Risk Aversion: Implications for Spatial Voting Models

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Abstract

Several spatial voting models allowing to locate voters or legislators on latent dimensions have been developed, giving rise to an important number of studies in the literature on representation. These techniques assume that actors choose between alternatives by comparing their corresponding utilities; all utilities being defined as a function of the ideological distances between the voter and the alternative. However, it is known that the propensity to take risks varies across individuals and some alternatives are riskier than others. This paper is an attempt to take this specificity into account in spatial voting models and finds that there is no effect of risk attitudes on legislative voting behavior.

1 Introduction

Spatial voting models use votes to locate voters, generally members of parliament (MPs), on latent issues. Most of these models assume that all voters have the same utility function: either a normal distribution (Poole and Rosenthal, 1985) or a quadratic utility function (Martin and Quinn, 2002; Clinton, Jackman and Rivers, 2004). More recently, attempts have been made on differentiating the variance of the utility function for different actors. For example Lauderdale (2010) assumes a quadratic utility function for all actors but allows for heteroscedasticity across voters and Carroll, Lewis, Lo, Poole and Rosenthal (2013) find that more extreme voters have more sharply peaked Gaussian utility functions.

Parallel to these developments, in the literature in psychology, economics, and political science, work has showed that individuals might have different attitudes towards risk (Kelling and Myerowitz, 1976; Zuckerman, 1991; Kam and Simas, 2010). Indeed, as it has already been suggested by Allais (1953): “Some person who believe in their fortune underestimate the probability of the events which are favorable to them. It is the opposite for the persons who

*The data used in this survey have been collected thanks to the help of Bettina K. Greuter and financed by the Rackham Graduate Student Research Grant, at the University of Michigan.
consider themselves pursued by the adversity. So there is a subjective distorsion of the objective probabilities. Studying risk attitudes is important because it is an integral part of all decision processes. Thus, risk should be taken into account when studying voting decisions. This is made even more crucial by the fact that risk is correlated with the left-right dimension.

Several empirical as well as theoretical studies investigate how risk affects voting behavior. At the theoretical level, Pratt (1964) proves that given the assumption of spatial voting models, risk averse voters should have a utility function that is more concave than risk acceptant voters. Assuming a concave utility function for risk averse voters and a convex utility function for risk acceptant voters, Shepsle (1972) shows that the uncertainty specific to a candidate has a different effect depending on the level of risk aversion of the voters. On the empirical side, however, the results are more disputable. Although Kam and Simas (2010) showed that risk averse individuals are more likely to choose sure outcomes, the fact that risk aversion determines the shape of the utility function is uncertain. Indeed, Berinsky and Lewis (2007) find that voters have different utility functions depending on how encline they are to accept risks. They estimate a binomial model where the dependent variable is vote choice and the main independent variable is a utility calculated as a function of ideological distance to each party, on the left-right dimension. This function varies across individuals, allowing the shape to be more or less concave. They find that risk averse voters have more concave utility functions. However, their analysis includes control variables known as being covariates of the left-right dimension, so one can wonder if their test is accurate.

The above literature tackles the assumption under which all voters have similar decision behavior and finds that voter behave differently depending on their level of risk aversion. The goal of the present paper is to take this feature into account in spatial voting models and see if it can lead to different ideal points estimations. In the next section, I present the main existing models. In the third section, I discuss different ways risk propensity could be taken into account and explain my choice. In the fourth section I present the data and the results of my analysis. In the last section, I will add some concluding remarks.

NOTE TO THE READER: SECTION 2 WILL END UP IN THE APPENDIX AND IS NOT ESSENTIAL TO MY ARGUMENT (EXCEPT MAYBE THE LAST PARAGRAPH).

2 The Main Existing Models

Beside the Optimal Classification model where no functional form of the utility is assumed, the main existing spatial voting models assume either a normal utility function, principally the model “NOMINATE” developed by Poole and Rosenthal (1985), or a quadratic utility function, issued from Item Response
Theory (IRT) (see for example Albert and Chib (1993) and Martin and Quinn (2002)). These two models are described below.

