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Ranked Choice Voting in Mayoral Elections

Bryan McCannon

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Bryan McCannon*
West Virginia University

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Abstract

Numerous cities across the U.S. have recently switched to ranked choice voting in their local mayoral elections. Proponents argue that, by allowing voters to fully express their preferences over the candidates, voter satisfaction and, ultimately, turnout will improve. Opponents are concerned over the number of candidates who enter the race, as it increases the chances of someone only supported by a minority taking office. To date, there has not been an empirical analysis of ranked choice voting's effects. First, using the Synthetic Control Method on three large U.S. cities who switched relatively recently, I explore the voting rule's causal impact. I show that the voting rule does not lead to a noticeable change in voter turnout, but does dramatically increase the number of candidates who compete. Second, I explore the public finance consequences comparing budgets of both these three cities to their synthetics and exploiting a panel data set of municipal budgets, which allows me to include additional treated cities. I provide evidence that budget deficits grow after its implementation. Evidence indicates that the increased spending occurs in public welfare programs.

Keywords: candiate entry; deficit; mayoral election; municipal finance; public finance; ranked choice voting; Synthetic Control Method; turnout

JEL codes: H11; H70; D73

1 Introduction

In 2019 voters in New York city approved a measure to use ranked choice voting in the election of the mayor and other important municipal leadership positions.[1] Ranked choice voting, also known as instant runoff, asks voters to rank candidates with their vote initially going

*Bryan C. McCannon, Ph.D., Department of Economics, John Chambers College of Business and Economics, 1601 University Avenue, Morgantown WV 26506, bryan.c.mccannon@gmail.com. I have benefitted from (and appreciate) the excellent research assistance of William Turman. I also appreciate discussions with Josh Hall, D. Marc Kilgore, Kole Reddig and seminar participants at West Virginia University.

[1]Its use occurs in the primaries.

to the candidate they rank #1.[2] If no one receives a majority, then the lowest vote recipient is removed and his/her vote is recast to the candidate ranked second on their ballots. This process continues until one candidate obtains a majority. Famously, and controversially, twenty-two candidates ran for mayor in the Democratic party primary in the 2021 NYC election.[3] This was the city's first use of this voting rule. Media outlets across the country criticized the voting method as causing excessive entry. A concern (among others) is that candidates supported by only a minority of the population can win. Proponents of ranked choice voting cite the benefit of positive enfranchisement as voters believe their preferred candidate has an increased chance of winning and, hence, are more motivated to participate in the election.[4]

To date, there has not been a systematic, formal analysis of the consequences of ranked choice voting on municipal elections. This is an important omission as there has been an explosion in its use. Considering just mayoral elections in U.S. cities, in 2003 there were not any municipalities using ranked choice voting. By 2023 thirty cities will be using this voting method. Further, the state of Maine has adopted ranked choice voting in 2018 for statewide elections, and Alaska will be using it for the first time in statewide and federal elections in 2022. Here, I explore three cities that adopted ranked choice voting recently: Minneapolis (passed in 2006/first used in the 2009 election), Oakland (2006/2010), and St. Paul (2009/2013). The date of adoptions allows for an evaluation of candidate entry and voter turnout in numerous elections both before and after the change in the voting mechanism. The other municipalities using ranked choice voting have either only adopted it recently (which does not allow for an analysis due to lack of data on outcomes after the rule change) or have adopted it in municipalities with relatively small populations. These three cities are well populated, so that the consequences are potentially large. Focusing

[2] Ranked choice voting is also labeled as preferential voting and alternative voting in other literatures.

[3] Nine withdrew their candidacy during the contest.

[4] To continue with the New York city example, Eric Adams, the eventual winner of the 2021 mayoral election had only 30.8% of the first-choice votes initially. A total of 801,829 votes were cast in the Democratic primary that year, which represents 91.4% of the registered Democratic voters in New York County. In 2017, the most recent prior election, 437,517 voted in the Democratic primary for New York mayor, which represents 56.1% of the registered Democrats in that year. Five candidates ran in the 2017 race. Thus, for New York, ranked choice voting corresponds to improved turnout and more candidate entry, but with the potential for victory of a candidate with only minority support.

on mayoral elections, I use the Synthetic Control Method to estimate the counterfactual electoral outcomes. This method uses a pool of donor units (i.e., other cities in the U.S.) and numerous predictor variables (e.g., socio-economic characteristics) to create a synthetic version of each city treated with the institutional change. Comparing political outcomes in the treated cities to their synthetics, the treatment effect can be estimated.

I find consistent results across mayoral elections in the three cities. First, I show that the move to ranked choice voting dramatically increased the number of individuals on the ballot. Second, I show that contrary to proponent's expectations, ranked choice voting does not improve voter turnout.

I go further and evaluate the consequences of the voting rule change on the municipalities' public finances. Ranked choice voting has the limitation, as pointed out in theoretical research in social choice, that a Condorcet Winner (i.e., a candidate who obtains majority support in a pairwise contest with every other candidate on the ballot) may not necessarily be selected.[5] Thus, it opens up the opportunity for policies far from the median voter's preference to be implemented. As the mayor can be expected to be influential in the determination of the city's budget allocation decisions, I ask whether ranked choice voting has an influence on public finance.

I provide evidence that it does. First, I compare the three treated cities to their synthetics by collecting city budgets. I show that both expenditures per capita and the size of the city's budget deficit grow in the years after ranked choice voting is implemented. To confirm this finding, I also utilitze a panel data set of finances of over 200 large cities in the U.S. provided by the Lincoln Institute of Land Policy. This allows me to include a city that adopted ranked choice voting much earlier (San Francisco) and a city with a much smaller population (Portland, Maine). Using a difference-in-difference estimation strategy, I am able to confirm the growth of budget deficits, but find only a statistically insignificant effect on expenditures per capita. Nevertheless, the evidence suggests that ranked choice voting not only has political effects, but has public financing consequences as well. Digging further, I

[5] As a simple numerical illustration of this, suppose three candidates (labeled A, B, and C) are running in a race and that A is the Condorcet winner with 55% supporting her over B, and 60% supporting her over C. If only 29% of the voters rank A as #1, and all 40% who prefer C rank him #1 (leaving 31% putting B on the top of their ranking), then A is eliminated in the first round.

show that spending on education reduces while spending on welfare programs improve.

