recommends populous political units. With the experimentalist model, the central mechanism is improvement through iteration and so considerations of scale enter only indirectly. So, for example, one might think that political competence increases with the smallness of a polity because problems are less complex and easier to understand, and because the effects of policies are easier to monitor and evaluate. On the other hand, a small polity may experience problems which originate substantially from outside its jurisdiction. Thus the optimal policy for such a polity may be rendered ineffective by the narrowness of its boundaries.[7] These considerations of optimal scale become quickly quite contextual, but even these most initial considerations show that issues of scale, though they do not figure directly into the experimentalist model above, bear upon the design of epistemic institutions.

A separate objection to the experimentalist model is that it is not an argument for democracy at all, but rather for the rule of highly competent experts. Condorcet models have the surprising feature that the judgment of a large group of reasonably competent persons via majority rule is superior to the judgment of its most competent member. Since this justification for democracy is unavailable to the experimentalist conception, one might think that it recommends better policy bureaucracies rather than a different conception of democracy. One response to this objection, which I mentioned only in passing in the construction above, is that the experimentalist model may be thought of as an iterated series of Condorcet votes.[8] Therefore the same considerations of democracy which issue from Condorcetian mechanisms also come into play in the experimentalist model.

The critic might respond in turn, however, that a policy bureaucracy might be better able to exploit the central mechanisms of experimentalism—evaluation and repeated innovation—and thus offset the Condorcetian advantage of competence within each iteration. So, for instance, trained experts might be much more competent at monitoring the effects of enacted policies, diagnosing defects, and constructing new policies which respond to those defects. Furthermore, they may be able to do so on a relatively continual basis rather than on a schedule of periodic and infrequent elections. My response to this objection is to contend, speculatively, that democracy is more congenial to successful experimentation than bureaucratic organization. Specifically, the experimentalist model depends upon the

successful evaluation of effects of policy and incorporation of that knowledge into future state action. The democratic contention is that the population of citizens will have a better grasp of the effects of state action, because they are its subjects, than insulated bureaucrats. Furthermore, citizens will have motivations to improve state policy, again because they suffer its burdens and enjoy its benefits, which bureaucratic staffs generally lack. The degree to which the People are able to comprehend and articulate complicated issues of politics and public policy depends, however, on the character of democratic deliberation, to which we now turn.

Deliberation and Competence

Deliberation, in our model of epistemic democracy above, serves two ends. First, any system of epistemic democracy will rely on robust processes of public deliberation to secure the antecedent dispositions upon which it relies. Epistemic democracy requires citizens who share a public conception of the common good and are willing to act upon the good that they have in common as citizens rather than their private ends. Since these concerns precede the mechanics of the experimentalist conception, we merely note their importance here and refrain from further elaboration.[9] Deliberation figures directly into the model, however, in its potential to enhance the political competence and reflective capacity of citizens.

So, the mechanism of experimental improvement in our model depends upon voters' competence (see eq. 5 above) to evaluate the distance

between their chosen policy and the optimal one. Public deliberation contributes to the development of this individual political competence in several ways. First, the ability to make good guesses about the correct policy choice requires a widespread capacity to understand political and policy matters which may in turn require, and in any case would certainly benefit from, institutions which support robust public discussion of the affairs of state.[10] Furthermore, the effects of state action are likely to be differentiated across various sectors of the population. Wide ranging deliberation about the effects of policy can make this diffuse and often tacit knowledge "public" and thus bring it to bear on the improvement of state policy. In addition to this publicity function, deliberation can at the same time enhance citizens' capacity to evaluate the connection between various policy options and the ends to which they are directed. Deliberation, then, enhances individual competence both by enlarging their stock of knowledge about the effects of various policies in worlds outside of their own and by increasing their faculties of practical reason as it concerns state action.

Furthermore, the experimentalist model avoids some of the objections to deliberation which have been leveled against Condorcetian models. CJT mechanisms require each vote to be an independent sample of an underlying reality and political deliberation has been thought to threaten this mathematical notion of voter independence. John Rawls, for example, has commented on the Condorcet theorem that "we must not only be sure that there is a greater chance of a correct than incorrect judgment…, but it is also

clear that the votes of different persons are not independent. Since their views will be influenced by the course of discussion, the simpler sorts of probabilistic reasoning do not apply" (Rawls at p. 358). On the other hand, interpersonal deliberation is thought to be one of the main sources of political competence, and so the issue of whether and when deliberation violates the condition of voter independence has become a vexed issue in the small literature on epistemic democracy (Ladha 1992, 1995; Estlund 1989, 1994; Waldron 1989 at p. 1325-8). The experimentalist model, however, largely sidesteps this dilemma because it relies upon reflection and learning rather than sampling via large numbers. Since considerations of political competence overshadow concerns that votes be independent, experimentalist epistemic democratic institutions should, without reservation, encourage a free-wheeling discussion of past policy performance and prospective options in order to increase the overall level of judgmental competence.

Frequency of Political Participation

The fourth implication of the experimentalist model is that democratic institutions ought to increase the frequency of opportunities to reconstruct, and thus improve, state policy. The closeness of realized policy to correct policy is determined not only by voter competence, but by the number of rounds of voting (see eq. 10). Experimental epistemic democracy, therefore, recommends more frequent voting because each round is an opportunity to incorporate new information into the choice of policy. This prescription is, of

courses, tempered by the requirement that the time between iterations of policy reformulation should be sufficiently great that the effects of policies be felt, made public, and digested through reflection and deliberation. The proper balance will vary from widely from case to case. This pragmatic justification adds a distinctive reason to gauge and support *regular* elections, which are standardly justified by their capacity to discipline leaders or because they legitimize political authority by institutionalizing the idea of popular sovereignty.

Conclusion

This article has several closely related aims. Beginning with a presumption in favor of epistemic democracy as a normative, and perhaps descriptive, notion of political institutions, I sought to draw out the implications of the Condorcet model for institutional design. The somewhat surprising conclusion of this straightforward extension is that majority-rule in a two party system generally yields incorrect decisions. A second, more fundamental, object of this paper has been to urge that Condorcet voting is not the only conception of epistemic democracy. I have offered one alternative model in which the truth is sought through iterated learning and experimentation. There are certainly other elaborations of epistemic democracy, still more persuasive, which await theorists' discovery and articulation.

Even in the rudimentary form presented above, the experimentalist

model offers a more attractive conceptualization than the Condorcet

mechanism. First, it more accurately describes the operation of real world

democratic assemblies by considering and exploiting the dimension of time.

Second, it demands less political competence from citizens while still yielding

correct results. Finally, it captures an important characteristic of citizens and,

one hopes, democratic societies—that we are capable of learning from our

mistakes.

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[2] For an important exceptions, see Young (1986, 1988).

[3] Cohen also argues that two-party systems are ill suited to the aims of epistemic democracy, though his argument is based on the relative ability of political institutions to increase political judgement (Cohen 1986, p. 35-6). However, my argument against two-party systems above already presumes that voters have good judgement.

[4] I thank Ross Levinsky for the clear inductive derivation which appears from eqns. (6) - (10).

[5] See, for example, Chapters 9 and 10 of Press, Plannery, Teukolsky and Vetterling (1986).

[6] I thank Charles Sabel for drawing out this important difference.

[7] For considerations of scale and democracy, see generally Robert Dahl (1967).

[8] I thank David Estlund for pointing out to me that it is difficult to avoid Condorcetian mechanisms in any conception of epistemic democracy.

[9] For excellent discussions, see Cohen (1986 and 1989).

[10] See Habermas (1989) for a discussion of the institutions of the public sphere.