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Context-dependent voting and political ambiguity☆

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Abstract

In recent decades psychologists have shown that the standard model of individual choice is often violated. One regularly observed violation is that choices are influenced by the decision context. To incorporate these effects into politics, we introduce a theory of context-dependent voting and apply it to the puzzle of why candidates are so frequently ambiguous in their policy pronouncements. We show that context-dependent voters develop a taste for ambiguity, even when they evaluate distances quadratically and exhibit traditional risk aversion. Turning to aggregate effects, we incorporate context-dependent voting into a model of electoral competition and show that strategic candidates respond in equilibrium to context-dependent voters by offering ambiguous platforms, thereby affecting the policy outcome.

Keywords: Behavioral political science; Political ambiguity; Electoral competition; Context-dependence

1. Introduction

A frequent refrain during elections is that the policy positions of the competing candidates cannot be pinned down precisely and it is said that candidates are ambiguous. While some of this effect is driven by imprecise communication mechanisms and voter apathy, it is widely accepted that ambiguity is largely the result of strategic obfuscation by the candidates themselves (Downs, 1957; Key, 1966; Page, 1976, 1978).

Formal analysis of political ambiguity began when Shepsle (1972), building on work of Zeckhauser (1969), asked the following question: in a single dimensional policy space, what conditions would induce a candidate to offer an ambiguous platform? The answer produced by Shepsle is sharp: candidates offer ambiguous platforms if and only if voters are risk seeking.[1] This simple result has provided a benchmark for understanding political ambiguity over ensuing decades. Unfortunately, despite its simple elegance, Shepsle's finding does not correspond to empirical evidence that voters are not risk seeking and on average are somewhat risk averse (Bartels, 1986; Alvarez, 1997; Berinsky and Lewis, 2007). Thus, while Shepsle defined and sharpened the theory of ambiguity, the dissonance between his necessary condition and the empirical evidence leaves the larger issue of ambiguity unresolved.

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[1] The term ambiguity is used differently in political science relative to its modern meaning in economics. We follow Shepsle (1972) in defining ambiguity as a lottery over policy positions with a known probability distribution, what economists would now consider risk.

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In this paper we reexamine Shepsle's question, focusing on the behavior of voters. Shepsle conducted his analysis with a model of voting that dates back at least to Hotelling. This theory, although simple, imposes strict assumptions on the rationality and, consequently, the preferences of voters. In particular, Hotelling's theory assumes voter preferences are well defined and satisfy the axiom of independence of irrelevant alternatives (that is, voters have a complete preference order over all alternatives). In other settings an abundance of evidence has accrued showing that this axiom and this model of individual choice is often violated. One frequently observed violation is that individual choice is influenced by the choice context (Tversky and Simonson, 1993).

We conjecture that similar effects arise with voting and introduce to ambiguous political environments a theory of *context-dependent voting*. We show that if voting is context-dependent then voters develop a taste for ambiguity. Notably, this preference arises even when voters evaluate distances quadratically and are, in the classic sense, risk averse. The voting behavior generated by our theory is different to simply assuming risk-seeking preferences in the Hotelling framework. We find that context-dependent voters are not globally risk seeking, rather their taste for ambiguity varies according to the context.

Context-dependent voting is motivated by the idea that voters do not evaluate candidates individually, but rather in the context of a larger choice set. Therefore, the attributes of all candidates affect a voter's evaluation of each one. For example, for a left wing voter the attractiveness of a left wing candidate is greater the more right wing is the opposing candidate. Context-dependent voting, by requiring that candidates be evaluated both directly and contextually, severs the logical link between risk aversion and a preference for unambiguous policy platforms. By incorporating the impact of context into voter decision making we show that the empirical evidence is not inconsistent with a taste for ambiguity.

After establishing an individual preference for ambiguity, we turn to the aggregate impact of this behavior on policy outcomes. We incorporate context-dependent voting into a formal model of electoral competition with policy ambiguity and explore the incentives faced by strategic candidates. Our main result is that if voters are sufficiently influenced by context, candidates respond by offering ambiguous platforms in equilibrium. Thus, context-dependent voting impacts both individual voting behavior and policy outcomes.

Intriguingly, the ambiguous equilibrium we characterize leaves voters worse off than if candidates were restricted to offering unambiguous platforms. Driving the result is the competitive forces of elections: as voters develop a taste for ambiguity candidates respond with ambiguous platforms, but the resultant competition in ambiguous platforms leads to a new equilibrium that delivers lower voter utility. An implication of this finding is the unexpected policy conclusion that voters benefit from requirements for political transparency (the absence of ambiguity) precisely because the voters themselves possess a taste for ambiguity.

1.1. Related literature

The focus of the political ambiguity literature has been on the question that composes the second part of this paper: how do ambiguity-loving voters affect the policy positions offered in elections? We differ from this literature in that we also step back and address the preceding question: from where does the voter taste for ambiguity originate? The principle contribution of our paper is to provide a primitive foundation for this preference.

As is by now clear, the approach of our paper is behavioral. Although a formal *behavioral political science* is in its nascency, the study of voting and elections appear to be particularly appropriate for the application of behavioral techniques. Citizens vote infrequently, their decisions are of low impact (at least on the outcome of the election), and an ever changing cast of candidates and issues are presented for voters to evaluate. These characteristics imply there is little opportunity for voters to learn their political preferences, and the framing of decisions through context remains an important determinant of choice. Moreover, Simonson (1989) shows that context effects are enhanced when people are required to justify their decisions to others, a situation that arises frequently due to the public nature of elections. Supporting the application of context-dependence to voting, in a companion paper we test the theory for unambiguous environments and show that context has a significant impact on voter behavior and the decision to turn out (Callander and Wilson, 2006).

Our behavioral approach to voting places us firmly in the tradition of Hotelling, who conceives of voting as an expressive act in which the vote decision is made independent of the election outcome (see also Smithies, 1941).[2] This

[2] One may argue whether Hotelling was aware of his "behavioralism" as his primary focus is consumer behavior. Smithies (1941), on the other hand, considers explicitly a political setting and incorporates into the model the behaviorally motivated abstention due to alienation. Regardless of intent, however, their theory gained popularity as a natural description of voter behavior and has profoundly influenced research ever since.

approach to voting stands in contrast to the instrumentally-rational theories that have dominated the literature in recent decades (Downs, 1957; Riker and Ordeshook, 1968). According to these theories, voters condition their vote on the behavior of fellow voters and their ability to influence the outcome. The central variable of analysis in these theories is the notorious "pivot probability," a variable that plays no role in Hotelling's theory of voting nor in our context-dependent theory.

With the theory of voting in place, we turn to the complementary question of how strategic candidates respond, bringing us into line with the focus of the formal literature on political ambiguity. Surprisingly, despite the importance and ubiquity of political ambiguity, this literature is small. This shortage reflects in part the difficulty of the problem, for although ambiguity is ostensibly intuitive, it has proven difficult theoretically to sustain ambiguity as equilibrium behavior in competitive environments. Shepsle (1972) and Zeckhauser (1969) are able only to show that in some circumstances voters prefer an ambiguous candidate, and do not establish the existence of equilibria in which candidates are ambiguous. More recently, Aragones and Postlewaite (2002) show this is possible if candidates are sufficiently restricted in the beliefs they can generate in voters about their policy intentions (if candidates can commit to policies, this is equivalent to restricting the platforms they can choose). The model we develop differs from this literature in that we assume candidates are motivated by policy outcomes, as proposed by Wittman (1983) and Calvert (1985), demonstrating how policy motivations can mitigate the equilibrium existence problems that otherwise arise.

For various environments, Alesina and Cukierman (1990), Aragones and Neeman (2000), and Meirowitz (2005) argue that politicians have good reason to be ambiguous separate from any immediate appeal to voters, and they explore the tension in policy making between ambiguity-seeking politicians and ambiguity-averse voters. The logic of all three papers differs substantively from the voter-centred model developed here.

Page (1976, 1978) offers an *emphasis allocation theory* of ambiguity that suggests ambiguity is used by candidates to distract voters from the policy issues, focusing their attention instead on non-policy characteristics of the candidates. Our context-dependent theory complements Page by showing how candidates may benefit from ambiguity even within the constraints of a single dimensional policy space.

