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# POLICY-MOTIVATED PARTIES IN DYNAMIC POLITICAL COMPETITION

Oleg Smirnov and James H. Fowler

### ABSTRACT

We analyze a model of a dynamic political competition between two policy-motivated parties under uncertainty. The model suggests that electoral mandates matter: increasing the margin of victory in the previous election causes both parties to shift towards policies preferred by the winner, and the loser typically shifts more than the winner. The model also provides potential answers to a number of empirical puzzles in the field of electoral politics. In particular, we provide possible explanations for why close elections may lead to extreme platforms by both parties, why increased extremism in the platform of one party may lead to greater moderation in the platform of the other party, and why increasing polarization of the electorate causes winning candidates to become more sensitive to mandates. We also show that, contrary to previous findings, increasing uncertainty sometimes decreases platform divergence. Finally, we pay special attention to the proper methodology for doing numerical comparative statics analysis in computational models.

KEY WORDS • Bayesian updating • computational models • dynamic models • electoral politics • party competition

## Introduction

How do electoral outcomes affect policy? The most obvious answer to this question is that elections determine *who* gets to make policy. But elections may also determine *what* kind of policy winners can enact. After a landslide victory winners may claim a 'mandate' to govern, arguing that the size of the victory shows that the public is eager to support their policies (Kramer, 1977; Kelly, 1983).

After a close election losers may claim that there is no mandate – the public's ambivalence should be interpreted as a sign that support for the winners' policies is qualified at best. Dahl (1990) points out that both of these arguments are self-serving and notes that even if the margin of victory is large it is unclear whether overwhelming support for the winner translates into support for a particular policy. However, recent empirical evidence indicates that mandates do have an effect on policies and candidates (Conley, 2001; Fowler, 2005, 2006; Peterson et al., 2003).

US Presidential and Congressional elections in 2000 and 2004 raised a number of burning questions such as 'Does the Republican party have a mandate to implement highly conservative policies?'; 'What platform do the Democrats adopt given their recent losses?'; and 'What political changes do we expect to see by the next election in 2008?' We address these questions in a formal theoretical model. To understand how parties use mandates, we return to the literature on spatial political competition between two parties. Traditional models assume that parties care *only* about winning elections (Downs, 1957; Davis et al., 1970). Wittman (1977) extends these models by assuming that parties also care about policy outcomes (see also Wittman, 1983; Calvert, 1985; Roemer, 1997, 2001; Duggan and Fey, 2005). Under this assumption parties face a dilemma. By moving *toward* the median voter's preferences they increase their likelihood of winning. By moving *away* from the median voter's preferences toward their own preferred policy they increase the desirability of the policy they implement should they win the election. As a result, policy-motivated parties offer policies that diverge when there is uncertainty about the preferences of the median voter.

The Wittman model is based a very simple concept: parties must balance the fear of losing the election against the greed of proposing the policies they most prefer. Unfortunately, this simplicity quickly disappears in formal settings. As the two parties mutually maximize their expected utilities, analytical solutions become very complicated. Roemer (1997) provides a rigorous and not trivial proof that a unique Wittman equilibrium exists. However, the Wittman model is usually too complicated to yield closed-form solutions for comparative statics analysis (Roemer, 2001). The few models that can be solved in closed form rely on the assumption that the median voter's preference is exactly equidistant between the preferences of the two parties (symmetry). As a result, there have been very few attempts to build on the Wittman model.[1]

To analyze the effect of electoral outcomes on policy, we extend the Wittman model by placing it in a dynamic setting and relaxing the crucial symmetry assumption. We introduce a model of Bayesian inference in the traditional spatial context which allows policy-motivated parties to use information about the past to update

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1. For notable exceptions see Groseclose (2001) and Adams and Merrill (2003) who study the valence advantage in the context of Wittman equilibrium.

their beliefs about the state of the electorate. We then analyze the effect of information gained in previous elections on equilibrium policies offered by the two parties. Unfortunately, incorporating Bayesian inference in the Wittman framework causes it to become analytically intractable. However, instead of abandoning the model we analyze it using *numerical comparative statics*. A special section in the article is devoted to the proper methodology for conducting such an analysis.

The model yields a number of novel hypotheses which can be tested empirically (see Table 2 for a complete summary). The most basic of these is that mandates matter – equilibrium policies are affected not only by *who* wins the election but by *how much*. Larger margins of victory cause both parties to move the policies they offer towards the winner's preferred policy. Moreover, the losing party tends to shift more than the winning party. This dynamic yields an interesting result. Contrary to the common view that close elections imply compromise and moderation, the model suggests that close elections may lead to the *largest* divergence in policies offered by the two parties.

Relaxing the symmetry assumption allows us to see how *party preferences* affect equilibrium policies. As one party becomes more extreme in the policies it prefers, the policies it offers also become more extreme, but the other party accommodates for the change by offering more *moderate* policies. The dynamic aspect of the model allows us to analyze two different kinds of uncertainty. The literature has typically focused on what we call *electoral volatility,* or the inherent randomness in the location of the median voter. We also analyze the effect of *confidence in prior beliefs*, which reflects uncertainty about previous information parties have about the electorate. Increasing either kind of uncertainty tends to yield policies that are more extreme, but the margin of victory complicates the relationship. Finally, the model allows us to study the effect of *electoral polarization* on equilibrium policies. As voters become more polarized, the winning party offers more extreme policies and the losing party offers more moderate policies. This implies that greater electoral polarization increases the importance of the electoral mandate that winners receive.

