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HOW DOES MUNICIPAL POLICY AFFECT STATE AND LOCAL ACTIONS? EVIDENCE FROM LAND CONSERVATION SPENDING

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Abstract
Understanding responses to government action is critical for developing efficient policy. In the context of land conservation, this paper examines whether municipal policy has a crowding-in or crowding-out effect on neighboring municipalities' actions and state government actions. Importantly, we focus on municipal conservation referendums, which allow us to use a regression discontinuity framework for causal inference. Using data from Massachusetts and New Jersey, our findings suggest municipal conservation decisions have no effect on neighboring local governments' or the state's conservation activity.

Keywords: local public finance; open space; regression discontinuity; voting; referendum
JEL codes: H73, H41, D72, Q24

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1. INTRODUCTION

One of paramount roles of government is the provision of public goods. In the United States, there are 30,000 municipal governments, and nested on top of that are county, state, and federal governments. When multiple governments can provide the same or similar public good, it is critical to understand if governments behave strategically with respect to other governments' actions. A wide variety of research focuses on how competition can cause government entities to react to the public good decisions of others which in turn effects the overall provisioning of public goods including charitable donations (Heutal 2014), public school inputs (Millimet and Rangaprasad 2006), and property tax rates (Bruickner and Saavedra 2001), amongst others. This reactionary dynamic gives rise to many questions: when a government entity provides a public good, how does that affect the actions of government at different levels? How might this decision affect the decisions of neighboring governments? Do reactions have a crowd-in effect where provisioning for public goods increases, or does a crowding-out effect result?

In this paper, we address these questions in the context of land conservation. With about two million acres of farm, forest, and open space land being converted to development each year (Cordell et al. 2014), federal, state, and local governments have established themselves as important agents in curbing urbanization by accounting for about half of total conservation easement holdings in the United States (NCED 2017). The overall production of conservation goals depends on, in part, the size and connectivity of conservation lands. The way governmental conservation agents react to the actions of other agents in land conservation decisions holds implications for how successful society is at protecting natural resources, supplying ecosystem services, providing outdoor recreational opportunities, and maintaining a representative sample of the full variety of biodiversity (Margules and Pressey 2000). In this paper, we test whether the passage of a conservation referendum in a municipality affects state level conservation activity in that or surrounding municipalities. We also test if there are spatial spillover effects among municipalities where conservation activity in one municipality influences the conservation activity of surrounding municipalities.

We build a panel dataset of conservation activity of multiple agents for Massachusetts and New Jersey. Both Massachusetts and New Jersey have state programs – the Community Preservation Act and the Green Acres Program, respectively – that incentivize municipalities to raise money through referendums for land conservation. This makes Massachusetts and New

Jersey ideal places to study because of their substantial amount of conservation activity and available data. We collect state level conservation spending for Massachusetts from the Conservation Almanac and local government conservation referendum activity for Massachusetts and New Jersey from the Trust for Public Land, both at the municipal level.

Since residents vote on local government conservation referendums, we utilize the regression discontinuity (RD) framework developed by Cellini et al. (2010) to test whether the relationship between conservations agents among different levels of government and across space are causal.[1] Past studies in the conservation literature that test for spillovers of conservation activity typically use models that rely on correct covariate selection to produce unbiased results (see Albers et al. 2008 and Parker and Thurman 2011 as examples). Omission of key covariates in these instances may lead to results that are indicative of correlations instead of causal relationships. We believe we are the first to use a causal framework that controls for both observed and unobserved municipal characteristics to estimate conservation spillover effects that do not suffer from omitted variable bias. To highlight the importance of using a causal framework such as the dynamic RD model, we also produce cross-sectional (XS) and difference-in-difference (DID) estimates and contrast results.

Results from the dynamic RD framework suggest there is not a causal relationship between municipal level conservation and state level conservation in the municipalities that pass conservation referendums and neighboring municipalities. We also do not find a causal relationship between municipal level conservation activity among neighboring municipalities in both Massachusetts and New Jersey. We note there are multiple possible explanations for this null result and we cannot rule out possible dependencies, but we interpret these results as suggesting that investments made by municipalities do not have a consistent impact on neighbor and state agencies. There are two main implications of our findings. First, municipal actors may not need to be concerned about their conservation activity crowding-out state level and neighbor municipality conservation activity. However, they should also not expect state level and surrounding municipalities to crowd-in additional conservation resources in the area after passing a conservation referendum. Second, land conservation provisioning may be at an

[1] Cellini et al. (2010) study how housing prices respond referendums authorizing school infrastructure spending in California. The dynamic RD method has been applied in a handful of papers since (e.g., Isen 2014, Martorell et al. 2016). Lang (2018) uses the same open space referendums data in this paper and examines housing price responses to authorization of conservation spending.

efficient level where surrounding towns do not need to compete with their neighbors through the allocation of conservation areas in order to attract residents. Our main results differ with results we obtain from XS and DID estimates, which show positive and statistically significant crowding-in effects between local and state conservation activity, as well as neighboring conservation activity. We interpret these differences as evidence of bias in the XS and DID estimates.

We contribute to the literature in two important ways. First, we believe we are the first to investigate whether the actions of conservation agents at different levels of government affect each other. Many papers in the public finance literature have investigated the dynamics between different levels of government in the context of setting consumption taxes (Besley and Rosen 1998), income and wealth taxes (Brülhart and Jametti 2006), and funding decisions for public schools (Cascio et al. 2013). Prominent papers in the land conservation literature have analyzed the effects of public conservation activity on private conservation activity (Parker and Thurman 2011, Albers et al. 2008, Lawley and Yang 2015). We extend this idea and test whether there is a reactionary dynamic between local and state governments when it comes to land conservation activity because such reactions can hold important implications for conservation efficiency.