To highlight the impact of context-dependence on vote choice, we organize the paper around a set of examples that are presented in Section 3. These examples bring out clearly the intuition for why context-dependent voters develop a taste for ambiguity and provide the foundation for the subsequent model of electoral competition presented in Section 4. Section 5 concludes.

2. A theory of context-dependent voting

We begin by describing context-dependent voting for unambiguous environments before expanding the model to incorporate ambiguity. Context-dependent voting involves a process similar to Hotelling's (1929) traditional theory in which each candidate is assigned a utility level, with the voter supporting the candidate with the highest rating.

Let the policy space be the real line, $\mathbb{R}$, with each candidate choosing a policy platform in $\mathbb{R}$. We develop the theory using language associated with models of policy commitment (candidates "choose" policies) although there is nothing that precludes application of these ideas in the absence of commitment.[3] For simplicity, suppose there are only two candidates, denoted by L and R. The (unambiguous) policy platforms of the candidates are denoted by the corresponding lower case, where $l, r \in \mathbb{R}$.[4]

Each voter possesses an ideal policy position, denoted for individual i by $b_i \in \mathbb{R}$. Context-dependent voting supposes that to determine the utility for a particular candidate a voter evaluates the candidate in isolation and then adjusts this evaluation by comparing the candidate with the opposing candidate. The utility of voter i for candidate L is given by:

$$u_i(L|l,r,b_i) = \alpha \cdot d(l|b_i) + \delta \cdot c(l,r|b_i), \tag{1}$$

where $d(\cdot)$ is the direct evaluation of candidate L and $c(\cdot)$ is the contextual evaluation of platform l offered by candidate L relative to platform r that is offered by candidate R (more generally, the first argument of $c(\cdot)$ is the "target" candidate and the second is the "comparison" candidate; thus, $c(r, l|b_i)$ is the contextual evaluation of candidate R relative to L).

[3] In which case candidates strategically influence voter perceptions of their true ideal point; Aragones and Postlewaite (2002) provide a thorough development of this interpretation.

[4] The restriction to two candidates and a single dimensional policy space is purely for expositional simplicity. In our companion paper (Callander and Wilson, 2006) we develop the model more generally and elaborate on its properties.

Each of these evaluations are made with respect to voter i's ideal point, b_i. The parameters α and δ reflect the weight assigned to each component of utility. The assumption that the components of utility are separable is also made by Tversky and Simonson (1993).[5]

As proposed by Hotelling, evaluations in the context-dependent theory are made by proximity of the candidate's platform to the voter's ideal point. To maintain consistency with Hotelling, we assume the direct evaluation of candidates, captured by $d(\cdot)$, is strictly decreasing in the distance between a candidate's platform and the voter's ideal point. Therefore, the traditional Hotelling model is nested within the context-dependent model (and corresponds to the case $\delta=0$). Shepsle (1972) shows that Hotelling's theory implies voters seek ambiguity if and only if $d(\cdot)$ is convex; we assume $d(\cdot)$ is concave, as suggested by empirical evidence. The standard functional form used in applications is:

$$d(l|b_i) = \tau_i^L - |l - b_i|^n, \tag{2}$$

where $n>1$ and τ_i^L represents a catch-all cost plus constant utility factor of voting for candidate L ($\tau_i^L > \tau_i^R$ implies that candidate L has a valence advantage over candidate R).

To impose some structure on how contextual evaluations are made by voters we specify three conditions to be satisfied. The first condition imposes mild anonymity and normalization requirements. Part (i) specifies that it is only proximity that matters to contextual evaluations, and not the specific locations of the candidates. This implies contextual evaluations are consistent with the method of direct evaluations of candidates. The second part of Condition 1 requires that contextual evaluations are utility "neutral." Thus, contextual evaluations represent only a redistribution of utility assigned to the candidates, which implies they are skew-symmetric (Fishburn, 1982).

Condition 1. *(i)* $c(l, r|b_i)=c(l', r'|b_j)$ *if* $|l-b_i|=|l'-b_j|$ *and* $|r-b_i|=|r'-b_j|$. *(ii)* $c(l, r|b_i)+c(r, l|b_i)=0$.

The remaining conditions are more substantive in their impact. For each of these conditions we provide some behavioral evidence in support of the underlying principles.

Condition 2 requires that the degree of dominance matters. That is, for a liberal voter the relative attractiveness of candidate L when compared to candidate R is increasing in the unattractiveness of candidate R. Evidence in support of this condition is provided by Dhar (1997), who shows that individuals are more likely to make a choice (rather than take the no-choice option) the greater the dominance of one alternative over another (see also Huber et al., 1982).[6]

Condition 2. $\frac{\partial c(l,r|b_i)}{\partial |l-b_i|} < 0$ *and* $\frac{\partial c(l,r|b_i)}{\partial |r-b_i|} > 0$ *for each voter i.*

In unambiguous environments, such as in Dhar (1997), a third, potentially outside, option is required for the degree of dominance to affect choice.[7] We show here that this effect can also affect choice over two alternatives if the alternatives are ambiguous.

Together, Conditions 1 and 2 imply the key insight of context-dependent evaluations: that the utility assigned to a candidate receives a boost if the candidate compares favorable to competing candidates and a reduction if he compares unfavorably (Tversky and Simonson, 1993). Formally, this delivers the following property, noting that as all candidate platforms represent "losses" from voters' reference points (their ideal points), less proximate candidates are less desirable to a voter.

$$c(l, r|b_i) \gtreqless 0 \text{ if } |r - b_i| \gtreqless |l - b_i| \quad \text{for each voter } i.$$

A straightforward but nevertheless important implication of this property is that a voter always finds it optimal to vote for the "closest" candidate. Predicted voting behavior is then the same as in Hotelling as contextual evaluations in unambiguous environments reinforce the direct evaluation: the closer candidate to a voter is favored by both the direct and the contextual evaluation, and the voters preference order in unambiguous environments cannot be reversed by context.

The final condition is perhaps less obvious but remains intuitive. It requires that absolute differences between the candidates (relative to the voter's ideal point) are more important the closer the candidates are to the voter. This condition captures the logic of Weber's Law (Miller, 1962) that the ability of people to compare alternatives is relative rather than absolute. Evidence in support of Weber's Law is provided by Pratt et al. (1979) and Thaler (1980) in riskless choice settings.[8] Surprisingly, we show that this same effect plays a key role in explaining a voter taste for ambiguity.

[5] Tversky and Simonson (1993) deal with several additional psychological effects that for space considerations we don't consider here.

[6] Tversky and Simonson (1993) do not require this condition, although doing so would be inconsequential for their results.

[7] In our companion paper we show that abstention provides this third option, with the degree of dominance affecting a voter's decision to turn out.

[8] Thaler (1980) refers to this as the Weber–Fechner law.

Condition 3. $\frac{\partial c(x,x+\Delta|b_i)}{\partial x}<0$ *for* $x\geq b_i$, $\Delta>0$, *and each voter i.*

This condition implies that marginal changes in utility are greatest around a voter's ideal point.[9] That is, for a voter with ideal point at 0, a distance of one unit between the candidates has a larger impact on her utility when the candidates are at 1 and 2 and the ratio of distances is $\frac{1}{2}$ than if the candidates are at 99 and 100 and the ratio is $\frac{99}{100}$. The voter perceives a significant difference between candidates at 1 and 2 – whereas in contrast the candidates at 99 and 100 are so distant as to be indistinguishable – and the contextual evaluation of the closer candidates has a bigger impact on utility.

To fix ideas, the following expression provides an example of a functional form that satisfies Conditions 1–3:

$$c(l,r|b_i)=\left[\frac{|r-b_i|}{|r-b_i|+|l-b_i|}-\frac{1}{2}\right]. \tag{3}$$

The value of $c(\cdot)$ ranges between $-\frac{1}{2}$ and $\frac{1}{2}$, and equals zero when the two candidates are equidistant from the voter.[10]

Given the utility level for each candidate, the voters' decision calculus is to maximize utility, as prescribed by Hotelling (1929). The vote choice, v_i, is then given by the following rule:

$$v_i(l,r,b_i)\in\left\{\arg\max_{X\in\{L,R\}}\{u_i(X|l,r,b_i)\}\right\}.$$

Extending the model to ambiguous environments is done in a straightforward way. Notably, in taking this step no new behavioral phenomena are introduced. Rather, we simply assume that voters take expected values over the possible policy outcomes, as would a voter or consumer with standard preferences. Thus, our departure from the classic model is contained wholly within unambiguous (riskless) environments and does not depend at all on voters' perception or treatment of risk.