## The Model

Two parties engaged in political competition, *L* and *R,* choose platforms $(y_L, y_R)$ in a one dimensional policy space such that $-\infty < y_L \leq y_R < \infty$. Parties are policy motivated with exogenous ideal points, $-\infty < p_L < 0 < p_R < \infty$, and gain utility according to a Euclidian utility function $U_i = -(y_W - p_i)^2$, i = L, R, where $y_W \in \{y_L, y_R\}$ is the platform of the winning party.[2] When choosing platforms, parties

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2. This choice of utility function is a standard approach for modeling policy-motivated candidates (cf. Wittman, 1983; Calvert, 1985; Duggan and Fey, 2005). Notice that it implies parties are risk averse – changes in outcomes produce increasingly worse utility as they become more distant from one's preferred outcome.

have full information about the previous election. This includes the location of platforms in the previous election $(x_L, x_R)$, and the previous election results as reflected in the vote share for the left party, $0 \leq s \leq 1$.

To introduce uncertainty, we assume that parties have prior beliefs about the location of the median voter, $M$. These beliefs are subject to a continuous distribution

$$M \sim \psi (M; \mu, \beta), \qquad (1)$$

with mean $\mu$ and variance $\beta > 0$. The mean can be interpreted as a party's *best guess* about the location of the median voter, while the variance denotes its *confidence in prior beliefs*. Small values of $\beta$ imply that the parties are confident in their prior guess about the location of the median voter; large values suggest that the prior information is less reliable.

Parties use information from the previous election to update their estimate of the location of the median voter. Elections, however, may not provide perfect information about the location of the median voter due to fluctuating turnout, idiosyncratic platforms, changing 'policy moods' (Stimson et al., 1995) and a variety of other random shocks (Londregan and Romer, 1993; Adams et al., forthcoming). Therefore, for any single election the median voter, $m$, can be thought of as the outcome of a random variable with mean $M$. These election outcomes are distributed according to the continuous distribution

$$m \sim \gamma (m; M, b), \qquad (2)$$

where mean $M$ is the location of the median voter and variance $b > 0$ can be thought of as *electoral volatility*, or how much the parties trust that the results of the previous election reflect the true location of the median voter. Small values of $b$ indicate that the parties think the election provides very accurate information about the location of the median voter; conversely, large values of $b$ imply that they think election results are more random and may contain little information about the location of the median voter.

Suppose that parties use Bayes's rule to incorporate information from the previous election into their estimate of the location of the median voter.[3] Specifically, parties must update their *beliefs* about the location of the median voter, $M$, given an *observation*, $m$, which is the location of the median voter implied in the previous election. If we assume that the distributions (1) and (2) are normal then the posterior mean $\mu'$ and posterior variance $\beta'$ are

$$\mu' = \frac{\mu b + m \beta}{b + \beta}, \qquad \beta' = \frac{b \beta}{b + \beta}.$$

*Proof.* See Box and Tiao (1973: 74–5).

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3. A variety of mechanisms have been advanced to explain learning behavior. Though these vary in the degree of efficiency, many of them converge to Bayesian updating in the limit (Fudenberg and Levine, 1997).

Notice that the updated estimate of the location of the median voter is simply a weighted average of the prior belief and the new information obtained in the previous election.[4] The weights on these beliefs are the variances. If prior information is unreliable then more weight is given to the new information yielded in the election. If electoral volatility is high then more weight is given to the prior belief.

This updating process assumes that the location of the median voter for the previous election, $m$, can be observed. However, it is not possible to use the vote share to infer the location of the median voter without also having a belief about the voter distribution. Therefore, we assume that parties believe that voters are distributed according to a symmetric continuous distribution

$$v \sim \phi\,(v; M, B). \tag{3}$$

Since the distribution is continuous and symmetric, the mean of the voter distribution, $M$, coincides with the location of the median voter. See Table 1 for an overview of the distributions of $M$, $m$, and $v$ and why all three are necessary in the model.

The variance of the voter distribution, $B$, represents how widely voter preferences spread across the policy space. For simplicity, we call it *electoral polarization*.[5] Small values of $B$ suggest that most voters have similar preferences in the middle of the policy space; large values imply that there are more extremists in the electorate and voter preferences are spread more broadly across the policy space. Specifying the voter distribution, we make it possible for the politicians to infer the location of the median voter in the *previous* election.[6]

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4. Notice also that the posterior variance $\beta'$ is always less than the prior variance $\beta$ since $\beta' = b\beta/(b + \beta)$ and $b/(b + \beta) < 1$. One implication of the result is that if preferences in the electorate are permanently fixed, then in the limit the posterior variance will approach zero and, therefore, the parties will know the location of the median voter with certainty which would lead to platform convergence (cf. Duggan and Fey, 2005). Letting the true location of the median voter be uncertain would prevent convergence, but we do not model this because it would require a fourth probability distribution and further unnecessary complexity without affecting the results.

5. Technically, the term 'polarization' may be more appropriate for a bimodal distribution of voters. We use the term to describe the variance of a normal distribution due to its intuitive simplicity as opposed to such terms as the 'spread' or 'variance' of the electorate.

6. If parties have beliefs about the degree of electoral polarization, then they can infer the location of the median voter in the previous election by observing the platforms and the margin of victory. Note that under proximity voting, the vote share must equal the area under the voter distribution up to the halfway point between the two platforms in the previous election, given the implied location of the median voter, $m$, and the electoral polarization, $B$:

$$s = \int_{-\infty}^{(x_L + x_R)/2} f(v \mid m, B)\,dv$$

if the voter distribution is normal then

$$s = \int_{-\infty}^{(x_L + x_R)/2} \frac{1}{\sqrt{2\pi B}} e^{-(v-m)^2/2B}\,dv.$$

As a result, the location of the median voter in the previous election, $m$, can be found if parties know the vote share, $s$, the platforms, $x_L$, $x_R$, and have beliefs about the degree of electoral polarization, $B$.

