Estimating the Probability of Acting as a Trustee

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Abstract

We introduce a binomial mixture model for estimating the probability of a representative acting as a delegate or a trustee. Our model also returns the probability of congruence of politicians with the national median voter. The estimated probability of congruence strongly correlates with the observed frequency of congruence obtained by matching parliamentary roll-call votes with the will of the median voter revealed in national referendums on identical legislative proposals. We thereby validate our estimation approach. Since our method uses the roll-call vote record of political representatives as sole input, it can be applied even if the will of the median voter is unknown.

Keywords: Political representation, delegate, trustee, binomial mixture model.

JEL-Codes: C13, D72.

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1 Introduction

The question of whether representatives act as delegates or trustees of their constituents has been at the heart of the theory of political representation for two centuries, yet identifying the actual mode of representation has been difficult in practice (Pitkin 1967, Przeworski, Stokes and Manin 1999, Ashworth 2012, Portmann 2014).

Whether representatives vote according to their own preferences or the preferences of their constituents cannot be tested directly, unless surveys of public opinion or instruments of direct democracy are used to reveal the latter (Stadelmann, Portmann and Eichenberger 2012, Stadelmann, Portmann and Eichenberger 2013, Brunner, Ross and Washington 2013). A test of the fidelity of political representation in an indirect democracy must remain an indirect one by nature, as preferences of constituents are usually unobservable. In practice, such tests compare the ideological position of a legislator to that of the median voter (Poole and Rosenthal 1997, Gerber and Lewis 2004, Matsusaka 2010). The ideological position of the legislator follows from her voting record (roll-call votes), whereas the ideological position of the median voter can be estimated from opinion surveys and election results, with estimates ranging from single-dimensional scores to multidimensional spatial fixings.

Nevertheless, no matter how accurate ex-post measures of congruence might be, there will always be doubt borne by observational equivalence regarding whether representatives act as delegates or trustees. This fact motivates this paper. Congruence between a representative and her constituency does not imply the delegate mode of representation, as the representative may make a popular choice for *idiosyncratic* reasons. Put differently, the representative may be congruent with the constituency while acting as a trustee. A trustee may act observationally equivalent to a delegate for various reasons: ideological radicalism of the representative, informational asymmetry between the representative and the public, the influence of parties, special interests, or the diversity of constituents. These are all plausible causes, among numerous others, for a representative to follow her own understanding of the best course of action (Denzau and Munger 1986, Grofman 2004, Carey 2008, Golder and Stramski 2010, Kauder and Potrafke 2016).

We contribute to the empirical literature on political representation by proposing a method of estimating the probability of a representative acting as a delegate or a trustee which overcomes the problem of observational equivalence between the two. Specifically, we propose a binomial mixture model of the representatives' votes. The model involves unobservable idiosyncratic signals – two for each representative, as well as a single unobservable common signal. The model is estimated using the roll-call votes of the representatives as sole input. We use the estimates to compute the probability of a representative voting idiosyncratically or acting as a trustee. The second quantity of interest is the probability of a representative voting according to an unobserved common signal that influences the votes of all representatives. This would be the probability of congruence with the median voter, if the common signal reflects the will of the median voter. Under this assumption, we can use the model to estimate the fidelity of representation based on roll-call votes alone for the first time in the literature.

The approach proposed in this paper resonates with some ideas found in the mathematical social science literature on Condorcet Jury Theorem. One problem in the jury setting is how to verify the quality of a decision. Whereas the jurisdiction of a lesser court can be reviewed by a higher judicial authority, the correctness of the jurisdiction by a Supreme Court is unobservable. How can we judge the Justices? The older literature on the classical Condorcet Jury Theorem, reviewed in Grofman, Owen and Feld (1983), proposed comparing an individual's vote with the majority vote. The more often an individual is congruent with the majority, the more frequently is she correct. This approach is not entirely satisfactory due to a degree of tautology inherent in it. In contrast, the interpretation of the common signal in this paper is inspired by the analysis of voting in the US Supreme Court (Iaryczower and Shum 2012). The reasoning is as follows: If judges vote according to a common signal, which by exclusion must be the evidence presented rather than an idiosyncratic signal such as personal ideology, we can be confident that the decision was a good one. Similarly, if a legislator votes in parliament according to a factor that influences the votes of *all* legislators, then we may trust that her decision will coincide with the countrywide will of the median voter. We can then calculate the probability of congruence from our model.