Policy ambiguity is modeled in the standard manner as a probability distribution over policy platforms. A policy platform for a candidate consists of k policy *stands*, where k is any positive integer. For candidate R, denote the jth policy stand by r_j and the vector of stands by $r=\{r_1, r_2, \ldots, r_k\}$. An *ambiguous platform* is defined as a platform such that there are policy stands at distinct points; formally, if there exists $i, j\in\{1, 2,\ldots, k\}$ such that $r_i\neq r_j$ then candidate R's platform is ambiguous.

Candidates also choose the weight to allocate to each policy stand. Denote the weight assigned to stand r_j by γ_j^r and the vector of weights by $\gamma^r=\{\gamma_1^r, \gamma_2^r,\ldots, \gamma_k^r\}$. The policy weights satisfy $\gamma_i^r\geq 0$ for each $i\in\{1, 2,\ldots, k\}$ and $\Sigma_{i=1}^k\gamma_i^r=1$. Thus, a policy platform for candidate R consists of k policy stands and corresponding weights, denoted by $\sigma_R=\{r, \gamma^r\}$ where $r\in\mathbb{R}^k$ and $\gamma^r\in[0, 1]^k$. σ_L is defined analogously.

In evaluating ambiguous candidates, context-dependent voters engage in the same process as with unambiguous candidates, except they must now weigh the different evaluations by the probability that a given policy stand will constitute the ultimate policy outcome. More specifically, voters evaluate each policy platform announced by a candidate and compare it to every possible policy platform announced by the opposing candidate. The expected value of the different possibilities is taken to determine the utility assigned to each candidate. Thus, the context-dependent utility of voter i for ambiguous candidates is:

$$u_i(R|\sigma_L,\sigma_R,b_i)=\sum_{j=1}^{k}\left\{\alpha\gamma_j^r d(r_j|b_i)+\delta\gamma_j^r\left\{\sum_{g=1}^{k}\gamma_g^l c(r_j,l_g|b_i)\right\}\right\}$$
$$u_i(L|\sigma_L,\sigma_R,b_i)=\sum_{j=1}^{k}\left\{\alpha\gamma_j^l d(l_j|b_i)+\delta\gamma_j^l\left\{\sum_{g=1}^{k}\gamma_g^r c(l_j,r_g|b_i)\right\}\right\}.$$

Although ambiguous strategies take the form of probability distributions, they are different from mixed strategies. A mixed strategy is a probability distribution over pure strategies with randomization occurring before the election such that voters face a definite choice without any residual uncertainty. In contrast, with an ambiguous strategy candidates announce and face each other with probability distributions, and voters must deal with unresolved uncertainty when making their vote decisions.

[9] The condition is reminiscent of Kahneman and Tversky's (1979) s-shaped value function in prospect theory.

[10] This function is undefined at $b_i=l=r$. As $c(\cdot)=\frac{1}{2}$ for all $l=r\neq b_i$, we adopt the convention that $c(x, x|x)=0$ for all x. It is also the case that Condition 2 applies only weakly when one candidate is at b_i.

3. A taste for ambiguity: some examples

We show through a pair of examples that context-dependent voters develop a taste for policy ambiguity. Consequently, a voter's preference order over a pair of candidates may be reversed relative to the preference predicted by Hotelling's theory of voting (to which we refer subsequently as a preference reversal). In all examples we suppose that policy platforms are restricted to two stands (k=2), that equal weight is assigned to each stand $\gamma_1^h=\gamma_2^h=\frac{1}{2}$ for any candidate H), and that neither candidate possesses a valence advantage ($\tau_i^L=\tau_i^R$). Candidate strategies are then fully described by the platforms l and r.

The first example considers a simple ambiguous strategy for candidate R relative to an unambiguous platform for candidate L. We begin by calculating the context component of utility for a voter with ideal point to the left of all policy platforms. We generalize notation slightly and allow $c(\cdot)$ to be a function of both ambiguous and unambiguous candidate platforms.

Example 1. Suppose candidate L offers the unambiguous platform l=0 and candidate R offers the ambiguous platform $r=\{-x, x\}$, where $x>0$ (see Fig. 1). For a voter with ideal point at $y\leq -x$,

$$\begin{aligned} c(\{-x,x\},0|y) &= \frac{1}{2}c(x,0|y)+\frac{1}{2}c(-x,0|y) \\ &> \frac{1}{2}c(x,0|y)+\frac{1}{2}c(0,x|y), \text{ by Condition (3)}, \\ &= 0, \quad \text{by Condition (1)}. \end{aligned}$$

As can be seen, candidate R offers an ambiguous platform relative to L, moving one policy stand x units toward the voter at y and the other policy stand x units away. Despite the symmetry of R's platform relative to L's, the ambiguity improves the contextual evaluation of candidate R made by a voter at y (as $c(0, 0|y)=0$). This follows directly from Conditions 1–3 imposed on the function c, leaning in particular on Condition 3. To see why, note that the voter at y, given the ambiguous platform of candidate R, must compare two distances between the candidates to contextually evaluate the candidates. These distance are of equal length (x units), although the one that favors candidate R is closer to the voter than the one that favors candidate L ($-x$ to 0 versus 0 to x). By the logic of Condition 3 the closer interval has more impact on voter evaluations than the interval further away, and so the voter's contextual evaluation favors candidate R.

The full power of this effect becomes clear upon noting that the exact same calculations are made by a voter on the other side of the candidates at $-y$, and she too draws favorable inferences about candidate R in a contextual comparison to candidate L. Therefore, by offering policy stands on either side of the policy platform of candidate L, candidate R is able to appeal contextually to voters on both flanks. In ambiguous settings, therefore, the standard notion of "closeness" no longer applies. We refer to the strategy of candidate R, for obvious reasons, as a straddling platform.

Continuing the example and considering total voter utility:

Example 1 (continued). Combining the context-dependent evaluation with the direct evaluation of candidates, the utility difference between candidates is:

$$u(R|0,\{-x,x\},y)-u(L|0,\{-x,x\},y)=\alpha\left\{\frac{1}{2}[d(x|y)+d(-x|y)]-d(0|y)\right\}+2\delta\cdot c(\{-x,x\},0|y).$$

The first term is negative by the concavity of $d(\cdot)$ and the second term is positive. For sufficiently large δ, $u(R|0, \{-x, x\}, y)>u(L|0, \{-x, x\}, y)$, and the voter possesses a taste for ambiguity.

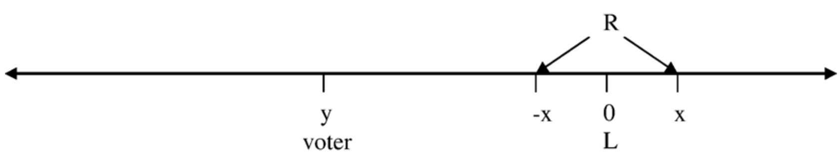

Fig. 1. Candidate R straddles candidate L.

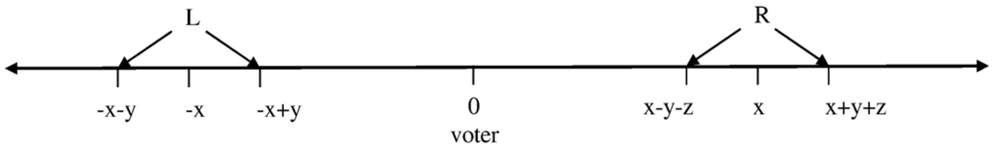

Fig. 2. Ambiguous platforms and a mean preserving spread.

As $d(\cdot)$ is concave the ambiguous policy platform offered by R lowers the direct evaluation component of voter utility, reflecting the risk aversion of voters in direct evaluations. However, when combined with the context-dependent comparison that favors candidate R, voters on both flanks experience a preference reversal and favor candidate R if sufficient weight is placed on the context term in utility. By offering a straddling strategy, candidate R is effectively able to appear as “all things to all men.”[11]

The extent of candidate R's ambiguous appeal, however, is limited to the flanks as voters with ideal points in the neighborhood of 0 still prefer candidate L. As such, the set of voters supporting candidate R is not convex, violating the usual cut-point logic of pivotal voting models.[12] This violation also leads to a novel aggregate level property: *that winning the median voter*, as might candidate L in this example, is not sufficient for electoral success in ambiguous environments.[13]

Candidate R's straddling strategy in Example 1 is successful as it makes for favorable relative comparisons by voters with ideal points on both the left and right of the policy space. The following example shows that the logic of Example 1 can also apply to competition for the median voter, and does not depend on one candidate offering an unambiguous policy platform. Example 2 generalizes the logic of Example 1 and plays an important role in the formal model of electoral competition developed in the following section.

