*WORKING PAPER - DO NOT DISTRIBUTE WITHOUT PERMISSION*

Multimember Instant Runoff Voting (MIRV): How Necessary Are the Quota and Fractional Transfers in Single Transferable Vote Elections?

Antony Hodgson, PhD  
President, Fair Voting BC

# Abstract

British Columbian voters participated in two referendums in 2005 and 2009 asking if they wanted to adopt the Single Transferable Voting (STV) system recommended by the Citizens’ Assembly on Electoral Reform. The recommendation received nearly 58% support in the first referendum, but only 39% support in the second. Both anecdotal and statistical evidence exists that suggests that difficulties in communicating the details of the standard STV counting process played a role in some voters’ reluctance to support the recommendation. Two of the most unfamiliar and problematic elements of conventional STV for voters unacquainted with the voting system are (1) the notion of a quota and (2) the use of fractional ballot transfers. Canadians are already familiar with the notion of a ranked ballot and whole ballot transfers as the Instant Runoff Voting (IRV) process is widely used to select leaders of political parties.

The purpose of this paper is to examine the question of whether or not a simplified form of STV (i.e., a multi-seat version of IRV, or MIRV) could produce substantially similar electoral outcomes without carrying the public communications burden of the two unfamiliar concepts of quotas and fractional transfers. We tested this question by applying both STV and MIRV counting to several sets of publicly available ballot data – three districts in Ireland in 2002, 21 districts in the Glasgow City Council elections of 2007, two civic elections in Minneapolis in 2009, eight elections in Cambridge for both city council and the school board every two years from 1997 through 2011, ten local elections in New Zealand in 2004 and one large 20-seat student senate election in Berkeley in 2005. We also ran this analysis on the ballot data from the simulated BC-STV election conducted by Demochoice in 2005. Results show that 299 of 308 seats in the real elections (or 97%) would have been won by the same candidates under both systems and 75 of 79 seats in the simulated election. The changes in outcome were all primarily due to a popular candidate capturing more votes under MIRV than would have been necessary to win the seat, thereby reducing the number of ballots still in play for their running mates. In practice, parties would likely take steps to communicate with their voters about voting strategies to minimize this effect, so we conclude that, for all practical purposes, MIRV and STV will produce virtually identical outcomes. Democratic reformers can in good conscience advocate for use of a simplified version of STV (i.e., MIRV) in order to gain the benefits of easier public explanation of the proposed reform without any significant trade-off in accuracy of representation.

# Introduction

The Canadian province of British Columbia ran two referendums in 2005 and 2009 on the question of whether or not to adopt the recommendation of its Citizens’ Assembly on Electoral Reform that the province switch from its current Single Member Plurality (First-Past-the-Post) voting system to the Single Transferable Vote (STV). The measure won 58% support in the first referendum, but the government of the day had decided that it would not implement the proposal unless it was supported by 60% of the voters. However, at the time, the government found it politically problematic to refuse outright to accept a majority vote in support of the proposed system, and so scheduled a second referendum to coincide with the subsequent election. In the runup to the 2009 election, popular support seemed initially to be modestly in favour, but, in the end, support on referendum day dropped to only 39% in favour, so the new voting system was not implemented.

Although we will not explore in detail the reasons for the large drop in support, one of the concerns raised during the referendum campaign, particularly by opponents of the recommendation, was the supposed complexity of the counting system. Conventional STV embodies five main ideas: (1) multimember districts, (2) the use of ranking (preferential ballots), (3) ballot transfers when low-scoring candidates are eliminated, (4) the use of a quota to determine when a candidate has sufficient votes to be elected, and (5) transfers of fractional ballots when a candidate has reached the quota and been elected. Of these five, the use of a quota and fractional transfers seem to have posed the greatest difficulties in communicating with the public about how STV works. See, for example, the following ‘Frequently Asked Question’ on the opposition website (nostv.org):

*Q. Isn't STV a lot more complicated than FPTP?*

*A. Yes. … Voters will […] be confused by a mathematical quota called the Weighted Inclusive Gregory System which determines how and where exactly their vote will be "transferred" to […].*

And in the opposition radio and TV ads, they claimed that “*The complicated STV system chops votes into fractions. You may never know where your vote went*.”

The primary justification for the fractional transfers is to ensure that winning candidates are elected with the same proportion of the total votes cast. This proportion is known as the quota, which is defined as Q = V/(N+1)+1, where V is the number of votes cast and N is the number of seats being contested[[1]](#footnote-1). For example, if 10,000 votes are cast in a district where 3 people are to be elected, the quota will be set at 2501 votes because a maximum of three candidates can win 2501 votes (a fourth candidate could win a maximum of 2497 votes). Under conventional STV, if a candidate wins more than the quota (let us define the number of votes received by a candidate as Vi, where Vi > Q), all ballots which contributed to electing this candidate are discounted in weight by the ratio of Q/Vi to reflect the portion ‘used’ to elect the current candidate, and the balance of each ballot is then ‘transferred’ to the next candidate listed[[2]](#footnote-2).

The philosophical reason for implementing the fractional transfer mechanism is to ensure that if a bloc of voters comprising at two or more quotas’ worth of voters collectively prefers a set of candidates (typically of a single party) to all others, even if one candidate is clearly preferred to the others, the bloc will nonetheless be guaranteed to be able to elect as many candidates as the number of quotas’ worth of votes they represent. Without the fractional transfer mechanism, a marked preference for one candidate could potentially lead to the early elimination of a less-preferred candidate and so to under-representation of the bloc’s true voting strength.

However, since both the notion of an electoral quota and this fractional transfer mechanism are relatively difficult to explain to the public, it is worth exploring whether or not they are, in practice, necessary to the effective functioning of STV. In other words, is it possible to implement a simplified form of counting ranked choice ballots that does not involve either quotas or fractional transfers, yet tends to produce much the same outcomes (i.e., similar sets of candidates elected)?

