

# An Estimate of Risk Aversion in the U.S. Electorate

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## **Abstract**

Recent work in political science has taken up the question of issue voting under conditions of uncertainty—situations in which voters have imperfect information about the policy positions of candidates. We move beyond the assumption of a particular spatial utility function and develop of a model to estimate voters' preferences for risk. Contrary to the maintained hypothesis in the literature, voters do not appear to have the strongly risk averse preferences implied by quadratic preferences.

Do voters have preferences over the policy risks presented by candidates in elections? If they do, what are those risk preferences? Answering these questions involves two considerations; (1) the shape of the utility function that maps the policy positions of candidates into vote choice and (2) the degree to which voters incorporate uncertainty about the policies that will be implemented as the result of an election into their utility calculus. In previous work, these two considerations are largely treated in isolation (Mebane 2000 being one notable exception). Authors such as Jackson (1991) and Westholm (1997) consider the shape of voters' utility functions over policy without accounting for uncertainty. Bartels (1986) and Alvarez (1997) consider how uncertainty about candidate locations enter the voters' decision calculus, but employ a quadratic utility function, which assumes strong risk aversion on the part of voters (see also Gill 2005). In what follows, we build upon these largely separate threads to present a more complete picture of voters' taste for risk.

The policy risk preferences of political actors bear directly on the study of elections and voting more generally. Spatial theories of voting have played a central role in the study of politics over the last 30 years. In legislative studies, spatial models dominate both the theoretical (e.g., Krehbiel 1998) and empirical literatures (e.g., Poole and Rosenthal 1997). As first shown by Enelow and Hinich (1981) and Shepsle (1972), formal notions of uncertainty and risk can be naturally incorporated into spatial models yielding powerful conclusions. For example, in a legislative setting, Alesina (1988) finds that two risk averse parties with divergent preferences will agree to implement a stable compromise policy rather than shifting policy with each change in the majority party.

Similarly, models incorporating risk aversion have been used to explain mass behavior, such as split-ticket voting (Alesina and Rosenthal 1995, Mebane 2000) and the punishment of ambiguous candidates (Shepsle 1972, Bartels 1986, Alvarez 1997). However, at the mass level, there is good reason to doubt that policy risk plays much of a role in voting. The expected value calculations implied by models of spatial voting require that voters have much more than a general notion about what each candidate would do if elected. Rather voters must have beliefs about all the policies that a candidate might implement and about the relative likelihood that each of the those policies will be put in place following the election. Furthermore, the individual act of voting has such a vanishingly small chance of affecting the

electoral outcome that it is not self-evident that voters would (or should) choose their votes with the same care and consideration that they might employ in choosing, for example, a mutual fund.

In this paper, we develop an estimator for the electorate’s policy risk preferences. We assume that voters utilities over policy outcomes are proportional to the distance between each voter’s most preferred outcome and the policy that the candidate will implement raised to some positive exponent,  $\alpha$ . Using data from the 1972–1996 American Nations Elections Studies (ANES), we find that quadratic utility function ( $\alpha = 2$ ) used in most of the empirical spatial voting literature—and a good deal of the theoretical literature—implies risk preferences that are considerably more risk averse than those that appear to characterize the US electorate. While we are able to reject quadratic preferences, we are not able to reject absolute value preferences ( $\alpha = 1$ ) that are consistent with large regions of risk neutrality in the voters’ utility functions. In particular, voters are approximately risk neutral with respect to alternatives that all lie on the same side of their most preferred (ideal) policy outcome. Our estimates also suggest that voters are generally quite certain about which side of their ideal points US major-party presidential nominees are located, implying that most voters do not appreciably discount most presidential candidates as the result of policy risk. As described below, the shape of the utility function (as parameterized by  $\alpha$ ) also reflects features of voter utility other than risk preference and it is possible to estimate  $\alpha$  even if voters are not engaging in behavior akin to expected utility maximization. To further investigate whether the estimated shape of the utility function reflects risk preference, we draw on a battery questions related to gambling contained in the 1972 ANES. We show that voters who appear to have a taste for risk in gambling habits are significantly less risk averse in their voting behavior.

