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Borda paradox in the 2017 Iranian presidential election: empirical evidence from opinion polls

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Abstract

Different voting paradoxes identified by social choice theorists have rarely been documented in real-world elections. The collected data from the opinion polls in the 2017 Iranian presidential election provides substantial empirical evidence indicating that during the electoral campaigns, strong Borda paradox (the Condorcet loser wins plurality.) and weak Borda paradox (An alternative that is not the Condorcet winner wins plurality.) have occurred. At the same time, there was no evidence of a Condorcet paradox, i.e., a cycle among the top three candidates. The results support the empirical relevance of theoretical paradoxes in social choice and a call for the importance of voting procedures.

1 Introduction

Iran has a theocratic presidential form of government. Every 4 years, a presidential election is held to announce the president based on the majority rule. If no candidate wins a majority of the votes, the election is repeated for a second round between the top two candidates. Nevertheless, opinion polls give us this opportunity not only to see what would happen in different voting methods, but also to determine its anomalies and paradoxes. At least in Iran, the 2017 presidential election was the first time

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to have had some survey data with polling agencies reporting relative pluralities and also pairwise comparisons.

On the one hand, the machinery does not still work perfectly since Iranians are experiencing elections for only a few decades and emotional instances might change voters' attitude toward different candidates. On the other hand, most of the people do not identify themselves with a specific political party since there are no western-style political parties who campaign months before the Election Day. They make up their mind about whom to vote for very late, even in the last days before the Election Day. Meanwhile, their preference over candidates might vary a lot and be prone to different social and behavioral biases. Therefore, looking from this perspective, with not necessarily consistent and rational political preferences, it is expected to observe some paradoxes in political preferences of voters over candidates.

To make a collective choice that genuinely represents the will of the people, we need to aggregate individual preferences socially via a voting method. Theoretically, three main voting methods are chosen for this study: The *Plurality Rule*, the *Condorcet Method*, and the *Borda Count*. The Plurality Rule elects the candidate with the most, and not necessarily the majority, of first-place votes. In other words, if the number of ballots ranking a candidate as the first preference is higher than those of other candidates, then the candidate is the winner in the plurality rule. While in pairwise majority rule, the winner of each contest between any pair is decided by the majority rule. The plurality rule is not indeed strategy-proof and tends to be biased toward extreme candidates.

A Condorcet Method selects the candidate who would win in all of the one-to-one contests against each of the other candidates based on pairwise majority. Such a candidate is called the Condorcet winner while a candidate who would lose in all of the one-to-one contests is called the Condorcet loser. The Borda Count is a single-winner consensus-based voting method that gives each candidate, for each ballot, a number conforming to the sum of alternatives the voter ranked inferior. For instance, in an election with n candidates, each candidate gets $n-1$ points for each of his votes as the first-choice, $n-2$ points for each of his second-choice votes, and so on, with no point for each of his vote as a last-choice. Once all ballots have been calculated, the candidate with the most points is the winner.

Nevertheless, as social choice theory suggests, making societal preferences based on individual preferences is not only problematic but also sometimes perplexing (Arrow 1963). The appearance of a paradox in elections casts doubt about effectiveness and fairness of democratic governance and makes some normative concerns on its relevance. Mackie (2003) confronted and subdued these doubts, and argued that problems of cycling, agenda control, and strategic voting are not that harmful, frequent, or irremediable. He also examined every serious empirical illustration of cycling and instability and showed that almost every empirical claim is inaccurate, and none is normatively troubling. Kurrild-Klitgaard (2014) also pointed out that cycles in social preferences appear to be occurring much less frequently than perhaps social choice theorists first thought. Nevertheless, they might exist and should be seriously taken as possibilities.

Social scientists have identified some paradoxes that arise while dealing with social choices. The two well-known puzzles are Condorcet paradox, named after

Marquis de Condorcet, and Borda paradox, after Jean-Charles de Borda. The strict Borda paradox arises when a plurality of voters prefer a candidate who is beaten in pairwise match-ups with each of the other candidates. (cf. Gehrlein 2006; Gehrlein and Lepelley 2011). The weak Borda paradox follows when at least one candidate could beat a plurality winner when compared head-to-head.