The cornerstone assumption of the common signal representing the will of the median voter cannot be tested if the latter is not observed, which is usually the case in practice. Observing the actual will of the median voter allows us to *validate* the model: We compare the predicted individual probabilities of congruence with the observed individual frequencies of congruence. The observed frequency of congruence each individual representative stems a quasi-experimental opportunity of the Swiss political system. The Swiss political system feeds the preferences of the voter majority to the legislative process by requiring representatives to vote in Parliament before placing the same issue on a country-wide referendum. All constitutional amendments passed by parliament require a referendum. A small group of citizens can start an initiative to amend the constitution or demand a referendum on laws enacted by parliament (Stadelmann et al. 2013, Portmann 2014, Hessami 2016). These elements of direct democracy make Switzerland exemplary. Our estimation method is validated by showing that the estimated probability of congruence significantly correlates with the observed frequency of congruence. Predicting the probability of congruence reasonably accurately lends validity to the estimated probability of a representative acting as a delegate or a trustee.

The binominal mixture model is presented in 2, 3 provides estimation results and the validation. Concluding remarks are offered in 4.

2 The model

In an assembly of n legislators, each legislator i, where $i = 1, 2, \ldots, n$, may vote according to a private binary signal X_i, or a common binary signal M. The choice of legislator i is modeled by a binary random variable L_i. Assume that the $2n + 1$ random variables L_i, X_i, M are independent Bernoulli random variables with the expectations $\mathbf{E}L_i = r_i$,

$\mathbf{E}X_i = r_{n+i}$, and $\mathbf{E}M = r_{2n+1}$. The vote V_i is modeled as a mixture:

$$V_i = L_i X_i + (1 - L_i)M. \tag{1}$$

It follows that the distribution of V_i is also Bernoulli, and $\mathbf{E}V_i = r_i r_{n+i} + (1 - r_i)r_{2n+1}$.

The common signal induces positive correlations between the votes, which are independent only conditionally on the common signal M. The Pearson product-moment correlation coefficient for any two votes V_i and V_j, where $j = 1, 2, \ldots, n$ and $j \neq i$, is given by

$$\mathbf{Corr}(V_i, V_j) = \frac{\mathbf{E}V_i V_j - p_i p_j}{\sqrt{p_i(1 - p_i)p_j(1 - p_j)}} = \frac{(1 - r_i)(1 - r_j)r_{2n+1}(1 - r_{2n+1})}{\sqrt{p_i(1 - p_i)p_j(1 - p_j)}} > 0,$$

where $p_i = \mathbf{E}V_i = r_i r_{n+i} + (1 - r_i)r_{2n+1}$. The votes are also correlated with the common signal

$$\mathbf{Corr}(V_i, M) = \frac{\mathbf{E}V_i M - p_i r_{2n+1}}{\sqrt{p_i(1 - p_i)r_{2n+1}(1 - r_{2n+1})}} = (1 - r_i)\sqrt{\frac{r_{2n+1}(1 - r_{2n+1})}{p_i(1 - p_i)}} > 0.$$

In the absence of absenteeism and abstentions, the roll-call data would comprise nT observations of random variables V_i, where n is the number of legislators and T the number of ballots, indexed by $t = 1, 2, \ldots, T$. In the next section we show how to estimate the vector of model parameters

$$\vec{r} = (r_1, \ldots, r_n, r_{n+1}, \ldots, r_{2n}, r_{2n+1})$$

from the roll-call votes, without observing the $(2n + 1)T$ realizations of L_i, X_i and M.

