Modeling the Effects of
Changing Issue Salience in Two-Party Competition

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ABSTRACT

For a given distribution of voter ideal points, candidates may compete, not only by changing their policy platforms, but also by seeking to persuade voters to place more weight on one of the given dimensions. We do not examine persuasion mechanisms, per se, but, rather, investigate how change of the salience weights can lead to alternation of majorities for the candidates, even though candidate positions remain fixed. Thus, competition over the salience of issue dimensions can, under certain circumstances, be crucial for determining election outcomes. We illustrate potential non-monotonicities in priming effects in terms of the Fourier series decomposition of the distribution of voter preferences, showing that the existence of higher-level harmonics leads to greater uncertainty about election outcomes and about best heresthetic strategies. We then demonstrate the empirical relevance of our results with data on two issue dimensions of political competition in the 2000 U.S. presidential election.

KEY WORDS: heresthetics, priming, issue dimensions, salience, party competition
Political conflict is not like an intercollegiate debate in which the opponents agree in advance upon the a definition of the issues …[T]he definition of the alternatives is the supreme instrument of power.

E. E. Schattschneider (1980)

Candidates do not know in advance which principle of cleavage would be most effective, but it is in their interest to seek it.


1. Introduction

In the standard Downsian approach to party competition, voters are taken as having fixed locations in some issue space, and parties compete by offering rival platforms to attract voter support. But it has long been recognized that this approach neglects the persuasive elements of political competition.1 In particular, William Riker (1982, 1984, 1986, 1996) has emphasized how politicians and parties can influence outcomes by framing issues in particular ways, by arguing for the salience of particular issue dimensions, and by introducing new issue dimensions that change the proximity of (some or all) voters to the candidates/parties. This has led to a literature on what, following Riker, has come to be called the art of heresthetics (see review in McLean, 2002; for a more critical view, see Mackie 2003).2
In this essay we do not look at mechanisms of persuasion. Rather our focus is on what would be the effects of successfully persuading voters to change the weights they attach to the various issues. In the political science literature, attempts to influence the relative weight/attention paid to different issues is studied under the label of “priming.”

In the first section of the paper we informally demonstrate the equivalence of the relative salience weights voters attach (on average) to different issue dimensions and a particular form of dimensional reduction. For two candidate competition over a two-dimensional issue space, we show that any issue weighting can be reframed as a collapse of the two dimensions into a single issue dimension that is characterized by an angle (of rotation) that is directly related to the relative weights to be attached to the two dimensions.

Changes in issue weighting can have dramatic consequences for election outcomes when a candidate is a winner over one dimension (i.e., if that dimension were the sole dimension of political choice) but not the winner on the other dimension. We show that such a candidate does not necessarily benefit by weighting more heavily the dimension on which that candidate is a winner. We illustrate potential non-monotonicities such that, if one candidate is the majority preferred candidate on one issue and the other is the majority preferred candidate on the other issue, increasing the (relative) weight all voters give to one of the two dimensions can lead, inter alia, to a pattern of victory, then defeat, then victory, then defeat, then victory, etc., for a given candidate. Indeed, even if one candidate is the majority preferred candidate on each dimension, separately, and the preferred candidate, for both dimensions taken together (in terms of Euclidean distance on the equally weighted dimensions), there may still be some relative weights on the two
dimensions such that s/he will be a loser. Only in the knife-edge situation where the two-dimensional majority rule voting game both has a core and the two candidates are located on a line that passes through that core, are there no weightings that will transform a loser into a winner.

In the third section we present a more formal analysis in which we show how non-monotonicities associated with issue weighting can be related to the underlying distribution of voter preferences in terms of decomposing voter preferences via Fourier series. Although application of Fourier analysis to real world data requires knowledge of the true (more complex) structure of preferences and the Fourier decomposition constitutes only an approximation to the preference structure, interpretation of the Fourier decomposition has two key benefits.

First, by examining the relative weight of different harmonics, we can judge the degree of multimodality of the underlying voter distribution, i.e., we can determine the extent to which there are large blocs of voters with similar ideological locations (Merrill and Grofman, 1997). Second, the existence of significantly weighted higher order (odd) harmonics in the electorate indicate potential volatility in the predicted winner because small movements of the cleavage lines, i.e., small shifts in the relative weights voters give to different issues, could reverse the outcome. In contrast, ceteris paribus, an electorate that is characterized by mostly lower level harmonics is one where attempts at strategic manipulation of issue dimensions is more feasible, since there are substantially larger ranges of cleavage angles that clearly benefit one party over the other. In an appendix, we express probabilities of winning as a function of the position of the cleavage line.
In the final section of the paper we illustrate the practical significance of our theoretical results on priming effects and non-monotonicities by simulating what happens to expected outcomes when we vary the salience of issue dimensions in the 2000 U.S. presidential election. In the concluding discussion we explore the links between our work and the political science literature on priming effects and the practical implications of our work for the study of two-party competition. We also identify possible extensions of our theoretical model, such as to the analysis of voter-specific salience weights.

2. An Informal Exposition of Basic Theoretical Results about Priming

Our general concern in this paper will be with modeling priming, i.e., changes in issue salience, in terms of voter choice in two-candidate competition over two dimensions where we take voter ideal points to be fixed and known. In this section we offer a relatively non-technical introduction to salience effects in a neo-Downsian context.

We informally illustrate the basic ideas with a simple three-voter example, as shown in Figure 1(a). To focus on issues that separate the candidates, we locate the origin at the midpoint between the two candidates. For simplicity, assume that the candidates are a Democrat (D) and a Republican (R). Here, candidate D defeats candidate R when preferences are Euclidean (ordinary distance), by a vote of two to one, with voters 1 and 3 preferring D to R.

