Deliberation, Preference Structuration, and Cycles: Evidence from Deliberative Polls[1]

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draft version Monday 8 October 2001 – please contact authors before citing text

Social choice theory has long posed serious problems for democratic theory. Condorcet's famous paradox shows that pairwise majority voting over as few as three options can yield cyclical majority preferences, and Arrow's impossibility theorem (1951) establishes that no procedure for aggregating individual preferences into overall social orderings satisfies a set of seemingly undemanding minimal conditions (transitivity of social orderings, universal domain, the weak Pareto principle, independence of irrelevant alternatives, non-dictatorship). In essence, the Gibbard-Satterthwaite theorem shows that any aggregation procedure satisfying even a weakened version of Arrow's conditions (universal domain, non-dictatorship, the "range constraint" or minimal responsiveness) is vulnerable to strategic manipulation by the submission of false preferences. Spatial voting theorists have shown that when both policy options and voters can be located anywhere in a multidimensional space there will almost never be a Condorcet winning policy option, i.e. one that would beat, or at least tie with, all other options in pairwise majority voting (see McKelvey, 1979; Schofield, 1976, 1986). Results like these, Riker (1982) has forcefully argued, undermine the very notion of democracy.

But need they, really? Social-choice-theoretic impossibility results like Arrow's assume 'universal domain'—basically that *any logically possible* combination, or *profile*, of preferences across individuals can in principle occur and that, accordingly, a democratic aggregation procedure should accept any such profile of preferences as a valid input. With no constraints apart from those requiring the most basic consistency on individual preference input, some preference profiles will surely exhibit so much diversity across different individuals' preferences that they cannot easily be aggregated into Condorcet-winning options. But if there is sufficient agreement—in the limiting case unanimity—across individuals, a Condorcet winner will exist. And if only profiles of the latter kind are included in the domain of admissible individual preference input, then it is certainly possible to design meaningful democratic procedures that cope with such input (for instance, pairwise majority voting).

Thus the important question for evaluating the possibility of meaningful, stable democratic decision making in the general population is: how frequently and under what conditions is the actual distribution of preferences problematic?

[1] Previous versions of this paper were presented at the conference *Deliberating about Deliberative Democracy*, University of Texas at Austin, February 2000 and at the 2000 Annual Meeting of the *American Political Science Association* in August / September 2000. We wish to express our gratitude to the conference participants for comments, to Pam Ryan and Issues Deliberation Australia for the use of the Australian data, and to Dennis Plane for research assistance.

The first generation of work on this question was theoretical, based on a so-called 'impartial culture' assumption (Gehrlein 1983). Assuming that any individual preference ordering was *a priori* as likely as any other, these papers showed that the probability of a Condorcet winner *decreases* with increases in policy options and in the number of voters. Since many communities have very large memberships, and many decisions involve large numbers of policy options, this result seems quite discouraging.

Still, there is no reason to expect an impartial culture. Any degree of convergence might be expected to increase the probability of stable democratic outcomes.[2] In particular, while unanimity would certainly have this effect, it is not necessary. Instead, suitable *preference structuration* is sufficient. By preference structuration we here mean the systematic alignment of the preferences of *different* individuals along the *same* shared issue dimension(s). A well-known simple concept of preference structuration is *singlepeakedness*: a profile of preference orderings across individuals is singlepeaked along some single dimension (such as from the economic 'left' to the economic 'right') if there exists a single ordering of the policy options from leftmost to rightmost such that *each* voter's preferences descend from his or her most preferred option toward either end. Black's median voter theorem (1948) establishes that singlepeakedness is sufficient for the existence of a Condorcet winner. More generally, if the condition of universal domain is relaxed and the domain of admissible individual preference input includes only singlepeaked profiles of preferences, it is possible to find aggregation procedures *on this restricted domain* satisfying all of Arrow's other conditions (as well as stronger desiderata).

But what makes for preference structuration? One strong candidate is *deliberation*—the process of learning, thinking, and talking about the policy options prior to the actual decision (a hypothesis suggested by Miller 1992 and developed by Dryzek and List 1999). As people get to know more about the subject of a collective decision, certain perspectives become more salient, and random and ill-formed preferences are replaced by preferences more systematically aligned along some underyling dimension(s). Of course some collective decision problems may be intractably multidimensional, and deliberation may in that case fail to affect or even decrease structuration. The sign of deliberation's effect is an empirical question.

Empirical work on these questions is methodologically difficult. Because most choice procedures elicit only top preferences or single binary preferences, complete preference orderings usually have to be inferred or reconstructed, an exercise that may involve heroic assumptions (see Mackie 2000 on Riker's examples). One suggestive line of evidence stems from Felsenthal, Maoz, and Rapoport (1993), who investigated a series of club and trade union elections for which complete preference orderings had been recorded and found that cycles only start to prevail when the number of candidates is 9 or greater. But of course clubs and trade unions are collections of people with similar objectives, and these data may therefore be unduly hostile to Riker's position.

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[2] List and Goodin (2001) have shown that, given suitable systematic, however slight, deviations from an impartial culture, the probability that there will be a cycle under pairwise majority voting vanishes as the number of individuals increases.

The present paper addresses the relationship between deliberation and structuration with representative samples of ordinary citizens from *Deliberative Polls* (hereafter *DPs*) conducted by Fishkin, Luskin, and colleagues (see Fishkin 1997 and Fishkin and Luskin 1999 for overviews). In *DP*s, randomly drawn respondents are first questioned about some policy or electoral choice, then sent carefully balanced and in many cases publicly vetted briefing materials , gathered to a common site to discuss the issues, and finally asked the same questions as at the beginning. On site, they alternate between discussions led by trained moderators in randomly assigned small groups and plenary sessions in which they put questions shaped by the small group discussions to panels of experts, policy makers, or politicians. Among other things, the moderators ensure that all the arguments, pro and con, in the briefing materials get considered and regulate the discussion so that no one dominates and everyone participates.