One such simplified counting mechanism is known as Instant Runoff Voting (IRV), which is based on whole ballot transfers of eliminated candidates alone. IRV (also known as the Alternative Vote, e.g., in Australia) is normally used to elect a single candidate. In IRV, voters rank the candidates in descending order of preference. In each round of counting, if no candidate has a majority of the votes, the candidate with the fewest votes is eliminated and their ballots are transferred to the next-ranked candidate on each ballot (or discarded as non-transferable if no other candidates are indicated on a particular ballot). The process continues until one candidate has a majority of the remaining ballots.

IRV can be easily modified to elect more than a single candidate. If we let N designate the number of seats being contested, then if we simply stop the transfer process when N+1 candidates remain, the top N candidates at this point can be declared elected.[[3]](#footnote-3) For the rest of this paper, we will use the term Multimember Instant Runoff Voting (MIRV) to refer to this simplified version of STV that uses only elimination transfers, reserving the term STV to refer to a more conventional implementation of STV that involves both elimination and surplus transfers (more specifically, in the balance of this paper, we will use the term 'STV' to refer to the version of STV recommended by the BC Citizens’ Assembly, which is essentially identical to that now practiced in Scotland for their Local Council Elections – this is based on the Droop quota and the use of the Gregory method for computing the so-called transfer value). We note that MIRV was used to some small degree in local elections in South Australia from 1984 to 1999, where it was given the somewhat unfortunate name of "Bottoms Up" preferential voting. Local authorities were free to choose between MIRV and STV. In 1999, South Australia removed the MIRV option and now only uses the more conventional form of STV for local elections.

# Methods

To test the hypothesis that MIRV would produce similar outcomes to STV, we applied both counting methods to a number of publicly published ballot datasets from real STV elections. These include:

* An electronic voting pilot conducted in three STV districts in the Republic of Ireland in 2002
* 21 STV districts in the Glasgow City Council election of 2007
* 2009 Minneapolis civic elections
* 1997-2011 Cambridge City Councila and School Committee elections
* 2004 New Zealand Local elections
* 2005 University of California Student Senate election

The ballot files for the public eletions were downloaded from the openstv.org or demochoice.org websites (or sent by the sites' authors) and processed using the open-source ballot counting program from the same website, first using an STV counting algorithm and second using the MIRV process.[[4]](#footnote-4) The results of the two counts were then compared. In addition to these real elections, we also processed the roughly 10,000 ballots submitted to a public simulation of STV prepared for the 2005 referendum held in British Columbia, Canada (demochoice.ca).

# Results

## 2002 Irish Election

The three Irish elections consisted of Dublin West (3 seats), Dublin North (4 seats) and Meath (5 seats). Table 1 shows the results of the Dublin West election. The first column lists the three winners (in order of their selection under STV), as well as the next-closest candidate in the STV election and the non-transferable votes (note: lower scoring candidates are not shown here and in subsequent tables for simplicity of presentation). We see here that Lenihan and Higgins had substantial leads in first preference votes, and these leads were maintained in both the STV and MIRV elections. The race for the third seat came down to Burton and Terry, both of whom were close in first preferences. In the end, Burton won under STV (we only show vote totals in the STV column for the final seat as most earlier seats are won by accumulating a quota’s worth of votes; winners are indicated by boldface and a checkmark in the SRV or MIRV columns) and would also have won under MIRV. STV produced a greater number of non-transferable ballots, mainly due to voters who indicated no preference after a winning candidate, so a fraction of the value of these ballots was in effect discarded, even though the voter succeeded in helping to elect their preferred candidate. Under MIRV, these ballots ended up resting with the elected candidate and not being transferred elsewhere, so the number of non-transferable (or *exhausted*) ballots is lower with MIRV. Under STV, Lenihan was elected in the first round since he marginally exceeded the 25% threshold required to win a seat. The additional votes he received under MIRV are therefore, strictly speaking, unnecessary for his election and could potentially have prevented a party colleague from winning a seat under MIRV, though, due to the small surplus, this did not happen in this case.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Brian Lenihan, FF | 27.0% | ✓ | **36.8%** ✓ |
| Joe Higgins, SP | 21.5% | ✓ | **27.7%** ✓ |
| Joan Burton, Lab | 12.7% | **21.0%** ✓ | **16.8%** ✓ |
| Sheila Terry, FG | 12.3% | 18.8% | 15.6% |
| Non-Transferable |  | 9.1% | 3.1% |

*Table 1. Dublin West Results*

In the Dublin North race, shown in Table 2, the same four candidates would have won under both STV and MIRV, and in the same order of selection. No candidate had a full quota’s worth of votes in the first round, so all seats were assigned following transfers after eliminations.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Trevor Sargent, GP | 16.6% | ✓ | **23.7%** ✓ |
| Sean Ryan, Lab | 14.5% | ✓ | **20.9%** ✓ |
| Jim Glennon, FF | 13.4% | ✓ | **18.9%** ✓ |
| GV Wright, FF | 12.9% | **19.6%** ✓ | **18.5%** ✓ |
| Clare Daly, SP | 12.5% | 17.1% | 16.0% |
| Non-Transferable |  | 3.0% | 2.0% |

*Table 2. Dublin North Results*

Finally, in the 5 seat Meath district (see Table 3), we again see that the same five candidates who won in the STV election would have won using MIRV. One apparent anomaly is the relatively higher final placements of the two Fine Gael candidates (Bruton and English) compared to what one might expect based on their initial shares of the first preference votes. This can largely be explained by the fact that Fine Gael ran a third candidate, John Farrelly, who won 6% of first preferences. When Farrelly was eliminated, the majority of his supporters had listed one of the other two Fine Gael candidates as their next preferences, so this bloc of voters was numerous enough (~27% of the voters, just shy of two quotas – 2x16.7% = 33.3%) that, with the support of some transfers from candidates from other parties, they were able to elect two representatives.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Noel Dempsey, FF | 18.0% | ✓ | **20.0%** ✓ |
| John Bruton, FG | 11.9% | ✓ | **18.8%** ✓ |
| Mary Wallace, FF | 13.7% | ✓ | **16.7%** ✓ |
| Damien English, FG | 9.3% | ✓ | **14.6%** ✓ |
| Johnny Brady, FF | 13.3% | **15.5%** ✓ | **14.6%** ✓ |
| Joe Reilly, SF | 9.4% | 12.6% | 12.2% |
| Non-Transferable |  | 4.7% | 3.2% |

*Table 3. Meath Results*

In summary, in these three elections, representing a total of 12 elected candidates, MIRV would have elected exactly the same set of candidates as STV and in all three cases would also have produced the same final pair of candidates contesting the last available seat.