<< Figure 1 about here >>
In Figure 1(a), if the only dimension of choice were that reflected on the horizontal axis, candidate R would be the winner; similarly, if the only dimension of choice were that reflected on the vertical axis, candidate R would again be the winner. Note that the outcome we get when we look at each dimension separately (a win for R on each separate dimension in each case) and the outcome we get when we combine the dimensions in terms of simple Euclidean distance (a win for D) are not the same. We wish to obtain more general insight into how preferences on individual dimensions, and the weights we attach to each dimension, are linked to overall preferences.

Let us transform the decision calculus of the voters by positing that each voter assigns a weight of \( w \) to the horizontal dimension (which we will label military spending, simply for illustrative purposes), and a weight of \( 1 - w \) to the vertical dimension (which we label domestic spending), with \( 0 \leq w \leq 1 \), and with the voter voting for the candidate to whom s/he is closer in weighted distance terms. We can imagine that we increment \( w \) continuously from a value of zero to a value of 1. We know that, for \( w = 0 \), and for \( w = 1 \), R is the winner, but what happens for intermediate values of \( w \)?

Denoting \( D = (D_x, D_y) \) and \( R = (R_x, R_y) \), a voter at location \((x, y)\) votes for D if

\[
\sqrt{w(x-D_x)^2 + (1-w)(y-D_y)^2} < \sqrt{w(x-R_x)^2 + (1-w)(y-R_y)^2}
\]  

(1)

and R otherwise, (with a coin flip breaking any tie), so that the indifference line between D and R is defined by

\[
xwD_x + y(1-w)D_y = 0,
\]

(2)

i.e., the line through the origin perpendicular to the vector \((wD_x, (1-w)D_y)\). We can now define the cleavage line, although this definition will be extended later.
Definition: A cleavage line is any line through the origin (i.e., through the midpoint between the D and R locations) that constitutes an indifference line between D and R.9

When the two dimensions are weighted equally, as in the usual Euclidean distance, (i.e., \( w = 1 - w \) and thus \( w = 0.5 \)), the indifference line becomes simply

\[
xD_x + yD_y = 0,
\]

that is, the line perpendicular to the vector \((D_x, D_y)\) or, equivalently, perpendicular to the line between D and R. For example, if \( D = (-1, 2) \) and \( R = (1, -2) \) for ordinary Euclidean distance (when \( w = 0.5 \)), this gives us \( y = x / 2 \). This cleavage line is shown in Figure 1(b).

If \( w = 0 \), the axis of cleavage is a horizontal line; as \( w \) increases, the cleavage line rotates counterclockwise around the origin until \( w = 1 \) and the cleavage line is vertical. As the line rotates, it passes over voter ideal points in both the upper right quadrant and the lower left quadrant.10 When \( w = 0 \), all voters in the upper right quadrant are on the D side; as the rotating line passes over a voter ideal point in this quadrant, that point moves to the R side. At the same time, all voters with voter ideal points in the lower left quadrant are R voters when \( w = 0 \). As the cleavage line rotates past them, they become D voters. When \( w = 1/2 \), the two dimensions are weighted equally and the axis of cleavage, i.e., the line perpendicular to the cleavage line, is simply the line between the two candidate positions. This example suggests the following definition.
**Definition:** The *choice line* is the line perpendicular to the cleavage line that passes through the origin, defined by \( y = [(1 - w)D_y / wD_x]x \).

For any set of weights \((w, 1 - w)\) on two dimensions, the choice line is a unidimensional representation of voter choices, in the sense that voter choice based on projections onto that line gives us the same results in terms of voter preferences among the two candidates as do the corresponding weighted distances in the two dimensions.

If \( w = 1 - w = 0.5 \), the choice line is defined by \( y = [D_y / D_x]x \) and is shown in Figure 1(c) for the three-voter example. Preference for the candidate who is closest to the voter’s projection on this choice line is equivalent to that determined by the cleavage line showing Euclidean preferences when the two dimensions are weighted equally (as shown in Figure 1(b)).

The above results show that changes in the weights of the different dimensions can have non-monotonic implications on electoral outcomes. Depending on the exact distribution of voter ideal points, as we increase \( w \) may initially pick up some voters for R in the upper right quadrant, and then lose some others in the lower left, etc.

**Remark:** An equivalent way to specify cleavage lines is in terms of an angle of rotation that we will label, to parallel language used in real politics, as a *spin* angle, which we define as the angle, \( \beta \), corresponding to the cleavage line with weights \( w \) and \((1 - w)\) for which

\[
\beta = \arctan[-wD_x / ((1 - w)D_y)], \quad \text{i.e.,} \quad \tan \beta = -wD_x / ((1 - w)D_y),
\]  

(3)
where \( 0^\circ \leq \beta < 90^\circ \) for \( 0 \leq w < 1 \) and \( \beta = 90^\circ \) for \( w = 1 \).^{11}

For \( 0 \leq w \leq 1 \), it is straightforward to interpret heresthetic attempts to increase (decrease) \( w \) as simply an attempt to persuade voters to place more weight (i.e., place greater importance) on the horizontal (vertical) dimension relative to the other dimension, with the extreme cases being \( w = 0 \) and \( w = 1 \). But we can also consider rotations of the cleavage line past the vertical, i.e., into the upper left quadrant and the lower right quadrant and extend the definition of the spin angle to specify these cleavage lines, so that \( 0^\circ \leq \beta \leq 180^\circ \). We show in Figure 2 the consequences for who wins for the example shown in Figure 1(a) for all values of \( \beta \), \( 0^\circ \leq \beta \leq 180^\circ \).