## 1. A SIMPLE SPATIAL MODEL OF VOTE CHOICE UNDER UNCERTAINTY

To estimate voters’ tastes for risk, we begin by developing a simple model of spatial voting under uncertainty that compactly describes a voter’s utility for a given candidate as a function of a small set of observable or estimable quantities and which parameterizes risk preference with a single parameter. To start, suppose that voters have a most preferred or ideal policy outcome in a  $k$ -dimensional policy space,  $\theta^* = (\theta_1, \theta_2, \dots, \theta_k)$ . We assume that

all voters have symmetric utility functions over possible policy outcomes in that space of the form

$$U(\theta, \theta^*) = -|\theta - \theta^*|^\alpha$$

for some  $\alpha > 0$  and where  $|\cdot|$  is a weighted Euclidean norm with dimension weights  $\Omega = (1, \omega_2, \dots, \omega_k)$ . Suppose, for the moment, that  $\alpha$  and  $\Omega$  are fixed across voters so that voters' preferences differ only by  $\theta^*$ . The value of  $\alpha$  can be understood as governing how voters trade policy distance off against other non-policy determinants of electoral preference such as valence (see Groseclose 2001). In this sense,  $\alpha$  captures how the choice of a particular metric for the issue space relates to voter utility. However, if candidate location  $\theta$  is only known by each voter up to some idiosyncratic subjective probability distribution,  $f$ , over the set of all possible policy positions that the candidate might take, then as detailed below,  $\alpha$  also parameterizes voters' risk preferences. The vector  $\Omega$  describes the relative salience that the electorate attaches to each issue and is normalized such that the first issue has a weight of one.

In what follows, we assume that voters do not know the candidates' exact locations and we assume that the distribution describing each voter's uncertainty about each candidate,  $f$ , is (multivariate) normal with voter-candidate pair-specific parameters  $\mu = (\mu_1, \mu_2, \dots, \mu_k)$  and  $\Sigma = \text{diag}(\sigma_1^2, \sigma_2^2, \dots, \sigma_k^2)$ . This assumption allows us to fully describe the expected policy utility that a given voter gets from a given candidate by only five quantities:  $\theta^*$ ,  $\mu$ ,  $\Sigma$ ,  $\alpha$ , and  $\Omega$ . In particular,

$$EU(\theta^*, \mu, \Sigma | \alpha, \Omega) = - \int |\theta - \theta^*|^\alpha \phi(\theta; \mu, \Sigma) d\theta \quad (1)$$

where  $\phi$  is the multivariate normal density function. In the empirical estimation,  $\theta^*$ ,  $\mu$ , and  $\Sigma$  (up to a scale factor) are measured variables and  $\alpha$  and  $\Omega$  are parameters to be estimated.

This simple model is consistent with previous attempts to measure both the shape of voters' utility functions and their response to uncertainty. The model presented by Jackson (1991) parameterizes the shape of voter utility function with an exponent on Euclidean distance, but does not consider uncertainty about candidate locations. Jackson's model can be thought of as a special case of our model in which  $\Sigma = \text{diag}(0, 0, \dots, 0)$ . Similarly, Alvarez (1997) and Bartels (1986), who both consider the effect of uncertainty under the assumption of quadratic preferences, present models which can be seen as special cases of the our model

where  $\alpha = 2$ . Mebane’s (2000) model of vote choice pairs for President and US House also uses the utility function described above and incorporates uncertainty. However, whereas Mebane assumes that voters know with certainty what each candidate would do if elected, but are uncertain about which candidates will be elected, our model follows Bartels (1986) and Alvarez (1997) in assuming voters are uncertain about each candidate’s positions.

By assuming that (1) preferences are quadratic ( $\alpha = 2$ ), that (2) there is no uncertainty about candidates’ locations, or (3) that the set of possible policy outcomes is finite, the previous literature avoids the otherwise difficult integral presented in Equation 1. Of particular interest is the assumption of quadratic preferences which is common in both the empirical and theoretical spatial voting literature. As shown in Enelow and Hinich (1981), the expected utility given in Equation 1 can be simplified to

$$EU(\theta^*, \mu, \Sigma | \alpha, \Omega) = - \sum_k \omega_k (\mu_k - \theta_k^*)^2 - \sum_k \omega_k \sigma_k^2$$

if  $\alpha = 2$ .<sup>1</sup> While this formulation is computationally convenient, by separating the expected utility into one component that reflects the squared distance between the voter’s ideal point and the candidate’s expected location and second component that captures disutility associated with uncertainty, the quadratic form implies that all voters discount a candidate with a given level of uncertainty in exactly the same risk averse way.

Formally, “[a] consumer [or voter] who prefers to get the expected value of a gamble for sure instead of taking the risky gamble (and whose utility function, in consequence, is concave) is said to be risk averse” (Krepps 1990, p. 82). Conversely, a voter who prefers the gamble to its expected value is said to be risk acceptant. Jensen’s inequality implies that risk aversion will obtain if a utility function is concave in the region of the uncertain alternatives and risk acceptance will obtain if a utility function is convex in that region. As noted in Shepsle (1972), all single-peaked spatial utility functions have risk averse regions in the neighborhood of the ideal point because the voter utility function must be concave in that neighborhood by definition. However, away from the ideal point, spatial utility functions can be convex implying regions of risk acceptance. In terms of the class of utility functions defined above, a voter will be risk acceptant with respect to a candidate whose possible

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<sup>1</sup>Indeed, this expression holds for any candidate uncertainty distribution ( $f$ ) with finite second moments—not just the normal distribution assumed here.

locations fall only or predominantly on one side of the voter’s ideal point if  $\alpha < 1$ . Voters will be risk averse with respect to all candidates if  $\alpha > 1$ .

