My Final College Paper

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Acknowledgements

I want to thank a few people.

Preface

This is an example of a thesis setup to use the reed thesis document class (for LaTeX) and the R bookdown package, in general.

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Abstract

One of the arguments against implementing ranked-choice voting (RCV) is that RCV is harder for voters to participate in. Two of the reasons for this are the more complicated ballot design and the extra effort that goes into forming a ordered preference of candidates. To evaluate this claim, we examine rates of ballot errors and undervoting (ranking fewer than the allowed number of candidates) in some American elections conducted with RCV. Results show that idk yet.

Second paragraph of abstract starts here.

Dedication

You can have a dedication here if you wish.

Chapter 1

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Placeholder

Chapter 2

What is ranked choice voting?

Ranked choice voting (RCV), also known as the alternative vote (AV) or instant-runoff voting (IRV) is an alternative voting method to the first-past-the-post (FPTP) or "plurality" election system more familiar to American voters, where the candidate with the most votes wins. Each voter, instead of choosing their highest preference among a set of candidates for an office, ranks some subset of the candidates in order of preference. This system (or a close variant) is used in Australia, Maine, and some American municipalities: San Francisco, CA; Minneapolis, MN; and Cambridge, MA; among others.

The single-winner RCV tabulation algorithm generally proceeds as follows:

1. For each voter, identify their most preferred candidate that has not yet been eliminated. Count up these preferences by candidate.

2. If one candidate has a majority (50% + 1) of the unexhausted votes, they are declared the winner and counting stops.

3. The candidate with the lowest number of votes is eliminated.

4. The ballots counted for that candidate are each transferred to the voter's next choice if one exists, or if one does not exist the ballot is "exhausted" and removed from counting for further rounds.

5. Return to 1.

Most jurisdictions that use RCV have slightly different rules for edge cases and ballot errors, but this algorithm is what distinguishes RCV from other ranked voting systems (e.g. Borda, Condorcet, Contingent, etc.). A close variant of RCV is the single transferrable vote (STV) method[1], which can be used to elect multiple candidates, i.e. for a school board, instead of just one. In the US, this is used in Cambridge, MA and Minneapolis, MN to elect multi-member offices.

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[1]More accurately, RCV is the single-winner implementation of the STV algorithm.

2.1   Frequently Used Terms

Below are some definitions for frequently used terms later on. These are not all ubiquitous (for example, "undervote" has another meaning in most voting research), but we define them here for clarity later on.

- *Overvote*: when a voter ranks multiple candidates in the same slot. This slot is typically thrown out entirely in counting, because it's often not possible to determine which candidate was preferred.

- *Undervote*: when a voter does not rank candidates in all of the slots available to them. This is different than other definitions of "undervote", which refer to a voter participating in one election on a ballot but not another one. This is not a problem in counting, and is explicitly allowed in the laws of most jurisdictions. A plurality election analog would be voting in high-profile races (e.g. presidential), but not down-ticket decisions (e.g. local water board).

- *Skipped vote*: when a voter ranks no candidate at slot x, but ranks a candidate at slot $y > x$. This is typically not a problem in counting, but different jurisdictions have different rules about whether a voter's ballot is exhausted at this point or continues on to their next ranked choice. Plurality voting has no analog to this, because each race only has one "ranking" (first!).

- *Duplicated vote*: when a voter ranks the same candidate for distinct slots x and y. This is typically not a problem for counting, and the first ranking for the candidate is used. Similar to a skipped vote, plurality voting has no analog to this.

- *Ballot exhaustion*: as ballot counting progresses, some ballots will become "exhausted" when all the candidates selected are eliminated. Suppose the final count in an election is between candidates B and D, and a voter ranked candidates C-A-E. Their ballot would not be counted in this final round, as they expressed no preference for either candidate B or D. An analogous situation in a plurality election might be voting in the general election but not a runoff, that is only having a say in part of the election.

Over-, skipped, and duplicated votes are really only interpretable as "ballot mistakes": for example, even if a voter truly prefers two candidates equally, the ballot instructions (should) make it clear that ranking them at the same slot is not allowed.