Conceptually, trustees exercise discretion by using own judgment and voting own conscience. To operationalize such behavior in the confines of our stochastic model of votes, we must envision how an impartial external observer would perceive a trustee's votes on a large set of independent and exogenous issues. For an impartial external observer, voting as a trustee would amount to voting *idiosyncraticaly.* We thus say that legislator i acts as a trustee on the ballot t, if i votes on t according to the t's realization of i's private and independent signal X_i. This allows us to interpret $\mathbf{E}L_i$ as the probability of acting as a trustee. Our primary objective is to estimate the probability of i acting as a trustee from i's voting record.

It is important to emphasize that the nature of the common signal M, as a source of stochastic dependence between the votes, has no direct bearing on the identification of the trustee voting. Ideally, we would like to interpret the complementary probability $(1-\mathbf{E}L_i)$ as the probability of acting as a delegate, so that the mixing equation (1) models the choice between the two classic modes of political behavior. This interpretation is admissible only if M indeed reflects the will of the median voter, an assumption that cannot be verified if the latter remains unobserved. For a typical indirect democracy our analysis would end here, because an indirect identification the common signal is unlikely due to a large number of potential factors. The model tells us that the realizations of M are binary, influence the votes of all legislators and are specific to each ballot, but this information alone will rarely suffice to identify M empirically.

In the case of Swiss referendums, we can verify our assumption of the common signal M being the will of the median voter on issues that were put on a referendum. This allows us to *validate* the assumption by comparing the predicted probabilities of congruence with the median voter with the observed frequencies of congruent votes. Since we do not observe an ex-ante estimate of the median voter's position on a given ballot, we proxy it with the actual outcome of the referendum, much as empirical tests of the Downsian model of turnout proxy the expected closeness of an election with the actual closeness observed ex post (Geys 2006).

The assumption that the common signal reflects the median voter's position allows us to predict the probability of congruence with the median voter using the roll-call data. The probability of congruence with the median voter M can be obtained from the following conditional probabilities:

$$\begin{aligned}
\pi_{11} &= \mathbf{P}\{V_i = 1 \mid M = 1\} = 1 - r_i(1 - r_{n+i}), \\
\pi_{00} &= \mathbf{P}\{V_i = 0 \mid M = 0\} = 1 - r_i r_{n+i}, \\
\pi_{10} &= \mathbf{P}\{V_i = 1 \mid M = 0\} = r_i r_{n+i}, \\
\pi_{01} &= \mathbf{P}\{V_i = 0 \mid M = 1\} = r_i(1 - r_{n+i}).
\end{aligned}$$

The probability of congruence is given by

$$\mathbf{P}\{V_i = M\} = r_{2n+1}\pi_{11} + (1 - r_{2n+1})\pi_{00}. \tag{2}$$

Here, the first term is the probability of congruence of a Yes vote: $\mathbf{P}\{V_i = 1 \cap M = 1\} = r_{2n+1}\pi_{11}$, whereas $\mathbf{P}\{V_i = 0 \cap M = 0\} = (1 - r_{2n+1})\pi_{00}$ is the corresponding probability for a No vote. In the case of the Swiss parliament, we use the probability of congruence to validate our interpretation of the common signal M as the preference of the median voter.

The *observational equivalence* discussed in the introduction follows because the event $V_i = M$ may occur with any L_i, i.e. a representative acting as a trustee or as a delegate may represent the will of the median voter. Put differently, the congruence of a legislator's vote (realization of V_i) with the median voter (realization of M) does not imply a certain mode of representation (delegate vs. trustee). A representative may make a popular choice ($V_i = M$) for idiosyncratic reasons ($L_i = 1$). The above model allows overcoming observational equivalence by disentangling the two cases which is a central new contribution of our approach.