Second, we use a causal framework to investigate the relationships between conservation agents instead of investigating spatial correlations that previous studies have identified. According to the public finance literature, public good decisions by a local government may cause a reaction to neighboring local governments because people can choose to move to a community with a level of public goods that fit their preferences (Tiebout 1956) or voters may judge their public officials based on the tax performance of politicians in surrounding areas in what is referred to as a yardstick competition (Besley and Case 1995, Bordignon et al. 2003). In addition, spatial spillovers often result due to strategic competition between neighboring jurisdictions when setting property tax rates (Brueckner and Saavedra 2001), school inputs (Millimet and Rangaprasad 2006), and other public finances (Baicker 2005, Isen 2014). Similarly, studies in the land conservation literature find evidence of spatial clustering between conservation agents and voting outcomes (e.g., Albers and Ando 2003, Heintzelman et al. 2013, Altonji et al. 2016), but tend not to make causal claims either due to dataset limitations or the scope of the study.

We aim to add to the valuable insights provided by the land conservation literature by analyzing a novel dataset that allows us to identify conservation activity spillover effects in a quasi-experimental manner. In contrast to the exiting literature, we find no evidence of a positive spillover effect between conservation agents.

2. DATA

This section describes the four sources of data used in our analysis: 1) municipal level referendums and associated spending, 2) state government conservation spending, 3) land use characteristics, and 4) municipal demographics.

2.1 Land Conservation Referendum Data

Land conservation referendum data come from The Trust for Public Land's LandVote Database (The Trust for Public Land, LandVote 2016) and spans the years 1996-2016. The data include proposed municipal level referendum information such as date, financial mechanism, total funds at stake, total funds approved, conservation funds at stake, conservation funds approved, as well as percentage of yes and no votes. Tables A1 and A2 in the online appendix show a yearly breakdown of municipal referendum activity for Massachusetts and New Jersey, respectively. On average, Massachusetts municipalities voted on 15 conservation related referendums a year, approved 10 of them, and dedicated about $28 million to conservation activities. Over the same time period, New Jersey municipalities experienced more conservation referendum activity compared to Massachusetts. They voted on an average of 23 referendums a year, passed 17 of them, and dedicated about $66 million to conservation activities.

Figures 1 and 2 show the spatial distribution of Massachusetts and New Jersey municipal referendum activity, respectively. The top map in Figure 1 and the map in Figure 2 differentiate municipalities that have never passed a referendum from municipalities that have passed at least one referendum. Conservation referendum activity in Massachusetts seems to be primarily concentrated in the eastern part of the state. Though municipalities in western Massachusetts have also held referendums, many municipalities either never proposed a referendum or never passed one. Like Massachusetts, there appears to be spatial patterns of referendum activity in New Jersey with activity being concentrated in the northern and western part of the state. Our analysis will allow us to determine if the spatial clustering of conservation referendum activity is caused by municipalities reacting to the conservation activity of their neighbors or is a function of observable and unobservable population characteristics that are spatially correlated.[2]

2.2 State Conservation Spending Data

Due to data availability, we are only able to observe historical state conservation spending at the municipal level for Massachusetts. Data on Massachusetts state conservation spending come from The Trust for Public Land's Conservation Almanac (The Trust for Public Land, Conservation Almanac, 2016). The data include dollars spent on land conservation from state programs such as the Massachusetts Department of Agricultural Resources, Department of Conservation and Recreation, Department of Fish and Game, and others from 1998-2011.[3] We aggregate dollar amounts by municipality by year for every year available. On average, the state spent about $37 million on conservation in Massachusetts municipalities (see Table A1 in the online appendix for a yearly breakdown).[4]

The bottom map in Figure 1 shows the spatial distribution of state conservation spending per capita from 1998-2011 for Massachusetts. State conservation spending occurred throughout

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[2] We fundamentally view municipal referendums as discrete activities between municipalities, rather than coordinated. The descriptions of the ballot referendums in the Land Vote database do not indicate explicit coordination. In contrast, state spending (described in Section 2.2) is often coupled with other sources (e.g., US Fish and Wildlife, municipal funds, land trusts). However, in both cases whether or not there is a causal strategic response is still an empirical matter.

[3] An important assumption in our analysis is that locally raised conservation funds and state conservation spending can be either complements (that could crowd-in each other) or substitutes (that could crowd-out each other). If the types of conservation projects that each funding source typically supports are not related to each other at all, then we would expect to see insignificant estimation results regardless of the appropriateness of methodology used. Massachusetts municipalities that adopt the Conservation Preservation Act (CPA) are incentivized to fund projects that preserve open space, affordable housing, historical sites, and recreation. Completed projects have funded agricultural preservation, bike trails, fish ladders, shellfish population preservation, among many others. We believe these projects are related enough to what state departments like the Department of Agriculture, the Department of Conservation and Recreation, and the Department of Fish and Game would focus on that it is plausible to test for crowding-in or crowding-out activity. For a full list of CPA related projects, please visit: http://communitypreservation.org/projects/new.

[4] Massachusetts municipalities that adopt the Community Preservation Act (CPA) to preserve open space, affordable housing, and historical sites automatically receive funding from the CPA Trust Fund which disperses revenues collected from statewide real estate transactions each year. Inclusion of CPA Trust Fund revenues in state spending measurements for our models would be expected to upwardly bias the estimated relationship between local referendum passage and state conservation spending. We do not believe this is a concern with our dataset because, after multiple communications with the Trust for Public Land, it was determined that money spent from the CPA Trust Fund would most likely be reflected in local and not state expenditures in the Conservation Almanac dataset. This concern is further dispelled by the mostly negative (and insignificant) coefficient estimates from our causal framework models.