2.2   Claims about RCV

There are plenty of arguments both for and against implementing RCV in place of plurality in different jurisdictions (see the literature review), but here we'll focus on evaluating one major argument against it - RCV is harder for voters to participate in than a plurality system. There are two major reasons cited for this:

- The physical design of an RCV ballot is usually more complicated than a plurality ballot, because there has to be a system to encode a more full preference among the candidates than just selecting one candidate

- The process of forming a multi-candidate preference inherently takes more mental energy than just choosing a favorite candidate

The first facet of this argument should be reflected in ballot errors made by voters. Compared to plurality voting, we expect more errors in an RCV ballot just because the ballot is more complicated. There are also more potentials for error in the RCV system generally. The only "errors" in a plurality ballot are incompletely marking a candidate (think incorrect Scantron bubbling, or hanging chads) or overvoting, both of which are potential pitfalls for a ranked choice ballot as well. On top of these, there are the potential errors of duplicated and skipped votes unique to ranked ballots[2].

The second facet should be reflected in incomplete ballots filled out by voters. Given that they understand how to encode their preferences on the ballot, there is still the non-trivial task of forming such a preference. Structurally, some of the factors that should affect this incompleteness are:

- The number of candidates running for a position

- The number of candidates voters can rank

- The number of seats elected in a given race

This first variable is at the election level (different for every election), the second is at the jurisdiction level, and the third is a mix of both. For a clear example of these differences, consider a 2016 San Francisco Board of Supervisors race (District 3) versus a 2017 Cambridge City Council race.

Factor	San Francisco 2016	Cambridge 2017
Candidates running	2	27
Candidates rankable	2 (Generally, up to 3)	27 (Generally, all)
Seats elected	1	9

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[2]These types of errors are not uniform, and some jurisdictions are more forgiving than others about rules for counting these errors. While it may be apparent that a voter who listed the same candidate 3 times (A-A-A) prefers that candidate, a candidate ranking of A-B-A is harder to extract a clear preference from. Skipped votes are where we see the most variance in jurisdiction counting rules: if a voter marks the ballot A-___-B, skipping the second slot, some jurisdictions will ignore the skip and treat B as the voter's second choice, while others will stop counting after A is eliminated (ignoring their vote for B), and others yet will throw out the ballot entirely.

2.3   History of RCV in the US (SF in particular)

In the United States, there have been two major periods of RCV implementation in various jurisdictions. Between 1915 and 1950, 24 American cities chose to institute RCV as a form of local election. By 1965, however, all of these except for Cambridge, MA had eliminated the policy change. Then, in the 2000s, there was a resurgence of uptake in a different set of American cities[3], including Minneapolis and a handful in the San Francisco Bay Area. While Cambridge has consistently used the multi-winner (STV) method to elect City Council and School Board seats, the modern resurgence of RCV almost universally deals with single-winner elections. Research argues that RCV appears in jurisdictions where there is strong multi-party support for the reform - the RCV method itself gives individual parties less power in the election process, so powerful single parties usually don't have reason to support it.

2.4   Why, or why not, implement RCV?

There are plenty of arguments on both sides of implementing RCV in jurisdictions that consider it.

2.4.1   Pros

No secondary elections

There are two major types of "secondary elections" used in American voting: primary elections and runoff elections. Primaries are used by political parties to select their nominee for a general election, so the voters of any one party aren't split between different candidates. Runoffs are most often used when no candidate in the general election surpasses 50% of the vote total. Typically the top two candidates from the general election[4] advance to a later runoff. These secondary elections face two main challenges: low turnout and high cost.

   Secondary elections as a whole face low turnout (Wright, 1989; Ranney, 1972). Reasons: Research shows that people don't actually like voting that much - the more frequently elections are held, the lower turnout will be for all of them generally (Boyd, 1986). Secondary elections increase the number of elections in a period, so this is one possible reason why they generally have low turnout. Further research indicates that holding elections concurrently with a presidential election "increase[s] the likelihood that citizens will vote" (Boyd, 1986). This is seen in off-year Congressinoal elections, where turnout drops from presidential years. Typically general elections are held concurrently with presidential elections (second Tuesday in November, super high media coverage, lots of voter outreach, yadda yadda), so secondary elections cannot be held at the same time as a presidential election and they should thus suffer in