Example 2. Suppose candidates L and R offer the policy platforms

$$
\begin{aligned}
l &= \{-x-y, -x+y\} \\
r &= \{x-y-z, x+y+z\},
\end{aligned}
$$

where $0<y\leq x$ and $0<z\leq x-y$, as depicted in Fig. 2. For a voter with ideal point at 0,

$$
\begin{aligned}
c(r,l|0) &= \frac{1}{4}\begin{bmatrix} c(x+y+z,-x-y|0)+c(x-y-z,-x-y|0) \\ +c(x+y+z,-x+y|0)+c(x-y-z,-x+y|0) \end{bmatrix} \\
&= \frac{1}{4}\begin{bmatrix} c(x+y+z,x+y|0)+c(x-y-z,x+y|0) \\ +c(x+y+z,x-y|0)+c(x-y-z,x-y|0) \end{bmatrix}
\end{aligned}
$$

as $c(x, y|0)=c(x, -y|0)$. Noting that $c(b, a|0)=-c(a, b|0)$,

$$
\begin{aligned}
4c(r,l|0) = &\ -c(x+y,x+y+z|0)+c(x-y-z,x+y|0) \\
&\ -c_R(x-y,x+y+z|0)+c(x-y-z,x-y|0) \\
= &\ [c(x-y-z,x-y|0)-c(x+y,x+y+z|0)] \\
&\ +[c(x-y-z,x+y|0)-c(x-y,x+y+z|0)] \\
> &\ 0.
\end{aligned}
$$

[11] The nature of preference when voting is context-dependent goes some way to explaining what is often called the projection effect (that voters perceive candidates as being closer to their own ideal points). That voters on both the left and right flanks perceive candidate R as “closer” to them than is candidate L suggests also in this environment that the standard conception of closeness of a candidate to a voter no longer applies.

[12] Close empirical work is required to ascertain the validity of disjoint voting coalitions. Standard empirical techniques rest on the assumption of pivot points and connected coalitions (for example, upon observing voting patterns of the sort described here, standard techniques would conclude that the issue space is multidimensional when in fact it is single dimensional with disjoint coalitions).

[13] In fact, the set of voters supporting candidate L in this example is also non-convex as candidate R wins only some of the voters on the flank. To see why, note that voters on the flank prefer candidate R only when his contextual advantage outweighs the loss in direct evaluation by voters. The contextual advantage of candidate R fades for more extreme voters as the candidates begin to look similar from greater distances. Consequently, the direct component of utility comes to dominate, and more extreme voters are again attracted to the unambiguous candidate.

In the example, candidates L and R are on either side of a voter with ideal point at 0. They are located symmetrically if $z=0$, and their platforms are ambiguous if $y>0$. The power of Example 2 is to show that for an increase in the level of his ambiguity, candidate R improves the contextual evaluation of himself (relative to L) made by the voter at zero. To contextually evaluate the candidates the voter must compare four relative distances (two stands for each candidate), two of which favor candidate R and two that favor candidate L. Significantly, and as in Example 1, the comparisons that favor R are "closer" to the voter at 0 than those favoring L, and so the net impact on the voter's utility benefits R. As such, if sufficient weight is placed on the contextual component of utility, the voter prefers candidate R to candidate L.

Applying the logic of Example 1 to the policy platforms in Example 2, it is easy to see that by increasing the ambiguity of his platform candidate R is more attractive in contextual evaluations to voters on the right flank as well as to the voter at zero. Thus, even without a straddling strategy, an increase in ambiguity can increase the support gained by a candidate from voters in two different regions of the policy space.[14]

4. A model of electoral competition

We develop a simple model of electoral competition and show how the intuitions presented in the previous examples induce candidates to offer ambiguous policy platforms in equilibrium. We follow the notation and environment established in Section 2.

The election is between two candidates, L and R, who announce policy platforms simultaneously. The policy space is the real line, $\mathbb{R}$. Candidates are free to locate anywhere in the policy space and can offer ambiguous or unambiguous policy platforms, although they are restricted to two stands ($k=2$). Although restrictive, two stands is sufficient to capture the incentive of candidates to deviate from unambiguous policy positions and be ambiguous.

Candidates are motivated by policy outcomes and are said to be policy motivated, as proposed by Wittman (1983) and Calvert (1985). The ideal policy points of the candidates are symmetric and normalized to 1 for candidate R and -1 for candidate L. To focus attention on the risk preferences of voters, we assume that candidates are risk neutral. Candidate utility is as follows, where $q(l, r)$ is the probability candidate R wins given platforms $\{l, r\}$:

$$U_L(l,r) = -(1-q(l,r))\left(\sum_{j=1}^{2}\gamma_j^l|-1-l_j|\right) - q(l,r)\left(\sum_{j=1}^{2}\gamma_j^r|-1-r_j|\right),$$
$$U_R(l,r) = -q(l,r)\left(\sum_{j=1}^{2}\gamma_j^r|1-r_j|\right) - (1-q(l,r))\left(\sum_{j=1}^{2}\gamma_j^l|1-l_j|\right).$$

Voter preferences over policy platforms are context-dependent, as specified in the previous sections, and all voters turn out (no abstention is allowed). More specifically, voter utility is given by the functional forms of Eqs. (2) and (3) with $n=1$ and $\alpha=1$ to normalize utility weights.

The electorate consists of three groups of voters: centrists, leftists and rightists. Voters in each group have common preferences (including a common ideal point) that is publicly known. The leftists correspond to candidate L's base and, for simplicity, we suppose their ideal point is at L's ideal point, -1. Similarly, the rightists' ideal point is 1 and they represent candidate R's base. The ideal point of centrists is zero and they represent the traditional notion of median or swing voters. The sizes of the groups are such that the support of any two achieves a majority but each group alone is less than a majority.

The valence component of utility is common across voters and private information. That is, $\tau_i^L=\tau^L$ and $\tau_i^R=\tau^R$ for all voters, where τ^L and τ^R are unobserved by the candidates (at least at the time they choose their platforms). Define the valence difference by $\tau=\tau_i^R-\tau^L$ and assume that τ is distributed uniformly on the interval $[-1, 1]$; as this interval is symmetric about 0 the candidates are ex-ante treated equally.

An equilibrium is an *unambiguous equilibrium* if both candidates announce unambiguous platforms, otherwise it is an *ambiguous equilibrium*. As is standard, we focus the description of equilibrium on the strategies of candidates as voter behavior is responsive but non-strategic. Proofs for all results are relegated to the Appendix.

[14] In this case from voters with ideal points between the candidates and on the right flank. In fact, voters on the left flank are also more favorably inclined towards candidate R, although the assigned utility is dominated by the utility for candidate L.

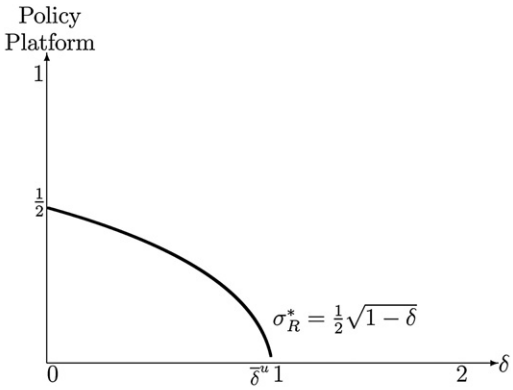

Fig. 3. Candidate R's equilibrium platform for $k=1$.

4.1. Unambiguous platforms

Our first result provides the benchmark equilibrium when candidates are restricted to be unambiguous.