## 2007 Glasgow City Council Election

The Glasgow City Council election consisted of 21 STV districts (wards), five of which elected three councillors and sixteen of which elected four, for a total of 79 council seats. Fully 78 of the 79 councillors elected under STV would have also been elected under MIRV. The one council seat that would have changed hands if MIRV had been used instead of STV arose in the 4-seat ward of Baillieston (Ward 20). This situation was somewhat unusual in that a very low-ranked candidate (David MacDonald of the Scottish National Party (SNP)) won a seat under STV despite only taking 2.4% of the first preference votes. How did this happen? As shown in Table 4, SNP candidates won 33.2% of first preferences and Labour candidates won 45.9% (the rest being distributed amongst smaller parties). Under STV, the quota for a 4-seat district is 20%, so Labour had enough support to win 2 seats outright (45.9% > 2x20%) and the SNP one seat (33.2% > 20%), with the fourth seat being allocated after accounting for the results of vote transfers; the SNP would have had 65% of a quota left over after the election of their first candidate, while Labour would have had only 30% of a quota left after electing two candidates, so an SNP candidate was likely to win the final seat. We note that under both STV and MIRV, the first three seats went to the same three candidates; only the outcome for the fourth seat differed.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidate** | **First Preferences** | **STV** | **MIRV** |
| John Mason, SNP | 30.8% | ✓ | **35.4%** ✓ |
| Jim Coleman, Lab | 25.9% | ✓ | **27.6%** ✓ |
| Douglas Hay, Lab | 12.9% | ✓ | **14.3%** ✓ |
| David MacDonald, SNP | 2.4% | **12.2%** ✓ | - |
| Robert MacBean, Lab | 7.1% | 10.2% | 8.1% |
| George Clark, Con | 6.5% | - | **8.6%** ✓ |

*Table 4. Results in Baillieston ward (Ward 20) in 2007 Glasgow City Council election.*

Under STV, the first candidate elected was John Mason from the SNP. Since he had a considerable surplus of votes, they were redistributed to the next-ranked candidate on those ballots. This resulted in a large transfer of votes (6.4% worth) to the originally 8th placed MacDonald. Subsequent transfers from candidates from Solidarity and the Liberal Democrats, as well as from the Conservative candidate, George Clark, eventually elevated MacDonald above Labour candidate Robert MacBean who received some additional transfers from Coleman’s surplus, but few others. Therefore, although MacDonald originally had very little first ballot support, SNP supporters and supporters of some other smaller parties preferred to see their ballots go to MacDonald than any of the other candidates.

Under MIRV, a somewhat different dynamic emerged. Since there is no quota with IRV, Mason’s surplus was never transferred to MacDonald (the other SNP candidate), so MacDonald was one of the first few candidates eliminated due to his lack of a strong personal showing. The Conservative candidate Clark picked up significant transfers from the Scottish Unionist and Liberal Democrat candidates as they were eliminated, while the third Labour candidate, Robert MacBean, received no transfers from Coleman’s surplus and only a handful from Solidarity and the Liberal Democrats. In the end, Clark moved from 0.6% behind MacBean to 0.5% ahead and took the fourth seat.

It is difficult to say which of these two results is more satisfying from a theoretical perspective. STV proponents would argue that SNP supporters numbered close to two quotas’ worth of voters and, based on attracting a few additional transfers from supporters of candidates from other parties, warranted electing a second candidate. However, it is clear that MacDonald as a candidate enjoyed very little direct support, having secured only 2.4% of first preferences – his support and subsequent win was most probably due to his party affiliation rather than to his personal profile. From this perspective, it is likely that MacBean (and arguable that Clark) enjoyed higher levels of direct personal support than MacDonald and on this basis better merited election. Interestingly, though neither MacBean nor Clark could amass more than 45% of a standard STV quota’s worth of votes under MIRV due to the retention of votes by the frontrunners, neither could MacDonald garner much more than 60% of a quota even under STV due to ballot exhaustion. It is therefore fair to argue that the last-elected candidate under either system was elected with much less support than the first three and that the election of any one of the final three candidates in Table 4 to the fourth seat would satisfy roughly the same number of voters.

## 2009 Minneapolis Civic Elections

Minneapolis adopted STV in 2007 for their civic elections. The first STV election was run in 2009 for two bodies – the Parks and Recreation Commission and the Board of Estimates. In the Parks and Recreation Commission election, nine candidates stood for three seats, while in the Board of Estimates election, seven candidates stood for two seats. Both STV and MIRV would have produced the same results in both cases.

## 1997-2011 Cambridge City Council and School Committee Elections

Detailed ballot data for Cambridge city council and school committee elections between 1997 and 2005 (every second year) has been made available on the Demochoice website (demochoice.org/real.php). Additional ballots (2007-2011) were sent to me by Jeffery O’Neill of OpenSTV.org.

**City Council Elections:** The results for the 9-seat city council elections under STV (Cambridge counting rules) and MIRV came out the same for all seats in all years except 2001 and 2003; in those years, 8 of 9 seats were allocated identically.

