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The failure of Instant Runoff to accomplish the purpose for which it was adopted: a case study from Burlington Vermont

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Abstract
Instant-Runoff Voting (IRV) has been marketed to "guarantee that the majority candidate is elected," to "eliminate the spoiler effect," and to empower voters, particularly those supporting third-party or independent candidates, to "vote your hopes, not your fears," which is meant to level the playing field between such candidates and those from the major-party duopoly. This paper shows that in Burlington Vermont, IRV objectively failed to deliver on these promises. However, this failure is not blamed on the use of ranked ballots, but rather on the Hare method of tallying the ballots and identifying the winner. To avoid the failure, this paper presents a variation on IRV, Bottom Two Runoff-IRV (BTR-IRV), including a template for possible legislative language.

Keywords Ranked choice voting · Bottom two runoff · Instant-runoff voting · Spoiler · Tactical voting · Center squeeze · Condorcet

JEL Classification D71 · D72

1 What are participatory democracies trying to accomplish with elections?

Ranked Choice Voting, or RCV, that is, voting based on ranking the candidates, is not new in the twenty-first century. It has earlier taken a few different forms. One form that saw use around the turn of the previous century is Bucklin Voting, in which second-ranked votes are added to first-ranked votes if the latter are not enough for a 50% majority. This election system was challenged in various state judiciaries. A ruling on Bucklin voting from the North Dakota Supreme Court

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(Spalding, 1911) made a fundamental observation about the purpose of elections and in the nature of majority rule:

> "The theory of cumulative voting... rests upon a false or fictitious premise. It assumes that the computation of the number of marks placed upon a ballot in favor of a candidate should determine whether he is elected, when in fact the marks are, and can only be, representative of persons possessing certain qualifications [citizens having franchise]. The end sought is to determine how many persons who have registered their preference by voting in favor of the election of a particular candidate, and the number of such persons cannot be increased or diminished by any false or fictitious system of marking the ballots.
> "The placing of marks upon the ballot is only a method of enumerating persons, and if the number of persons desiring the election of a named candidate can be multiplied by two by the fiat of the legislature, it can, by the same means, be multiplied indefinitely. Our system of government is based upon the doctrine that the majority rules. This does not mean a majority of marks but a majority of persons possessing the necessary qualifications and the number of such persons is ascertained by means of an election… regardless of all theories of those who would, by means more or less indirect, make it possible for a minority to secure representation where not entitled to it under our system."

The salient lesson to draw from this opinion and ruling is that, while minority groups (along any lines, not only along those of race, creed, ethnicity, class or gender) can expect protections of various rights, an entitlement of a minority of the electorate to rule, to set policy, to elect leaders is not one of them. That right belongs to the majority of those individuals in the electorate with the franchise who bother to go to the polls and vote. That is the only way for us, as citizens possessing equal rights, to have our votes count equally. If, because of a "false or fictitious system of marking the ballots," the candidate favored by the majority of voters is not elected, that means that the voters for the minority-favored winning candidate had cast votes that each counted more than each of the greater number of votes cast for the majority-favored candidate.

Elections are about majorities, not a majority of marks for their own sake, but of a majority of enfranchised citizen voters, who have the right to have their votes count equally and "not be increased or diminished by any false or fictitious system of marking ballots." This principle of equality of the value of our votes is commonly expressed as:

1. One person, one vote. ***Every voter has an equal influence on the outcome of elections*** because of our inherent equality as citizens, and this is independent of any utilitarian notion of personal investment in the outcome. If I enthusiastically prefer Candidate A and you prefer Candidate B only tepidly, your vote for Candidate B counts no less than my vote for A. The effectiveness of a vote—how much the vote counts—is not proportional to the voter's degree of preference

> but is determined only by their franchise. A citizen with franchise has a vote that counts equally as much as any other citizen with franchise. For any ranked ballot, this means that if Candidate A is ranked higher than Candidate B, then that is a vote for A. It doesn't matter how many levels A is ranked higher than B; it counts as exactly one vote for A.