The Condorcet paradox occurs when there is a cyclical majority in a head-to-head comparison of societal preferences between candidates even if the individual preferences of voters are acyclic. This means that for each candidate, it might be possible to select an opponent where the opponent would win a majority of the votes. e.g., A beats B, B beats C, but C also beats A. (cf., e.g., Gehrlein 2006; Gehrlein and Lepelley 2011). This cyclical majority is inconsistent since the majority's desire is in conflict with each other and the availability of a losing candidate could influence election of the winner. The Condorcet paradox implies that the election has no Condorcet winner since no candidate can win a head-to-head election against other candidates. This will pose real problems to democratic decision making since once we only have societal ranking over candidates, there is no fair and deterministic resolution to solve this puzzle.

Voting paradoxes are not just hypothetical mathematical or made-up hypothetical situations but rather the very reality of ordinary elections that might be highly consequential. These paradoxes may even interfere with real-world politics inadvertently as a by-product of institutional choices made earlier (Kaminski 2015). With these paradoxes, we might have a discrepant choice as it depends not only on societal preferences but also on voting arrangements. Since modern social networks, such as Facebook and Telegram, have allowed manipulation of news and beliefs, and also presentation of a fabricated view of reality, polls could assist a better understanding of societal trends by utilizing scientific and credible measurements.

Although conducting polls in the course of electoral campaigns has increased lately, they mostly use plurality voting which does not elicit preference ranking over candidates. Therefore, it is not possible to measure potential voting paradoxes in the preference of voters since we do not have any information about the pairwise comparison of candidates. Hence, with the lack of actual data, it is not possible to assess paradoxes empirically in social choice. That was the reason why studies often reconstruct real preferences (Kaminski 2015: 367ff) or deal with hypothetical scenarios (Kurrild-Klitgaard 2001).

Polling has recently become a universal toolbox in electoral campaigns to realize voters' preferences and somehow open up what is going on in their minds. However, the problem has been once again raised as their data have been mostly private and not provided for general audiences. Although there is a growing literature on theoretical basis and implications of these paradoxes for social choice, there have been relatively few studies with empirical pieces of evidence of these puzzles in real elections. This lack of observational testimonies has mostly happened since in voting only one's best choice is counted and his/her second or third, etc. choices are not.

Empirical research studies have mostly failed to provide real-world evidence of theoretical phenomena studied in the social-choice literature such as cyclical collective preferences or strategic voting. The purpose of Lagerspetz (1993) was to show empirical relevance for theoretical results of social choice theory as almost all its

theoretically interesting phenomena were evident in the 1956 Finnish Presidential elections. As it will be explained later in this paper, Lagerspetz (1997) analyzed the Finnish presidential elections in 1925, 1931, 1937 and 1982 and demonstrated that preference cycle and strategic voting have had a significant impact on those elections.

Using pair-wise comparisons, Kurrild-Klitgaard (2001) suggests the existence of a real cyclical majority in a poll of Danish voters' preferred prime minister. Moreover, this result is compared with those of a similar poll. However, each poll results in different choices when we use different voting methods. Kurrild-Klitgaard (2008) used survey data to analyze voter preferences for eight general elections for the Danish parliament. He concluded that three types of social choice paradoxes occurred in eight general elections for the Danish parliament though with different frequencies.

Van Deemen (2014) reviewed the literature on empirical relevance of Condorcet's paradox and investigated conditions on the domain of voter preferences to prevent the paradox, its likelihood, and empirical detection. His overall conclusion was that the empirical relevance of Condorcet's paradox is still unsettled. Kurrild-Klitgaard's study (2017) was one of the few studies with empirical evidence of Condorcet as well as Borda Paradoxes in real elections. Kurrild-Klitgaard identified that a cyclical majority might have existed in Republican voters' preferences in the pre-primary 2015 by using polling data from the 2016 Republican presidential primaries. Furthermore, later polling data in early 2016 suggests that while Trump was the Plurality Winner with less than half of the total votes, he could have been the Condorcet Loser.