<<Figure 2 about here>>

When, however, we are looking at angles larger than 90 degrees in cleavage lines, it is not so straightforward how to interpret the heresthetics of the situation. One way to think about this is in terms of situations where a position on an issue can be interpreted as how much a voter wishes to spend on that issue. For issues that can be formulated in terms of spending, spin angles between 0 and 90 degrees correspond to the share of total spending to be devoted to each issue, i.e., with the values of \( w \) and \( 1 - w \) representing the relative shares of the pie that go to each issue, while angles larger than 90 degrees can be interpreted in terms of how large a pie the voter favors.

We show in Figure 1(d) the projections onto the choice line that weights the two dimensions equally but now looks at total spending (the sum of the horizontal and
vertical dimensions), not at the relative levels of spending on the two dimensions. Other
spin angles between 90 and 180 degrees can be interpreted in terms of total weighted
spending, where spending on one issue matters more for voter choice than spending on
the other issue, but total spending (rather than relative spending) also matters.

While it almost certainly makes most sense to think about how persuasion might
actual operate in terms of priming (weighting of issues) rather than rotations, for some
purposes it is easier mathematically to represent results in terms of angle of rotation of
choice lines. In the next section we will state results in terms of angles of rotation
because that allows us to make use of insights from Fourier analysis. The equivalence
we have given above between weights and rotation (spin) then allows us to restate the
rotational results in terms of weights, and vice versa.

3. Fourier Analysis of Non-Monotonic Weighting Effects

Let us continue with our two-dimensional framework involving competition
between two candidates, D and R, but assume now a continuous voter distribution. First
we proceed to a more formal exposition of the basic ideas of the heresthetics of issue
weighting/spin, and then we show how non-monotonicities can be expressed in terms of
the Fourier structure of the voter preference distribution.

With voter and candidate positions fixed, suppose \( m \) is the midpoint between the
candidates, D and R. Let C be the circle with center \( m \) that passes through D and R.
Then the points on the circle can be parametrized by \( m + (r, \alpha) \) where \( r \) is the radius of
the circle and \( \alpha \) varies between 0 and 360°. We are concerned with how the cleavage
lines through the point $m$ that result from issue salience partition the voter distribution and how they relate to majorities for D or R.

The side of a cleavage line on which a particular voter location (not located at $m$) falls depends only on the angle made by the vector from $m$ to the voter’s location. Accordingly, for convenience, we project all voters onto the circle $C$, i.e., each voter at location $(R, \alpha)$ is projected onto the location $(r, \alpha)$. Assuming that the probability of voters located at $m$ is zero, for purposes of our analysis using cleavage lines, all of the information about the voter distribution is captured by the distribution of projection points on the circle $C$. We refer to the probability density function $f$ of projection points as the *voter projection function*.¹³ We propose to characterize the voter distribution and determine the effects of varying candidate positions and cleavage angles on candidate vote share in terms of the Fourier expansion of the voter projection function.

The Fourier expansion of the function $f$ is of the form

$$f(\alpha) = \frac{1}{360} \sum_{n=1}^{\infty} c_n \cos n(\alpha - \phi_n), \quad 0 \leq \alpha \leq 360^\circ,$$  \hspace{1cm} (4)

where $c_n$ is the amplitude and $\phi_n$ is the phase shift. Each term of the form $c_n \cos n(\alpha - \phi_n)$ is called the $n$th harmonic. The value of $c_0$ is set to $1/360$ and the values of the amplitudes $c_n, n = 1, \ldots$ are constrained so that $f$ is a probability density function, in particular so that $f$ is non-negative and integrates to unity (see Merrill and Grofman 1997 for the representation of the voter distribution by Fourier series).

For even values of $n$, the harmonics of the Fourier expansion are each symmetrical with respect to the point $m$, i.e., these terms have the same value at $\alpha$ and at $\alpha + 180^\circ$ for any $\alpha$. Hence any harmonic with even $n$, or any function that is a
combination only of even-numbered terms, constitutes a generalization of the Plott (1967) conditions for symmetry, so that all median lines cross at $m$, i.e., $m$ is the core of the voter distribution. No matter in what direction the cleavage line is drawn, it constitutes a median of the voter distribution and each candidate receives one half of the vote.

Thus, it is the odd-numbered harmonics that are of primary interest in determining the majority winner. For simplicity we first suppose that the phase angles are all 0. For the $n^{th}$ harmonic, this simply rotates the voter distribution by the phase angle, $\phi_n$. The angular position of candidate D, denoted by the angle, $\rho$, is the angle between the X-axis and the location of the candidate D (in the conventional counter-clockwise direction). Furthermore, $\alpha$ is equal to the spin angle, $\beta$, i.e., the angle between the X-axis and the cleavage line as defined in equation 3 and extended in the paragraph following equation 3, where $\beta(=\alpha)$ is taken to lie between angle 0 and angle 180°.14

The $n$th harmonic represents a spatial model concentration of the electorate near $n$ nodes or poles. For example, the 3rd harmonic -- representing three concentrations of voters -- might be used to model the American electorate at mid-twentieth century consisting of Republicans, northern Democrats, and southern Democrats in which the dimensions might be economic issues and civil rights.