Prior research on ranked choice voting is rather sparse. A number of theoretical studies have been done studying its normative properties. For example, Ornstein and Norman (2014) and Miller (2017) study the prevalence of nonmonotonicity; i.e., when increased support for a candidate from a subset of the voters can injure that candidate's ability to win the election, initially identified by Smith (1973). Grofman and Feld (2004) constrasts the normative properties of "traditional" ranked choice voting to one that uses what is known as the Coombs Rule. It eliminates the option with the most last-place votes, rather than the one with the fewest first-place votes.

Empirical research on the use of ranked choice voting is also scarce. Researchers have used simulations or single election anecdotes to illustrate its properties. For example, Allard (1996) uses polling data to estimate the likelihood of nonmonotonicity if ranked choice was used in the United Kingdom. Kilgour, Gregoire, and Foley (2020) use data from a handful of elections using ranked choice voting to estimate ballot exhaustion.[6] Igersheim *et al.* (2022) use data on individuals' preferences for U.S. Presidential candidates in 2016 and engage in the thought-experiment of how the election results may be different if alternative voting rules (including ranked choice voting) were used. John, Smith, and Zack (2018) estimate a difference-in-difference model considering a data set of electoral races in California's Bay area, which includes a cluster of cities that have adopted ranked choice voting and geographically close cities that still use plurality voting. Their outcome variables of interest are the proportion of candidates running in the local election that are women and racial minorities. They document relatively little change in the composition of office seekers. Juelich and Coll (2021) engage in telephone surveys of residents across cities that have ranked choice voting and those that do not and report that, while overall voter turnout seems unaffected, youth turnout improves.

Finally, survey-based research has attempted to measure satisfaction with ranked choice voting. For example, Coll (2021) surveys likely Democrat voters asking them to rank candidates, and then asking them how difficult it is for the to rank. Anthony *et al.* (2021)

[6] For conciseness, I do not review the literature on closely related voting rules such as plurality runoff or single transferable voting.

surveys local election officials across Maine after its statewide adoption. They find that from election officials' perspective they do not find it more costly, but approval of the system falls along partisan lines. Donovan, Tolbert, and Gracey (2016) survey voters in municipalities using both ranked choice voting and plurality voting asking them questions related to the civility of the recent campaigns. They show that voters in cities using ranked choice voting perceive the elections as more civil and less negative. Donovan, Tolbert, and Gracey (2019) survey voters in California municipalities with ranked choice and plurality voting asking them how easy the instructions are to understand. They show that ranked choice voting is more difficult for people to understand overall, but do not find racial disparities. Simmons, Gutierrez, and Transue (2022) survey voters on their preferences over 2020 U.S. Presidential candidates randomly assigning some respondents to a treatment where they were asked to rank the candidates. They show that ranking increases the number of first-place votes for third-party candidates. To date, a formal, empirical investigation of ranked choice voting has not been done. I fill this gap.

The research potentially closest to mine is Bordignon, Nannicini, and Tabellini (2016) who also look at candidate entry, voter turnout, and ultimate public finance outcomes empirically. They analyze the introduction of runoff elections in Italy instead.

Section 2 presents the data and methods to be used in the analysis. Section 3 presents the construction of the synthetics, provides the impact of ranked choice voting on candidate entry and voter turnout, and extends the analysis to its impact of public finances. Section 4 concludes.

2 Data & Methods

2.1 Mayoral Elections in the U.S.

A variety of voting methods are used in U.S. municipal elections. One common method is to first hold primary elections where candidates compete with those within their own political party. From the primaries, each party nominates one candidate to compete in the general election. To reduce political party control, some municipalities have moved toward non-partisan contests by using a runoff election. A first vote is taken and the top two vote receivers compete in a second election to determine the winner.[7]

Quite a few cities, though, have moved toward a ranked choice voting system. In this alternative, voters are asked to rank the candidates in the election. If a candiate receives more than 50% of the #1 votes, then s/he is declared the winner. If not, then the last place vote getter is eliminated and citizens who selected this eliminated option as #1 have their votes re-cast automatically for whoever is listed as #2 on their ballots. The process continues, eliminating the candidate with the fewest votes and redistributing his/her votes, until one candidate secures majority support.[8]

Proponents of this alternative laud the ability for voters to express their preference ordering over the alternatives. As articulated by Rep. Andrew McLean, one of Maine's members of the House of Representatives, "with Ranked Choice Voting, you have the freedom to vote for the candidate you like best, without worrying that you will help to elect the candidate you like least ... Ranked Choice Voting rewards consensus candidates and ensures that candidates who are opposed by a majority of voters can never win. This better voting system gives more voice and more choice to voters."[9] The voting rule allows citizens to feel free to express their support for a minority candidate. Concerns have arisen that it encourages excessive entry into the races though.[10] To illustrate, in an Op-Ed piece written by Vin Weber, a former Minnesota representative to the House of Representatives, it was argued that ranked choice voting has failed to improve the "tone of elections" in Minneapolis or improve voter turnout, but has led to a minority candidate (with initially only 25% of the votes) winning the election (Weber and Meeks, 2021). I seek to test these hypotheses.

