Latent Ideological Positions of Swiss Parties and the Population.

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Abstract

Many fundamental aspects of democracies are related to the link between political elites and citizens. A central concept for the comparison of these groups is their ideology. Political representation, responsiveness, or models of voting all assume that ideology is a crucial concept when comparing political elites and citizens. However, studies usually rely on different data and operationalization to measure this complex concept. Thus, evaluating how empirical results using these indicators are subjected to measurement errors and reporting under or over-evaluation of estimates is problematic. In this research note, I aim to present a newly developed method that uses observational data on Swiss Direct Democracy in a dynamic Bayesian Item-Response-Theory model to evaluate the position of parties and segments of the population in the same ideological latent space. In doing so, I propose a way to evaluate the ideological position of parties and the population in a similar latent space. This operationalization opens new ways to elaborate research on political behavior and the link between parties and voters' ideology in the Swiss context.

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Introduction

The relationship between political elites and voters is a key component of functioning democracies. Understanding this relationship requires comparable measures of voters' and political elites' ideological positions. Prominent models of voting rely on the idea that there is a common ideological space shared by political parties and voters driving the decision-making of citizens (Downs, 1957; Rabinowitz & Macdonald, 1989). Also, to test whether voters are substantively represented (Achen, 1978; Phillips, 1995; Pitkin, 1967) and political elites responsive to voters (Stimson, MacKuen, & Erikson, 1995), it is essential that scholars study this relationship. One key concept that ties elites and voters is ideology. However, we currently lack measures of ideology able to place both political elites and groups of citizens in the same latent space. This paper aims to fill this gap and show how data on Swiss direct democracy can place parties and voters in the same ideological space.

Generally, studies operationalizing ideology voters rely on left-right self-placement (Adams, Clark, Ezrow, & Glasgow, 2006; Adams, Haupt, & Stoll, 2009; Steenbergen, Edwards, & De Vries, 2007) to position survey respondents on the ideological space. For political elites, studies often rely on elite surveys (Koedam, 2021), or party manifestos (Franzmann & Kaiser, 2006; König, Marbach, & Osnabrügge, 2013; Pelizzo, 2003). While many other methods are used to position these two political entities, they all have in common the notion that they measure the ideology of these groups separately. As highlighted by Adams et al. (2019), different measures of similar groups' ideologies do not necessarily correlate between them. While some research have presented ways to measure the ideology of both groups in the same space (Kurella & Rosset, 2018; Leimgruber, Hangartner, & Leemann, 2010), we still lack ways to adopt such measure systematically over long period. As a result, comparisons between the ideologies of these groups are largely subjected to measurement bias, which makes it difficult to reach a definitive conclusion in related research.

Recent development in political science research makes use of Bayesian Item-Response Theory models (Clinton, Jackman, & Rivers, 2004) to place political elites or voters in an ideological space (Caughey, O'Grady, & Warshaw, 2019; Kubinec, 2019). These models rely on a variety of responses to political questions, assess discrimination scores to questions, and ideal position estimates to individuals. Different ideal positions' values affect the probability of answering political questions in some ways. For instance, if two parties have a progressive and a conservative ideal position, their probability of supporting a progressive or a conservative policy proposal will differ. Using observational data on Direct Democracy in Switzerland, this paper provides a new way to position parties and segments of the electorates on the same ideological dimension, enabling a better comparison of ideological changes of Swiss voters over time. As voters

and parties reply to the same policy question in direct democratic votes, I propose to use their response to these policy questions to position both voters and parties in the same ideological space.

To do so, I proceed in three steps. First, I use a dynamic Bayesian IRT model to compute the ideal position of Swiss parties from 1965 to 2022. This first step defines the party competition space, and I will then measure the population's ideological position. As the ideological space dividing voters is strongly influenced by the party competition space (Sartori, 1969), I argue that measuring the ideological positions of the population through the party competition space enables a comparable and accurate measurement of the population ideology. Second, I use the posterior probabilities of item discrimination from the dynamic Bayesian IRT model to define the conservative and progressive direction of ballot proposals and regress this on the relative support for direct democratic proposals of segments of the Swiss population. Finally, I compute the difference between the predicted support for conservative and progressive proposals. This difference indicates how segments of the population support progressive ballots compared to their support of conservative ballots.

In summary, this paper provides a practical method to compute the ideal position of segments of the population based on a latent space defined by the ideological space in which party competition takes place. Using only observational data, this method positions parties and segments of the electorate on the same dimension, offering a useful tool for political scientists and researchers. The method's applications, including its potential to study the rural-urban divide and other aspects of party competition, underscore its relevance and potential impact.

In the following, I first present the dynamic Bayesian IRT model used to evaluate the ideal position of parties. Then, I take a closer look at the discrimination parameters of ballot proposals and explain how I classify them between ballots aiming at progressive/conservative reforms. Third, I explain how to compute the estimates that indicate the ideal position of segments of the population. Fourth, I will show the application of the method with data on the results of the cantonal and municipal elections. Finally, I will lay out concluding remarks on the paper, explain how it can be applied in various contexts, and explain what limitations and next steps should be investigated.

Latent positions of Swiss parties overtime.

Measuring the positions of different actors over time is a large challenge in political science research. In many aspects, ideology is expected to play a large role. Prominent models of voting assume that voters vote for parties that are close to them (Downs, 1957) or in their

ideological direction Rabinowitz and Macdonald (1989). Democratic systems are also expected to be responsive in an ideological shift of the electorate Stimson et al. (1995) and concepts such as political congruence (Bingham Powell Jr, 2009), representation (Achen, 1978) and polarization (Dalton, 2021) have large relations to the concept of ideology and the link between the ideology of the mass public and the political elites. A renewed interest in the rural-urban cleavage (Brown, Mettler, & Puzzi, 2021; Iversen & Soskice, 2019; Maxwell, 2019) enhances researchers' interest in measuring the ideological subsets of the population. Yet, research positioning both political elites and segments of the population in the same ideological space is scarce. This paper aims to contribute to the effort to improve measurement strategy and enable more accurate and comparable measurement of ideology for various groups of voters and political elites.