Poole and Rosenthal’s model and its main assumptions

In this model, the utility of voter $i$ ($i = 1,...,n$) to choose “Yea” on vote $j$ ($j = 1,...,m$) is defined as:

$$U_{ijY} = u_{ijY} + \varepsilon_{ijY} = \gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijY}||^2}{2}\right) + \varepsilon_{ijY},$$

with $z_{ijY}$ the location of the “Yea” alternative of vote $j$ and $\varepsilon_{ijY}$ a random variable independent and identically distributed following a Weibull distribution. $u_{ijY}$ is just the utility of the “Yea” alternative without the random term. The parameters $\gamma$ and $w$ equal $1/\left(\sqrt{2\pi}\sigma^2\right)$ and $1/\sigma$ respectively, if the Normal distribution has variance $\sigma^2$. Similarly, the utility of voter $i$ to choose “Nay” for vote $j$ is:

$$U_{ijN} = u_{ijN} + \varepsilon_{ijN} = \gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijN}||^2}{2}\right) + \varepsilon_{ijN},$$

with $z_{ijN}$ the location of the “Nay” of vote $j$ and $\varepsilon_{ijN}$ a random variable iid distributed following the log of the inverse exponential distribution. The term $u_{ijN}$ is the utility of the “Nay” alternative without the random term. The probability of voter $i$ to answer “Yea” on vote $j$ is defined as follows:

$$p(v_{ij} = \text{yes}) = p(U_{ijN} < U_{ijY})$$

$$= p(u_{ijN} + \varepsilon_{ijN} < u_{ijY} + \varepsilon_{ijY})$$

$$= p(\gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijN}||^2}{2}\right) + \varepsilon_{ijN} < \gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijY}||^2}{2}\right) + \varepsilon_{ijY})$$

and by defining:

$$\epsilon_{ij} = \varepsilon_{ijN} - \varepsilon_{ijY},$$

$\epsilon_{ij}$ follows the logistic distribution with mean 0 and standard deviation 1, and the probability of voter $i$ to answer “Yea” on vote $j$ becomes

$$p(v_{ij} = \text{yes}) = \int_{-\infty}^{u_{ijN} - u_{ijY}} \frac{\exp\left(-x\right)}{\exp\left(u_{ijY}\right) \left[1 + \exp\left(-x\right)\right]} \, dx$$

$$= \frac{\exp\left(\gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijY}||^2}{2}\right)\right)}{\exp\left(\gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijN}||^2}{2}\right)\right) + \exp\left(\gamma \cdot \exp\left(-\frac{w^2 \cdot ||x_i - z_{ijY}||^2}{2}\right)\right)}$$

This model estimates iteratively the parameters $\gamma$ and $w$, the locations of the legislators, and the locations of the alternatives.

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$^{2}$Poole and Rosenthal (1985) then set $\gamma$ to 1/2 in their estimation.

$^{3}$The full equation is: $p(v_{ij} = \text{yes}) = \frac{\exp(\gamma \cdot \exp(-w^2 \cdot ||x_i - z_{ijY}||^2))}{\exp(\gamma \cdot \exp(-w^2 \cdot ||x_i - z_{ijY}||^2)) + \exp(\gamma \cdot \exp(-w^2 \cdot ||x_i - z_{ijN}||^2))}$
Martin and Quinn’s model and its main assumptions

In this model, the utility of voter $i$ ($i = 1, ..., n$) to choose “Yea” on vote $j$ ($j = 1, ..., m$) is defined as:

$$U_{ijY} = ||x_i - \zeta_j||^2 + \eta_{ij},$$

with $\zeta_j$ the location of the “Yea” of vote $j$ and $\eta_{ij}$ a random variable following a normal distribution with mean 0. Similarly, the utility of voter $i$ to choose “Nay” for vote $j$ is:

$$U_{ijN} = ||x_i - \psi_j||^2 + \nu_{ij},$$

with $\psi_j$ the location of the “Nay” of vote $j$ and $\nu_{ij}$ a random variable following a normal distribution with mean 0. The probability of voter $i$ to answer “Yea” on vote $j$ is defined as follows:

$$p(v_{ij} = \text{yes}) = p(U_{ijN} < U_{ijY}) = p(-||x_i - \psi_j||^2 + \nu_{ij} < -||x_i - \zeta_j||^2 + \eta_{ij}) = p(\nu_{ij} - \eta_{ij} < ||x_i - \psi_j||^2 - ||x_i - \zeta_j||^2) = p(\nu_{ij} - \eta_{ij} < \psi_j^2 - \zeta_j^2 - 2x_i\psi_j + 2x_iz_j) = \Phi(\beta_jx_i - \alpha_j),$$