Lemma 1. *Set $k=1$. An unambiguous equilibrium exists if and only if $\delta \le \bar{\delta}^u$, where $\bar{\delta}^u \approx 0.991$. The equilibrium is unique, symmetric and given by*:

$$l^* = -\frac{1}{2}\sqrt{1-\delta}, \quad r^* = \frac{1}{2}\sqrt{1-\delta}.$$

With unambiguous strategies, the contextual evaluations cannot change a voter's ordering of the candidates based on their policy positions. They do, however, change how much the voter prefers the policy of the nearest candidate. This difference must be weighed against the voter's valence preference and, consequentially, variations in δ can affect the equilibrium behavior. Lemma 1 shows that the level of equilibrium policy divergence decreases in δ (as a higher δ provides more reward for pandering to the median voter).[15]

Candidate platforms are divergent and symmetric in every unambiguous equilibrium. The logic of equilibrium is the same as in Wittman (1983) and Calvert (1985): candidates balance probability of winning versus the policy outcome should they win, with the outcome determined by the preference of the median voter. Fig. 3 depicts the equilibrium platform of candidate R as δ varies.

A novelty of Lemma 1 is that, despite the decisiveness of the median voter in equilibrium, it is possible for candidates to bypass the median and target disjoint coalitions. In fact, it is this possibility that leads directly to the breakdown of equilibrium for larger δ. To see why this is the case, suppose that candidate L is located at 0, the median voter's ideal point, and that $\delta \ge 1$. If candidate R were to also locate at 0 he would win with probability one half and the policy outcome would be 0. If, however, he were to locate to the right of zero he would alienate the median voter sufficiently and never win her support. This holds regardless of the size of R's deviation as to the median voter candidate L represents the perfect candidate and dominates the contextual evaluation.

If competition were only for the median voter this would be the end of the story and candidate R could do no better than locate at 0 himself, sustaining an equilibrium with fully convergent platforms. However, it is not the end of the story as it is possible that the voters at -1 may still support R, despite the median voter definitely voting for L. To a voter at -1 the contextual evaluation of candidates favors candidate L, but from a distance the candidates are sufficiently indistinguishable that this advantage is small. Moreover, the direct evaluation, which also favors candidate L, is small for small deviations by R. Overall, therefore, the voters at -1 are much less enamored with their more preferred candidate than is the median voter, and their vote choice may be swayed by the valence realization. This argument does not require full convergence and holds if the opposing candidate is sufficiently convergent ($\delta > \bar{\delta}^u$), breaking apart the equilibrium.

[15] The rate of convergence depends on the bound on the support of τ . If instead $\tau \sim [-\chi,\chi]$ then the degree of convergence would be a decreasing function of χ.

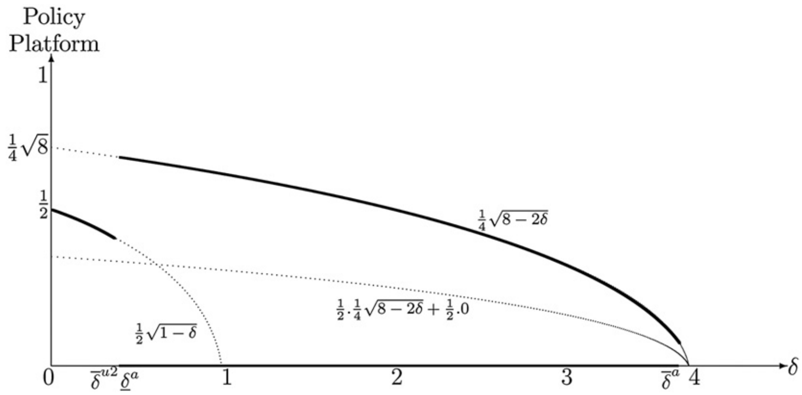

Fig. 4. Candidate R's equilibrium platform for $k=2$.

4.2. Ambiguous platforms

We now allow for political ambiguity ($k=2$). Theorem 1 shows that the possibility of ambiguity changes the nature of electoral competition. By definition, the equilibria of Lemma 1 are robust to unambiguous deviations. Allowing for ambiguity expands the set of possible deviations, and for sufficiently large δ this expansion causes the unambiguous equilibrium to break down.

Theorem 1. *Set $k=2$. An unambiguous equilibrium exists if and only if $\delta \leq \overline{\delta}^{u2} \approx 0.39$. The equilibrium is that specified in Lemma 1.*

The logic of this result is a direct application of Example 2. As in all unambiguous equilibria the candidates are divergent, it is possible for each to deviate by offering a mean-preserving spread without crossing over the platform of the other candidate or the median voter's ideal point.[16] To the median voter, therefore, the ambiguous candidate lowers his direct evaluation but increases his contextual appeal. For sufficiently large weight on contextual evaluations the net effect on utility is positive and the deviation is profitable.

Our main interest here is not just the breakdown of unambiguous equilibria, but in the existence of pure strategy ambiguous equilibria. Theorem 2 shows for a range of parameter values that ambiguous equilibria indeed exist when $k=2$. Thus, for sufficient utility weight on context, voters develop a taste for ambiguity and candidates respond in equilibrium with ambiguous platforms.

Theorem 2. *Set $k=2$. An ambiguous equilibrium exists if and only if $\delta \in (\underline{\delta}^a, \overline{\delta}^a)$, where $\underline{\delta}^a \approx 0.41$* and *$\overline{\delta}^a \approx 3.96$. The equilibrium is unique, symmetric and given by:*

$$l^* = \left\{0, -\frac{1}{4}\sqrt{8-2\delta}\right\}, \quad r^* = \left\{0, \frac{1}{4}\sqrt{8-2\delta}\right\}.$$

The equilibrium platforms for $k=2$ are depicted in Fig. 4. In equilibrium one of the policy stands of each candidate is fully convergent to the median voter's ideal point, whereas the other stand is more extreme than the unambiguous equilibrium (of Lemma 1). As is the case with unambiguous equilibria, the degree of policy divergence is decreasing in the weight placed by voters on contextual evaluations, although convergence is slower in the ambiguous equilibrium.

The ambiguous equilibrium of Theorem 2 offers an unusual answer to the question of whether candidates are convergent or divergent: they are both. In the ambiguous equilibria the candidates are simultaneously convergent and divergent as one stand is located at the median voter's ideal point whereas the second stand diverges towards the

[16] It is in considering mean-preserving spreads of this sort that the assumption of candidate risk-neutrality simplifies the analysis (although it is not crucial). The candidate's indifference allows us to focus solely on voter utility to determine the profitability of the deviation.

candidate's ideal point. Although ostensibly unusual, this type of ambiguity is consistent with the multiplicity of views on the relative positioning of parties in modern elections: some observers view the parties as indistinguishable whereas others see them as far apart. If an observer were to focus on particular pairs of policy stands it is possible that neither observation will be falsified by the data.

The preceding two theorems do not span the entire parameter space. The following corollary states that for other values of δ, pure strategy equilibria – whether in unambiguous or ambiguous strategies – do not exist.

Corollary 1. *Set $k=2$. A pure strategy equilibrium does not exist if $\delta \in (\overline{\delta}^{u2}, \underline{\delta}^{a}) \approx (0.39, 0.41)$ or $\delta > \overline{\delta}^{a} \approx 3.96$.*

Existence fails in these ranges because of preference cycles. In the region (0.39, 0.41) the tension is between ambiguous and unambiguous platforms: for any potential unambiguous equilibrium a profitable ambiguous deviation can be found, and for any potential ambiguous equilibrium an unambiguous deviation exists.

For δ larger than 3.96 the tension is instead between coalitions. Using only ambiguous strategies (although unambiguous strategies may also be used), a candidate can always find a profitable deviation by targeting a different coalition: full convergence is defeated by a straddling strategy, yet straddling strategies can themselves be defeated by strategies targeting the median voter.[17]

4.3. Equilibrium properties

Our final two results deal with the nature of equilibrium behavior. In Corollary 2 we address the issue of political polarization and whether ambiguity ($k=2$) leads to greater or less polarization. Define the degree of polarization for candidate R by: $\frac{1}{2}(|r_1| + |r_2|)$.

Corollary 2. *On the domain $\delta \in (\underline{\delta}^{a}, \overline{\delta}^{u})$, political polarization is greater in the unambiguous equilibrium ($k=1$) than in the ambiguous equilibrium ($k=2$) if and only if $\delta < \frac{4}{7} \approx 0.57$.*

The degree of polarization in each equilibrium can be seen by the dotted lines in Fig. 4. Corollary 2 shows that there is a range of δ such that ambiguity leads to greater policy convergence than occurs if candidates are restricted to being unambiguous. This occurs for smaller values of δ when, surprisingly, ambiguity is less profitable for candidates. This property reverses at $\delta = \frac{4}{7}$, after which ambiguity leads to greater policy divergence.