Three cities have adopted ranked choice voting for municipal elections recently. Min-

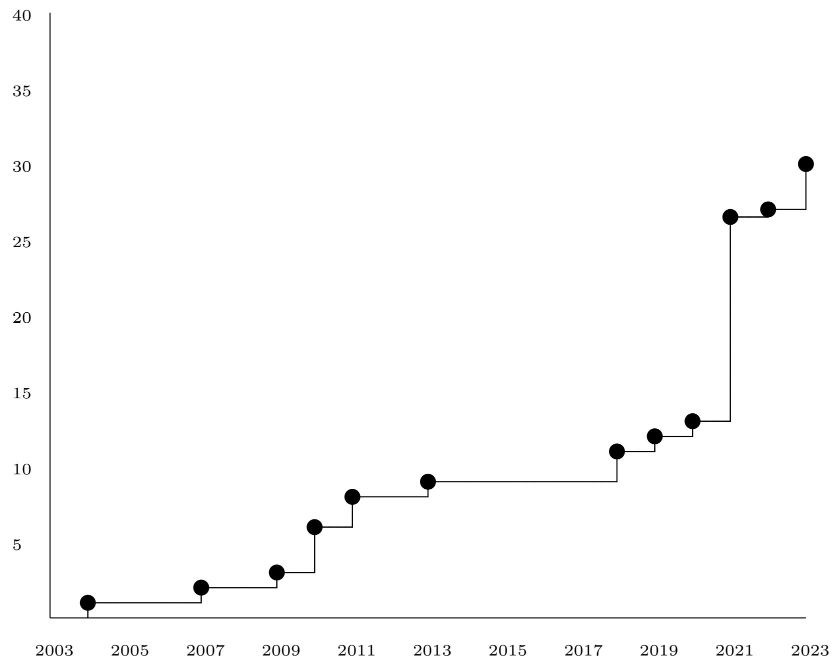
[7]These runoff election mechanisms typically allow for a declaration of a winner after the first stage if one candidate receives a substantial proportion of the votes (typically 50%). See Martinelli (2002) for a theoretical comparison of these two voting mechanisms and Bordignon, Nannicini, and Tabellini (2016) for an empirical investigation of their use in Italian municipal elections.

[8]It differs from a Borda count which assigns votes to all ranked candidates. It differs from plurality runoff as it asks voters to come back for a second election months later and does not use a voter's preference for #2 and #3.

[9]Quoted in the National Conference of State Legislatures's monthly publication *The Canvass* (NCSL, 2017).

[10]My goal is not to fully document all normative aspects of ranked choice, plurality runoff, and plurality voting here. Further, my objective is not to assess the validity of the normative claims made by politicians, media, or advocates. Instead, my focus is on the empirically-observable effects of the voting rule on political and financial outcomes.

Figure 1: Adoption of RCV in U.S. Mayoral Elections



The number of U.S. cities which use ranked choice voting for mayoral elections depicted. The year in which the voting method was first used is recorded for the institutional change (hence, implementation rather than adoption is considered). These counts do not include municipalities which use ranked choice voting only for other local elections, cities that use rankings for multi-seat elections, or cities that have passed but not yet implemented ranked choice voting. Data from fairvote.org used.

neapolis, Minnesota passed legislation in 2006 and first used it in their 2009 elections. Oakland, California also passed it in 2006 and first implemented it in its 2010 local elections. St. Paul, Minnesota followed Minneapolis's lead passing the voting change in 2009 implementing it in their 2013 elections. The timing of these changes are ideal for analysis as pre-change election data prior to the institutional change is readily available and multiple election cycles have occurred since the change.

Importantly, as mentioned, quite a few cities have adopted the new voting rules recently. Figure 1 provides a graphical depiction of the explosion in its use across the United States.

Early adoption occurred primarily in the Bay area of California and Minnesota. Multiple municipalities within Colorado, Maine, and New Mexico have since adopted it as well.[11] The

[11]In addition, one city in Maryland, Massachusetts, and New York have implemented it as well.

substantial jump in 2021 came from the state of Utah freeing up its municipalities to select the voting system they prefer. The figure does not include cities that adopt similar variants for multi-seat elections (such as single transferable votes), those that use ranked choice voting only for lower level municipal elections (such as city council and school boards), municipalities that have passed but not implemented the new system (such as Sarasota, Florida which cannot get its election equipment certified), or cities that have repealed it (e.g., Burlington, Vermont). In addition, as mentioned, Maine implemented it for statewide elections in 2018 and Alaska will followed suit in 2022.

In these three cities, voters are presented with three columns labeled "1^{st} choice", "2^{nd} choice", and "3^{rd} choice", respectively. Each column lists the names of all candidates running for mayor. The candidate with the fewest votes is eliminated in each round until one receives a majority.[12] St. Paul differs from the other two in that it asks voters to rank their top six candidates, while Minneapolis and Oakland have voters rank their top three. Kilgour, Gregoire, and Foley (2020) provide an analysis and discussion of the potential consequences of a phenomenon known as *ballot truncation* where a voter who is only asked to rank a subset of the candidates, which opens up the possibility of *ballot exhaustion* (Burnett and Kogan, 2015) where all of the candidates ranked by a voter are eliminated, so that the voter's ballot no longer counts in the determination of the final winner.

2.2 Synthetic Control Method

This paper employs the Synthetic Control Method introduced by Abadie and Gardeazabal (2003). The objective is to create a formalized case study. The idea is to use a set of predictor variables on a donor pool of units to create a "synthetic" version of a treated unit. Prior to the treatment, the synthetic is constructed to match the treated unit as closely as possible. As the synthetic is not affected by the treatment, the divergence between the synthetic and actual unit in the years after the treatment becomes the measurement of the treatment's causal impact.

To formalize, suppose there are J available control units that are not exposed to the

[12] See https://vote.minneapolismn.gov/media/-www-content-assets/documents/RCV-Handout-Landscape-11x8.5.pdf for the handout created by the city of Minneapolis to help its residents.

intervention of interest (i.e., our "donor pool"). Let T_0 be the last time period prior to the intervention. Thus, $t = 1, ..., T_0$ are the pre-treatment periods and $t = T_0 + 1, ..., \overline{T}$ are the treated periods.

Let $\mathbf{W} = (w_1, ..., w_j)'$ be a $J \times 1$ vector where each w_j is a nonnegative weight assigned to a single control unit out of the J donor units. The vector of weights sum to one. There are K predictor variables. Define $\mathbf{X}_1$ as a $K \times 1$ vector containing values for these predictor variables for the treated unit. Similarly, $\mathbf{X}_0$ is the $K \times J$ matrix containing these same predictor variables for the J control units. The optimal counterfactual uses the vector of weights, $\mathbf{W}^*$, which minimizes $\|\mathbf{X}_1 - \mathbf{X}_0\mathbf{W}\|$.