DP data are thus nicely suited to the question of whether citizen deliberation can induce preference structuration. The immersion in deliberation is intense, and the participants constitute a random sample of the relevant population, in contrast to the club and trade union members examined by Felsenthal et al. and the college student subjects of most social science experiments. Any DP that contains data about each participant's pre- and post-deliberation complete preferences over at least one set of three or more options can supply evidence about the effects of deliberation on preference structuration.

Our first dataset come from a series of DPs commissioned by Texas electric utility companies, then regulated monopolies, at the instance of the state's Public Utility Commission (PUC) (see Luskin, Fishkin, and Plane 1999 for details). The PUC was interested in precisely what Deliberative Polling provides: a glimpse of what the whole public might think about the relevant issues on closer reflection. By contrast, conventional polls, on a subject of such low salience, yield representative but often ill-informed opinions, while open meetings tend to yield highly informed but rather unrepresentative ones. A second dataset comes from a DP on the November 1999 referendum in Australia on the proposition that Australia should become a republic (see Luskin, Fishkin, McAllister, Higley, and Ryan 2000). A third dataset comes from a DP conducted in Britain in 1996 on Britain and the Monarchy.

Structuration, Deliberation, Sophistication

Structuration is the systematic alignment of the preferences of different individuals along the same shared issue-dimension(s). Structuration captures a form of convergence that is different from unanimity. Structuration requires that the preferences of different individuals be representable in terms of the same shared geometrical dimension(s), but it does not require that the preferences be identical. The most famous condition of preference structuration is Duncan Black's condition of singlepeakedness (1948), which we will employ in the present paper.[3] Apart from

[3] Other structuration conditions have also been proposed, for example *single-cavedness* (Inada 1964), *separability into two groups* (Inada 1964), *latin-square-lessness* (Ward 1965), and (triple-wise) *value-restriction* (Sen 1966/1982). Triple-wise value-restriction is the most general of all these conditions (on the logical relations between these conditions, see Sen, 1966/1982). Moreover, each of these

pointing towards escape-routes from social-choice-theoretic impossibility problems, the concept of preference structuration provides a framework for an analysis of the *type* of agreement or disagreement contained in a profile of preferences, and their observable implications. The condition of singlepeakedness, for instance, enables us to distinguish between *agreement/disagreement at a substantive level* and *agreement/disagreement at a meta-level* (List 2001). Agreement or disagreement at a substantive level concerns the question of how similar or dissimilar the preferences of different individuals are. Agreement or disagreement at a meta-level concerns the question of whether different individuals structure their preferences in terms of the same shared issue-dimension(s), even if they disagree on the actual ranking of the options. Disagreement at a substantive level – implying lack of unanimity – is thus compatible with agreement at a meta-level – implying singlepeakedness.

The concept of structuration bears some resemblance to the combination of dimensionality and fit in the factor analyses of attitude responses commonly, and loosely, used to gauge the structuredness of opinion in empirical public opinion research (for example in Stimson, Judd and Milburn xxxx, Peffley and Hurwitz xxxx, Rohrschneider xxxx). The closer to one dimension and the better the fit, the greater, roughly speaking, the structuration.

In both cases, the formulas refer only to the statistical patterning of responses across individuals, although it must be noted that a good many public opinion researchers have mistakenly equated statistical patterning with with cognitive organization, inside the minds of individual respondents (see Luskin 1987, 2001). At last this confusion, never shared by the social choice community, seems to be fading (and, in ways unfairly, the popularity of factor analysis with it).

To say that structuration is not the same as individual-level cognition, however, is not to say that there is no relation between the two. Indeed the heart of this paper is the assertion that there is. The more the individual members of any sample or population know and have thought about the subject, the more structured their preferences over a set of policy alternatives should be. [Note to reader: this is an empirical claim we are investigating]. And if the respondents are all weighing similar arguments and acquiring similar information, then these individual structures may well have a tendency to be similar—or similar enough for the collective property of structuration to result.

Consider two conceptually separable sources of structure. Some degree of observed structuration may be purely social, a matter of arbitrary but conventional agreement over the appropriate alignment of alternatives along some shared dimension. But some may also be logical: some such alignments may be intrinsically more compelling than others. These are related to two of Converses's (1964) famed 'sources of "constraint",' which he meant in this context to mean the aggregate patterning or structure of policy attitudes. Those who know and have thought more

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conditions shares with single-peakedness the property that it is *sufficient*, though not *necessary*, for the existence of Condorcet winners, for avoiding Arrow's impossibility result and, as easily provable, for avoiding the Gibbard-Satterthwaite result on strategic manipulability.

about a subject—the "sophisticated"—may be expected both to see the logic that urges some orderings of alternatives over others more clearly and to imbibe more of the socially agreed-upon orderings, whatever their logic.

Deliberation, in the sense we intend here, is a partly social process, including *discussion* as well as individual *learning* and *rumination*. All three components should increase both sophistication and thus the logical contribution to structuration—discussion mainly indirectly, by stimulating learning and rumination. All three should also increase the social contribution to expertise—discussion especially, since it is itself social.