Massachusetts, with the heaviest concentration in the western part of the state and the least amount of activity in the eastern part of the state right before the state's peninsula, Cape Cod. By comparing state conservation and referendum activity, we can get an initial assessment of how municipal and state conservation actions relate to one another. Referendum activity appears to have a few distinct pockets with a lot of activity in the entire eastern part of the state, where state spending is sparse, and a smaller concentration in the western part of the state right before the highest concentration of state spending. Visually, there seems to be a substitution effect of conservation vehicle where state conservation spending reacts to municipality referendum activity by increasing spending in municipalities that do not hold referenda or vice versa. This may lead to the conclusion that referendum activity crowds-out state conservation spending where Massachusetts conservation funds are focused on communities that may not have the resources or support to conserve on their own. Our main analysis allows us to investigate whether this relationship is causal.

2.3 Land Use Data

Municipalities that hold referendums are matched with land cover control variables. Acres available in each municipality for open space is calculated using GIS and the National Land Cover Database (NLCD) (Homer et al., 2015). The NLCD creates a pixelated map of the United States, available for years 2001, 2006, and 2011, where each pixel is assigned a category based on land use type. We use this information to calculate the percentage of total land within each municipality categorized as developed open space, forests, and grasslands to proxy for acres available for conservation for 2001 and 2011. We then linearly interpolate available acres for years in between and extrapolate for years before and after 2001 and 2011.

2.4 Demographic and Partisanship Data

Finally, municipalities that hold referendums are matched with municipal level socioeconomic data from the 2000 Census, 2010 Census, and 2010 American Community Survey. We collect data on municipal level median household income, population density, median house price, and proportion of residents under 18, over 65, white, black, and with a bachelor's degree or higher. Sociodemographic values were interpolated for years between 2000 and 2010 and extrapolated for years before and after.

We use presidential election outcomes as a proxy for political ideology. For Massachusetts, we gathered results for each election at the municipal level between 1996 and 2016 from the Elections Division of the Secretary of the Commonwealth. For New Jersey, the same data was only available between 2004 and 2016 (from the Division of Elections). With this data, we calculate the Democrat share deviation, which equals the share of votes the Democrat candidate received in a given municipality minus the statewide Democrat vote share. This measurement accounts for changing candidate popularity and provides a better accounting of changes to partisanship over time (Lang and Pearson-Merkowitz 2015). As with census data, we interpolate Democrat share deviation for years between elections.

3. METHODOLOGY

3.1 Outcome Variable Construction

To assess the effect that municipal open space conservation has on other government decision making, we construct and test empirical models with four different outcome variables. The first outcome variable is the amount of state government conservation spending per capita in the municipality that passed the referendum. To form this variable, we sum state level spending for each municipality by year and normalize it by population. The second dependent variable is state government spending per capita in neighboring municipalities. To form this variable, we calculate annual state level conservation spending per capita and then calculate a weighted average of all municipalities that share a border with a given municipality with weights proportional to the length of border in common.[5] The third dependent variable is the number of open space referendums passed by neighboring municipalities. The last dependent variable is the amount of open space funding per capita approved by referendums held by neighboring municipalities. Both of these neighbor averages are similarly weighted by the length of the town borders.

3.2 Dynamic Regression Discontinuity Model

We begin with a simple model and build up to our preferred specification in order to build intuition. We are interested in whether municipal conservation decisions have any effect on

[5] The intuition behind this construction is that there is more likely to be strategic behavior between municipalities that share a longer border. Results are qualitatively similar with different weights.

state and neighboring municipality conservation decisions. We observe municipality *j* hold an open space referendum, and the measure passes if the vote margin, which equals the percent approval minus the percent required to pass, is greater than zero, i.e., $Pass_j = 1$ if $margin_j > 0$. We also observe our four outcome variables for government *i* that is linked to municipality *j*, denoted y_{ij}. Government *i* can be the state government or a municipality that neighbors *j*. A simple bivariate regression of the outcome on referendum passage would be:

$$y_{ij} = \alpha + \beta Pass_j + \varepsilon_{ij} \qquad (1)$$

Since voting outcomes are correlated with observable and unobservable municipality characteristics that are also likely correlated with state and neighbor actions, it is likely that $\hat{\beta}$ will be biased.

This endogeneity problem can be mitigated by applying the RD framework originally proposed by Thistlethwaite and Campbell (1960) that takes advantage of the continuous nature of vote margin. By flexibly controlling for the vote margin, we can essentially compare outcomes just below the passing threshold (the control group) and just above (the treatment group) where both observable and unobservable characteristics of municipalities holding referendums are most likely very similar. Transforming Equation (1) into an RD model, we get:

$$y_{ij} = \alpha + \beta Pass_j + f\left(margin_j, \gamma\right) + \varepsilon_{ij} \qquad (2)$$

where $f(\cdot)$ is a flexible polynomial and γ signifies the corresponding parameter. We use a cubic polynomial of vote margin in our main analysis, but also present results with linear and quadratic polynomials in the online appendix as a robustness check.[6]

Comparing outcomes for municipalities that are just below and just above the threshold results in a quasi-experiment where referendum passage is as good as randomly assigned, and the causal effect of referendum passage on other government conservation spending can be isolated. Election outcomes in an RD framework have been used to examine causal relationships between incumbency and election advantage in the House of Representatives (Lee 2008), electoral support and legislator's voting behavior (Lee et al. 2004), political party affiliation and land use policies (Solé-Ollé and Viladecans-Marsal 2013), legislator partisanship on city policing and fire

[6] Gelman and Imbens (2014) argue that high order polynomials can lead to biased inference and should be avoided. We chose to use a cubic polynomial in our main specification because Cellini et al. (2010) and Lang (2018) use a cubic specification in similar econometric setting. We admit this is ad hoc, which is why we present estimates using linear and quadratic polynomial specifications in the online appendix (Tables A3 and A4). Results are similar regardless of polynomial order choice.

protection expenditures (Gerber and Hopkins, 2011), and the spillover effects of incumbency in mixed election systems (Hainmueller and Kern 2008).