In 2001, the first eight seats were allocated identically under STV and MIRV. John Pitkin and David Maher placed 9th and 10th in first preferences, respectively, with 37 votes (out of 8563) initially separating them. Under STV, then Deputy Mayor Anthony Galluccio received nearly two quotas’ worth of votes; Maher received just over 200 ballots from transfer of this surplus and maintained this lead over Pitkin to the end of the count. Under MIRV, Pitkin received marginally more votes during transfers than Maher did and finished 66 votes ahead.

In 2003, the top seven candidates (by first preferences) were elected by both MIRV and STV, as was the initially 10th ranked candidate (only 20 votes out of 10,040 cast separated the 8th and 10th ranked candidates). Under STV, Maher won a seat, largely on the strength of the initial transfer from first-ranked Mayor Anthony Galluccio, who won 1.5 quotas’ worth of first preferences and had 125 votes transferred to Maher. Under MIRV, Maher did not receive this transfer and so ended up about 20 votes behind when he was eliminated (next to last); Matt DeBergalis took the final seat instead.

**School Committee Elections:** In the six-seat School Committee elections, results were identical under MIRV and STV in five of the eight elections from 1997 to 2011; there was a single seat difference in 2001, 2007 and 2009.

In the 2001 election, the top five candidates (based on first preferences) were elected under both MIRV and STV. The 6th and 7th ranked candidates (Nancy Walser and Susana Segat) initially differed by only 21 votes out of 8245 (0.25%). Under STV, Walser’s lead was only 9 votes when the next to last candidate was excluded; this transfer favoured Segat by 36 votes, so she won over Walser by only 27 votes. Under MIRV, the race was also highly competitive – in the end, Segat beat Walser by only 8 votes.

In 2007, just as in 2001, the top five candidates were elected under both MIRV and STV. The 7th ranked candidate, Nancy Tauber, was initially over 300 votes behind 6th ranked Richard Harding (with over 13,000 ballots cast). The next-to-last candidate eliminated had over 1000 ballots when she was excluded; under MIRV, Harding received 49 transfers, while Tauber received a much higher number: 335. In addition, over 500 transfers went to the top five candidates. Despite Tauber’s much greater number of transfers, she was unable to overcome Harding’s initial lead and finished 20 votes behind him. Under STV, however, a large number of those 500 ballots that went initially to the top five candidates took them past their quotas and so continued to be passed on; Tauber won 475 transfers to Harding’s 90 and so was able to beat him by nearly 100 votes.

In the 2009 election, five of the top six candidates (based on first preferences) were elected under both MIRV and STV. The 5th and 7th ranked candidates (Joseph Grassi and Patrick Nolan) finished 18 and 24 votes apart under STV and MIRV, respectively. Under STV, Nolan captured approximately 40 extra votes (out of over 15,000 ballots cast, or ~0.25%) through transfers from surpluses that were not available to him under MIRV and so was able to squeeze past Grassi.

**Summary:** In summary, in the eight Cambridge City Council and School Committee elections from 1997 to 2011, MIRV and STV would have delivered identical results in 70 of 72 of the council seats and 45 of 48 school committee seats, or 115 of 120 seats altogether. Amongst the five of these 16 districts where a difference between MIRV and STV was found, only two involved contests where the choice of voting system would have made a difference of more than a few dozen votes (i.e., the 2001 city council and the 2007 school committee elections); the other three were simply close contests.

## 2004 New Zealand Local Elections

New Zealand started using STV in selected civic elections in 2004 (local councils, health districts, community boards). Data is available through the Demochoice website (see http://www.demochoice.org/real.php) for 10 multiseat elections. MIRV and STV would have delivered identical results in 8 of these 10 elections, differing by one seat each in two five-seat districts; in total, 50 of 52 seats would be allocated identically under both MIRV and STV.

In the two races where the systems would have produced a difference, one was simply a matter of it being an extremely close race. In Porirua East, David Stanley had 11 more first preferences than Timothy Manu (out of 1891 ballots cast) and, under STV, ended up gaining less than two more votes on Manu after all fractional transfers were made, thereby winning the seat. Under MIRV, Manu earned 12 votes more than Stanley through transfers, which allowed him to win the final seat by a single vote.

In Porirua North, in contrast, Maureen Gillon started out 28 votes behind Kevin Watson (out of 3144 ballots, or just under 1%), but on the final transfer received close to 140 votes to Watson’s 70 and so overtook him. Under MIRV, Gillon finished 20 votes behind Watson. In this case, MIRV would have resulted in approximately 340 votes (~11% of all ballots) being assigned to candidates who finished above the STV quota. Since the preferences of these voters were heavily tilted towards Gillon, it is clear that the choice of electoral system would have played a more significant role in this particular contest.

## 2005 University of California Berkeley Student Senate Election

The UCB student senate election is an interesting test case because it represents one of the largest STV elections known; the 2005 election saw 100 candidates competing for 20 senate seats. While data is available for a number of these senate elections, such large districts are unusual in more conventional political settings, so we present the results of only a single senate election as an example of how MIRV would compare with STV in the context of a district with a large number of seats.

Even in this very large district, MIRV and STV would only have differed in the allocation of a single seat – 19 of 20 seats would have been won by the same people. The candidates elected under both systems were initially ranked 1st to 12th, 14th, 15th, 17th, 19th, 20th, 21st and 28th by first preferences. STV also elected the candidate initially ranked 16th (Chris Abad), while MIRV elected the candidate initially ranked 13th (Melissa Jones). This was a close race under both systems – under STV, Abad was only 3 votes ahead of Jones, while under MIRV, Jones edged Abad by only 4 votes (out of 3458 ballots cast). In either case, there was no significant discrepancy in the number of voters who secured their preferred representative.