This paper is intended to demonstrate that social choice paradoxes are indeed not only happening in elections but also might affect their outcomes. Our study follows the same procedure with different data and various results. We will conduct this research by using some specific polling data, before the 2017 Iranian presidential election, which have not previously received any attention. Our results not only prove the practical importance of theoretical voting paradoxes and importance of voting procedures but also shed some light on surprising and unforeseen outcomes of elections in Iran.

This paper is organized as follows. In Sect. 2, we will briefly review the 2017 Iranian presidential election. In Sect. 3, we introduce the main opinion polls conducted during electoral campaigns and focus on some specific dates when we had data from some of the polling agencies. In Sect. 4, we discuss the general results from all polls and present conclusions.

2 The 2017 Iranian presidential election

The 2017 Iranian presidential election was held under the plurality runoff rule. Out of over 1600 candidates who had registered as candidates for the 2017 presidential election in 5 days, six candidates were approved to run by Iran's Guardian Council, the organization that scrutinizes candidates for public office. Once the final list of candidates was announced, the official election campaign began and it continued

until 24 h before the Election Day. That year's campaign period lasted from April 28 to May 17, and the Election Day was on May 19, 2017.

Electoral politics in Iran revolve not around parties but around evolving factions that are built around political figures and often short-lived (quasi) small parties. Among six final candidates, namely Hassan Rouhani, Ebrahim Raisi, Mohammad-Baqer Ghalibaf, Eshaq Jahangiri[1], Mostafa Hashemitaba[2], and Mostafa Mir-Salim[3], only the latter was officially running with his conservative party's support although he did not accept the decision of his party to withdraw. In this election which was held on May 19, 2017, Hassan Rouhani was re-elected for a second term with 57.1% of votes counted while Ebrahim Raisi, his closest rival, received 38.2% of the votes after the strategic withdrawal of Mohammad Ghalibaf.

Reformist and fundamentalist factions in the political sphere of Iran differ on a wide variety of issues, from political liberalization to relations with the West. They also have the flexibility to create alliances and electoral lists that bring their factions' resources together in the service of a particular election. For example, a reformist-centrist alliance worked to get Hassan Rouhani elected in 2013, and this year, various fundamentalist factions have come together to support the candidacies of Ebrahim Raisi and Mohammad Baqir Ghalibaf.

As an incumbent, centrist president Hassan Rouhani was running for his second term in 2017. Rouhani delivered on his primary campaign promise, the 2015 nuclear deal, but both citizens and conservative opponents argue that its economic benefits have not trickled down to the society. Uncharismatic conservative cleric Ebrahim Raisi was considered the preferred choice of Iran's hard-line establishment. He oversees Iran's most celebrated, multi-billion-dollar religious foundation, the Astan Quds Razavi, based in Mashhad. The longtime Tehran mayor Mohammad Bagher Ghalibaf was considered among Rouhani's strongest competitors. A conservative former commander of the Islamic Revolutionary Guard Corps and a licensed pilot, Ghalibaf had run twice for president, finishing fourth in 2005 and second in 2013.

3 Election opinion polls

The time voters spent and the period in which they decided to vote for a particular candidate are significant factors or analysts, media organizations as well as social and political actors and activists who want to evaluate the impacts of election campaigns on changing voter's behavior and preferences. The Presidential Election in 2017 was indeed a turning point in using different polls to understand the voting behavior of people and their opinions about participation and who to vote for.

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[1] A reformist candidate and vice president of Rouhani whose candidacy was meant to advance Rouhani's campaign, and eventually withdrew in favor of Rouhani.

[2] An Independent candidate who was former vice president and minister of heavy industries in the early 1980s who finished tenth in Iran's 2001 presidential election.

[3] A conservative candidate, French-educated engineer, and minister of culture in the mid-90s who has been absent from Iranian politics for the last two decades.

