Machine Learning vs. Swiss Politics

Bachelor's Thesis

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Abstract

Smartvote is an online application for voting advice, allowing voters to find the candidates that most closely match the voter's political opinion and hence giving the users of smartvote a way of ensuring their ballot choice is based on good information.

The scope of this thesis is manyfold: at first a proper cleaning and preprocessing of the dataset was necessary to subsequently perform a detailed analysis of voter demographics. Additionally, potential biases in the dataset have been identified, and a critical analysis on the "goodness" of questions asked in the questionnaire has been performed. Finally, Smartvote's "Smartmap" a tool for visualizing political positions was critically evaluated.

Contents

Smartvote

Smartvote is an online application for Voting Advice. It was founded by Daniel Schwarz, Jan Fivaz and Albert Waaijenberg in 2003. It is operated by Politools, a Swiss organisation focusing on online projects in the field of civic education and e-democracy.

Politools aims to provide interested citizens with scientifically sound information about politics in a simple and understandable matter. Politools' most significant projects are Smartvote, with the goal of providing transparency before elections and Smartmonitor, with the goal of providing transparency after elections by systematically monitoring parliamentary events. [1]

1.1 Idea behind Smartvote

Smartvote argues that democratic elections are based on the ideal that voters vote for those candidates who best fit their own political positions and values. This ensures that the will of the electorate is represented in parliament. In order to make a good decision, voters are dependent on comprehensive information regarding the positions of the parties and candidates.

This role of an information provider is where Smartvote comes in. Before any election in Switzerland, smartvote and a few selected politically neutral experts create a questionnaire that is designed to determine both long-term values and political beliefs but also opinions on short-term current topics that are relevant for the election. All candidates that are up for election are invited to create a smartvote profile and answer all questions according to their opinion beforehand. Their answers are later on publicly visible on smartvote's website.

A few weeks before the election the questionnaire is published on the website and users can fill it out to get a recommendation of which politicians they share the most values/opinions with based on a matching algorithm as described in section 1.4

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1.2   Questionnaire

The questionnaire is compiled as follows: In the first phase, ideas and suggestions for the questionnaire are collected. Non-binding suggestions can come from various sources: Parties, interest groups, citizens, the media and the smartvote team itself. In the run-up to the 2019 National Council elections, over 1500 question proposals were collected. The questions are then selected in several rounds. Depending on the election, between 45 and 75 questions are included in the final questionnaire.

Smartvote aims to develop a questionnaire that is as balanced as possible and covers all relevant topics. The selection of topics for the questionnaire is subjective. Science, media, politicians and voters might perceive different topics as having different importance,that is why smartvote has set itself the goal of creating a questionnaire that is as balanced as possible. Particular attention is paid to selecting topics on which candidates have diverging opinions and which are of interest to a broad audience. Political neutrality and the broadest possible thematic coverage of the questionnaire are indispensable characteristics that were taken into account.

In a final step, concrete formulations are determined and explanations are written before the questionnaire is subjected to an evaluation, during which the questionnaire undergoes a check and smartvote asks experts from the scientific community and selected smartvote users for feedback. [2]

For the national council elections in 2019, the questionnaire included 75 questions, categorized into 15 topic areas. For reference, the questionnaire can be found in Appendix A. There are three types of different question types: **"Slider-4"**, **"Slider-7"** and **"Budget-5"**.

- The first 13 pages of the questionnaire containting the first 60 out of 75 questions (topics: "*Welfare state & Family*", "*Healthcare*", "*Education*", "*Immigration & Integration*", "*Society & Ethics*", "*Finances & Taxes*", "*Economy & Labour*", "*Digitisation*", "*Energy & Transport*", "*Nature Conservation*", "*Political System*", "*Security & Military*" and "*Foreign Trade & Foreign Policy*") are questions of type **"Slider-4"**. A question of this type has four possible answers: No, Rather No, Rather Yes, and Yes, an example of such a question can be seen in Figure 1.1.

- Page 14 in the questionnaire, ("*Values*") contains seven questions of type **Slider-7**. Such a question contain a statement and there are 7 possible answers ranging from "Completely disagree" to "Completely Agree". Find an example of such a question in Figure 1.2.

- Page 15 ("*Federal Budget*"), has 8 questions of type **Budget-5**. Voters and Candidates can evaluate how much they want the federal government to spend on a specific area. Possible answers are Significantly less, less, Same amount, more and Significantly more.

Figure 1.1: Sample Question of Type **Slider-4**

Figure 1.2: Sample Question of Type **Slider-7**

Figure 1.3: Sample Question of Type **Budget-5**

Furthermore, voters have the option to state how important the question is to them by setting a weight to + (if they deem the question important) or to - (if they deem the question unimportant). This relative importance is later on factored into the calculation of the recommendation. Alternatively, questions can also be skipped which results in the question not being accounted for in the recommendation.

1.3   Voter experience

Voters can choose between the "deluxe questionnaire", answering all 75 questions and the so-called "rapid questionnaire", which contains a subset of only 31 questions. After answering all questions, voters are asked to answer a survey to get a

little more information on the voters, this does not affect the recommendation, it only serves for analysis purposes and voters can skip these questions. The questions in the survey are the following:

Survey	
Question	Possible Answers
Year of Birth	Any integer
Postal Code	Any 4-digit integer
Gender	Male, Female
Educational Level	Select from 14 differenct levels
Your general interest in politics	Scale from "very low (1)" to "very high (7)"
Where would you place yourself on the left-right axis	Scale from "left (1)" to "right (7)"
Preferred Party	Select from a list of all major parties

Finally, the voters get an overview with a few recommendations, depending on the election. For the 2019 National Council Election, voters could choose between a recommendation for the National Council, or for the Council of States, as both of them are elected at the same time in Switzerland. The Swiss voting system is based on a district level, hence the voter has to choose his voting district. The recommendation is threefold:

- the candidate recommendation ranks all of the district's candidates with respect to similarity to the voter's opinion. See Figure 1.4

- the list recommendation averages over all of the district candidates by list and this way ranks lists with respect to the voter's opinion. See Figure 1.5

- Smartvote's Smartmap is a more visual recommendation. Candidates that are close by on the 2D graph have similar opinions, if a voter has answered all 75 questions, he can opt to have his position in the 2D graph shown. See Figure 5.2

1.4   Methodology

For candidates to be considered for recommendation, they must answer all 75 questions. Voters, on the other hand, can omit individual questions; these questions are then weighted with 0 in the calculation of the recommendation (i.e. they are not factored in). The following table (Table 1.1) gives an overview of the answer options for each question type as well as the assigned values between 0 and 100, which are used to calculate the choice recommendation:
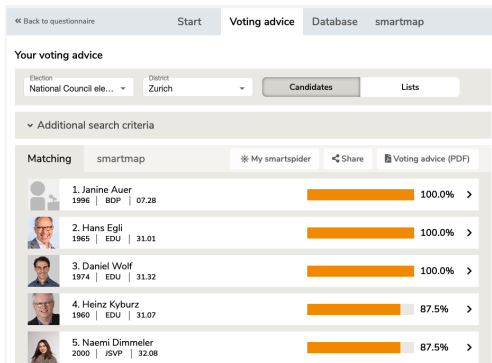
Figure 1.4: Candidate Recommendation
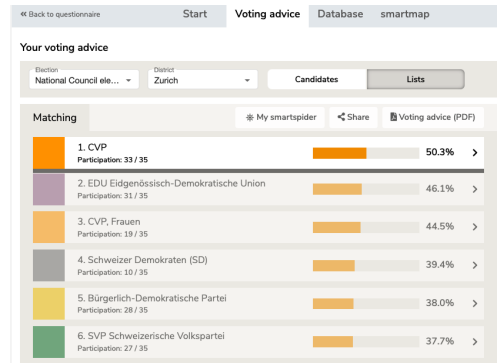
Figure 1.5: List Recommendation
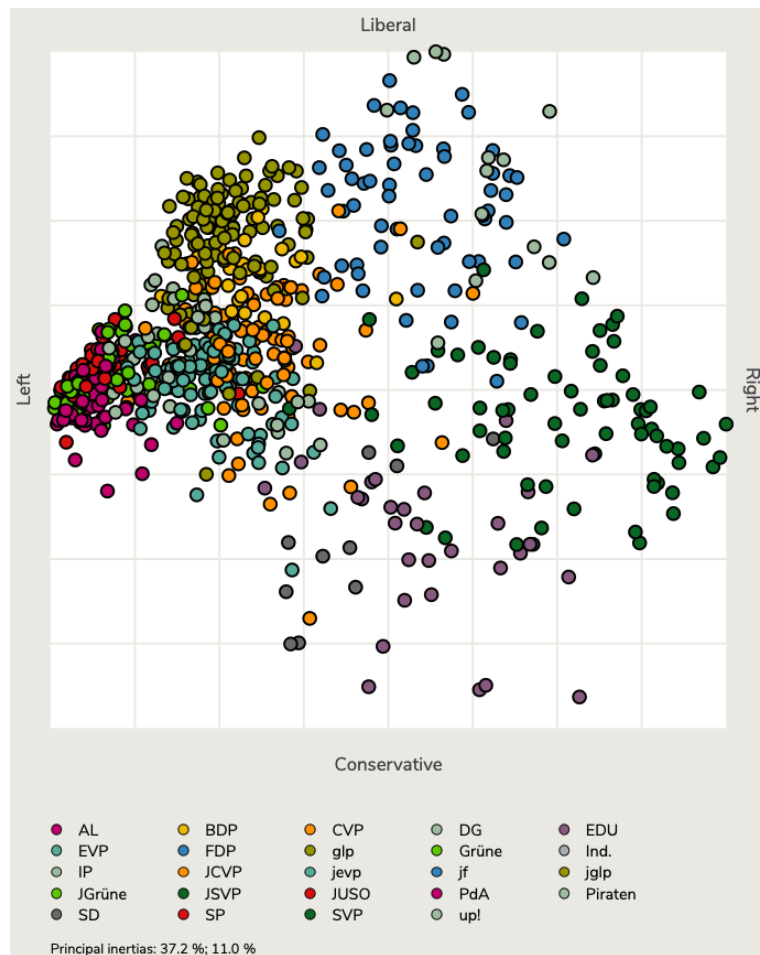
Figure 1.6: Smartmap

Table 1.1: Values assigned to Answers/Weights

Answer	Value
Type 1: **Slider-4**	
No	0
Rather no	25
Rather yes	75
Yes	100
Type 2: **Slider-7**	
Completely disagree	0
(2)	17
(3)	33
Neutral	50
(5)	67
(6)	100
Completely agree	100
Type 1: **Slider-5**	
Significantly less	0
Less	25
Same amount	50
More	75
Significantly more	100

Weight	Value
Important (+)	2.0
Normal (=) (default setting)	1.0
Unimportant (-)	0.5
Irrelevant (No answer)	0.0

The calculation of the electoral recommendation is based on the measurement of the (political) or proximity between the candidates and the voters on the basis of the Euclidean distance.

As a first step, the distance $Dist(v, c)$ between a candidate (c) and a voter (v) is calculated over all questions answered by the voter. Let i be an iterator over all questions (in case of the 2019 National Council election $n = 75$), and define v_i as the voter's answer to question i, c_i as the candidate's answer to question i and w_i as the weight the voter has assignnd to question i. Then the distance is calculated as

$$Dist(v, c) = \sqrt{\sum_{i=1}^{n} (w_i * (v_i - c_i))^2} \tag{1.1}$$

As a next step, the maximum distance between a voter v and a candidate c is calculated, based on the maximum difference between answers (which is 100 for every question type) and the weights the voter has set.

$$MaxDist = \sqrt{\sum_{i=1}^{n} (100 * w_i)^2} \tag{1.2}$$

Finally, the distance determined in the first step is converted into a measure of proximity and displayed as a percentage value between 0 and 100. This is done by normalizing the calculated distance by the maximum distance, which is subtracted from 1 and multiplied by 100.

$$Matching(v, c) = 100 * (1 - \frac{Dist(v, c)}{MaxDist}) \tag{1.3}$$

The political proximity to the opinions of a single voter is calculated for all candidates up for election in the district of the voter. Each candidate gets a "proximity to the voter" score between 0 (no overlapping positions) and 100 (completely congruent positions), and the voter can see the list of all candidates sorted by the score starting with the best.

As mentioned in section 1.3, voters can also choose to get a list recommendation, in this case, the score is calculated for all candidates individually and then the average score is shown for each list. [3]

For the **Smartmap**, Smartvote calculates the results using Correspondence Analysis (CA). Correspondence Analysis is a tool for dimensionality reduction and works very similarly to a Principal Component Analysis. It uses Singular Value Decomposition to remove correlated information and maximise variance in

the result. The first two components of the CA are plotted for every candidate. CA can only be applied to data points (voters or candidates) that have answered all 75 questions. It does not take the weighting of the answers into account.

Voters could chose from a total of 23 parties for their *"preferred party"*. For simplicity, the parties were replaced by the fraction in the National Council they belong to, smaller parties were replaced by "Other" in the final dataset.

Analysis of the Data set

For this thesis, I received and analysed two data sets from the 2019 National Council election. The first one is a data set containing all information and answers from the voters and the second one is the data set including all smartvote-related information on the candidates for the election.

2.1 Voter Data

In the voter dataset, there are a total of 427,572 entries. An entry was saved into the data set, as soon as somebody requested a recommendation. That also includes very few data points (24) of voters who have not answered any questions. However overall, only very few people proceeded to click "Voting Advice" without answering at least a few questions. For example, only around 5300 voters in the data set answered less than 10 questions. Out of all voters, 269,847 (63.11%) answered the deluxe questionnaire, while 157.253 voters (36.77%)filled out the rapid questionnaire. The remaining data points have invalid values for this attribute. Every data point has 180 attributes. They include:

- 75 answers + 1 attribute "$n\_answers$"

- 75 weights + 1 attribute "$n\_weights$"

- 8 values for positions on smartvote's *Smartspider*

- 8 attributes for the answers to the survey (*Postal Code, District, Gender, Educational Level, Political Interest, Political Position, Preferred Party, Birth Year* + 1 additional attribute *year_of_birth_REC*, a preprocessed version of the Birth Year, where any unreasonable values have been deleted)

- attributes for language, questionnaire type and source (information on where and how the questions were answered (could be on smartvote, but also on other platforms such as SRF), some answered the rapid questionnaire, some the deluxe one)

- timestamps and several internal IDs for smartvote: election ID, voter ID (new ID for every new request to answer the questions), recommendation ID, and user ID.

The data set required some cleaning and preprocessing before it could be used for further analytics. There are multiple sources for **duplicates** in the data, the first of which is the **recommendation ID**. A voter that requests a recommendation for the National Council and another one for the Council of States is represented in the dataset twice, although they only answered the questions once. For the voters where this was the case, only the data point for the recommendation for the national council was kept in the final data set.

Another source of duplicates is that users are not limited to answering the questionnaire only once. Anytime somebody revisits Smartvote's website to answer the questions again and requests a recommendation, a new entry is saved. This is a noticeable bias however it cannot be properly removed. Smartvote allows voters to create user profiles to prevent the above problem, however, the majority of data points in the data set, 352,520 have no user profile linked to them. For the rest, we have 63,583 unique users, some of which have answered the questionnaire more than 30 times. For the processed dataset, only the attempt with the most questions filled out was factored in per user, all other duplicates have been removed. At this point note again that for voters without a user profile there is no way of deleting duplicates.

Furthermore, the data was cleaned with respect to the timestamp. Any recommendation made after the date of the election has been deleted, as voters can be biased by knowing the election result, additionally, the motivation behind filling out the questionnaire cannot have been to make an informed choice on the ballot. Additional cleaning involved removing useless attributes such as election ID, as is it the same for all entries, or changing the questionnaire type to deluxe for entries with type "*rapid*" but more than 31 answered questions. Finally it needs to be noted that there is no way of knowing whether the users have always answered the questions from the questionnaire and the survey truthfully. A possible bias could arise from users providing experimental responses in order to see which candidates are then suggested to them.