The main hypothesis to be tested is that deliberation provides protection against unstructured preference profiles. There are four different possible effects that deliberation might have on preference structuration:

(1) unstructured preferences before deliberation – unstructured preferences after deliberation
(2) unstructured preferences before deliberation – structured preferences after deliberation
(3) structured preferences before deliberation – unstructured preferences after deliberation
(4) structured preferences before deliberation – structured preferences after deliberation

If effects (1) or (3) occurred, this would be bad news for deliberative democracy, so what we need to test is whether effects (2) or (4) occur. Before we can operationalize the hypothesis that deliberation provides protection against unstructured preference profiles, we need to introduce methods of quantifying structuration.

Quantifying Structuration

We first introduce a measure of preference structuration, using the approach developed by List (2000).

Let $N = \{1, 2, ..., n\}$ be the set of individuals (here *DP* participants), and $X = \{x_1, x_2, ... x_k\}$ be the set of alternatives facing them.

Let R_i be individual i's *personal preference ordering* on X, and $x_1 R_i x_2$ mean that from the perspective of person i, option x_1 is at least as good as option x_2. Each R_i induces a *strong ordering*, P_i, and an *indifference relation*, I_i, defined as follows:

$x_1 P_i x_2$, if and only if $x_1 R_i x_2$ and not $x_2 R_i x_1$
$x_1 I_i x_2$, if and only if $x_1 R_i x_2$ and $x_2 R_i x_1$

Let $\{R_i\}_{i \in N}$ be the corresponding *profile* of personal preference orderings across N.

For each $M \subseteq N$, we can ask whether or not $\{R_i\}_{i \in M}$ is singlepeaked, i.e. whether there exists at least one linear ordering Ω of the alternatives in X—a left/right dimension—such that, for all $i \in M$, R_i has (at most) one peak with respect to Ω (for a more formal definition and graphic representation, see Figure 5-2 in Riker 1982).

As a simple index of structuration, we use the following *index of singlepeakedness*, based on an idea first suggested by Niemi(1969; also Niemi and Wright 1987). Let i_{max} be the maximal size of M (a subset of N) such that the profile $\{R_i\}_{i\in M}$ across M is singlepeaked. If $|M| = i_{max}$, $\{R_i\}_{i\in M}$ will be called a *maximal structured component* of $\{R_i\}_{i\in N}$. The index of singlepeakedness is the quotient of i_{max} to n (the size of N). Formally, let

$$i_{single\text{-}peaked}(\{R_i\}_{i\in N}) = \frac{max\{|M| : M \subseteq N \;\&\; \{R_i\}_{i\in M} \textit{ is single-peaked}\}}{|N|},$$

the maximal fraction of n whose preference orderings have no more than one peak with respect to a single common dimension Ω.

Obviously, $0 \leq i_{single\text{-}peaked}(\{R_i\}_{i\in N}) \leq 1$. $i_{single\text{-}peaked}(\{R_i\}_{i\in N}) = 1$ when there is a common structuring dimension Ω shared by all preference orderings. $i_{single\text{-}peaked}(\{R_i\}_{i\in N})$, however, is insensitive to the level of structuration among the preference orderings *outside* any maximal structured component of $\{R_i\}_{i\in N}$.

For a measure sensitive not just to a single maximal structured component of $\{R_i\}_{i\in N}$, but also to all other preference orderings, we turn to an index based on the frequently used Rae-Taylor and Laakso-Taagepera approaches towards measuring the level of fractionalization, and the effective number of components, in a system (List 2000).

Suppose the set of people N can be partitioned as follows:

> $N = N_1 \cup N_2 \cup ... \cup N_r$, where $i \neq j$ implies $N_i \cap N_j = \emptyset$ and $N_1, N_2, ..., N_r \neq \emptyset$, such that, for each $j \in \{1, 2, ..., r\}$, $\{R_i\}_{i\in N_j}$ is singlepeaked (or contains only one ordering).

In these terms, our simple index of structuration focuses only on the largest component of a partition of this form and asks how large this largest component can maximally be. The new index of preference structuration, by contrast, asks whether an *entire* such partition is 'maximal' in a relevant sense. Given the set of all partitions of N of the stated form, we first define a lexical ordering on this set as follows: a partition $N = N_1 \cup N_2 \cup ... \cup N_r$ *lexically precedes* a partition $N = N'_1 \cup N'_2 \cup ... \cup N'_{r'}$ if and only if the r-tuple $<|N_1|, |N_2|, ..., |N_r|>$ is lexically greater than the r'-tuple $<|N'_1|, |N'_2|, ..., |N'_{r'}|>$, where $<a_1, a_2, ..., a_r>$ is *lexically greater* than $<b_1, b_2, ..., b_{r'}>$ if and only if there exists $i \leq min(r, r')$ such that $a_i > b_i$ and, for all $j < i$, $a_i = b_i$. Now a partition $N = N_1 \cup N_2 \cup ... \cup N_r$ of the stated form will be called a *maximal structured component partition* if it is not lexically preceded by any other partition of this form.

Given any partition of N into $N_1, N_2, ..., N_r$, the level of concentration is given by

> $\sum_{j\in\{1, 2, ..., r\}}(|N_j|/|N|)^2$ (which is 1-[Rae-Taylor index of fractionalization]),

and the Laakso-Taagepera index of the effective number of components in the system is given by the reciprocal of this level of concentration, interpretable as the number of components that would be required to generate the given value of the concentration index in a partition with perfectly equal-sized components, formally

$$1/(\sum_{j \in \{1, 2, ..., r\}}(|N_j|/|N|)^2).$$

Now the refined *index of structuration* is defined in terms of the level of concentration in a maximal structured component partition of N with respect to $\{R_i\}_{i\in N}$, and a corresponding *index of effective dimensionality* is defined in terms of the effective number of components in such a partition, formally

$structure(\{R_i\}_{i\in N}) = \{\sum_{j \in \{1, 2, ..., r\}}(|N_j|/n)^2 : N = N_1 \cup N_2 \cup ... \cup N_r$ *is a maximal structured component partition with respect to* $\{R_i\}_{i\in N}\}$, and

$dim(\{R_i\}_{i\in N}) = \{1 / [\sum_{j \in \{1, 2, ..., r\}}(|N_j|/n)^2] : N = N_1 \cup N_2 \cup ... \cup N_r$ *is a maximal structured component partition with respect to* $\{R_i\}_{i\in N}\}$.