While RD is a powerful research design for causal inference, we must further modify Equation (2) for this specific setting. Municipalities can and do hold more than one referendum over the course of our data timespan. Across all sample years, on average 37% of municipalities that are holding a referendum have held one in the past. If we restrict the sample to year 2006 or later, that proportion jumps to 55%. Given this, it is absolutely essential for the empirical model to control for past referendum attempts in order to not attribute crowd-in/out effects to one referendum when there could be multiple effects present. Following the model developed by Cellini et al. (2010), we implement a dynamic RD estimator that conditions treatment effects on other referendums a community has held. Our preferred specification is:

$$y_{ijt} = \alpha_j + \sum_{\tau=0}^{\bar{\tau}} [\beta_\tau Pass_{j,t-\tau} + f(margin_{j,t-\tau}, \gamma_\tau) + \mu_\tau Held_{j,t-\tau}] + \pi_t + \varepsilon_{ijt} \quad (3)$$

where *t* indicates the year of observation, τ is the number of years since a referendum, $Pass_{j,t-\tau}$ is a binary indicator for municipality *j* passing a referendum τ years prior to year *t*, $Held_{j,t-\tau}$ is a binary indicator for municipality *j* holding a referendum (this acts as an intercept to separate municipalities that do versus do not hold referendums in a given year), α_j is a municipality fixed effect, and π_t is a year fixed effect. Additionally, this specification allows the polynomial in vote margin to vary across lagged years. By controlling for the vote margin, past referendum activity, and municipality and year fixed effects in Equation (3), β_τ no longer suffers from the endogeneity problem that plagued Equation (1) and is interpreted as the causal effect that passing a conservation referendum has on another government τ years after the referendum is passed for municipalities that are near the vote margin threshold. Additionally, Equation (3) models time paths of government responses. Conserving land parcels or placing items on the ballot is not immediate, and thus the effect may be delayed or heterogeneous over time.[7]

4. REGRESSION DISCONTINUITY DIAGNOSTICS

The RD framework aims to replicate the identification of treatment effects from randomized experiments in settings where treatment is not randomly assigned. This is done by focusing regression analysis to observations just below and just above an arbitrary threshold

[7] In the context of U.S. state capital tax policy, Chirinko and Wilson (2017) find that a dynamic specification is critical for understanding strategic responses.

where treatment assignment is as good as random due to the similarity of observation characteristics and the inability of observations to affect the treatment outcome.

The key identifying assumption of the framework is the continuity of the conditional expectations of counterfactual observations below and above the threshold. This assumption may not be valid, however, if observations can manipulate their treatment status. Though very unlikely in our setting where municipalities use thousands of votes to determine the passage of a referendum, we can test for manipulation in a few ways. One way is to look at the density of observations around the threshold. If municipalities cannot manipulate their treatment status, we would expect a relatively smooth density of observations across the passage threshold. Another way is to analyze the similarity of municipality characteristics around the passage threshold. Municipalities can be similar in observable and unobservable ways. Although it is impossible to explicitly test for similarities in unobservable characteristics, we can compare observable municipality characteristics for municipalities that fail a referendum and municipalities that pass a referendum.

4.1 Referendum Vote Margin Density

Figure 3 shows the distribution of vote margins for all referendums held in Massachusetts from 1996-2016 in the form of a local polynomial density estimator of observations on either side of the passage threshold. Evidence of strategic behavior in voting outcomes would reveal a statistically significant difference in the frequency of vote margins just below and just above the threshold of a 0% vote margin. A visual inspection of the vote margin distribution shows an increase in frequency on the positive side of the threshold, but a density test for manipulation of the running variable proposed by Calonico et al. (2014) reveals an insignificant test statistic of 1.105 with a p-value of 0.269. This suggests manipulation of the running variable should not be an issue in our identification strategy for Massachusetts.

Figure 3 also shows the vote margin distribution for New Jersey referendums during the same time period. New Jersey municipality vote margins visually do not show the same jump that Massachusetts has around the threshold. Any concerns of strategic behavior are further dismissed after the manipulation test reveals a statistically insignificant test statistic of -0.2975 with a p-value of 0.7661. Like for Massachusetts, this suggests that manipulation of the running variable should not be an issue for New Jersey.

4.2 Sociodemographic Balance

Table 1 presents the means and standard deviations of Massachusetts sociodemographic characteristics to investigate whether municipalities that have failed at least one conservation referendum are similar to those that have passed at least one referendum. Columns 1 and 2 show municipalities that have ever failed a referendum and municipalities that have ever passed a referendum are very similar in median income, percentage of population under the age of 18, percentage of population that is white, percentage of population that is black, population density, number of acres that are available for conservation, and median house price. Column 3 shows the results of a t-test between the means presented in Columns 1 and 2. There is a statistically significant difference between the two groups of municipalities when it comes to the percentage of population over the age of 65, the proportion of populations that have a bachelor's degree or higher, and Democrat share deviation.