General figures, paralleling Figure 2 for our previous 3-voter example, are shown in Figure 3 for the first order, third order, fifth order, and seventh order harmonics.15

<<Figure 3 about here>>
Figures 3(a)-3(d) provide general illustrations of the non-monotonicities associated with priming effects that we identified in the introductory section of the paper, with different patterns for each of the harmonics. Note that each $n$th harmonic (for odd $n$) offers the potential for $n + 1$ separate cleavage regions for each candidate, as is the case for three of the examples in Figure 3(a, c, and d). For the example in Figure 3(b), however, which depicts the 3rd harmonic and in which candidate D is placed at the worst possible location, there are only two, not four, separate cleavage regions. Such an occurrence is a knife-edge result, so that in general $n + 1$ separate cleavage regions occur for each candidate with probability 1 for a pure harmonic with odd $n$.

Any real world voter projection function will, of course, almost certainly involve a composite of multiple harmonics. Still, one or more of the odd harmonics may dominate, i.e., the absolute value of its coefficient may be much larger than that of the other coefficients, reflecting a particular spatial pattern of voting blocs, i.e., groups of voters who have similar patterns of ideological preferences in the two dimensional issue space. On the other hand, the more different significant harmonics there are in the Fourier decomposition of the voter projection function, the more complex is the likely structure of the distinct voting blocs.

In general, the lower order harmonics (in particular the 3rd harmonic representing three spatial concentrations of voters) give rise to greater motivation for the parties/candidates in two-party competition to seek to manipulate issue salience. That is because each span of angles in which a given candidate wins is wider and the amplitude of variations in the voter distribution is greater. In this case, any manipulation that succeeds in locating the voters’ salience weights within a favorable zone assures a
winning position. In contrast, for higher order harmonics, it is more likely for candidates to overshoot or undershoot the angular span that would represent successful priming.

For example, suppose we consider again the example in which a Democratic candidate is located at $D = (-1, 2)$ and the Republican at $R = (1, -2)$, and suppose that each is supported by polarized constituencies concentrated about one of these two points. If the two issues are weighted equally, then the cleavage line is given by $y = x / 2$.

Suppose, now, that there is also a third concentration or bloc of voters near the point $(2,1)$, which lies on the cleavage line, so that these voters split their support between the two candidates. Finally, suppose that the Republican candidate successfully increases her emphasis of the horizontal dimension, thereby increasing the spin angle of the cleavage line. This maneuver delivers votes to candidate R from the third bloc but hardly affects votes from the other two blocs, which are far from the original cleavage line, so that R can expect to win the election.\(^\text{17}\) The effectiveness of such strategies depends on the concentration of the blocs and the degree of separation between them. This example represents very roughly an electorate whose 3\(^{\text{rd}}\) harmonic is dominant, in which priming is relatively likely to be feasible.

If we take as baseline a uniform distribution over the entire feasible range of spin angles, then the probability that a given voter distribution will generate a victory for a given candidate is the proportion of angles in which that candidate is victorious.\(^\text{18}\) In the appendix we show how these probabilities can be calculated for any odd-numbered harmonic.\(^\text{19}\)

In the next section we turn to an empirical analysis of the relationship between the voter distribution and non-monotonicity of the effects of priming.

We provide empirical evidence of the existence of non-monotonic patterns in a U.S. presidential contest when weights on the dimensions of competition are varied. We consider the implications of two important dimensions of political disputation in the United States: spending on social services and spending on defense. The National Election Survey (NES) has frequently collected information on voter preferences on each of these dimensions (defined in terms of more or less spending) along with voter perceptions of candidate positions on each issue.20 We use these data to examine the Bush-Gore contest in 2000.

For each particular axis, we assume that each candidate and each voter has a preferred position. However, it is well recognized that respondents vary in their subjective placements of the different candidates. To simplify the analysis, we act as if candidates actually have fixed positions in the space, with respondents sometimes misperceiving those positions. As a practical simplification to illustrate priming effects, we use the average of all of the respondents’ perceptions to provide a best overall indicator of the position of the candidates. Then, we determine each respondent’s preferences between the candidates based upon the respondent’s own position and the mean perceived candidate position. As in the previous section we will present results in terms of rotations.

In 2000, George W. Bush was closer to the majority of respondents on each of the dimensions of social services and defense taken individually. However, Figure 4 shows
that Bush would not get a majority of preferences for all cleavage angles in between. At various weightings, including near equal weighting of the two different issue dimensions, Al Gore would get a majority of votes. Thus, even though Bush would get a majority if either dimension were considered alone, he could lose the majority if the weightings changed over the two issues (or equivalently, if the two issues were projected onto certain choice lines). This provides a stark example of non-monotonicity, where a candidate could gain or lose by emphasizing a particular issue dimension. In particular, while either Bush or Gore might have benefited by being able to shift the relative issue weights of the voters in order to cross a particular cleavage line from a zone where they lost to a zone where they won, such nuanced appeals would have been highly problematic because of the close proximity of the cleavage regions depicted in Figure 4, which would make overshooting or undershooting of targets very likely.

<< Figure 4 about here >>

The rather chaotic pattern in 2000 vis-à-vis priming effects shown in Figure 4 is not surprising, because the midpoint between Gore and Bush on each primary dimension was very close to the median of the voter preferences on each dimension. More specifically, we can determine that, for this set of voter locations, the Fourier coefficient $c_5$ of the voter projection function is small whereas the coefficients $c_5$ and $c_9$ are relatively large, indicating that higher order, odd harmonics exert a significant effect. Thus, based on the observations in section 3, many oscillations between wins by Gore and wins by Bush can be expected as the cleavage line rotates. In fact, there are 10
(i.e., $9+1$) cleavage regions for each candidate (see Figure 4). This reflects the strength of the $9^{th}$ harmonic and the uneven distribution of voter ideal points with respect to social service and defense spending.