with $\alpha_j = (\zeta_j^2 - \psi_j^2)/\sigma_j$, the discrimination parameter. The difficulty parameter is $\beta_j = 2(\zeta_j - \psi_j)/\sigma_j$, and $\sigma_j$ is the standard deviation of $(\nu_j - \eta_j)$ that is assumed to follow a normal distribution $N(0, \sigma_j)$.

These two models assume that the utility is a function of the exact distance between a voter and an alternative, plus a random noise. In other words, it assumes that the noise is not due to a lack of perception of the effective distance. As I will discuss, this has implications concerning how risk attitudes can be taken into account in these spatial voting models.

3 How to take risk aversion into account

In the literature, the work investigating the effect of individual levels of risk propensity either assumes that the spatial utility function differs across individuals depending on their risk attitude or directly tests the effect of risk attitude on individual decisions. Thus, I see two approaches susceptible to be relevant here. First, one could assume that the convexity of the spatial utility function of each actor can be determined by its propensity to take risks. Second, one could assume that among the two alternatives of each vote, the new proposal is likely to entail more uncertainty than the status quo and thus, risk averse voters should be more likely to opt for the status quo, all else being equal. Below I discuss the two approaches and explain why the second is more appropriate.
Risk Aversion and the shape of the Utility Function

Kahneman and Tversky (1983) define risk aversion as follows: “In general, a preference for a sure outcome over a gamble that has higher or equal expectation is called risk averse, and the rejection of a sure thing in favor of a gamble of lower or equal expectation is called risk seeking”. Thus, a risk averse behavior can be seen as a preference by an individual for a more certain but more moderate gain (loss) over a less certain but more important gain (loss). From this definition, some authors deduce implications concerning the spatial utility function of voters. In spatial models, it is generally assumed that the utility $U$ of a voter to choose a particular alternative is a function of the distance ($d$) between his ideal point ($x_v$) and the location of the alternative $a$ ($x_a$):

$$U = g(d), \quad \text{with } d = ||x_v - x_a|| \text{ and } g \text{ a monotonic decreasing function.}$$

If the location of the alternative entails some uncertainty, $x_a$ can be seen as a random variable and the expected utility for a voter to choose a specific alternative may be written as follows:

$$E[g(||x_v - x_a||)] = \int g(||x_v - x_a||)f(x_a)dx_a,$$

with $f$ the distribution function of the random variable $x_a$. Following Pratt (1964) and Berinsky and Lewis (2007), let us assume now that there are two voters with the same ideal point $x_v$, the first being less risk averse than the second. For the first voter, the expected utility of choosing the alternative $a$ corresponds to the utility of choosing a sure outcome at a distance $d_1$ ($g_1$ is the utility function of the first voter):

$$E[g_1(||x_v_1 - x_a||)] = \int g_1(||x_v_1 - x_a||)f(x_a)dx_a = g_1(d_1),$$

If the second voter is more risk averse than the first, then the expected utility for him to choose the alternative $a$ is smaller than the utility to choose a sure alternative with distance $d_1$ ($g_2$ is the utility function of the second voter):

$$E[g_2(||x_v_1 - x_a||)] = \int g_2(||x_v_1 - x_a||)f(x_a)dx_a \leq g_2(d_1)$$

This holds for any alternative $a$ if $g_2^{-1}(g_1(d))$ is concave (see Pratt (1964) for a proof), or in other words, if $g_1$ is more concave than $g_2$. Thus, according to this approach, people have utility functions with different levels of concavity, the ones with the more concave utility function being the more risk averse.