Elections are about "enumerating persons" and identifying the choice of the majority of voters as persons having equal rights and equal franchise. However, the numerical and operational meaning of *"majority"* needs to be considered. An *"absolute majority"* are more votes than half of all cast, more than the totality of **all** other alternatives, and a *"simple majority"* is more than half of votes cast, excluding abstentions. If 100 ballots are cast in a two-candidate single-winner race, 45 for Candidate A, 40 for Candidate B, and 15 expressing no preference between A and B, we say that Candidate A received a simple majority (53% of voters expressing a preference) but not an absolute majority (45%) of the cast ballots.

Nonetheless, everyone agrees that Candidate A, having a simple majority, is the preference of the electorate, and no one disputes the legitimacy of the election of Candidate A. Between two candidates, there is always a simple majority, unless they tie. This simple fact is sometimes misconstrued that Hare RCV elections (also called "Instant-Runoff Voting" or IRV) "guarantee a majority winner" because they gradually boil the field of candidates in an election down to two candidates, between which there is always a simple majority.

When there are two alternatives to choose from in an election, either two candidates for office or a binary yes/no question, everyone agrees who or which alternative has won. The candidate that has more votes than the other, a simple majority, wins even if that candidate did not get an absolute majority of support from the electorate. ***If more voters mark their ballots preferring Candidate A to Candidate B than the number of voters marking their ballots to the contrary, then Candidate A is elected and Candidate B is not elected.*** This is the principle of majority rule in an election with a binary choice. We elect the candidate that displeases the fewest voters expressing a preference on their ballots.

However, when there are more alternatives than two, when there is Candidate C in the race, then we don't know from the votes between A and B that Candidate A is still the majority choice of the electorate. Perhaps Candidate C is preferred over both A and B, or perhaps C is less preferred than either A or B. But this does not change the preference the electorate has for Candidate A over B. If the presence of Candidate C somehow causes the election of Candidate B, even though a simple majority of voters prefer A to B, we call that a *"spoiled election"* or the *"spoiler effect"* and Candidate C is the *"spoiler"*. A spoiler is a candidate who loses in an election yet by being a candidate in that election changes who the winner is.

When an election is apparently spoiled, those voters who voted for the ostensible spoiler suffer voter regret for their vote when they learn of the outcome of the election and realize that they aided the candidate whom they preferred least to win by *"throwing away their vote"* or *"wasting their vote"* on their favorite candidate rather than voting for the candidate best situated to beat their least-preferred candidate.

This leads to tactical voting in future elections, where the voting tactic is called "*compromising*." This tactic is not a nefarious strategy to throw or game an election but is an undesired burden that minor party and independent voters carry, which pressures them to vote for the major party candidate that they dislike the least. They are voting their fears and not their hopes, and this advantages the two major parties. This reflects "*Duverger's Law*" which states that elections under the plurality rule promote a two-party political system, and third-party or independent candidates will not have an equal opportunity in such elections. Voters who want to vote for these third-party or independent candidates are discouraged from doing so, out of fear of helping elect the major party candidate they dislike the most.

With Candidate C in the race, we don't know immediately that Candidate A is still the majority preference, but we continue to know that Candidate B is not. Thus, with more than two candidates, the principle of majority rule is generalized as:

2. Majority rule: ***If more voters mark their ballots preferring Candidate A to Candidate B than the number of voters marking their ballots to the contrary, then Candidate B is not elected.*** If Candidate B were to be elected, that would mean that the fewer voters preferring Candidate B had cast votes that had greater value and counted more than those votes from voters of the simple majority preferring Candidate A.

Along with well-warned elections, equal and unhindered access of the enfranchised to the vote, the secret ballot, and process transparency, these two principles; *Majority rule* and "*One person, one vote*", are among the fundamental principles on which fair single-winner elections are based.

