



On the prevalence of Condorcet's paradox

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Abstract

The Condorcet paradox has been a significant focus of investigation since Duncan Black and Kenneth Arrow rediscovered its importance for economic and political theory. Recent research on this phenomenon has oscillated between simulation studies, probability calculations based on hypothetical voter preferences, and empirical analyses of single election studies. This paper presents a comprehensive evaluation of 253 electoral polls conducted across 59 countries. Our findings demonstrate that the Condorcet paradox has virtually no empirical relevance: we find no robust evidence of cyclical majorities in any of the 253 elections. This result remains robust after statistical inference testing. Furthermore, this study provides insights into which parties are particularly likely to emerge as Condorcet winners and explores how these Condorcet winners assert themselves after elections.

Keywords Elections · Condorcet paradox · Condorcet winner · Voting

JEL Classification D71

1 Introduction

A *Condorcet winner*—an alternative that defeats all other contestants in pairwise majority comparisons—has intuitive appeal for democratic decision-making as it aligns with the principle of majority decision (Sen 2017, Ch. 5). An alternative x should be chosen over y if more voters prefer x to y . However, such a winner may not exist. Even when voters have transitive preferences, majority amalgamation can produce intransitive outcomes, a phe-

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nomenon known as the *Condorcet paradox* (Condorcet 1785, p. lxj(76)). A simple example involves three voters with antisymmetric (strict) preferences over three candidates: Voter 1 ranks $A \succ_1 B \succ_1 C$, Voter 2 ranks $B \succ_2 C \succ_2 A$, and Voter 3 ranks $C \succ_3 A \succ_3 B$. Here, A beats B by majority (henceforth: APB), B beats C (BPC), and C beats A (CPA), violating transitivity which in turn may cause an unstable and unpredictable outcome.

The Condorcet paradox, originally discovered by the Marquis de Condorcet in 1785 and intensely debated in the years predating the French Revolution, faded into obscurity for nearly 150 years (Rothschild 2005; McLean 2019, p. 99) before its significance was revived by Black (1948) and Arrow (1950) (Igersheim 2025(cf.). The Condorcet paradox has been regarded by many scholars in the social sciences as a serious problem, often described in stark terms such as “discordant”, “anarchic”, or even a “pathological” (see Miller (1983), p. 738ff, for an overview). However, the desirability of transitive social outcomes was questioned as intransitive outcomes can be seen as a protection for minorities against the ‘tyranny of the majority’ (Miller 1983; Moulin 1988, Ch. 10.4).

Eminent scientists have recently advocated for electoral reforms in favour of the Condorcet method, even beyond the academic realm (Maskin and Sen 2016, 2017b, a). In this public discourse, the Condorcet paradox is the unresolved core issue, as it is—alongside the debate over whether cardinal information should be considered—the main argument against the practical implementation of the Condorcet method.

Sen (2017, Ch. 10.2) highlighted the necessity of determining the relevance of Condorcet’s paradox through a comprehensive empirical analysis as a basis for advancing discussions on electoral reforms. Such a study should ideally cover various points in time and different societies. Motivated by this research desideratum, our work presents a comprehensive study that examines the occurrence of the Condorcet paradox across numerous national elections, spanning multiple countries and time periods and including both parliamentary and presidential elections.

We analyse data from 253 elections across 59 countries, provided by the Comparative Study of Electoral Systems (CSES 2024). Our results are not based on observed vote outcomes, but on data that allow us to reconstruct complete preference orderings for each respondent. The main finding of our analysis is that virtually no instance of a Condorcet paradox can be robustly identified across the election data under study.

Beyond this, we provide insights into the identity of Condorcet winners and evaluate the extent to which different electoral systems succeed in bringing these winners to office (in candidate elections) or into government (in parliamentary elections). We also examine which parties identified as Condorcet winners fail to win elections. In doing so, we offer, for the first time, a systematic analysis of the identification and electoral success of Condorcet winners.

2 Theoretical background and related literature

In spatial voting models, a Condorcet winner exists if voters’ ideal points are value-restricted (like single-peaked) on the underlying dimension (Black 1948). If the policy space is multi-dimensional, e.g., because multiple issues are decided upon simultaneously or because candidates are evaluated along multiple dimensions, preferences need to be radially symmetric (Plott 1967) to ensure the existence of a Condorcet winner—a highly unlikely condition in

empirical contexts such as large-scale national elections. In the absence of such Plott symmetry, a cycle over a triplet can extend across the entire set of options (McKelvey 1979). This may result in unstable, cyclical majority preferences (viz., Condorcet paradoxes) and hypothetically grants considerable agenda-setting power to whoever controls the voting sequence (Miller 2015).

Despite its theoretical significance, the empirical relevance of the paradox in democratic elections remains insufficiently substantiated. The most recent survey concluded that its empirical relevance is far from settled (Van Deemen 2014), largely due to a persistent lack of reliable data. Most results on the occurrence of Condorcet paradoxes are based on simulated data (Lepelley and Martin 2001; Gehrlein 2006; Sauermann 2022; Pittel 2025), or on non-political elections, like elections in academic institutions (Niemi 1970; Chamberlin et al. 1984; Feld and Grofman 1992; Regenwetter et al. 2007; Tideman 2009; Popov et al. 2014).