Except for the “Optimal Classification” model that does not make any assumption about the shape of the utility function and error terms, the spatial voting models assume that the shape of the utility function is constant across voters. In each of these models, the random utility function is defined as follows:
$$U(a_j) = g(d(x_i; x_{a_j})) + \epsilon_j,$$

with most of the models assuming $g$ to have either the shape of the normal distribution (Poole and Rosenthal, 1985) or a quadratic utility function (Martin and Quinn, 2002; Clinton, Jackman and Rivers, 2004). So the noise is not assumed to affect different voters differently, all else being equal. It is important to note that this is not compatible with the conceptualization of risk aversion presented above. Here, $\epsilon_j$ can be better understood as a “classification error” than an error specific to the location of the alternative, a “perceptual error”. In fact, it is interesting to note that Poole and Rosenthal (1985, p.361) acknowledged this in a footnote:

“Technically, spatial error should appear in [the distance]. For example, in the case of perceptual error, an individual might use $[x_{a_j}] + [\gamma]$, where $[\gamma]$ is the perceptual error, instead of $[x_{a_j}]$ to compute [the distance]. We avoided this complex specification in order to make the problem tractable. We do not think this is a serious problem, however. In our Monte Carlo work we found that the recovery of the $[x_i]$ and the $[x_{a_j}]$ to be reasonably robust to a misspecification of the form of the utility function.”

So if we follow the conceptualization of risk suggested by Pratt (1964), the random utility function should have the form:

$$U_{v_i}(a_j) = g_i(d(x_{v_i}; x_{a_j} + \epsilon_{a_j})).$$

with $g_i$ being more or less concave for each actor $i$. To summarize, the way Pratt (1964) and Berinsky and Lewis (2007) conceptualize risk aversion directly comes from the assumption that the alternatives entail some uncertainty. The more the actor is risk averse, the more the utility function is concave, and the more uncertainty specific to an alternative will lower the utility of this alternative. Existing spatial voting models are far from this conceptualization because they do not allow the concavity of the utility function to vary across actors\footnote{Carroll, Lewis, Lo, Poole and Rosenthal (2013) allow the shape of the utility function to be a mixture of a quadratic utility function and a normal distribution but the function does not vary across individuals. Then they assume that the utility function has a normal shape with variance that can vary across individuals. Also, Lauderdale (2010) assumes a quadratic utility function for all actors but adds a variance parameter at the individual level.} and because they do not have alternative specific error terms. In fact, as suggested by the footnote cited above, it would be difficult to estimate a model with perceptual errors. This is because in both models, a strong assumption on the distribution of the difference of the two error terms, respectively $(\epsilon_{ijY} - \epsilon_{ijN})$ and $(\nu_j - \eta_j)$, allows to render the problem tractable. Such assumption would not be possible if the error terms were inside the distance function.

However, even if it was possible to include perceptual errors, I argue that using Pratt’s (1964) conceptualization for spatial voting models would lead to
serious drawbacks. This is because, according to this approach, for a sure alternative, the utilities between two actors with similar ideal points and different risk propensities differ, the more risk averse actors having a steeper utility function. Indeed, as the utility functions must be differentiable and decreasing, a more concave utility function (risk averse) will necessarily be steeper than a less concave one. The implication of some utility functions being steeper than others is particularly important in spatial voting models, because some actors will have more impact on the Loglikelihood than others. More specifically, risk averse actors will affect the model (the estimation of the votes’ parameters and thus indirectly all ideal points) more than other actors. I use Lauderdale’s (2010) model in Appendix A to show that voters tend to have flatter utility functions if they are extreme relative to the others.

For the reasons presented above, I argue that the conceptualization of risk attitudes as suggested by Pratt (1964) and Berinsky and Lewis (2007) would not be appropriate for spatial voting models, even if there was a tractable solution.

**Risk aversion and the status quo bias**

Another approach is to focus on the difference between the status quo and the new proposal of each vote. As the consequences of the status quo is observed, the new proposal entails more uncertainty. When explaining why most people are risk averse, Quattrone and Tversky (1988, 724) write that:

“... most people are reluctant to accept a bet that offers equal odds of winning and losing \( x \) number of dollars. This reluctance is consistent with loss aversion, which implies that the pain associated with the loss would exceed the pleasure associated with the gain, or \( v(x) < -v(-x) \). This observation, however, is also consistent with the concavity of the utility function, which implies that the status quo (i.e., the prospect yielding one’s current level of wealth with certainty) is preferred to any risky prospect with the same expected value. These accounts can be discriminated from each other because in utility theory the greater impact of losses than of gains is tied to the presence of risk.”