2.1 The Maximum Likelihood estimate

We can estimate $\vec{r}$ using Maximum Likelihood from the parliamentary roll-call data, or realizations v_i of the random variables V_i, despite the realizations of X_i, L_i and M being unobserved. Let $v_i = 1$ if legislator i votes Yes, and $v_i = 0$ if i votes No. Let n be a fixed number of legislators, and let v_i^t be independent (in t) observations of V_i for $t = 1, 2, \ldots, T$ ballots. The likelihood function reads

$$F_T(\vec{r}) = \prod_{t=1}^{T} \left[r_{2n+1} \prod_{i=1}^{n} F(i, M = 1, t, \vec{r}) + (1 - r_{2n+1}) \prod_{i=1}^{n} F(i, M = 0, t, \vec{r}) \right], \tag{3}$$

where

$$\begin{aligned} F(i, M = 1, t, \vec{r}) &= v_i^t (1 - r_i(1 - r_{n+i})) + (1 - v_i^t) r_i (1 - r_{n+i}), \\ F(i, M = 0, t, \vec{r}) &= v_i^t r_i r_{n+i} + (1 - v_i^t)(1 - r_i r_{n+i}). \end{aligned}$$

To estimate the vector of parameters $\vec{r}$, the logarithm of likelihood function $F_T(\vec{r})$ is maximized subject to the following constraints:

$$r_i \in [0, 1], \quad i = 1, 2, \ldots, 2n + 1. \tag{4}$$

To improve the fit, we require that the marginal probabilities of affirmative votes equal their observed counterparts. This additionally imposes n constraints:

$$r_i r_{n+i} + (1 - r_i) r_{2n+1} = p_i, \quad i = 1, 2, \ldots, n, \tag{5}$$

where the means $p_i = (1/T) \sum_{t=1}^{T} v_i^t$ are the frequencies of Yes votes. We use the following re-parametrization to simplify the optimization problem: $R_i = r_i$, $R_{n+i} = r_i r_{n+i}$ and $R_{2n+1} = r_{2n+1}$, with $R_i \geq R_{n+i}$ imposed in addition to (4). Further constraints related to the mixed moments of the joint probability distribution can be imposed. The Bahadur (1961) parametrization suggests a large number of moment-based constraints that may be imposed. A natural addition to the first-moment constraints would be those based on the mixed moments $\mathbf{E} V_i V_j$ and the frequency of all ballots in which the legislators i and j both voted Yes. This would introduce $n(n-1)/2$ additional constraints. The trade-off lies in the increased complexity of the optimization problem, and the possible non-existence of a solution.

The above likelihood function implicitly assumes a fixed number of legislators deciding on every ballot, and attaches the index i to the same legislator. While the assumption of a constant composition is suited for small voting bodies such as juries, it is not tenable for large voting assemblies such as parliaments. The actual number of votes cast on any particular legislative ballot is likely to be smaller than the number of seats in the parliament, because some legislators could abstain from voting, be temporarily absent or be permanently replaced by other legislators in the middle of a legislative session due to resignation or demise. Our method is sufficiently flexible to accommodate abstentions and irregular tenures.

To account for absenteeism and abstentions in parliament, we introduce a binary participation parameter a_i^t, such that $a_i^t = 1$ if legislator i voted on the ballot t, and $a_i^t = 0$ if she did not. If $a_i^t = 0$, we set $v_i^t = 1$. This information is collected in an

$n \times T$ binary attendance matrix A. The following definitions replace their counterparts in problem (3):

$$F(i,1,t,A,\vec{r}) = a_i^t[v_i^t(1-r_i(1-r_{n+i})) + (1-v_i^t)r_i(1-r_{n+i})] + 1 - a_i^t, \tag{6}$$
$$F(i,0,t,A,\vec{r}) = a_i^t[v_i^t r_i r_{n+i} + (1-v_i^t)(1-r_i r_{n+i})] + 1 - a_i^t. \tag{7}$$

This simple modification fully captures absenteeism and abstentions, as well as different tenures of legislators. If i has resigned during a session at time τ, then $a_i^\tau = 0$ for all $\tau \geq t$. If j succeeds i, then $a_j^\tau = 0$ for all $\tau < t$. In this formulation, n denotes the number of legislators that voted at least once. The estimates for the Swiss parliament below were obtained using an adjusted maximum likelihood function (3) with (6) and (7), under the moment restrictions (4) and (5). We also provide the estimation code for the statistical program R on request.

3 Estimates

3.1 Probability of acting as a trustee

The Swiss Parliament comprises two houses, a Lower House and an Upper House. This study analyzed voting behavior in the Lower House. The Lower House has 200 members, who are elected using a proportional system (Hug and Martin 2012).