Several polls were conducted by collecting public opinion about different candidates for the 2017 presidency and asking respondents for their first preferences. Polls before the recent election were mostly conducted by governmental organizations with biased and non-transparent results which were mostly not released publically. Of those polls in the lead-up to and during the 2017 Iranian presidential election, it seems that there were four main polls: a main governmental polling agency, *IRIB*[4], and three main non-governmental polling agencies namely *ISPA*[5], *IPPO Group*[6], and *FP*[7]. Since these non-governmental polls are not influenced by political considerations or focused on some geographical regions, they may be considered to be more reliable.

The IPPO Group was among the polls allowing for eliciting social ordering. This polling was carried out on a national level in Iran from May 6, 2017 to May 17 2017 and it was reported on a 3-day rolling average basis. The interviews[8] were conducted via phone. The sample size was more than 1000 Iranians each day, 18 years of age and older, who were residing in Iran and were selected randomly[9]. Once some pollsters realized that relative popularity and comparison of candidates in pair matter just a few weeks before the election, they tried to reconstruct pairwise preferences among the top three candidates with the intention of predicting the outcome in the potential runoff.

Unfortunately, the IPPO group did not report head-to-head comparison. Therefore, we used Fardaye Pars (FP) poll, the only accurate polling in Iran that used the same methodology as IPPO, namely phone survey. The FP was also one of the leading private and independent institutes conducting polls before the 2017 election, based in Mashhad, the second-largest city in Iran. Mashhad was not only the hometown of Ghalibaf but also the base for Raisi's campaign as he was the custodian of Astan Quds Razavi (a wealthy charitable foundation and powerful administrative

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[4] The IRIB (Islamic Republic of Iran Broadcasting) is an Iranian media corporation that holds the monopoly of domestic radio and television services in Iran. It has a polling center not only for its own programs but also for other socio-political issues (https://www.irib.ir/).

[5] The ISPA (Iranian Students Polling Agency is affiliated with the Academic Center for Education, Culture, and Research (ACECR), an Iranian public, non-governmental higher education institution (http://ispa.ir/Default/Index/en).

[6] IPPO Group (International Perspectives for Public Opinion LLC) is a privately held company based in Washington DC that offers not only analytical and consulting services, and researches in social, political and cultural fields but also consulting services in designing online social research tools. It utilizes quantitative methods to conduct social surveys such as polling, need assessment, attitude research, KAP surveys, and market research (http://ippogroup.com/).

[7] FP (Fardaye Pars) is a non-governmental polling agency. Fardaye Pars means Persian's tomorrow (http://www.fardayepars.org/).

[8] Farsi native speaking interviewers conducted the interviews during daylight hours, local time. They were trained—both for general skills of phone polling and for the specific needs of this survey. The interviewers were selected post training after passing an interviewing skills exam.

[9] The sampling methodology was a two-stage proportional sampling. The data were weighted based on the last available National Iranian Census (2011) with gender, age group and place of residence (urban/rural) as weighting variables. The results of each interview were assessed twice by the interviewer and the supervising team—concerning respondent's trust in the interviewer and the interviewer's assessment of the respondents' honesty. Those respondents who had received very low scores for trust and honesty have been removed from the random sample.

Table 1 Polls on April 24th 2017

Candidates	Polls					
	IRIB	ISPA	IRIB	IRIB	ISPA	ISPA
Ghalibaf	34.6%	37.7%	36.5%	–	–	22.6%
Raisi	–	–	27%	27%	32.4%	17.4%
Rouhani	40.9%	49%	–	43.3%	52.9%	43.5%

organization which manages the holy shrine of Imam Reza (May God Bless Him) and its various associated institutions). It conducted five waves of phone polls between May 1 and May 15, 2017 with the sample size of between 300 and 6600 respondents.

Given the need for considering public opinion, ISPA started its activities in 2001. One of the successful polls of ISPA was the 12th Presidential Election in 2017 on people's participation rate, voting rate of candidates in election advertisement days, and amount of votes for the two leading candidates, namely Hassan Rohani and Ebrahim Raisi. They published the results having used head-to-head comparisons between more than the two leading candidates, and only two of these polls pitted all considered candidates against everyone else in pairwise comparisons, thus allowing to draw inferences about social orderings.