This explains why people often tend to favor the status quo. Thus, risk averse MPs should be less likely to vote for the new alternative, everything else being equal. Although the object of choice differs, this is consistent with Morgenstern and Zechmeister (2001) who find that the more risk averse the voters are in Mexico, the less likely they are to vote for the opposition. It is also consistent with Kam and Simas (2012) who find that risk propensity increases the likelihood to vote for the incumbent.

It is possible to include this feature into a spatial voting model, by modifying the IRT model available in *rjags*. I add a “penalty” to all new alternatives.

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6 This model does not allow for the concavity of the utility function to vary across individuals, but some utility functions are steeper than others.
and this penalty is multiplied by the level of risk aversion of the legislator, as estimated by a survey of the Swiss Legislators. The probability of voter $i$ to select “Yea” on vote $j$ becomes:

$$p(v_{ij} = yes) = \Phi(\beta_j x_i - \alpha_j + \lambda \times risk_i \times I_{yna_j}),$$

with $\lambda$ the coefficient to be estimated, $risk_i$ a measure of risk aversion of legislator $i$, and $I_{yna_j}$ an indicator equal to 1 if “Yea” of vote $i$ corresponds to the new alternative and −1 if “Yea” corresponds to the status quo. I expect $\lambda$ to be negative, as risk aversion should decrease the likelihood to choose the new alternative. This will allow me to test the following hypothesis:

**Hypothesis 1**: The more MPs are risk averse, the more likely they are to vote for the status quo, ceteris paribus.

### 4 Empirics

#### 4.1 Data

The variables used to estimate the propensity to take risks among representatives is part of a survey conducted during the 2014 summer session of the Swiss Upper House. As risk aversion is a personal trait, it is important to ensure that the legislators themselves answer the survey, so face-to-face interviews are preferred over questionnaires sent by mail or email. One advantage of the Swiss case is that the MPs are known as being quite approachable (see Buetikofer and Hug (2008) who interviewed the Swiss legislators), allowing to conduct these face-to-face interviews. Among the 46 members of the Upper House, 35 agreed on answering my survey.

The survey includes seven questions on risk (see Appendix B). Risk aversion varies across contexts, although it has a clear personal component too (Dohmen, Falk, Huffman, Sunde, Schupp and Wagner, 2011). Thus, it is necessary to have questions on various topics, including topics related to political decisions. The survey includes four questions related to uncertainty in political decisions, and three related to risk attitudes in life in general. In order to increase the chances to have a meaningful measure, I estimated the Cronbach’s alpha of all possible combinations of the seven variables. The highest Cronbach’s alpha is 0.615 and includes three questions. The second highest is 0.597 and includes four questions. Because the alpha is not much smaller and because it combines two questions related to political decisions and two more general questions on risk, I decide to aggregate these four questions to measure risk. The first question (see question 2 in Appendix B) asks the respondent: “How inclined are you to vote

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7 In fact there were 36 legislators, but one refused to answer any of the question. Among the 35, 6 did not answer all questions. See Appendix B for a more detailed description of the missing values.
for a new agreement between Switzerland and another country if among the 3 sources you trust the most, 2 predict that it will be favorable to the people you represent and one say that it will be unfavorable to them?” The second question (question 3 in Appendix B) asks the respondent to choose between two programs for establishing solar energy, the consequences of program X being 40 million CHF savings with certainty, and the consequences of program Y 80% chance of saving 60 million CHF, 20% chance of no saving. This question is from Quattrone and Tversky (1988). The third question (question 6 in Appendix B) asks: “In general, how easy or difficult is it for you to accept taking risks?” , a question examined by Nadeau, Martin and Blais (1999). The fourth question (question 8 in Appendix B) asks the respondent to indicate how similar they are to a person for whom adventure and taking risks are important, to have an exciting life. This question is part of the World Value Survey. I construct the measure of risk aversion by rescaling all four variables from 0 (risk acceptant) to 1 (risk averse) and taking the mean of these four rescaled items.