RD makes a comparison at the threshold, and it is most important that there is balance, and hence no manipulation, at that point rather than across the whole distribution. Lee and Lemiuex (2010) suggest a way to test this balance, which is to estimate the RD model with the sociodemographic variables as the dependent variables and inspect for discontinuity at the threshold. Since we have many covariates, we follow Lee and Lemiuex's suggestion to perform a chi-squared test for the discontinuity to be zero for all covariates after running a Seemingly Unrelated Regression (SUR). Column (4) of Table 1 shows the results of the SUR model where each sociodemographic variable is a dependent variable with a dummy variable indicating a passed referendum and a cubic polynomial for vote margin as the independent variables. Individual coefficient estimates for the pass dummy variable are mostly not statistically different than zero, with the exception of proportion over age 65 (at the 10% level). However, a post-estimation Chi^2 test does not allow for the rejection of the null hypothesis that each of the coefficients are equal to zero. Together with the results of the vote margin manipulation test, we are comfortable proceeding with the RD framework to analyze the Massachusetts referendum data.

Table 2 repeats the same columns as in Table 1, but for New Jersey. Democrat share deviation is not included because those data are only available since 2004, which removes about one-third of the observations. Column (3) shows that there are statistically significant differences in means between towns that have ever failed a conservation referendum and those that have ever passed a referendum in the proportion of the population under the age of 18 and median house price. Estimation results of the SUR model in Column (4) show a statistically significant discontinuity for the proportion of the population over the age of 65, but the Chi^2 test shows the same conclusions as those for Massachusetts. This suggests we can use a RD framework to analyze New Jersey referendum data as well.

5. RESULTS

Table 3 shows the main results from Equation (3). Columns 1-4 present results for Massachusetts with each column being a different outcome variable. Across columns, almost all of the coefficients are not statistically different from zero, which suggests municipal referendum passage does not have any effect on state conservation spending, neighbor state conservation spending, or neighbor referendum activity in the year of the referendum and the years following. There is a statistically significant coefficient estimate for neighbor state spending per capita six years after a passed referendum, however, it is not robust to controlling for alternate vote margin polynomials.[8] Estimates are also inconsistent throughout time with coefficient signs switching between positive and negative magnitudes in each model.

Table 3 also produces the results from Equation (3) for New Jersey referendum activity. Consistent with the results for Massachusetts, nearly all coefficients are statistically insignificant, which suggests municipal referendum passage does not have a causal effect on neighbors' conservation referendum activity.

While there is no statistical evidence of strategic responses by other governments, we must caution against strong conclusions because our results are not precisely estimated zeros. Point estimates vary considerably across years and standard errors are large, meaning that within the bounds of what is statistically consistent with the data are economically meaningful strategic responses. We attempted to improve precision by including socioeconomic covariates that vary by year in Equation (3) and by combining data from Massachusetts and New Jersey, but neither are a panacea. These results are reported in the online appendix and have similar coefficient variation and standard errors. We proceed cautiously with the interpretation that there is no causal effect of municipal conservation on other governments' actions.

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[8] Robustness results that control for linear and quadratic polynomials of vote margin are included in the online appendix.

6. TESTING THE IMPORTANCE OF THE RESEARCH DESIGN

To better understand the importance of our dynamic RD modeling strategy, we also estimate cross-sectional (XS) and difference-in-differences (DID) models that address the same questions, and then we compare the results to our preferred results to assess bias in XS or DID models. The DID model analysis is performed on the same dataset as the dynamic RD model. The specification does not control for the referendum vote margin, but is otherwise identical to Equation (3), namely the specification still conditions on past referendum activity to account for municipalities that hold more than one referendum. For the XS analysis, we sum our outcome variables across years and the independent variable of interest is a binary indication of whether the municipality passed at least one conservation referendum over the whole time period. In the XS specification, we lose municipality fixed effects, but instead include a rich set of socioeconomic variables that are averaged across years. When the outcome variable measures actions taken in a neighboring municipality, the socioeconomic variables are averaged across neighbors, using the same weights (border length) as the dependent variable construction (see Section 3.1). Lastly, for the XS model, we include all municipalities, not just those that hold a referendum, though results are similar if we do not expand the sample in that way.

6.1 Cross-Sectional Analysis

Table 4 shows the results from XS regressions for Massachusetts (columns 1-4) and New Jersey (columns 5-6). All models regress the outcome variable (identified at the column header) on an indicator for referendum passage and a suite of socioeconomic variables.

Columns 1 and 2 of Table 4 show the correlations between a municipality passing a referendum and the amount of state funded conservation that happens in that municipality and in neighboring municipalities. Column 1 shows a statistically insignificant positive coefficient between a referendum passage and state conservation spending while Column 2 shows a statistically significant coefficient for the relationship between a municipality passing a referendum and state spending in neighboring municipalities.

Columns 3 and 4 show the conditional correlations between a municipality passing a referendum and the referendum activity of neighboring municipalities in Massachusetts. The results indicate a positive and statistically significant coefficient for the relationship between a municipality passing a referendum and the number of referendums their neighbors pass and the total conservation funds attached to those referendums. The results are quite similar for New Jersey, as shown in columns 5-6.

6.2 Difference-in-Differences Analysis

Table 5 presents regression results from the DID analysis for Massachusetts (columns 1-4) and New Jersey (columns 5-6). Columns 1-2 of Table 5 estimate the dynamic relationship between passing a conservation referendum and the amount of state conservation expenditure in the municipality that held the referendum and neighboring municipalities. These results have both positive and negative coefficients, and most are insignificant. Columns 3-4 show positive and statistically significant coefficients in the concurrent year, as well as a lag of seven years, which indicates some support for a crowd-in effect for neighboring municipalities. This finding is bolstered and more pronounced in New Jersey (columns 5-6), which shows positive and statistically significant coefficients in the concurrent year through a four year lag.