Figure 5 shows, for each cleavage angle, the share of the vote that Bush would have been predicted to have received in the 2000 presidential contest. It shows that, not only is there non-monotonic variation in which candidate wins as we increase the spin angle, but also that there is considerable variation in exactly how close the election would have been in terms of the popular vote.\textsuperscript{22}

The patterns shown in Figure 4 and Figure 5 suggest that, even if we knew all voter preferences, the Bush-Gore contest was an election whose winner might be hard to predict at the level of the overall popular vote --- even though Bush appeared to have the majority position on both issues and even though the majority of the graph is shaded to indicate a victory for the Republican candidate. In terms of the two issues we have identified, the 2000 U.S. presidential election was a difficult one for political strategists in both camps because neither candidate could plan a simple strategy about the relative emphasis to place on issues with any confidence that such a strategy could command a stable majority of voters if the persuasion efforts of the candidate directed to changing voter salience weightings did not have the \textit{precise} effects anticipated.

In contrast, when similar analyses are performed for the elections of 1988 and 1996; each indicates dominance by the first harmonic and in each case – as expected –
only two cleavage regions per candidate are found. (For both elections, $c_9$ is about as 
large as $c_1$ but, as indicated in the Appendix, vote shares deviate less and less from 1/2 as 
n increases, so that the first harmonic still dominates the 9th harmonic.)

5. Discussion

The standard Downsian approach to candidate/party competition emphasizes 
party/candidate location as the driving force in voter choice, with voters choosing the 
issue platform closest to the voter's own ideal point. But, often the location of candidates 
will be, if not completely fixed, at least constrained, with only limited "wiggle room." Here, paralleling ideas in Petrocik (1996) on "issue-ownership," we have looked at 
situations in which certain issues favor a particular party or candidate. We have offered a 
broader notion of strategic choice, in which candidate decisions go beyond the choice of 
policy platforms to include decisions about persuasive aspects of the campaign -- here, 
which dimensions to emphasize (as well as which views about total spending to 
propound). In such situations, although we have not looked at the actual mechanics of 
persuasion, we have looked at the consequences of attempts to persuade voters to change 
the relative importance that they attach to different issues, taking the candidate’s issue 
positions as (largely or entirely) given.

It is natural to ask “How do our analyses contribute to understanding the strategic 
issues in two-party political competition?” We offer five answers to that question.

First, even if we had done nothing else, our paper reminds spatial modelers that 
the notion of equal (or even fixed) weights on the issue dimensions -- an assumption of
literally hundreds of papers on spatial models written since Downs (1957)-- completely
neglects the possibility that candidates also compete by trying to make some issues more
important than others.\textsuperscript{24}

Second, we articulate the equivalence of dimensional salience weighting and
rotations of axes of cleavage. Although this is a simple and intuitive equivalence, it
seems not to have received the attention it deserves.

Third, we show that, contrary to the initial intuition of at least one of the present
authors, in some real world elections, e.g., that of 2000, there can be no obvious practical
strategy concerning priming, i.e., what weights each candidate ought to try to persuade
the voters to place on the different issues. Even if a candidate could persuade voters to
shift weightings toward a range of weights favorable to that candidate, the potential for
undershooting or overshooting renders such a strategy highly vulnerable to backfiring. In
an electorate, however, that can be modeled primarily in terms of lower order harmonics
– particularly a 3\textsuperscript{rd} order harmonic -- such priming may be more feasible.

Fourth, and relatedly, in general, dominant higher order harmonics make it harder
to forecast the winner since the outcome is so sensitive to small changes in issue
weighting by the voters. We show (in the appendix), however, that we may still be able to
assess the relative probability that each candidate wins as a function of the cleavage
angles, and thus evaluate the robustness of electoral prediction.

Fifth, Figure 5 shows how the competitiveness of the election (and not just the
identity of the winner) can vary with spin angle.

Our work (like that of Humphreys and Garry 2000) has shown specifically how,
given the geometry of voter choice, perverse effects of dimensional weightings can arise.
We believe we are the first, however, to show that such perverse possibilities are empirically not just possible, but actually found in real world elections -- as we have demonstrated for the U.S. presidential election of 2000. Our illustrative analysis of the configuration of voter preferences and candidate positions in the 2000 American presidential elections shows the complexities arising when candidates can compete by seeking to vary the issue saliences of the different dimensions.

There is a considerable body of empirical work on priming (Iyengar and Kinder 1987; Krosnick and Kinder 1990; Johnston et al. 1992; Druckman 2004; Druckman, Jacobs and Ostermeir 2004), including work on the effects of attempts to increase the salience of racial considerations (e.g., Mendelberg 2001). The key intuition is that priming can occur both through specific claims being offered about the importance of given issues (or, more rarely, the relative non-importance of others), but also by simply making certain issues more visible to the voters by talking about them more, or by framing ads in such a way that the given issue dimension is clearly in the background (e.g., an ad about a paroled criminal committing a crime can raise the salience of “law and order” concerns). However, links between this literature on priming and, on the one hand, Rikerian ideas of heresthetics and, on the other hand, neo-Downsian models of voter choice, have not yet been clearly articulated.

Let us summarize what our results say about priming: In this essay we have been able to offer a formalization in neo-Downsian terms of the potential consequences of priming for two-candidate competition over a two dimensional issue space. We show the theoretical logic underpinning the intuition that, when there is issue-linked voting, priming can be important in affecting election outcomes, especially if there are only a
limited number of large blocs of relatively ideologically concentrated voters. But we also show that priming is far more complicated than is commonly thought, especially if there are many distinct blocs of relatively ideologically concentrated voters. For example, we have shown that even if one issue is “owned” by one party in the sense of that term intended by John Petrocik (1996), giving more weight to the issue owned by that party does not necessarily improve the party’s chances of victory.