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[3]Mostly in the American West: there are 9 cities west of the Mississippi River currently using RCV and only 4 east of it

[4]Or primary election - Seven Southern states require primary winners to obtain 50% of the vote to get on the general election ballot, and some other states have a requirement of 40%. (WaPo article)

turnout. This low turnout has consequences for representation in the system. The same research (Ranney, 1972) finds that while primary voters are not ideologically unrepresentative of general election voters, they are both demographically unrepresentative and unrepresentative on some major issues. Traditional knowledge holds that primary voters are more committed partisans than general election voters, leading the eventual candidates in a general election to be polarized away from the "center" of political ideas (double check this but I'm pretty sure the cite is Hill's *Instant Runoff Voting*).

The higher costs associated with secondary elections are a little more intuitive than turnout issues - it takes money to hold elections. Pollworkers have to be paid, facilities have to be reserved, and candidates have to do more campaigning. A 2011 City Council runoff in Plano, TX cost the city an extra $73,000 (Plano Star Courier, 2011). A 2012 Alabama runoff for multiple seats cost the state about $3 million. Since RCV eliminates the need for primary and runoff elections while still ensuring majority rule (which is the main reason for these elections), it should avoid the problems of lower turnout and higher costs associated with secondary elections[5].

Ensures majority rule

In jurisdictions without rules for 50% minimums, a common phenomenon is a candidate winning an election with less than 50% of the vote (a plurality, rather than a majority). The major conceptual issue with this is that more people preferred a candidate other than the one who was elected[6]. RCV requires that a winning candidate receive at least 50% of the votes remaining[7], ensuring that a majority of voters prefer the elected candidate to other candidates.

This means that RCV does not always agree with the plurality method on choosing a winner. In the Senate race in Maine between Bruce Poliquin and Jared Golden, while Poliquin was on top at the end of the first round of counting, neither had 50% and Golden took the lead (and the election) after other candidates were eliminated and their votes transferred to voters' second choices (Portland Press-Herald).

This is particularly important in jurisdictions (like Maine) with strong third-party support and more than two viable candidates. Former Maine Governor Paul LePage, a Republican, won his first election in 2010 with 38.1% of the vote, compared to Independent Eliot Cutler's 36.7%[8].

Effect on spoiler candidates and third parties

The "spoiler effect" is when a third party candidate draws votes away from the ideologically closest major party candidate, thus contributing to the election of the other major party candidate. The most recent large-scale accusation of this was in

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[5]Or at least some of it - see below for negative impacts on turnout and cost from RCV

[6]The 'ideal' for electoral systems is the Condorcet condition: the candidate elected should beat all other candidates in one-on-one contests.

[7]See below for issues with this 'remaining' concept.

[8]a margin of about 7,500 votes. Democrat Libby Mitchell received 19%.

the 2000 election. Green Party candidate Ralph Nader drew about 3% of the national vote, more than the margin of victory for George W. Bush over Al Gore[9]. In the especially consequential state of Florida, Nader took 1.6% of the vote: almost 200 times greater than the margin between the two major party candidates of less than .01 percentage points[10] (source from FEC). Many believed that Nader, generally seen as more liberal than the Democrat Gore, drew votes from the Democratic base that would have helped Gore win the election otherwise. While research into third-party voters casts some doubt on this theory's applicability in 2000 (Herron, Lewis)[11], public opinion still rests on the idea that Nader cost Gore the presidency[12].

This also helps third-party candidates get elected, because voters can ignore this facet of strategic voting[13] and select their truly preferred candidate. Due to the spoiler problem, voters who want to vote for a third-party candidate are incentivized to vote for the major candidate they prefer to avoid the less preferred candidate from being elected - a situation of "the lesser of two evils", so to speak.