Swiss legislators vote on new laws and amendments like parliamentarians in all democracies around the world. But Swiss direct democracy allows us to directly measure congruence between representatives and the median voter. The proposals accepted by the parliament do not turn directly into law. Parliamentary decisions can be challenged by citizens demanding a referendum. Final votes in the Lower House are recorded by an electronic voting system. We apply the estimation approach detailed in the previous section to roll-call data from the Swiss Lower House on bills that were subsequently put on a country-wide referendum. In particular, these bills include all constitutional amendments, as they require a confirmatory referendum. In addition to these mandatory referendums, a small group of citizens can put forward an initiative to amend the constitution by referendum, or demand a referendum on a simple law already passed by the parliament. In all cases the legislators vote on precisely the same proposals as citizens, allowing us to compare their votes (Portmann 2014, Stadelmann, Portmann and Eichenberger 2016).

We estimate the model using roll-call data from the Swiss Lower House for three sessions from 1999 to 2011. Table 1 summarizes the distributions of the estimated individual probabilities of acting as a trustee by legislative sessions, which is given by $\mathbf{E}L_i = r_i$, the expected value of the mixing variable. Depending on the legislative session, the median values of the estimates of r_i lie between 0.48 and 0.62, implying that half of the legislators act as trustees slightly more often than not. Although this finding may sound inherently plausible, it hides significant heterogeneity in the estimates. Figure 1 plots the estimated probabilities of acting as a trustee by session, sorted in assenting order. Roughly one third of the estimates equal unity, implying clear idiosyncratic behavior. Who are these so-called mavericks and how representative are they? It turns out that the perfect trustees correctly anticipate the will of the median voter about half of the time. For them, the observed shares of congruent votes range from 0.36 to 0.52, while the estimated probabilities of congruence range from 0.5 to 0.53. Perhaps unsurprisingly, almost all perfect trustees are members of parties from the right or the left on the traditional left-right spectrum (share of left-right in the final column of Table 1). Members of centrist parties tend to act as delegates.

Table 1: Estimated Probability of Acting as a Trustee

			ESTIMATES					PERFECT TRUSTEES			
									Congruence		Share of
Session	MPs	Refs	Min	q25	q50	q75	Max	MPs	Freq.	Prob.	Radical
1999 to 2003	212	43	0	0.13	0.54	1	1	68	0.36	0.51	0.94
2003 to 2007	224	20	0	0.32	0.48	1	1	74	0.52	0.53	0.96
2007 to 2011	220	30	0	0.21	0.62	1	1	65	0.49	0.50	0.98

Roughly one third of the estimate probability of acting as a trustee equals unity. Statistics presented in this table pertain to this group.

3.2 Model validation

To validate the model empirically, we estimate the probability of congruence and compare it to the observed frequency of congruence derived from comparing the representative's roll call vote with the decision of the majority of voters – and hence also that of the median voter – in a referendum. Table 2 summarizes the distributions of the *estimated* individual probabilities of congruence (ESTIMATES) by legislative sessions.

Table 2: Estimated Probability of Congruence

			DATA	ESTIMATES					VALIDATION		
Session	MPs	Refs	Votes	Min	q25	q50	q75	Max	ρ	τ	R^2
1999 to 2003	212	43	All : 7458	0.48	0.49	0.74	0.93	1	0.89	0.61	0.72
			Yes : 3941	0.68	0.82	0.87	0.96	1	0.83	0.68	0.56
			No : 3517	0.48	0.67	0.94	0.99	1	0.96	0.59	0.86
2003 to 2007	224	20	All : 3646	0.37	0.47	0.76	0.83	0.99964	0.69	0.51	0.48
			Yes : 2214	0.78	0.86	0.89	0.97	1	0.76	0.64	0.42
			No : 1432	0.37	0.62	0.81	0.91	1	0.88	0.7	0.72
2007 to 2011	220	30	All : 5391	0.49	0.5	0.69	0.89	1	0.63	0.56	0.36
			Yes : 2830	0.69	0.8	0.84	0.95	1	0.49	0.45	0.18
			No : 2561	0.58	0.71	0.87	0.94	1	0.78	0.54	0.49

We validate the model by comparing the estimated probabilities of congruence by correlation coefficients (Pearson ρ and Kendall τ) with the observed frequencies of congruence and a pseudo-coefficient of determination for a logistic regression of the frequencies of congruence on the probabilities (Nagelkerke's $R^2 \in [0, 1]$).