6.3 Comparison to the main results

The main results using the dynamic RD indicate that no causal effect of municipal open space referendums on other government conservation actions. The intuitive appeal of the dynamic RD model is that it controls for the selection process by which municipalities decide to spend money on conservation, which could lead to biased inference if not controlled for. However, the extent of bias is an empirical question for this given setting.

With the XS and DID models, we do not find evidence of municipal actions affecting state actions in the municipality that holds a referendum, the same conclusion as the dynamic RD. Thus, in this case, we find no evidence of bias in this setting.

In contrast, the XS and DID models suggest that municipal actions positively affect neighboring state and municipal actions, whereas the dynamic RD models indicated no effect. We interpret these differences as evidence of bias in the XS and DID estimates. We hypothesize that the XS and DID results reflect spatial correlations that are not adequately captured by socioeconomic control variables or municipality fixed effects. Supporting this idea, the DID models estimate statistically significant positive effects in the concurrent year, which is most likely not causal given that it takes time to strategically respond.

7. CONCLUSION

We use local government conservation referendum data from Massachusetts and New Jersey, two states with land conservation incentive programs, as well as state government conservation spending data from Massachusetts, to investigate the relationship between public conservation agents at different levels of government and across space. Using a RD framework, our results suggest there is not a causal relationship between the conservation activity of local and state governments as well as between neighboring local governments.

By investigating whether there are spillover affects among public conservation agents at different levels of government and neighboring governments, we make two main contributions to the literature. First, we believe we are the first to investigate whether conservation agents in different layers of government react to each other. Prior literature investigates externalities between different levels of governments for other public goods, but not for land conservation. Second, our methodology allows us to investigate these relationships between public conservation agents in a more causal manner than what has been done in the past.

As urban sprawl in the United States continues to damage biodiversity and natural resources, communities can use land conservation as a tool to curb urban sprawl. The types of agents involved in conservation and how they react to each other will determine how efficient conservation actions will be. Our empirical setting is unique in that extensive municipal conservation voting allows for causal identification, however this may impact external validity. We choose to study two states that have state-level incentives for municipalities to take conservation actions. Results found here may not hold in states without these types of policies. One could imagine that state-level policies increase positive responses because municipalities face the same incentives and their state institutions see conservation as a priority. On the other hand, municipalities in states without conservation incentives may, in the face of scarcer resources, be more proactive in building off of neighbors' actions to enhance conservation benefits. Future research that examines states without strong land conservation incentive programs or uses a causal framework to examine the relationship between public conservation agents and private land trusts can also aid in understanding the efficiency of land conservation provisioning.

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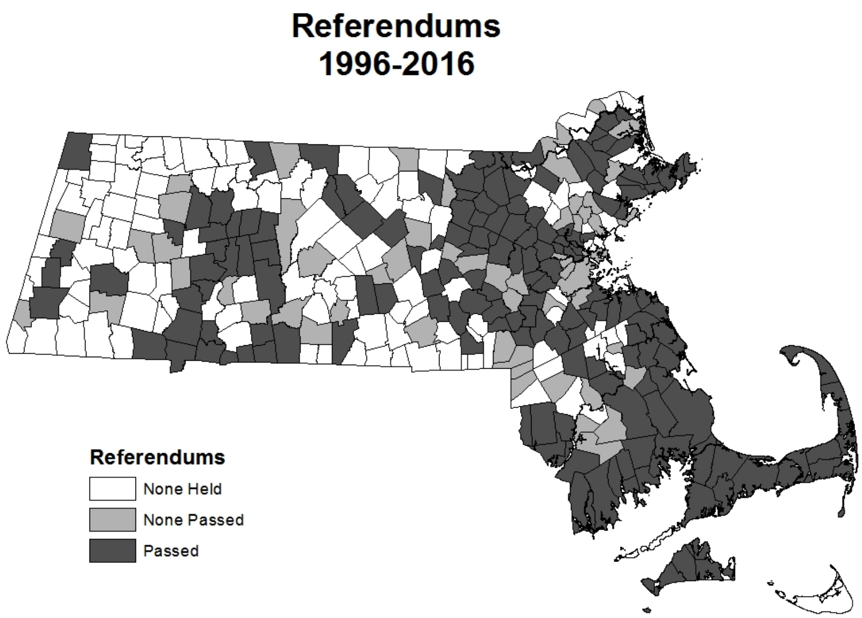
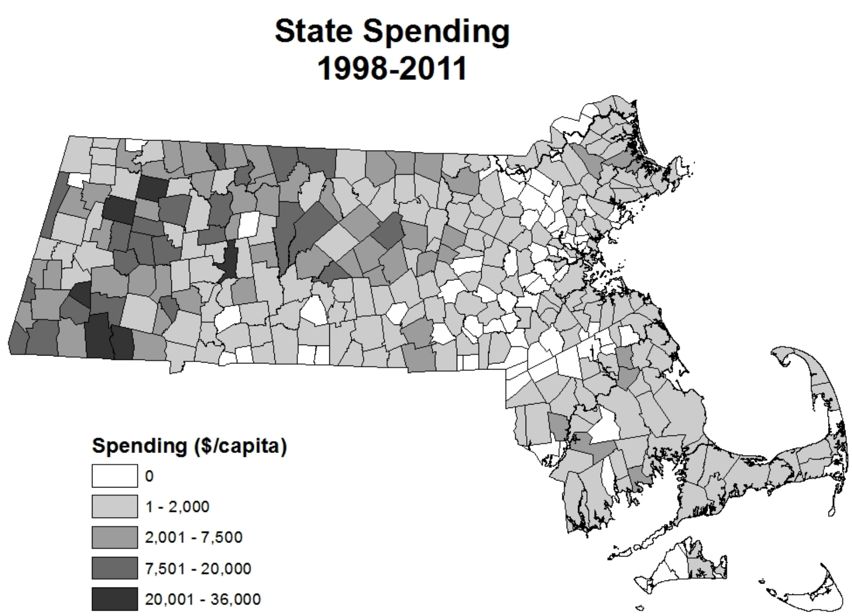
Figures and Tables