The social-choice-theoretic motivation for using an index of singlepeakedness as a (first) measure of structuration lies in the following theorems:

A *Condorcet winner* is an alternative in X which beats, or at least ties with, all other alternatives in X in pairwise majority ballots.

THEOREM 2.1. (Black). Given $\{R_i\}_{i\in N}$, a *sufficient* (though not *necessary*) condition for the existence of a Condorcet winner among X is $structure(\{R_i\}_{i\in N}) = 1$ (or, equivalently, $dim(\{R_i\}_{i\in N}) = 1$, or $i_{single\text{-}peaked}(\{R_i\}_{i\in N}) = 1$).

This is a version of the median voter theorem, which states that, for a profile of preferences that is singlepeaked, the most preferred alternative of the median voter is a Condorcet winner.

THEOREM 2.2. (well-known). There exist SWFs generating transitive social orderings on the domain $\{\{R_i\}_{i\in N} : structure(\{R_i\}_{i\in N}) = 1\}$ satisfying independence of irrelevant alternatives, the weak Pareto principle and non-dictatorship.

I.e., both Arrow's impossibility theorem the Gibbard-Satterthwaite theorem, adding that no voting procedure satisfying a set of minimal conditions similar to those proposed by Arrow is invulnerable to strategic manipulation, cease to hold on the domain of all singlepeaked preference profiles, $\{\{R_i\}_{i\in N} : structure(\{R_i\}_{i\in N}) = 1\}$ (see also Dryzek and List 1999).

Informally, the more closely the domain of actually occurring preference profiles approximates a domain of singlepeaked preference profiles (i.e. the greater the values of $structure(\{R_i\}_{i\in N})$), the more likely it is that the paradoxes and instabilities of social choice can be avoided. In support of this claim, Niemi (1969) has shown that a value of $i_{single\text{-}peaked}(\{R_i\}_{i\in N})$ as low as 0.75 or less makes the existence of Condorcet winners very likely.

Evidence from Delliberative Polling

In terms of the formalism introduced above, our hypotheses can be stated as follows:

We use, firstly, the simple index of structuration, $i_{single\text{-}peaked}(\{R_i\}_{i\in N})$, secondly, the refined index of structuration, $structure(\{R_i\}_{i\in N}$ (and, equivalently, the index of effective dimensionality, $dim(\{R_i\}_{i\in N})$, and, thirdly, the *proportion of strict orderings*, $|M| / n$, where $M = \{i\in N : \forall x_1, x_2 \in X\ x_1 \neq x_2 \rightarrow \text{not } x_1 I_i x_2\}$. Let $i_{single\text{-}peaked}$(D, Tx), *structure*(D, Tx), *dim*(D, Tx), and $I_>$(D, Tx) denote, respectively, the simple index of structuration, the refined index of structuration, the effective dimensionality, and the proportion of strict orderings in DP D at time Tx.

To operationalize this, we will consider the following three hypotheses.

(H1) $i_{single\text{-}peaked}$(D, T2) > $i_{single\text{-}peaked}$(D, T1);
(H2) *structure*(D, T2) > *structure*(D, T1)
(equivalently, *dim*(D, T2) < *dim*(D, T1));
and (H3) $I_>$(D, T2) > $I_>$(D, T1).

(H1) and (H2) state, in terms of, respectively, the simple and refined indices of structuration, that the level of preference structuration after deliberation is greater than before. (H3) states that after deliberation the proportion of preference orderings which do not reflect indifference between two or more alternatives in X is greater than before.

While all these three hypotheses refer to effect (2) above – unstructured preferences before deliberation; structured preferences after deliberation –, we should still keep effect (4) –structured preferences before deliberation; structured preferences after deliberation – in mind when interpreting our results regarding (H1), (H2) and (H3).

We take our data from seven *DP*s conducted among Texas utility customers and the 1999 Australian *DP* on the issue of Australia's becoming a republic and cutting its vestigial ties with the British crown.

In each DP, panellists were asked at least twice (at time T1: before deliberation, at time T2: after deliberation) to rank problems of power generation in an order of importance, and/or to rank their preferred solutions. Typical examples of the questions asked are in Appendix **2.**.

The data were processed twice, the first time to uncover information about strong orderings only (i.e. P_i, for each person i), and the second time to uncover information about all orderings, strong and weak (i.e. R_i, for each person i). The more frequent the occurrence of ties, the more difficult it is to attain singlepeakedness. Preference orderings with a flat tail on a given issue-dimension, for instance, fail to meet the condition of singlepeakedness. In order to test our hypotheses in their most demanding (and thus strongest) form, we therefore chose *not* to exclude orderings with ties from our data set.

The data were analysed using a program in Pascal. This Pascal program implements an algorithm for computing a maximal structured component partition of N for each given $\{R_i\}_{i\in N}$, as briefly introduced above.

Texas Results

[Tables 1 and 2 here]

Table 1 shows the results of testing hypotheses 1 and 3 on the data from the seven Texas DPs. Table 2 shows the same results for hypothesis 2. Some of the DPs contained two sets of usable 'before and after' questions, so there are ten tests of each hypothesis altogether. In 30/30 tests, the hypotheses are confirmed. These findings support the hypothesis that deliberation has effect (2), i.e. that it increases preference structuration, in the form of (H1), (H2) and (H3).