Empirical studies of real-world (democratic) elections are scarce. Many contributions investigate primary elections (Kurrild-Klitgaard 2018), referenda (Bochsler 2010; Justesen 2007), or sub-national elections (Munkøe 2014; Darmann and Klamler 2023). To the best of our knowledge, studies of national parliamentary elections are only available for three countries: the Netherlands 1982–1994 (Van Deemen and Noël 1998), the UK in 2010 (Abramson et al. 2013), and Denmark 1973–2005 (Kurrild-Klitgaard 2001, 2008). Empirical studies on presidential elections are limited to the US (Riker 1982; Abramson et al. 1995; Potthoff and Munger 2021), Iran 2017 (Feizi et al. 2020), Brazil 2018 (Maciel 2024) and France in 2007 (Abramson 2007). We are aware of only three empirical studies that investigate the (non-)occurrence of the Condorcet Paradox and winners across countries: McDonald et al. (2012) analyse cyclical majorities in 12 West European countries in 2004, but their data was not collected in the context of national elections. In a study covering 196 parliamentary elections, Desai and Kalandrakis (2025) found that in the vast majority of cases no strict Condorcet winner party exists, but that core parties (weak Condorcet winner parties) can be identified in every election. Lachat and Laslier (2024) focus primarily on how frequently different electoral systems produce divergent outcomes, and in this context they also report an almost complete absence of cyclical majorities in party elections.

Adding to the challenge is the observation that most studies refrain from making claims about statistical inference. Notable exceptions include Potthoff and Munger (2021); Desai and Kalandrakis (2025); Regenwetter et al. (2007); Darmann and Klamler (2023); Lachat and Laslier (2024); Maciel (2024), with the latter four explicitly assessing the robustness of their findings through bootstrap methods, an approach that we will adopt for the present study.

Based on the literature, only two elections likely revealed the existence of a Condorcet Paradox: the 2016 US election (Potthoff and Munger 2021), and the Danish election in 1994 (Kurrild-Klitgaard 2008). While this evidence is far too limited to evaluate the empirical relevance of the Condorcet Paradox in real-world national elections, especially considering elections in non-Western democracies, it suggests that cyclical majorities occur far less frequently than simulation-based studies have indicated. These studies consistently emphasize that both the number of alternatives and the structure of underlying preferences critically influence the frequency of Condorcet paradoxes, with greater randomness and more alternatives increasing their likelihood.

While single-peaked preferences guarantee the absence of majority cycles, their exclusive occurrence are not a *necessary* condition for the existence of a Condorcet winner. Intuitively, the probability of encountering a Condorcet paradox decreases as voter preferences become less random, for example, as their distribution increasingly resembles ideological-driven preferences (like single-peakedness). Since preferences over political parties or presidential candidates are likely shaped by a few underlying political conflict lines, or even by only one (ideological) dimension, empirical voter preferences may be sufficiently non-random to prevent Condorcet paradoxes most of the time. At a later point, we will therefore examine the structure of preferences in our empirical data.

3 Data and methods

We use survey data from the Comparative Study of Electoral Systems (CSES 2024). This is a cumulated data set consisting of nationally representative post-election studies fielded in 59 countries from 1996 onwards.¹ We use all currently available survey waves (1 – 5), covering elections up to 2021.

The dataset includes party and candidate ratings on a non-ipsative 11-point like-dislike scale (*integer sympathy scales*) for up to nine political parties and candidates. Such like/dislike data are frequently used to analyse strategic voting, because they have been shown to validly serve as strategy-proof reference values, which may then be compared with actual vote choices or voting intentions (Abramson et al. 2009; Eggers and Nowacki 2024; Núñez 2025). In this line, we also assume that the data are not significantly biased by strategic considerations and broadly reflect respondents' sincere preferences over parties and candidates.² Following an established procedure that was most recently applied by Lachat and Laslier (2024), we convert the ratings into individual preference orderings.³ For example, if voter i rates party A with +2, party B with +4, and party C with +1, this information is transformed into binary preference relations $B \succ_i A$, $A \succ_i C$. If a respondent rated two parties equally, we consider this as indifference. We infer respondents' preference orderings over parties in parliamentary elections by their party ratings. For presidential elections, we instead use candidate ratings to infer their preference rankings.⁴

Our analysis focuses on the existence of Condorcet paradoxes among national parties in parliamentary systems and among individual candidates in presidential elections. As a result, our research design does not capture Condorcet paradoxes that may arise among

¹ The CSES is a global research programme where election study teams from participating countries include a common set of survey questions in their post-election studies. The research agenda, questionnaires, and study design are developed by an international committee of experts and implemented by leading social scientists in each country. For more information, see their documentation on [cses.org](https://www.cses.org).

² Since parties' positional and valence strategies vary across electoral systems, we cannot entirely exclude the possibility that respondents' preferences are influenced by the institutional environment in which they are expressed, but are confident that they are not biased by strategic vote considerations that may be present within that system.

³ Based on a comprehensive dataset for Germany, where respondents provided both their ranking and their thermometer rating, Barbaro and Specht (2024) showed that the orders generated by the thermometer variables have a very high correlation with the directly reported orderings.

⁴ Unfortunately, candidate ratings are not available for three presidential elections, such that we have to infer respondents' candidate rankings from their party ratings. These cases are the presidential elections in Chile 1999, in France 2002, and in Taiwan 2004.

individual candidates within electoral districts, for example, in open-list proportional representation (OLPR) systems with weak parties.