The goal of the synthetic's construction is to be able to estimate the outcome variable's time path for the treated unit if the intervention were to not occur. Let Y_{1t}^0 be this counterfactual outcome for the treated unit at time τ and $Y_{1,\tau}^1$ be the observed outcome. Therefore, the method attempts to estimate $Y_{1,\tau}^0$ by $Y_t^0 = \sum_{j=1}^{J} w_j^* Y_{j,\tau}$. The estimated average treatment effect is $Y_{1,\tau}^1 - Y_\tau^0$ for periods $t > T_0$.

The Synthetic Control Method has been used in many applications across numerous fields. This is not the first application in social choice either. Lee (2014) uses it to estimate the effect of California's adoption of supermajority voting for tax increases. Singh (2018) uses it to study compulsory voting in Thailand. See Abadie, Diamond, and Hainmueller (2015) for a discussion of the value of its use in political science applications and Abadie (2021) for its use in economics.

2.3 Data

To collect voting data, I rely heavily on local Board of Election websites. When needed, election data is supplemented with information from Ballotpedia. For each city I record the number of candidates who ran for mayor in the general election and the total number of votes cast.[13] These will be my two main outcome variables of interest.[14]

For most socio-economic and demographic variables, data is collected from IPUMS, which catalogs historical American Community Survey data collected by the U.S. Census Bureau.

[13] I included the number of write-in ballots in these mayoral elections, but I do not count ballots that are cast but do not record a vote for the mayoral election.

[14] The number of votes cast will be normalized by the city's population.

I used an initial sample of just less than 60 million individual-level observations. I eliminated observations prior to 2005 and from those not in the list of cities as potential donor pool units. I then collapsed the data set to calculate for each city in the donor pool the mean values of the predictor variables. Population data was taken directly from the U.S. Census.

Regarding the donor pool, I start with a list of every city with a population over 180,000 in 2020. This, of course, includes our three treated cities. Cities which do not have socio-economic information provided in the IPUMS data are excluded. This leaves me with a total of three treated cities and 104 cities in the donor pool.

My data collection efforts are complete for the relevant time period of 2005 to 2009 – the years that will be used to identify the synthetic versions of the three treated cities. The one exception is missing population data for Augusta, GA. I use linear interpolation to fill in these missing values.[15]

3 Results

First, I provide the results of the process of creating the synthetics. With this done, I turn to estimating the institutional change's effect on political outcome variables of interest. Finally, I extend the analysis to its effect on municipal public finance.

3.1 Creation of the Synthetics

As stated, I use numerous predictor variables on a rather large donor pool of U.S. cities to create each treated city's synthetic. Table 1 provides the list of cities selected to make up each synthetic.

While the synthetics are constructed to minimize the prediction errors in the pre-treatment years, the cities making up the synthetics are also quite reasonable. Both the Minneapolis and St. Paul synthetics derive much of their weight from other northern, midwestern cities (Chicago, Grand Rapids, and Madison). Oakland's synthetic is made up of numerous modestly-sized cities such as Greensboro, Huntsville, Montgomery, and Plano. It also includes San Francisco which, while distinct, is geographically close.[16]

[15]As this city is not selected to make up the synthetic version of any of the treated cities, the choice of interpolation method is likely irrelevant.

[16]San Francisco uses ranked choice voting for local elections such as the Board of Supervisors and school

Table 1: Synthetics

Minneapolis		Oakland		St. Paul	
city	weight	city	weight	city	weight
Fontana, CA	0.077	Detroit, MI	0.071	Chicago, IL	0.009
Lincoln, NE	0.003	Greensboro, NC	0.068	Grand Rapids, MI	0.422
Madison, WI	0.920	Huntsville, AL	0.290	Madison, WI	0.189
		Memphis, TN	0.229	Newark, NJ	0.037
		Montgomery, AL	0.016	Plano, TX	0.171
		Plano, TX	0.240	Seattle, WA	0.089
		San Francisco, CA	0.075	Santa Ana, CA	0.083
		Yonkers, NY	0.011		

Table 2: Comparing the Predictor Variables

	Minneapolis		Oakland		St. Paul		donor pool
	actual	synthetic	actual	synthetic	actual	synthetic	(mean)
Age (mean)	35.60	35.79	38.64	39.17	35.63	36.07	37.11
% pop under 18 years old	0.198	0.193	0.211	0.214	0.243	0.211	0.238
% pop. over 65 years old	0.088	0.101	0.125	0.142	0.106	0.104	0.122
# hours worked per week (mean)	23.38	23.68	20.76	20.46	20.90	22.12	20.86
Household income (mean)	678,509	664,282	185,232	335,935	584,978	580,475	322,487
Unemployment rate	0.076	0.047	0.083	0.093	0.078	0.071	0.079
Labor force participation rate	0.720	0.711	0.648	0.625	0.688	0.679	0.647
Population	378,366	223,685	385,548	503,765	280,807	326,726	490,532
% pop. female	0.506	0.521	0.529	0.529	0.521	0.517	0.521
% pop. white	0.774	0.867	0.542	0.498	0.736	0.759	0.732
% pop. black	0.159	0.068	0.266	0.395	0.130	0.164	0.195
% pop. with a college degree	0.329	0.350	0.311	0.257	0.274	0.289	0.218
% pop. without high school degree	0.486	0.438	0.538	0.579	0.557	0.531	0.607

There are 520 observations being used to calculate the mean in the last column. For each city (and its synthetic) the values presented are averaged over the 2005 to 2009 time period.

The appropriateness of the synthetics can also be evaluated by the closeness of the predictor variables' means. Table 2 compares the average values for the treated city and its synthetic for the 2005-09 time period. Table 2 also provides the full sample, donor pool means for these years.

Consistently, the mean value of the predictor variables for the synthetic version of each city is substantially closer to the actual city's value than the full donor pool. The Synthetic Control Method does a good job of constructing a synthetic that matches the treated unit across these variables. Consequently, one can be confident that divergence in outcomes after the voting rule change captures the causal effect.

board. Since this adoption occurs well before the time period studied here (and therefore does not experience an institutional change) its inclusion is valid.