There are at least two other properties that we desire for elections:

3. Avoiding the *"spoiler effect"*: The relative merit of candidates A and B is not affected by the presence of a third candidate C. If a simple majority of voters agree that Candidate A is better than B, whether Candidate C enters the race or not, it does not reverse the preference of Candidate A over Candidate B. If that relative preference of candidates are not affected among voters (with Candidate C in the race), then the relative outcome of the election should not be affected (which would be Candidate B winning over Candidate A). Conversely, this means that removing **any** loser from the race and from all ballots, that this should not alter who the winner is.
4. Voters should not be called upon to do *"tactical voting"*. Voters should feel free to simply vote their conscience and vote for the candidates they like best, without worrying about whom that they think is most electable. Voters should be able to vote for the candidate of their choosing (e.g. Perot in 1992 or Nader in 2000) without risk of contributing to the election of the candidate they **least** prefer (perhaps Clinton in 1992 or Bush in 2000). They should not have to sacrifice their vote for their favorite choice because they are concerned about "wasting" their vote and helping elect the candidate they loathe. Voters should be able to *"Vote their hopes rather than their fears"*.

2 An anomalous election in a small and progressive city

At least two studies have been made analyzing the results of IRV elections, and the individual ballot data, to see how well they perform regarding the promises of IRV: to elect the majority candidate even with more than two candidates in the race, to eliminate the spoiler effect, and to give voters the freedom to support third-party and independent candidates. One study is Song (this volume) that considered 172 IRV elections with more than two candidates. Another is Sarwate et al. (2013) that considered 37 IRV elections. Both studies have found that the IRV method (Hare) of tallying the ballots and identifying the winner had elected the *"Condorcet Winner"* in nearly all elections. The sole exception[1] is the 2009 mayoral election in Burlington Vermont.

A *Condorcet Winner* (named after the Marquis de Condorcet, an eighteenth century French mathematician and philosopher) is the candidate who, from the ranking data expressed on ranked-order ballots, defeats every other candidate when paired with them in head-to-head runoffs. The head-to-head runoff is exactly what happens in the IRV final round.

It should not be surprising that the Condorcet Winner wins in almost all IRV elections, because the Condorcet Winner must have some base support just to achieve all those head-to-head wins. And all the Condorcet Winner needs to do to win an IRV election is to get into the IRV final round; the Condorcet Winner will always win that final round.

For any candidate other than the Condorcet Winner to be elected (as in the sole exception of Burlington 2009), it is necessary that Principles 1 and 2 above (One-person-one-vote and Majority rule) be violated. Furthermore, I show that Properties 3 and 4 above must also be violated in such an election.

The 2009 Burlington IRV election illustrates this perfectly. I compiled the data in Tables 1 and 2 from public files obtained from the Burlington City Clerk. My analysis was replicated by Gierzynski et al. (2009) and Olson (2009). These analyses show that candidate Andy Montroll was preferred to Kurt Wright by a margin of 933 voters and that Andy Montroll was preferred to Bob Kiss by a margin of 588 voters, yet the IRV final round was between Wright and Kiss, with Kiss being preferred (to only Wright, not Montroll) by a margin of just 252 voters (out of 8374). Why was the final round contested between candidates Wright and Kiss when the ballot data indicates that candidate Montroll would have defeated either of them in the final round?

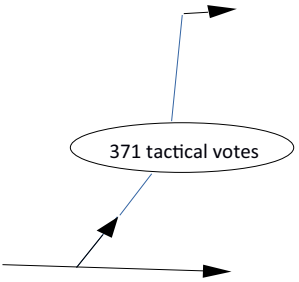
Candidate A (Andy) was preferred, as expressed explicitly on their ballots, by a simple majority of Burlington voters over Candidate B (Bob), yet Candidate B was elected to office. The 3476 voters that preferred Bob had votes that counted more than those of the 4064 voters that preferred Andy. These are **not** equally valued votes nor is this majority rule and as such is a **failure of democracy**.

[1] In August 2022, the Special General Election for U.S. Congress in Alaska provided another example of an IRV election in which the Condorcet winner was not elected.

Table 1 Actual and Possible Strategic Outcome of the Burlington Mayoral Election

(a) Ballot rankings for the top three candidates in the semifinal round.

1332	M>K>W
767	M>W>K
455	M
2554	Montroll
2043	K>M>W
370	K>W>M
568	K
2981	Kiss
1510	W>M>K
495	W>K>M
1289	W
3294	Wright



(b) Had 371 or more of the 1510 Wright voters who disliked Kiss the most voted tactically, they would have prevented Kiss from winning.