In total, we analyse data on 212 parliamentary elections and 41 presidential elections. Restricting the CSES data to respondents who rated at least one party or candidate leaves us with 424,413 individual-level observations.⁵ On average, each election includes data from around 1730 individuals. We only include elections in which more than two parties or candidates were evaluated in the dataset. As a result, we had to exclude a few elections from the analysis. This primarily affects presidential elections in the United States. While multiple candidates ran in these elections, 'like-dislike' ratings were only collected for two candidates in each case.⁶

We treat the election survey as a representative sample of voter preferences within a single national district to determine whether a Condorcet paradox existed at a specific election.⁷ This simplification of the national electoral system is valid for our purposes because we focus on whether the pattern of voter preferences would lead to a Condorcet paradox if amalgamated most simply and directly, irrespective of district boundaries, federal pattern, electoral stages, and political engineering (Kaminski 2015, 2018; Evci and Kaminski 2021).

We identify the Condorcet winner and loser party for each parliamentary election. For presidential elections, we identify the Condorcet winner and loser candidates inferred from candidate ratings when possible. We first construct party and candidate preference profiles from the rating data, as explained earlier. We then apply the Condorcet method to these preference profiles for each election separately.⁸ Specifically, we calculated how many voters strictly prefer candidate *A* over *B* and vice versa. If a respondent rated *B* but not *A*, we assume they prefer *B*, and the same logic applies in reverse. We also conduct a robustness test in which we impute missing ratings instead of treating them as last ranked.

With κ parties/candidates, the procedure is repeated for all $\binom{\kappa}{2}$ pairwise contests, such as *A* vs. *C* and *B* vs. *C*, and so on. A party or candidate that wins each pairwise match-up is identified as the Condorcet winner. An election is classified as exhibiting a Condorcet paradox if no such winner exists due to cyclical majorities. Conversely, a party or candidate that loses all pairwise contests is referred to as the Condorcet loser.

To account for the uncertainty surrounding our survey-based results, we generate 10,000 bootstrap replications from the preference profiles of each election. Specifically, for each election we draw with replacement 10,000 samples of size *n* from the original sample of *n* individuals and apply the Condorcet method to each replication. For every single replication, we determine whether a Condorcet winner exists. This process results in 10,000 outcomes per election. In this way, we generate 2.53 million profiles.

The bootstrap method was employed to address the randomness inherent in the sample. Complementing this, we implemented a random-noise approach to account for uncertain-

⁵ 37,504 respondents reported no ratings, less than ten percent of our dataset. Respondents with incomplete ratings are included in our analysis.

⁶ We also had to remove the presidential elections in Kyrgyzstan 2005, as well as the Russian presidential elections in 2000 and 2004, due to a lack of like-dislike ratings of the presidential candidates Kurmanbek Bakiyev and Vladimir Putin, who ran as independents.

⁷ We consider weighting factors that weigh respondents by their political behaviour in a robustness test below.

⁸ We used the condorcet function in R's vote package (Raftery et al. 2021).

ties in the rating data. In this method, a random number drawn uniformly from the interval $[-1.1, 1.1]$ (representing $\pm$ ten percent of the total scale range) was added to each party or candidate rating. For each election case, we replicate this procedure 10,000 times. These matrices were then converted into preference orders following the procedure outlined earlier and subsequently analysed for the presence of cyclical majorities. In total, this process resulted in 2.53 million random-noise replications.

The random-noise approach effectively resolves all individual indifferences between two alternatives. For each triplet of alternatives, respondents are distributed across 13 distinct preference orderings: six are strict, six involve indifference between two alternatives, and one reflects indifference among all three. Figuratively speaking, the random-noise approach virtually eliminates indifferences by assigning respondents a strict preference ordering. However, the procedure may also result in the reversal of previously existing strict binary preferences.

4 Results

We do not find a single instance of a Condorcet paradox among the 212 parliamentary elections. Among the 41 presidential elections, for which the dataset provides ratings on more than two viable candidates, we identify one case of cyclical majorities, namely the 2011 Peruvian presidential election.

The overall pattern remains remarkably robust across all bootstrap replications. In 198 out of 212 parliamentary elections, not a single one of the 10,000 replications for each case exhibits a cyclical majority. In eleven cases Condorcet cycles appear in less than one percent of the replications. We observe a noteworthy number of bootstrap replications exhibiting cyclical majorities in only two cases. The first is the 2011 Peruvian parliamentary election, where approximately 18% of the replications display such patterns. However, as we demonstrate below, this result disappears entirely once political weighting factors are taken into account. The second case concerns the 2003 election in Iceland, where around 11% of replications show cyclical majorities. In this instance, a high number of individual indifferences in party ratings contributes to the outcome. As we show further below, once indifferences are effectively resolved through a random-noise procedure, the share of replications with cyclical majorities drops to just 2%.

A similar pattern emerges for the presidential elections. In 34 out of 41 cases, none of the respective 10,000 bootstrap replications exhibit cyclical majorities. With the exception of the 2011 Peruvian election—where a Condorcet paradox was identified in the original sample—cyclical majorities occur in fewer than 4% of replications, if at all. Even in the Peruvian case, the vast majority of replications (73.9%) indicate a transitive social ordering. As with the parliamentary elections held concurrently, the presence of cyclical majorities disappears once political weighting factors are taken into account.

The results from the random-noise replications align closely with those of the bootstrap analysis. In most cases, no Condorcet Paradox is observed across the 10,000 replications for each election. However, in four elections, cyclical majorities appear in more than five percent of the total replications, including the 2011 Peruvian election, where they occur in 10.7% of cases.

A list of elections in which cyclical majorities occur in at least one bootstrap replication or in at least one random-noise replication is provided in the Electronic supplementary material accompanying this paper.