There are a variety of issues that suggest themselves for future work, but that are well beyond the scope of this paper.

First, it would be desirable to extend our results to multiparty competition (but still within the confines of two-dimensional competition). We believe that this is doable. If we assume that the equivalent of weighted distance is what determines voter choice then, as we rotate a cleavage line, we change the relative vote shares of the parties.

Second, it might be possible to extend our model, which assumes that parties and candidates manipulate the overall level of salience attached to particular issues, with a more nuanced model that would allow variation in the salience different voters attach to different issues. In such a model, for example, part of the electorate might consist of “single issue” voters.

Third, our restriction to two dimensions is not nearly as limiting as it might first seem. There is theoretical work showing how multiple issue dimensions may be restricted to a space that has the same dimensionality as the number of candidates, or at most the number of candidates plus one (Hinich and Munger 1994; Taagepera and Grofman 1985; cf. Glazer and Grofman 1989). Furthermore, there is empirical work showing that party
competition often takes places primarily in one or at most two dimensions (Poole and Rosenthal 1997).

Finally, and perhaps most importantly, it would be valuable to give a direct empirical component to this line of research by exploring actual campaign strategies to see how different camps think about the dimensionality of the issue space and whether they seek to take advantage of a perceived potential for manipulation of issue salience in that issue space.
Acknowledgements: Earlier versions of portions of this paper were given at the Annual Meetings of the Public Choice Society, in San Antonio, March 2001 and in San Diego, March, 2002, and at the Annual Meeting of the European Public Choice Society, Aarhus, Denmark, April 26-28, 2003. This earlier research was partially supported by National Science Foundation grant SBR 97-30578 (to Bernard Grofman and Anthony Marley), Program in Methodology, Measurement and Statistics; more recent work was supported by SSHRCC research grant #410-2007-2153. (co-PIs: Stanley Winer and Stephen Ferris), on which Grofman is an associate investigator, by the Jack W. Peltason (Bren Foundation) Chair, University of California, Irvine, and by the UCI Center for the Study of Democracy. We are indebted to Clover Behrend for library assistance and to Joseph Godfrey for assistance in programming and some of the graphics used in this paper. We are indebted to the ICPSR for access to data from the U.S. National Election Studies.
ENDNOTES

1 For an identification of other aspects of political competition neglected by the standard Downsian approach, see Skaperdas and Grofman 1995.


3 We will have more to say about the empirical literature on priming in the concluding discussion.

4 Survey data on voter positions and candidate placement is taken from the National Election Study conducted under the auspices of the University of Michigan.

5 To avoid technical complexities caused by knife-edge results such as the possibility of ties, we assume that there are an odd number of voters and that no two voters are located at the same point, i.e., we assume that no two voters have identical preferences. The latter assumption can be dropped were we to look at weighted voting games.

6 Knowledgeable readers will recognize this situation as one where there is no core point, i.e., an alternative that can defeat (or at least avoid being defeated by) all other alternatives in paired competition. However, some seemingly perverse results can occur with weightings even when there is a core if both candidates are not at the core or on a line that passes through it.
Our formalization is a special case of specifying weighted distances between \( v = (x, y) \) and \( D = (D_x, D_y) \) by \( \|v - D\|_4 = (x, y)A(D_x, D_y)^T \) where \( A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \), \( a_{11} = w, \)

\[ a_{22} = 1 - w, \text{ and } a_{12} = a_{21} = 0 \] (see, e.g., Enelow and Hinich 1984).

To derive equation 2, replace the inequality in equation 1 with an equality and solve for \( x \) and \( y \), recalling that \( (D_x, D_y) = (-R_x, -R_y) \).

For any number of dimensions, an issue-weight \( w \) specifies a separating hyperplane defining the half-spaces of voters who vote for the respective candidates.

If the candidate points lay instead in the upper right and lower left quadrants, the cleavage lines would rotate through the upper left and lower right quadrants.

The initial formulation of this equivalence between “spin angle” and salience weight was suggested to us by Guillermo Owen (personal communication, 2008).

An alternative geometric way to view changes in weightings of dimensions is in terms of “stretchings” or “shrinkings” of one or both issue dimensions. Such topological changes can be displayed visually, but we will not pursue this approach further here since it is essentially equivalent to weighting dimensions and thus adds nothing new.

We assume regularity conditions for the function \( f \), namely that \( f \) is continuous and piecewise smooth. A function is piecewise smooth if it has left and right derivatives at every point and – except possibly for a finite number of points – these are equal and define a continuous derivative.

Note that the other end of the cleavage line is at the antipode of the circle, at angle \( \alpha + 180^\circ \), so that the cleavage lines “repeat” after \( 180^\circ \).
Because the three voters in Figure 1(a) are not symmetrically spaced, more than one harmonic would be needed to represent voter preferences.

For an \( n \)th harmonic function \( f \) (where \( n \) is odd), the majority switches each time the cleavage line passes through a minimum or maximum value of the function \( f \) (a total of \( 2n \) times) and also when the cleavage line passes through the line between the candidates (2 times). Thus, there are typically \( (2n + 2) \) cleavage regions and hence \( (2n + 2)/2 = (n + 1) \) majority sectors for each candidate. This latter number may be reduced to \( n \) if the line connecting the candidates coincides with a minimum or maximum of \( f \) as in Figure 3(b).