Our final result considers the impact of ambiguity on voter welfare. Popular wisdom suggests that ambiguity is harmful to voters as not only is the inherent uncertainty harmful, but the freedom to be ambiguous allows candidates to deliver unattractive policies. Ambiguity in our model provides candidates with no greater freedom to deliver unattractive policies (as they are committed to implement policies according to their platforms), yet Corollary 3 shows that the conventional wisdom on this issue is correct.[18] Denote by $Eu_i^k\,(l^*, r^*, \delta)$ the expected level of voter utility for an equilibrium $\{l^*, r^*\}$ when k policy stands are permitted, parameterized by δ.

Corollary 3. *$Eu_i^1\,(l^*, r^*, \delta) > Eu_i^2\,(l^*, r^*, \delta)$ for all i and $\delta \in (\underline{\delta}^{a}, \overline{\delta}^{u})$.*

This result says that when the ambiguous equilibrium exists the corresponding candidate platforms provide voters with strictly *less* utility than they would receive if $k=1$ and candidates were restricted to unambiguous strategies. What is remarkable about this result is that it is voter preferences that induce candidates to be ambiguous (the candidates have no innate preference for ambiguity). Thus, a voter taste for ambiguity induces candidates to offer ambiguous platforms, but the competition among candidates leads to platforms that make voters strictly worse off. As direct evaluations are concave, this welfare reduction occurs even when $\delta \in (\underline{\delta}^{a}, \frac{4}{7})$ and the expected outcome of the ambiguous equilibrium is less divergent.

4.4. Discussion

To focus on what is novel, we have not attempted to formulate the model as generally as possible and many features can be relaxed without in principle upsetting the underlying intuition. Two modeling choices do, however, play

[17] Strategies that straddle the median voter can always be defeated in this way – which is why they cannot support equilibria – but it is only if $\delta > \overline{\delta}^{a}$ that they can defeat the non-straddling strategies of Theorem 2.

[18] This possibility was first raised by Aragones and Postlewaite (2002).

important roles in the existence of pure strategy ambiguous equilibria: policy motivated candidates and uncertainty over valence.

The role of policy motivation is best seen by considering what happens at the opposite extreme when candidates are perfectly office motivated. In this case pure strategy equilibria are not possible once ambiguity is profitable.

Theorem 3. *If candidates are entirely office motivated, a pure strategy equilibrium does not exist in ambiguous strategies.*

The result is easily demonstrated by example, noting that because the candidates are able to imitate each other precisely, in equilibrium they each win election with probability $\frac{1}{2}$. For any ambiguous platform offered by candidate L, at least one stand, say the kth, is different to the median voter's ideal point. Suppose then that candidate R imitates L's strategy on all stands but the kth, and that on this stand he moves slightly toward the median voter. As the candidates are identical on all but one stand, competition and voter evaluations reduce to this stand, on which candidate R is more attractive to the median voter and R wins more frequently than candidate L, thereby violating the requirements of equilibrium.

By assuming that candidates are office motivated, early papers on political ambiguity were able to show why voters may prefer ambiguity but they were unable to provide an equilibrium characterization (Shepsle, 1972; Zeckhauser, 1969), an inability reflected in Theorem 3. Instead it is only if the candidates are restricted in the platforms they can choose that equilibria exist (Aragones and Postlewaite, 2002).

The innovation we offer here is to show that policy motivation serves a similar role to a restriction on player strategies. With complete freedom to move about the policy space, candidates have available platforms that increase their chances of winning should they choose them. However, the candidates do not want to choose these platforms as they care about policy outcomes and are reluctant to choose a platform that is on the side of the median voter opposite to their ideal point. It is this reluctance that supports pure strategy ambiguous equilibria.

The role of valence uncertainty is more one of tractability. Since the seminal results of Wittman (1983) and Calvert (1985), it has become standard to model candidate uncertainty as over the location of the median voter's ideal point, an approach that induces "intrinsically badly behaved" payoff functions and problems with existence (Roemer, 2001, p. 57). In modeling uncertainty instead over the valence rather than the policy dimension of voter preference, we find that the problems of existence can be mitigated.

5. Conclusion

The results presented in this paper are of interest for several reasons. The primary contribution is to provide a possible explanation for an enduring puzzle of elections: why candidates offer ambiguous policy platforms. Moreover, this puzzle is explained in a manner that is consistent with empirical observations that voters are risk averse.

It is surely the case that contextual factors impact political outcomes more broadly than we consider here. Indeed, the oft lamented apathy of the voting public – and the small affect each individual has on political outcomes – provides a ripe environment for all behavioral traits to manifest, not just context-dependence. Exploring these possibilities is a worthwhile objective for future research.

Appendix A

Label the three groups of voters by their ideal points, such that utility is written u_{-1}, u_0, and u_1, and drop the argument b_i in utility as it is reflected in the group label. For each $i \in \{-1, 0, 1\}$, denote the utility difference between the two candidates as: $u_i^d(l, r) = u_i(R|l, r) - u_i(L|l, r)$, and the policy only component of this by: $u_i^p(l, r) = u_i^d(l, r) - \tau$. We begin with two additional lemmas that prove useful in the characterization of equilibrium.

Lemma 2. *In any pure strategy equilibrium $l^* \in [-1, 0]^2$ and $r^* \in [0, 1]^2$.*

Proof of Lemma 2. Straightforward techniques establish that $l^*, r^* \in [-1, 1]^2$. Suppose then that the lemma is not true and $l_2 > 0$. For $\tilde{r} = \{|l_1|, l_2\}$, competition reduces to the first stand, and by symmetry the candidates win equally often. The expected policy outcome is then $\frac{1}{2}\frac{l_1+l_2}{2} + \frac{1}{2}\frac{|l_1|+l_2}{2} > \frac{l_2}{2} > 0$, violating equilibrium. □

Lemma 3. *Set $l=\{a, b\}$ and $r^{\mu}=\{x+\mu, x-\mu\}$. If $u_i(R|l, r^{\mu})>u_i(R|l, r^0)$ for some $\mu>0$, then $u_i(R|l, r^{\mu})$ is increasing in μ for $b_i \notin (x+\mu, x-\mu)$.*

Proof of Lemma 3. Fix $l=\{a, b\}$, and suppose firstly that $r=\{x, y\}$. Voter utility is separable in the two stands of candidate R. The following properties of the derivatives are established by tedious but straightforward algebra:

	Direct component	Contextual Component	Total
$\frac{\partial}{\partial x}u_i(l,r)$	<0	<0	<0
$\frac{\partial^2}{\partial x^2}u_i(l,r)$	<0	>0	Indeterminate
$\frac{\partial^3}{\partial x^3}u_i(l,r)$	=0	<0	<0
$\frac{\partial^4}{\partial x^4}u_i(l,r)$	=0	>0	>0

The strategy r^{μ} is a mean-preserving spread around $r^0=\{x, x\}$, the profitability of which depends on the sign of the second derivative. That it is indeterminate shows that mean-preserving spreads are profitable only if sufficient weight is placed on the contextual component of evaluations. The concavity of the second derivative is given by the fourth derivative, which is positive. This establishes that $\frac{\partial^2}{\partial \mu^2}u_i(l,r^{\mu}) > 0$.

Thus, if any mean preserving spread is profitable, voter utility is maximized by the maximum spread. □

Proof of Lemma 1. To support an equilibrium, a set of strategies must be robust to deviations that target all possible majority coalitions. We begin by targeting the median voter (as in standard models), and then consider deviations that target other coalitions. Set $l=-a$ and $r=x$. Then $u_0^p(-a,x)=x^2+a^2+2\delta\left(\frac{a}{a+x}-\frac{1}{2}\right)$, giving $q(-a,x)=\frac{1}{2}\left(\frac{x+a-x^3-x^2a+a^2x+a^3+\delta a-\delta x}{x+a}\right)$ and:

$$U_R(a,x)=-q(a,x)(1-x)-(1-q(a,x))(1+a),$$

where $q(\cdot)$ is understood as the probability of R winning voters at 1 and 0. Optimizing with respect to x, the first order condition becomes:

$$x=-\frac{1}{3}a+\frac{1}{3}\sqrt{(4a^2+3-3\delta)}.$$

A symmetric condition arises for candidate L and the second order condition for a maximum is satisfied. Solving both first order conditions simultaneously produces a unique solution, as required.