**Table 1.**  Summary of the Three Distributions in the Model

| Distribution | Description | Mean | Variance | Purpose/Necessity |
|---|---|---|---|---|
| $M \sim \psi(M; \mu, \beta)$ | $M$ is the true and unknown location of the median voter. Parties believe that it is distributed according to $\psi(\mu, \beta)$. | $\mu$ describes the parties' initial best guess about the location of the median voter. | $\beta$ describes how certain the parties are about their initial best guess. | The distribution is essential in the model as it describes the uncertainty about the location of the median voter as reflected in the parties' prior beliefs. |
| $m \sim \gamma(m; M, b)$ | $m$ is the location of the median voter in the previous election (which can be inferred from the previous election; Lemma 1). | $M$ is the true and unknown location of the median voter; a median voter in a particular election is most *likely* to be located at the mean $M$. | $b$ describes how much the parties trust that the results of the previous election reflect the true location of the median voter. | The distribution makes the model dynamic: it describes the new information about the location of the median voter that the parties receive as the previous election results become known. The parties' posterior beliefs are a Bayesian product of the prior beliefs and the newly acquired information. |
| $\upsilon \sim \phi(\upsilon; M, B)$ | $\upsilon$ is the density of the voter distribution; the area under the density function corresponds to the total number of voters. | $M$ is the true and unknown location of the median voter *and* it is also the mean of the voters' distribution. | $B$ describes the spread of the voters' distribution which we call 'electoral polarization $M$'. | The distribution is necessary because it allows the parties to use the results of the previous election to calculate $m$, the true location of the median voter in the previous election (Lemma 1). |

# Equilibrium

We use a Nash equilibrium concept to analyze the behavior of policy-motivated parties. Using the standard notation, we define equilibrium as a combination of candidates' platforms $(y_L^*, y_R^*)$ such that $y_L^*$ arg max $U_L$ and $y_R^* =$ arg max $U_R$ :

$$\max_{y_L} EU_L = \pi(y_L, y_R^*) \, U_L(y_L) + (1 - \pi(y_L, y_R^*)) \, U_L(y_R^*)$$

$$\max_{y_R} EU_R = \pi(y_L^*, y_R) \, U_R(y_L^*) + (1 - \pi(y_L^*, y_R)) U_R(y_R), \tag{4}$$

where $\pi(y_L, y_R)$ is the probability that party $L$ wins given the platforms $y_L$ and $y_R$, $U_i(y_i) = -(y_W, p_i)^3$ is the utility of party $i = L, R$ if the party wins the election, $y_W = y_i$, and $U_i(y_{-i}) = -(y_W - p_i)^2$ is the utility of party $i = L, R$ if the party loses the election, $y_W = y_{-i}$.

The platform closest to the median voter's ideal point wins the election. Therefore, the probility that the Left wins the election is $\pi(y_L, y_R) = \Pr(M < (y_L + y_R)/2)$. Parties believe that the location of the median voter $M$ is distributed according to (1), which we assume to be normal.

In the first – or 'previous' – election, the candidates' locations are the Wittman equilibrium platforms $(x_L^*, x_R^*)$, and the probability that that Left wins the election is

$$\pi(x_L, x_R) = \int_{-\infty}^{(x_L+x_R)/2} \frac{1}{\sqrt{2\pi\beta}} e^{-(M-\mu)^2/2\beta^2} \, dM,$$

where $\mu$ is the prior belief about the locations of the median voter and $\beta$ is the confidence in the prior belief. This gives us all the information we need to find the first order conditions for the utility equations in (4):

$$\frac{\partial EU_L}{\partial y_L} = \frac{e^{-(y_L+y_R-2\mu)^2/8\beta}(y_R - y_L)(y_L + y_R - 2p_L)}{2\sqrt{2\pi\beta}}$$

$$+ 2(p_L - y_L)\left( \int_{-\infty}^{(y_L+y_R)/2} \frac{1}{\sqrt{2\pi\beta}} e^{-(M-\mu)^2/2\beta^2} \, dM \right)$$

$$\frac{\partial EU_R}{\partial y_R} = \frac{e^{-(y_L+y_R-2\mu)^2/8\beta}(y_R - y_L)(y_L + y_R - 2p_R)}{2\sqrt{2\pi\beta}}$$

$$+ 2(p_R - y_R)\left( 1 - \int_{-\infty}^{(y_L+y_R)/2} \frac{1}{\sqrt{2\pi\beta}} e^{-(M-\mu)^2/2\beta^2} \, dM \right)$$

For the current election, however, both $\mu$ and $\beta$ need to be updated given the information that the previous election provided. As a result, the new expression for the probability of victory by the Left becomes:

$$\pi(y_L, y_R) = \int_{-\infty}^{(y_L+y_R)/2} \frac{1}{\sqrt{2\pi\beta'}} e^{-(M-\mu')^2/2\beta'^2} \, dM,$$

where $\mu'$ and $\beta'$ are the product of Bayesian inference as defined previously. The first order conditions for the current election will be identical to those for the previous election except we use the posterior mean and variance instead of the prior.

One might be reluctant to refer to this model as one of *dynamic* competition because it does not consider the possibility that parties might use their platforms to manipulate future inferences about the location of the median voter. However, given the posited beliefs about the voter distribution and common knowledge of the platforms, notice that *it is not possible to manipulate future inferences*. Under proximity voting there is a fixed relationship between the voter distribution and the election outcome given a set of platforms. Changing those platforms will change the vote share, but it also changes the cutpoint between them. As a result, the inference about the location of the median voter will always be the same *regardless of the choice of platforms*. Thus, our model accounts for the behavior of parties that optimize dynamically over a series of elections because this behavior will be exactly the same as the behavior of parties that optimize separately in each period.