3.2 Candidate Entry & Voter Participation

With the constructed synthetics, outcomes of the political races can be compared and evaluated. To do so, I use the year that each city adopted ranked choice voting as the year of the treatment. The election in time period $t = 0$ is the first election which implements ranked choice voting. For Minneapolis, this is the municipal elections in 2009. For Oakland, this is the 2010 election cycle. For St. Paul, the first election to use the new voting rules occurs in 2013. Since mayors serve four year terms in each city, the $t = 1$ elections occur in 2013, 2014, and 2017, respectively. The $t = 2$ elections occur in 2017, 2018, and 2021, respectively. Thus, I have three post-treatment elections to consider. Regarding the pre-treatment elections, complete voting records are easily obtainable for the treated cities and the control cities used in the synthetics for two election cycles prior. Thus, the $t = -1$ elections occur in 2005, 2006, and 2009, respectively. Continuing, the $t = -2$ elections occur in the years 2001, 2002, and 2005, respectively.

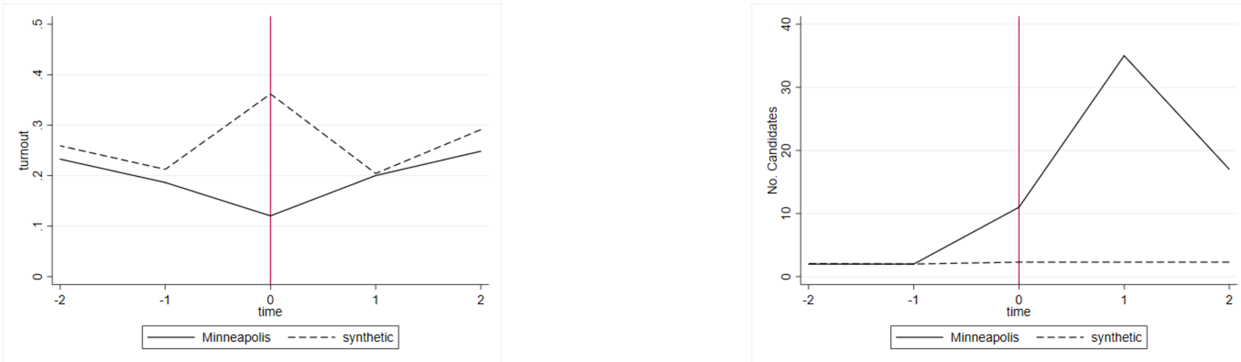
Similarly, for each city used in one of the treated unit's synthetic, election information for the five election cycles is again collected. The first election occurring in the control city after the treated city adopts ranked choice voting becomes $t = 0$. The two following election cycles, and the two preceding elections, make up the five election sample considered throughout.

Regarding the values selected for these outcome variables, when a city uses plurality voting, the number of votes cast and the number of candidates in the general election is used. For cities that use runoff elections, the number of candidates and the number of votes cast in the first round is used. Further, for the fourteen control cities considered, only two have their municipal elections occurring during the same year as the Presidential election. In Oakland's synthetic, Huntsville, Alabama contributes a weight of 0.29. In St. Paul's synthetic, Santa Ana, California contributes only a weight of 0.083. The rest of the twelve control cities hold elections in off-cycle years. Thus, the enhanced voter turnout arising during Presidential election years likely contributes little to the synthetics' value.[17]

I graphically illustrate the time series for each treated city, and its constructed synthetic,

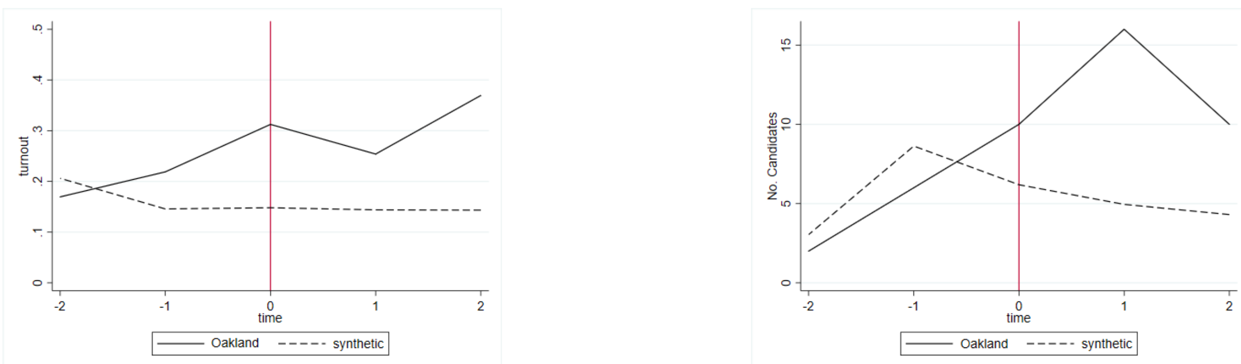
[17] As a robustness check I re-estimate Oakland's and St. Paul's synthetics eliminating these two cities. The main results are unchanged.

Figure 2: Minneapolis



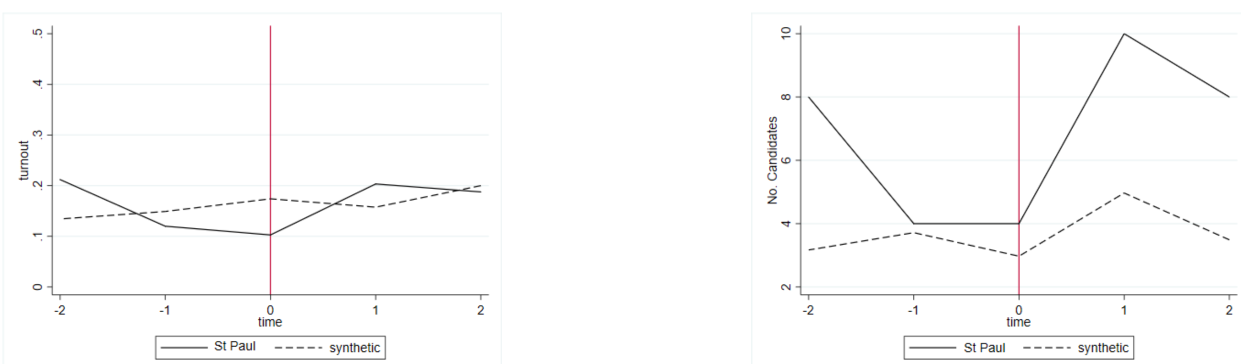
(a) Voter Turnout (b) Number of Candidates

Figure 3: Oakland



(a) Voter Turnout (b) Number of Candidates

Figure 4: St. Paul



(a) Voter Turnout (b) Number of Candidates

for both political outcome variables of interest. Figure 2 depicts Minneapolis. Oakland and St. Paul are depicted in Figures 3 and 4, respectively.