Estimating the construct validity of this measure is difficult and this for three main reasons. First, risk propensity varies across contexts. Thus, no clear correlation pattern with other covariates emerge from the literature. Second, a measurement bias might not be directly linked to the context but to the most current measure used in this context. This can also lead to different correlation patterns for different contexts. Third, most of these correlates are highly dependent. So, depending on the characteristics of the population under study, a different correlation structure might emerge. Thus, in a nutshell, the task content, the measurement method as well as the sample under study might generate different correlation structures and consequently, construct validity is difficult to test for risk attitudes, especially in a new context. In the present case, it is important to keep in mind that the sample only entails people with relatively high education levels, with medium to high income levels, and with an age of 34 or above. Table 1 presents the correlations.

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Correlation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.03</td>
<td>0.89</td>
</tr>
<tr>
<td>Age</td>
<td>0.34</td>
<td>0.06</td>
</tr>
<tr>
<td>Left-r</td>
<td>0.26</td>
<td>0.20</td>
</tr>
<tr>
<td>Open</td>
<td>-0.24</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Byrnes and Schafer (1999) present a meta-analysis of 150 studies testing the effect of age on risk propensity. They find that men take generally more risks than women. However, they also find that the gender gap decreases over age. They show that the effect of gender on risk attitudes decreases after 21 years old. As the mean age of our sample is 56 and the range goes from 34 to 69, this can explain why gender is not significantly correlated with risk attitudes in Table 1. MacCrimmon and Wehrung (1990) find that their measure of “maturity”
(an aggregation of age, seniority in the firm and the number of dependents) explains the difference between high risk taking and high risk averse executives, the higher on the “maturity” scale being more risk averse. Riley and Chow (1992) find that risky asset allocation is more frequent among people between 20 and 65 years old, so the relation between age and risk aversion has a U shape. The sign of the correlation between age and risk aversion is thus consistent with the literature. Also included in Table 1 are the correlation coefficients between risk and two political dimensions. In order to avoid endogeneity, the measure used here to estimate the location on the left-right dimension is the left-right location of the MP’s party as estimated by the respondents of the Swiss Electoral Survey of 2011. Leftists being generally more risk acceptant than Rightists, the sign in Table 1 is as expected, but the relation is not significant. The second is a political dimension that I will call “political openness”. It is the second main political dimension in Switzerland. According to Hermann and Leuthold (2001), this dimension englobes two main conflicts: the conflict for or against change, and the question about the relation with other countries and the condition of foreigners in Switzerland. The measure used in Table 1 is the location on this dimension of the MP’s respective political parties. Although the correlation is negative, it is not significant. To my knowledge, no such correlation has been estimated in the literature. However, this result is somewhat consistent with Ehrlich and Maestas (2010) who find that risk averse low-skilled workers are less likely to support free trade, and that risk acceptant high-skilled workers are more likely to support free trade. To summarize, only one covariate is correlated significantly (at the 10% level) with risk attitudes. However, this might be explained by the particular characteristics of the sample.

4.2 Analysis

I will use this measure to test if risk aversion has an effect on MP’s voting behavior. To do so, I use all final votes of the Upper House of the 49th legislature (except the last session that will be held in December). I use final votes only because MPs tend to behave strategically in non-final votes (Buetikofer and Hug, 2008), which can bias the results. The votes were normally counted via a show of hands. This changed at the beginning of 2014, final votes being now electronically registered. Thus, I registered the votes from watching the videos of the sessions until the last session of 2013, and the more recent votes

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8 However, as the authors explain, their result might be explained by wealth and income, as they tend to increase until retirement and then decrease.
9 Hermann and Leuthold (2001) named this dimension liberal-conservative. I name it “political openness” to avoid any confusion with the left-right scale, as liberal-conservative and left-right are often taken as synonyms in the American literature.
10 I estimated the locations of the political parties on this second dimension using four questions from the Swiss Electoral Survey (2011). These questions concern immigration and European Integration. I conducted a PCA on the answers of all respondents to these questions and then took the mean of the first dimension of the PCA by party (Respondents also give the party they would vote for.).
11 see http://www.parlament.ch/d/mm/2013/seiten/mm-bue–2013-08-23.aspx
are accessible on the official website of the Swiss parliament. The total number of final votes is 227, and among those, 95 votes are non-unanimous. I kept the 56 votes for which I have at least four “Yea” and four “Nay”. Given the missing values in the survey, there is 31 MPs for which I have a measure of risk, so the roll call matrix is 31 by 56. I estimate the quadratic model modified, presented above, using \textit{rjags} (Plummer, 2014):

\[ p(v_{ij} = yes) = \Phi(\beta_j x_i - \alpha_j + \lambda \times risk_i \times Iyna_j), \]

\(Iyna\) is a variable coded 1 if the “Yea” is the new alternative and -1 otherwise. As I expect risk averse legislators to be less likely to opt for the new alternative, \(\lambda\), the estimated parameter, should be negative.