Australian Results

The Australian *DP* is of particular interest because much commentary in the run-up to the referendum suggested that a non-Condorcet-winning option was likely to prevail. The proposition on the ballot was "A Proposed Law *To alter the Constitution to establish the Commonwealth of Australia as a republic with the Queen and Governor-General being replaced by a President appointed by a two-thirds majority of the members of the Commonwealth Parliament*". This proposition had emerged from a convention arranged after the Liberal election victory of 1996, convened for that purpose. Its advocates anticipated that it would be seen as a compromise between two more polar options—a directly elected head of state and the satatus quo. To the extent that they were right, opinion would be single-peaked, and the result would be a well-behaved majoritarian outcome.

Many republicans, however, expressed the view that a republic in which politicians elected the head of state would be *worse* than a continuation of the monarchy. This opens the possibility of the referendum's failing to choose a Condorcet winner, either because (a) opinion regarding these three options was actually cyclic or because (b) even if not, the status quo couldprevail as among these three options but lose to some other republican option in a pairwise vote.

The Australian Republic DP data were analysed in the same way as the Texas utility data, in order to see whether structuration increased or decreased as a result of the deliberative meeting.

The three options over which participants were asked to express their preferences are:
1: "Change to a Republic with a President Directly elected" (the option supported by many republicans but not offered by the referendum)
2: "Change to a Republic with a President appointed" (the option offered by the referendum)
3: "No Change to a republic" (the status quo)

[Tables 3 and 4 here]

In contrast to the Texas data, the Australian data (Tables 3 and 4) exhibit high levels of preference structuration both before and after deliberation, and while the *content* of the participants' preferences changes significantly from time T1 to time T2, the indices of structuration, with the exception of the proportion of strict orderings (a finding that still requires explanation), are almost unchanged. It is, however, important to note that we are dealing with a case of high preference structuration both before and after deliberation. The Australian data might therefore be seen as an illustration of effect (4) above. Nonetheless, it was only after deliberation, i.e. at time T2, that the issue-dimension the Constitutional Convention's proposal apparently intended to capture, positioning the three options between the two polar positions "directly elected head of state" and "no change", apparently became salient for a large number of people.

As far as the *content* of people's preferences is concerned, the following observations can be made from our findings:

(1) Before deliberation, i.e. at time T1, "Change to a Republic with a President Directly elected" is the Condorcet winner. To the extent that the preferences of the DP participants at time T1 can be considered a representative sample of the preferences in the general population, the actual outcome of the referendum, "No Change to a republic", was indeed a non-Condorcet-winning option.

(2) After deliberation, i.e. at time T2, "Change to a Republic with a President appointed", the option offered by the referendum, is the Condorcet winner.

If the DP data are representative in a relevant sense, we can even use these observations to speculate that it *might* have been possible for the republicans to win the referendum in (at least) two different ways. According to observation (1), the following alternative proposition might have been successful against the status quo: "A Proposed Law *To alter the Constitution to establish the Commonwealth of Australia as a republic with the Queen and Governor-General being replaced by a President directly elected by the citizens of Australia*". According to observation (2) -- though this depends on much more contentious assumptions about whether the effects of deliberation in a DP can be 'replicated' in the general population --, more wide-ranging processes of political deliberation amongst the Australian electorate might have increased support for the option offered by the referendum, "Change to a Republic with a President appointed". A third solution might have been to split the referendum into two parts, into (i) "Change to a Republic versus No Change" and (ii) "In the event of a Change to a Republic, Direct Election of the President versus Parliamentary Appointment of the President".

In one of the first scholarly discussions of the Australian repferendum, Uhr (2000) believes that it 'test[s] deliberative democracy'. His model of deliberation is that of Gutmann and Thompson (1996), and he points out that the designers of the Australian constitution expected that the Senate would be the more deliberative chamber. His explanation for the failure of the referendum to reach a majority-preferred outcome is that 'voters are suspicious of governments' (p.196). Our findings, while in no way inconsistent with his, extend the idea of the referendum as a deliberative exercise. We show what the public might have come to, if there were extensive deliberation among the mass public.

British Results

The question we studied in the British DP was which of three options (1: monarchy with a more ordinary royal family; 2: republic with head of state-duties of Queen; 3: republic with head of state-duties of Queen and PM) participants would prefer if there were a change to the monarchy. It is important to note that this question is a conditional question. It does not include any information as to whether participants would actually prefer a change to the monarchy, although other parts of the same DP did include such information.

[Tables 5 and 6 here]

The following can be observed. First, structuration is reasonably high both before and after deliberation. Second, from before to after deliberation, there is very little change, neither in terms of structuration, nor in terms of the Condorcet winner. Third, the observed pattern is similar to the one in the Australian DP. However, unlike in the Australian case, the Condorcet winner remains the same before and after deliberation, i.e. option 1: monarchy with a more ordinary royal family.

Discussion of the Results

All of our results are consistent with the hypothesis that deliberation provides some protection against a lack of preference structuration, in the form of effects (2) and (4) discussed above. More specifically, the Texas results support the hypothesis that deliberation actually *increases* preference structuration (effect (2)), while the Australian and British data exhibit high levels of structuration both before and after deliberation (effect (4)). In the Australian case deliberation induces a shift from one Condorcet winner to another and apparently making the issue-dimension intended to be the relevant one by the Constitutional Convention more salient.