2.2   Candidate Data

In the candidate dataset, there are 4663 entries. Smartvote created an entry for every politician up for election in Switzerland, 679 of them did not fill out the smartvote dataset. Nevertheless, there is an entry for them, however, naturally, no question is answered. Each entry has 184 attributes:

- 75 answers + 1 attribute "*n_answers*"

- 75 comments to give explanations for each answer

- smartmap x and y coordinates

- 8 values for positions on smartvote's *Smartspider*

- more information on the candidate such as occupation, residence, gender, year of birth, the language of correspondence with smartvote, and internal IDs for smartvote

- political information: party, list, list place, the list place the candidate ended up in after the election, whether or not they were in office (National Council) before the election and after the election.

This dataset needed no further cleaning or preprocessing, however, similar to the processed voter's dataset, the candidates' parties have been replaced by the corresponding fraction in the National Council for simplicity reasons (dealing with hundreds of regional versions of parties or the parties' youth organisations would have been messy).

Voter Demographics

In order to understand who uses smartvote, and to see what groups of the population are over/underrepresented in the voter data set, a thorough analysis of the demographic attributes was conducted. See the findings below.

3.1 Age & Gender

$189,666$ voters gave an answer when asked for their birth year in the survey. 8,111 of them indicated their birth year years were outside the interval $[1919, 2001]$ and those were hence considered unreasonable and deleted. Figure 3.1 shows a histogram of all the birth years of smartvote users. To put the data into context, in Figure 3.2 the data birth year and gender are compared against the publicly available data from the Swiss Federal Statistical Office [4]. As can be seen in Figure 3.2, there is an overrepresentation of the young population in the dataset, especially for voters younger than 50, while only a small percentage of the Swiss population older than 60 made use of smartvote. Another observation that clearly stands out in Figure 3.2, is that while the gender distribution is very close to 50/50 over the entire Swiss population, almost 57% of the smartvote users are male. In other words, there is a certain bias toward younger voters and toward male voters.

Inspections of the voters' average age per party have not shown particularly interesting/odd results. The average age per party is between 37 and 40 years, with the exceptions of the Center Group, whose voters are on average a bit older than 41, and of "Other Parties" (those are parties that are not represented in the National Council and hence to not belong to any fraction), whose voters are on average younger than 36. For more detailed information see Figure B.1 in the appendix.
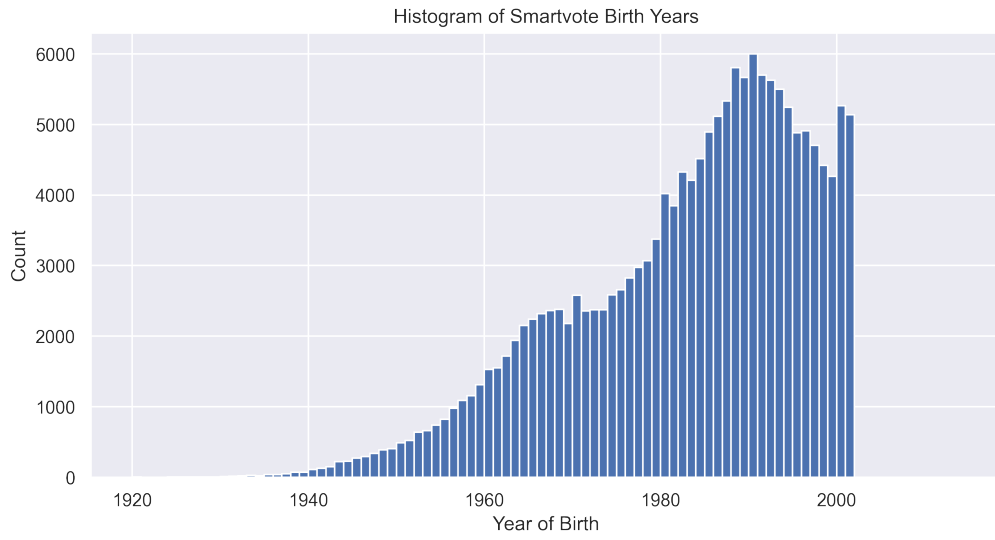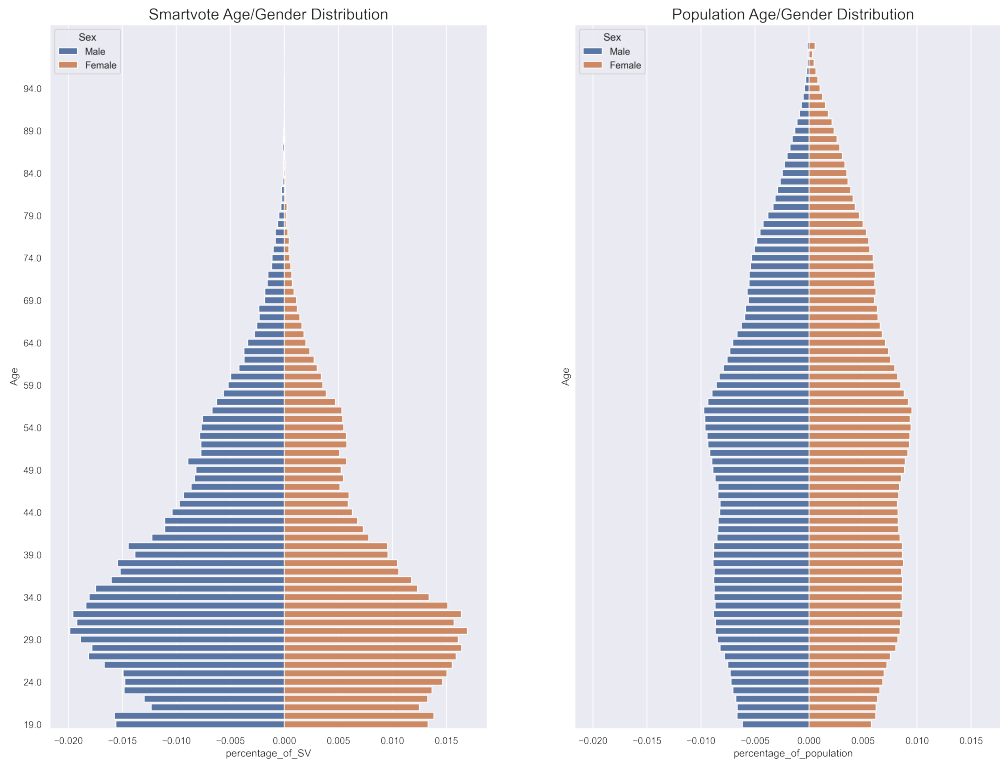
Figure 3.1: Year of Birth of Smartvote Users

Figure 3.2: **Age/Gender Pyramid**: Smartvote (left) vs Swiss Population (right)

3.2   Education

182,330 voters answered when asked to disclose their educational level. They could chose from a list of 14 options, in Figure 3.3 the distribution of answers is shown. There is no baseline to compare this distribution to, since no publicly available statistics on education levels in the Swiss population consider the same levels as in smartvote's survey. However, an observation that is still noticeable is that voters with tertiary education (this includes degrees from a University of applied sciences/ technical college, or from normal University/ETH) are heavily overrepresented in the smartvote community. While almost half of smartvote's users have a degree from a tertiary education institution, only 28,6% of the Swiss population has successfully completed tertiary education according to [5].
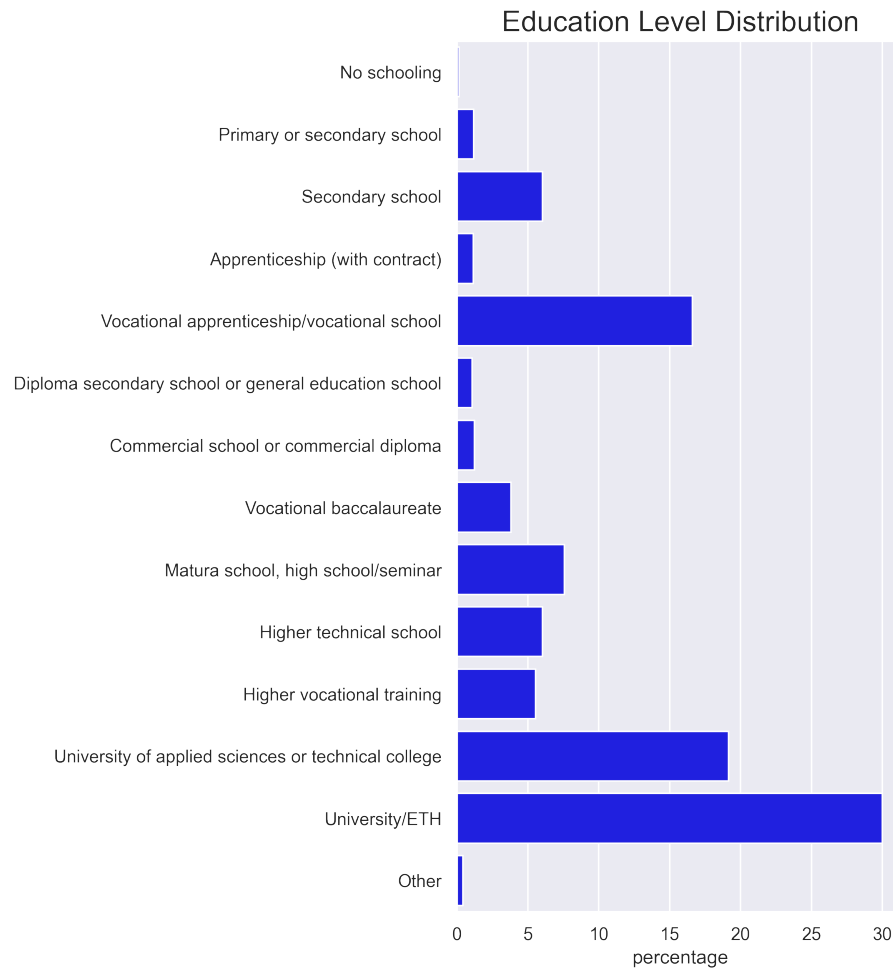

Figure 3.3: Education Level Distribution of Smartvote users

3.3 Cantons

In order to get a recommendation, a smartvote user has to choose his home canton. Every datapoint hence has a value for canton. Comparing the absolute counts for every canton against the cantonal population published by [6], shows that smartvote is not equally popular all over Switzerland. If we can assume that every data point in the dataset represents a separate citizen from the canton, it follows from the data that while in many german speaking cantons (Lucerne, Bern, Basel-City, Aargau, Zurich) more than 5% of the population have answered the questionnaire, in the French and Italian speaking cantons the relative population that used smartvote is rather low:

- Neuchâtel: 3.57%

- Vaudt: 2.58%

- Jura: 2.43%

- Geneva: 1.75%

- Ticino: 0.89%

This data suggests that voters from german speaking cantons might be over-represented in smartvote's users. However, there are also German speaking cantons such as Nidwalden (1.03%), or Glarus(1.31%) where smartvote is not as popular. Figure 3.4 shows the relative share of the population that used smartvote for every canton.

3.4 Language

To further investigate the trend that smartvote is more commonly used in german-speaking cantons, an analysis was done on what language users use to answer the questionnaire. The following list compares the percentages of languages used by the users with the language distribution of the Swiss population [7]:

- German: 82.3% of users, 63.5% of the population

- French: 16.56% of users, 22.5% of the population

- Italian: 0.77% of users, 8.1% of the population

- English: 0.36% of users, 1% of the population

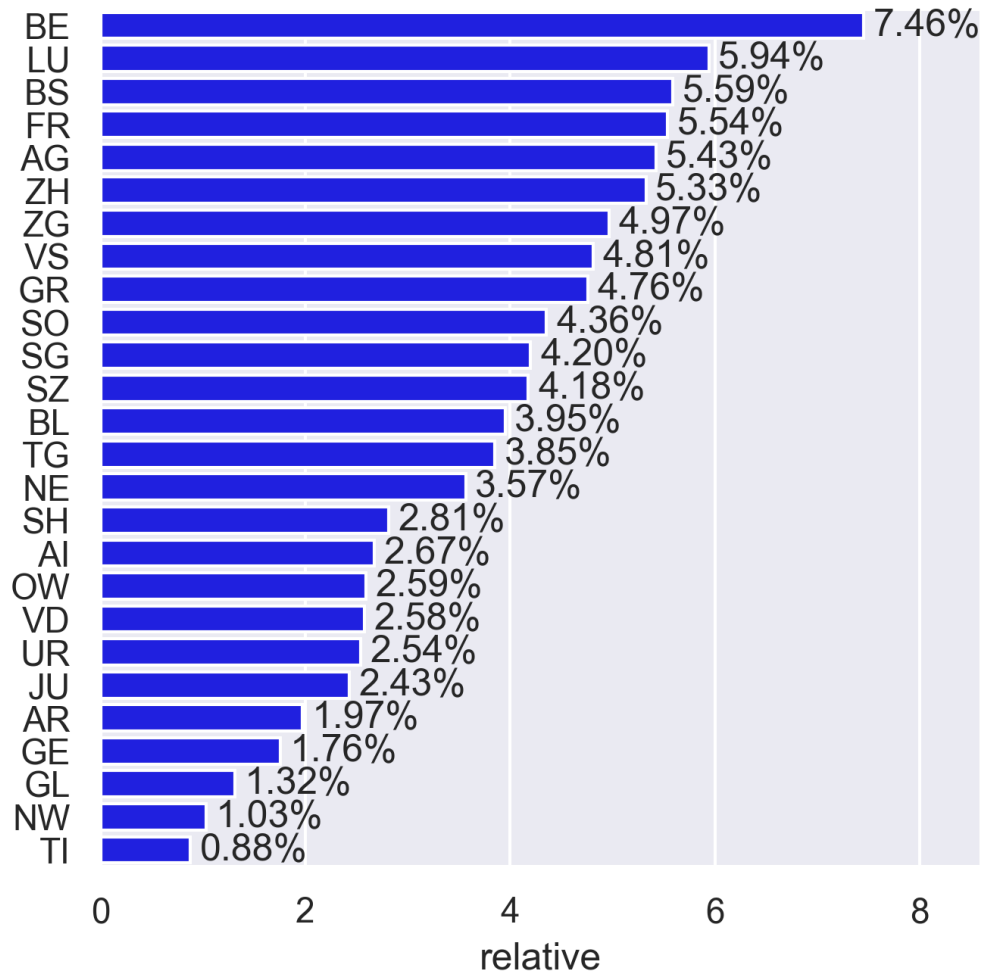- Romanic: 0.01% of users, 0.5% of the population

Figure 3.4: Relative share of smartvote users in the cantonal population

To reveal that this trend is not influenced by the fact that German is smartvote´s default language, an analysis was done to retrieve the language distribution of voters from Geneva and Ticino:

- Geneva: 92.7% French, 5.7% German, 1.27% English, 0.3% Italian, Rest Romanic

- Ticino: 74.1% Italian, 20.8% German, 4.58% French, Rest English

As can be seen, voters usually use the language they speak to answer the questions, independent of smartvote's default language. The hypothesis that a disproportionally large group of smartvote users is german-speaking seems to be true.