## 2005 Demochoice Election (BC)

A final dataset to consider is the simulated election held in the runup to the 2005 referendum campaign in British Columbia. This simulation was organized by the author working in collaboration with Demochoice USA. The purpose was to give British Columbians an opportunity to experience what it would be like to vote using the proposed BC-STV voting system prior to casting their ballot in the referendum. Although no definitive district boundaries had been proposed at that time by the relevant authority (the Electoral Boundaries Commission), we artificially created 17 districts ranging from 2 to 7 seats (totalling 79 seats)[[5]](#footnote-5) by combining adjacent existing ridings and populated the candidate lists in each district by using the names of all candidates running in the individual riding elections comprising each district. We sent out invitations to all political parties to pass on the simulation’s website to their supporters to minimize the extent to which the results would be biased due to differences in participation by supporters of different parties. Over 10,000 ballots were cast in the simulated election, although no attempt was made to ensure that the same person voted only once, so we do not know how many distinct voters participated. Nonetheless, we believe that this simulation provides a useful glimpse into how BC voters would cast their ballots if they had an opportunity to vote using preferential ballots.

Of the 79 seats contested in the 2005 simulated BC election, 75 of them would have been won by the same candidates under both STV and MIRV and thirteen of the seventeen districts would have produced identical results under both systems. In four districts (one in each of a 4-seat, 5-seat, 6-seat and 7-seat district)[[6]](#footnote-6), one seat was won by a different person under the two different counting systems. In all cases, the first N-1 seats in an N seat district would have been won by the same person under both systems; only the final seat assignment ever differed.

We now examine in detail these four districts where different outcomes occurred. One difference between these simulated elections and real life elections is that the candidate list is considerably larger than we would normally find in real STV elections because we listed all candidates from the corresponding set of single member districts, so in an N seat STV district used in this simulated election, we would almost always have N candidates from each of the Liberal, NDP and Green parties on the ballot since each party ran a candidate in each single member riding; in addition, we would have a few minor party or independent candidates. Among other effects, this means that first preferences for individual candidates can appear to be quite small – e.g., in a 7-seat district contested by over 20 candidates, the average first preference percentage is under 5%.

**Kootenays:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Corky Evans (N) | 34.8% | ✓ | **42.6%** ✓ |
| Bill Bennett (L) | 5.5% | ✓ | **12.3%** ✓ |
| Luke Crawford (G) | 9.5% | ✓ | **14.0%** ✓ |
| Katrine Conroy (N) | 7.0% | **17.5%** ✓ | - |
| Norm Macdonald (N) | 8.0% | 13.8% | **12.3%** ✓ |
| Pam Lewin (L) | 8.8% | - | 11.8% |

*Table 5. Comparison of results in the Kootenays 4-seat district.*

The situation in the 4-seat Kootenays election (see Table 5) is very similar to the Baillieston ward in the Glasgow election discussed above – in both elections, there was a candidate of one party who won many more first preferences than any other candidates from the same party; here, Corky Evans of the NDP won nearly 35% of first preferences. Under STV, Evans’ surplus flowed in significant measure to his party-mates (Conroy’s vote share increased by nearly 6% alone in the first transfer). In the end, Conroy held more votes than her party-mate Norm Macdonald and so took the final seat. Note that one of the Liberal candidates, Bill Bennett, came from behind to beat party-mate Pam Lewin, mainly on the strength of transfers from another Liberal candidate (not shown in the table).

In the MIRV count, however, there is no concept of a surplus to transfer, so Conroy did not win any votes from those who gave first preferences to Evans and trailed Macdonald until she was eliminated. At that point, Macdonald received the bulk of Conroy’s ballots, which elevated him above his Liberal competitor, Pam Lewin, thereby winning him the fourth seat. Since both Conroy and Macdonald were from the same party, the choice of counting system did not affect the seat distribution of the parties.

**North Shore – Coast:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Adriane Carr (G) | 20.9% | ✓ | **34.0%** ✓ |
| Dan Jarvis (L) | 8.5% | ✓ | **13.3%** ✓ |
| Joan McIntyre (L) | 7.6% | ✓ | **11.8%** ✓ |
| Dennis Perry (G) | 8.9% | ✓ | - |
| Craig Keating (N) | 8.7% | **14.2%** ✓ | **14.0%** ✓ |
| Nicholas Simons (N) | 8.5% | 14.2% | **13.1%** ✓ |
| Maureen Clayton (L) | 7.6% | - | 11.4% |

*Table 6. Comparison of results in the North Shore - Coast 5-seat district.*

In the North Shore – Coast district, a similar dynamic again played out. There was a clear front-runner in terms of first preferences (Adriane Carr, leader of the Green Party, with approximately 1.25 quotas), and then four candidates (Perry, Jarvis, Keating and Simons) within two votes of one another out of 473 ballots cast in this district. Under STV, Carr’s surplus, together with a transfer from a third Green Party candidate (Long) who was eliminated, helped Perry secure a win. Under MIRV, no surplus was transferred from Carr and Long’s ballots were largely added to Carr’s total, so Perry collected fewer transfers and ended up being the second from last candidate excluded when he had accumulated 11.0% of the ballots. In the end, the final seat was contested by two Liberal party candidates, with Joan McIntyre edging out Maureen Clayton (in the STV count, McIntyre likewise had a tiny lead of 0.1% over Clayton when she was excluded). Under MIRV, therefore, the NDP ended up taking one additional seat at the expense of the Greens.