1332	M>K>W
1138	M>W>K
455	M
2925	
1139	W>M>K
495	W>K>M
1289	W
2923	

Table 2 Six Pairings, Showing the Pairwise Tallies for the Four Significant Candidates

The tallies for the Kiss-Wright pairing are consistent with the results of the IRV final round. Note that only candidate Montroll defeats every other candidate he faces. Because Condorcet-consistent RCV is precinct summable, these figures can be obtained by totaling the corresponding pair subtotals for all precincts

Montroll	4064	M > K	Montroll	4570	M > S	Montroll	4597	M > W
Kiss	3476	K > M	Smith	2997	S > M	Wright	3664	W > M
Margin	588		Margin	1573		Margin	933	
Kiss	3944	K > S	Kiss	4313	K > W	Wright	3971	W > S
Smith	3576	S > K	Wright	4061	W > K	Smith	3793	S > W
Margin	368		Margin	252		Margin	178	

Although he ran to win and was a serious contender, Kurt Wright was effectively a spoiler; a candidate who loses an election but by his presence *changes* who the winner is. Had Kurt Wright not run and the same Burlington electorate come to the polls and expressed their same preferences over the remaining four candidates, the election outcome would have been different, with Andy Montroll prevailing in the final round over Bob Kiss by a margin of 588 votes.

Of the voters preferring Wright in the semifinal round, the largest group were 1510 voters who marked Montroll as their second choice and preferred Kiss not at all. As Table 1 shows, if 371 (less than one in four) or more of these voters had anticipated that their guy was not going to win and had voted tactically, this voting tactic being "compromising," they would have prevented the election of Bob Kiss, the candidate they disliked the most. Or if 587 of those voters, along with

154 preferring only Wright, had just stayed home and not come to the polls at all, they would have prevented the election of the candidate they disliked the most.

Except that Ranked-Choice Voting was used, this is hardly different than what happens with Progressive or Green Party voters who compromise and vote for the Democrat out of fear of helping elect the GOP candidate they loathe. IRV promised these voters that they could "Vote their hopes rather than vote their fears".

But these conservative voters in Burlington found out otherwise: *"In this liberal town I gotta choose between* 'Liberal' *or* 'More-Liberal'*, because if I vote for the guy I really like then* 'More-Liberal' *gets elected!"* That has got to make some people angry. Simply by marking their sincere favorite choice as #1, they literally *caused* the election of their most disliked candidate.

Recently, former Vermont governor, presidential candidate, and longtime Burlington resident Howard Dean, in promoting re-adoption of Hare RCV, mistakenly claimed *"you can still get your second-choice vote"* (Lamdin, 2021). That promise was not kept with the 1510 Wright voters who disliked Kiss and caused the election of Kiss simply by marking Wright as #1. Their first choice was defeated and their second-choice vote was not counted. If those second-choice votes had been counted, a different candidate for mayor would have been elected. The following year, IRV was repealed in Burlington Vermont.

An additional desirable property of a voting system is:

5. *Precinct summability:* Transporting ballot information from precincts to the central tallying location (City Hall) in an opaque manner is viewed as less transparent than having each precinct report subtotals for each race to the public, to the media, and to the campaigns for them to also tally and audit the election results. While plurality is precinct summable and precincts report their vote subtotals, IRV is not. However, a Condorcet-consistent RCV method can, for each precinct, report vote subtotals for each pairing of candidates. These are then summable by outside parties. Condorcet-consistent RCV methods preserve this salient property of process transparency that IRV does not.

IRV in Burlington in 2009 did not elect the candidate that was preferred by simple majorities over all of the other candidates. IRV did not protect against the spoiler effect and, after promising not to, IRV punished a large group of voters (one sixth of the electorate) for simply ranking their favorite choice first, thus discouraging sincere non-tactical voting. These facts are indisputable and are supported by the public record.

Furthermore, IRV is not precinct summable, thus requiring the opaque transporting of voting data from precincts to a central tallying location and the tallying of votes and identification of the winner to be done only at that central location.