3.1 Polls on April 24th 2017

IRIB poll was carried out on April 24th, claiming to have Rouhani leading both Ghalibaf and Raisi in head-to-head matchups. It asked the respondents to compare the three presidential candidates: Rouhani (*Ro*), Raisi (*Ra*), and Ghalibaf (*Gh*). The poll showed that in the head-to-head comparison, Rouhani was a winner in a competition with Ghalibaf as well as Raisi, while Ghalibaf was a winner in a competition with Raisi. In each comparison, the rest did not answer or support neither one of them. Other polls such as ISPA on April 23rd and 24th also confirmed these pair social rankings over the candidates[10].

Although the ISPA poll did not include a full set of head-to-head comparisons, it rather compared the Plurality winner Rouhani, with the two runner-ups and without matching the latter two against each other[11]. This is while in all polls up to May 7th, Rouhani, Ghalibaf, and Raisi, respectively were the relative social order of preferences for the candidates among those who had stated that they shall surely participate in the election. Table 1 shows the relevant results in detail. The first five columns exhibit the pairwise comparison of the main candidates while the last one shows their plurality ranking.

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[10] "Opinion Poll Results: Rouhani 1st, Raisi 3rd". Deutsche Welle (in Persian). 24 April 2017. Retrieved 24 April 2017. (Alef report in Persian)

[11] The Race: Poll Results", The Iranian Students Polling Agency (ISPA), The Iranian Labour News Agency (ILNA), 18 May 2017, retrieved 22 May 2017—via The Iran Primer

Table 2 Polls on May 8th 2017

Candidates	Polls								
	FP	ISPA	FP	FP	ISPA	FP	ISPA	IPPO	Borda
Ghalibaf	–	–	25%	34.5%	44.1%	11.8%	24.6%	23.9%	192
Raisi	38.1%	38.7%	36.5%	–	–	39.6%	26.7%	16%	239
Rouhani	37.8%	47.7%	–	37.8%	44.8%	43.8%	41.6%	51.9%	245

The results obtained from this poll suggest that there was no cyclical majority of the three leading candidates. In other words, Rouhani was a Condorcet Winner, who could not be beaten by at least one candidate while Raisi was a Condorcet Loser since all other candidates could beat him in head-to-head match-ups. Moreover, there is no Borda Paradox as head-to-head comparison resulted in $Ro \succ Gh \succ Ra$ which is consistent with their plurality ranking. It should be noted that as the sample size is unknown, we cannot decide whether the difference in relative share is significant or not for several of the pairwise comparisons at conventional levels of statistical significance.

3.2 Polls on May 8th 2017

On the ISPA poll on May 7th and 8th among those who stated that would have participated in the election, Rouhani was the Plurality Winner (41.6%) followed by Raisi (26.7%), and Ghalibaf (24.6%), with a marginal difference[12]. The FP Poll on May 8th showed the same ranking in Table 2. The first five columns exhibit the pairwise comparison between the main candidates, the following three show their plurality ranking, and the last one demonstrates their Borda scores.

In this poll, ISPA also asked for pairwise comparisons. Again, the poll did not include a full set of head-to-head comparisons. However, it compared only Rouhani with the two runner-ups but did not match the latter two against each other. Their survey shows that although Rouhani was the winner in the contest with Raisi, he was only a marginal winner against Ghalibaf. The third round of IPPO polling was carried out at a national level in Iran from the 5th to the 8th of May 2017 and it was reported on a four-day rolling average basis. The random sample size was 1076 Iranians 18 years of age or older, residing in Iran[13].

In the past 3 days before this poll, 51.9% of those who said that they would definitely or likely participate in the May 2017 election and were inclined to vote for

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[12] The Race: Poll Results", The Iranian Students Polling Agency (ISPA), The Iranian Labour News Agency (ILNA), 18 May 2017, retrieved 22 May 2017—via The Iran Primer

[13] Assuming the maximum variation, the results of this survey can be generalized to the whole of the 18 years and older Iranians (who reside in Iran) with a margin of error of ± 2.99 to ± 3.91 for the 95% confidence interval (based on the responses to questions).