The estimated total probabilities range from 0.37 to 1. Median values between 0.69 and 0.76 suggest that half of the legislators disagree with the median voter in about 30 percent of their decisions. This figure is consistent with the congruence rates in referendums (Brunner et al. 2013, Garrett 1999, Stadelmann et al. 2012, Matsusaka 2015). The extreme estimates of one, indicating perfect congruence, occur for legislators with exceptionally short tenures. This applies to four members of the 1999-2003 session and five members of the 2007-2011 session, who voted on fewer than one-tenth of ballots during a session – too seldom for a reliable estimate.

The model is estimated using the entire voting record of a given session on proposals with subsequent referendums, yet the above probabilities can be obtained for Yes and No votes separately. The median probability of congruence for the first and third sessions is higher for No votes than for Yes votes, which is consistent with the view that legislators are more attentive to voters if they are likely to disapprove. The estimates suggest that 46, 24 and 31 legislators in the respective sessions flawlessly anticipated the disapproval of the majority, resulting in absolute congruence. The corresponding numbers for the Yes votes are 17, 36, 17.

We validate the model using correlation coefficients between the estimated probability and the observed frequency of congruence as well as with coefficient of determination in a logistic regression. The observed frequency of congruence reflects the actual matches between the vote of a representative and the observed will of the national median voter in referendums. These are the cases in which the representative voted Yes and the subsequent referendum resulted in a Yes, or if the legislator voted No and the referendum resulted in a No. Recall that this information has not been used in the estimation.

In Table 2, ρ denotes the standard Pearson product-moment coefficient and τ denotes the Kendall rank correlation. The input of both correlation coefficients is the estimated probability and the observed frequency of congruence. The Kendall rank correlation coefficient τ is better suited for uncovering dependence in a nonlinear relationship. Both correlation coefficients indicate a strong association between the estimated probability and the observed frequency of congruence. The correlation patterns are broadly consistent, except for the relative strength of the correlation with the No votes during 1999-2003. Nagelkerke's R^2 serves as a measure of fit for a logistic regression of the estimated probability of congruence on the observed frequency of congruence; it confirms good cross sectional fits implied by the correlation analysis. The fits are better for No votes than for Yes votes. The model has thus been able to predict the actual matches between the decisions of individual legislators and the will of the majority of voters.