To confirm this as an equilibrium we must check that the above equilibrium is robust to deviations that seek disjoint coalitions; in particular, suppose $l=-\frac{1}{2}\sqrt{1-\delta}, r=x$, and that candidate R targets the coalition $\{-1,1\}$. Then we have:

$$U_R\left(-\frac{1}{2}\sqrt{(1-\delta)},x\right)=-q\left(-\frac{1}{2}\sqrt{(1-\delta)},x\right)(1-x)-\left(1-q\left(-\frac{1}{2}\sqrt{(1-\delta)},x\right)\right)\left(1+\frac{1}{2}\sqrt{(1-\delta)}\right),$$

where $q(\cdot)$ is now understood as the probability of R winning voters at -1 and 1. Parameterizing utility by δ, tedious algebra establishes that:

$$\frac{dU_R\left(-\frac{1}{2}\sqrt{(1-\delta)},x|\delta\right)}{d\delta}=\frac{1}{32}\frac{\text{numerator}}{\left(4+2x-\sqrt{(1-\delta)}\right)^2\sqrt{(1-\delta)}},$$

where the numerator is the right hand side of the inequality:

$$0<\left(128x^3--96x^3\sqrt{(1-\delta)}\right)+\left(312x^2-256x^2\sqrt{(1-\delta)}\right)+\left(160x-56x\sqrt{(1-\delta)}\right)$$
$$+\left(224\delta x-8\delta x\sqrt{(1-\delta)}\right)+\left((-39+94\delta+9\delta^2+72\delta x^2+16x^4)+\sqrt{(1-\delta)}(96+32\delta)\right),$$

and we have that $\frac{dU_R\left(-\frac{1}{2}\sqrt{(1-\delta)},x|\delta\right)}{d\delta}>0$. Thus, if targeting coalition $\{-1, 1\}$ is profitable at δ' for some x, then it is profitable for all $\delta>\delta'$. Numerical verification determines the value of $\overline{\delta}^u$.

Finally, we rule out equilibria in which one or more candidates target disjoint coalitions. If $u_{-1}^p(\cdot)<u_0^p(\cdot)$ candidate R is competing for the median voter and targeting $\{1, 0\}$. So suppose $u_{-1}^p(\cdot)>u_0^p(\cdot)$ and that R targets the coalition $\{-1, 1\}$. By Lemma 2, $l<r$, and by continuity the deviation $\tilde{l}=l-\varepsilon$, for ε positive and small, is profitable as it increases L's chance of winning, moving the expected outcome toward his ideal point. Finally, it is impossible for both candidates to target disjoint coalitions in equilibrium: this requires min $[u^p_{-1}(\cdot), u^p_{-1}(\cdot)]>u^p_0(\cdot)$ for candidate R and max $[u^p_{-1}(\cdot), u^p_1(\cdot)]<u^p_0(\cdot)$ for candidate L, which cannot hold simultaneously. □

Proof of Theorem 1. If an unambiguous equilibrium exists it must be that of Lemma 1. No profitable unambiguous deviations exist, so consider only deviations to ambiguous platforms. For any $r=\{z-\beta, z+\beta\}$ to be a profitable deviation, the mean-preserving spread around z is profitable (as the unambiguous z is not a profitable deviation). Lemma 3 implies then that increasing ambiguity further is more profitable. In targeting the median voter, this implies we need only check that at least one stand is at a boundary (either 0 or 1). Set $l^*=-\frac{1}{2}\sqrt{1-\delta}$ and consider R's optimal strategy in the two cases.

Case 1. One stand at 1. Starting at $\hat{r}=\{y,y\}$, Lemma 1 proves that deviating toward the median is profitable if $y>\frac{1}{2}$. This implies that:

$$\begin{aligned}\frac{\partial u^P_0(l^*,\hat{r})}{\partial y}&=\frac{\partial d(\hat{r})}{\partial y}-\frac{\partial d(l^*)}{\partial y}+\delta 2\frac{\partial c(l^*,\hat{r})}{\partial y}\\&=-2y-0+\delta 2\frac{\partial c(l^*,\hat{r})}{\partial y}\\&<0.\end{aligned}$$

Consider a similar deviation by both stands if R is ambiguous, set $r=\{y-\rho, y+\rho\}$:

$$\begin{aligned}\frac{\partial u^P_0(l^*,r)}{\partial y}&=\frac{\partial d(r)}{\partial y}-\frac{\partial d(l^*)}{\partial y}+\delta 2\frac{\partial c(l^*,r)}{\partial y}\\&=-2y-0+\delta 2\frac{\partial c(l^*,r)}{\partial y},\end{aligned}$$

as $d(r)=-y^2-\rho^2$. This deviation is profitable as $\frac{\partial c(l^*,r)}{\partial y}<\frac{\partial c(l^*,\hat{r})}{\partial y}$, which follows directly from the negative first derivative and positive second derivative for contextual evaluations. Setting $y+\rho=1$ and $x=y-\rho$, a profitable deviation exists from $r=\{x, 1\}$, if $x\neq 0$.

Case 2. $r=\{0, z\}$. For this deviation, consider R's utility as δ varies for $\delta<1$:

$$\frac{\partial}{\partial\delta}U_R(l^*,r|\delta)=\frac{1}{32}\frac{26z\sqrt{(1-\delta)}(1-\delta)+z^2(14-6\delta)+8z^4+9(1-\delta)^2}{\left(\sqrt{(1-\delta)}+2z\right)^2\sqrt{(1-\delta)}}>0,$$

and U_R is strictly increasing in δ for a fixed z. As $U_R(l^*, r^*)=-1$ in any symmetric equilibrium, this implies that if z is a profitable deviation for some δ', then it is a profitable deviation for all $\delta>\delta'$. This proves the existence of a lower bound $\overline{\delta}^{u2}$; numerical verification determines the value of $\overline{\delta}^{u2}$.

The remaining possibility is that a candidate targets a disjoint coalition with an ambiguous strategy (Lemma 1 considered only the unambiguous targeting of disjoint coalitions). A profitable deviation requires that the expected value of r is greater than 0. Lemma 3 then implies that the most profitable deviation for candidate R is of the form $\{x, 1\}$, where $x<0$. For $\delta<\overline{\delta}^{u2}, l<-0.39051$ in the unambiguous equilibrium and the direct evaluation component of u^p_{-1} is less than −1.6. As in this domain the contextual component of u^p_{-1} cannot exceed $\delta\frac{1}{4}, u^p_{-1}<-1$ and the ambiguous strategy is never profitable (as L wins with probability 1). □

Proof of Theorem 2. Lemmas 2 and 3 require that in equilibrium at least one stand of each candidate is at 0 or their ideal point. If candidate R targets a disjoint coalition, this implies one stand is at 1. Lemma 2 implies that R loses the contextual evaluation and that:

$$u^p_{-1}(\cdot)<-\frac{1}{2}(2^2+1^2)+\frac{1}{2}(1^2+1^2)=-\frac{3}{2},$$

meaning that voters at -1 can't vote for candidate R in equilibrium. Analogous logic applies to candidate L, ruling out equilibria in which candidates target disjoint coalitions.

Suppose hereafter that in equilibrium candidates target the median voter (although deviations that target disjoint coalitions are allowed). The asymmetric situation – in which one candidate has one stand at their ideal point and the other candidate a stand at 0 – is subsumed into the symmetric situations (see Case 2 below). So suppose first that each candidate has one stand at their ideal point: $l=\{-1,-a\}$ and $r=\{z,1\}$; these strategies are mean-preserving spreads of the unambiguous strategies $l'=\frac{-1-a}{2}\leq-\frac{1}{2}$ and $r'=\frac{1+z}{2}\geq\frac{1}{2}$. If the candidates play l' and r' then the proof of Lemma 1 shows that R wishes to deviate toward 0. This implies, by an analogous process to that in the proof of Theorem 1, that a deviation to $\tilde{r}=\{1-\rho,z-\rho\}$ is profitable against l (for some $\rho>0$).