Table 3 Polls on May 10th 2017

Candidates	Polls					
	FP	FP	FP	FP	IPPO	Borda
Ghalibaf	–	28.4%	39.6%	24.8%	20.8%	379
Raisi	36.5%	31.5%	–	35.2%	20.8%	378
Rouhani	31.1%	–	30.1%	36.5%	58.3%	341

one of the six running candidates[14]. They voted for Hassan Rouhani as their first choice. After Rouhani, Ghalibaf was standing with 23.9% of the votes while Raisi was in the third place with 16% of the respondents' votes.

Even though at least the head-to-head comparisons of Rouhani and Raisi at FP and ISPA had different outcomes, their overall plurality ranking was also the same in which Rouhani was the winner in a competition with Ghalibaf as well as Raisi. The societal preference based on the Borda count gave the same ranking as well. This is while Ghalibaf was the runner-up instead of Raisi in the IPPO survey.

Most respondents of the IPPO poll preferred not to indicate their most unfavorable candidate. One was so unfavorable that they would not have voted for him under any circumstances. More precisely, almost 67.4% of the respondents either stated that no candidates were the most unpopular or that they could not or did not wish to name the most unfavorable candidate. Interestingly, among those who specified their least favorable candidate, the ranking for the most unfavorable candidate was similar to the ranking of the most favorable one. The highest rating of being unfavorable belonged to Hassan Rouhani with 27.6% and after him Ghalibaf (14.4%) and Raisi (11.2%).

Since there is no cyclical majority, we do not have a Condorcet paradox here. Indeed, FP showed that Raisi is the Condorcet winner while Ghalibaf is the Condorcet loser since both other main candidates beat him. Therefore, we have weak Borda paradox here: head-to-head comparison resulted in $Ra \succ Ro \succ Gh$ which is inconsistent with their plurality ranking in which Rouhani was the first best social choice followed by Raisi and Ghalibaf, respectively.

3.3 Polls on May 10th 2017

We can observe that Rouhani comes out as a solid loser and is a full-fledged example of the strict Borda Paradox. The Plurality Winner is the Condorcet Loser, losing in pairwise contests against all other candidates. The first three columns of Table 3 exhibit the pairwise comparisons, the following two show their plurality ranking, and the last one demonstrates their Borda score.

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[14] There are always people who do not wish to disclose their vote possibly due to the level of political anxiety and fear. There is the possibility that the respondents are fearful of disclosing their final decision due to the rising level of political agitation, and as such, they are not willing to reveal their vote. Moreover, the common phenomenon of spoiled ballots in Iranian elections is to vote for names that are not on the ballots, including names of celebrities, dissidents, politicians who are not running, etc.

The fifth round of IPPO polling was carried out at a national level in Iran from May 7th to May 10th and was reported on a 4-day rolling average basis. The sample size was 1189 Iranian residents, 18 years of age and older, who were selected randomly[15].

In this poll, 58.3% of those who would definitely or likely participate in the election voted for Hassan Rouhani as their first choice. After Rouhani, Raisi and Ghalibaf were standing with almost the same 20.8% of the votes. Again most respondents of the IPPO poll (81%) preferred not to indicate their most unfavorable candidate. Interestingly, among those who specified their least favorable candidate, the ranking for the most unfavorable candidate is similar to the ranking of the most favorable one. The highest rating of being undesirable belongs to Hassan Rouhani with 42.1% and Ghalibaf (21%) and Raisi (21%) stand after him.

The FP also revealed almost the same plurality ranking in which Rouhani was the first, with Raisi and Ghalibaf following him, respectively. Interestingly, the Borda count based on the FP data showed a completely different overall ranking in which Ghalibaf was the first with slightly more votes than Raisi while Rouhani was the last choice among the leading candidates. Again, as there is no cyclical majority, we do not have a Condorcet paradox. Indeed, FP showed that Raisi was the Condorcet winner while Ghalibaf was the Condorcet loser. However, FP indicated that Rouhani was the Plurality winner.