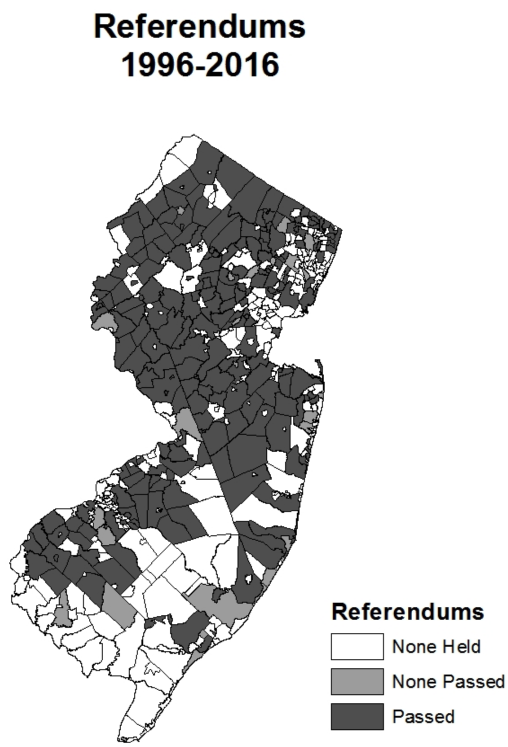
Figure 1: Massachusetts Land Conservation Activity





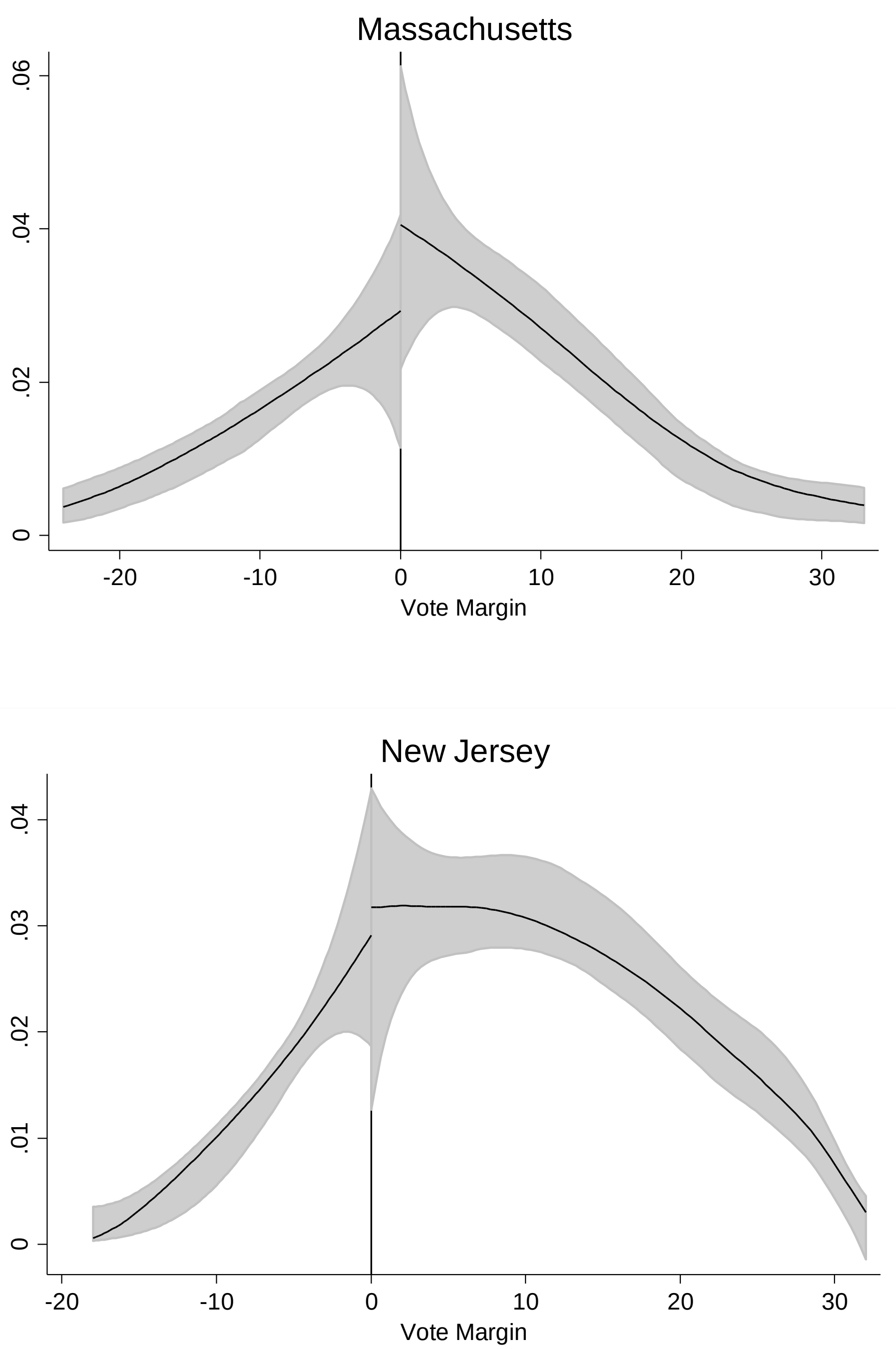
Notes: Figures show referendum and state spending activity for conservation in Massachusetts municipalities.