Disincentivizes negative campaigning

Ranked choice voting should incentivize candidates to avoid negative campaigning. In a plurality election, since candidates don't care about voters who are committed to their competitors, a well-thought out negative campaign will only ostracize voters who were never going to support another candidate in the first place, and perhaps bring more swing voters to their side. Under RCV, however, alienating another candidate's voters could backfire in the event that candidate is eliminated and these voters decide to support your opponent in the next round, causing your defeat . An interesting real-life case of this is in the 2018 San Francisco mayoral election . There were three frontrunners heading into election day, all incumbent members of the city's Board of Supervisors: London Breed, Jane Kim, and Mark Leno. As polls showed Breed ahead about a month before the election, Kim and Leno held a joint press conference to endorse the other as voters' second choices. By drawing second-choice votes from the other candidate, the remaining candidate hoped to overcome the gap between them and Breed. In the actual election, the standing when it came time to proceed to the final round of counting was 102,767 for Breed, 68,707 for Leno, and 66,043 for Kim. While a significant proportion of Kim's voters transferred to Leno after her elimination, in the final round Breed surpassed Leno by about 2,000 votes.

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[9]Admittedly, the margins are less clear-cut than this at the state level, where the margins actually matter for the Electoral College.

[10]Not to point fingers at Nader alone in this case - while he was the most popular third party candidate by far, all 8 official third-party candidates received more votes than the major-candidate margin of only 537 votes

[11]In short - while Nader's Florida voters potentially would have broken enough for Gore to put him over the top, this was more a factor of the extreme closeness between the two major candidates than anything that Nader aided in particular.

[12]One of the sections of Nader's Wikipedia page is entitled "Spoiler controversy" in regards to this election.

[13]Or any strategic voting - while not impossible, it's infeasible to vote strategically under RCV (source from the computational paper).

Though it's outside the scope of this research to tell if this cross-endorsement was effective[14], there is some evidence in favor of this theory. Leno received almost 70% of the votes previously counted for Kim compared to Breed's 20%, bringing Breed's final margin of victory down to only 1 percentage point. In previous rounds of the election, no single candidate ever received more than 35% of the transferred votes from an eliminated candidate[15], so this is at least an unusual observation.

Minority Candidate Election

Imagine a city that consistently had 45% of voters pick Party A and 55% pick Party B. The minority in party A would never be able to elect a candidate under plurality voting because they would lose the one election every year - the representation of the city would be 100% Party B. If the district elected two seats under STV, however, there would be one candidate from each party - the city's representation would be 50% Party A and 50% Party B, which is much representative of the population's actual views[16]. The benefit of having multi-member districts is the ability for minority groups in the city to be represented.

While the example above used political parties, consider the application of multi-member districts to racial or ethnic groups. In Cambridge, with an African-American population of roughly 5-10% of the city over time, there has consistently been a black member elected to the City Council. Since there are 9 seats on the City Council, the threshold for electing candidates is only 10% (instead of 50%), so minority groups are much more likely to elect their preferred candidates to office.

Turnout Improvements

All of these pros boost turnout, because people are more trusting that their government actually represents them.

2.4.2 Cons

Doesn't *really* ensure a majority, just a majority of final voters
  Less extant infrastructure - sometimes handcounted, non-instant results
  Legal challenges (Maine constitution)
  Voter education problems - ballot errors, decreased turnout
  Less intuitive rules (perhaps fold into the previous)
  Lack of true adoption by voters, only listing first choice (perhaps also fold into previous)

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[14]Other confounding factors counld exist: maybe Kim and Leno had similar enough positions that this scenario would have happened without the endorsement, maybe this number is only significant because in the final rounds there were only 2 candidates for second choice votes to flow to, etc.

[15]Except for round 2, where all 3 votes for the same write-in candidate transferred to Breed.

[16]The study of gerrymandering uses this type of analysis, involving a metric called the "efficiency gap".

2.5 Research into SF?

Chapter 3

Methods and Structure

Placeholder

3.0.1 Data Structure and Source

Chapter 4

This chunk ensures that the thesisdown package is

Placeholder

4.1 Tables

4.2 Figures

4.3 Footnotes and Endnotes

4.4 Bibliographies

4.5 Anything else?

Conclusion

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More info

And here's some other random info: the first paragraph after a chapter title or section head *shouldn't be* indented, because indents are to tell the reader that you're starting a new paragraph. Since that's obvious after a chapter or section title, proper typesetting doesn't add an indent there.

Appendix A

The First Appendix

This first appendix includes all of the R chunks of code that were hidden throughout the document (using the `include = FALSE` chunk tag) to help with readibility and/or setup.

In the main Rmd file

In Chapter ??:

Appendix B

The Second Appendix, for Fun

References

Placeholder