Although we have characterized the first-order conditions, we do not have a closed-form expression for the posterior platforms. This is because an analytical solution is usually not available in the Wittman model. Even when there is a closed-form solution, analytical comparative statics always rely on an assumption of preferences that are symmetric around the mean of the median voter distribution. It is not possible to make this assumption if beliefs about the median voter change from one election to the next – parties can have symmetric preferences either in the prior election or the posterior election but not both. How then should we proceed? Roemer (2001: 89) notes that 'although the Wittman model is, in most cases, too complex to permit solving for the political equilibrium by hand, solutions are easily computable by machine'. Therefore, to study the effect of beliefs on the equilibrium behavior of policy-motivated parties we turn to computational simulation.

## Comparative Statics in Computational Models

There is a perception among formal theorists that computational results are unreliable because they are sensitive to human error. However, mathematical proofs are also subject to error. Moreover, even though programs are sometimes more complicated than proofs, the computer enforces a consistency on the programmer that may be missing for the analytical theorist. Mistakes in coding often cause a program not to run. Mistakes in proofs, however, must be discovered by the author or human referees and colleagues.

Although it is obviously difficult to quantify uncertainty related to errors in proofs and programming, we can estimate uncertainty in comparative statics

results given there are no errors in these methods. Suppose we claim that for a given parameter space, a value of interest $f(a,b)$ is always increasing in one of the parameters, $a$. If an analytical solution is available, we can prove this claim with certainty by showing that the derivative $df(a,b)/da$ is positive in this space. What the derivative tells us is that for each very small change in the parameter $a$ we get a positive increase in $f(a,b)$. The equivalent procedure for a computational model is to *sample* parameters from the space. For a given set of parameters we find $f(a)$. Then we increase $a$ by a very small amount $\varepsilon$ and find $f(a + \varepsilon)$. If $f(a + \varepsilon) \leq f(a)$, then we have contradicted the claim and it is false. If not, the claim may be true.

Each draw from the sample space decreases uncertainty about the claim. If the parameters are drawn equally from all parts of the space and each point in the space has an equal chance of contradicting the claim, then we can use conventional probability calculations to estimate the uncertainty. Suppose that in $n$ draws we do not contradict the claim. If the portion of the space that would contradict the claim is $p$, then the probability of not contradicting the claim is $(1-p)^n$. To estimate the maximum value of $p$ consistent with 0 observations of a contradiction we can set this probability equal to 0.05 (to estabilish 95% confidence). Then $(1-p)^n = 0.05$ which implies $p = 1-0.05^{\frac{1}{n}}$. It is easy to compute this threshold exactly for any $n$, but a well-known rule of thumb is $p \approx 3/n$ (Hanley and Lippmanhand, 1983). Although analytical results are always more certain ($p = 0$), when they are not available we can ensure that $p$ is very small for computational results by relying on a large $n$ number of draws.

In this article we are interested in how the parameters *vote share*, *party preferences, electoral volatility, confidence in prior beliefs*, and *electoral polarization* affect the dynamic choice of party platforms. Party preferences are held constant at −1 and 1 to model parties with divergent interests. However, for one of the results we relax this assumption and vary the right preference between 0 and 1 to see how preference change affects party platforms. We allow vote share for the left to vary between 0 and 1, but we restrict the belief about the mean location of the median voter to the interval between the party preferences. Substantively, this means the parties always think they are on opposite sides of the median voter. Finally, we allow each of the three variance parameters (electoral volatility, confidence in prior beliefs, and electoral polarization) to range from 0 to 1. To search this parameter space, we draw each parameter from an independent uniform distribution on the defined interval.

Each of the results we present below is accompanied by figures that illustrate the relationships in question with a single set of parameter values. However, to test the general validity of each result we sample the parameter space 1000 times and evaluate the claim for each set of parameters (see Appendix for the computer code). To do this, we find posterior equilibrium platforms for a given set of parameters, then increase one parameter by 0.001 and repeat the procedure to see how a small change

in one of the parameters affects the model. *Not one of the draws contradicts any of the results.* According to the previous analysis, that means we can be 95 per cent confident that less than 0.3 per cent of the parameter space contradicts the findings.

### Vote Share: Moving with the Mandate

The intuitive idea behind the notion of electoral mandates is that, depending on the margin of victory, the winning party adopts a *new* platform closer to its ideal preference point. The new platform could be a policy implemented right after the election, or – in an alternative interpretation – it could be a platform of the candidate for the *next* election. In the model, we indeed observe that as the vote share of the winning party increases, the winner moves its (subsequent) platform closer to its most preferred policy.

RESULT 1: *Increasing the vote share of the left (right) party in the previous election causes both parties to shift their platforms towards the left (right).*

Figure 1 illustrates how both parties react to the outcome of the previous election represented as a vote share for the left party.[7] Figure 1(a) shows the effect of vote share on the equilibrium platforms of both parties when everything else in the model is held fixed. Higher values in this figure indicate more conservative platforms. The top line represents the platform for the right party while the bottom is the platform for the left party. Notice that *both* platforms become more liberal as vote share for the left party increases. The higher left vote share indicates the median voter is farther to the left, so the left party has more leeway to move platforms toward its own preferences while the right feels more pressure to move its platforms towards the center. In other words, *both* parties move with the mandate.

   Figure 1(b) shows the effect of vote share on divergence. Notice first of all that regardless of the size of the vote share parties do not converge. This confirms a well-known result that policy-motivated parties offer divergent platforms when the location of the median voter is not known with certainty (Wittman, 1983; Hansson and Stuart, 1984; Calvert, 1985; Roemer, 1997). In addition, the degree of divergence varies with the margin of victory. The right platform is farthest away from the left platform when the previous election was very close ($s = 0.5$). Conversely, when one party wins in a landslide (e.g. $s = 01$ or $s = 0.9$) the platforms end up closer together. Notice that the small divergence for landslides does *not* mean that parties are unresponsive to the results of the previous election. The divergence only measures the distance between platforms, and not how much they changed from the previous election.