Table 3: Ratio of RMSPEs

	Turnout		*No. Candidates*	
	ratio	p-value	ratio	p-value
Minneapolis	5.4004	0.0202	390.7791	0.0101
Oakland	2.9999	0.0606	3.7530	0.0909
St. Paul	0.8418	0.5455	1.1531	0.4748

The squared difference between the actual and synthetic city is averaged for the three post-change periods and the two pre-change periods. The ratio of the square roots of these values is presented in the first column for each outcome variable. The second column for each outcome variable presents the Fisher Exact p-value generated from conducting placebo voting rule modifications in 2009 in each donor pool unit (98 donor units used).

With the Synthetic Control Method divergence observed after the institutional change needs to be compared to the discrepancy between the actual and synthetic prior to the change. If the synthetic fits poorly prior to the treatment, then differences between the two after the treatment are likely due to noise. The common way to evaluate the divergence is to consider the ratio of the root mean squared prediction error in the post periods over the value in the pre-treatment periods. Values substantially greater than one signify a meaningful separation in the two time series. Table 3 presents the calculations.

The divergence between the actual and synthetic cities is substantial for the change in the number of candidates. The separation's magnitude differs between them. Oakland experiences 3.75 times as many candidates running for mayor, compared to its synthetic, after ranked choice voting is introduced, relative to elections prior. St. Paul's change is modes seeing only a 15% increase in entry. Minneapolis's large effect comes from it consistently having only two candidates running before the change, but an average of 23.3 mayoral candidates per election with ranked choice voting.

I conduct a placebo test to engage in hypothesis testing. For each city in the donor pool, I falsely assume that this city changed its voting rule in 2009. I use the same predictor variables on the rest of the donor pool to create a synthetic version of each donor pool unit. Election data is then obtained for the three elections that come after this date, and the two prior, for each. The ratio of the RMSPEs is calculated for each donor pool unit creating a distribution of divergence measurements that would occur by random chance in this data set. The ratio of each of the three treated cities can be compared to the distribution of placebo institutional changes. The proportion of the donor pool units that generate a greater ratio than the treated city becomes a measurement of the false-positive rate; i.e., the Fisher Exact p-value. The result of this process is presented in the second and fourth column of Table 3.

The divergence observed in Minneapolis and Oakland are statistically significant at conventional levels. The relatively smaller change in St. Paul cannot be confidently distinguished from random noise.

For voter turnout similar effects arise. Minneapolis experiences a rather large increase in the proportion of voters at the polls. From Figure 2 this arises primarily from the substantial difference occurring in the first election after the institutional change. Importantly, this is a negative change, or rather, the gap occurs because fewer Minneapolis residents vote than what would have been predicted. Further, the change arises not because there is a time trend break in Minneapolis, but rather the synthetic experiences a bump in that year. Thus, the change in Minneapolis should be taken as unreliable. Oakland records a noticeable increase in voter participation that differs from what arises in the placebos. Thus, consistent with Figure 3, Oakland may have experienced an improvement in turnout with its timing coinciding with changes in the voting rule. St. Paul, on other hand, experiences more discrepancy between the actual and synthetic's voter turnout prior to the institutional change than after. Consequently (and obviously), this growth is not statistically different from zero.

To calculate the average treatment effects and conduct a statistical test for confidence in the divergence observed, I pool the data from the three treated cities with the three synthetics. For each city, the three elections after the institutional change and two elections prior have available information for all units within the synthetic. Hence, there are five elections to consider for each cross-sectional unit. This pooling creates a panel data set with 30 observations. With it, I estimate a difference-in-difference specification:

$$Y_{cty} = \alpha_0 Synthetic_t + \alpha_1 Post_{cy} + \alpha_2 Synthetic_t \times Post_{cy} + \epsilon_{cty}. \tag{1}$$

The indicator variable $Synthetic_t$ is equal to one if the observation is of type $t = s$, or rather, if it comes from a synthetically created observation. It equals zero if its type is the actual city's value, $t = a$. The indicator variable $Post_{cy}$ is equal to one if the observation occurs in a year, y, after city c has adopted ranked choice voting. For each city, $Post_{cy}$ turns on in $t = 0$. The

Table 4: Average Treatment Effects

	Turnout	No. Candidates
Synthetic x Post	-0.0139	-9.4620 **
	(0.0516)	(3.9299)
Synthetic	-0.0054	-0.2273
	(0.0400)	(3.0441)
Post	0.0322	9.4444 ***
	(0.0365)	(2.7789)
R^2	0.049	0.446
N	30	30

The number of votes cast in the mayoral election is divided by the city's population for the first dependent variable. Its mean value is 0.2023. In the second column the dependent variable is the number of candidates running in the election. Its mean is 6.71. Along with the presented explanatory variables, each specification includes a constant. Standard errors are presented in parentheses.

final term is the difference-in-difference component as it identifies whether the gap between the synthetic and actual city grows or contracts in the years after that city adopts ranked choice voting (but its synthetic does not). A value of $\widehat{\alpha}_2 > 0$, for example, suggests that the introduction of ranked choice voting decreases the outcome variable of interest (relative to its synthetic). I will consider the two outcome variables previously discussed: voter turnout and candidate entry. Table 4 provides the estimates.