At the same time, a number of questions require further investigation. A possible objection to our conclusions, namely that the Texas utility data were likely to produce results too favourable to this hypothesis, must be examined but may be rejected. It has been held since Converse (1964) that mass opinion on non-salient issues is poorly structured. It may therefore approximate to the social choice construction of an impartial culture. *Any* information could be expected to increase structuration and reduce the proportion of randomly chosen opinions.

In the Texas DPs, the pattern was indeed that structuration was consistently greater after deliberation than before. Whether this increase in structuration was due to the specific nature of the deliberation process or whether *any* supply of information (deliberation being only a special case) could have achieved a similar effect is still an open question. Ultimately, this question might be addressed by running modified DPs, with a controlled 'downgrading' of the level and nature of interaction of the kind of 'deliberation' taking place between time T1 and time T2.

The Australian and British DPs, on the other hand, represent cases of highly salient issues, because even at the start of the DP many participants held strong and relatively well-informed opinions on the question of whether or not Australia or Britain should become a republic. The effect of deliberation on the numerical indices of structuration was much less marked in the Australian and British cases than in the Texan one. But in the Australian and British cases preferences were already highly structured at the outset, which would explain why we could hardly have expected a significant increase in preference structuration during the DP. However, it is important to stress that if the relevant claim of deliberative democracy is that deliberation provides protection against a lack of preference structuration (in the form of either effect (2) or effect (4)), then the Australian and British data are no less compatible with this claim than the Texan data. An anomaly that still requires explanation is the fact that the proportion of strict orderings in both the Australian and British data decreased after deliberation.

If deliberation produces highly structured preference profiles, what mechanisms might be responsible for this effect? One hypothesis is that deliberation may induce a socially coordinated re-framing of decision problems (for a related account of framing, see also Bacharach and Bernasconi 1997), so as to eliminate certain purely self-regarding and socially inconsiderate preferences, and that deliberation may facilitate the identification of one or several publicly sustainable relevant issue-dimensions, on each which people's preferences are highly structured, since each person can find his or her 'peak' on each such issue-dimension (see also Miller 1992; Dryzek and List 1999).

Which of these mechanisms (if any) explain the effects we have identified in this paper is still an open question. Methodologically, a few words of care are due.

Firstly, the indices of structuration we have employed are based upon the concept of *onedimensional* singlepeakedness. In cases of highly complex issues, it is to be expected that, even if deliberation successfully induces greater preference structuration *of some form*, onedimensional singlepeakedness may be an unrealistic goal. Different measures of structuration will have to be deployed in such cases. But, as many social choice theorists have argued, stable solutions to collective decision problems become more difficult in such multidimensional cases.

Secondly, if we identify an ordering Ω of the alternatives in X with respect to which a (possibly maximal) set of people have singlepeaked preferences (e.g. $\{R_i\}_{i\in M}$ is singlepeaked with respect to Ω, where $|M| = i_{max}$), e.g. Ω = "1 2 3" in the Australian DP at T2, this does not automatically entail that Ω corresponds to a substantive issue-dimension in terms of which all these people conceptualize the given decision problem. To say that someone's preference ordering has (at most) one peak with respect to Ω is to make a purely formal statement about the mathematical representation of this ordering, rather than to give an account of how this person actually conceptualizes the issue. In fact, there is typically more than one ordering ('dimension') Ω of the alternatives in X with respect to which an individual preference ordering has no more than one peak. Still, the larger the number of people whose preference orderings, whilst different in content, are structured by the same 'dimension' Ω, the more plausible it would seem to try to explain this pattern in terms of the 'semantics' of Ω.

In short, further research is required. However, so far all our findings favour the hypothesis that deliberation can provide protection against a lack of preference structuration. If this hypothesis were to remain defensible in the light of further empirical and theoretical investigation, this would be one step towards answering the question of whether deliberative democratic arrangements can facilitate meaningful collective decision-making in pluralistic environments.

Appendix 1. Statistical Issues

Consider the population of all *groups* of people (similar to the groups of around 200 DP participants) discussing the subject of energy provision. Our *set of data sets* from the Texas utility DPs is a *sample* drawn from this population of groups. Each data set in our sample provides a test-case for hypotheses (H1), (H2) and (H3). In each individual DP, *either* structuration increases *or* it doesn't (in terms of (H1), (H2), (H3)). So each individual DP can be interpreted as a 'tossing-the-coin' experiment. By the sign-test, the fact that, in *all* data sets in our sample, structuration increased is sufficient to statistically rule out the null-hypothesis that each DP is an 'unbiased coin'; and the effect we have identified is therefore statistically significant. For a more detailed statistical analysis of our results, the T-test could be employed.

Appendix 2. A Sample Codebook, with frequencies (relevant questions only)

Q5a IM1CPL1: Which of these factors is the most important?

Pre: Most Important Factor in CPL Survey T1 (Q5a)

IM1CPL1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	261	20.9	261	20.9
2 Maintain Environment	189	15.2	450	36.1
3 Create Jobs	273	21.9	723	58.0
4 Renewable Resc.	475	38.1	1198	96.1
99 dk	48	3.9	1246	100.0

Q5a IM1CPL2 (CPL): Post: Most Important Factor in CPL Survey
Which of these factors is the most important?

IM1CPL2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	3	24.5	53	24.5
2 Maintain Environment	78	36.1	131	60.6
3 Create Jobs	41	19.0	172	79.6
4 Renewable Resc.	40	18.5	212	98.1
98 NA	3	1.4	215	99.5
99 dk	1	0.5	216	100.0

Frequency Missing = 1040

Q5b IM2CPL1: Which is the second most important?