Among globally risk averse preferences ( $\alpha > 1$ ), a further distinction can be drawn between those utility functions having values of  $\alpha$  less than and greater than 2. If  $\alpha > 2$  then the effect on expected utility of increasing candidate uncertainty (increasing a given element of  $\Sigma$ ) is increasing in the distance between the voter and the expected location of the candidate. On the other hand, if  $\alpha < 2$  then the effect of uncertainty on a voter’s expected utility is greater the closer the candidate’s expected location is to the voter’s ideal point. That is, if  $\alpha > 2$ , voters are most concerned about the uncertainty associated with candidates they think are likely to be located far from their ideal position, whereas if  $\alpha < 2$ , voters are relatively unconcerned about the uncertainty associated with candidates they expect are located far from their ideal positions as compared to those located close to their ideal position. Only if  $\alpha = 2$  does the effect of candidate uncertainty on expected utility not depend on the location of the voter or the expected location of the candidate. By estimating  $\alpha$ , we are able to describe whether voters are generally risk averse and which voters will be most risk averse with respect to a particular candidate.

In order to estimate  $\alpha$ , we embed the expected policy utility functions described above into a standard probit model of vote choice. Limiting our attention to US presidential elections and to the two major-party candidates contesting those elections, we specify that

$$\text{Pr}_{it}(\text{Vote Democrat}) = \Phi(\nu_t + \beta [EU(\theta_{it}^*, \mu_{idtd}, \Sigma_{idtd} | \alpha, \Omega) - EU(\theta_{it}^*, \mu_{idtr}, \Sigma_{idtr} | \alpha, \Omega)] + Z'_{it}\lambda) \quad (2)$$

where  $t$  indexes the election,  $i$  indexes voters in each election, and  $d$  and  $r$  indicate whether the corresponding quantity is associated with the Democratic or the Republican candidate.  $\beta$  is the weight given to policy preference (issue voting) and  $Z$  is a vector of non-policy determinants of vote choice and  $\nu$  is an election-specific fixed effect. The value of  $\alpha$ ,  $\beta$ , and  $\Omega$  are assumed fixed across voters, elections, and candidates. The main difference between this empirical model and those commonly employed in the voting behavior literature is the addition of the parameter  $\alpha$  that appears inside the expected utility functions. The difficulty of implementing this model is that the (multidimensional) integral required to solve for the expected utilities cannot be evaluated analytically (unless  $\alpha = 2$ ). We approximate these

integrals using standard Monte Carlo integration techniques.<sup>2</sup> Given Equation 2 and a method for evaluating the expected policy utilities, we maximize the likelihood of the data as a function of the parameters using standard numerical techniques.

## 2. DATA AND ESTIMATION

There are several issues we need to consider before we begin our analysis. First, we need to specify the non-policy determinants of an individual’s candidate preference ( $Z_{it}$ ). We are primarily interested in the effect of issue positions on the vote choice, but also want to include factors that might plausibly be correlated with both vote preference and perceived distance between the respondent and the candidates. We therefore include measures of the race, gender, income, and—most importantly—the partisanship of the respondents.<sup>3</sup>

Second, we need measures of five quantities for each individual per issue dimension (indexed by  $i = 1, \dots, k$ ) that we wish to analyze: the voter’s ideal point on the issue ( $\theta_{itk}^*$ ), the perceived placement of the two major party candidates on that issue ( $\mu_{itkd}, \mu_{itkr}$ )—where  $d$  and  $r$  index the Democratic and Republican candidates, respectively—and the uncertainty surrounding each candidate’s position on the issue ( $\sigma_{itkd}, \sigma_{itkr}$ ).<sup>4</sup>

We have straightforward measures of the first three quantities. We use the respondent’s reported self-placement on the seven-point issue scale as his ideal point, ( $\theta_{itk}^*$ ). We also use each voter’s reported placement of the candidates as their expected position on that issue, ( $\mu_{itkd}, \mu_{itkr}$ ).<sup>5</sup> But we still need a measure of the voter’s uncertainty around the perceived candidate placement, ( $\sigma_{itkd}, \sigma_{itkr}$ ). In 1996, ANES asked respondents who placed themselves and candidates on the ideology and services/spending 7-point scales how certain they were of these placements. In most years, however, direct measures of uncertainty are not directly observable. We must, therefore, indirectly estimate those from the available data. To do

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<sup>2</sup>The R code used to estimate the model is available from the authors. The expected utility received by each voter from each candidate is approximated by the mean utility provided to the voter by 1000 pseudo-candidates drawn from the distribution of candidate locations implied by the model and estimated parameters.