It is this failure that happened in 2009 that we should not repeat. Particularly in the City of Burlington that had the only government election employing IRV in which IRV elected the wrong candidate, someone other than the Condorcet Winner.

3 The seminal flaw

Elections are zero-sum games. There are winners and losers. The only party that benefited from IRV in the only two applications of IRV in Vermont is the Progressive Party. In 2009 IRV demonstrated a bias that harms the centrist candidate and favors candidates on the left or right wings. This bias is called the *"Center Squeeze effect"* (Electowiki 2021). It comes from the fact that IRV does not consider second-choice votes that are not yet transferred to voters' first choices and counted. The centrist candidate loses out because, in the semifinal round, this candidate normally receives more second-choice rankings from voters on the left or right than the candidates on the left or right can expect to receive from voters in the opposite wing.

By comparison, in the final round the entire ballot is considered. Every ballot with A ranked higher than B counts as a vote for A no matter how low both rankings are. Some second-choice votes count and indicate voter support. Obscuring this voter support in the semifinal round disproportionately harms the centrist candidate more than those on the left or right wings. This can make the voter support for the centrist candidate appear, in the semifinal round, to be less than what it truly is when second-choice votes are visible. That disproportionate effect is the Center Squeeze.

This bias does not inherently lean left or right; it just leans away from the center. However, since 2019 there have been no Republicans in Burlington elected to public office. Only the Progressive Party remains to benefit from this Center Squeeze effect, and 13 years ago this known bias of IRV, harming the candidate and voters in the center of the spectrum, was demonstrated in the Burlington Vermont mayoral election.

Conservative voters were promised (as were all voters) that they could vote for their favorite candidate without fear of helping elect their least favorite candidate. That promise was not kept in Burlington in 2009. GOP voters are now, in reality, the *third party* in Burlington and the voters who should most look forward to benefiting from the blessings of Ranked-Choice Voting. They should be able to run a candidate for mayor without fear of vote splitting with the Democrats.

It is only the Progressive Party that conveniently benefited from this unnecessary flaw in IRV that, in different ways, harmed both Democrats and the GOP in Burlington Vermont.

4 A simple correction compatible with the Single Transferable Vote model

The IRV method can be modified to correct its mistake in Burlington in 2009, in failing to elect the Condorcet Winner. It can be modified so that the Condorcet Winner is never eliminated. This modification to IRV is called "BTR-IRV" for "Bottom Two Runoff-Instant Runoff Voting" and was conceived by Rob LeGrand (Electowiki, 2020). It is very similar to the Single Transferable Vote (STV)

model in standard IRV; having sequential rounds, eliminating one candidate each round, and transferring votes from defeated candidates to the contingent choices of voters. In IRV, each voter has a vote token that, with the voter's permission, is transferred to another candidate when the voter's preferred candidate is defeated. But instead of eliminating the candidate with the fewest tokens in each round, BTR-IRV requires the two candidates with the fewest votes to contend in a head-to-head runoff, just as in the IRV final round, to see which candidate has *greater voter support*. That candidate advances to the next STV round, and the candidate with *lesser voter support* is eliminated.

Greater and *lesser voter support* are defined exactly as they would be if the bottom two candidates were the final two candidates. If the number of ballots ranking A higher than B exceeds the number of ballots ranking B higher than A, then B has *lesser voter support*, B is defeated, and A advances to the following IRV round. In the critical decision that eliminates a candidate, the same metric of voter support is used as in the IRV final round.

The Condorcet Winner can never be the candidate with *"lesser voter support"* in any pair, and therefore the Condorcet Winner will never be defeated in any BTR-IRV round, insuring that the Condorcet Winner wins. Having the fewest vote tokens does not mean the same thing as having *"lesser voter support"* **except** in the IRV final round. That is when the candidate with the most votes must be the candidate with the greater voter support, and that candidate is elected.