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7. The set of parameters used in all figures is $p_L = -1$, $p_R = -1$, $\mu = 0$, $s = 0.5$, $\beta = 0.25$, $b = 0.25$, $B = 0.5$. The examples assumes that prior platforms $x_L$, $x_R$ are in equilibrium,
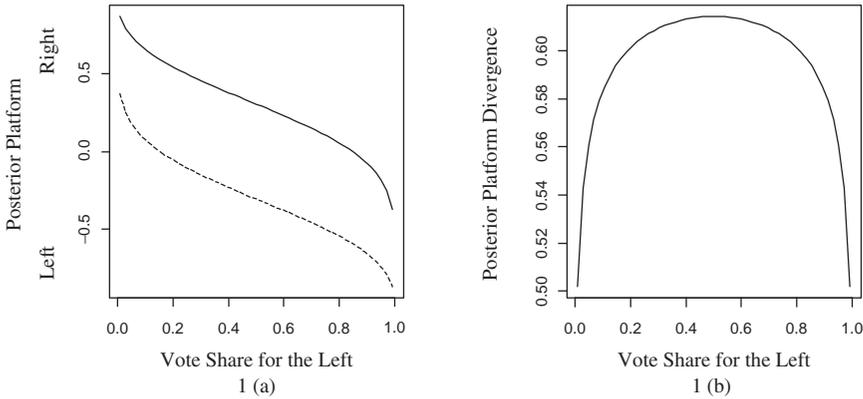
**Figure 1.** Effect of Vote Share on Party Platforms

*Note.* Solid line is the right party, dashed line is the left party.

RESULT 2. *Close elections yield the largest platform divergence.*

How can we explain such a puzzling result? Under certainty, the margin of victory would have no effect: the candidates would converge to the known location of the median voter. Under uncertainty, however, the divergence is persistent and its magnitude is *inversely* related to the margin of victory. This may seem counterintuitive. For example, Robertson (1976) argues that close elections indicate the electorate is evenly divided and, therefore, parties will compromise and offer centrist platforms. However, Robertson's argument does not take into account the asymmetric forces that affect the equilibrium platforms of the winning and losing party. Election results suggest that the location of the median voter is closer to the party that won the election. *In addition*, they decrease uncertainty about the location of the median voter. For the losing party, both forces work in the same direction, toward the center. The party not only learns that the median voter is located father away from its own ideal point, it also becomes more confident about this location. For the winning party the two forces oppose each other. Winning the election allows a party to move away from the center toward its own ideal point. At the same time, the party becomes more confident about the location of the median voter, which drives its new equilibrium platform toward the center.

Figure 1 shows that as the vote share of the winning party increases, it chooses a more extreme platform. In fact, the marginal effect of vote share *increases* as the margin of victory becomes more extreme. However, the marginal effect on the losing party is even stronger as it races to close the gap between itself and the winning party. Qualitatively, the winning party frequently claims a mandate even if it wins by a small margin (cf. Conley, 2001); the losing party, however, does not always compromise. When the election is close, the losers are *least* likely to

sacrifice their policy preferences because they know that the winners will not become much more extreme. This decreases the losing party's aversion to a loss, giving it more leeway to hold its ground. To put it simply, close elections do not provide enough information for the losers to start chasing winners across the issue space. Landslide elections, on the other hand, provide a reliable signal for the loser that the median voter is *definitely* closer to the other candidate and further policy moderation is necessary.

### Asymmetric Preferences

Another potentially important implication of the model is how increased extremism in one party affects the platform of the other party. Figure 2 shows how changing the preference of the right party from 0 to 1 affects equilibrium platforms. Notice that as the preferences of the right party become more extreme, it tends to choose platforms farther to the right. This may not be surprising, but it does provoke an interesting reaction from the left: the left party reacts to a more extreme opponent by choosing a platform *closer* to the center.
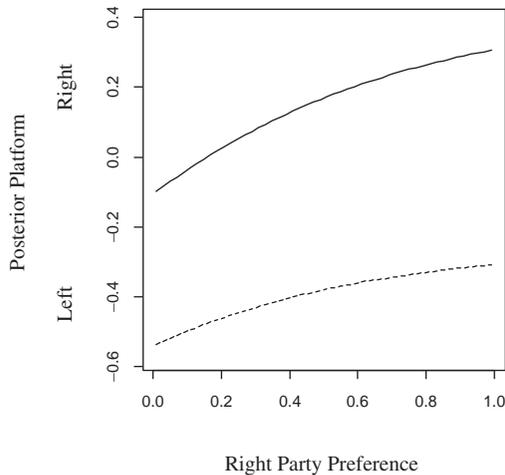


**Figure 2.** Effect of Party Preferences on Platforms

*Note.* Solid line is the right party, dashed line is the left party.

RESULT 3. *As one party's ideal point becomes more extreme, the equilibrium platforms of both parties move in the direction of the more extreme party.*

This dynamic may surprise formal theorists and scholars who study party behavior. First, a more extreme platform has a lower probability of winning the election. Second, a more extreme platform can be viewed as an aggressive challenge to the

other party. Both factors might warrant a tit-for-tat type response: the other party could similarly choose a more extreme platform closer to its preference point. Nevertheless, the other party chooses a more moderate platform in equilibrium.