<sup>3</sup>Certainly many other factors could enter into the vote choice calculus, but we do not wish to overload our model with control variables. Including additional demographic controls do not change the results.

<sup>4</sup>We allow the effects of distance to vary by issue, but we constrain the effects of a particular issue to be same for both candidates in an election.

<sup>5</sup>Following convention (see, for instance, Bartels (1986), Alvarez (1997)) we treat the ANES 7-point scales as cardinal measures.

this, we follow the method used by Bartels (1986).

Bartels uses the patterns of non-response on the candidate placement items to estimate each voters' uncertainty regarding that candidate. Bartels assumes that a respondent will place a candidate on a particular issue dimension if he is sufficiently certain of the candidate's position on that issue, but he will refuse to place the candidate if his uncertainty concerning that position exceeds some threshold value. While we cannot directly observe this uncertainty, if we assume that the uncertainty is systematically related to the observable characteristics of the respondents, we can measure the relative impact of these characteristics on uncertainty by modeling the ability to place a candidate on a given issue scale using a probit model. Specifically, we model the refusal of respondent  $i$  to place a candidate on issue  $j$  as a function of the respondent's gender, race, education, age, partisanship, political information level, interest in politics, and level of campaign-related activity. We then use the probit estimates and the characteristics of the respondents to generate  $\sigma_{itkp}$  (where  $p$  indexes the party of the candidate). Following Bartels, we assume that  $\sigma_{itkp}$  is proportional to the predicted probability of non-response implied by the probit model. Because candidate uncertainty is only assumed to be known up to a fixed constant of proportionality, the value of that constant,  $\gamma$ , is an additional parameter to be estimated in the vote choice model described in the previous section. While this method requires strong assumptions, we find very similar results using the direct candidate uncertainty measure available (only) in the 1996 ANES.

For our analysis, we use three issue dimensions: (1) General liberal/conservative ideology, (2) whether the government should provide jobs and a good standard of living, and (3) whether the government should provide aid to minority groups. Together these dimensions capture a broad scope of issues relating to vote choice. Equally important, these questions are asked in every year of the survey (except 1992, where the candidate placements for the minority aid question were not asked).

### 3. RISK PREFERENCES IN THE US ELECTORATE, 1972-1996

To estimate our model, we pooled ANES data from six of the seven presidential elections between 1972 (the year the seven-point issue scales were first introduced) and 1996 (we

excluded 1992, where the minority aid question was not asked).<sup>6</sup> We estimated voting under uncertainty using reported vote choice as our dependent variable, with the Democratic candidate coded as the high category. We also included fixed effects for survey year. The first column of Table 1 present the model results where we follow previous literature by constraining  $\alpha=2$ . The second column presents the results where we estimate  $\alpha$ .

In both the constrained and unconstrained models, the control variables all have effects in the expected direction and are largely the same across the two models. Furthermore  $\beta$  is highly statistically significant, indicating that—as we expect—issues matter in the vote choice process. However, the central question of our work concerns the spatial preferences of the electorate when candidate locations are uncertain. The results here are clear. The estimates of  $\alpha$  are inconsistent with the quadratic model. The null hypothesis of strong risk aversion implied by that model ( $\alpha = 2$ ) can be soundly rejected with a likelihood ratio test. Instead, our estimates indicate that utility functions are nearly linear on either side of their ideal points.

[Table 1 about here.]

The estimates of  $\alpha$  and  $\gamma$  combine to suggest that uncertainty in candidate locations have played only a small role in determining the outcome of the US presidential general elections since 1972. First, we find relatively similar levels of uncertainty for Democratic and Republican candidates across issues (as shown in Table 2 column one) and also across time. Second, it is well known that voters (or, at least, ANES respondents) tend to locate themselves between the major party nominees on most issues. As shown in the second column of Table 2, the average voter located himself between 1.6 and 2.2 units from their best guess (expectation) about the location of the average Democratic and Republican candidate on the 7 points issue scales. At the same time, the estimate of  $\gamma$  implies that the average standard deviation (uncertainty) associated with those best guess candidate locations range from 0.43 to 0.52 across the parties and issues (shown in column one of Table 2). Thus, the average voter with the average level of uncertainty places himself at a distance from his expectation of the candidate’s location that is more than three times the standard deviation of his uncertainty about that location. Therefore, nearly all of the probability mass associated

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<sup>6</sup>We also ran the model on year-by-year data, including data from 1992. Some of these results were not particularly stable because the effective sample size was quite small. However, we found that the parameter on the loss function was statistically distinguishable from (and smaller than) two in every year except 1996.

with the policies that the average voter believes a typical candidate might implement falls on one side of the average voter's ideal point. Because  $\alpha \approx 1$ , voters are approximately risk neutral with respect to lotteries over positions on one side of their ideal point and, therefore, the average voter experiences virtually no utility loss from the uncertainty he has about the locations of US presidential candidates.