Conversely, the Democrat can increase her vote share by giving more emphasis to the vertical dimension. Had the third bloc been centered at \((-2,-1)\) in the lower left quadrant, then the favorable issues to prime for the two candidates would have been reversed.

We may also calculate the vote shares of each candidate at each angle of spin (see Figure 5 below).

Of course, these probabilities are only suggestive, because the degree of priming is a choice of the two contestants.

Voter and candidate positions are on the conventional 1-7 Likert scale.

The Fourier coefficients \( c_1, c_3, c_5, c_7, c_9 \) for the 2000 electorate are 0.018, 0.026, 0.046, 0.018, and 0.049.

Of course we recognize that the actual contest was fought at the state level, in terms of the Electoral College, but we are not alone in neglecting that complication when
considering presidential elections in the United States. Indeed, there are only a relative handful of formal papers that allow for this complexity by going beyond the popular vote in looking at presidential election competition (see e.g., Owen 1975).


24 Our work is also directly related to the saliency theory approach to political competition (Robertson 1976; Budge and Farlie 1983) which highlights how parties employ selective emphasis on issues: rather than taking a (maybe unpopular) position on all issues, parties focus only on those issues where they are perceived as particularly credible (e.g., defense of the welfare state for leftist parties, law and order for conservative parties, etc.). In our opinion, though, the most interesting feature of saliency theory is one that is seldom mentioned in the literature: the (often successful) attempts of parties to convert a positional into a valence issue by carefully hiding the implied policy trade-off. As an example, a leftist party will emphasize its preference for a larger and better welfare state, but will hardly mention that this would imply higher taxes, while conservative parties will emphasize their promise of lower taxes, carefully hiding that this would imply a substantial reduction of welfare state provisions. In other words, the (selective) emphasis on only one side of a policy tradeoff is the tool that parties can employ to frame in valence terms (shared goals for the whole community) issues that in principle are inherently positional, i.e., with clearly defined policy alternatives.

25 There are many ways in which candidates and their supporters can seek to change the salience of different issues and thus to affect voter choices. For example, Salvanto (2000) has looked at the effects of ballot referendums in California on voter perceptions of the most relevant campaign issues. His analyses look both at the anticipated
consequences of decisions to place particular referendums on the ballot and on the
decisions of some candidates to identify their own campaigns with particular ballot
issues, a practice he call “referenda as running mates.” In California in 1994, the
incumbent Republican governor, Pete Wilson, ran an anti-illegal-immigration platform
and strongly associated his campaign with the campaign to pass Proposition 187, a
referendum proposing to eliminate state spending on public services for illegal
immigrants. By associating himself with a YES vote on the referendum he increased the
salience of the immigration issue for those voting on the governor's race. While this
strategy appeared to make sense for Wilson, in that a substantial majority of voters were
in favor of Prop. 187, the results in this paper show that we must be cautious in assuming
that being associated with the winning side of an issue necessarily benefits a candidate as
the (relative) weight attached to that issue increases among voters.

26 There are also other literatures on persuasion in both political science and social
psychology. Perhaps the most relevant for present purposes is the literature on
campaigning that look, e.g., to the effects of negative campaigning (e.g., Ansolabehere
and Iyengar 1995; Skaperdas and Grofman 1995; Ansolabehere, Iyengar and Simon
1999; Sigelman et al. 1999), or to the effects of endorsement cues (e.g., Lupia and
McCubbins 1998), or to selective information attention and retention effects (e.g., Zaller
APPENDIX: Calculating Probabilities of Victory for Any Odd -Numbered Harmonic.

Consider the 1st harmonic, which, without its coefficient, is \( \cos(\alpha) \) [so that \( f(\alpha) = (1/360) + \cos(\alpha) \)]. This harmonic has its maximum value at \( \alpha = 0 \), at the rightmost point on the circle, and its minimum value at \( \alpha = 180^\circ \), the leftmost point on the circle. For cleavage lines between 0 and 180°, the semicircle containing angle 0 holds a majority of the voter distribution, so that the candidate wins who is in the same semicircle as angle 0. Thus, D wins if \( \rho < \alpha < 180^\circ \) and R wins otherwise. Thus, if \( \alpha \) is uniformly distributed over the semicircle (intuitively, if all cleavage lines are equally likely) the probability that D wins is simply the proportion of the semicircle in which it wins, i.e.,

\[
g_1(\rho) = \Pr[D \text{ wins}] = \frac{|\rho - 180|}{180}. \tag{A1}
\]

Considering now the 3rd harmonic \( \cos(3\alpha) \) and again assuming that \( \alpha \) is uniformly distributed, the wins for D will occur according to the results shown in Table A1, where all angles are in degrees. We conclude that the a priori probability that D wins, i.e., the proportion of the cleavage lines on which D is the winning candidate, is given by

\[
g_3(\rho) = \Pr[D \text{ wins}] = \frac{1}{180} \text{mod}(\rho, 120) - \frac{1}{3} + \frac{1}{3}. \tag{A2}
\]

where \( \text{mod}(\rho, 120) \) denotes the remainder when \( \rho \) is divided by 120. Note that the probability that D wins is highest when \( \rho \) (i.e., the angular position of candidate D) is
near one of the three modes of the harmonic, which occur in this initial example at
\(\rho = 0^\circ, \rho = 120^\circ, \text{ and } \rho = 240^\circ\). Values of this probability vary between 1/3 and 2/3,
and are plotted in Figure A1.