**South Island:**

In the six-seat South Island district, where an STV quota was 14.3%, the six NDP candidates collectively won 43.2% of first preferences (nearly three quotas), the Liberals won 30.8% (over two quotas) and the Greens won 18.7% (slightly more than one quota). It was therefore somewhat surprising to see that under STV each of these three parties won two seats each, rather than the NDP winning their expected three seats and the Greens their expected one seat. The NDP’s leading candidate, Carole James, had nearly two quotas’ worth of first preferences and so won handily on the first round of counting; the vast majority of her supporters indicated another NDP candidate as their second choice. As the count went on, however, some of the NDP candidates to be eliminated, particularly some of the female candidates, saw their ballots being transferred to the two Green party candidates still in the race at that point (i.e., Sterk and Rouleau), rather than to other NDP candidates; these two had similarly benefitted from virtually all of the transfers from earlier exclusions of other Green party candidates. Such inter-party transfers added almost 10% support to Sterk and Rouleau, enabling them unexpectedly (i.e., based on relative number of first preferences alone) to take one seat from the NDP. Although unexpected, this kind of outcome is in fact perfectly consistent with the party-agnostic and candidate-centred focus of STV, so the result is not in any significant way inconsistent with how voters expressed their preferences.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Carole James (N) | 25.6% | ✓ | **32.9%** ✓ |
| Rob Fleming (N) | 5.6% | ✓ | **10.8%** ✓ |
| Jane Sterk (G) | 5.2% | ✓ | **10.3%** ✓ |
| Ken Rouleau (G) | 7.6% | ✓ | 9.9% |
| Jeff Bray (L) | 7.0% | ✓ | **11.2%** ✓ |
| Ida Chong (L) | 6.6% | **11.2%** ✓ | **10.6%** ✓ |
| Murray Coell (L) | 6.6% | 10.7% | **10.3%** ✓ |

*Table 7. Comparison of results in the South Island 6-seat district.*

Under MIRV, five of the top six candidates in the STV column (all but Rouleau) were elected. Rouleau was still competitive for the final seat under MIRV, but was not re-elected because many of the transfers that came to him from NDP candidates eliminated late in the counting process with STV ended up going to James and Fleming instead. In the end, Rouleau ended up a mere four votes behind Murray Coell of the Liberal party, who won his party’s third seat, and also four votes behind his party-mate, Jane Sterk. The NDP won only two seats under MIRV instead of three because one of their candidates, Carole James, had a much higher profile than the others (likely by virtue of being party leader) and so captured many more votes than she needed to be elected. The Liberals managed to win three seats despite having much less first preference support than the NDP because the support for their candidates was relatively evenly distributed (each of the three elected candidates ended up with between 10.3% and 11.2% of the ballots).

**Vancouver – Burnaby:**

An interesting dynamic played out in this 7-seat district. First ballot preferences ran 40.7% to the NDP, 37.2% to the Liberals and 15.5% to the Greens. The STV quota was 12.5%, so both the NDP and the Liberals could be expected to win three seats, while the Greens could likely win one. Under STV counting, this is in fact what happened. In contrast to most of the other districts where MIRV produced a different outcome from STV, here there was no ‘star’ candidate who took more than a quota’s worth of first preferences. The STV counts proceeded much as one would normally expect, with steady intra-party transfers as various candidates were excluded. At the point where Calendino (NDP) was excluded, less than 1% separated him from his party-mates Simpson and Yiu, so small changes in the vote distribution could easily have shifted the result. In the end, Simpson received more transfers from Calendino’s supporters, and so edged out Yiu for the last seat.

|  |  |  |  |
| --- | --- | --- | --- |
| **Candidates** | **First Preferences** | **STV** | **MIRV** |
| Wally Oppal (L) | 11.1% | **✓** | **16.3% ✓** |
| Ian Gregson (G) | 4.9% | **✓** | **13.9% ✓** |
| Patty Sahota (L) | 7.1% | **✓** | **11.7% ✓** |
| Adrian Dix (N) | 7.8% | **✓** | **12.0% ✓** |
| Chuck Puchmayr (N) | 8.0% | **✓** | **11.1% ✓** |
| Joyce Murray (L) | 7.1% | **✓** | 9.6% |
| Shane Simpson (N) | 6.8% | **10.4% ✓** | **9.7% ✓** |
| Gabriel Yiu (N) | 6.4% | 9.1% | - |
| Pietro Calendino (N) | 5.0% | - | **9.9% ✓** |

*Table 8. Comparison of results in the Vancouver-Burnaby 7-seat district.*

Under MIRV, an initially slightly surprising thing happened – Calendino ended up ahead not only of both Simpson and Yiu, but also ahead of Liberal competitor Murray, so the NDP won four seats, the Liberals two, and the Greens one. The primary reason that Murray (or a third Liberal candidate) did not win a seat was that, under MIRV, when Liberal candidates were excluded, some transfers went to the leader (Wally Oppal) who had no further need of votes to be elected. The main reason why Calendino won under MIRV instead of Yiu was simply that they were running neck-and-neck; Calendino ended up being a single vote ahead of Yiu at the point where one of them was to be excluded, so the result could easily have gone the other way.

### Summary of Demochoice Election Results

The primary reason for differences between outcomes under MIRV and STV in the Demochoice simulated election was that one candidate was noticeably more popular than other candidates and so captured and retained a relatively large number of ballots that would normally be redistributed under STV. In the four (of seventeen) districts where a notably popular candidate ran (Evans, Carr, James, and (to a lesser extent) Oppal[[7]](#footnote-7)), three resulted in a change in the party distribution. There was no change in the Kootenays, the NDP moved up one at the expense of the Greens in the North Shore – Coast district, the Liberals moved up one at the expense of the Greens in South Island, and the NDP moved up one at the expense of the Liberals in Vancouver – Burnaby. The net effect of these changes was that the Liberals came out the same, the Greens dropped two seats, and the NDP moved up two seats under MIRV.

In terms of overall proportionality of the STV and MIRV elections, the Liberals had earned 30.2 electoral quotas, the NDP 29.8 and the Greens 12.6. Under STV, the Liberals won 31 seats, the NDP 30, the Greens 16, and two other parties won single seats. Under MIRV, the Liberals would have stayed at 31 seats, the NDP would have won 32, and the Greens would have won 14. The sum of absolute deviations from perfect proportionality would have been 0.8+0.2+3.4 = 4.4% with STV *vs* 0.8+2.2+1.4 = 4.4% with MIRV, so from the perspective of this measure of party proportionality, the two systems produced identical results.