3.5   Political Interest

For the "political interest", 193,297 users positioned themselves with respect
to how big their interest in politics is on a scale from *very little interest* (1)
to *very big interest*(7). The answers as shown in Figure 3.5 indicate that a
majority of smartvote users generally have a relatively big interest in politics.
On a per fraction level, voters from different sections have similar interest, the
data indicates that on average voters from the Swiss People's Party as well as
the Center Group show slightly less interest in politics than the other parties.
See Figure B.2 in the appendix for a more detailed view of the average interest
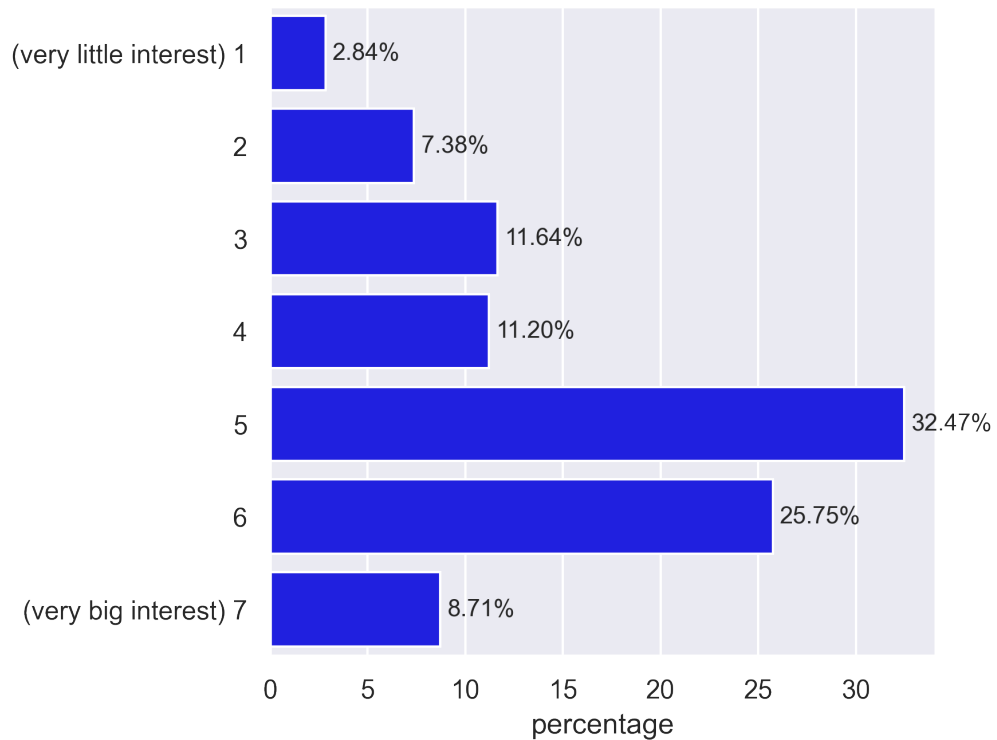of voters by national council's fractions.

Figure 3.5: Political Interest of Smartvote users

3.6   Political Position

For the "political position", 185,526 users positioned themselves with respect
to where they see themselves on the political spectrum on a scale from *left* (1)
to *right*(7). The answers as shown in Figure 3.6 indicate that a majority of
smartvote users generally see their position as rather left, around 60% state that

they are on the left side of the centre, whereas only around 25% label themselves righter than the centre. The left bias in smartvote will further be analysed in section 3.7. On a per fraction level, the voters position themselves as expected, matching with the parties positions. See Figure B.3 in the appendix for a more detailed view of average positions of voters by national council's fractions.
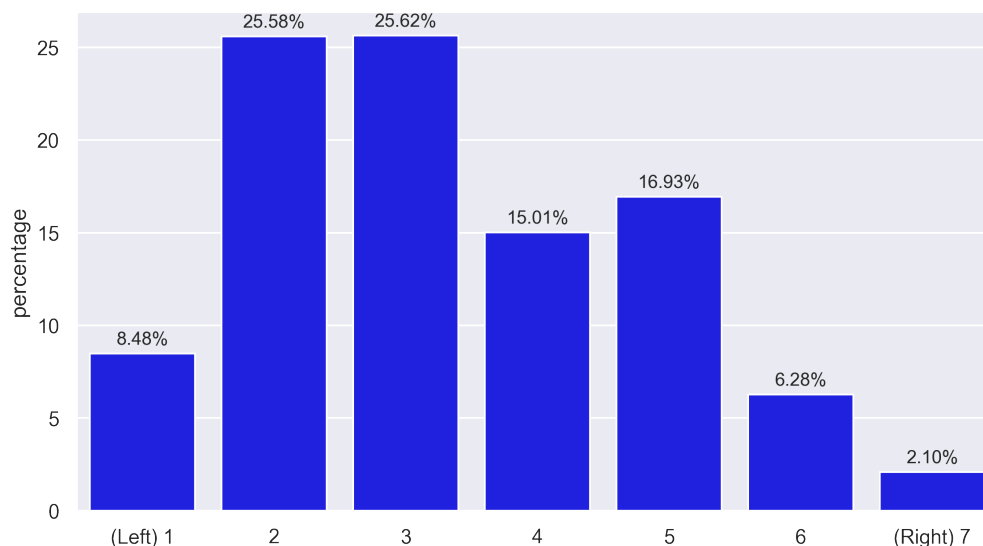

Figure 3.6: Political Position of Smartvote users

3.7   Preferred Party

141,946 data points have a value for the attribute *preferred party*. As mentioned before, the parties have been replaced with the corresponding National Council fraction, to help with readability, i.e. to make results easier to understand. For a graph showing the distribution of parties in the original, unprocessed data, see Figure B.4 in the appendix. The preferred fractions in the processed data is distributed as shown in Figure 3.7. Around 33% have either answered "*No preferred party*" or have chosen a party as their preferred party that is not represented in the current National Council. In order to be able to compare the data we have with the actual distribution of seats in the National Council after the election, we do not further factor in *Other* and *No Party*. The comparison to the national council reveals several biases in smartvote's user base, as can be seen in Figure 3.10. The data indicates that the lefter fractions (Green Group, Green Liberal Group, Social Democrats) are overrepresented in the dataset, whereas the fractions that are more right (The Center Group, Swiss People's Party) are very much underrepresented. This further supports the claim from section 3.6, that left voters are overrepresented in smartvote's community.
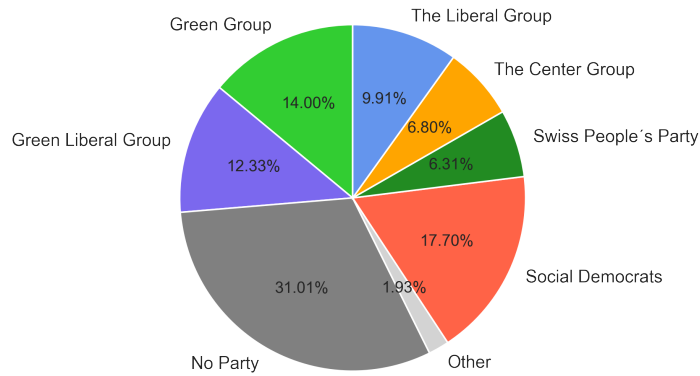
Figure 3.7: Preferred Parties of Smartvote users

3.8 Biases in Smartvote community

The analysis of the demographic data for the voter dataset suggests that there are certain biases present in the dataset. In comparison with the Swiss population, smartvote users tend to be younger, there are more males, more academic people, and a higher proportion of users is from german-speaking cantons. Smartvote users tend to be interested in politics, and a disproportionally large group is left; a substantially larger percentage of smartvote users prefer left parties than what could be expected from looking at the results of the 2019 National Council election.
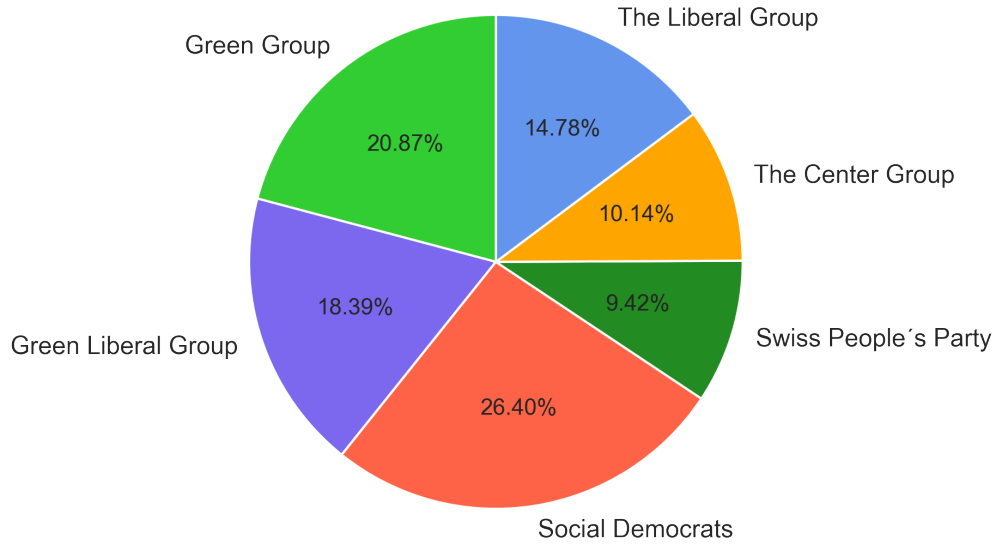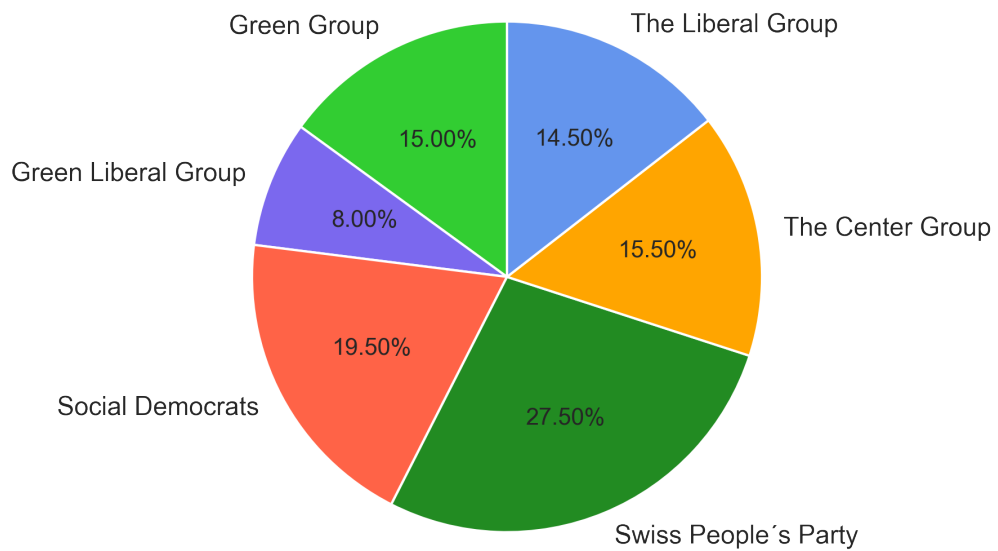
Figure 3.8: Smartvote user's preferred fraction

Figure 3.9: National Council Seats

Figure 3.10: **Comparison Smartvote Preferred Fraction Distribution vs National Council Seat Distribution**

CHAPTER 4

Question Analysis

The questionnaire's goal is to give the voter a recommendation as to which candidate he should vote for, therefore it is essential that candidates do not agree on a question. A good question hence is one where there is a very split opinion in candidates answers. In order to rank questions on how well they split the candidate base, I take the mean answer for every fraction from the candidates and calculate the standard deviation of the means. This approach favors questions were different fractions have very different opinions, but mostly agree within the fraction. The best question in this measure is one where half of the fractions have an opinion that corresponds to answering 0, while the other half predominantly chooses 100 as an answer. According to this measure, the five questions that most split the opinion of candidates are:

1. Question 32: Are you in favour of introducing a general minimum wage of CHF 4'000 for all employees for full time employment? See Figure B.5 in the appendix.

2. Question 16: Should foreigners who have lived in Switzerland for at least ten years be given the right to vote and be elected at the municipal level? See Figure B.6 in the appendix.

3. Question 55: Are you in favour of Switzerland acquiring new fighter jets for the armed forces? See Figure B.7 in the appendix.

4. Question 18: Should sans-papiers be able to obtain a regularized residence status more easily? See Figure B.8 in the appendix.

5. Question 51: Are you in favour of lowering the voting age to 16? See Figure B.9 in the appendix.

Questions that are deemed "not good" according to this measure are questions where we either have most candidates agree on the same answer (e.g. Question 13), or where candidates within a fraction have very different opinions (e.g. Question 9). The five questions which, according to this measure, are least useful to determine which candidate matches which voter are:

1. Question 13: Are you in favour of schools granting / allowing exemptions from individual subjects or events for religious reasons (e.g. PE/swimming, sex education, etc.)? See Figure B.10 in the appendix.

2. Question 71: Should the federal government spend more or less in the area of "Educational research"? See Figure B.11 in the appendix.

3. Question 70: Should the federal government spend more or less in the area of "Public security"? See Figure B.12 in the appendix.

4. Question 65: What is your position on the following statement: "The ongoing digitalization offers significantly more opportunities than risks."? See Figure B.13 in the appendix.

5. Question 9: Should compulsory vaccination of children be introduced based on the Swiss vaccination plan? See Figure B.14 in the appendix.

4.1   Importance of Question to Voters

Another important measure to see how good a question is, is to analyse how important it was perceived by the smartvote users. Voters essentially have two ways of giving negative feedback on a question. They can choose not to answer the question, and they can adjust the weight to be lower if they do not want the answer to the question influence their recommendation too much. For the following analytics, only data points from users who answered the deluxe questionnaire were taken into account, there were a total of 269,847 of those. Figure 4.1 shows the number of answers for each page in the questionnaire. To better visualize the trend of how many questions were answered, an interpolation using a polynomial of degree 5 was calculated. As can be seen in Figure 4.2, the trend of number of answers per question is going down. While for the first few questions around 230,000 voters answered, especially for the last two pages, *Values* and *Federal Budget*, voters answered slightly less (only around 200,000 answers).

4.1.1   Weights

Once the weights are also considered, the trend becomes clearer. Voters have 4 options to adjust the weight to. By not answering the question, the question is given a weight of 0.0 for the calculation of the recommendation, by selecting (+) (*Important*) the weight is set to 2.0, by selecting (-) (*Unimportant)*, the weight is set to 0.5 and for (=) (*Default*) the weight set to 1.0. Figure 4.3 shows the mean weight per question. Again an interpolation with a poynomial of degree 5 was fit to the data, to better visualize the trend. The data clearly suggests that the importance of questions to the voters drops the longer the questionnaire is. Two possible explanations for this trend come to mind. Either the question types for
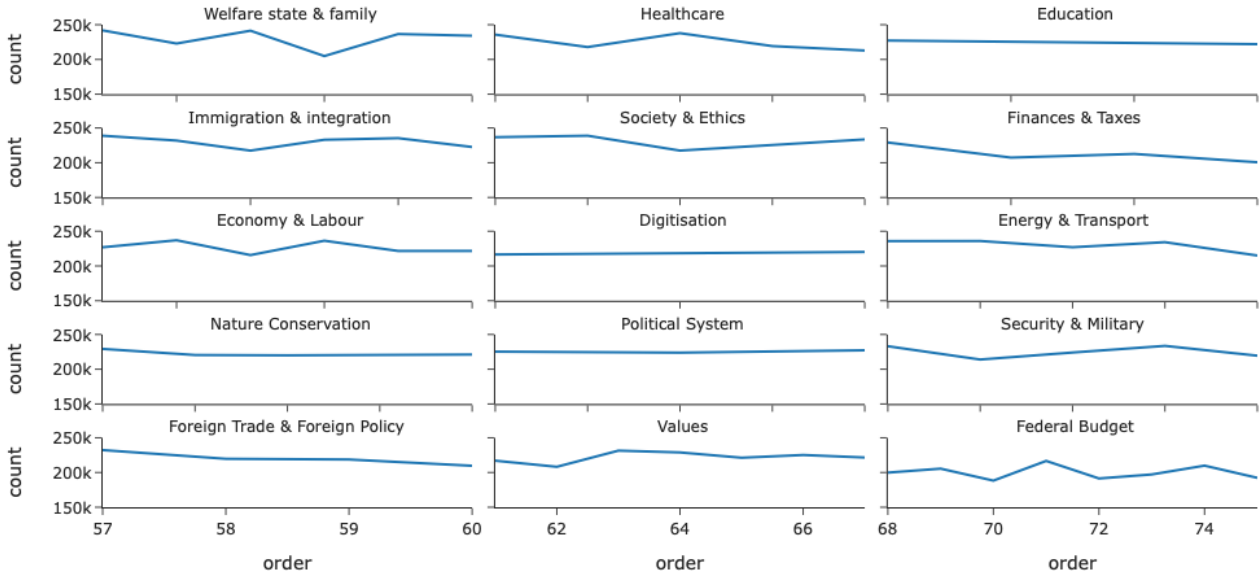
Figure 4.1:

the last 15 questions (Value questions and Questions on Federal Budget)are not as interesting to voters, or potentially the questionnaire is simply too long, and the voters' attention drops.