Recent developments aim to position parties and citizens in a similar latent space. For instance, Leimgruber et al. (2010) used elites and population surveys to position both candidates and voters on the same policy space. Kurella and Rosset (2018) used a similar strategy to position individual voters and political candidates in the same space. Also, Jessee (2016) used a Senate survey and positioned survey respondents and Senators on the same scale using respondents' positions on real bills. While this approach is very promising, it does not enable researchers to position whole subsets of the population over time. However, the basic idea is essentially similar: using an ideal points model to position different groups based on their responses to similar (policy) questions. In their paper, Masket and Noel (2012) use district-level ballot results from direct democratic proposals in California to place both districts and legislators on the same latent dimension. This approach uses the 50% threshold to position the median voter in the different districts as supporters or opponents of the ballot. Although this gives the possibility to model the position of legislator and district in one model, using the 50% cutoff as a standard may be problematic for different reasons. First, if the proposal is largely supported by the population, all districts may be supportive of the ballot, although some useful information in the variation of the support among the different districts. Indeed, between districts where 55% or 90% of the population supports the ballot, there are clear differences that are erased in the model. Second, the difference between slight support - 51% - and slight opposition - 49% - is similar to a large opposition. In addition, a district with a small support - 51% - is way more different from a district with a large support - 75% - than a district with a small opposition - 49%. Thus, we consider that using the 50% threshold as a cutoff point loses some useful information. In this paper, we aim to use the variation in ballot support to place a subset of the population on the same dimension as the dimension of the party competition. In opposition to Masket and Noel (2012), we do not compute a single latent space for the legislator and the population using the results from direct democratic ballots. Instead, we use the latent space

defined by the party competition to place voters in different contexts. Thus, the paper does not compute the ideal position of the population but computes the position of the population based on the ideal position of parties. In doing so, it follows Sartori (1969) that argues that the ideological space in which the population evolves is strongly dependent on the space defined by the party competition.

To do so, we proceed in three steps. First, I use the vote recommendation from parties to measure their ideal position and extract the discrimination parameter from the Bayesian Item-Response-Theory model. Second, I use linear regressions to estimate how the progressive/conservative direction of a ballot influences the relative support of the population for a ballot. Finally, we compute the difference between the predicted support for conservative and progressive ballots to estimate how different support for ballots is when it goes in different directions. In doing so, I estimate how the direction of direct democratic ballots influences the support of the ballots. The more the direction of a ballot influences the support of the population, the more the population is away from the national median voter.

The first step of this process is to compute the ideal position of parties over time. To do so, I rely on the Swissvote dataset (Swissvotes, 2021), which collects party vote recommendations for direct democratic proposals. In doing so, the paper follows the path set by Hug and Schulz (2007) and shows parties' positions over time using vote recommendation with the DW-NOMINATE model. In this paper, I use the same data with a dynamic Bayesian IRT model.

Bayesian IRT models have recently been used in different instances of political science research. Caughey and Warshaw (2018), used the model to compute the level of liberalism of political elites in the US. Caughey et al. (2019) also provides methods that place individual survey respondents in Europe on the same latent space across time. O'Grady and Abou-Chadi (2019) used this computation to evaluate parties' responsiveness in Europe. Bayesian IRT models are currently in the state of the art in measuring ideal positions of actors in latent dimension. They have been applied to dynamic data and are also able to measure multidimensional spaces. However, to do so, researchers need to have access to actors' responses to sets of questions related to the latent concept. These questions are not always available or comparable over time and for a different set of actors. For instance, Caughey and Warshaw (2018) use roll call votes of US Congress and Senate to measure the liberalism of political elites, but voters do not take a position on these issues. Thus, it is not possible to position voters in the same latent space. Similarly, Caughey et al. (2019) use value questions of European surveys to measure the policy ideology of the mass public. However, these questions are not directly answered by political elites. Thus, it is not possible to position these different groups on the same latent dimension. The issue at stake is that a large amount of data exists on political elites and the mass public,

but the data are not related to each other. Thus it is not possible in most cases to position these groups in the same latent space.

Bayesian IRT models aim to measure the ideal position of actors by collecting their answers to questions related to a latent concept. In this case, we collect party responses to the political question and consider that the latent concept that explains parties' responses to these questions is their ideology. In short, the Bayesian IRT model builds on three parameters: the difficulty of the item a_i, the discrimination of item b_i, and the latent position of the actor θ_j. A particularity of the Bayesian IRT to measure the ideal position of parties is that there are no "right or wrong" answers to the political question - in opposition, for instance, to concepts such as ability or knowledge. Thus, all the parameters can be positive or negative. In our case, we are especially interested in the ideal position of parties - the parameter θ_j - and the discrimination of items - the parameter b_i. The ideal position of the parties enables us to validate the model and be sure that the parties' position follows our current knowledge of the parties' ideology. This means that generally, we should expect the SP and GPS to be on one side of the ideological spectrum and the SVP to be on the other, with the FDP and the CVP being closer to the center-right of the ideological space. The discrimination parameter is the quintessential parameter for this paper. In short, it tells us how much each item discriminates amongst parties. The more this parameter is far from 0, the more parties' responses to political questions are dependent on their ideology. The closer it is to 0, the less ideology is relevant for predicting parties' responses to political questions. Formally, the Bayesian IRT model can be formulated as:

$$Y_{ij} \sim Bernouilli(logit^{-1}(\theta_{jt} b_i + a_i)) \tag{1}$$

Where Y_{ij} is the outcome - the response of actor j on question i, $theta_j$ is the latent position of actor j, b_i is the discrimination parameter of question i and a_i is the difficulty of the question i. The priors of these parameters follow a normal distribution centered on 0, with a standard deviation of 1 - for $theta_j$ - and a standard deviation of 5 for the parameters related to the items. The $logit^{-1}$ is the inverse logit transformation that translates a number between -/+ infinity to a probability between 0 and 1. The $Bernouilli$ distribution splits these numeric values into 0 and 1. As shown in equation 1, the parameter for the ideal position of actors θ_j multiplies the discrimination parameter b_i of items. Thus, the more the discrimination parameter of items is far from 0, the more the response to the item is indicative of the latent position of actors.

I use the Swissvotes database (Swissvotes, 2021) observational data on parties' positions in Direct Democratic ballots to compute a Bayesian Item-Response Theory model and measure the ideal position of parties over time. This data contains lots of information at the ballot level, including vote recommendations for parties on Swiss Direct Democratic proposals. I recode these

positions to a binary variable so that when parties recommend rejecting the proposal, it takes the value 0 and takes the value 1 when parties recommend adopting the proposals. I select all direct democratic ballots between 1970 and 2022 and filter out the counter-proposal as parties' positions on these ballots may have different meanings depending on the parties' position on the initiative[1]. Overall, the model thus analyses the position of five parties - GPS, SP, CVP (Mitte), FDP, and SVP - over 434 ballots between 1965 and 2022.

The outcome of the dynamic Bayesian IRT model is the position of party j on proposal i. As the paper considers ballot proposals over 57 years, it is important to consider that the position of parties may evolve over time. Thus, I include a time component for the parameter $theta_j$. This is implemented by a random walk that considers parties' positions at $t = 1$ and is centered on the parties' position at $t = 0$ with some standard deviation. In short $\theta_{jt=1} \sim N(\theta_{jt=0}, \sigma_{jt=0})$. We thus use the same approach as Kubinec (2019) to measure the time-varying ideal position. The basic idea of the random walk is that the ideal point is based on a normal distribution of the ideal position at a previous time. Thus, while the model accepts position changes over time, if nothing indicates otherwise, it encourages the ideal position to remain stable over time.

I implement the dynamic Bayesian IRT using *Rstan* (Carpenter et al., 2017) with 10'000 iterations, including 5000 warmups. We use the posterior probability from the 5000 iteration after the warmup stage to evaluate the position of parties over time. Figure 1 presents the position of the five parties - SVP, FDP, CVP, SPS, and GPS - between 1965 and 2022 based on their vote recommendations in direct democratic proposals.

Figure 1 presents the posterior probability of the parameter θ for party j and year t. It shows that the five main Swiss parties are best summarized as three ideological blocks. On the left, we see that the SPS and GPS have relatively similar ideological positions over time. In the center-right, we see that the FDP and CVP are closely related, and finally, the SVP represents the conservative ideological block on the right. This is in line with positions of elites measured by Sciarini (2023) with population survey data and self-position of parties electorate over time. Indeed, we see that while at the beginning of the period, there were some ideological differences, the space between the left and right parties significantly grew between the years 1990 and 2000.

In this first step, I computed the ideal position of parties over time with a dynamic Bayesian IRT model and presented the posterior probabilities of the parameter that indicates the parties' positions. In the following, I focus especially on the discrimination parameter of ballot proposals

[1]For instance, parties may recommend to reject the counter-proposal to increase the chance of the initiative's success if they support the initiative. If they do not support the initiative and recommend the rejection of the proposal as well, the meaning of the position against the counter-proposal is different from an ideological standpoint. Thus, to increase the reliability and veracity of the Bayesian IRT model, I remove the counter-proposals from the data analyzed in the paper.

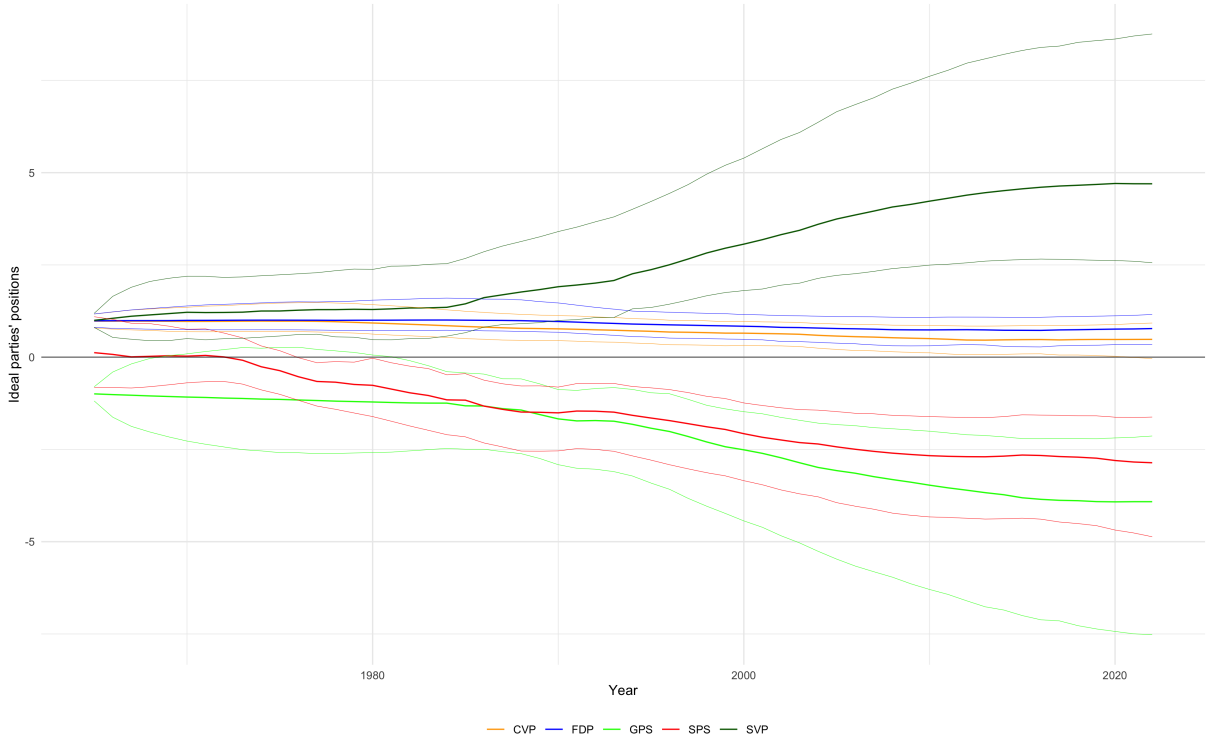

Figure 1: Parties' position between 1965 and 2022 based on the posterior estimate of the ideal position parameter θ_{jt}.

b_i. As shown in the model formulation, only direct democratic proposals with discrimination parameters significantly different from 0 are useful to position parties over time - otherwise, the product between the ideal position parameters and the discrimination parameter is null. In the next section, I explain how we can understand the discrimination parameter and how I use it to define the progressive or conservative nature of the proposal. In the third step, I then use this parameter and combine it with population support to direct democratic proposals to evaluate the latent position of cantonal and municipal segments of the Swiss population.

Identifying conservative and progressive proposals

Policy proposals can aim for different ideological goals. For instance, accepting a proposal that aims to ban immigration does not have the same ideological meaning as accepting a proposal that aims to facilitate the inclusion of immigrants. The whole challenge lies in the fact that this is a latent concept related to given proposals and that researchers can only see which actors accepted and/or rejected which proposals.

In the Bayesian IRT model presented in the previous section, the ideological direction of proposals is modeled through the discrimination parameter b_i. In short, the higher the score of the model is, the higher the probability that the party j supports the proposal i. The

lower the score is, the higher the probability that party j rejects the proposal i. As shown in figure 1, the position of parties on the left - SP and GPS - have negative values of their posterior probabilities. This means that the increase of the discrimination parameter lowers their probability of supporting the proposal. The opposite parties with positive posterior probabilities of the parameter θ have a higher probability of supporting proposals with positive discrimination parameters. In short, this means that proposal with positive discrimination parameters aims for conservative reforms, and proposals with negative discrimination parameters aim for progressive reforms. Figure 2 presents the posterior probability distribution of the 434 proposals taken into account in the model.

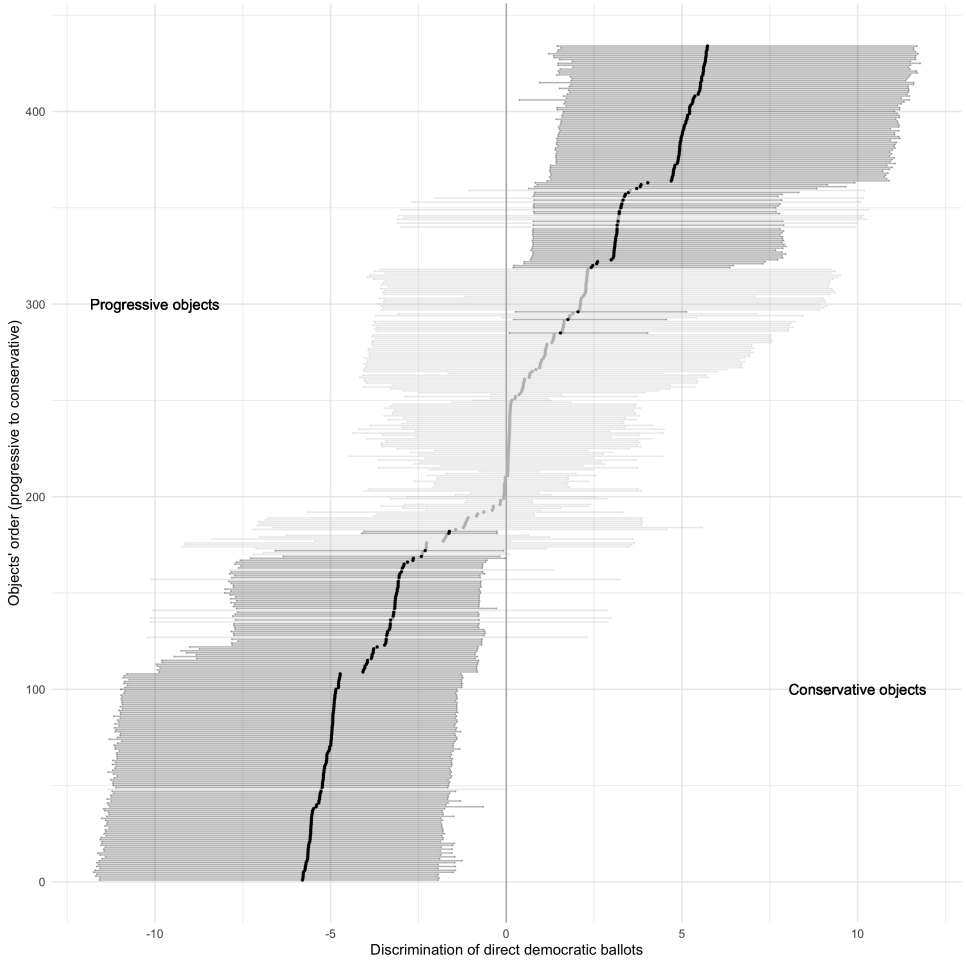

Figure 2: Posterior estimate for the discrimination parameter of the direct democratic proposals. Dots represent the median of the iteration after warmup and the lines represent the space between the $5^{th} and 95^{th} percentiles of the iterations. Items in dark have 95\% of iterations above or under 0$.