Consistent with the figures, there is little change in voter turnout after the ranked choice voting rule is implemented. The estimated increase of 1.4 percentage points is highly statistically insignificant. On the other hand, the number of candidates running for election increases by approximately 9.5 individuals per election in the cities that adopt ranked choice voting, as compared with their synthetics. This growth is statistically significant at the 5% level. Hence, ranked choice voting increases entry into the political races without motivating improved voter turnout.

3.3 Public Finance Consequences

Up to this point I have focused on the impact of the voting rule's change on the elections directly. It is prudent to evaluate whether there is any impact on public policies and city governance. Given that ranked choice voting can eliminate a Condorcet Winner and multi-candidate elections open up the real possibility of policy diverging from the preferences of the median voter, identifying systematic changes in local governance policy can indicate real consequences of the voting rule. While it is hard to anticipate which policies potentially changed because of the institutional adjustment, one important city-level outcome that mayors across the country consistently influence is their city's budget. Therefore, I ask whether there is any noticeable and consistent changes to public finances after the implementation of ranked choice voting.

3.3.1 City Budgets of the Synthetics

The frustration is that data collection on city budgets across the country is challenging. To engage in the needed analysis, I hand-collect city budgets from the three treated cities and the fourteen cities making up the synthetics. I collect information on each city's adopted operating budget. This has a number of advantages that makes the data collection effort manageable. First, the adopted city budgets are voted on by city council and, consequently, are typically readily available as they are distributed on the cities' web page. It does not require hunting down interim reports or after-the-fact actual, realized revenues and expenditures. Accounting practices and naming conventions differ substantially across states. Measuring total revenue and total expenditures avoids the concerns over differentiating budgets for "general funds" from "special funds" and other budgeting subsets. Total operating budgets aggregate all sources.

From each budget I collect the total expenditures and total revenues for the year. The objective was to obtain city budgets from all seventeen cities for each year from 2004 to 2021. The beginning date was selected as many cities have budgets dating back 20 years (as the data collection occurs in 2022). Not all cities have available budgets going that far back. Best efforts were made to have a complete data set. Unfortunately, each city's synthetic can only be constructed through those years in which every city has complete information. Minneapolis's synthetic can be constructed back to 2004. Oakland's begins in 2005. St. Paul's synthetic starts in 2009. An important limitation is that Plano, Texas does not have budget information available to the public prior to 2013. To handle this, for the synthetics that use Plano, the weight put on that city is redistributed to the other cities making up the synthetic.

From the data collection effort, I consider two public financing outcomes. First, I calculate the per capita expenditures for each city. This allows for a measurement of the government's size and impact in residents' lives. Second, I measure the annual budget deficit by dividing total expenditures by total revenues. This allows me to assess whether deficit spending changes in prevalence, which can be taken as a sign of short-run fiscal management.

To estimate average treatment effects, I pool the three treated cities (Minneapolis, Oakland, and St. Paul) and their three synthetics over the 2009 to 2021 years. The start year of 2009 is selected as all six time series are complete after this year. This creates a balanced panel data set of $N = 78$ observations. With it, I estimate a difference-in-difference specification:

$$Y_{cty} = \beta_0 Synthetic_t + \beta_1 Post_{cy} + \beta_2 Synthetic_t \times Post_{cy} + \epsilon_{cty}. \qquad (2)$$

The indicator variable $Synthetic_t$ is equal to one if the observation is of type $t = s$, or rather, if it comes from a synthetically-created observation. It equals zero if its type is the actual city's value, $t = a$. The indicator variable $Post_{cy}$ is equal to one if the observation occurs in a year, y, after city c has adopted ranked choice voting. For each city, $Post_{cy}$ turns on in a different year. The final term is the difference-in-difference component as it identifies whether the gap between the synthetic and actual city grows or contracts in the years after that city adopts ranked choice voting (but its synthetic does not). A value of $\widehat{\beta}_2 > 0$, for example, suggests that the introduction of ranked choice voting decreases the outcome variable of interest. I will consider the two outcome variables previously discussed: expenditures per capita and budget deficits. Table 5 presents the results.

The results from this estimation suggest that the introduction of ranked choice voting has important effects on a city's public finances. Expenditures per capita increase. The city's budget deficit grows as well.

3.4 Panel Data Set

One shortcoming of the previous analysis is that budget records were hand collected for only a small number of cities. It would be valuable to identify whether the effects observed for these three cities can be found in a comprehensive city budget data collection.

Table 5: Public Finance Treatment Effects (synthetics)

	Expenditures	Deficit
Synthetic x Post	-2396.191 ***	-0.1236 ***
	(570.970)	(0.0404)
Synthetic	957,591	0.1320 ***
	(481.193)	(0.0341)
Post	552.089	0.0546
	(513.970)	(0.0364)
R^2	0.372	0.317
AIC	1323.8	-166.8
DV μ	2195.077	1.019

Data set is comprised of the three treated cities (Minneapolis, Oakland, and St. Paul) and their three synthetics over the 2009 to 2021 years; $N = 78$. Standard errors are presented in parentheses. A constant is included, but not reported, in each specification. The dependent variable in the first column is the expenditures per capita. In the second column it is the ratio of total spending to total revenues (i.e., deficit). The dependent variable in the third column is the proportion of total revenues that come from property taxes and sales taxes. Finally, the fourth column uses the proportion of these two taxes that comes from property taxes as the dependent variable.

Fortunately, one exists. the Lincoln Institute of Land Policy has created a standardized database of budgets from 212 cities in the United States.[18] This data ahs been used to assess the impact of the Great Recession (Chernick, Langle, and Reschovsky, 2011; Chernick and Reschovsky, 2017) on city public finances for example. From it, I use the total city spending for each year and the total city revenues to re-create the expenditure and deficit calculations previously done. While some cities making up the synthetics are not in the data set (e.g., Newark, New Jersey and Plano, Texas are absent) the data set includes Portland, Maine, which adopted ranked choice voting in 2011. Further, it provides budget information going back to 1978. This allows for an analysis of San Francisco as well, which adopted ranked choice voting in 2004. The panel has the benefit of including this historial budget information, but suffers from being organized only up until 2017 (so that recent adoptions of the voting rule cannot be analyzed).

From this panel, I estimate a two-way fixed effects, difference-in-difference model. Specifically, I estimate

$$Y_{cy} = \gamma_0 Post_y \times Treated_c + \kappa_c + \tau_y + \epsilon_{cy}. \quad (3)$$

The specification includes 212 city fixed effects, κ_c, and 50 year fixed effects, τ_y. The

[18]lincolninstitute.edu

Table 6: Public Finance Treatment Effects (panel)

	Expenditures		*Deficit*	
	(1)	(2)	(3)	(4)
Post x Treated	-0.0008	0.0001	0.0657 *	0.0583 **
	(0.0024)	(0.0043)	(0.0363)	(0.0246)
City Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes
# treated cities	5	3	5	3
R^2	0.921	0.842	0.081	0.071
AIC	-40235	-52752	8867	10217
N	8692	8610	8692	8610
DV μ	0.0244	0.0245	1.0268	1.0268

The data covers 212 cities across the 1978 to 2017 time period. The second and fourth column exclude San Francisco, California and Portland, Maine. Standard errors are clustered at the city level (212/210 clusters). The first two columns use the expenditures per capita as the dependent variable. The last two columns use the ratio of total city spending divided by total city revenues (i.e., deficit) as the dependent variable.

difference-in-difference terms captures whether the treated cities diverge further from the control cities in the years after the voting rule change goes into effect. If $\widehat{\gamma}_0 > 0$, for example, then the outcome variable of interest grows after the institutional change. I consider both the expenditures per capita (dividing the total city spending by the city's population in each year) and the ratio of total city spending to total revenues, which will equal one for balanced budgets and take values greater than one when a city is running a budget deficit, as dependent variables. Table 6 presents the results.

The results in (3) and (4) confirm the finding in Table 5 $--$ the introduction of ranked choice voting corresponds to an increase in budget deficits. Columns (1) and (2) do not necessarily match the previous results. While Table 5 shows that the expenditures per capita expands in those cities that adopt ranked choice voting after its implementation, Table 6 identifies an essentially zero effect.

Column (2) replicates (1) but eliminates the two cities not included in the previous analysis. Column (4) does the same for (3). In the latter, the results strengthen.

Difference-in-difference results can be taken as causal only if the treated and control cities follow parallel trends. This assumption can be tested for the pre-treatment periods. The results of an event study analysis is saved for the supplemental appendix. In summary, though,

Table 7: Spending (panel)

	Education (1)	*Welfare* (2)	*Safety* (3)	*Admin.* (4)	*Environ.* (5)
Post x Treated	-0.0173 ***	0.0287 ***	0.0051	0.0064	0.0147
	(0.0046)	(0.011)	(0.0126)	(0.0184)	(0.0199)
City FEs?	Yes	Yes	Yes	Yes	Yes
Year FEs?	Yes	Yes	Yes	Yes	Yes
R^2	0.948	0.838	0.804	0.696	0.689
AIC	-33275	-26566	-25835	-33101	3 -2095
N	8692	6930	6930	6930	6930
DV μ	0.0767	0.0325	0.2071	0.0625	0.1957

The data covers 212 cities across the 1978 to 2017 time period. Standard errors are clustered at the city level (212 clusters). Each column uses the proportion of direct expenditures spent on that subcategory as the dependent variable.

both expenditures per capita and budget deficits exhibit statistically indistinguishable differences prior to the treatment. Thus, the growth in budget deficits can be interpreted as a causal change.

Hence, the results suggest that city leadership arising after ranked choice voting is implemented tends to engage in deficit spending. A natural question to ask is what types of projects receive this additional support. I consider two prominent, broad categories of spending. First, a core public service provided by a municipality is education. Hence, I consider total spending on education by the city. This includes spending at each level of education, as well as spending on libraries. I normalize this by total direct expenditures of the city, which is the total city spending used previously minus intergovernmental expenditures. Second, I consider spending on public welfare programs. Again, this is measured as a proportion of the city's direct expenditures. I also evaluate spending on public safety, government administration, and environmental/housing expenditures.[19] Table 7 presents the results.

Spending on education declines, while spending on welfare programs increases. Support for public safety, environment/housing, and government administration is unaffected. While not presented here, these results are relatively robust to the exclusion of the two added,

[19]Other broad categories of spending include health, transportation, interest on debt, miscellaneous direct spending, and utilities. While not presented here, if the spending on the rest of these areas are included as a dependent variable, the difference-in-difference coefficient is statistically insignificant.

treated cities (San Francisco and Portland). These results suggest that there are real effects of changes in the voting rule on local governance that impact people's lives.

4 Conclusion

Numerous cities in the U.S. have recently adopted ranked choice voting in their local elections. The voting rule allows individuals, unlike plurality voting, to express their preferences for the slate of candidates when more than two run for election, and does not have the drawback of requiring a second election as is necessary in runoff elections. I study Minneapolis, Oakland, and St. Paul who changed their voting rules for mayoral candidates between 2009 and 2013. The timing of these changes allows me to evaluate electoral outcomes in the elections just before and just after the institutional update.

Using the Synthetic Control Method, I fail to find evidence that voter turnout has improved, but I find that the number of candidates running in the election increases substantially. In fact, estimates of the average treatment effect indicate that there are approximately 9.5 more candidates running in each race than would have been had these cities not adopted ranked choice voting.

Further, I explore public financing consequences as ranked choice voting is known to allow a Condorcet Winner to not win the election, which opens up the possibility of candidates supported by only a minority to take office. Using both the Synthetic Control Method and confirming with a panel data set of city spending across the country, I show that budget deficits grow and provide suggestive evidence that spending per capita increases. Looking into a breakdown by budgeting categories, spending on social welfare programs expands at the expense of education.

The full normative consequences of the voting rule are beyond the scope of this work. For example, by looking at voting outcomes only I cannot identify how policies were affected and, importantly, whether the identity of the winner would have changed. Further, it is unclear that the changes in city budgeting would be replicated if other cities were to adopt ranked choice voting as there is not a clear theory of whether the change supports a particular set of policy-related preferences. Nevertheless, cities considering making this change in the future should be aware of its impact on candidate entry and lack of movement in voter turnout.

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