The estimation of 3 chains of length 10 000, with a burnin of 3000 for each gives an estimated parameter \(\lambda\) of mean 0.446 and standard deviation 0.483. Figure 4 show the three chains and the distribution of the estimated parameter \(\lambda\).

According to these results, as \(\lambda\) is not significantly different from 0, I conclude that risk attitudes do not have an effect on legislative voting. To confirm this result, I present an additional analysis below. I estimate a binomial regression to predict the likelihood of voting for the new alternative.

### 4.3 Additional Analysis

In this model, all votes are included for all legislators. The dependent variable equals 1 if the legislator chose the new alternative and 0 otherwise. The main explaining variable of interest is the measure of risk aversion. According to Hypothesis 1, the coefficient or risk aversion should be negative. As new alternatives do not all entail similar levels of uncertainty, the model estimates a fixed effect for each vote. Because the ideological dimension should explain part of the variability, the location of the MP’s party on the left-right scale as well as on the second dimension “political openness” are included too. Table 2 displays the results.

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
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<th>Model 3</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>constant</td>
<td>0.08</td>
<td>0.46</td>
<td>1.53</td>
<td>0.51</td>
<td>1.92</td>
<td>1.36</td>
</tr>
<tr>
<td>riskaverse</td>
<td>-0.98</td>
<td>0.32</td>
<td>0.17</td>
<td>0.35</td>
<td>0.18</td>
<td>0.35</td>
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<td>ideology (right)</td>
<td>-0.42</td>
<td>0.04</td>
<td>-0.49</td>
<td>0.24</td>
<td>-0.19</td>
<td>0.60</td>
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<tr>
<td>ideology (openness)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>N</td>
<td>1429</td>
<td></td>
<td>1429</td>
<td></td>
<td>1429</td>
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<td>1397.2</td>
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<td>1399.1</td>
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</tbody>
</table>
In Model 1, risk has the expected effect on the likelihood of voting for the new alternative. However, when adding the left-right dimension, the effect of risk attitudes becomes insignificant. The effect of left-right ideology has a positive and significant effect on the likelihood of voting for the new alternative. Political openness, on the other hand, has no significant effect.
5 Conclusion

This project investigates how risk attitudes can be taken into account in spatial voting models. After explaining why allowing for the shape of the utility function to vary across individuals will not be a suitable method to test the effect of risk attitudes on legislative voting, I estimate a model that includes a penalty for the more uncertain alternatives. The results show that risk attitudes have no effect on legislative voting.

References


Appendix A

In his model, Lauderdale (2010) allows for some MPs to have a steeper utility function than others. His model is a modification of Martin and Quinn’s (2002) model where:

\[ p(v_{ij} = \text{yes}) = \Phi\left( \frac{\beta_j x_i - \alpha_j}{\sigma_i} \right) \]

This is equivalent to Martin and Quinn’s (2002) model with the following modification to the utility function:

\[ g = -\frac{1}{\sigma_i}(d)^2, \quad \text{with } \sigma_i > 1 \]

the more \( \sigma_i \) is large, the less flat is the utility function.

Londregan argues that unpredictable, or “mavericks” legislators have a flat utility function. I argue here that there might be another reason for an actor to have a flat utility function: more extreme actors are more likely to have flat utility functions, and this independently of their behavior.

In the following analysis, we will see that steeper utility functions are not only attributed by the model according to the behavior of the actor but also to the extremity of his location. The reason behind this is that the model only uses votes that are not unanimous. Thus, it is likely that these votes will have a cutpoint somewhere between the two most extreme legislators. Thus the more extreme voters are more likely to be far from the cutpoints and their “missclassified” votes will have a strong impact on the likelihood except if their utility functions are flat. Thus, extreme voters will have flatter utility functions.

In order to test if the location of a voter \( i \) has an effect on \( \sigma_i \), I estimated the location of the Swiss legislators of the lower house using all final votes for the legislature 48, and using Lauderdale’s heterogeneous model. I then split the sample into two groups, those below zero and those above zero (this time based on the homogeneous model) and reestimate two models. I then compare the \( \sigma_i \)’s of all voters and it seems that the voters who are close to the middle in the first estimation and extreme in the second estimation (the ones located close to zero) have a higher \( \sigma_i \) in the second estimation (relative to the rest of the sample). Figure 2 and 3 display the difference between \( \sigma_i \) in the second estimation and \( \sigma_i \) in the first estimation (“delta sigma”).

\[ ^{12} \text{the two } \sigma_i \text{'s have been standardized, that is, divided by the standard deviation of the distribution of the MPs of the corresponding estimation.} \]
We see that MPs that were not extreme in the first estimation but were in the second (the moderate MPs) have a $\sigma_i$ that increased between the two
estimations (delta sigma is larger than 0). Consequently, it seems coherent to argue that the location of an MP might have an impact on the shape of its utility function, and that the shape of the utility is not only defined by its behavior.
**Appendix B**

The main goal of the survey is to estimate the level of risk aversion of each MP of the Upper House in Switzerland. The survey includes seven questions on risk and one aiming at estimating how likely MPs are to follow the party line. The questions are displayed below:

**Question 1**: Imagine that Switzerland is preparing for an outbreak of an unusual disease which is expected to kill 600 people. Two alternative programs to combat the disease are proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If program A is adopted, 400 people will die. If program B is adopted, there is a $\frac{1}{3}$ probability that no one will die, and $\frac{2}{3}$ probability that 600 people will die. Which of the two programs would you favor?

A  
B

**Question 2**: How inclined are you to vote for a new agreement between Switzerland and another country if among the 3 sources you trust the most, 2 predict that it will be favorable to the people you represent and one say that it will be unfavorable to them?

0 very inclined  
1 somewhat inclined  
2 neither somewhat inclined nor somewhat disinclined  
3 somewhat disinclined  
4 very disinclined

**Question 3**: The state of Epsilon is interested in developing clean and safe alternative sources of energy. Two programs for establishing solar energy within the state are considered. If program X is adopted, then it is virtually certain that over the next four years the state will save 20 million CHF in energy expenditures. If program Y is adopted, then there is a 80% chance that the state will save 30 million CHF in energy expenditures over the next four years and a 20% chance that because of cost overruns, the program will produce no savings in energy expenditures at all. To summarize, the alternative policies and their probable consequences are:

Program X: 40 million CHF savings with certainty  
Program Y: 80% chance of saving 60 million CHF, 20% chance of no saving.

Imagine you were faced with the decision of adopting program X or program Y. Which would you select?
**Question 4**: How inclined are you to vote for a new economy bill that has 70%

0 very inclined
1 somewhat inclined
2 neither somewhat inclined nor somewhat disinclined
3 somewhat disinclined
4 very disinclined

**Question 5**: If you are unsure about the outcome of a bill, how likely are you to turn to your co-partisans as reliable sources of information about the effect of the bill on the constituents?

0 very likely
1 somewhat likely
2 neither somewhat likely nor somewhat unlikely
3 somewhat unlikely
4 very unlikely

**Question 6**: In general, how easy or difficult is it for you to accept taking risks? (very easy; somewhat easy; somewhat difficult; very difficult)

**Question 7**: Suppose you were betting on horses and were a big winner in a race. Would you be more likely to continue playing or take your winnings?
- definitely continue playing;
- probably continue playing; not sure;
- probably take my winnings;
- definitely take my winnings)

**Question 8**: Now I will briefly describe a person. Would you please indicate whether that person is:
- very much like you,
- like you,
- somewhat like you,
- little like you,
- not like you, or
- not at all like you?

Adventures and taking risks are important to this person; to have an exciting life
Below are displayed the distributions of each variable measuring risk. The variables have been rescaled (0 = risk acceptant, 1 = risk averse).

Figure 4: Distribution Risk Aversion

35 legislators agreed on answering the survey, but some of them refused to answer a few questions. The number of missing values is displayed in the table below for each question.

Table 3: The Effect of Risk Attitudes on Vote Choice

<table>
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