Therefore, we have strong Borda paradox here: head-to-head comparison resulted in $Ra \succ Gh \succ Ro$ which is inconsistent with their plurality ranking in which Rouhani is the first best social choice followed by Raisi and Ghalibaf, respectively. In other words, while the majority of people prefer Rouhani to Ghalibaf as well as Raisi, once we compare Rouhani in a head-to-head comparison, he is the Condorcet Loser.

Interestingly, in the FP polls of Tables 2 and 3, the expressed support for Rouhani is higher in three-candidate comparisons than in pairwise ones. For instance, in Table 2, Rouhani wins the plurality of 43.8% of the first votes but loses with a tiny margin, 37.8% against 38.1%, to Raisi in a head-to-head comparison. In a pairwise comparison between Rouhani and Raisi, as the two main candidates, the former gets the most number of reformists' votes while the latter attracts conservative voters. In a three-way comparison, the split of pro-conservative votes between Raisi and Ghalibaf could have made Rouhani a relative winner among those who vote.

In particular, in overall comparison, Raisi lost his lead on May 8th in pairwise comparison with Rouhani as he was only marginally ahead. In short Table 2 shows that while Rouhani was a winner with a relative majority of 43.8% of votes in comparison with the other two major candidates, he was losing to the conservative party if we add up the total votes of Raisi (39.6%) and Ghalibaf (11.8%).

To put it differently, the results of different IPPO polls demonstrate that the supporters of Ghalibaf mostly voted for Raisi in a runoff with Rouhani[16]. Therefore, once we exclude Ghalibaf from three-way compassions, the relative votes for Raisi among those who vote increases a lot (from $\frac{39.6\%}{11.8\%+39.6\%+43.8\%} = 41.60\%$ to $\frac{38.1\%}{38.1\%+37.8\%} = 50.20\%$), while the relative votes for Rouhani, among those who vote, slightly increases (from $\frac{43.8\%}{11.8+39.6+43.8} = 46.01\%$ to $\frac{37.8\%}{38.1\%+37.8\%} = 49.80\%$).

This argument would be even strengthened if we take account of the arrangement of social classes in Iran and their preferences for distribution policies, especially the cash subsidy that has remained in place since early 2011. In May 2017, voters perceived a remarkable resemblance between Raisi and Ghalibaf, as both focused on drawing the lower-class votes through the promise of increased cash subsidies. During their campaign, both Ghalibaf and Raisi both promised that if they were elected, they would triple the monthly cash transfer. Meanwhile, President Rouhani had repeatedly expressed his disapproval with the cash transfer policy.

The drop of votes in pairwise runoff could also be explained by the respondents' unwillingness to revealing their preferences in a pairwise setting. There are always people who do not wish to disclose their vote possibly due to political anxiety and fear. It might be possible that respondents are fearful of disclosing their final decision and revealing their vote due to the rising level of political agitation.

The Kuran's (1997) idea of preference falsification also indicates that individuals commonly express preferences that are in contrast with what they sincerely desire and they tailor their choices to what seems socially acceptable. This phenomenon has substantial political and social consequences that not only include unanticipated revolutions but also prevalent public support for a candidate that would be rejected definitively in a secret ballot voting.

Indeed, people were afraid to explicitly express their true preference for Raisi and Ghalibaf in pairwise comparisons with Rouhani since they were both perceived to be the candidates of the establishment. In other words, it is more likely in pairwise comparisons to expect preference falsification as it might be more costly to reveal the real taste. However, being indecisive in three-candidate comparisons could merely mean that one has not yet made up his mind to choose between the leading two conservative figures who represent values of the establishment. The fact that the same 37.8% voters as loyal supporters back Rouhani in a pairwise comparison with Ghalibaf confirms this argument.

3.4 Polls on May 11th 2017

We could compare this result with the result of the IRIB poll conducted just before the last live debate on May 12, 2017 using a sample of 12,800 respondents. According to this poll on the of May 11th 2017, Rouhani got 40.1% of all respondents vote

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[16] For instance, the results of May 14th poll (http://ippogroup.com/poll9/) show that, among those who chose Ghalibaf as their first best candidate and decided about their second choice, about 30% would vote for Rouhani while around 45% would vote for Raisi.