[Table 2 about here.]

In particular, using the estimates of the model shown in Table 1, we find that across candidates, elections, and issues, at most 40 percent of voters have any appreciable uncertainty about which side of their ideal point a given candidate is located (see column 3 of Table 2). Thus, at least 60 percent of the electorate experienced little to no disutility as a result of their uncertainty about the policy preferences of US presidential candidates.

Of course, for the minority of voters whose ideal points fall within the range of policies that they believe particular candidates are likely to implement, any policy uncertainty is over outcomes in the concave region of these voters' utility functions. Consequently, such voters do experience a loss in expected utility as a result of this uncertainty. However, the losses are relatively small. Define a util to be the amount of utility loss associated with moving a given candidate one unit further from the voter with certainty (on the 7-point issue scale).<sup>7</sup> The 20 percent of the electorate most affected by policy uncertainty loses, at worst, an average of two-tenths of a util due to uncertainty (see column 5 in Table 2). Even the top five percent of voters most impacted by candidate uncertainty experience an average loss of less than three-quarters of a util as a result of their uncertainty regarding the candidate's position (see column 7 of Table 2).

In sum, it appears that for most ANES respondents the amount of uncertainty associated with the policy positions of major party US presidential nominees is not large enough to cause any significant loss of expected utility. In particular, most voters have a high degree of certainty about which side of their ideal point each candidate is located on for each issue. The estimated  $\alpha$  suggests that the voters are, for all practical purposes, risk neutral with respect to this sort of uncertainty.

This is not to say that uncertainty might not play an important role in other electoral settings in which candidates are less well known. For example, lacking partisan cues, voters

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<sup>7</sup>Because  $\alpha \approx 1$ , this utility loss is the same regardless of how far the candidate is located from the voter.

may be considerably less certain about which side of their ideal points candidates in non-partisan elections are located. Similarly, uncertainty might also play a larger role in primary elections where the expected locations of competing candidates are presumably closer together and where the voters are more likely to locate themselves in close proximity to where they believe the candidates are located. But in presidential elections, where most voters perceive relatively large differences between the expected locations of the candidates—on average 2.5 points on the 7-point issue scales—the effect of uncertainty on vote choice is limited.

#### 4. 1972 RISK PROCLIVITY ANALYSIS

The analyses presented above rely on the assumption that  $\alpha$  reflects voters' taste for risk. As noted above,  $\alpha$  can also reflect other aspects of voters' preferences and can be estimated even in a setting in which uncertainty is assumed to have no effect (Jackson 1991). To gain additional purchase on the validity of the assertion that  $\alpha$  reflects risk preference, we turn to a more detailed analysis of the 1972 election and demonstrate that those voters who are less averse to risk in other decision areas are less risk averse in their voting decisions than those voters who are more averse to risk in other decision areas.

Preferences toward risk may be context dependent (Kahneman and Tversky 1979), but work in psychology suggests that risk-taking could be a general psychological predisposition that is stable across different choice contexts (Dahlback 1990, 1991, Kowert and Hermann 1997, though see Slovic 1964).<sup>8</sup> The 1972 ANES is well suited to examine the implications of heterogeneity in risk-taking. The ANES asked a battery of questions concerning the gambling behavior of the respondents. Respondents were asked if they engaged in common betting activities, ranging from playing the numbers to buying raffle tickets, to investing in the stock market. Though the gambling proclivities of respondents might not correlate perfectly with their general acceptance of risk, studies in psychology have detected an empirical link between tendencies toward risk-taking behavior and gambling (Powell et al. 1999).<sup>9</sup> We therefore used the ANES items to construct a scale of risk proclivities and split the sample

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<sup>8</sup>For an examination of the effect of heterogeneity in risk-taking preferences on vote choice in the economic context, see Morgenstern & Zechmeister 2001 and Nadeau, Martin, & Blais 1999.

<sup>9</sup>Consistent with this finding, within the sample, the gambling items predict the propensity to accept uncertainty in choice situations outside the realm of gambling.

at the median into two groups: high-risk-takers and low-risk-takers.<sup>10</sup> Our expectation was that the  $\alpha$  term would be smaller for high risk-takers, indicating higher risk acceptance.

We therefore employed a variant of the model presented above, where the  $\alpha$  term is parameterized as a function of an additional independent variable. By using our median-split dummy variable for this independent variable, we can estimate two  $\alpha$  parameters: one for respondents with high risk proclivities, and one for respondents with low risk tendencies.