4.1 Robustness checks

We have already mentioned that our analyses of the CSES dataset were conducted without applying sampling weights. The simple reason is that weighting factors are only available for a subset of election cases. These so-called 'political behaviour weights' (henceforth: PBW) serve to correct potential under-representation of specific voter groups. Where available, we included them as a robustness check. In only one instance (Croatia 2007) did the inclusion of PBW result in a significant number of cyclical majorities across the respective bootstrap replications (11.4%). However, the PBW inclusion in the case of the 2011 Peruvian elections (where we had previously detected cyclical majorities in the unweighted sample) yields no indication of such cycles. On the contrary, not a single Condorcet paradox appears in any of the 10,000 bootstrap replications using the PBW. Instead, Alejandro Toledo emerges as the Condorcet winner in 96.7% of the replications.

Another assumption underlying our empirical strategy concerns the treatment of missing values. If a survey respondent did not rate a particular alternative, we placed that alternative at the bottom of the respondent's preference ordering. To assess whether this approach had a discernible and influential effect on the results, we implemented an imputation procedure in which missing values were replaced with the respective median rating. That is, if a respondent did not evaluate party *A*, we substituted the missing value with the median rating assigned to party *A* by all other respondents in the same election. Based on the resulting modified dataset, we generated 10,000 new bootstrap replications for each elections case. Once again, we find that the results do not change in any substantial way. As with the consideration of weighting factors, it is possible that different parties or candidates are identified as Condorcet winners. However, this has no meaningful effect on the frequency of Condorcet paradoxes, neither in the bootstrap replications, nor in the random-noise replications.

4.2 Intransitivities

A Condorcet winner in an election does not necessarily imply a transitive order (Sen and Pattanaik 1969). Cyclical majorities can appear 'below' the Condorcet winner. In our analysis, we observe such cases four times, including the election in Finland in 2005, which is the only instance where no Condorcet loser is present. Overall, our findings indicate that collective preferences are almost universally transitive. Note that accounting for cyclical majorities in cases with a Condorcet winner does not dilute the overall result. On the contrary, in each election, we have $\binom{\kappa}{3}$ triplets. Summed across all elections, we analyse 8,099 triplets. Among these, we find cyclical majorities in five cases (0.06%).

4.3 What drives our results?

In light of our findings, it is natural to ask what explains the empirical absence of Condorcet paradoxes in democratic elections, and why the results appear so robust.

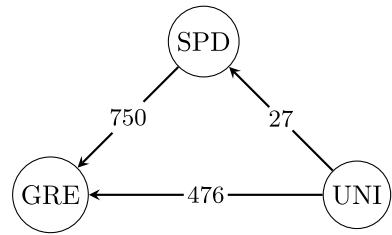
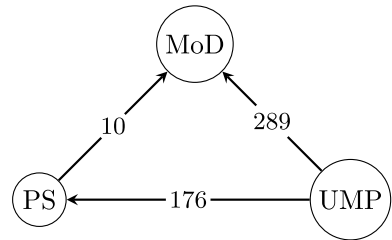
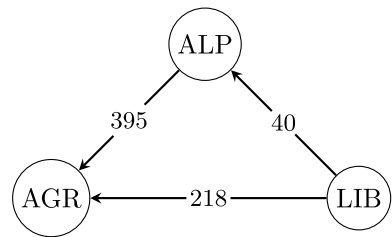
Sufficient conditions for the transitivity of majority decisions, such as the well-known *value restriction* (of which *single-peakedness* is a special case), the *extremal restriction*, and *limited agreement* (Sen 1966; Inada 1969), are all formulated as restrictions of the general type: if any individual holds a preference ordering of type R_1 , then no individual may hold an ordering of type R_2 (Sen and Pattanaik 1969, Sect. I). These conditions are rarely satisfied in empirical contexts. In large datasets, virtually every logically possible configuration of individual preferences tends to be observed. What matters for the existence of a Condorcet winner is not the absence of specific orderings, but rather that the empirical distribution of preferences exhibits a certain degree of homogeneity, as opposed to being uniformly random. In particular, within any triplet of alternatives, the alternative that lies between the other two on an ideological scale should be ranked last less frequently than the others. Such 'ideologically-driven' preference orderings (Dasgupta and Maskin 2004) reflects the idea behind single peakedness—not in a strict, but in an approximate sense. We will show that ideologically-driven preferences are highly prevalent in our data.

To assess the extent of ideologically-driven preferences in our data, we regress the individual party ratings on the distance between respondents' and parties' ideal points on a common left-right scale, considering the nested data structure by fitting a mixed regression model. We use the respondents' reported left-right position and their perceived party positions on a non-ipsative 11-point scale as provided by the CSES. We further rescale the preference and perception data by a technique originally developed by Aldrich and McKelvey (1977), to account for idiosyncratic scale usage, as well as projection effects, which could bias the results. We then calculate the absolute distance between rescaled individual ideal points and estimated party positions on the common scale as the independent variable to predict respondents' party/candidate ratings. Negative coefficients indicate that increasing ideological distance between respondent and party lowers rating scores. The results, which we present in Table 1, confirm that ideological distance exerts a statistically significant effect on party ratings. With conditional $R^2 > 0.8$, the model fit is very good and thus we

Table 1 Mixed regression model of party ratings on ideological distance between respondent and party, including random slope for ideological distance

Fixed effects	Coeff.	Std. err.
Intercept	5.44***	0.067
Ideological distance	−2.32***	0.105
Random effects	Variance	Std. err. (Var)
Individual: Intercept	0.990	0.994
Election: Intercept	1.097	1.047
Election: Ideological distance	2.711	1.647
Residual	6.897	2.626
# Individuals		273,535
# Elections		249
# Observations (Individual × party)		1,763,372
Log-likelihood		−4,293,563
AIC		587,140
R^2 (cond.)		0.827
R^2 (marg.)		0.508