# Discussion and Conclusions

The purpose of this paper was to explore the question of whether or not a simplified version of the Single Transferable Vote that did not involve the use of either quotas or fractional ballot transfers (which we refer to as Multiseat Instant Runoff Voting, or MIRV) would provide substantially equivalent results to more standard versions of STV which did include these two features. To test this question, we recounted ballots from three real elections and one simulated election using MIRV.

**Summary of Results from Real Elections:** In the set of real elections presented here, comprising a total of 53 separate districts and 308 seats (with district sizes ranging from 2 to 20 seats), 299 of the 308 seats would have been won by the same candidates had the ballots been counted using MIRV, for a raw concordance rate of 97%. The nine differences occurred once in a 4-seat district (Glasgow), twice in a 5-seat district (New Zealand), three times in a 6-seat district (Cambridge), twice in a 9-seat district (Cambridge) and once in a 20-seat district (California).

**Summary of Results from Demochoice Election:** In the simulated Demochoice election, there were four districts in which a single seat changed hands, and this produced a small change in outcome on a party basis – the NDP won two additional seats and the Greens lost two. There was no effect on overall proportionality as measured by the sum of absolute differences from perfect proportionality (4.4% in both cases, *vs* typical values of 20-40% for Single Member Plurality elections).

**Primary Reason for Differences Between STV and MIRV:** When we studied the four districts in the Demochoice election where the outcome of STV and MIRV differed, we found that the primary reason for the difference was the presence of a highly popular candidate. Because MIRV does not include the concept of a quota, there is likewise no notion of a surplus, so, in contrast to STV, votes above those needed to ensure election cannot be transferred to other candidates, typically of the same party, who are in danger of being eliminated. Occasionally, such candidates will fail to be elected under MIRV when they would have been under STV.

Given this difference in electoral outcome, we need to ask three questions: (1) is this difference significant enough that it should be addressed, (2) does it produce results that are less ‘democratic’ than either or both of STV and Single Member Plurality (SMP) voting, and (3) if there is a significant difference, how might we address or ‘correct’ it?

**Are Differences Between STV and MIRV Significant?** To address the question of whether the impact is significant, we have presented evidence from a number of real elections comprising a total of 308 seats and have shown that using MIRV would have caused a difference in who would have won a seat less than 3% of the time. Even in the simulated Demochoice election, only four seats changed hands.[[8]](#footnote-8) There was no obvious bias in who was affected by these changes, and the deviation from proportionality between STV and MIRV was unchanged in the Demochoice election. We therefore find it hard to accept the argument that adopting MIRV will have any significant or systematic impact on election results. We do note that differences only occurred in districts with four or more candidates, so perhaps these differences could be further minimized by reserving MIRV for use with districts electing four or fewer candidates, though this would have an adverse impact on overall proportionality, so we do not endorse this suggestion.

**Is MIRV Less ‘Democratic’ Than STV?** As to the question of whether the results of MIRV are less ‘democratic’ than those of STV or SMP voting, we repeat the observation that there was no change in the measure of (dis)proportionality in switching from STV to MIRV in the Demochoice elections. From this perspective, we regard the two counting methods as substantially equivalent and significantly better than SMP. However, we do accept the observation that, in principle (and perhaps occasionally in practice), MIRV may prevent a large bloc of voters from securing as much representation as they would otherwise be entitled to and so would be open to considering ways to reduce the occasional discrepancy between outcomes under MIRV and under STV.

However, before considering changing the rules of MIRV, we should consider how parties and voters might change their behaviours, if MIRV were actually in place, to minimize or mitigate the possibility that too many votes might be unproductively captured by a particularly popular candidate. If MIRV were in place, party strategists would certainly understand the potential for benefitting from vote management strategies and a significant number of voters would also likely understand the problem sufficiently well to affect how they ranked candidates (see [home.versanet.de/~chris1-schulze/schulze2.pdf](http://home.versanet.de/~chris1-schulze/schulze2.pdf) for a description of how informed voters seek to maximize the value of their vote and parties seek to manage their supporters’ votes under STV). In short, votes would quickly understand that they shouldn’t automatically give a popular candidate their first preference, as that would reduce the chances of their second choice being elected as well; we could therefore expect some voters to switch the preferences they mark on their ballots. Likewise, parties might adopt a strategy such as asking voters in particular parts of the district to mark a less popular candidate higher than a more popular candidate. As long as this did not result in a complete reversal of the voters’ true preferences (considered as a whole), these strategies should significantly reduce the possibility of a popular candidate accumulating any significant surplus, particularly in the opening round of counting.

**Could MIRV Be ‘Improved’?** This leads to our third question – how might MIRV be improved? Unfortunately, since the virtue of MIRV lies in its simplicity, particularly the ease of explaining the concept and counting process to a public largely unfamiliar with the operation of different voting systems, dealing with any of its failings, however slight in practice, will necessarily result in adding elements to MIRV. The two principal ways in which MIRV differs from STV are (1) due to the absence of a notion of a quota, there is no mechanism for preventing transfers to candidates who already have enough votes to be elected, and (2) due to the absence of fractional transfers, there is no mechanism for distributing surplus votes from candidates who have more than they need to be elected. The obvious halfway step, therefore, is to re-introduce the notion of an electoral quota, but not the fractional transfers. Once a candidate has more than a quota’s worth of votes, they would not be permitted to receive any additional transfers from eliminated candidates. Reviewing the districts in the simulated Demochoice election where STV and MIRV produced slightly different outcomes, we find the following:

*Kootenays:* Corky Evans had originally won 1.75 STV quotas (35% of the vote), and then accumulated another 3% in transfers prior to the point where one of the two remaining NDP candidates (Conroy and Macdonald) was to be eliminated. Since less than 1% separated the two at that point, it is theoretically possible that preventing transfers to Evans could have tipped the balance in favour of Conroy, but it is certainly not guaranteed to have produced the same outcome as STV. Rather, it is more appropriate to compare the 15% surplus Evans had with the subsequent 3% in transfers he received and to conclude that the originally captured surplus was the more significant factor in affecting the outcome of this election.