<<Table A1 and Figure A1 about here>>

In general, for \(n\) odd, we may set \(n = 2k + 1\), and the \textit{a priori} probability that D
wins is given by
\[
g_n(\rho) = \Pr[D \text{ wins}] = \frac{1}{\left\lfloor 180 \mod (\rho, 360/\,n) \right\rfloor + \frac{k}{n}}. \quad (A3)
\]
It follows that, for \(n = 2k + 1\),
\[
\frac{k}{n} < \Pr[D \text{ wins}] \leq \frac{k + 1}{n}. \quad (A4)
\]
Coupled with the fact that, for \(n = 2k\), \(\Pr[D \text{ wins}] = 1/2\) for all \(\rho\), we have
\[
\lim_{n \to \infty} \left| \Pr[D \text{ wins}] - 1/2 \right| = 0, \quad (A5)
\]
uniformly in \(\rho\).

If we now take account of the phase shifts, \(\phi_n\), the plots for \(\Pr[D \text{ wins}]\) are each
simply shifted to the right by \(\phi_n\). Thus, for example, for \(n = 3\), the probability that D
wins is highest when \(\rho\) is near the three modes of the 3rd harmonic, i.e., at \(\phi_n, \phi_n + 120^\circ, \text{ and } \phi_n + 240^\circ\).

So far we have addressed the question: How does the probability of the set of
cleavage lines for which D wins vary as the axis between the candidates’ positions
changes its alignment with a given harmonic? Now we consider the question: For a fixed
location for D and R, i.e., for a fixed axis between D and R, how does the proportion of votes received by D (and hence by R) vary as the cleavage line rotates, i.e., as the spin angle $\alpha$ varies from 0 to $180^\circ$?

Denoting by $V_n(\alpha)$ the proportion of the vote received by D when the spin angle is $\alpha$ and the voter projection function is the $n$th harmonic for odd $n$ plus a constant, i.e., (setting $\phi_n = 0$), of the form $f(\alpha) = (1/360) + c_n \cos n\alpha$, we observe that

$$
V_n(\alpha) = \begin{cases} 
\int_{\alpha}^{\alpha+180^\circ} \frac{1}{360} [1 + c_n \cos nx \, dx], & \text{for } 0 \leq \alpha < \rho \\
\int_{\alpha+180^\circ}^{\rho} \frac{1}{360} [1 + c_n \cos nx \, dx], & \text{for } \rho \leq \alpha < 180^\circ
\end{cases}
$$

Thus, the proportion of the vote received by D oscillates above and below $\frac{1}{2}$ in a sinusoidal fashion, more and more rapidly for large values of $n$. Furthermore, as $n$ increases, the oscillations are increasingly dampened, so that for high values of $n$, D’s vote share varies only from slightly below to slightly above $\frac{1}{2}$. Plots of D’s vote share are presented in Figure A2 for the first three harmonics. Note that, for each harmonic, discontinuities occur when $\alpha = \rho$.

<<Figure A2 about here>>
Figure A1.

Probability that candidate D wins, as a function of the angular position of candidate D
Figure A2.

Candidate D’s vote share as a function of the spin angle, for selected harmonics.

Note: Candidate D is placed at angle 60° from the zero point of the harmonics.
Table A1.
Win probabilities for the 3rd harmonic

<table>
<thead>
<tr>
<th>Candidate interval</th>
<th>P wins if:</th>
<th>Length of winning interval for D</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 &lt; \rho &lt; 60$</td>
<td>$\rho &lt; \alpha &lt; 60$, or 60 $&lt; \alpha &lt; 180$</td>
<td>$120 - \rho$</td>
</tr>
<tr>
<td>$60 &lt; \rho &lt; 120$</td>
<td>$60 &lt; \alpha &lt; \rho$, or 120 $&lt; \alpha &lt; 180$</td>
<td>$\rho$</td>
</tr>
<tr>
<td>$120 &lt; \rho &lt; 180$</td>
<td>$60 &lt; \alpha &lt; 120$, or $\rho &lt; \alpha &lt; 180$</td>
<td>$240 - \rho$</td>
</tr>
</tbody>
</table>
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Figure 1.
(D)emocrat and (R)epublican Candidates With Three Voters 1,2,3

1(a) Voter Ideal Points
1 (b) The Cleavage Line that Mimics Euclidean Preferences with Equally Weighted Dimensions: Domestic Spending versus Military Spending
Figure 1. (cont.)

1 (c) The Choice Line that Mimics Euclidean Preferences with Equally Weighted Dimensions: Domestic Spending versus Military Spending
1(d) Choice Line Based Upon Total Spending (Military plus Domestic) With Equally Weighted Dimensions
Figure 2.
All Possible Weights (Based on Lines of Cleavage)
for the Three Voter Example in Figure 1(a)

Note: D Gets the Majority in the Shaded Areas.
Figure 3

Majorities for D and R, for selected harmonics,
with D located at 60° and phase angle $\phi_n = 90°$.

Notes: D wins in shaded areas; R in unshaded areas. Because the phase angle is 90°, the cleavage line rotates from the vertical position in a counter-clockwise direction.

A. 1st harmonic.

B. 3rd harmonic. Note that for the 3rd harmonic, D’s location at 60° (at a minimum of the harmonic) is its worst possible position, so that there are only two, not four, separate cleavage regions.
Figure 3 (cont.)

Majorities for D and R

C. 5\textsuperscript{th} harmonic.

D. 7\textsuperscript{th} harmonic.
Notes: Possible outcomes are specified in terms of choice lines. Bush wins in shaded areas; Gore wins in unshaded areas.
Figure 5.
Expected Proportion for G. W. Bush as a Function of Rotation of the Line of Cleavage