Here is a plausible template for legislative language to implement BTR-IRV:

> All elections for the office of [office] shall be by ballot, using a system of ranked-choice voting without a separate runoff election. The presiding election officer shall implement a ranked-choice voting protocol according to these guidelines:

1. The ballot shall give voters the option of ranking candidates in order of preference, with smaller numbers indicating higher rank, and the candidate marked "1" considered to be ranked highest. Equal ranking of candidates shall not be allowed. Any candidate not marked with a preference shall be considered as ranked lower than every candidate marked with a preference.
2. If a candidate receives a majority (over 50 percent) of the first preferences of all marked ballots, then that candidate is elected.
3. If no candidate receives a majority of first preferences, an instant runoff retabulation shall be performed by the presiding election officer. The instant runoff retabulation shall be conducted in sequential rounds. A "continuing candidate" is defined as a candidate that has not been defeated in any previous round. Initially, no candidate is defeated and all candidates begin as continuing candidates.
4. In each round, every ballot shall count as a single vote for whichever continuing candidate the voter has ranked highest. The two candidates with the fewest votes in the round, herein denoted as "A" and "B", shall contend in a runoff using all ballots. If the number of ballots ranking A higher than B exceeds the number of ballots ranking B higher than A, then B is defeated and A continues to the following round. Likewise, if the number of ballots ranking B higher than A exceeds the

number of ballots ranking A higher than B, then A is defeated, and B continues to the following round. If the numbers of ballots favoring the two candidates are tied, then the candidate with fewest votes is defeated in the current round.

5 The aforementioned instant runoff retabulation, eliminating one candidate each round, shall be repeated until only one candidate remains. That candidate is elected.

6 The governing jurisdiction may adopt additional regulations consistent with this subsection to implement these rules.

5 Conclusion

Five simple and uncontroversial principles and desirable properties of governmental elections are enumerated:

1 One-person-one-vote
2 Majority rule
3 Avoid the Spoiler effect
4 Disincentivize tactical voting
5 Precinct summability and audit transparency

It is hard to imagine any advocate of participatory democracy disputing the salience and value of any of these principles or properties. Yet in Burlington Vermont in 2009, the IRV election failed to comport with any of these five principles or desirable properties. Proponents of IRV never promised precinct summability but they do regularly promise that IRV:

1 is "guaranteed to elect the candidate with majority support" even when there are more than two candidates,
2 "eliminates the Spoiler Effect", and
3 removes the burden of tactical voting from voters allowing them to "Vote their hopes rather than their fears," which levels the playing field for third-party and independent candidates to fairly compete with the candidates of the two major parties.

Thirteen years ago in Burlington Vermont, IRV objectively failed to deliver on any of those promises. Following the 2009 election there was great and acrimonious controversy. The elected mayor was perceived to have diminished legitimacy.

Bob Kiss in 2009, unfortunately shares a distinction with George W. Bush in 2000 and with Donald Trump in 2016. All three candidates were elected to executive office when the public record indicates that more voters marked their ballots preferring a different *specific* candidate for that office.

The following year, 2010, Instant-Runoff Voting was repealed and the city reverted to the plurality rule.

In 2021, Burlington voted to readopt IRV and, ironically, in the same election, the incumbent Mayor Miro Weinberger was reelected under plurality, with a 43% plurality, only 0.9% more than Max Tracy, when independent Ali Dieng received nearly 13%, clearly enough to possibly alter the outcome of the election. If Dieng had not run and his voters split 7–6 in favor of Tracy, then Max Tracy would have been elected mayor. But we'll never know, because we did not collect enough information from the voters in Burlington under the traditional *"mark-only-one"* ballot. A ranked ballot is needed to collect this contingency information from voters. This close election with a plausible spoiler precipitated clamor for expeditiously completing enactment of the re-adoption of the ranked ballot. As of 2021, the Burlington IRV charter change is in the hands of the Vermont legislature, which must approve it for it to take effect.[2]

Now that Ranked Choice Voting is on the cusp of returning to the state, Vermont is in a unique position to correct this technical flaw in IRV. In doing so, Vermont can again make history, ***good*** history, history befitting a discerning and progressive *"brave little state"* by recognizing and understanding the problem and, rather than ignoring or denying it, acting to correct the problem with model legislation.

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Declarations

Conflict of interest The authors declare no competing interests.

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[2] In April 2022, the Vermont Legislature passed the charter change with the specific RCV method removed, to be resolved by the Burlington City Council at the ordinance level.