Pre: Second Most Imp. Factor in CPL Survey T1 (Q5b)

IM2CPL1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	285	22.9	285	22.9
2 Maintain Environment	382	30.7	667	53.5
3 Create Jobs	274	22.0	941	75.5
4 Renewable Resc.	236	18.9	1177	94.5
98 NA	48	3.9	1225	98.3
99 dk	21	1.7	1246	100.0

Post: 2nd Most Imp. Factor in CPL Survey T2 (Q5b)

IM2CPL2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	53	24.5	53	24.5
2 Maintain Environment	78	36.1	131	60.6
3 Create Jobs	41	19.0	172	79.6
4 Renewable Resc.	40	18.5	212	98.1
98 NA	3	1.4	215	99.5
99 dk	1	0.5	216	100.0

Frequency Missing = 1030

Q5c IM3CPL1: Which is the third most important?

Pre: Thrid Most Imp. Factor in CPL Survey T1 (Q5c)

IM3CPL1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	365	29.3	365	29.3
2 Maintain Environment	309	24.8	674	54.1
3 Create Jobs	307	24.6	981	78.7
4 Renewable Resc.	170	13.6	1151	92.4
98 NA	69	5.5	1220	97.9
99 dk	26	2.1	1246	100.0

Post: 3rd Most Imp. Factor in CPL Survey T2 (Q5c)

IM3CPL2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Lowest Cost	64	29.6	64	29.6
2 Maintain Environment	31	14.4	95	44.0
3 Create Jobs	61	28.2	156	72.2
4 Renewable Resc.	54	25.0	210	97.2
98 NA	3	1.4	213	98.6
99 dk	3	1.4	216	100.0

Frequency Missing = 1030

The next section concerns options which CPL might consider as it plans for the future. We realize you may not know much about these options, so feel free to tell us if you don't have an opinion in response to these questions.

CPL projects a need for additional resources in the Valley withink the next three years. There are a number of options which the company might use to meet this need. These options include:
* Providing programs or technologies which decrease the need for additional electric generation facilities,
* Building electric generation facilities in the Valley that use coal or natural gas,
* Building electric generation facilities in the Valley which rely on solar power or wind power, and
* Building transmission lines and bringing electric power in from somewhere outside of South Texas.

Q6 PREF1: Assuming the cost is the same, can you first tell us, yes or no, whether you have any opinion about which of these options CPL should pursue? (If you answered "NO" or "DON'T KNOW" to Q6, skip to Q7).

Pre: Does R Prefer An Option? T1 (Q6)

PREF1	Frequency	Percent	Cumulative Frequency	Cumulative Percent

1 No	324	26.0	324	26.0
2 Yes	779	62.5	1103	88.5
99 dk	143	11.5	1246	100.0

Post: Does R Prefer an Option? T2 (Q6)

PREF2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 No	1	0.5	1	0.5
2 Yes	204	94.4	205	94.9
99 dk	11	5.1	216	100.0

Frequency Missing = 1030

Q6a PR11: Which do you think your utility should pursue first?

Pre: Rs First Preference T1 (Q6a)

PR11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Decrease Need	100	8.0	100	8.0
2 Build Fuel Fac.	104	8.3	204	16.4
3 Build Renew Fac	473	38.0	677	54.3
4 Import Power	83	6.7	760	61.0
98 NA	467	37.5	1227	98.5
99 dk	19	1.5	1246	100.0

Post: Rs First Preference T2 (Q6a)

PR12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Decrease Need	96	44.4	96	44.4
2 Build Fuel Fac.	60	27.8	156	72.2
3 Build Renew Fac	32	14.8	188	87.0
4 Import Power	17	7.9	205	94.9
98 NA	8	3.7	213	98.6
99 dk	3	1.4	216	100.0

Frequency Missing = 1030

Q6b PR21: Which do you think they should pursue second?

Pre: Rs Second Preference T1 (Q6b)

PR21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Decrease Need	239	19.2	239	19.2
2 Build Fuel Fac.	236	18.9	475	38.1
3 Build Renew Fac	146	11.7	621	49.8
4 Import Power	104	8.3	725	58.2
98 NA	486	39.0	1211	97.2
99 dk	35	2.8	1246	100.0

Post: Rs Second Preference T2 (Q6b)

Cumulative Cumulative

PR22	Frequency	Percent	Frequency	Percent
1 Decrease Need	45	20.8	45	20.8
2 Build Fuel Fac.	53	24.5	98	45.4
3 Build Renew Fac	78	36.1	176	81.5
4 Import Power	26	12.0	202	93.5
98 NA	10	4.6	212	98.1
99 dk	4	1.9	216	100.0

Frequency Missing = 1030

Q6c PR31: Which do you think they should pursue third?

Pre: Rs Third Preference T1 (Q6c)

PR31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Decrease Need	246	19.7	246	19.7
2 Build Fuel Fac.	215	17.3	461	37.0
3 Build Renew Fac	86	6.9	547	43.9
4 Import Power	145	11.6	692	55.5
98 NA	521	41.8	1213	97.4
99 dk	33	2.6	1246	100.0

Post: Rs Third Preference T2 (Q6c)

PR32	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1 Decrease Need	35	16.2	35	16.2
2 Build Fuel Fac.	59	27.3	94	43.5
3 Build Renew Fac	56	25.9	150	69.4
4 Import Power	42	19.4	192	88.9
98 NA	12	5.6	204	94.4
99 dk	12	5.6	216	100.0

Frequency Missing = 1030

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Table 1. Texas data: Hypotheses (H1) and (H3) tested

data set	time T1		time T2		Hypothesis confirmed	
	proportion of strict orderings	simple index of structuration	proportion of strict orderings	simple index of structuration	H1	H3
SWEPCO						
(a) pref.	115/232	94/232	212/232	129/232	y	y
(b) im. f.	201/232	55/232	228/232	84/232	y	y
CPL						
(a) pref.	133/216	84/216	190/216	112/216	y	y
(b) im. f.	199/216	96/216	209/216	125/216	y	y
WT						
(a) pref.	127/230	86/230	220/230	114/230	y	y
(b) im. f.	206/230	56/230	229/230	76/230	y	y
Entergy im. f.	142/175	112/175	169/175	121/175	y	y
El Paso pref.	106/137	105/137	120/137	111/137	y	y
HL&P im. f.	174/192	100/192	189/192	130/192	y	y
SPS im. f.	194/222	124/222	212/222	144/222	y	y

'pref.' = answers to question 'Which do you think your utility company should pursue first?'