[Table 3 about here.]

The results of this analysis, presented in Table 3, are clear. The coefficient on the risk-proclivity variable ( $\Delta$  Risk) is in the expected direction and statistically significant at the .05 level (using a one-tailed test). Thus, the results of this analysis gives face validity to our use of  $\alpha$  to estimate aversion to uncertainty in choice behavior and strengthens our faith in the results presented above.

## 5. CONCLUSION

By specifying a model that allows us to estimate the power term in voters' utility functions in the presence of uncertain candidate locations, we are able to characterize the overall risk proclivities of the U.S. electorate. Our analysis of risk-taking using data from the 1972 ANES substantially buttresses existing theoretical and empirical findings that apply the logic of expected utility and risk to voting under uncertainty by providing the first direct empirical evidence that the discounting of uncertain candidates depends on voters' tastes for risk.

More importantly, our analysis of presidential elections over the last quarter-century demonstrates that contrary to the assumptions of many studies of issue voting, the strong global risk aversion implied by the quadratic utility model is not supported by the data. Indeed, the estimates suggest that many voters may well be risk neutral or even risk acceptant with respect to most presidential candidates over the last 30 years.

Taken together, these results have important implications for both the empirical study of elections and the normative issues surrounding campaigns. Recent studies of issue voting have demonstrated that the effect of issues on political choices is more nuanced and

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<sup>10</sup>For details of scale construction, see Berinsky (2004)

complicated than had previously been assumed. For example, the significance of particular issues have been found to vary in systematic ways across voters (Corrigan & Grynawski 2004, Glasgow 1999). The data are not sufficiently rich to separate out the various sources of heterogeneity in voting behavior—to allow the weights of different issues to vary across voters would have made our model intractable. However our results point to another important problem with existing studies of issue voting. The use of quadratic utility functions may be mathematically simple, but this simplicity comes at the expense of an accurate representation of reality. Whereas the quadratic model implies that the uncertainty in a candidate’s positions uniformly reduces the expected utility associated with that candidate across the electorate, our results suggest that the uncertainty associated with major-party presidential nominees did not appreciably reduce the expected utility that the majority of voters associated with those candidates. Thus, at the levels of policy uncertainty associated with presidential campaigns, marginal increases or decreases in candidate uncertainty are unlikely to have much bearing on campaign outcomes. However, in cases where the policy uncertainty is larger or where more voters are uncertain about which side of their ideal points the candidates are located (as might occur in down-ballot, primary, or non-partisan contests), uncertainty could have a larger bearing on campaign outcomes.

On a theoretic level, the results in this paper can inform the study of campaigns. The communication of information between candidates and voters lies at the heart of democratic politics. Our results suggest that most voters, at least in presidential campaigns, are able to inform themselves to the point where their remaining uncertainty has little effect on the expected utility that they associate with each candidate; marginally decreasing the policy uncertainty associated with either candidate would have little if any effect on the voting behavior of more than a small fraction of the electorate.

This finding has implications for how we understand some commonly employed campaign tactics. For example, it is unlikely that presidential candidates characterize their opponents as ‘flip-floppers’ (as Bush did Kerry in 2004) in an attempt to marginally increase the uncertainty that voters associate with their opponent’s policy positions. Perhaps the real intention of such campaigning is to reveal a weakness of character or a lack of conviction that might enter elsewhere in the voters’ calculus. On the other hand, in contests involving much greater policy uncertainty, as in the case of a complex ballot measure, playing up the uncertainty associated with a proposal in comparison to the known status quo could

be an effective tactic. From this way of thinking, it is not surprising that opponents of complex ballot measures often characterize the measures as “risky schemes” designed to hoodwink unsuspecting voters. Even if most voters think that the most likely outcome of the proposition is very close to their ideal policy, a sufficiently large degree of uncertainty might serve to defeat the proposal.

The implications of our findings for future studies of voting behavior in high-information elections is somewhat mixed. On the one hand, uncertainty clearly matters and is not additively separable in the convenient way implied by the quadratic utility model. Thus, ignoring uncertainty in a model of vote choice involves a loss of fidelity while including uncertainty adds considerable complexity. On the other hand, for researchers interested in other aspects of voting decisions, the fact most voters are estimated to be roughly risk neutral with respect to most major-party presidential candidates of the last 30 years is fortuitous. Because of this risk neutrality, ignoring voters’ uncertainty about candidate location is unlikely to undermine empirical findings related to other aspects of voting behavior. In low information settings involving greater uncertainty, we expect risk aversion to be more common in the electorate. In those cases, the uncertainty is not so safely ignored.