Significance: *** $\equiv p < 0.001$; ** $\equiv p < 0.01$; * $\equiv p < 0.05$

Fig. 1 Germany 2013**Fig. 2** France 2007**Fig. 3** Australia 2019

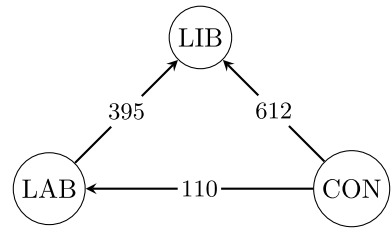
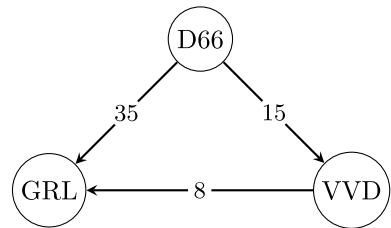
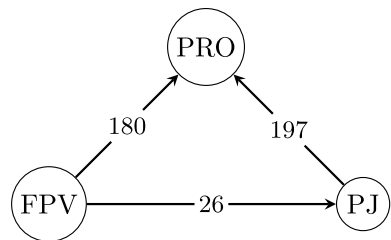
can imply that preferences over parties and candidates largely follow ideological considerations. Furthermore, the effect (slope) does not vary significantly across elections.

We conducted two additional analyses to assess the non-random structure of voter preferences. First, we applied χ^2 -tests to each party's and candidate's ranking distribution within every election study, testing for deviations from a uniform random distribution. In 99.51% of cases (1422 out of 1429 parties/candidates), we can reject the null hypothesis of uniformity at the 5% significance level.

Second, we performed factor analyses on the election-level matrices of party or candidate ratings, using parallel tests to determine the number of underlying factors. This approach allows us to identify how many latent dimensions structure individual preference profiles. The results show that in 49% of elections, three latent dimensions sufficiently capture the data, while in another 34% of elections, two dimensions are adequate.

To illustrate our overall findings, Figs. 1, 2, 3, 4, 5, 6 display six outcomes using margin graphs. In each case, we focus on the parties that secured the largest number of pairwise victories in the respective election. In the 2013 German federal election, these were the CDU/CSU (abbreviated as UNI), identified as the Condorcet winner, the Social Democratic Party (SPD), and the Green Party (GRE). A Condorcet winner is identifiable by the presence of two outgoing arrows in a margin graph.

The parties are ordered according to their perceived positions on a left–right ideological scale, as reported by the respondents. Our data indicate that centrist parties are significantly

Fig. 4 Great Britain 2015**Fig. 5** Netherlands 2017**Fig. 6** Argentina 2015

less likely to be ranked last than the parties to their left and right. For instance, in the 2017 parliamentary election in the Netherlands—a case discussed in greater detail below—we observe that fewer than 20% of respondents ranked the party D66 as the least preferred among the three parties considered. By contrast, approximately 80% of respondents exhibit single-peaked preference structures.

Regarding the 2013 German case, 799 respondents rated UNI higher than SPD, while 772 expressed the opposite preference, resulting in the majority of 27 shown in Fig. 1. Due to this relatively narrow margin, the SPD emerges as the Condorcet winner in approximately 25% of all bootstrap replications (19% of the random-noise replications). However, in every replication, either UNI or SPD is identified as the Condorcet winner, and each replication yields a transitive social ordering (considering all parties in the sample). The absence of cyclical majorities in the replications is attributable to the robust majority held by UNI over the Green Party. Breaking this majority would be a necessary condition for a Condorcet paradox to arise among the three parties. The alternative route to the emergence of cyclical majorities would require a reversal of the majority relation between the SPD and UNI, combined with a simultaneous reversal of the majority held by UNI over the Greens. Methods of statistical inference do not provide support for either of these routes.

We observe a very similar pattern in the case of the 2019 Australian election (Fig. 3), and in the 2015 Argentinian election (Fig. 6). In 16% of our bootstrap replication for the Australian case, the *Labor Party* (ALP) emerged as Condorcet winner instead of the *Liberal*

Party (LIB), but the *Australian Green Party* (AGR) consistently ranked third. The *Partido Justicialista* (PJ), the party once founded by Juan Perón, resulted in around 20% of the replication as Condorcet winner party instead of the center-left *Frente para la Victoria* (FPV). Again, every bootstrap replication indicated a transitive order with the market-orientated liberals from the *Propuesta Republicana* (PRO) consistently ranked below the other two parties.

However, in most cases the outcomes are highly robust with regard to the Condorcet winner. One example is the 2015 British general election (Fig. 4), where the *Conservative Party* emerge as Condorcet winner in all replications. However, among the cases with a highly robust Condorcet winner the subsequent ranks were less robust. An example for this pattern is the 2007 French election (Fig. 2), where the *Union pour un mouvement populaire* (UMP, conservative party in the Gaullist tradition) becomes a robust Condorcet winner, but it is uncertain whether the *Parti socialist* actually have beaten the centrist *Mouvement démocrate* (MoDem, the party endorsed in 2007 Emmanuel Macron).

The closest contest in our analysis occurred among three parties in the Netherlands (2017, Fig. 5). The centre-left party D66 emerges as the Condorcet winner. That D66 wins all pairwise comparisons has also been noted by Van Deemen and Noël (1998) for an earlier Dutch election (in 1994).⁹ However, the majorities over the conservative *Volkspartij voor Vrijheid en Democratie* (VVD) as well as over the *GroenLinks* (GRL) are rather narrow. We use this case to demonstrate why, even with slim majority margins, the existence of a Condorcet winner is robust across the statistical inference tests.