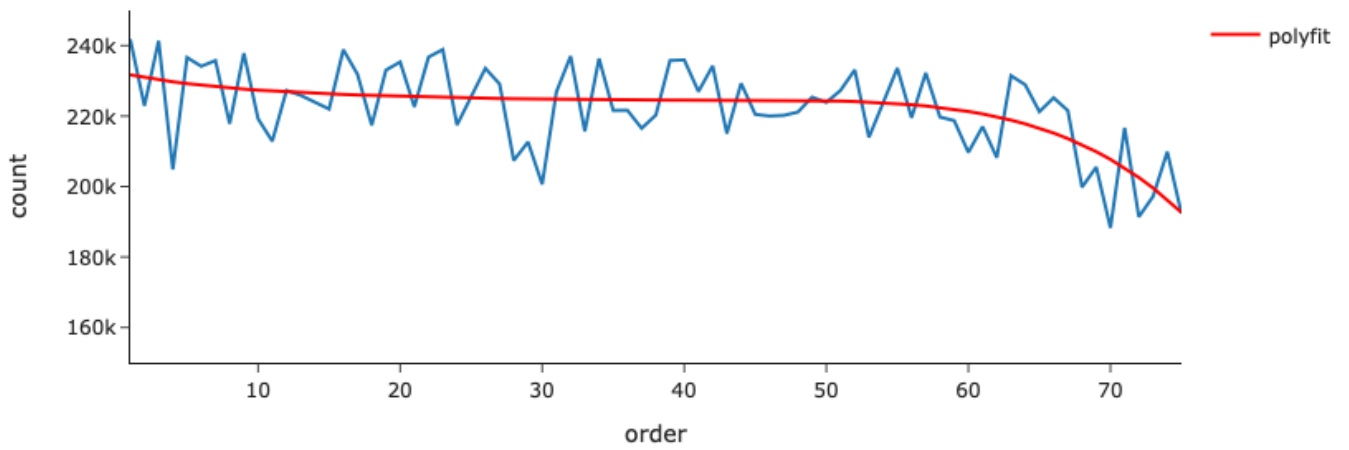Number of Smartvote Answers per Question for each Page

Figure 4.2:
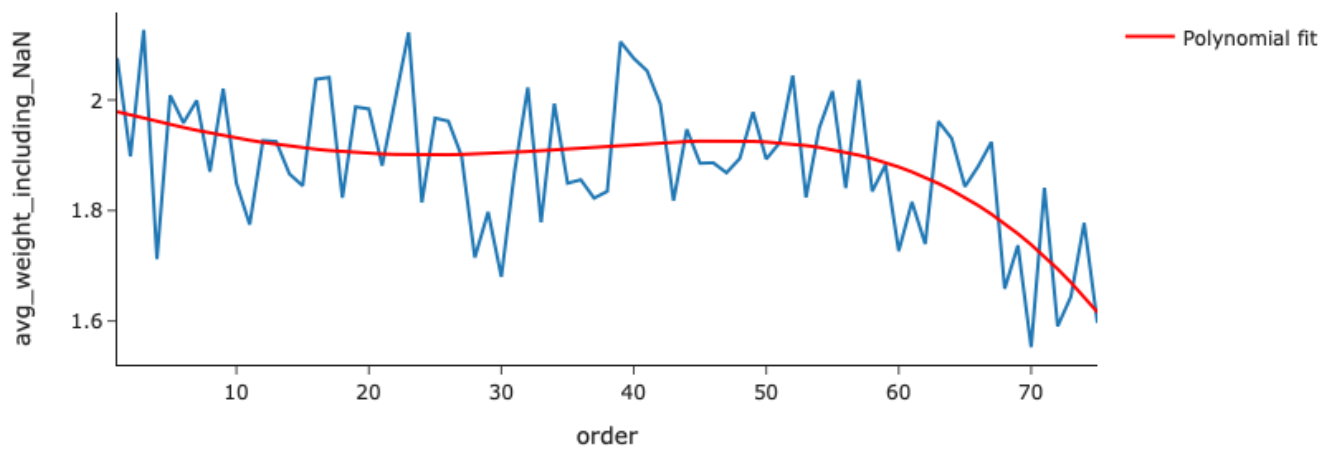
Average Weight per Question (including NaN)

Figure 4.3:

4.2   2D Plot of Questions

Using the two metrics introduced above, the standard deviation of mean answers per fraction that shows how split the answers for a question are and the average weight that is an indication of how important the question is to individual voters, a visualization of "Goodness" of the questions was concepted. A two-dimensional scatter plot positions questions according to the two metrics. The y-axis represents how split the opinions on the question are, while the x-axis represents the average weight.
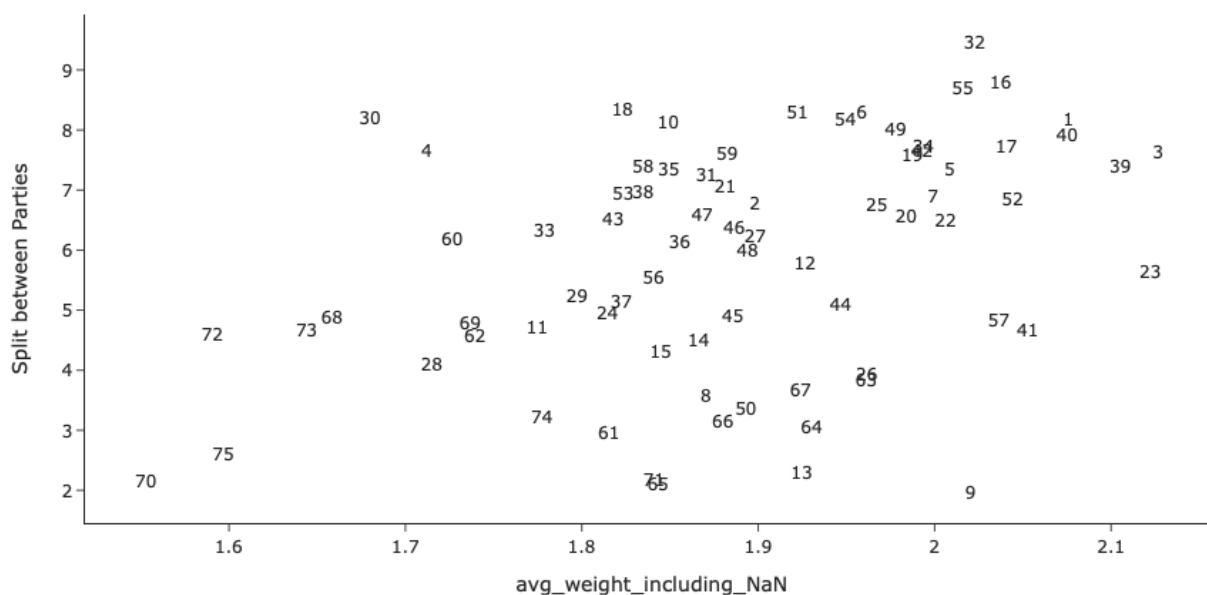

Figure 4.4: 2D Visualization of "Goodness" of Questions

As can be seen in Figure 4.4, good questions include:

- Question 3: An initiative calls for the introduction of paid paternity leave for four weeks. Do you support this proposal?

- Question 32: Are you in favour of introducing a general minimum wage of CHF 4'000 for all employees for full-time employment?

- Question 16: Should foreigners who have lived in Switzerland for at least ten years be given the right to vote and be elected at a municipal level

- Question 1: Do you support an increase in the retirement age (e.g. to 67)?

- Question 40: Currently, a CO2 charge is levied on fossil combustibles (e.g. heating oil, natural gas). Should this charge be extended to motor fuels (e.g. petrol, diesel)?

- Question 39: An initiative calls for Switzerland to stop using fossil fuels by 2050. Do you support this proposal?

- Question 55: Are you in favour of Switzerland acquiring new fighter jets for the armed forces?

4.3 Underrepresented (Smartvote) Opinions in the National Council

Another key result from analysing the voters data set is the successful identification of opinions that smartvote users have, where the opinion of the candidates that have been elected to the National council differ. The five questions where this phenomenon is the strongest are:

1. Question 11: An initiative wants to give the federal government more powers to introduce measures to reduce healthcare costs (Introduction of a cost barrier). Do you support this proposal? Figure B.15 in the appendix.

2. Question 50: Should the introduction of electronic voting in elections and referendums (e-voting) be further pursued? Figure B.16 in the appendix.

3. Question 10: An initiative calls for health insurance subsidies to be designed so that no one needs to spend more than ten percent of their disposable income on health insurance premiums? Figure B.17 in the appendix.

4. Question 32: Are you in favour of introducing a general minimum wage of CHF 4'000 for all employees for full-time employment? Figure B.18 in the appendix.

5. Question 49: Should campaign finance for political parties and referendums be openly declared? Figure B.19 in the appendix.

Interestingly, three out of the five questions involve changes in the political system (Q11 asks for a shift of power to the federal government for healthcare decisions ,Q50 involves the voting system, and Q32 is a modification of an organizational matter), they do not directly address political agendas. It might be reasonable to suggest this is a potential reason for the difference in opinions. Candidates usually have experience in the field, and because they have an understanding of how these changes influence their work, they might have a different view than a layman.

Another important observation is that question 11 has a logical flaw in the way it is posed. It can be interpreted in two ways:

- Should the power for decisions regarding healthcare costs be moved to the federal government?

- Should healthcare costs be reduced?

Potentially this ambiguity explains the difference in voters' opinions and elected officials' opinions for that topic. Supposedly an expert in politics rather focuses on the first interpretation of the question whereas a layman understands the question as is laid out in the second bullet point. Ambiguous questions like this can create noise for the recommendations when misunderstood and should therefore be excluded from the questionnaire if possible.

4.4 Recommendation for future questionnaires

The data from the 2019 National Council election indicates that the users deem questions at the end of the questionnaire to be less important than questions in the first few pages. In order to understand if this is due to the length of the questionnaire, i.e whether users simply process the questionnaire less attentively toward the end, or whether this might be due to the types of question at the end (Value questions and Federal Budget Questions), it would be helpful to be able to compare the data against a smartvote dataset from another election, preferably with the pages in another order. If the questionnaire turns out to be too long, I would recommend smartvote to nevertheless come up with 75 questions, and possibly remove the questions where candidates have shown the least split opinion before publishing the new questionnaire to the public.

Furthermore, I recommend that smartvote takes special care to avoid ambiguous questions like Question 11 in the process of creating the questionnaire.

Smartmap

As part of their recommendation to the voter, smartvote has devised a two dimensional visualization of political positions. The two axis in the graph are supposed to represent the political spectrum from left to right (x-axis) and differentiate between conservative and liberal (y-axis). Originally, every question was manually assigned a label (*right*,*left*,*conservative*,*liberal*). A candidates'/voters' initial position on the smartmap was set to the center and then adjusted as follows:
For every question labeled *right* that the person answered with a positive answer, the position of the person moved more to the right in the visualization, the process for the other labels was done analogously.

The smartmap in its current state was introduced by David Furrer in 2010, when he conducted a methodological investigation of smartvote for his bachelor thesis [8]. Furrer correctly identified limitations of the original approach:

- distances between points were not indisputably interpretable

- the directional labelling was done in an exploratory way, not in an analytical way.

- the amount of questions labeled for each category could strongly influence the visualization.

The current smartmap introduced by Furrer uses Correspondence Analysis, a common way of performing a dimensionality reduction of multidimensional categorical data. The reason for using Correspondence Analysis (CA) over the more commonly used Principal Component Analysis (PCA) is due to the fact that Correspondence Analysis performs better for categorical data, and Furrer considers smartvote's data to be categorical (*No*, *Rather no*, *Rather yes*,...). This consideration is not sound. Categorical data is data that cannot be ordered in a logical way. To prove my point let's take an example from this dataset: it would not make sense to define an order on cantons in this dataset, there is simply no relational information in the classification of cantons. There is however, a lot of relational information in the answer options for all of the question types
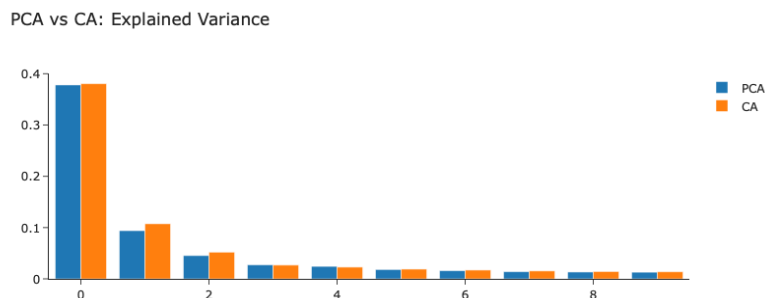
PCA vs CA: Explained Variance

Figure 5.1: Explained Variance PCA vs CA

in the smartvote questionnaire. As an example *No* and *Rather no* are more closely related than *No* and *Yes*, and we do want to differentiate between these relationships. Therefore it is not reasonable to use CA over the more common PCA.

Having said that, both PCA and CA are based on a Singular Value Decomposition to calculate a basis of the data space and project the data to this new space with a change of basis. The procedure is very similar for both, in fact CA is commonly considered a version of PCA, therefore the results are not drastically different, however in the context of smartvote, PCA will give better results and should be the method of choice for performing the dimensionality reduction.

5.1 Comparing CA to PCA

Figure 5.2, Figure 5.3 and Figure 5.4 show how smartvote's smartmap of all candidates (which smartvote calculates using CA on a subset of candidates that have already filled out the questionnaire before publishing it) compares to a CA performed using prince's CA library, and sklearn's PCA, both fitted to all candidates in the dataset. Given that the smartmap and the CA were calculated using the same method, it is hardly surprising to see that the plots look very similar. The PCA stands out and seems to be better at differentiating between the fractions, albeit it is not displaying very different results either. If we take into consideration that Politools classifies The Center Party as in between the Green Liberal Group and the Liberal Group on their smartmonitor [9] (in terms of left-right), PCA seems to better at meeting this classification.