APPENDIX A: PROOF OF THE PROPOSITION THAT VOTERS' RISK PREFERENCES CAN  
BE ORDERED BY THE CONCAVITY OF THEIR UTILITY FUNCTIONS

**Proposition:** Suppose voters  $i = 1, 2$  have preferences of the form

$$g_i(|\theta - \theta^*|)$$

for  $i = 1, 2$ .  $\theta \in \mathbb{R}^1$  is the location of a policy alternative and  $\theta^* \in \mathbb{R}^1$  is the voters' shared ideal point.<sup>11</sup> Let  $f$  be a density function over  $\mathbb{R}^1$  that represents voter uncertainty over the position of the candidate. Voter 1 is said to be less averse than voter 2 if for any  $f$  and  $\theta'$  such that

$$\int g_1(|\theta - \theta^*|) f(\theta) d\theta = \mathbb{E}[g_1(|\theta - \theta^*|)] = g_1(|\theta'_1 - \theta^*|),$$

we also have

$$\int g_2(|\theta - \theta^*|) f(\theta) d\theta = \mathbb{E}[g_2(|\theta - \theta^*|)] \leq g_2(|\theta' - \theta^*|)$$

and for some  $f$  and  $\theta'_1$  the inequality holds strictly. That is, if the less risk averse voter 1 is indifferent between  $f$  and the certain outcome  $\theta'$ , then voter 2 is either indifferent between  $f$  and the certain outcome  $\theta'$  or prefers the certain outcome and for some  $f$  and  $\theta'_1$ , voter 2 strictly prefers the certain outcome. This will be true if  $g_2(g_1^{-1}(d))$  is concave. In the case where  $g(d) = -d^\alpha$ , if  $\alpha_2 > \alpha_1$  then voter 1 is less risk averse than voter 2.

**Proof:** The proof closely follows that of Pratt (1964). Let  $d_i = |\theta - \theta^*|$  for  $i = 1, 2$ . By assumption  $g$  is monotonically increasing in  $d$  (utility is decreasing in the distance between the voter's ideal point and candidate's location). Let  $d'_i = |\theta'_i - \theta^*|$  for  $i = 1, 2$ .

$$\begin{aligned} d'_1 &= g_1^{-1}(\mathbb{E}[g_1(d)]) \\ d'_2 &= g_2^{-1}(\mathbb{E}[g_2(d)]) \\ d'_1 - d'_2 &= g_1^{-1}(\mathbb{E}[g_1(d)]) - g_2^{-1}(\mathbb{E}[g_2(d)]). \end{aligned}$$

Finally,

$$d'_1 - d'_2 = g_1^{-1}(\mathbb{E}[t]) - g_2^{-1}(\mathbb{E}[g_2(g_1^{-1}(t))]) \tag{3}$$

where the random variable  $t = g_1(d)$ . By Jensen's inequality,

$$\mathbb{E}[g_2(g_1^{-1}(t))] \leq g_2(g_1^{-1}(\mathbb{E}[t]))$$

if  $g_2(g_1^{-1}(t))$  is a concave function. Because  $g$  is monotonically decreasing,  $g_2^{-1}$  is also mono-

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<sup>11</sup>Note that if the two voters have different ideal points, then they may have different preference orderings over  $\Theta$  (the set of possible candidate locations) and differences between their choice behavior when facing different lotteries cannot be attributable simply to differences in taste for risk. Thus, comparisons of risk preference are made conditional on a given common ideal point.

tonically decreasing and, thus,

$$\begin{aligned} g_2^{-1}(E[g_2(g_1^{-1}(t))]) &\geq g_2^{-1}(g_2(g_1^{-1}(E[t]))) \\ g_2^{-1}(E[g_2(g_1^{-1}(t))]) &\geq g_1^{-1}(E[t]). \end{aligned}$$

This establishes that the first term on right-hand side of (3) is smaller than the second and thus,

$$d'_1 - d'_2 \leq 0.$$

That is, the certainty equivalent to the lottery  $f$  for voter 2 is at least as far from her ideal point as voter 1's certainty equivalent to  $f$ . Thus, because  $d'_1$  is (at least weakly) preferred to  $d_2$  by voter 2 and voter 2 is indifferent between  $f$  and  $d'_2$ , voter 2 must (at least weakly) prefer  $d'_1$  to  $f$ .<sup>12</sup> That  $g_2(g_1^{-1}(t))$  is concave if  $g_i(d) = -d^{\alpha_i}$  and  $\alpha_2 > \alpha_1 > 0$  follows immediately,

$$g_2(g_1^{-1}(t)) = ((-t)^{1/\alpha_1})^{\alpha_2}.$$

Differentiating twice, we have

$$\left( \frac{g_2(g_1^{-1}(t))}{t^2} \right) \left( \frac{\alpha_2}{\alpha_1} \right) \left( \frac{\alpha_2}{\alpha_1} - 1 \right).$$

Because  $\alpha_2 > \alpha_1 > 0$  the second two terms are positive. The first term is negative because  $g_2(d) < 0$  for all  $d > 0$ . Therefore the entire expression is negative, demonstrating that  $g_1(g_2^1(d))$  is concave and completing the proof. ■

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<sup>12</sup>Jensen's inequality may hold with equality if  $g_2(g_1^{-1}(t))$  is only weakly concave (linear) or if the distribution of  $t$  is degenerate which is possible even if  $f$  is non-degenerate.