This phenomenon can be explained in part by risk aversion in the utilities. If both parties have utility functions that are linear in losses, then party preferences play no role in the equilibrium.[8] A change in policy has the same effect regardless of how far away it lies from a party's preferred policy. However, in our model we assume utility functions that are *quadratic* in losses. This means that parties are more sensitive to small changes in policies that are far away than they are to small changes in policies that are close. Thus, although more extreme platforms are less likely to win elections, when they do it is much more painful to the opposing party. In equilibrium, offering a moderate platform is the best response to increased extremism in one's opponent. This may help to explain why in the United States the recent movement of the Republican party to the right has been accompanied by the Democratic party moving to the center rather than to the left.

*Electoral Volatility: Winner's Foe, Loser's Ally*

Recall that electoral volatility is the variance in the distribution of the median voter. Lower values of electoral volatility indicate that parties believe election results provide reliable information that can be used to infer the location of the median voter. Higher values mean parties believe there is a noisier relationship between election outcomes and the voter distribution. Turnout may be one of the more important determinants of electoral volatility. For example, *ceteris paribus* high turnout would provide more reliable information about preferences of the electorate and, therefore, would correspond to a smaller variance. In our model, the effect of electoral volatility on future platforms is intuitive. If the volatility is high and the election results are not very informative about the true preferences of electorate, then parties have not learned much about the possible location of the median voter. As a result, both the winner and the loser have freedom to adopt platforms which substantially diverge. However, there is one exception. Consider the plots in Figure 3. The left figure shows how electoral volatility affects platforms when the right party wins a close election while the right figure shows the effect when it wins in a landslide.

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8. Specially, here are the first-order conditions for the utilities under the assumption that losses are linear (and not quadratic) in the distance between preferences and outcomes:

$$\frac{\partial EU_L}{\partial y_L} = \frac{e^{-(y_L+y_R-2\mu)^2/8\beta}(y_R-y_L)}{2\sqrt{2\pi\beta}} + \int_{-\infty}^{(y_L+y_R)/2} \frac{1}{\sqrt{2\pi\beta}} e^{-(M-\mu)^2/2\beta^2} dM$$

$$\frac{\partial EU_R}{\partial y_R} = \frac{e^{-(y_L+y_R-2\mu)^2/8\beta}(y_R-y_L)}{2\sqrt{2\pi\beta}} + 1 - \int_{-\infty}^{(y_L+y_R)/2} \frac{1}{\sqrt{2\pi\beta}} e^{-(M-\mu)^2/2\beta^2} dM$$
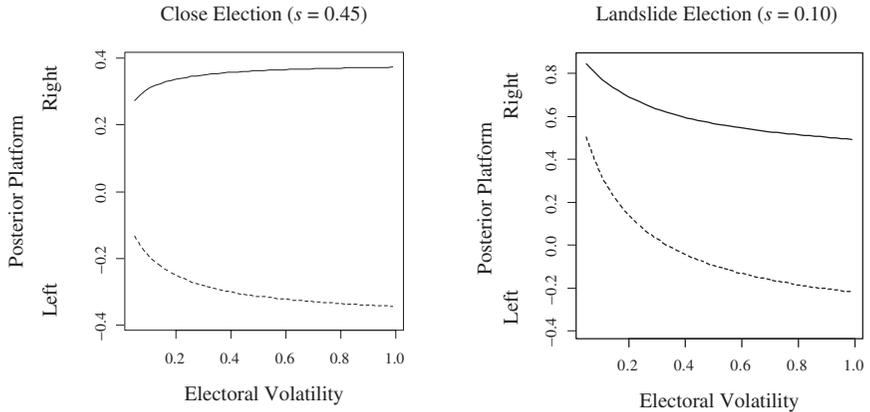
**Figure 3.** Effect of Electoral Volatility on Party Platforms

*Note.* Solid line is the right party, dashed line is the left party.

Regardless of the margin of victory, increasing the belief that the election results do not reflect the opinion of the electorate causes the left party to discount the election and move towards its own preference in choosing a new platform. The effect on the right party depends on the margin of victory. When the Right wins a close election, greater electoral volatility leads to a more extreme platform. When the Right wins in a landslide, greater electoral volatility makes the party choose a more moderate platform. This is a counter-intuitive result:

RESULT 4. *If the margin of victory is large enough, greater electoral variance causes the winning party to choose a more moderate platform.*

The explanation, however, is simple. We know that uncertainty is necessary for divergence, but it also decreases the importance of the margin of victory. Higher electoral volatility makes it more difficult to tell who the electorate actually prefers when the election is close, which causes both the winner and the loser to offer more extreme platforms. However, higher volatility also increases the chance that a landslide victory might have been a fluke, weakening the inference that the landslide winner is much closer to the median voter. This pushes the winner back towards the center and at a high enough margin of victory reverses the relationship between electoral volatility and the winner's platform.

*Prior Information: Confidence Yields Divergence*

Confidence in prior information is defined as a party's prior belief about the variance of the location of the median voter. High variance means that parties have

little certainty about their prior beliefs. Low variance means that prior information is thought to be reliable. In the extreme case when the variance is zero (perfect certainty), the parties think they know the exact location of the median voter to which they converge.