4 Conclusions and extensions

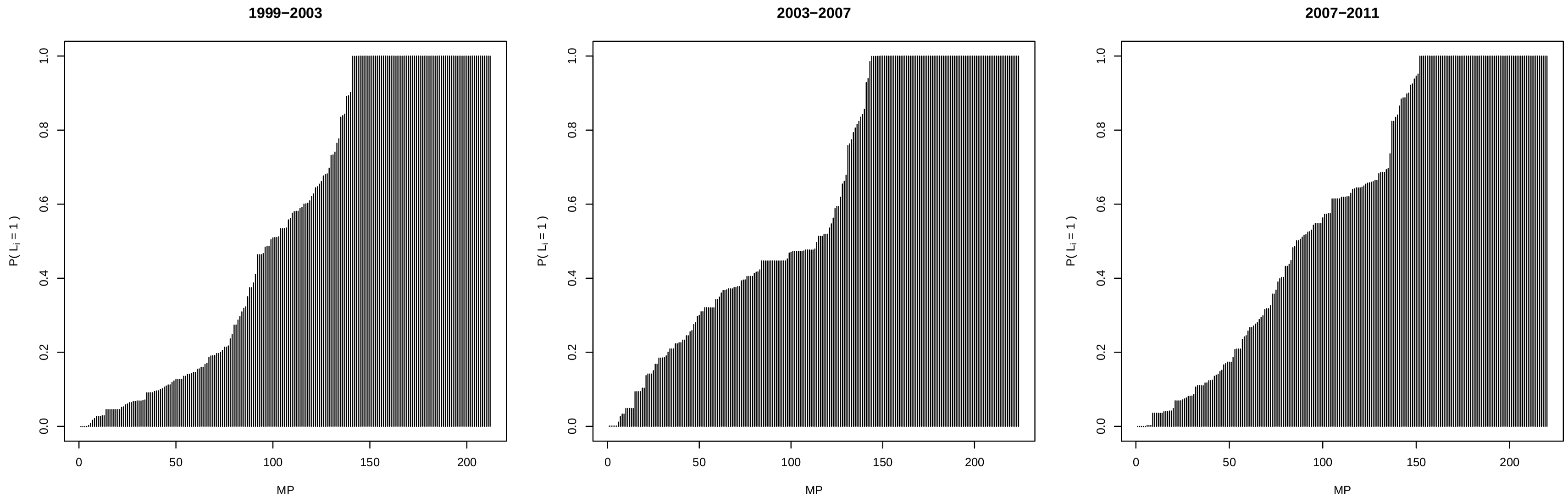
We propose a new empirical approach for estimating the probability of a representative acting as a trustee. The underlying modeling assumption is that trustees vote idiosyncratically. Under this assumption, we can estimate the probability of acting from a set of roll-call data only. The fact that the estimates are specific to each political representative opens the venue for investigations that not only address the nature of issues, but also political campaigns, party affiliations and the personal characteristics of legislators. In our empirical application, we find that almost all Swiss representatives who always act as trustee come from the far right or the far left of the traditional ideology spectrum.

The second quantity of interest from our estimation approach is the probability of a representative voting according to an unobserved common signal that influences the votes of all representatives. If the common signal reflects the will of the median voter, this would be the probability of congruence with the median voter. We validate our model and the assumption of the common signal representing the will of the Swiss median voter by confronting the predicted probabilities of congruence with the observed frequencies of congruence observed in a data set that matches the roll-call votes of Swiss legislators and the outcomes of subsequent referendums. The predicted probabilities of congruence strongly correlate with observed frequencies of congruence. We can then derive predictions for whether legislators act as delegates or trustees.

Our estimation model has several attractive features: i) it is flexible enough to accommodate abstentions and irregular tenures that are common in parliaments, ii) it generates positive correlation between individual votes that is typically observed, iii) it delivers estimates on an individual level (ranking of politicians) that can be aggregated to the institutional level. Under the assumption that the common signal represents the will of the median voter, this allows us to estimate the fidelity of representation for each legislator and for the parliament as a whole.

Once the relevance of a common factor (signal) in explaining voting patterns has been established, and given sufficient data, the model can be extended to include additional unobserved signals that are common to a subset of the legislators as opposed to all legislators. The subsets would partition the legislators into groups, for example, according to party membership. The approach can thus incorporate a third mode of political behavior known as the mandate model, which stipulates that politicians adhere to the electoral promises made by their party, and bow to the party discipline. The question would then be: 'To which extent to they bow to party discipline?' But it could be other things that align roll call votes, such as interest group influence and shared regional interests. For example, we may include signals specific to each constituency in an attempt to capture the effect of the constituency on voting behavior. Doing this would allow to predict the probability of congruence with the district median voter or even a party-specific voter in addition to predicting the probability of congruence with the country-wide of median voter. The approach presented in this paper allows to successively refine the common signal from a perspective by making it, loosely speaking, successively less common. As the estimation of rich binominal mixture models that contain multiple levels of signals requires extensive mathematical modeling and computing resources, our approach points to promising technical and empirical research avenues.

Figure 1: Estimated Probability of Acting as Trustee



The probability of a legislator acting as a trustee is given by $\mathbf{E}L_i = r_i$, the expected value of the mixing variable. The estimates are sorted in ascending order of their magnitude. Roughly one third of the estimates equals unity, implying certain idiosyncratic behavior.

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