Figure 5.1 shows how much of the variance in the dataset is explained by the first components of PCA and CA. Although PCA performs slightly worse, the results are comparable, and hence for further analytics on the smartmap, I proceeded with sklearn's PCA, which was fitted to all candidates in the dataset.
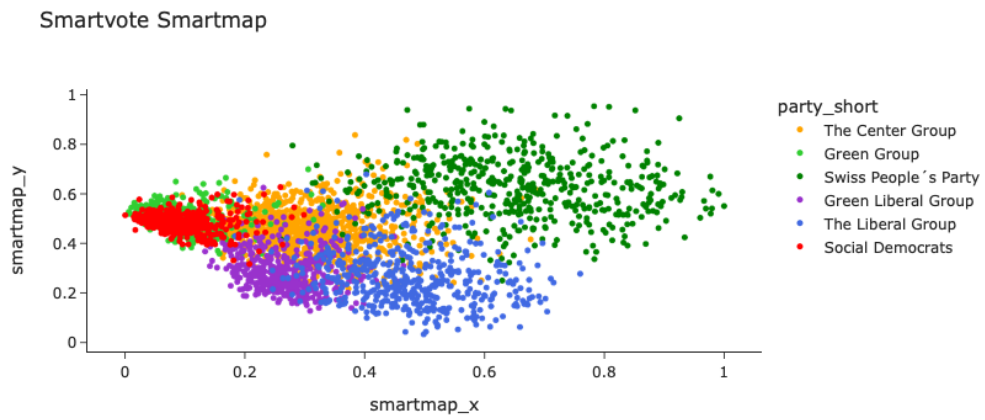
Smartvote Smartmap

Figure 5.2: Smartmap

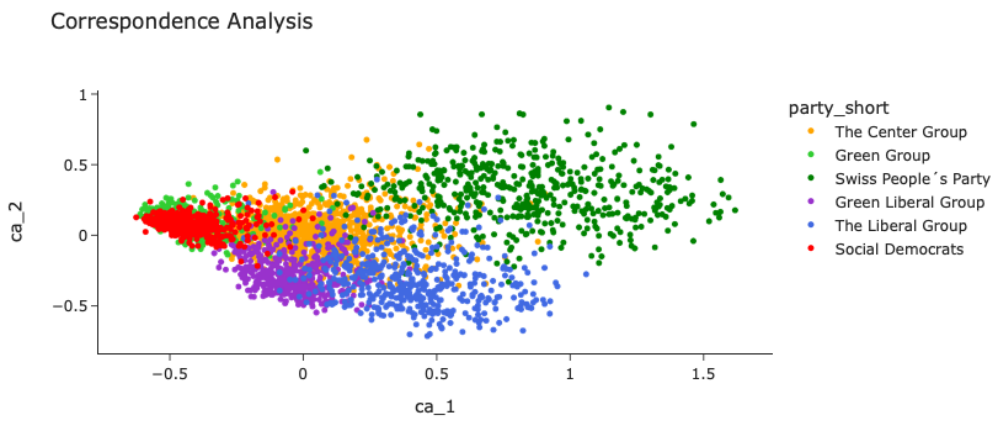Correspondence Analysis

Figure 5.3: CA
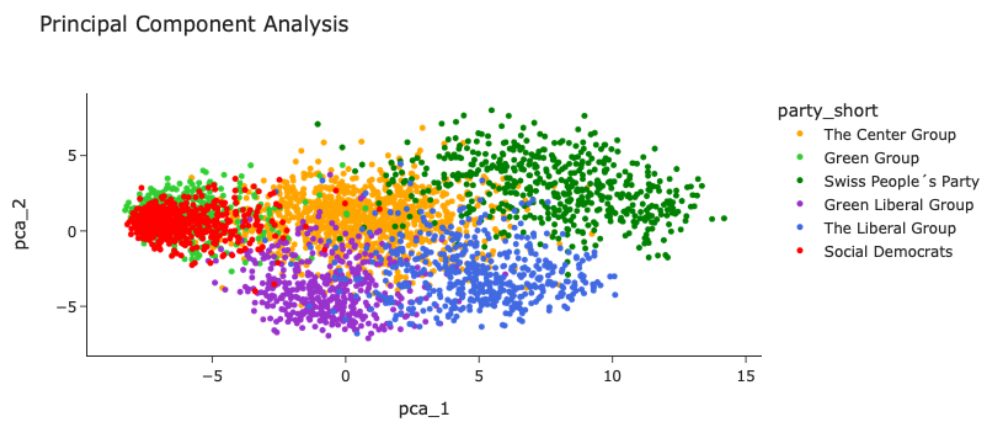
Principal Component Analysis

Figure 5.4: PCA

5.2   Comparing Green Group and Social Democrats

An observation that needs further investigation is that there seems to be little difference between candidates from the Green Group and from the Social Democrats. Figure 5.5 shows a three dimensional scatter plot, that includes the third principal component as a new dimension. Nevertheless, the two fractions cannot be clearly separated. An analysis on all the answers given by candidates from the two fractions explains the reason behind this problem. Other than for very few questions, the distribution of answers given by candidates from the Green Group and the Social Democrats are virtually the same. All questions have been ordered by how big the standard deviation of the answers for the two parties is, and only very few show differences: The five questions were Green Group and Social Democrats agreed least on are:

- Question 37: Should the expansion of the mobile network according to the 5G standard continue? Figure 5.6

- Question 58: Should Switzerland strive for a free trade agreement with the USA? Figure 5.7

- Question 42: Are you in favour of introducing "Road Pricing" for motorised individual transport on busy roads? Figure 5.8

- Question 24: Should the rules for reproductive medicine be further relaxed? Figure 5.9

- Question 50: Should the introduction of electronic voting in elections and referendums (e-voting) be further pursued? Figure 5.10

For most of the remaining questions, the Green Group and the Social Democrats have provided the almost the exact same questions. Find five questions where the two fractions almost have the exact same distribution of answers in the Appendix in Figure B.20, Figure B.21, Figure B.22, Figure B.23, Figure B.24

Figure 5.5: 3-Dimensional PCA
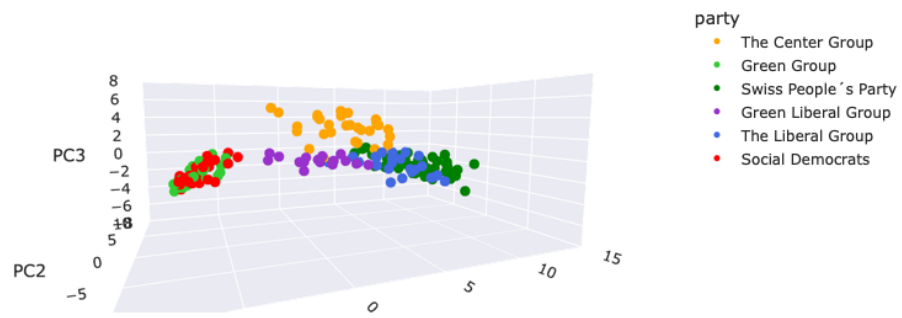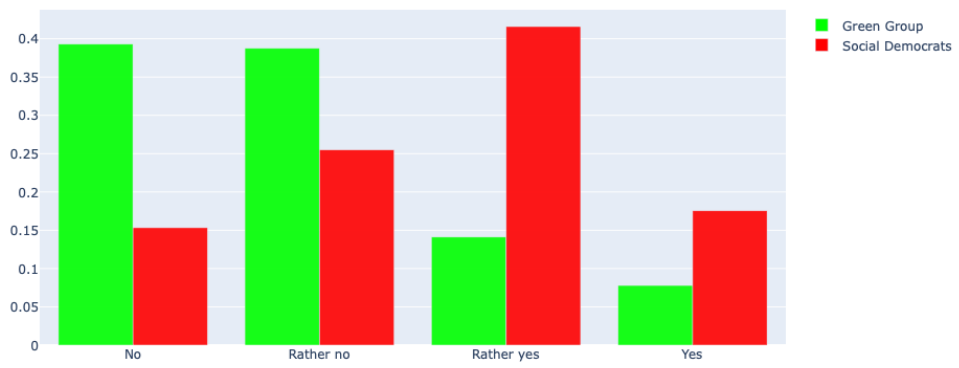

Figure 5.6:

Q58: Should Switzerland strive for a free trade agreement with the USA?
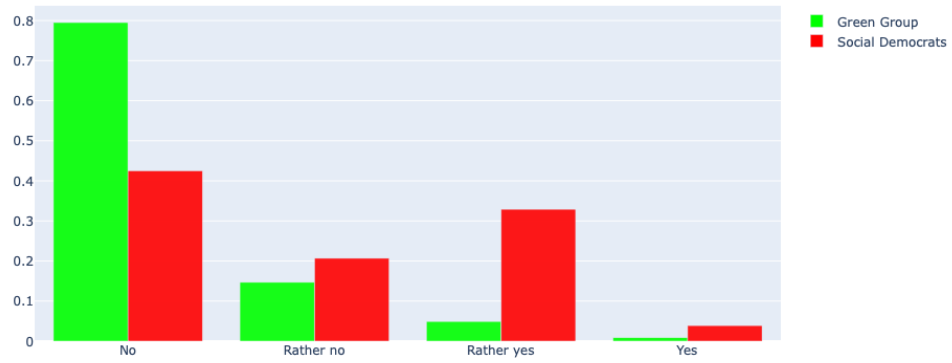

Figure 5.7:

Q43: Are you in favour of introducing "Road Pricing" for motorised individual transport on busy roads?
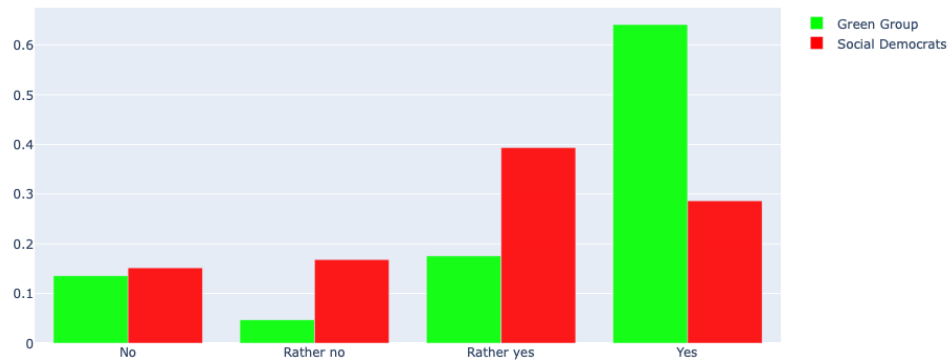

Figure 5.8:

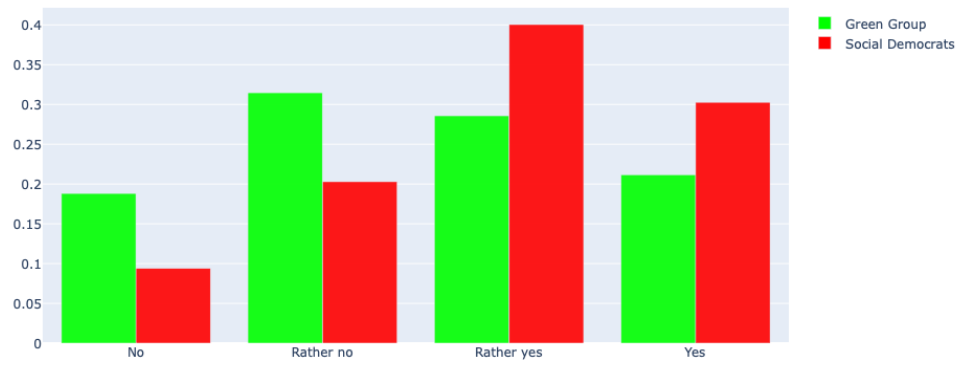Q24: Should the rules for reproductive medicine be further relaxed?

Figure 5.9:

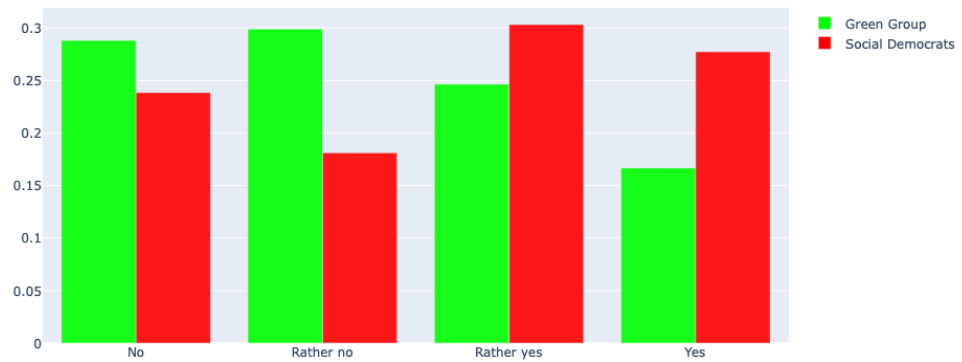Q50: Should the introduction of electronic voting in elections and referendums (e-voting) be further pursued?
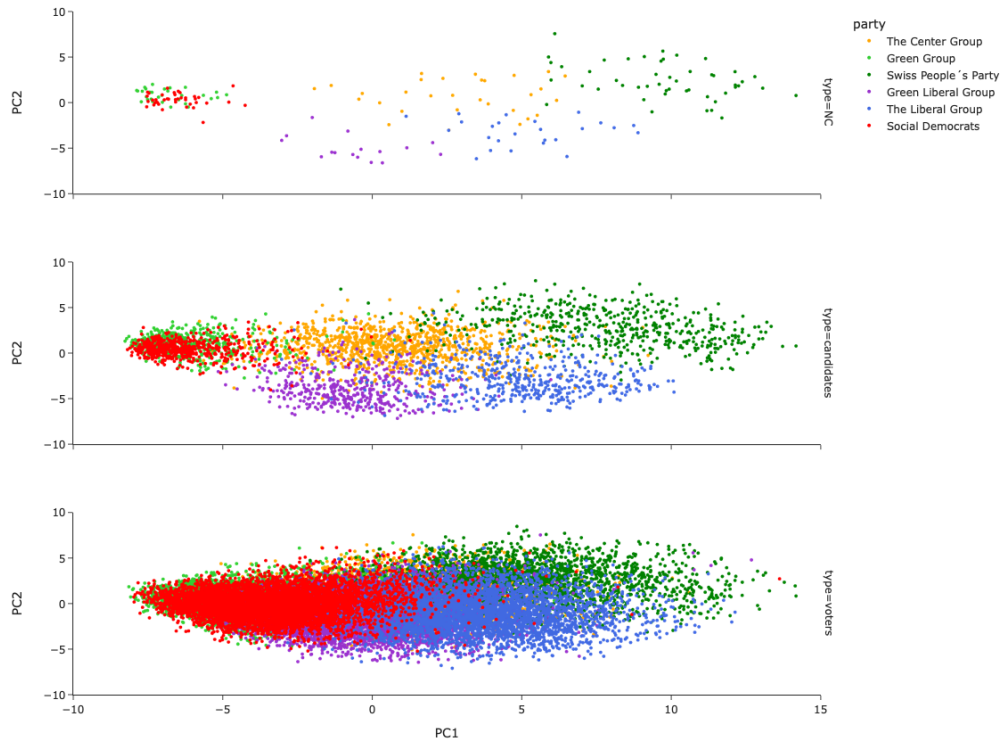

Figure 5.10:

Figure 5.11: PCA for National Council officials (1), all candidates (2) and voters (3)

5.3 Voters' Position in the PCA

Interesting new perspectives come from plotting the position of voters on the same dimensions as the candidates. This is done by using the same principal components which have been fitted to all candidates and project the voter data on these components. As PCA does not work for NaN-values, only voters that have answered all questions are represented in the scatter plot. Figure 5.11 compares the PCA of elected officials to the PCA of all candidates as well as the voters. An interesting insight is that voters are on average more moderate than the fractions that they vote for. If we assume for now that the x-axis of the PCA in fact represents the left-right axis of the political spectrum, following statements can be made about the data:

- Only 19,7% of users voting Social Democrats are as left as the rightest elected representative from the Social Democrats

- Only 18,1% of users voting for the Green Group are as left as the rightest

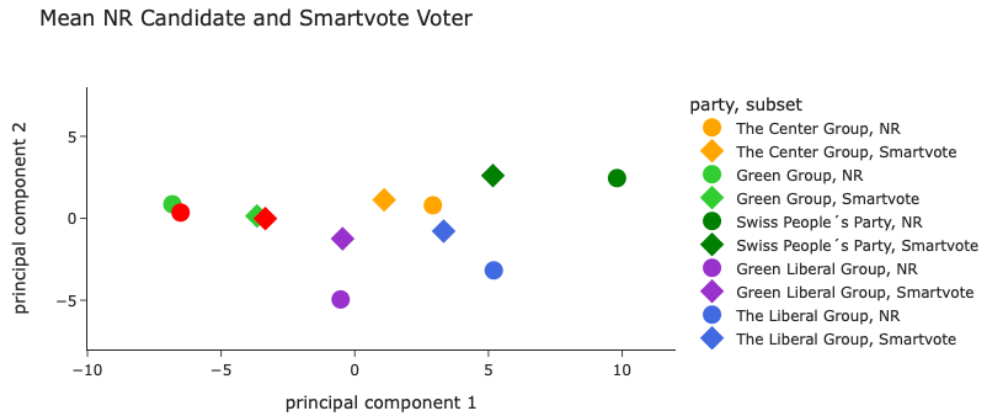Mean NR Candidate and Smartvote Voter

Figure 5.12: Mean voter and mean NC representative position

elected representative from the Green Group

- Only 37,1% of users voting for the Swiss People's Party are as right as the leftest elected representative from the Swiss People's Party.