Higher uncertainty about prior beliefs increases the relative importance of new information obtained from the election outcome, which makes winning more meaningful for estimating the location of the median voter. This increases the ability of the winning party to shift platforms towards its own preference by claiming a mandate after an election. Thus, the effect on future platforms is less straightforward. Consider the figures in Figure 4. The left figure shows how uncertainty about prior beliefs affects platforms after the right party wins a close election while the right figure shows the effect after it wins in a landslide. Regardless of the margin of victory, increasing uncertainty (decreasing confidence) in prior beliefs causes the right party to propose a platform closer to its own ideal point. The effect on the left party depends on the margin of victory. When the Left loses in a landslide, increasing uncertainty causes the Left to shift towards the Right. Otherwise when the Left loses a close election, increasing uncertainty causes the Left to shift towards its own ideal point. This implication of the model is essentially symmetric to the implication regarding electoral volatility:

RESULT 5. *If the margin of victory is large enough, decreasing confidence in prior beliefs causes the losing party to choose a more moderate platform.*
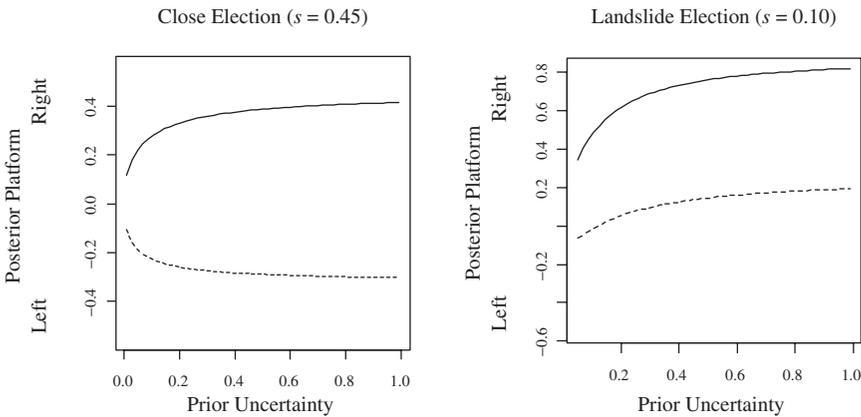


**Figure 4.** Effect of Prior Uncertainty on Party Platforms

*Note*. Solid line is the right party, dashed line is the left party.

Decreasing confidence in prior information increases posterior uncertainty about the location of the median voter which pushes both parties towards the extreme. However, reduced confidence in prior beliefs also increases the relative importance of new information obtained from election results and makes both parties more sensitive to the winner's claim of a mandate. Thus, at a high enough margin of victory the relationship between confidence and the loser's platform reverses.

An important implication of these dynamics is that greater *prior* uncertainty *increases* the likelihood that both parties will move toward the center. This result may seem at odds with what we have learned from the literature on policy-motivated parties under uncertainty. Static models of party competition suggest that uncertainty about the location of the median voter increases *divergence*. However, when parties are less certain about their *prior* beliefs they are more likely to *converge*. The explanation for this paradox is simple. Parties are most likely to move toward the center when the election is close because there is no mandate effect to push parties left or right and the reduced uncertainty from observing the election causes the parties to converge towards the center. As the prior uncertainty *increases*, it improves the informative value of the observed election for *reducing* posterior uncertainty. This increases the strength of the pull towards the center and counteracts the mandate effect for a wider range of election outcomes.

### Electoral Polarization: Mandate Amplifier

Party leaders, activists, and even rank-and-file members are known to have polarized preferences that diverge significantly from those of the median voter (Iversen, 1994; DiMaggio et al., 1996; Abramowitz and Saunders, 1998; Hetherington, 2001; Layman and Carsey, 2002). Our model suggests how the magnitude of divergence in *voter* preferences might affect political equilibrium. Recall that the degree of polarization of the electorate is related to the variance of the voter distribution. A small variance indicates that voters have similar preferences. A large variance suggests that there are more extremists and voters are spread more broadly across the policy space. Figure 5 shows what happens to platforms after a victory by the right party as we increase electoral polarization. Notice that increasing polarization causes both parties to shift towards the right.

RESULT 6. *Increasing electoral polarization causes the winning party to propose a more extreme platform and the losing party to propose a more moderate platform.*
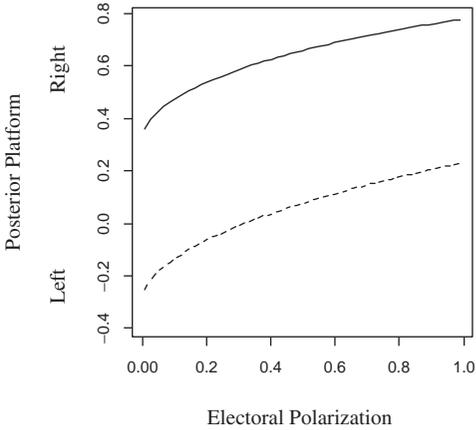
**Figure 5.** Effect of Electoral Polarization on Party Platforms

*Note*. Solid line is the right party, dashed line is the left party. A vote share of $S = 0.10$ is assumed.

The effect of electoral polarization on platforms is straightforward. A fixed margin of victory implies a shift in the location of the median voter from the prior belief about its location. As voters become more polarized, the size of this shift increases because the same number of voters is spread over a larger region of the policy space. Thus, electoral polarization magnifies the importance of the mandate on future platforms.

## Discussion

Our analysis of dynamic political competition is based on a unidimensional spatial model, in which we assume that the location of the median voter is unknown and that the parties competing for office are policy motivated. Past election results serve the same function as a very good opinion poll (cf. Adams et al., 2003). By introducing Bayesian learning into the well-known spatial context, we allow policy-motivated parties to use their past experience to estimate the location of the median voter in the present. This setup allows us to examine how the margin of victory, party ideal points, electoral volatility, confidence in prior information, and electoral polarization affect equilibrium behavior (see Table 2).

The model implies that mandates matter. An increase in the winning party's vote share in the previous election helps the winner and hurts the loser because it causes *both* parties to shift their platforms for the next election in the direction of the winner's ideal point. This result can be tested empirically. For example, Fowler (2005) shows that US Senate candidates from winning parties tend to become more extreme and candidates from losing parties tend to become more moderate in proportion to the previous margin of victory. The model also suggests that the losing party tends to shift more than the winning party and the size of the difference is increasing in the margin of victory. Thus, contrary to the conventional wisdom, close elections yield the greatest amount of divergence in the parties.

In contrast to past analytical efforts that assume party ideal points are symmetric about the median voter, we analyze the effect of asymmetric ideal points on party behavior. Scholars have typically assumed that extremity provokes extremity, but our model shows that when one party becomes more extreme in its ideal point the other party responds by offering a more *moderate* platform. This suggests a perverse incentive. If activists with extreme ideal points can manipulate the ideal point of their party they can pull not only their *own* party's platform, *but also the opponent party's platform* towards their ideal point. This may help to explain the extremity of preferences known to exist among party leaders, activists, and rank-and-file party members (Iversen, 1994; DiMaggio et al., 1996; Abramowitz and Saunders, 1998; Hetherington, 2001; Layman and Carsey, 2002).

We also analyze the effect of two different kinds of uncertainty on the model, electoral volatility and confidence in prior beliefs. The impact of electoral volatility is well known (Roemer, 2001). More volatile elections yield greater uncertainty about the location of the median voter causing both parties to offer more extreme platforms. The model reproduces this finding with one exception. A party that wins the previous election in a landslide will actually offer a more *moderate* platform as electoral volatility increases because the greater uncertainty decreases the credibility of claiming a mandate. The second kind of uncertainty – confidence in prior beliefs – has not been studied previously but we show it also has an important impact on equilibrium platforms. Decreasing confidence in prior beliefs means parties have *greater* prior uncertainty about the location of the median voter and this causes both parties to offer more extreme platforms. Once again there is an exception relating to the vote share. A party that *loses* the previous election in a landslide will actually offer a more *moderate* platform as confidence in prior beliefs decreases because this increases the information value of the loss which makes the loser more sensitive to the mandate.

Finally, electoral polarization has an important effect on the choice of equilibrium platforms. A more polarized electorate allows the winning party to choose a platform closer to its ideal point, but it also makes the losing party choose a more moderate platform. Again, this suggests a perverse incentive. If parties can influence the relative polarization of the electorate, then winners may try to divide the public while losers try to unite it. Since winners end up with control of the

**Table 2.** Summary of the effects

| Effect | Winning party's vote share increases | Winning party's ideal point becomes more extreme | Electoral volatility increases | Exogenous Change | |
|---|---|---|---|---|---|
| | | | | Confidence in prior beliefs decreases | Electoral polarization increases |
| *Winning party's platform becomes* | Somewhat more extreme | Much more extreme | More extreme for close elections; More moderate for landslides | More extreme | More extreme |
| *Losing party's platform becomes* | Much more moderate | Somewhat more moderate | More extreme | More extreme for close elections; More moderate for landslides | More moderate |
| *Result #* | 1,2 | 3 | 4 | 5 | 6 |

policy apparatus, this may help to explain why polarization in the electorate persists. However, these results are merely suggestive – future analytical efforts should endogenize electoral preferences to study whether or not such incentives exist in a richer model.

To conclude, we note that we are surprised that this work has not been conducted already. The Wittman model is very simple and has been around for about 30 years. Roemer (2001:71) notes that the fact that it produces policy divergence means that it is probably a better model than the traditional models of office-motivated parties. However, very little work has been done to extend the Wittman model, probably because of its analytical intractability. This is unfortunate because the model is extremely easy to solve and analyze with the use of simulation. We hope these results will encourage further analytical exploration of the Wittman model and further efforts to test empirically some of its implications. We also hope that the guidelines we provide for deriving numerical comparative statics will be used by other scholars when they think they have the right model but cannot solve it in closed form.

# Appendix

```
## FOC for party 0
deu0 <- function (x0, x1, p0, p1, mu, bt)
(exp (− ((x0 + x1 − 2*mu)^2) / (8*bt)) * (x1 − x0) *(x0 + x1−2*p0)) / 2*sqrt(2*bt*pi)) +
2*(p0 − x0) * pnorm ((x0 + x1)/2, mean=mu, sd=bt^(1/2))
```

```
## FOC for party 1
deu1 <- function (x0,x1,p0, p1, mu, bt)
(exp(−((x0+x1−2*mu)^2)/(8*bt))*(x1−x0)*(x0+x1−2*p1))/2*sqrt(2*bt*pi))+
2*(p1−x1)*(1−pnorm((x0+x1)/2, mean=mu, sd=bt^(1/2))
## find Wittman equilibrium policies, utilities
fweq <- Function (p0, p1, mu, bt, b, B, s) {

    ## previous election:
    ## optimize by minimizing loss function
    ## (start near median voter)
    eq<-optim (c (mu, mu+ .01), function (x)
        abs (deu0 (x [1], x[2], p0, p1, mu, bt)) +
        abs (deu1(x [1], x[2], p0, p1, mu, bt)) +
        if (x[1] > p1 || x[2] < p0) .01 else 0)
    xs<-eq$par

    ## infer median voter from vote share
    m <- qnorm(1−s, mean= (sum(xs))1/2, sd=sqrt(B))
```

```
## Bayesisn update mean and variance
mup<− (bt*m+b*mu)/(bt+b); btp<−bt*b/(bt+b)
## current election:
## optimize by minimizing loss function
## (start at median voter)
peq<−optim (c(mup, mup+.01), function(x)
    abs (deu0 (x[1], x[2], p0, p1,mup,btp))+
    abs (deu1(x[1], x[2],p0, p1, mup, btp))+
    if (x[1]>p1|| x[2]<p0) .01 else 0)

## return vector of eq platforms
print (peq$par)

}

## example: preferences at −1, 1, median voter at 0,
## electoral variance, conf. in prior, voter distribution = 1, 1, 1
## Vote share for left = 0.5

fweq (p0 = −1, p1=1, mu=0, bt=1, b=1, B=1, s=0.5)
```

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