For cyclical majorities to emerge in Fig. 5, there would need to be a majority in favour of the GRL over the VVD, and simultaneously a majority of the VVD over D66. Alternatively, assuming the other two majority relations remain unchanged, the existing majority relation between *GroenLinks* and D66 would need to be reversed. Without loss of generality, we focus on the first case. In the sample for this election, there are 938 respondents. Of these, 376 prefer the VVD over the *GroenLinks*, while 368 express the opposite preference. In the match-up between VVD and D66, 327 respondents favour VVD and 342 favour D66. Given such narrow margins of only 8 and 15, one might expect frequent reversals of the majority relation in the replications. However, this impression is misleading.

The crux of the matter is that only one of the twelve (ignoring the cases with two indifference) possible preference orderings may occur with sufficiently high frequency, namely $GRL \succ VVD \succ D66$. In our dataset, only 50 respondents (approximately 5%) exhibit this specific ordering. Now consider the hypothetical case of adding 16 new respondents, which resembles a simplified bootstrap procedure. If respondents with other preferences are drawn, they either counteract the emergence of cyclical majorities (e.g. $D66 \succ VVD \succ GRL$), or contribute to it only partially and hence ineffectively (e.g. $GRL \succ VVD \sim D66$). The probability that all 16 newly drawn respondents possess precisely the required preference ordering is practically zero.

Of course, there are other combinations in which two or more preference orderings would need to occur in specific proportions,¹⁰ but these cases are even less likely and, in aggregate, do not meaningfully increase the overall probability of cyclical majorities.

⁹The far-right PVV, the party of Gert Wilders, won the second-most votes with 13.1% but emerges as Condorcet loser party in our assessment.

¹⁰For example, nine respondents with $GRL \succ D66 \sim VVD$ and sixteen with $VVD \succ D66 \sim GRL$, or sixteen with $VVD \sim GRL \succ D66$.

A detailed description of the distribution across the twelve preference orderings, along with a more comprehensive explanation of the just-outlined results, is provided in the Electronic supplementary material accompanying this paper. For now, however, we may conclude that the presence of several narrow majority margins does not, in itself, imply that intransitivities necessarily fall within the range of statistical uncertainty.

5 Condorcet winner parties and candidates

Given that Condorcet winners exist in virtually all elections under study, we subsequently focus on descriptive results on these winner parties and candidates.¹¹ Figure 7 plots the frequency of Condorcet winners and losers by party family.¹² It shows that Condorcet winners are most often social-democratic parties. National parties are the most common among the Condorcet losers. A full list of Condorcet winner and loser parties is presented in the Electronic supplementary material. Table 2 provides an extract from the full list, covering the G7 countries only.

This list yields some interesting insights. For example, although Condorcet-winner parties are often centrally located within the party system, they are not necessarily large parties. In the Netherlands, for instance, the liberal party 'Democrats 66' (D66) was the Condorcet-winner party in 2010, 2017, and 2021, despite its low vote share of only 7%, 12%, and 15%, respectively. In the 2010 election, it was only the sixth-largest party in terms of votes and parliamentary seats. In 2017, it ranked fourth, and in 2021, it ranked second. In an earlier study for the election year 1994—which our dataset does not extend back to—Van Deemen and Noël (1998) had already found that D66 emerged as the Condorcet-winner party. Even

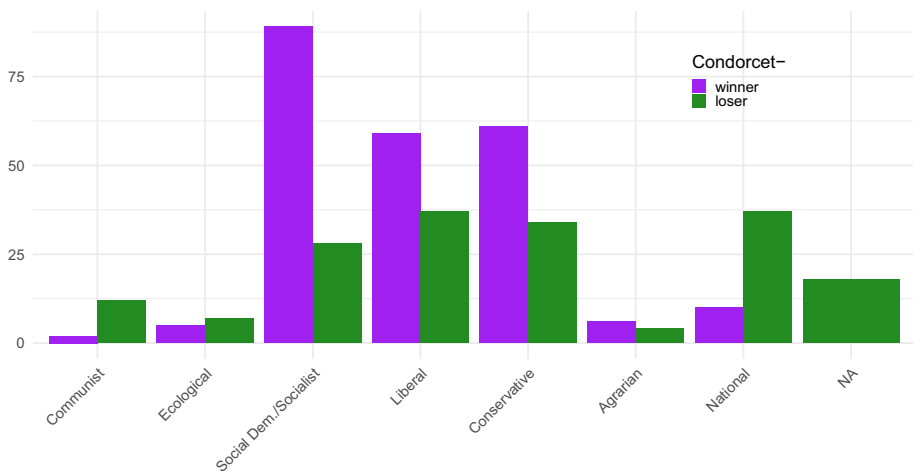


Fig. 7 Frequency of Condorcet winner and loser parties by party family

¹¹ In cases where the bootstrap or random noise procedure sometimes detects other winning parties or candidates, we focus on the Condorcet winners that we detect based on the original sample in the following section.

¹² We use the classification of party families as provided by the CSES. It is based on expert judgments of the CSES national collaborators as to which ideological family each party belongs to.