In fact, as can be seen in Figure 5.12, for each fraction it holds that the mean voter is more moderate in terms of the left-right axis as well as the conservative-liberal axis than the mean candidate. This is a common trait in democratic elections. In a paper published in the American Political Science Association by Orit Kedar [10], the author shows that voters are often concerned with policy outcomes, and usually incorporate the way political institutions convert votes to policy into their choice. Since a policy is often the result of institutionalized multiparty bargaining and thus votes are watered down by power-sharing, voters often compensate for this watering-down by supporting parties whose positions differ from (and are often more extreme than) their own.
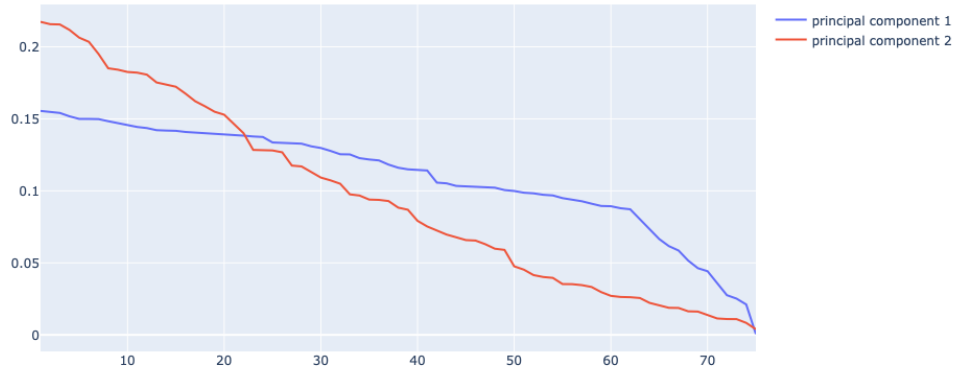
Figure 5.13: PC vector entries (*absv*) in descending order

5.4   Interpreting Principal Components

Interpreting principal components can be useful, yet it is often very subjective
and provides a huge space for error in data analytics. The method that is usually
applied for labeling the "meaning" of principal components is the "*interpret-by-
top-k*" rule. The rule says first sort the PC vector entries in descending order of
absolute values, then assign the PC its label according ot the top k features, ig-
norning entries with smaller values.[11] Choosing k remains subjective, and while
this method can be useful for some cases, it is not very much applicable to this
dataset. As can be seen in Figure 5.13, there principal component vectors are far
from sparse and k would have to be very large to make sure there interpretation
is not false. It has been decided not to pursue this approach for labelling the axis
of the PCA.

5.5   Smartmap's Interpretation of the Components

The interpretation of the axis for the smartmap is highly subjective and to some extent incorrect. In order to highlight the flaws in the logic behind labelling the two axis *(left-right)* and *(conservative-liberal)* lets compare the smartmap to the actual positions of the fractions with respect to the two categories. Smartmonitor smartmonitor.ch, Politools' web application that actively monitors the Swiss poltical landscape and displays the gathered information publicly, has tools for tracking how left/right and how liberal/conservative the national council parties are. Screenshots of the tools can be seen in Figure 5.14 and Figure 5.15 respectively. Comparing this to the smartmap with its labels, several inconsistencies catch the eye.

- according to smartmap, the Green Group/Social Democrats are pretty much in the center when it comes to their liberal/conservative position. In the smartmonitor, they at the very liberal end of the spectrum.

- According to the smartmap positions candidates from the Centre Group are more conservative than the Liberal Group and the Green Liberal Group, who are pretty much the same. In contradiction to this, smartmonitor shows that for candidates in the Swiss national council, the Centre Group and the Liberal Group have similar positions with respect to the liberal/conservative spectrum, whereas the Green Liberal Group is more liberal than the two.

- candidates from the Swiss People's Party are almost at the same position as the Green Group/Social Democrats when it comes to whether they are liberal or conservative; this is clearly not the case in reality.

While there is good overlap between smartmap's left-right axis and the Swiss national council's distribution as laid out in Figure 5.15, the interpretation of the axes is not sound and should in my opinion therefore be discontinued.
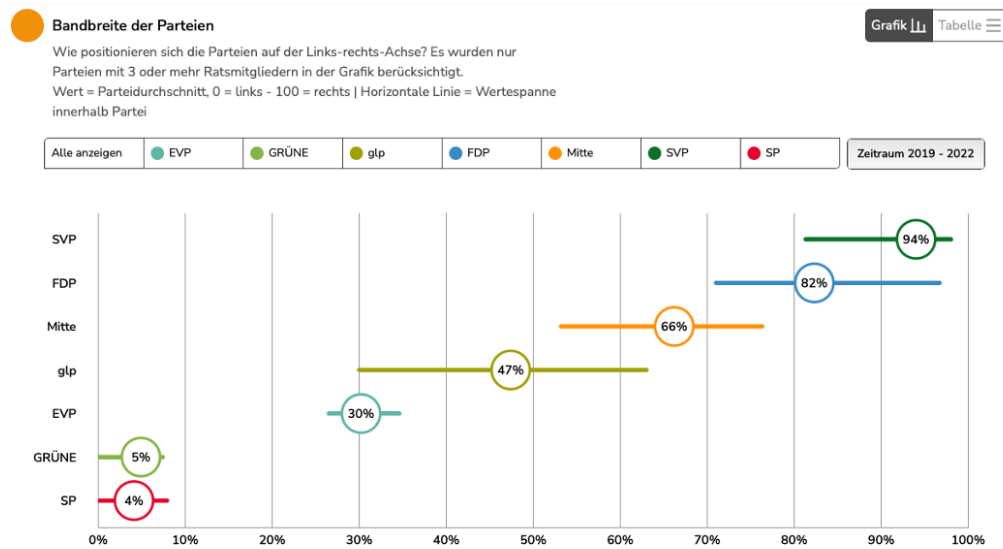
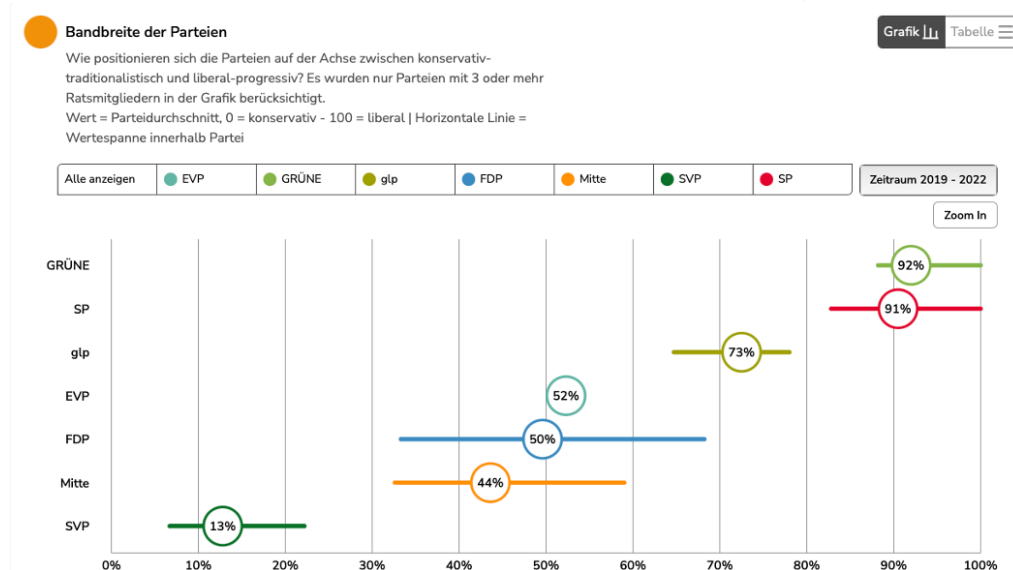Figure 5.14: Smartmonitor: Position of each party in the left/right spectrum

Figure 5.15: Smartmonitor: Position of each party in the liberal/conservative spectrum
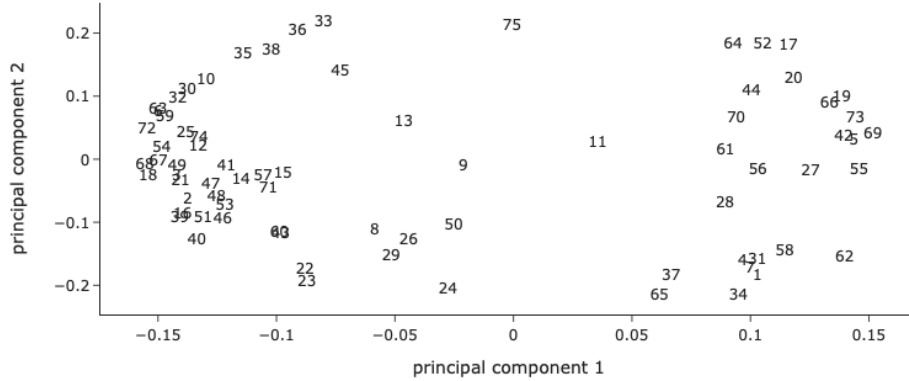
Figure 5.16: How Positive Answers influence the PCs

5.6 Potential New Approach for a 2D Graph of Political Positions

In an attempt to identify a reasonable interpretation for the axes, an analysis the principal components are influenced by a positive answer for every question was done. A positive answer corresponds to answers with the value 100, i.e. *Yes* for type Slider-4 questions, *Completely agree* for type Slider-7 questions and *Significantly more* for Budget-5 questions). A visualization of all questions can be seen in Figure 5.16.

In a next step, questions were manually classified into categories. Whenever possible without considerable doubt, positive answers to a question were be attributed to a label in {*left,right,liberal,conservative*}. Some questions were not clearly attributable to one of the four, and were classified into other categories (*other, infrastructure, green, military*). Figure 5.17 visualises this classification into categories. The figure also shows the mean direction for each of the four main categories.

At this point it is important to note that however thorough the classification was done, it is a manual process, hence somewhat subjective and therefore provides a space for errors.

Nevertheless, Figure 5.17 clearly shows that the axes (left-right) and (liberal-conservative) do not match the principal components.
To compensate for this I propose a new idea: If one takes the the mean of the categories as a basis for the 2 dimensional vector space, it becomes possible to express the principal components in terms of this new basis, i.e. perform a change of basis to have the axes of the graph match the (left-right) and (liberal-
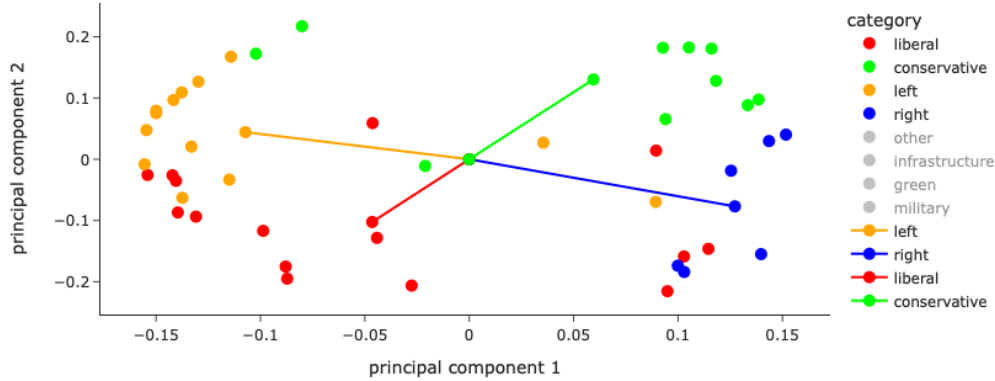
Figure 5.17: Questions per category; Category Means

conservative) axes. The result of this change of basis is shown in Figure 5.18.

Notably, after performing the change of basis, it is possible to transform the dataset with regards to the new principal components, in the same matter that would have been done with the original principal components. Since no information is lost during the change of basis, candidates that have similiar opinions and hence are close in the old PCA will also be close in the new linearly transformed PCA. However, the axes can now be correctly labeled as "left-right" and "conservative-left".

Figure 5.19 visualises the new PCA. The positions in the plot mostly match how smartmonitor has classified parties in their monitoring tool for left-right and liberal-conservative, further supporting the validity of this approach.

It is important to state that this newly proposed version of a smartmap is not ready to be used to replace the current smartmap, although we have established that the current version's methodology is inappropriate and the interpretation of axes is incorrect.

This new approach needs to be challenged by experts, and thoroughly tested for inconsistencies, preferably using data sets from more than only the 2019 election.
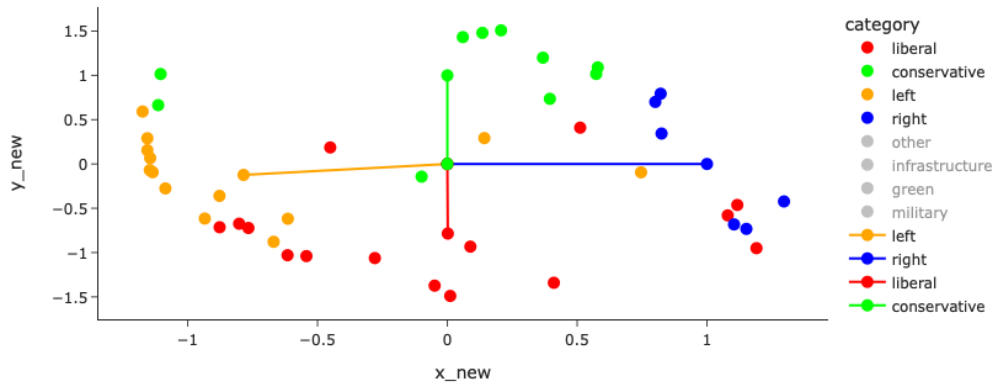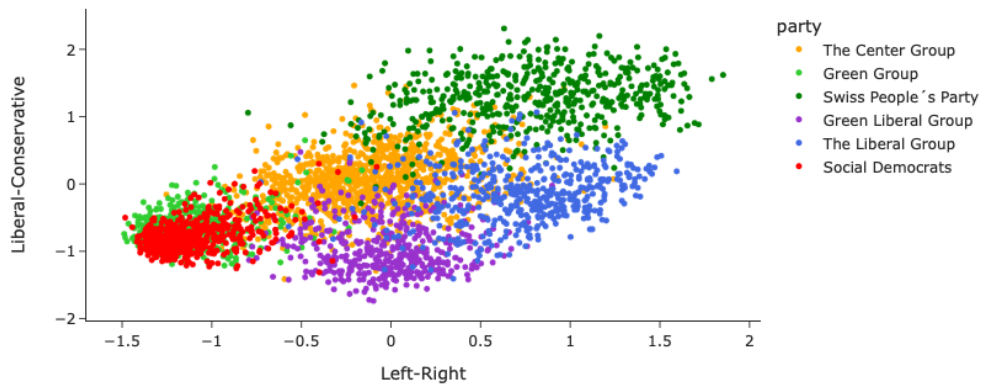
Figure 5.18: Questions in PCA after change of basis

Figure 5.19: PCA after change of basis

Final Remarks

All of the data analytics was done in Python. Jetbrain's PyCharm served as the IDE of choice, important libraries used in the project are:

- pandas for working with dataframes

- numpy for several mathematical functions

- prince for Correspondence analysis

- sklearn for PCA

- pyplot for graphs

- plotly for interactive plots

Find all code in my github repository for this thesis:
github.cm/duxirosenberg/MachineLearning_vs_SwissPolitics/
Many more analytics have been conducted on the dataset, all figures created are available in the repository in the *output* directory as png and also as interactive plotly figures.

Feel free to reach out to me for questions concerning the code or ideas for future research with smartvote.

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Questionnaire

Page 1: Welfare state & Family (Type: Slider-4)		
Order	ID	Question
1	3412	Do you support an increase in the retirement age (e.g. to 67) ?
2	3413	Should the federal government provide more financial support for the creation of childcare facilities outside the family?
3	3414	An initiative calls for the introduction of paid paternity leave for four weeks. Do you support this proposal?
4	3415	Should the conversion rate of the occupational pension fund be reduced in order to adjust for increases in life expectancy?
5	3416	Do you support cantonal efforts to reduce social welfare benefits?
6	3417	Should the federal government provide more support for the construction of non-profit housing?