As shown in figure 2, proposals have different ideological meanings. As emphasized, proposals with higher discrimination parameters aim for more conservative reforms. On the opposite, proposals with lower discrimination parameters aim for more progressive reforms. In short, the higher the discrimination is, the more conservative the proposal is, and the lower the dis-

crimination is, the more progressive the proposal is. We also see that several proposals have discrimination parameters posterior estimates that are not significantly different from 0 - items in grey presented in figure 2. This means that the parties' positions on these proposals are not relevant to evaluating the position of actors in the models. As the product $\theta_{jt}b_i$ is not significantly different from 0, the position of parties on these ballots is best summarized by the remaining difficulty parameter a_i.

In the following, I will use the discrimination parameter posterior estimates of ballots to classify proposals as either progressive - if they are significantly lower than 0 - or conservative - if they are significantly above 0. To increase the reliability of the measure, we only take into account proposals with discrimination parameters that have 95% of iterations that are negative or positive - proposals in dark in the plot. In the next section, I show how it is possible to use the discrimination parameter from the Bayesian IRT model to estimate the position of other actors who take a position on the same direct democratic ballots. I take the case of sub-national populations - cantons and municipalities- here, but the process can be applied broadly to any actor who takes a position on the ballots.

Measuring ideology of sub-population

This section aims to give an illustrative example of how to estimate the position of actors in the same latent space as parties. To do so, I rely on observational data of support for direct democratic ballots by the Swiss population and cantonal or municipal support for these proposals from the Swiss Federal Office for Statistics. The core idea is that cantons or municipalities that support more progressive proposals are more progressive than those that support the more conservative proposal.

To model the position of cantons and municipalities, I use the difference in the support for ballots between the sub-population and the national population. This considers that the national population is the 'median voter,' and the difference to the median voters indicates the relative position of voters in cantons and municipalities. This relative support of direct democratic proposals is used as a dependent variable. The independent variable is the liberalism of ballots, which is a binary variable that takes progressive/conservative values as determined by the dynamic Bayesian IRT model presented in the two previous sections. This ensures that the explanatory power of the independent variable is related to the ideological dimension of the party competition. The first step is to estimate the effect of the liberalism of ballot proposal for each canton and municipality. The model can be formalized as follows:

$$Y_i = \beta_0 + \beta_1 Lib_i + \epsilon_i \tag{2}$$

Where Y_i is the relative support of the canton/municipality for the ballot i, Lib_i is the liberalism of the ballot, β_0 is the intercept - which represents the general level of support for ballot proposals - and β_1 is the regression coefficient of interest. It indicates whether cantons/municipalities have different support for ballots with different ideological meanings.

With this model, it is then possible to compute predicted relative support for ballots that go in the conservative direction with:

$$\hat{Y}_{cons} = \beta_0 + \beta_1 Lib_{cons} \tag{3}$$

Where $\hat{Y}_{cons}$ is the predicted relative support of the population for conservative ballots. In the same way, it is possible to predict the relative support for progressive ballots with:

$$\hat{Y}_{prog} = \beta_0 + \beta_1 Lib_{prog} \tag{4}$$

Where $\hat{Y}_{prog}$ is the predicted relative support for progressive ballots. The general idea behind the proposed method is that if the vote share of the population supports more ballots aiming for conservative policies than ballots aiming at progressive policies, then the population is more conservative based on the latent ideology of the party competition. On the opposite, if the population supports more progressive than conservative policies, they are more progressive. Thus, it is possible to create an ideological score of the population with the difference of the two predicted values computed with equations 3 and 4 with the following:

$$\hat{Y}_{ideology} = \hat{Y}_{cons} - \hat{Y}_{prog} \tag{5}$$

Where $\hat{Y}_{ideology}$ is the predicted ideology of the population. It is the difference between the predicted values of relative support for progressive and conservative proposals. Positive values mean that the population supports more conservative than progressive ballots, and negative values mean that the population supports more progressive proposals than conservative proposals. In short, the more positive $\hat{Y}_{ideology}$ is, the more conservative the population is, and the more negative it is, the more progressive the population is.

Figure 3 maps the results of the computation for Swiss cantons - on the left - and municipalities - on the right. It shows that western cantons are generally more progressive than the cantons in central and eastern Switzerland.

Figure 3 presents the ideological measure for all ballots between 1965 and 2022. However, the ballots have different characteristics. By moderating the liberalism of ballots with other

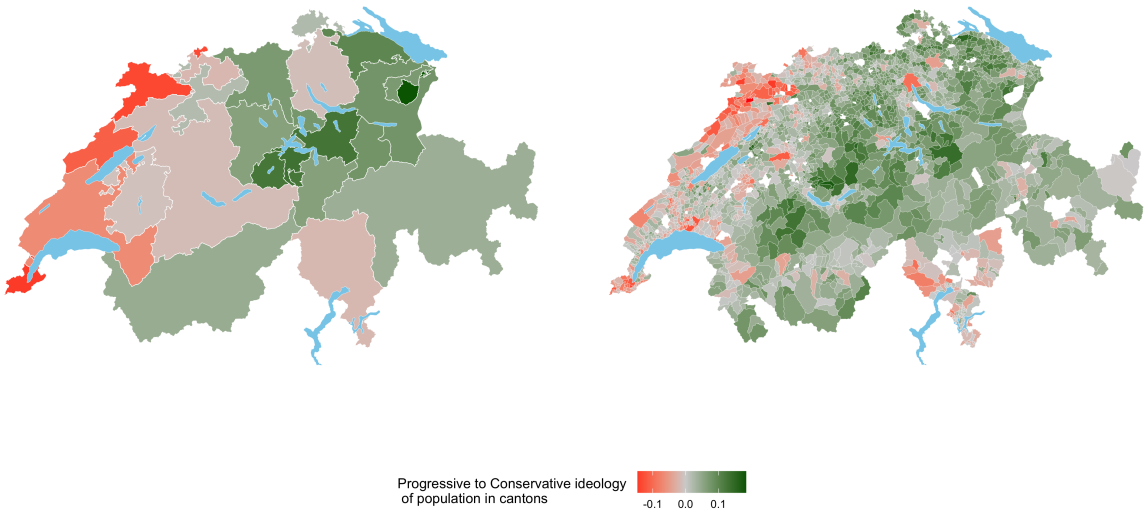

Figure 3: Latent ideological position of cantons (left) and municipalities (right)

characteristics of the ballots, it is possible to adapt the model presented above to measure the ideological position of the population in different dimensions. In the following, I first show how the time dimension can be included in the ideological measure of the population to, for instance, visualize which places became more progressive or conservative over time. Second, I take into account the issue of the ballot to visualize which populations have different ideological dimensions on different issues.

The basic idea is that, in addition to their liberalism direction, ballots have different characteristics that influence the position of the population, such as a time dimension. Let's consider a dimension X of size n. To evaluate how the dimension X moderates the ideology of the population under study. Thus, I include an interaction term between the independent variable and the dimension X. The model can be formulated as:

$$Y_i = \beta_0 + \beta_1 Lib_i + \beta_2 X_i + \beta_3 Lib_i X_i + \epsilon_i \tag{6}$$

Where X_i is the additional characteristic under study, such as the time dimension or issue dimension. By comparing the ideology of population on the different dimensions of X, it is possible to estimate whether the population of cantons and municipalities have significant ideological differences amongst the n dimensions. Based on the results of the model, we can then estimate the conservative position of the population on the dimensions with the following set of computations:

$$\hat{Y}_{cons,n_1} = \beta_0 + \beta_1 Lib_{prog} + \beta_2 X_{n_1} + \beta_3 Lib_{prog} X_{n_1}$$

$$\vdots$$

$$\hat{Y}_{cons,n_n} = \beta_0 + \beta_1 Lib_{prog} + \beta_2 X_{n_n} + \beta_3 Lib_{prog} X_{n_n} \tag{7}$$

We thus compute n estimation of the relative support of the population under study for conservative ballots and do the same computation for the relative support for progressive proposals. With the progressive and conservative relative support on the n dimensions, it is thus possible to compute the ideology of estimate of the population on each of these dimensions with:

$$\hat{Y}_{ideology,n_1} = \hat{Y}_{cons,n_1} - \hat{Y}_{prog,n_1}$$

$$\vdots$$

$$\hat{Y}_{ideology,n_n} = \hat{Y}_{cons,n_n} - \hat{Y}_{prog,n_n} \tag{8}$$

Where $\hat{Y}_{ideology,n_n}$ is the ideology of the population on the dimension n. This computation makes it possible to compare the ideology of populations on different dimensions. While the number of dimensions is constrained by the data availability, it can be applied to a variety of concepts that may influence the ideology of the population.

I focus on two different concepts to exemplify how this measurement can be applied to answer substantial political questions. First, I take the time dimension and create a binary indicator for the moderating variable X that differentiates between proposals until 1990 and proposals after 2000. This can test whether and which canton/municipality is more progressive/conservative in the latter years than in the former. Second, I use the Comparative agenda's project[2] classification of ballots into *majortopics*. I then keep ballots of social welfare and immigration issues to see which cantons/municipalities have different positions on social welfare and immigration issues.

Figure 4 presents the evolution of ideology for cantons and municipalities between the years before 1990 and after 2000.

Figure 4 shows that at the cantonal level, the canton of Fribourg is the only one that is significantly more progressive after 2000 than before 1990. It also shows that five cantons - Solothurn, Basel Landschaft, Uri, Schwytz, and Nidwalden - are more conservative after 2000 than before 1990. At the bottom of figure 4, we see that municipalities that have become more progressive are mostly concentrated in the western part of Switzerland, while the ones that became more conservative are highly present in the center of Switzerland.

[2]The data used here were originally collected by Roy Gava, Pascal Sciarini, Anke Tresch and Frédéric Varone, with the support of Swiss National Science Foundation (grant number 105511-119245/1 and project 'The Mediatization of Political Decision Making' sponsored as part of the National Center of Competence in Research' Challenges to Democracy in the 21st Century'), and were distributed through the Department of Government at the University of Texas at Austin. Neither SNSF nor the original collectors of the data bear any responsibility for the analysis reported here.