Table 2 List of Condorcet winner and loser parties or candidates in G7 countries

Country	Year	Condorcet winner party	Condorcet loser party
Canada	1997	Liberal Party (LIB)	Bloc Quebecois (BQ)
Canada	2004	Liberal Party (LIB)	Bloc Quebecois (BQ)
Canada	2008	Conservative Party (CP)	Bloc Quebecois (BQ)
Canada	2011	Conservative Party (CP)	Bloc Quebecois (BQ)
Canada	2015	Liberal Party (LIB)	Bloc Quebecois (BQ)
Canada	2019	Liberal Party (LIB)	Bloc Quebecois (BQ)
France	2002	Jacques Chirac (RPR)	Jean-Marie LePen (FN)
France	2012	Francois Hollande (PS)	Francois Bayrou (MoDem)
France	2017	Emmanuel Macron (LaREM)	Marine Le Pen (FN)
Germany	1998	Soc. Dem. Party (SPD)	Left Party (DIE LINKE)
Germany	2002	Soc. Dem. Party (SPD)	The Republicans (REP)
Germany	2005	Soc. Dem. Party (SPD)	Nat. Dem. Party of Germ. (NPD)
Germany	2009	Christ. Dem. Party (UNI)	Left Party (DIE LINKE)
Germany	2013	Christ. Dem. Party (UNI)	Alt. for Germany (AfD)
Germany	2017	Christ. Dem. Party (UNI)	Alt. for Germany (AfD)
Germany	2021	Soc. Dem. Party (SPD)	Alt. for Germany (AfD)
Great Britain	1997	Labor (Lab)	Conservatives (Con)
Great Britain	2005	Labor (Lab)	Conservatives (Con)
Great Britain	2015	Conservatives (Con)	UK Independence Party (UKIP)
Great Britain	2017	Labor (Lab)	Plaid Cymru (PC)
Great Britain	2019	Conservatives (Con)	Plaid Cymru (PC)
Italy	2006	National Alliance (AN)	Communist Refoundation (PRC)
Italy	2018	Five Star Movement (M5S)	Free and Equal (LeU)
Japan	1996	Liberal Democratic Party (LDP)	New Party Harbinger (NPH)
Japan	2004	Democratic Party of Japan (DPJ)	Jap. Communist Party (JCP)
Japan	2007	Democratic Party of Japan (DPJ)	Jap. Communist Party (JCP)
Japan	2013	Lib. Dem. Party (LDP)	Green Wind
Japan	2017	Lib. Dem. Party (LDP)	Japanese Communist Party (JCP)
USA	1996	Democratic Party	Reform Party
USA	2004	Democratic Party	Reform Party

then, the vote share of 15.5% did not reflect the broad support for the D66 party among the electorate. We also find a correspondence with the results from two Danish elections in 1998 and 2001, as identified by Kurrild-Klitgaard (2008) (using a different dataset than the one we employed).

For Great Britain, our data show that the Condorcet winners can indeed vary but generally align with the winners under the First-Past-The-Post system. An exception is 2017, when the Tories narrowly won the general election, but Labour emerged as the Condorcet winner. The 2005 election is not included in our dataset; however, Abramson et al. (2013) identified the Liberal-Democrats as the Condorcet winner for that election.

Noteworthy, there are instances where Condorcet-loser parties gain a significant number of votes and seats. Polarising right-wing parties, in particular, benefit from this imbalance. For example, the far-right 'Sweden Democrats' were the Condorcet-loser party in 2006, 2014, and 2018. Yet, they increased their vote share to 12.9% in the 2018 election, becoming the third-largest party out of eight in the 2014 and 2018 parliaments. In Germany, the far-right Condorcet loser AfD became the third-largest faction in the Bundestag in 2017

Table 3 Condorcet efficiency by type of election (parliamentary vs. presidential and by electoral systems

Condorcet winner	Parliamentary			Presidential
	Plurality	Proportional	Mixed	
	<i>N</i> = 26	<i>N</i> = 135	<i>N</i> = 51	<i>N</i> = 41
Largest elect.	68%	61%	82%	79%
Party/candidate	[51–81]	[54–68]	[72–90]	[67–88]
Prime minister/ President	88% [73–96]	66% [58–72]	73% [61–82]	78% [64–87]
Part of Government	92% [78–98]	89% [84–93]	98% [91–100]	
Condorcet loser				
Part of Government/ president	0%	13% [11–23]	6% [3–19]	2% [0–11]

with 12.5% of the vote, surpassing three parties that had each won their pairwise comparison against the AfD. An even more extreme case is the 2011 Swiss election, where the national-conservative Swiss People's Party gained the largest vote share while emerging as the Condorcet loser.

6 Condorcet efficiency

Table 3 provides a systematic overview of the empirical *Condorcet efficiency*¹³ of electoral systems. We calculate how frequently Condorcet winners emerge as electoral victors (i.e., as the largest parliamentary faction) and examine how often they are included in the subsequent government following the election. The results are presented by election type and electoral system. At the end of this section, we also report the Condorcet efficiencies of the Borda count. The first row of Table 3 highlights the frequency¹⁴ at which Condorcet winners become the largest electoral party, revealing significant variation across election types and systems. Condorcet winners are most successful in parliamentary elections with mixed electoral systems (82%) and in presidential elections (79%), but their success rate is lowest in parliamentary elections using proportional representation (61%).

The second row in Table 3 reports how often Condorcet winners win the prime minister's office or the presidency. It shows that in parliamentary systems with plurality or proportional rules, Condorcet winners obtain government leadership even if they are not the largest electoral party, increasing their success rate to 88% resp. 66%. This is not the case in any of the mixed systems in our data. Since the most-vote getter in presidential elections typically also win the presidency, the rate is identical to the first row.