Page 2: Healthcare (Type: Slider-4)		
Order	ID	Question
7	3418	Should insured persons contribute more to healthcare costs (e.g. by increasing the minimal deductible)?
8	3419	Would you support the introduction of an opt-out solution of for organ donation?
9	3420	Should compulsory vaccination of children be introduced based on the Swiss vaccination plan?
10	3421	An initiative calls for health insurance subsidies to be designed so that no one needs to spend more than ten percent of their disposable income on health insurance premiums. Do you support this proposal?
11	3422	An initiative wants to give the federal government more powers to introduce measures to reduce healthcare costs (Introduction of a cost barrier). Do you support this proposal?

Page 3: Education (Type: Slider-4)		
Order	ID	Question
12	3423	Should the government increase its efforts to support equal education opportunities (e.g. through vouchers for private tutoring for students from low-income families)?
13	3424	Are you in favour of schools granting/allowing exemptions from individual subjects or events for religious reasons (e.g. PE/swimming, sex education, etc.)?
14	3425	Should the federal government expand its financial support for continued education and retraining?
15	3426	According to the Swiss integrated schooling concept, children with learning difficulties or disabilities should be taught in regular classes. Do you approve of this concept?

Page 4: Immigration & integration (Type: Slider-4)		
Order	ID	Question
16	3427	Should foreigners who have lived in Switzerland for at least ten years be given the right to vote and be elected at the municipal level?
17	3428	Should foreigners who have lived in Switzerland for at least ten years be given the right to vote and be elected at the municipal level?
18	3429	Should sans-papiers be able to obtain a regularized residence status more easily?
19	3430	Are you in favor of further tightening the asylum law?
20	3431	Should the requirements for naturalization be increased?
21	3491	Should the federal government provide more support for the integration of foreigners?

Page 5: Society & Ethics (Type: Slider-4)		
Order	ID	Question
22	3492	Should cannabis use be legalized?
23	3432	Should same-sex couples have the same rights as heterosexual couples in all areas?
24	3433	Should the rules for reproductive medicine be further relaxed?
25	3434	Are you in favour of stricter monitoring of pay equity for women and men?
26	3435	Would you be in favour of a doctor being allowed to administer direct active euthanasia in Switzerland?

Page 6: Finances & Taxes (Type: Slider-4)		
Order	ID	Question
27	3436	In your opinion, is lowering taxes at the federal level a priority for the next four years?
28	3437	Do you support a further reduction in contributions paid by financially strong cantons to financially weak cantons within the framework of financial equalisation (NFA)?
29	3438	Should married couples be taxed separately (individual taxation)?
30	3439	Are you in favour of restricting competition between the cantons with regard to corporate tax rates?

Page 7: Economy & Labour (Type: Slider-4)		
Order	ID	Question
31	3440	Should private households be free to choose their electricity supplier (complete liberalisation of the electricity market)?
32	3441	Are you in favour of introducing a general minimum wage of CHF 4'000 for all employees for full-time employment?
33	3442	Should investment controls be introduced in order to better protect Swiss companies from takeovers by foreign investors?
34	3443	Are you in favour of a complete liberalisation of business hours for shops?
35	3444	Should the protection against dismissal for older employees be extended?
36	3445	Should the federal government provide more support for public services (e.g. public transport, post offices) in rural regions?

Page 8: Digitisation (Type: Slider-4)		
Order	ID	Question
37	3446	Should the expansion of the mobile network according to the 5G standard continue?
38	3447	Should online brokerage services (e.g. "Airbnb" accommodations, "Uber" taxi services) be regulated more strongly?

Page 9: Energy & Transport (Type: Slider-4)		
Order	ID	Question
39	3448	An initiative calls for Switzerland to stop using fossil fuels by 2050. Do you support this proposal?
40	3449	Currently, a CO2 charge is levied on fossil combustibles (e.g. heating oil, natural gas). Should this charge be extended to motor fuels (e.g. petrol, diesel)?
41	3450	Should the federal government provide more support for renewable energies?
42	3451	Should high traffic motorways be expanded to six lanes?
43	3452	Are you in favour of introducing "Road Pricing" for motorised individual transport on busy roads?

Page 10: Nature Conservation (Type: Slider-4)		
Order	ID	Question
44	3453	Do you support the relaxation of the current measures to protect large predators (lynx, wolves, bears)?
45	3454	Should the current moratorium on genetically modified plants and animals in Swiss agriculture be extended beyond 2021?
46	3455	Should direct payments only be granted to farmers that provide an extended ecological performance record (e.g. no synthetic pesticides and limited use of antibiotics)?
47	3456	Are you in favour of extending landscape protection (e.g. stricter rules for building outside existing building zones)?
48	3457	Are you in favour of stricter animal welfare regulations for livestock (e.g. permanent access to outdoor areas)?

Page 11: Political System (Type: Slider-4)		
Order	ID	Question
49	3458	Should campaign finance for political parties and referendums be openly declared?
50	3459	Should the introduction of electronic voting in elections and referendums (e-voting) be further pursued?
51	3460	Are you in favour of lowering the voting age to 16?

Page 12: Security & Military (Type: Slider-4)		
Order	ID	Question
52	3398	Should Switzerland terminate the Schengen Agreement with the EU, in order to reintroduce more security checks directly on the border?
53	3461	Should the Federal Council's proposal to tighten the conditions for admission to the civil service be abandoned?
54	3462	Should the export of war materials from Switzerland be banned?
55	3463	Are you in favour of Switzerland acquiring new fighter jets for the armed forces?
56	3464	Do you support an expansion of the legal possibilities for using DNA analysis in investigations?

Page 13: Foreign Trade & Foreign Policy (Type: Slider-4)		
Order	ID	Question
57	3468	Should Switzerland start membership negotiations with the EU?
58	3469	Should Switzerland strive for a free trade agreement with the USA?
59	3470	An initiative calls for liability rules for Swiss companies with regard to compliance with human rights and environmental standards abroad to be tightened. Do you support this proposal?
60	3471	Are you in favour of Switzerland's candidacy for a seat on the UN Security Council?

Page 14: Values (Type: Slider-7)		
Order	ID	Question
61	3387	What is your position the following statement: "Someone who is not guilty, has nothing to fear from state security measures."
62	3465	What is your position the following statement: "In the long term, everyone benefits from a free market economy in the long term."
63	3399	What is your position the following statement: "Wealthy individuals should contribute more to the funding of the state."
64	3389	What is your position the following statement: "It is best for a child, when one parent stays home full-time for childcare."
65	3466	What is your position the following statement: "The ongoing digitalization offers significantly more opportunities than risks."
66	3388	What is your position the following statement: "Punishing criminals is more important than reintegrating them into society."
67	3367	What is your position the following statement: "Stronger environmental protection is necessary, even if its application limits economic growth."

Page 15: Federal Budget (Type: Slider-7)

| Order	ID	Question
68	3472	Should the federal government spend more or less in the area of "Development assistance"?
69	3473	Should the federal government spend more or less in the area of "National defence"?
70	3474	Should the federal government spend more or less in the area of "Public security"?
71	3475	Should the federal government spend more or less in the area of "Education and research"?
72	3476	Should the federal government spend more or less in the area of "Social services"?
73	3477	Should the federal government spend more or less in the area of "Road traffic (motorised individual transport)"?
74	3478	Should the federal government spend more or less in the area of "Public transport"?
75	3479	Should the federal government spend more or less in the area of "Agriculture"?

Additional Figures

This chapter includes any additional graphics that have not been included in the continuous text for reasons of readability.

B.1 Demographics
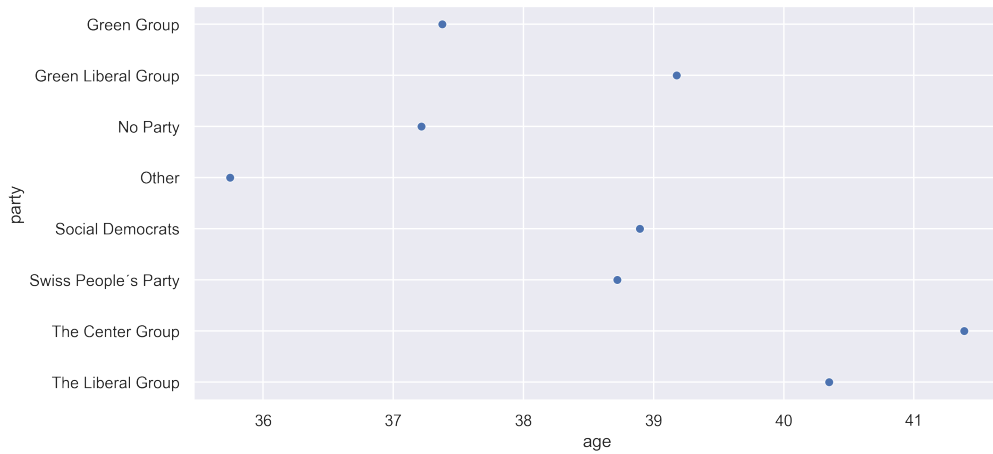
Figure B.1: Average Voters's Age per NC Fraction
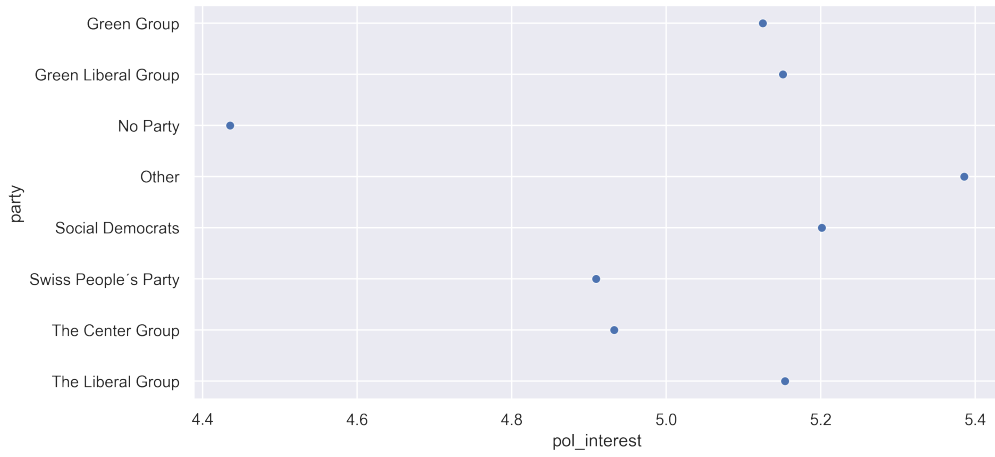
Figure B.2: Average Political Interest of Smartvote users per NC Fraction
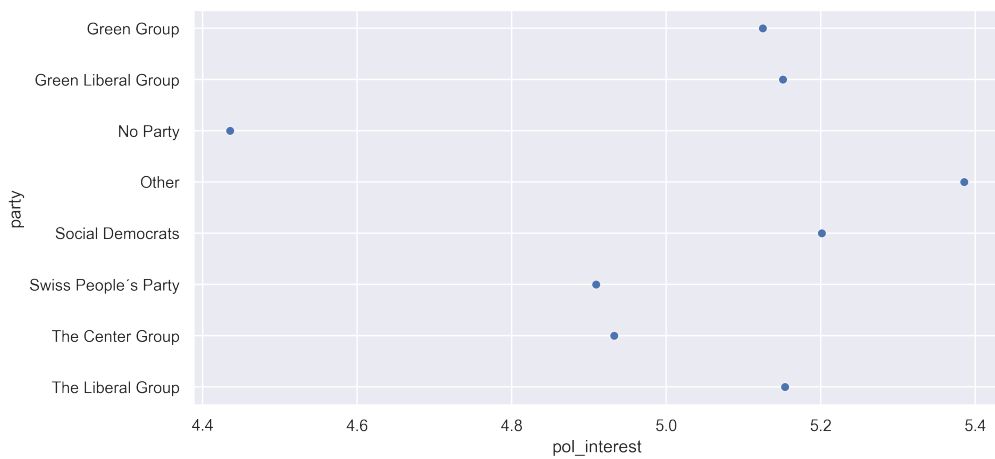
Figure B.3: Average Political Position of Smartvote users per NC Fraction
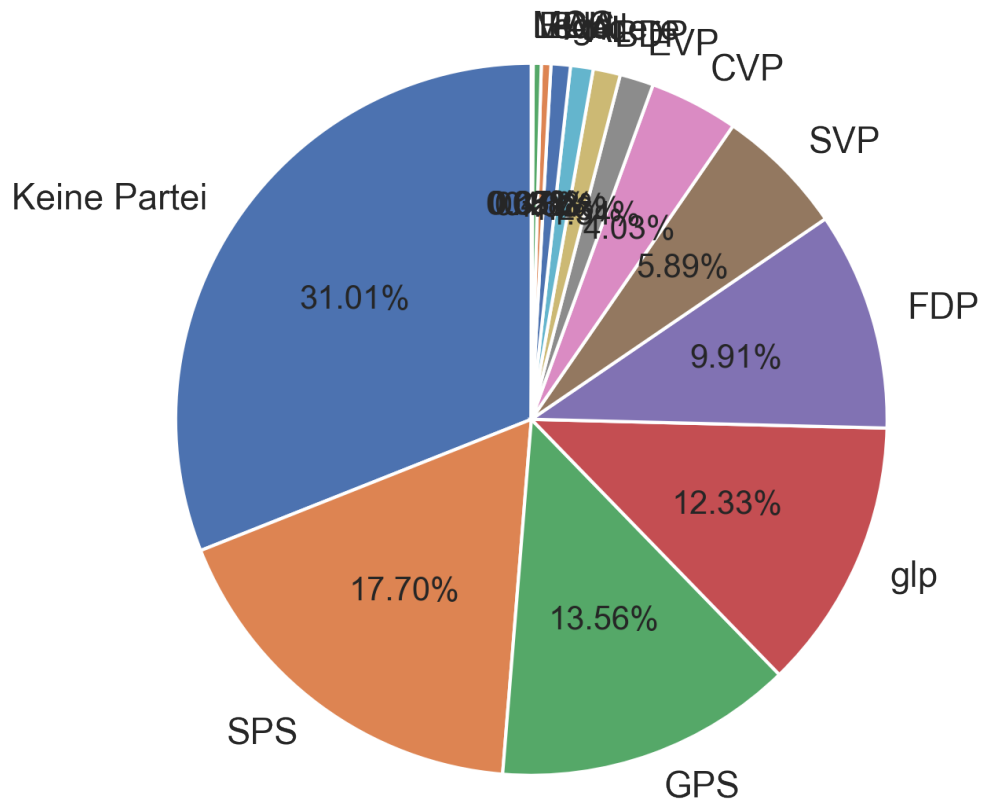
Figure B.4: Preferred Parties of Smartvote users

B.2   Splitrank

Q32: Are you in favour of introducing a general minimum wage of CHF 4'000 for all emplo
yees for full-time employment?
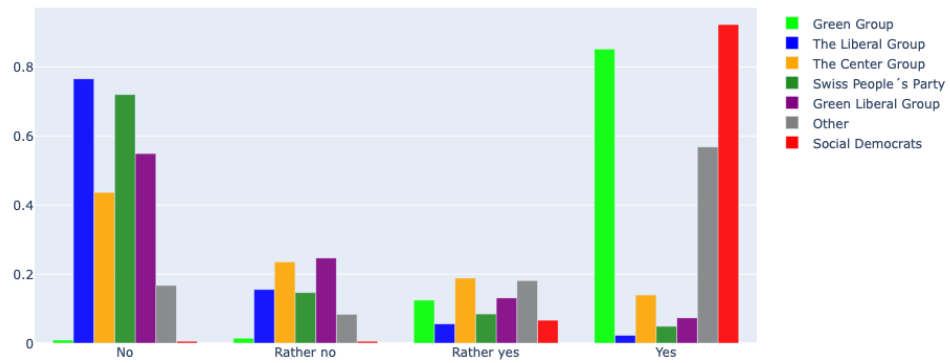
Figure B.5:

Q16: Should foreigners who have lived in Switzerland for at least ten years be given th
e right to vote and be elected at the municipal level?
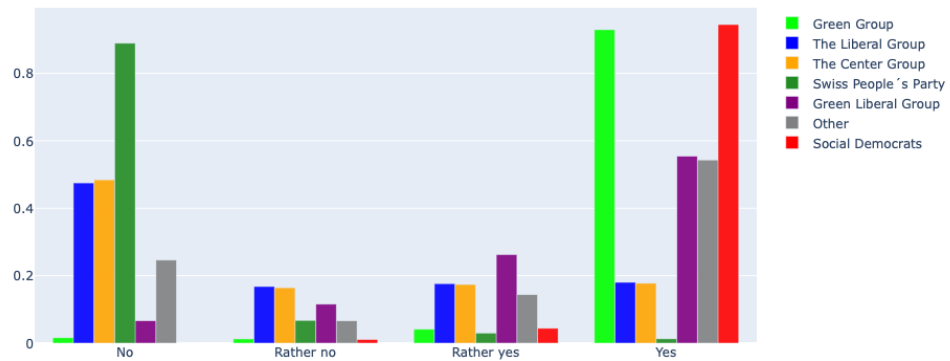
Figure B.6:

Q55: Are you in favour of Switzerland acquiring new fighter jets for the armed forces?
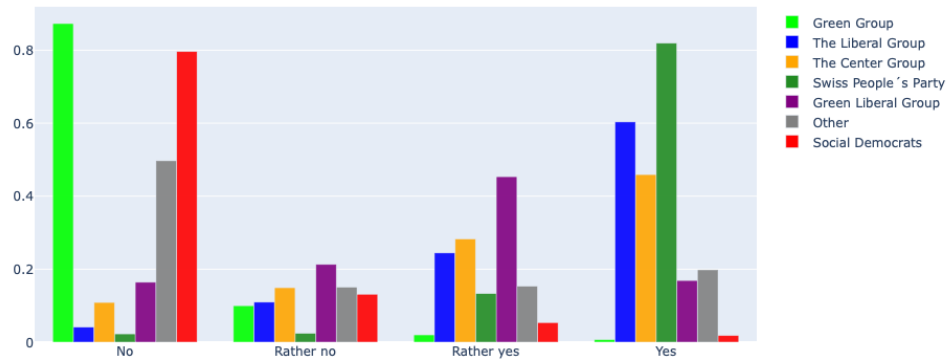
Figure B.7:

Q18: Should sans-papiers be able to obtain a regularized residence status more easily?
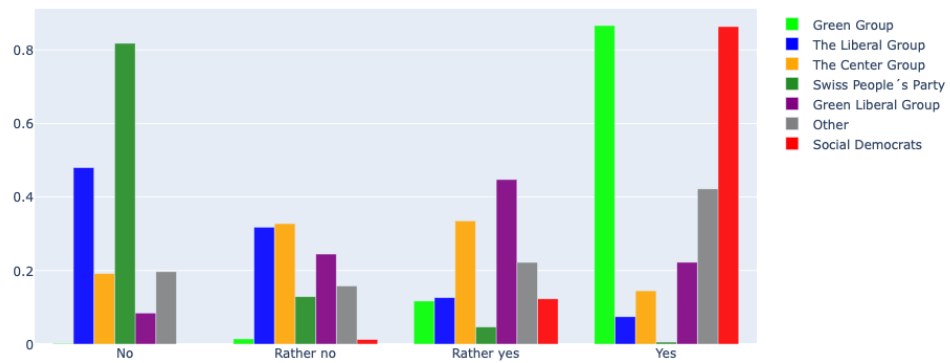
Figure B.8:

Q51: Are you in favour of lowering the voting age to 16?
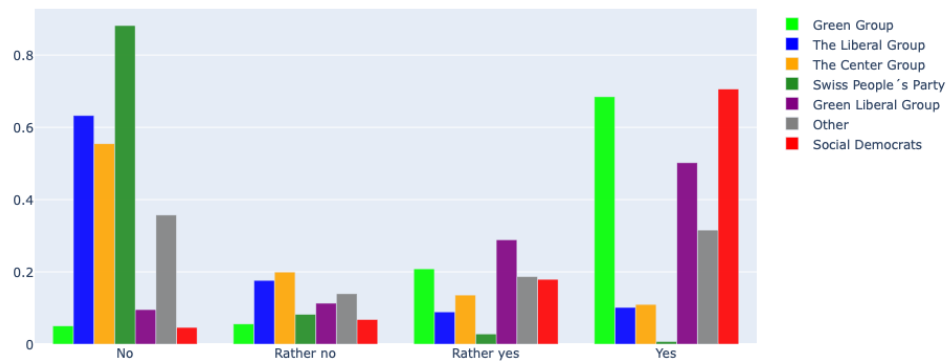
Figure B.9:

Q13: Are you in favour of schools granting/allowing exemptions from individual subjects
or events for religious reasons (e.g. PE/swimming, sex education, etc.)?
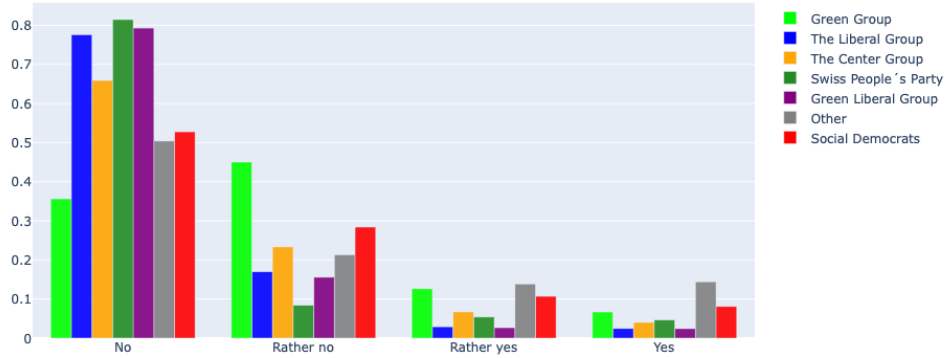
Figure B.10:

Q71: Should the federal government spend more or less in the area of "Education and res
earch"?
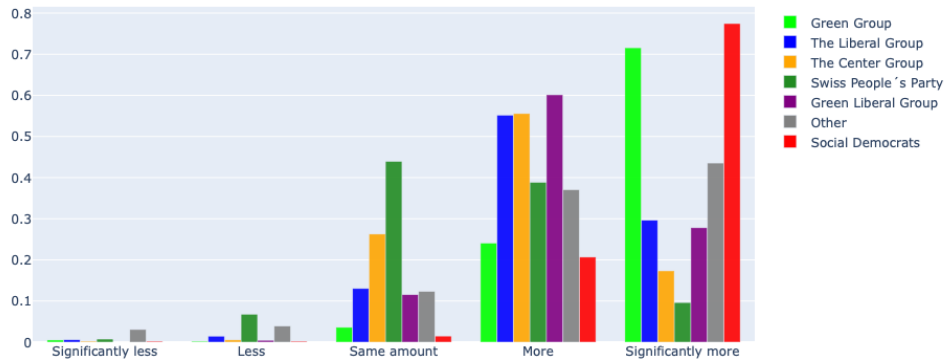
Figure B.11:

Q70: Should the federal government spend more or less in the area of "Public security"?
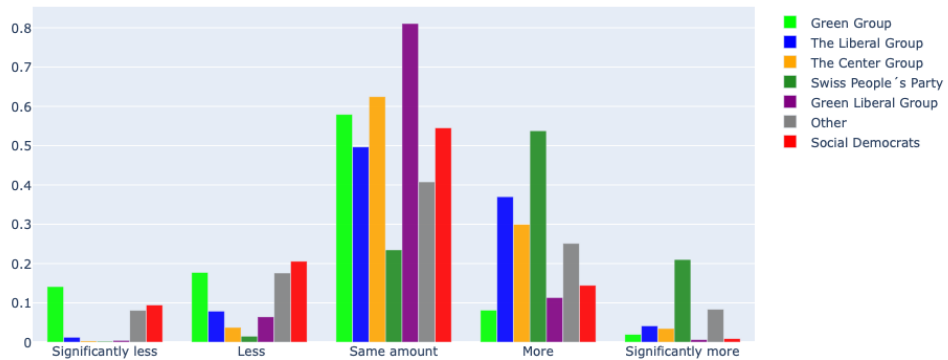
Figure B.12:

Q65: What is your position the following statement: "The ongoing digitalization offers significantly more opportunities than risks."
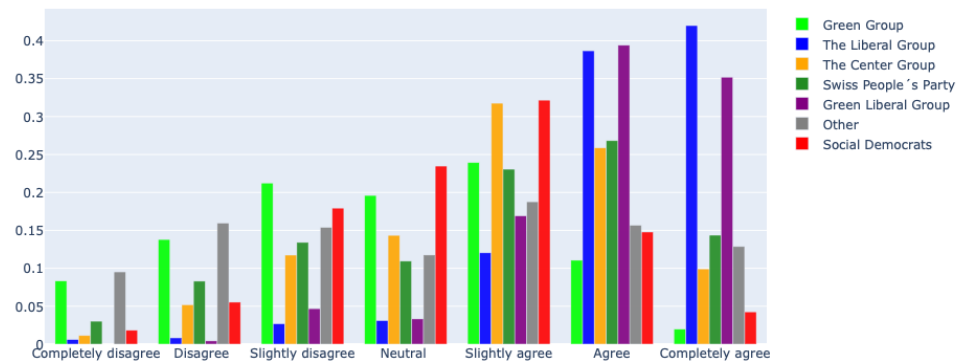
Figure B.13:

Q9: Should compulsory vaccination of children be introduced based on the Swiss vaccination plan?
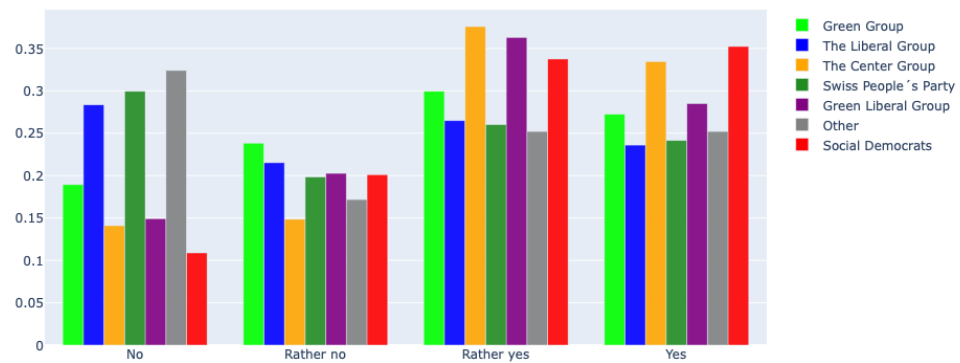
Figure B.14:

B.3   Underrepresented (Smartvote) Opinions in the National Council

Q11: An initiative wants to give the federal government more powers to introduce measures to reduce healthcare costs (Introduction of a cost barrier). Do you support this proposal?
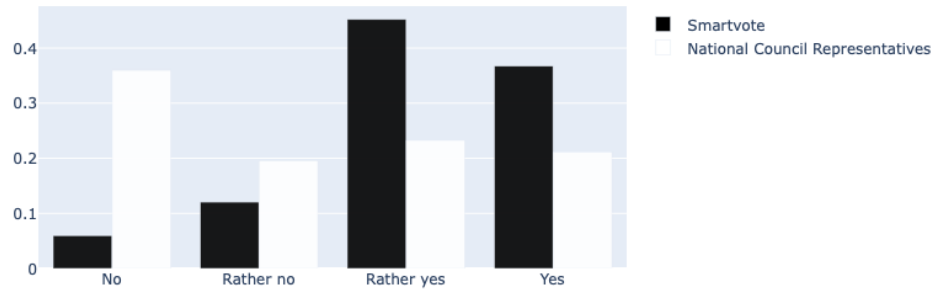
Figure B.15:

Q50: Should the introduction of electronic voting in elections and referendums (e-voting) be further pursued?
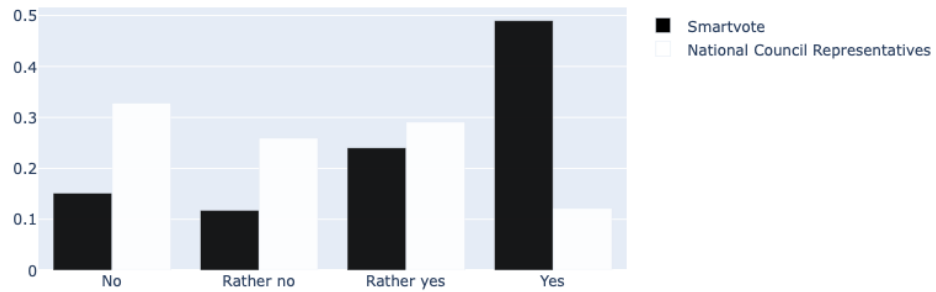
Figure B.16:

Q10: An initiative calls for health insurance subsidies to be designed so that no one n
eeds to spend more than ten percent of their disposable income on health insurance premiu
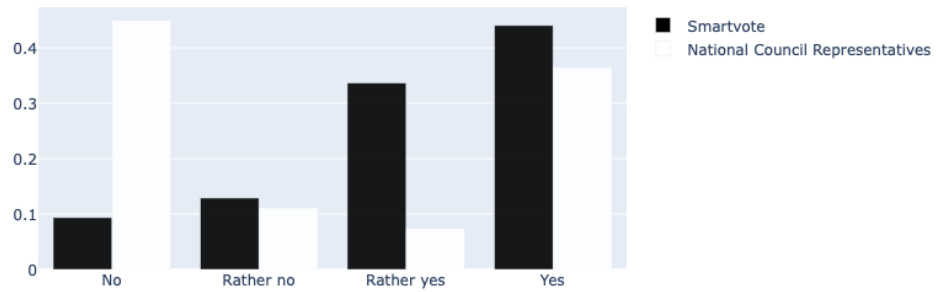
Figure B.17:

Q32: Are you in favour of introducing a general minimum wage of CHF 4'000 for all emplo
yees for full-time employment?

Figure B.18:

Q49: Should campaign finance for political parties and referendums be openly declared?

Figure B.19:

B.4   Green Group / Social Democrats Questions with smallest difference in Distribution

Figure B.20:

Q18: Should sans-papiers be able to obtain a regularized residence status more easily?

Figure B.21:

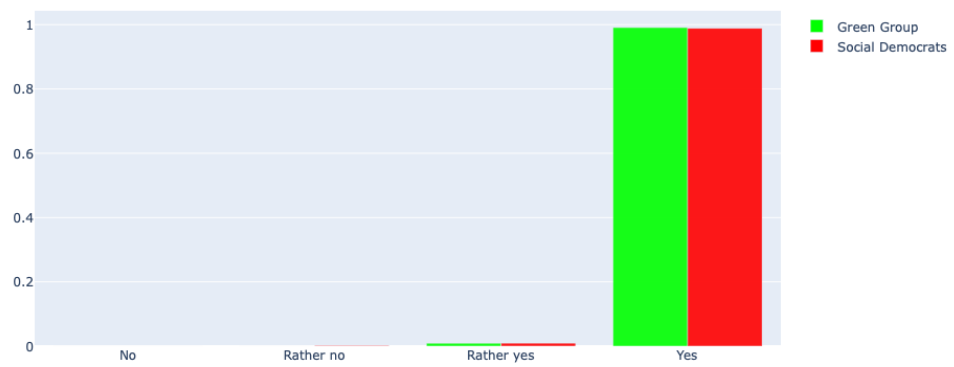Q49: Should campaign finance for political parties and referendums be openly declared?

Figure B.22:

Figure B.23:

Figure B.24: