Parliaments as Condorcet Juries: Quasi-Experimental Evidence on the Representation of Majority Preferences

David Stadelmann\textsuperscript{a} \hspace{1cm} Reiner Eichenberger\textsuperscript{b}
(University of Fribourg, CREMA) \hspace{1cm} (University of Fribourg, CREMA)

Marco Portmann\textsuperscript{c}
(University of Fribourg)

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Abstract

In parliament, individual representatives vote with a certain probability according to their constituents’ preferences. Thus, the mechanism of the Condorcet Jury Theorem can be fruitfully applied to parliamentary representation: The probability that a majority of representatives votes according to the preferences of the majority of their constituents increases with the number of representatives per district. The political economy literature has so far disregarded this aspect. We provide a theoretical discussion and quasi-experimental evidence for the validity of the Condorcet Jury Theorem in parliamentary representation by contrasting unique data from parliamentary roll call votes and popular referenda decisions.

Key words: Condorcet Jury Theorem, Preference Aggregation, Voting Behavior, Legislature, Political Representation.

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\textsuperscript{a} University of Fribourg, Bd. de Pérolles 90, 1700 Fribourg (Switzerland), +41 (0)26 300 82 63, david.stadelmann@unifr.ch and CREMA, Center for Research in Economics, Management and the Arts, Gellerstrasse 18, 4052 Basel (Switzerland)

\textsuperscript{b} University of Fribourg, Bd. de Pérolles 90, 1700 Fribourg (Switzerland), +41 (0)26 300 82 62, reiner.eichenberger@unifr.ch and CREMA, Center for Research in Economics, Management and the Arts, Gellerstrasse 18, 4052 Basel (Switzerland)

\textsuperscript{c} University of Fribourg, Bd. de Pérolles 90, 1700 Fribourg (Switzerland), +41 (0)26 300 82 62, marco.portmann@unifr.ch
1 Introduction

In representative democracies, citizens delegate their decision-making power to their representatives in parliament. Good systems of political representation align representatives’ voting behavior in parliament with the electorate’s preferences (Cox 1997, Gerber and Lewis 2004, Persson and Tabellini 2000). Economists and political scientists have intensely studied the effects of political institutions on decisions made by representatives. While they focused mainly on how different voting rules shape the incentives of parliamentary representatives and on institutional rules translating individual preferences into aggregate decisions, they have been astonishingly mute on the effect of the pure number of parliamentary representatives per district. However, the number of representatives per district can easily be hypothesized to play an important role: If the probability of each individual representative to vote according to her constituents’ preferences is below 100 percent but higher than 50 percent, the likelihood that majority decisions by parliamentary representatives meet the preferences of the majority of their constituents increases with the number of representatives per district.

Of course, this hypothesis is closely related to the mechanism of the Condorcet Jury Theorem which states that the size of a jury is systematically related to the quality of its decision. While this theorem has been widely investigated in other areas (see, e.g., Miller 1996, Mueller 2003, Congleton 2007 for overviews), its consequences for the match between legislative decisions of parliamentary representatives and their constituents’ preferences have – to the best of our knowledge – neither been addressed theoretically nor empirically.

We employ unique quasi-experimental data from Switzerland which allow us to empirically test the application of the Condorcet Jury Theorem’s mechanism in parliaments. Swiss voters reveal their preferences on real policy outcomes in popular referenda.1 We analyze 102 referenda an match revealed constituents’ preferences with their political representatives’ roll call votes in parliament. Representatives, i.e. members of the Swiss Lower House, are elected in districts which are identical to the 26 Cantons. As the number of representatives per district is proportional to population size, it varies widely from 1 to 34. Combining the variation in the number of representatives per district with information on whether representatives decide in parliament according to their district voters’ preferences results in a unique test for the mechanism of the Condorcet Jury Theorem in parliaments.

1 See the large economic literature on Swiss direct democracy starting with Schneider et al. (1981).
This paper contributes to the literature twofold. Firstly, we address the link between parliamentary representation of constituents’ preferences and the Condorcet Jury Theorem theoretically. Secondly, we provide unique quasi-experimental evidence on the Condorcet Jury Theorem with data from real parliamentary decisions which are matched with real decisions in popular referenda on exactly the same issues with the identical wording. Section 2 relates parliamentary political representation to the existing literature on the Condorcet Jury Theorem. Section 3 describes unique quasi-experimental data which allow us to match real decisions of political representatives with revealed citizen preferences and outlines our empirical approach. Section 4 provides empirical results which indicate that, due to the Condorcet Jury Theorem, the probability that a majority of representatives decide according to the preferences of their district voters is higher with many representatives per district than with few representatives or single-member districts. Section 5 concludes.

2 Parliamentary representation and the Condorcet Jury Theorem

When citizens delegate their decision-making power to parliaments they expect their delegates to represent their preferences. But representatives may largely deviate from voters’ interests as has been broadly discussed in the literature (Gerber and Lewis 2004). Therefore, economists and political scientists have intensely studied the effects of a large number of most diverse political institutions on the representation of voters’ preferences, such as majoritarian vs. plurality party systems, single vs. multi-member districts, presidential vs. parliamentarian systems, open vs. closed list elections, media and campaigning regulations, remuneration and side income regulations, lobbying regulations, committee structures, term restrictions, and many more (see Persson and Tabellini 2000 or Mueller 2003 for an overview). However, they seem to have disregarded the mechanism of an old but related theorem, the Condorcet Jury Theorem.

In his book “Essai sur l’application de l’analyse à la probabilité des décisions rendues à la pluralité des voix“ Marquis de Condorcet (1785) first described the quality enhancing property of majority decisions by many actors in the context of judicial juries: When juries try to find the truth, they may occasionally judge wrongly. Yet, if individual jury members more often judge rightly than wrongly, the majority decision of a sufficiently large jury will most likely reflect the truth. Clearly, this follows from the law of large numbers and Marquis de Condorcet therefore refers in his analysis to Jacques Bernoulli (Condorcet 1785, p. viii).
The Jury Theorem was originally developed by Marquis de Condorcet to analyze the quest for truth by juries in lawsuits (see, e.g., Stutzer 2004). However, the mechanism of the theorem may be applied more widely. Under simple majority voting the Condorcet Jury Theorem provides the important statement that as the size of the group goes to infinity the accuracy of the group’s decision goes to one (Young 1988, 1997). While the Condorcet Jury Theorem has been used to defend voter referenda and elections in democracies (see Miller 1996, Mueller 2003 and Congleton 2007) it has not been taken into account for parliamentary decisions.\(^2\) As the task of parliamentary representatives consists of representing voters’ true preferences, the Condorcet Jury Theorem’s mechanism can be fruitfully applied to parliaments where legislators may either represent voters’ preferences or not. Transferred to parliamentary decisions the theorem implies that the likelihood of a majority of parliamentary representatives to vote according to the preferences of the majority of their constituents increases with the number of representatives per district.

Political representatives accept or reject legislative issues in parliament. District citizens have preferences concerning the consequences of legislative issues. An individual representative deciding on a legislative issue votes with probability \(p\) according to the preferences of the majority of her constituents. With probability \(1 − p\) she votes against them. Probability \(p\) may depend on the differences in preferences between a representative and citizens, the representative’s incentives to cater to the preferences of her constituents, the representative’s information about the preferences of her constituents, and individual errors (see, e.g., Bohnet and Frey 1994, Frey 1994, 1997). As the respective incentives and information are not perfect, probability \(p\) is below 100 percent. However, \(p\) is typically above 50 percent. If this were not true, a representative could easily improve her performance as seen by the electorate, and thus her reelection chance, by just doing the opposite of what the other representatives are doing. Moreover, it would be better for the district majority to have a panel of experts advancing legislative proposals and to determine by flipping a coin which proposals should be accepted and which ones should be rejected. Therefore, it can be safely assumed that \(0.5 < p < 1\).

Thus, decisions of individual and independent parliamentary representatives, who represent the preferences of the majority of their constituents, follow in essence the assumptions of the Condorcet Jury Theorem. Denote with \(P_{[\nu/2]}\) the probability that a strict majority of \(n\) representatives votes according to the preferences of the district

\(^2\) In the masterly volume by Persson and Tabellini (2000), the Condorcet Jury Theorem is not even mentioned. In Mueller’s (2003) important book the theorem is discussed with respect to decision making in general but it is not applied to the size of parliaments.
majority, where \( \lfloor n/2 \rfloor \) is the greatest integer less than or equal to \( n/2 \). In the simplest form of the Condorcet Jury Theorem, the probability that a strict majority of \( n \) independent and identically distributed parliamentary representatives of a certain district vote according to the majority of their constituents may be given by expression (1)

\[
P_{\lfloor n/2 \rfloor} = 1 - \sum_{k=0}^{\lfloor n/2 \rfloor} \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k}
\]

for \( n \) odd (see Mueller 2003, pp. 128-129 for a similar formula applied to juries). Formula (1) represents a direct application of the basic Jury Theorem’s mechanism to political representatives and their constituents: The probability that a strict majority of parliamentary representatives vote according to the majority’s preferences of their electoral district increases with the number of representatives per district. While the depicted formula reflects the Condorcet Jury Theorem in its simplest form, it has been further generalized to, for instance, collective choices with dependent decision makers (see, e.g., Berend and Sapir 2007).³

As a consequence of the undue neglect of the Condorcet Jury Theorem’s mechanism in the context of parliamentary representation of district majority’s preferences, there exists so far no empirical evidence on its validity. We analyze whether decisions of the majority of representatives from the same district correspond to their constituents’ preferences. As the number of representatives per districts varies across Switzerland, we have an ideal setting to provide strong empirical evidence for the relevance of the Condorcet Jury Theorem for parliamentary decision making.

3 Matching political choices with preferences

We apply the insights from the Condorcet Jury Theorem’s mechanism to parliaments and test the proposed mechanism empirically, i.e. we test whether a large number of representatives per district produce majority decisions which are closer to the preferences of the majority of their constituents.

Switzerland offers a unique quasi-experimental setting to analyze the Condorcet Jury Theorem in political representation because it allows matching popular referenda data with decisions in parliament on exactly the same issues with the identical wording. The Swiss National Council (parliament) has 200 members from whom we possess individual voting records on 102 final votes (roll calls) from 1995 to 2007. These roll call votes were

³ The literature on political representation brought also forward substantial theoretical considerations and evidence on the effect of group size on the incentives of individual agents. Those different effects are ambiguous and we leave them to further research.
subsequently presented to the citizens in referenda from 1996 to 2008. The 26 Swiss cantons form the parliament’s electoral districts. The number of political representatives differs largely across electoral districts. Six districts have only one representative while the largest district, the canton of Zurich, has 34 representatives.

Political representatives in Switzerland vote on laws and law changes. The Federal Parliamentary Services Office records their individual votes on legislative proposals. Accepted legislative proposals do not directly turn into law. Swiss citizens may demand a popular referendum on parliamentary decisions before laws are enacted. Moreover, all constitutional amendments have to be confirmed by citizens, and citizens may also propose constitutional amendments and demand a referendum on their proposal. In popular votes, citizens reveal their preferences for policy outcomes by ranking law proposals against the status quo (as already argued in Schneider et al. 1982, Matsusaka 1992, Frey 1994).

Referenda results are available for every electoral district and for the whole period of analysis from 1996 to 2008 by the Swiss Federal Statistical Office. Referenda results for districts can be matched with voting data for political representatives on exactly the same political issues with the identical wording. More specifically, our data allow us to directly identify whether a representative in parliament voted according to her constituents’ preferences as revealed in the respective referendum. Appendix Table A1 provides the original text of each referendum’s topic in our dataset and the national result.

Individual political representatives to the Swiss Parliament generally vote with a probability higher than 50% with their district majority. Over the period analyzed we find 393 different individual representatives who voted at least once on an issue which was subject to a referendum. Figure 1 presents a boxplot of the average number of times each individual representative voted during her time in parliament with her district majority.

< Figure 1 here >

Analyzing individual correspondence of 393 representatives to district majority preferences, the average representative votes according to the preferences of the majority of her district voters in 67.9% of the cases (the standard deviation is 16.4). Over all representatives, the median corresponds in 71.3% of the cases with the preferences of the majority of her district voters, while the first quartile politician corresponds in 57.6%, and the third quartile politician in 79.4%, of the cases with majority preferences. Eleven representatives always voted according to the majority preferences and four outliers systematically voted against the majority of their constituents during their time in parliament. For our purpose it is important to note that individual correspondence to district
majority preferences does not increase but even slightly decreases with the number of representatives per district as could be expected theoretically.\footnote{In districts with several representatives there is proportional representation while in districts with only one representative elections follow a plurality rule. Plurality rule is generally believed to induce higher individual congruence between representatives and the median constituent (see, among others, Cox 1997 for a theoretical discussion and Portmann et al. 2010 for empirical evidence with Swiss data).}

By comparing revealed constituents’ preferences in referenda with representatives’ decisions on the same issues we can test whether the majority of representatives is more likely to vote according to the preferences of the majority of their constituents when the number of representatives per district increases. We thus analyze decisions on individual issues in parliament and check whether the majority of representatives have voted according to the district preferences. If strictly more than 50% of representatives have voted according to the revealed preferences of the majority of their constituents, we set the dependent variable \textit{MajorityMatch} equal to 1, otherwise \textit{MajorityMatch} is 0.\footnote{Consider two examples: (1) 57\% of the population of Uri voted “yes” in the referendum “Postal service for everybody (Postdienst für alle)” while the only representative of Uri voted against the proposal in parliament. Thus, \textit{MajorityMatch} equals 0. (2) The same referendum was rejected by the district of Zurich and a majority of its representatives. Thus, \textit{MajorityMatch} equals 1.}

\section{Evidence for the Condorcet Jury Theorem in parliamentary decisions}

We use the following logistic specification to evaluate the validity of the Condorcet Jury Theorem’s mechanism in political representation:

\[ P(\text{MajorityMatch}) = \Lambda(\alpha_0 + \alpha_1(#\text{Representatives}) + \sum_j \alpha_j x_j + \varepsilon), \]

where $\Lambda$ denotes the logistic function $\Lambda = \exp(X)/(1 + \exp(X))$ (with $X$ a design matrix). $\alpha_1$ captures the effect of increasing the number of a district’s representatives and $\alpha_j$ measures the effect of other controls. Appendix Table A2 provides descriptive statistics for all variables. If the Condorcet Jury Theorem in political representation holds, we expect $\alpha_1 > 0$. Table 1 presents the empirical results. We report robust standard errors which are clustered at district level.

\begin{table}
\caption{Table 1}
\end{table}

Specification (1) confirms the Condorcet Jury Theorem in political representation. The coefficient for the variable \textit{#Representatives} is positive and significant at the 1\%-level. As the number of representatives increases, the probability that the majority of them votes according to the preferences of the majority of their constituents increases too. From the theoretical model, i.e. equation (1), we can infer that due to the mechanism of the
Condorcet Jury Theorem in its simplest form, an increase in the number of representatives per district from 1 (lowest observed) to 34 (highest observed) should raise the probability that a majority of representatives votes according to their district majority’s preferences by 29.8 percentage points when $p = 0.6786$, i.e. at the observed mean value for individual representatives. To confront this theoretical prediction with the empirical data, we calculate a discrete change from 1 to 34 representatives for the predicted probability that the majority of representatives votes according to the district majority. The discrete change indicates that an increase in the number of representatives from 1 to 34 raises the probability that the majority of representatives votes according to the district majority by 26.0 percentage points. This is a large and important effect. It is, for instance, larger than the standard deviation (16.4) of the probability with which an average representative votes according to her constituents’ preferences and it is also larger than the inter-quartile range (79.4-57.6=21.8) of individual congruence.

In specification (2) we drop those observations from the dataset where exactly 50% of representatives voted according to the district majority’s preferences. Consequently, we exclude unclear majorities where MajorityMatch was defined as 0 before. Again, we find a positive and significant effect of the number of representatives on the probability to vote according to the preferences of the majority of constituents. The discrete change when increasing the number of representatives per district from 1 to 34 is 19.2 percentage points which is approximately two thirds of the theoretical prediction.

Thus, increasing the number of representatives per district leads to a closer match between constituents’ preferences and the majority of their representatives even if individual incentives for good representation are constant or decrease slightly in the number of representatives per district. This prediction by the Condorcet Jury Theorem for parliaments is strongly confirmed empirically. In the remaining specifications (3) to (8) we analyze whether the effect of the number of representatives remains stable for the inclusion of different controls.

We control whether the district majority’s vote in a referendum equals the national majority’s vote for all observations in specification (3) and for a restricted dataset in specification (4). Thereby, we capture the influence of diverging local and national interests on parliamentary decisions. If the district majority voted in line with the national majority the probability that a majority of representatives votes as the district (and the nation) increases, i.e. the variable DistrictMatchesCH is positive and significant. The effect of the number of representatives (#Representatives) remains positive and significant in both

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6 This can happen when there is an even number of representatives.
specifications. The discrete change is 20.7 percentage points in specification (3) which is again about two thirds of the theoretical prediction by the simplest form of the Condorcet Jury Theorem. In specification (4) the discrete change is with 14.0 percentage approximately half of the Jury Theorem's prediction which does not take account of other controls. Still, its absolute size is of obvious importance.

In specifications (5) and (6) we control for the time to the next parliamentary election (\textit{TimeToElection}), i.e. whether a referendum took place shortly ahead of parliamentary elections or not. The coefficient of this control is negative and significant. The longer the distance between the respective referendum and next parliamentary election, the larger the divergence between the majority of representatives and the majority of citizens. The sign, size and significance of \#Representatives does not change compared to earlier specifications.

Specifications (7) and (8) control for the district’s GDP (\textit{Income}), population density (\textit{Density}), and a dummy for French and Italian speaking districts (\textit{Latin}). Again, \#Representatives remains positive and significant confirming the Condorcet Jury Theorem’s mechanism in political representation. The discrete change is close to two thirds of the theoretical prediction in specification (7) and approximately 7 percentage points lower in specification (8) where the reduced number of observations is used.

5 Conclusion

The literature on political representation tries to analyze whether “what legislators do” reflects “what citizens want”. We show that, due to the Condorcet Jury Theorem’s mechanism, the probability that a majority of representatives votes according to the preferences of their district majority increases in the number of representatives per district. So far, this has been a neglected fact in political economy when analyzing parliamentary representation.

To establish the Condorcet Jury Theorem for parliaments empirically and quantify its importance, we take advantage of unique data from a quasi-experiment in Switzerland: Swiss referenda reflect voting behavior of citizens and thus how the majority of voters in each district value legislative proposals against the status quo. Referenda results can be matched with voting data for political representatives on exactly the same legislative issues with the identical wording.

Our results show that the probability that a majority of representatives votes according to the district preferences strongly increases with the number of representatives per district. The empirical effect is of a similar magnitude as the simplest form of the Condorcet Jury Theorem predicts. We usually establish more than half of theoretically predicted
congruence between the majority of constituents’ preferences and representatives’ legislative decisions. In other words, in line with the Condorcet Jury Theorem, a majority of many representatives per district is more likely to produce congruence with the majority of their constituents than a majority of few representatives.

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Figure 1: Probability of representatives to vote as district population

Notes: The Box-Whisker-Plot is based on votes of individual political representatives to the Swiss Parliament with the preferences of the majority of their constituents expressed in referenda over the years 1996 to 2008. The whiskers extend to the most extreme data point which is no more than 1.5 times the interquartile range from the box. Dots represent observations outside the interquartile range.