Condorcet winners may still hold government offices, e.g., as a junior coalition partner. The results reported in the third row indicate that this is often the case: the government

¹³ The term Condorcet efficiency refers to the conditional probability that a voting rule selects the Condorcet winner, given that one exists (Gehrlein and Lepelley 1998).

¹⁴ The values in square brackets indicate the confidence interval of Agresti-Coull binomial tests (Agresti and Coull 1998) (values in percentages and at a 90% significance level).

participation rates are significantly larger than the election winner rates and the prime minister/presidency rates. Again, there is variation by election type and system, with mixed electoral systems in parliamentary elections showing the largest Condorcet efficiency in government participation (98%). Proportional and mixed rules in parliamentary elections are less efficient in selecting Condorcet winners into government (92% and 89%). Overall, the government formation period that follows upon parliamentary elections enhances the Condorcet efficiency of parliamentary systems, superseding presidential elections in terms of government posts for Condorcet winners.

Another way to assess the Condorcet efficiency of electoral systems is to examine how frequently the participation of Condorcet-loser parties in government is prevented. The bottom row in Table 3 indicates that proportional electoral systems are most prone to the success (viz., becoming part of the government) of Condorcet-loser parties. From a normative standpoint, this may be justified, as one of the premises of proportional systems is to enable ethnic, religious or other minorities to have their legitimate share of power, so as to prevent the 'tyranny of the majority' (Miller 1983). However, in only four out of twenty cases the Condorcet loser party in cabinet is categorized as ethnic party.

A particularly striking scenario in candidate elections, which defies axiomatically grounded reasoning, occurs when, ironically, the Condorcet loser emerges as the plurality winner. This phenomenon is known as *Borda paradox*, termed after Condorcet's intellectual foil. In our analysis of 41 presidential candidate elections, we uncover a notable instance of this paradox in the 2000 Mexican presidential election. In this case, Vicente Fox secured the plurality vote despite being a Condorcet loser, while the Condorcet winner, Cuauhtémoc Solórzano, placed third in the election.

Finally, we applied our data to the Borda rule, a positional voting system that assigns weights to alternatives based on their rank-order positions. We then compared the winners under the Borda rule with the Condorcet winner to evaluate how often they align. The results reveal that 93.4% of Borda winners are also Condorcet winners, indicating that the Borda rule achieves a higher Condorcet efficiency compared to the plurality rule (see Table 3).

If a party is the Borda winner but not the Condorcet winner, this discrepancy stems from differences in the intensity of preferences. The Condorcet method adheres to Arrow's Independence of Irrelevant Alternatives (IIA), which disregards any consideration of preference intensities (Sen 2017, Ch. 7). In contrast, the Borda rule incorporates preference intensities through ordinal information (Nitzan and Nitzan 2024; Maskin 2025). For example, suppose 60% of the electorate prefers $A \succ B \succ C$, while 40% prefers $B \succ C \succ A$. In this scenario, A emerges as the Condorcet winner, while B becomes the Borda winner. This outcome is influenced by candidate C (violating IIA): their middle ranking within the minority group may indicate that the preference intensity for B over A in the smaller group outweighs the preference intensity for A over B in the majority group.

When the Condorcet winner belongs to the socialist/social democratic or liberal party families, they also tend to be the Borda winner in 98% of cases. In contrast, this coincidence is lower for the conservative/Christian-democratic party family, at 85%.

7 Conclusion

Two hundred and forty years ago, the Marquis de Condorcet introduced to the French Academy of Sciences the paradox that now bears his name. Ever since, it has been recognized as a profound challenge within the social sciences. In recent decades, researchers have sought in various ways to assess the empirical relevance of the Condorcet paradox in democratic elections. However, it has always been clear that only a comprehensive empirical analysis across different countries and dates could provide a substantive insight. This study leverages the availability of comparative data and advanced computational capabilities to conduct an empirical investigation in this broader vein. Our findings reveal that, based on latently-existing preferences of voters, the Condorcet paradox holds virtually no empirical relevance in national elections.

We find a Condorcet winner in virtually every country and at every point in time. Moreover, we are able to identify who these Condorcet winners are and the party families to which they belong. Our results are encouraging in that Condorcet winners frequently succeed in becoming part of the governing coalitions. However, the degree of Condorcet efficiency varies significantly between electoral systems.

Our analysis also demonstrates that Condorcet losers nearly always exist. Fortunately, Condorcet-loser parties do not frequently make it into government. However, we observe that different electoral systems vary in their effectiveness at preventing this. Our findings reveal that proportional electoral rules are the least effective in ensuring electoral victory and government participation for Condorcet winners, while simultaneously being the least effective at preventing Condorcet losers from participating in government. These insights should be carefully considered in ongoing debates about electoral reform.

With regard to candidate elections, our findings may encourage advocates of electoral reform in favour of simple-majority rules based on Condorcet's principle of pairwise comparisons. However, we adopt a more cautious stance when it comes to multi-winner elections, such as parliamentary contests. These require an apportionment method, as the ordinal nature of the Condorcet procedure provides a social ranking of parties but does not, by itself, imply a determinate allocation of parliamentary seats. That is, it does not answer the question: how many more seats should the Condorcet winner receive compared to the second-ranked party? The choice of apportionment method, however, introduces a strategic element for electoral authorities (Kaminski 2015). Even if strategically motivated changes to electoral rules do not always produce the intended effects (Evci and Kaminski 2021), they may induce strategic behaviour among voters that could, in turn, manifest in cyclical majorities. However, the problem that institutional frameworks may distort electoral outcomes arises under any voting procedure.

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