Table 4 Polls on May 11th 2017

Candidates	Polls						
	IRIB	ISPA	IRIB	IRIB	IRIB	ISPA	IPPO
Ghalibaf	–	–	34.9%	39.5%	27.2%	21.7%	23.1%
Raisi	34.8%	41.3%	32.7%	–	25.7%	24.7%	21.2%
Rouhani	46.3%	49.9%	–	42.9%	40.1%	43.2%	55.8%

who were most likely about to participate in the election while Ghalibaf and Raisi received only about 27.2% and 25.7% of the votes, respectively (the rest were in favor of other candidates)[17]. The first four columns of Table 4 exhibit the pairwise comparison and the following three show their plurality ranking.

Moreover, Rouhani was a winner in competition with Ghalibaf with 42.9% against 39.5% (The 17.6% remaining did not answer or were not in favor of either of them.). Rouhani was a winner in a competition with Raisi with 46.3% against 34.8% (The 19.9% remaining did not answer or were not in favor of either of them.). Finally, Ghalibaf was a winner in competition with Raisi with against votes (The remaining did not answer or were not in favor of either of them.). Although the results of the ISPA poll on May 13th 2017 confirmed pairwise comparison between Rouhani and Raisi, it was in contrast with the overall ranking of the main candidates based on their relative share of votes from the IRIB poll[18].

4 Discussion and conclusion

Indeed, the paradoxes in social choice are not merely theoretical phenomena but rather genuine practical circumstances with potentially troublesome consequences. As such, we illustrate an explicit example confirming the fact that real-world social choices are sensitive to differences in voting procedures and how they are made may lead to significant implications for the results. Moreover, polls mostly do not allow social choice analysis, because they are not framed such as to enable analysts to establish rankings of the alternatives.

Nevertheless, this was not true for the 2017 Iranian presidential election, since for the first time we had polls asking for not only the first and second choices but also the head-to-head comparison between the main figures. In those polls with this approach, at least partially, there are good reasons to believe that the voting paradoxes may be present. However, the poll results did not suggest a top-cycle majority among three of the leading top-ranked contenders for presidency in voter's preferences. In this sense, social preferences over the three leading candidates were rational and did not exhibit the Condorcet paradox. Nevertheless, there was a small set of candidates in the 2017 Iranian presidential election, only three main candidates among a total of six. It is

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[17] Alef report in Persian (in Persian). 11 May 2017: http://old.alef.ir/vdcirua53t1ay32.cbct.html?47txt

[18] "Latest ISPA Poll: Rouhani Still Leading". The Iranian Students Polling Agency (ISPA) (in Persian). 16 May 2017. Retrieved 17 May 2017—via Shafaqna.

well-established fact that larger sets of alternatives increase the probability of occurrence of cyclical majorities' (cf. Jones et al. 1995).

The FP polls on May 2017 with head-to-head comparisons present substantial empirical evidence that during the electoral campaigns, voting paradoxes seem to have occurred in the preferences of the voters. On the one hand, Raisi was always the Condorcet winner but not always the plurality winner. Raisi comfortably beat Rouhani in the head-to-head comparisons of the simultaneous polls of Tables 2 and 3, even though Rouhani was leading the field in the same poll. Moreover, Ghalibaf was always the plurality loser while he was not always the Condorcet loser.

On the other hand, Rouhani was the plurality winner while he was never a Condorcet winner since in pairwise contests he would always be beaten by Raisi and sometimes by Ghalibaf in pairwise comparisons of the FP poll. As Kurrild-Klitgaard (2017) also articulated, there is no guarantee that the ultimate winner is the Condorcet winner, if it exists in the first place since the plurality (majority) voting is designed as an all-against-all vote in which the winner takes all.

Remarkably, Rouhani was the least favorable candidate in any poll that raised a question such as IPPO. Moreover, he was never the plurality loser when he was the Condorcet loser and he was the plurality winner while he was the Condorcet loser in a match-up against Raisi and Ghalibaf, in the last wave. Therefore, both strong and weak versions of the Borda paradox (but not the Condorcet paradox) was present.

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