*North Shore – Coast:* Green Party leader Adriane Carr had an initial surplus of about 4% of the vote, and ended up gaining another 5% in transfers as candidates were eliminated. At the point where a difference in the outcomes between STV and MIRV occurred, only 2 votes (0.4%) separated the Green candidate who was being eliminated (Perry) from his two closest competitors. The proposed change disallowing transfers to candidates already holding a quota’s worth of votes could therefore quite possibly have changed the outcome by allowing Perry to secure more votes prior to being eliminated, which would have brought the MIRV result into agreement with the STV result.

*South Island:* NDP leader Carole James initially had 25.6% of first preferences, 11.3% more than a single electoral quota. As the MIRV count continued, she gained another 7% in transfers, including nearly 1% from eliminated Green candidates and 5% from eliminated NDP candidates. The Green candidate who had won under STV (Rouleau) ended up only 0.4% behind the Liberal candidate, Coell. Since more NDP supporters would likely have been inclined to support Rouleau than Coell, it is quite conceivable that disallowing transfers to James after she had received a quota’s worth of votes could have resulted in Rouleau being elected instead of Coell.

*Vancouver – Burnaby:* In this district, the leader (Liberal candidate Wally Oppal) did not initially hold a quota of first preferences, so there was no surplus to transfer. By the end of the MIRV count, however, he had accumulated an excess of nearly 4% over the quota. Since excluded Liberal candidate Joyce Murray ended up a single vote behind, preventing transfers to Oppal after he had achieved a quota would almost certainly have resulted in Murray being elected.

In summary, in three of these four districts, adding a rule preventing transfers to candidates already holding a quota would likely have produced results identical to those using the full STV count; only in the Kootenays would the transfer-limitation rule have been unlikely to have changed the outcome (largely because the effect of this change would have been dwarfed by the size of Evans’ surplus). We therefore conclude that adding this transfer-limitation rule could possibly play a role in further minimizing differences in outcome between STV and MIRV, though this modest and arguable benefit would have to be balanced against the need to explain the concept of a quota in addition to a preferential ballot and transfers following elimination and the fact that, on the whole, there appears to be little necessity for such a rule.

**Conclusions:** Overall, based on the analyses presented in this paper, we conclude that, to the extent that the patterns of district size, number of parties, party support and public awareness of candidates found in the various elections studied would be similar in a future election using MIRV, we could reasonably expect that MIRV would result in outcomes virtually identical (or at least substantially similar) to those of full-fledged STV. Although we could not explicitly compare STV/MIRV against the existing Single Member Plurality voting system, we would certainly expect MIRV to produce the same significant reduction in disproportionality normally encountered when moving from SMP to STV. If an important goal of electoral reform is to find a politically viable replacement for SMP voting that has a markedly lower disproportionality measure, we believe that both MIRV and STV can be considered equally effective.

We further conclude that, while the use of quotas and fractional ballot transfers may address some theoretical concerns, they are, for most practical purposes, largely unnecessary. Even where a difference results, it is arguable which result better reflected the values and desires of the voters – for the most part, the final outcomes hinged on very slight differences in voter preferences. Indeed, one of the strengths of both STV and MIRV is that they tend to make the last seat in a district highly competitive (i.e., a *swing* *seat*). This feature makes the overall election outcome sensitive to small shifts in overall levels of party support, which increases the ability of voters as a whole to affect the outcome of an election. In contrast to SMP voting, where swing seats exist in a minority of ridings (which parties can therefore narrowly target, substantially ignoring ridings where the outcome is more predictable), every district in an STV or MIRV election can be considered to contain at least one swing seat, so parties are motivated to make substantially broader appeals to the voters.

We feel that democratic reformers can therefore in all good conscience advocate the use of MIRV in place of STV if they feel that the gains in ease of explanation of MIRV outweigh the small, largely theoretical, advantages of the more elaborate STV voting system.

1. There are at least two different definitions for the quota that have been used historically: the Hare quota (Q = V/N) and the Droop quota, defined above. [↑](#footnote-ref-1)
2. This process is known as the Gregory method; it is used in STV elections in Northern Ireland and was essentially the system proposed for use in BC by the Citizens’ Assembly. [↑](#footnote-ref-2)
3. A further minor modification designed to minimize the number of over-votes a candidate receives would be to prevent any transfers to a candidate who has already achieved a quota’s worth of votes, although this comes with the added complexity of having to introduce the idea of a quota. For this reason, we will not further consider this variant in this paper. [↑](#footnote-ref-3)
4. We used the Northern Irish algorithm to process the Irish election results, and the Scottish algorithm to process all the others. These will not typically produce any difference in the seat allocations, but may produce slightly different vote counts at different stages of the process as the Irish process defers distribution of transfers if they are not necessary to determine a winner. [↑](#footnote-ref-4)
5. In forming these districts, we attempted to respect the recommendations of the Citizens’ Assembly by creating smaller (2-4 seat) districts in less populated areas and larger (5-7 seat) districts in more urban areas. By 2009, six additional seats had been added and the Electoral Boundaries Commission had recommended a set of 20 STV districts, but we did not have their recommendations available to us in 2005. [↑](#footnote-ref-5)
6. In this election, there were two 4-seat districts, the three 5-seat districts, the two 6-seat districts and four 7-seat districts. [↑](#footnote-ref-6)
7. Note that two of these candidates are party leaders – Green leader Adriane Carr and NDP leader Carole James. [↑](#footnote-ref-7)
8. We recommend being cautious in interpreting the Demochoice election results. It was not a real election, but rather primarily an educational tool, and we took no steps to verify voter identities or ensure that the voter distributions matched those of the actual ridings, so it is possible (and even likely) that supporters of candidates in particular ridings voted much more frequently than voters in other ridings; as a consequence, some candidates likely received a far higher share of the votes than they would in a real election. [↑](#footnote-ref-8)