Now suppose that each candidate has at least one stand at 0: $l=\{-a,\ 0\}$ and $r=\{0,\ x\}$. For the median voter $c(r,l)=\frac{1}{4}\left(\frac{a}{a+x}-\frac{1}{2}\right)$ and:

$$\frac{\partial U_R(l,r)}{\partial x}=-\frac{3}{8}x^2-\frac{1}{4}ax-\frac{1}{16}\delta+\frac{1}{8}a^2+\frac{1}{4},$$
$$\frac{\partial^2 U_R(l,r)}{\partial x^2}=-\frac{3}{4}x-\frac{1}{4}a<0.$$

The first order condition gives $x=-\frac{1}{3}a+\frac{1}{6}\sqrt{(16a^2-6\delta+24)}$, and the same condition for L is $a=-\frac{1}{3}x+\frac{1}{6}\sqrt{(16x^2-6\delta+24)}$. Solving simultaneously gives $a^*=x^*$ in equilibrium and $x^*=\frac{1}{4}\sqrt{8-2\delta}$.

To confirm this equilibrium we need to consider deviations. Deviations to internal ambiguous platforms cannot be optimal (Lemma 3). Having one stand at 0 is covered in the calculation of the equilibrium; and both stands at 0 implies that the expected policy outcome is no better than 0, which is not profitable. This leaves deviations to unambiguous platforms and those with at least one stand at 1, with the deviator targeting the median or a disjoint coalition. This leaves four cases that we consider in turn.

Case 1. $l^*=\left\{0,\ -\frac{1}{4}\sqrt{8-2\delta}\right\},\ r\ =\ \{x,x\}$ targeting the median. Several steps of algebra produces:

$$\frac{\partial}{\partial\delta}U_R(l^*,r|\delta)=-\frac{8\left(299x^2-2-\delta+\frac{3}{8}\delta^2\right)+128x^2(1-x^2)+712x^2(1-\delta)+4x\sqrt{(8-2\delta)}\left[(68-21\delta)+256x^2\right]}{128\sqrt{(8-2\delta)}\left(\sqrt{(8-2\delta)}+4x\right)^2}.$$

The denominator is positive and the numerator is positive if $299x^2-2-\delta+\frac{3}{8}\delta^2>0$, a sufficient condition for which is: $x\geq\sqrt{\frac{1}{100}}=\frac{1}{10}$. For $x\geq\frac{1}{10}$ we have $\frac{\partial}{\partial\delta}U_R(l^*,r|\delta)<0$, and thus if a deviation is profitable for some δ', it is also profitable for all $\delta<\delta'$. This establishes the existence of an upper bound $\underline{\delta}^a$; numerical verification determines the value.

For $x<\frac{1}{10}$, compare r to $r'=\{0,\ 2x\}$. Comparing components: $d(r)-d(r')=-x^2+\frac{1}{2}(2x)^2=x^2<\frac{1}{100}$, and $c(r',l^*)-c(r,l^*)=\frac{1}{4}\left(\frac{1}{2}+0+\alpha-\beta\right)$, where $\alpha-\beta>0$ by Condition (3). As r' is not a profitable deviation, a necessary condition for r to be profitable is that $U_R(l^*,r)>U_R(l^*,r')$, which is only true if $\delta<\frac{1}{12}<\underline{\delta}^a$.

Case 2. $l^*=\left\{0,-\frac{1}{4}\sqrt{8-2\delta}\right\},\ r\ =\ \{z,1\}$ targeting the median. Begin by considering the unambiguous strategy $\hat{r}=\{y,y\}$. Optimizing and rearranging:

$$\frac{\partial}{\partial y}U_R(l^*,\hat{r})=-\frac{1}{16}\frac{160y^2+56y^2\delta+384y^4+56\delta-9\delta^2+32y\sqrt{(8-2\delta)}[2(\delta-1)+7y^2]-80}{\left(\sqrt{(8-2\delta)}+4y\right)^2}$$
$$\frac{\partial^2}{\partial y^2}U_R(l^*,\hat{r})=\frac{1}{2}\frac{-384y^4-168y^2(4-\delta)-2y\sqrt{(8-2\delta)}[9(4-\delta)+152y^2]-\delta(24-7\delta)-16}{\left(\sqrt{(8-2\delta)}+4y\right)^3}$$
$$<0.$$

Thus, there is a unique maximum. We show that this maximum is at $y^*<\frac{1}{2}$. Define the numerator of the first derivative by $\xi(y,\delta)$. Tedious algebra shows at $y=\frac{1}{2}$ that $\frac{\partial^2}{\partial\delta^2}\xi\left(\frac{1}{2},\delta\right)<0$ for $\delta<4$. As $\xi\left(\frac{1}{2},\frac{1}{5}\right)=-\frac{59}{25}+\frac{12}{25}\sqrt{190}>0$ and $\xi\left(\frac{1}{2},4\right)=384\left(\frac{1}{2}\right)^2+384\left(\frac{1}{2}\right)^4>0$, then $\frac{\partial}{\partial y}U_R(l^*,\hat{r})<0$ for $\delta\in(\underline{\delta}^a,4)$ and the maximum is at $y^*<\frac{1}{2}$.

Returning now to $r=\{z, 1\}$, we have $\frac{1+z}{2} > \frac{1}{2}$. Applying the techniques from the proof of Theorem 1, and that candidate R wishes to deviate inward from the unambiguous $r' = \left\{\frac{1+z}{2}, \frac{1+z}{2}\right\}$, it follows that the deviation to $\tilde{r}=\{1-\rho, x-\rho\}$ is profitable.

Case 3. $l^* = \left\{0, -\frac{1}{4}\sqrt{8-2\delta}\right\}, r = \{z, 1\}$ targeting the coalition $\{-1, 1\}$. For voters at -1 the direct evaluation of candidates gives $d(R|-1)-d(L|-1)<-1$, and so R must benefit from the contextual evaluation for the deviation to be profitable. For fixed z, an increase in δ increases candidate R's utility for two reasons: (i) l^* approaches 0, a more preferred policy for R, and (ii) this implies that $\frac{du^p_{-1}(l^*,r|\delta)}{d\delta} > 0$ and R wins more frequently. Thus, if for some z and δ' the deviation r is profitable, it is profitable for all $\delta>\delta'$. Numerical verification delivers the bound $\overline{\delta}^a$.

Case 4. $l^* = \left\{0, -\frac{1}{4}\sqrt{8-2\delta}\right\}, r = \{x, x\}$ targeting the coalition $\{-1, 1\}$. The approach is the same as in Case 3 although the analysis is far more involved; we provide a sketch here. It is obvious that $x<0$ is not profitable, and as $x>0$ implies $u^p_{-1}<0$ we require $x > \frac{1}{2}\frac{1}{4}\sqrt{8-2\delta}$ for the deviation to be profitable. As $\frac{du^p_{-1}(l^*,r)}{dx} < 0$, profitability requires that $u^p_{-1}>-1$ at $x = \frac{1}{2}\frac{1}{4}\sqrt{8-2\delta}$. Tedious algebra establishes that a necessary condition for this is $\delta>3.4$ Now fix x and again algebra shows that the contextual component of u^p_{-1} is increasing in δ for $\delta>3.4$ (it increasingly favors R). This property is not straightforward: an increase in δ increases the weight on a factor that benefits L, but L moves away from voters at -1, which decreases his advantage. This property implies that if the deviation l is profitable for some δ', it is profitable for all $\delta>\delta'$. Numerical verification establishes the bound to be greater than $\overline{\delta}^a$. □

Proof of Corollary 1. Follows from Theorems 1 and 2. □

Proof of Corollary 2. Polarization in the $k=1$ unambiguous equilibrium is $\frac{1}{2}\sqrt{1-\delta}$ and for the $k=2$ ambiguous equilibrium it is $\frac{1}{8}\sqrt{(8-2\delta)}$. The result follows from simple algebra. □

Proof of Corollary 3. As in equilibrium each candidate wins with equal probability and $c(\cdot)$ is skew-symmetric, expected voter utility is given by the direct evaluation component only. As all equilibria are symmetric, for the median voter this leads to:

$$Eu^1_0(l^*, r^*, \delta) = -\left(\frac{1}{2}\sqrt{1-\delta}\right)^2 \times \frac{1}{2} \times 2 = -\frac{1}{4} + \frac{1}{4}\delta$$

$$Eu^2_0(l^*, r^*, \delta) = -\frac{1}{2}\left(\frac{1}{4}\sqrt{(8-2\delta)}\right)^2 \times \frac{1}{2} \times 2 = -\frac{1}{4} + \frac{1}{16}\delta$$

$$< Eu^1(l^*, r^*, \delta).$$

Analogous derivations hold for the other voters. □

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