'im. f' = answers to question 'Which of these factors is the most important?'

(see Appendix **2.** for sample of question wording)

Table 2. Texas data: Hypothesis (H2) tested

data set	time T1			time T2			Hyp. conf.
	component size in a maximal structured component partition	refined index of structuration	index of effective dim'ality	component size in a maximal structured component partition	refined index of structuration	index of effective dim'ality	H2
SWEPCO							
(a) pref.	94, 23, 11, 6, 98*1	0.1685	5.9332	129, 58, 24, 9, 2, 10*1	0.3831	2.6103	y
(b) im. f.	55, 49, 28, 18, 12, 11, 11, 7, 5, 3, 33*1	0.1274	7.8496	84, 49, 34, 23, 14, 9, 8, 6, 3, 2*1	0.2141	4.6704	y
CPL							
(a) pref.	84, 32, 13, 7, 3, 77*1	0.1740	5.7457	112, 46, 32, 10, 2, 14*1	0.3377	2.9610	y
(b) im. f.	96, 65, 23, 19, 2, 11*1	0.3067	3.2609	125, 43, 25, 17, 2, 4*1	0.3941	2.5376	y
WT							
(a) pref.	86, 32, 14, 6, 2, 90*1	0.1565	6.3895	114, 55, 37, 17, 7*1	0.3337	2.9963	y
(b) im. f.	56, 44, 29, 24, 17, 13, 6, 5, 5, 4, 27*1	0.1313	7.6155	76, 59, 30, 19, 16, 10, 8, 6, 3, 2, 1*1	0.2076	4.8166	y
Entergy im. f.	112, 23, 10, 8, 22*1	0.4329	2.3098	121, 32, 13, 7, 2*1	0.5187	1.9279	y
El Paso pref.	105, 8, 24*1	0.5921	1.6889	111, 12, 14*1	0.6649	1.5040	y
HL&P im. f.	100, 35, 14, 10, 4, 29*1	0.3120	3.2050	130, 39, 16, 4, 3*1	0.5070	1.9725	y
SPS im. f.	124, 42, 20, 14, 3, 19*1	0.3590	2.7858	144, 34, 25, 10, 9*1	0.4584	2.1813	y

'pref.' = answers to question 'Which do you think your utility company should pursue first?'
'im. f' = answers to question 'Which of these factors is the most important?'
(see Appendix **2.** for sample of question wording)

How to read the cell entries: an example

For the SWEPCO DP, on the preference questions, at time 1, there were component sizes, in descending order, of 94, 23, 11, 6, 98*1 (that is, 98 components of size 1). This gives a refined index of structuration of 0.1685 and a dimensionality index of 5.9332. At time 2 the index of structuration has risen and the index of dimensionality has fallen. Therefore H2 is confirmed.

Table 3. Australian data: Hypotheses (H1) and (H3) tested

Time T1			time T2			Hypothesis confirmed	
Condorcet Winner	proportion of strict orderings	simple index of structuration	Condorcet winner	proportion of strict orderings	simple index of structuration	H1	H3
1	317/347	287/347 Ω: 2 1 3	2	259/347	268/347 Ω: 1 2 3	n	n
First choice preferences: 172 for 1 70 for 2 92 for 3			first choice preferences: 68 for 1 211 for 2 52 for 3				
1: "Change to a Republic with a President Directly elected" 2: "Change to a Republic with a President appointed" 3: "No Change to a republic"							

Table 4. Australian data: Hypothesis (H2) tested

time T1			time T2			Hyp. confirmed
component size in a maximal structured component partition	refined index of struct.	index of effective dim.	component size in a maximal structured component partition	refined index of struct.	index of effective dim.	H2
287, 45, 2, 13*1	0.6997	1.4292	268, 50, 13, 16*1	0.6172	1.6203	n

Table 5. British data: Hypotheses (H1) and (H3) tested

Time T1			time T2			Hypothesis confirmed	
Condorcet Winner	proportion of strict orderings	simple index of structuration	Condorcet winner	proportion of strict orderings	simple index of structuration	H1	H3
1	199/258	168/258 Ω: 2 1 3	1	181/258	167/258 Ω: 2 1 3	n	n
First choice preferences: 136 for 1 41 for 2 33 for 3			first choice preferences: 128 for 1 46 for 2 24 for 3				
1: "Monarchy with a more ordinary royal family" 2: "Republic with a head of state with duties of Queen" 3: "Republic with a head of state with duties of Queen and Prime Minister"							

Table 6. British data: Hypothesis (H2) tested

time T1			time T2			Hyp. confirmed
component size in a maximal structured component partition	Refined index of struct.	index of effective dim.	component size in a maximal structured component partition	refined index of struct.	index of effective dim.	H2
168, 41, 1, 48*1	0.4960	2.0162	167, 28, 3, 60*1	0.4893	2.0439	N