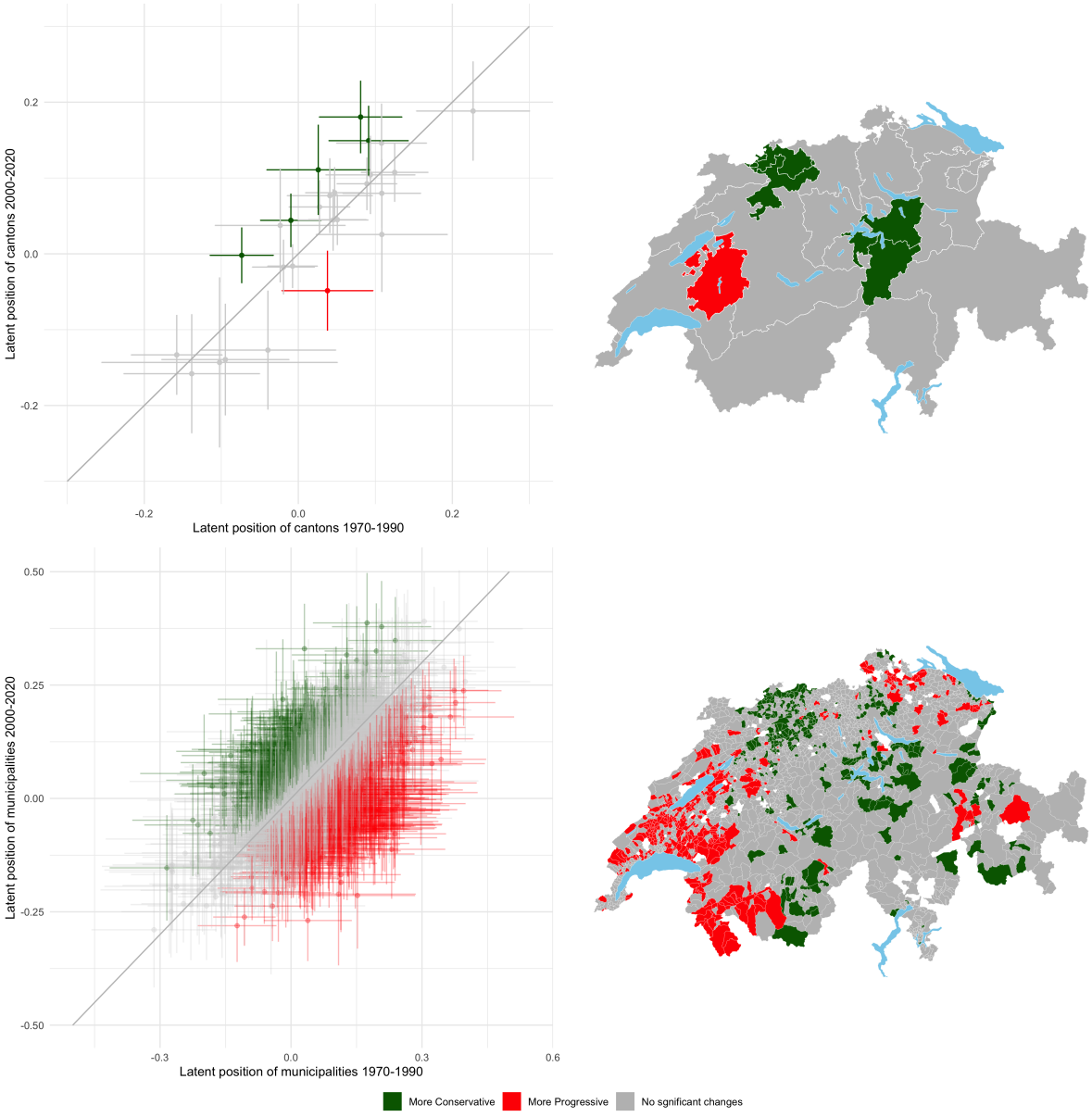

Figure 4: Evolution of the latent ideological position between the period 1965-1990 and 2000-2022 of cantons (up) and municipalities (bottom).

The second application concerns the comparison of ideological positions on issues. Figure 5 shows the results of the computation for cantons and municipalities.