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**Estimated parameters of the spatial voting under uncertainty model,  
pooled 1972 to 1996 data**

Coefficient	Model			
	Constrained ( $\alpha = 2$ )		Unconstrained	
	Est.	(SE)	Est.	(SE)
Risk ( $\alpha$ )	2.00	-	1.02	(0.12)
Uncertainty ( $\gamma$ )	4.90	(1.13)	4.27	(1.48)
Issues ( $\beta$ )	0.07	(0.01)	0.46	(0.12)
Liberal/conservative ( $w_1$ )	1.00	-	1.00	-
Jobs ( $w_2$ )	0.52	(0.07)	0.54	(0.08)
Minority aid ( $w_3$ )	0.40	(0.07)	0.45	(0.08)
White	-0.35	(0.11)	-0.36	(0.11)
Male	-0.01	(0.06)	0.01	(0.06)
Party ID	1.06	(0.06)	1.01	(0.06)
Income	-0.10	(0.03)	-0.09	(0.03)
Year 1976	0.36	(0.10)	0.36	(0.10)
Year 1980	-0.05	(0.12)	0.01	(0.12)
Year 1984	-0.16	(0.10)	-0.17	(0.10)
Year 1988	0.33	(0.11)	0.33	(0.11)
Year 1996	0.80	(0.12)	0.83	(0.11)
Constant	0.33	(0.16)	0.29	(0.16)
Log likelihood	-1059.5		-1035.0	
GMP	0.757		0.762	
$N$	3814		3814	

Table 1: *Model estimates pooling American National Election Study (ANES) data from each presidential election between 1972 and 1996 (excepting 1992, when the minority aid question was not asked). As described in the text the coefficients in the “vote choice” model use reported vote choice as the dependent variable and are based on a probit link.*

## Uncertainty and voter utility by issue

Issue	Avg. cand. uncertainty (standard deviation)	Average distance to expected cand. location	Percent of voters affected by uncertainty	Avg. expected utility loss due to uncertainty within various percentiles of expected utility loss		
				80th	90th	95th
Democratic candidate:						
Liberal/Conservative	0.47	2.01	29	0.00	0.02	0.16
Jobs	0.50	2.19	30	0.02	0.18	0.50
Minority aid	0.52	1.96	33	0.10	0.38	0.74
Republican candidate:						
Liberal/Conservative	0.43	1.64	35	< 0.01	0.04	0.19
Jobs	0.46	1.60	39	0.05	0.24	0.49
Minority aid	0.48	1.59	40	0.17	0.41	0.69

Table 2: *The average uncertainty in beliefs about candidate locations (shown in column 1) are small relative to the average distance between voters' locations and the positions they expect candidates to take (shown in column 2). Accordingly, most voters are nearly certain about which side of their ideal point each candidate is located on. Because voters are estimated to be risk neutral with respect to alternatives on one side of their ideal points, most voters do not discount most candidates on most issues due to uncertainty (column 3). In no case do more than 5 percent of voters experience a utility loss due to uncertainty as large as 0.7 units relative to the utility that they would have received from a candidate if they had no uncertainty about his location (columns 4, 5, and 6).*

### Partitioning the 1972 electorate into low and high risk-seeking populations

Coefficient	Vote choice	
	Est.	(SE)
Risk ( $\alpha$ )	0.95	(0.25)
$\Delta$ Risk	-0.14	(0.07)
Uncertainty ( $\gamma$ )	0.37	(1.36)
Issues ( $\beta$ )	0.60	(0.39)
Ideology ( $w_1$ )	1.00	-
Jobs ( $w_2$ )	0.59	(0.14)
Minority Aid ( $w_3$ )	0.39	(0.15)
Male	-0.09	(0.14)
White	-0.65	(0.29)
Party ID	0.92	(0.13)
Income	-0.05	(0.07)
Constant	0.54	(0.36)
Log likelihood	-218.9	
GMP	0.764	
$N$	815	

Table 3: *Model estimates using data from 1972. Here we parameterize the Risk ( $\alpha$ ) term as a function of  $\Delta$  Risk. The Risk coefficient gives the  $\alpha$  for the “low risk” group. The sum of the  $\Delta$  Risk coefficient and the Risk coefficient is the  $\alpha$  for the “high risk” group.*