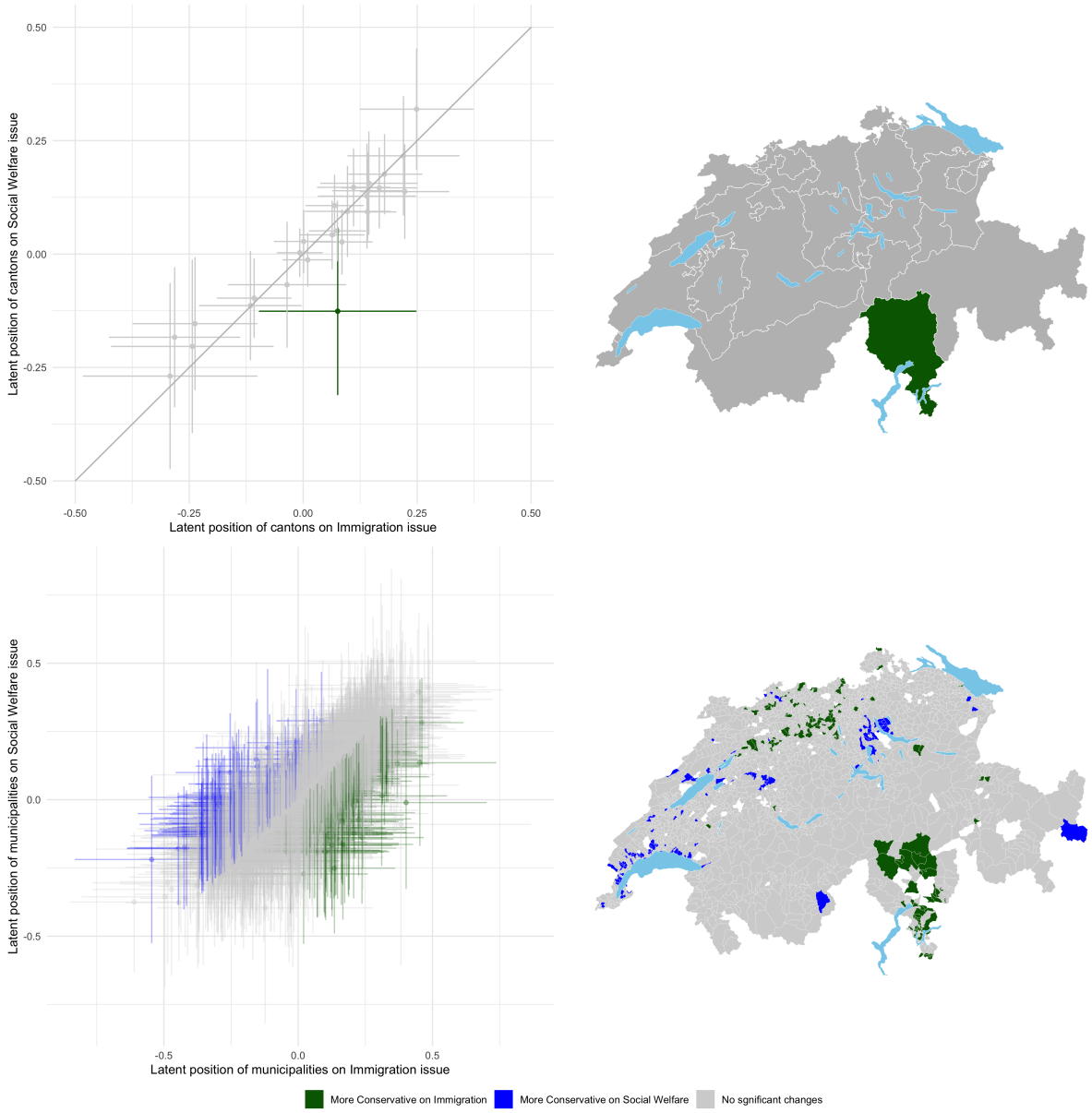

Figure 5: Latent ideological position of cantons (up) and municipalities (bottom) on Immigration and Social Welfare issues.

Figure 5 shows that, at the cantonal level, only Ticino has a significantly different position on immigration and social welfare issues. Indeed, the canton is significantly more conservative on immigration issues than on social welfare issues. At the municipal level, we see that some municipalities in the western part of Switzerland are more conservative on social welfare issues than on immigration issues. Also, in addition to municipalities in Ticino, we see that municipalities in the center north of Switzerland are also more conservative on immigration issues than on social welfare issues.

These applications have shown that, based on a dynamic Bayesian IRT model to position parties with their positions on direct democratic ballots, it is possible to position different segments of the Swiss population in the same ideological space as parties. Also, it shows that it is possible to use some variation in the dimensions of the ballot to evaluate whether and which populations have significantly different ideologies on which dimension. The general idea behind the paper is simple: supporting progressive ballots is more progressive than not supporting them, and supporting conservative ballots is more conservative than not supporting them. By imputing discrimination parameters on direct democratic ballots to voter data, it is not only possible to evaluate voters' positions, but it also makes sure that the ideological space represented in this way is strongly correlated with parties' ideological space. This can be applied broadly in the study of the relationship between parties and voters but also may serve as a useful variable in studies that aim to use ideology as a variable of interest.

Conclusion

In this paper, I aim to provide a way to position different segments of the Swiss population on the latent dimension defined by party competition using observational data in direct democracy. It does so by modeling parties' positions over time with a Dynamic Bayesian IRT model and uses parameters from this model to define proposals with progressive or conservative aims. I then compute the predicted difference in support for ballots with different aims as an indicator of the level of liberalism in different contexts.

The paper shows that it is not only possible to position the population in the latent space defined by the party competition, but it can also help answer various questions about public opinion. Indeed, I show that it is possible to map which cantons and municipalities became significantly more progressive/conservative over time. Also, I map the cantons and municipalities that have different ideological positions on immigration and social welfare issues. Recent research has shown interest in the geographical polarization of rural-urban regions and its growing importance regarding immigration issues. The proposed estimations can be used to study these dynamics over time, giving new perspectives to researchers on the topic. More generally, the estimation method proposed in this paper can have many applications. The main advantage is that it helps model parties and voters on the same party competition dimension using only observational data.

However, this estimation method has several limitations. First of all, I do not model the ideal position of the population but their position on the dimension of party competition. Although the dimensional space between parties and voters may be close, and this limitation can

have theoretical justification (Sartori, 1969), the proposed method limits the measurement of ideology in the population on the party competition space. Second, party vote recommendations influence the position of voters, as several papers on the use of party cues in direct democratic decision-making show (Boudreau & MacKenzie, 2014; Kriesi, 2006; Kriesi et al., 2005; Walder & Strijbis, 2022). Thus, this estimation may imply a latent measure of party preference. Third, the model used in this paper operationalizes the party competition space in a single dimension. Yet, researchers have long argued that the competition space has transformed (Inglehart, 1971; Kitschelt, 1988; Kriesi et al., 2006), which potentially requires a multidimensional operationalization of the party competition space. Nevertheless, the method proposed in this paper can be adapted to measure ideological position in a multidimensional space (Leimgruber et al., 2010). However, given the limited number of party actors that can be considered overtime considered in this research,

Nevertheless, the estimation strategy presented in this yields interesting results that can be used in a large variety of contexts. Considering the relative position across municipalities and the differences within municipalities' preferences based on a solid party competition dimension may help the researcher shed better light on nonobservable concepts related to the ideology. More importantly, I think the estimation methods proposed in this paper should be used to conduct more research on party strategies and behaviors and, more generally, the structure of partisan competition.

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