Figure 2: New Jersey Land Conservation Activity



Notes: Figure shows referendum activity for land conservation in New Jersey municipalities.

Figure 3: Distribution of referendum voting by margin for Massachusetts and New Jersey



Notes: Graphs are visualizations of manipulation tests for open space referendum vote margins in Massachusetts and New Jersey using a quadratic local-polynomial to construct the density point estimator and a cubic polynomial to construct the bias-corrected density point estimator. Solid lines are density point estimates and the shaded areas are 95% confidence intervals. Test statistics of density discontinuity are insignificant for both states.

Table 1: Sociodemographic Balance of Treatment and Control Groups for Massachusetts

	(1) Municipalities that ever fail a referendum (std. dev.)	(2) Municipalities that ever pass a referendum (std. dev.)	(3) Difference of means (t stat)	(4) SUR model difference (std. error)
Median Income ($)	88,977	88,633	-344	-8,071
	(24,441)	(29,264)	(-0.11)	(5,955)
Bachelor's Degree or more (%)	40.06	43.27	3.22*	-1.941
	(14.11)	(15.21)	(1.82)	(3.288)
Population Under 18 (%)	23.45	22.96	-0.49	-0.837
	(4.16)	(5.05)	(-0.88)	(1.017)
Population Over 65 (%)	13.64	15.16	1.52***	2.114*
	(3.91)	(6.02)	(2.75)	(1.095)
White Population (%)	93.25	92.51	-0.74	-0.729
	(6.73)	(7.57)	(-0.87)	(1.583)
Black Population (%)	1.78	1.86	0.08	0.272
	(3.08)	(2.96)	(0.24)	(0.653)
Population Density	1,305	1,096	-210	-197.1
	(2,044)	(2,047)	(-0.88)	(446.0)
Available Acres	8,923	8,992	68	634.3
	(6,607)	(6,830)	(0.09)	(1,471)
Median House Price ($)	366,801	397,879	31,078	-17,556
	(131,672)	(171,608)	(1.68)	(34,321)
Democrat Share Deviation (%)	-4.80	-2.92	1.88*	1.968
	(8.52)	(9.96)	(1.70)	(2.044)
Observations	115	203	318	318
Number of Municipalities	96	171	267	267
Vote Margin Polynomial				Cubic
Chi^2 Test				8.07
Prob > Chi^2				0.6215

Notes: Demographic data is for the year the referendum was held. Values were interpolated/extrapolated from the 2000 Census and 2010 Census or ACS, NLCD database for 2001 and 2011, and the Elections Division of the Secretary of the Commonwealth of Massachusetts. Results for Column (4) are from seemingly unrelated regressions where the error terms are assumed to be correlated between individual regression equations. Municipality demographics were the dependent variables and the exogenous explanatory variables were a dummy variable for a passed referendum and a cubic vote margin polynomial. Coefficient estimates for the pass dummy variable are shown. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 2: Sociodemographic Balance of Treatment and Control Groups for New Jersey

	(1)	(2)	(3)	(4)
	Municipalities that ever fail a referendum (std. dev.)	Municipalities that ever pass a referendum (std. dev.)	Difference of means (t stat)	SUR model estimated difference (std. error)
Median Income ($)	105,423	106,291	868	-1,371
	(31,480)	(29,697)	(0.26)	(6,059)
Bachelor's Degree or more (%)	39.79	40.56	0.77	-0.312
	(15.19)	(16.23)	(0.43)	(3.212)
Population Under 18 (%)	24.47	25.23	0.77*	0.813
	(3.65)	(4.09)	(1.73)	(0.791)
Population Over 65 (%)	14.42	13.47	-0.95	-2.448**
	(4.77)	(6.22)	(-1.45)	(1.192)
White Population (%)	85.61	87.24	1.63	-0.320
	(10.31)	(12.10)	(1.25)	(2.345)
Black Population (%)	4.24	4.59	0.35	1.870
	(5.81)	(7.94)	(0.42)	(1.492)
Population Density	1,968	1,802	-166	65.60
	(1,838)	(2,830)	(-0.57)	(530.0)
Available Acres	7,765	7,965	201	2,178
	(8,963)	(8,000)	(0.22)	(1,647)
Median House Price ($)	440,913	379,184	-61,730***	-35,759
	(235,050)	(193,801)	(-2.73)	(41,022)
Observations	105	357	462	462
Number of Municipalities	77	235	312	312
Vote Margin Polynomial				Cubic
Chi^2 Test				9.53
Prob > Chi^2				0.3897

Notes: Demographic data is for the year the referendum was held. Values were interpolated/extrapolated from the 2000 Census and 2010 Census or ACS, NLCD database for 2001 and 2011. Results for Column (4) are from seemingly unrelated regressions where the error terms are assumed to be correlated between individual regression equations. Municipality demographics were the dependent variables and the exogenous explanatory variables were a dummy variable for a passed referendum and a cubic vote margin polynomial. Coefficient estimates for the pass dummy variable are shown. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 3: The Effect of Passing a Conservation Referendum on Own and Neighbor State Spending and Neighbor Referendum Activity

	(1)	(2)	(3)	(4)	(5)	(6)
	Massachusetts				New Jersey	
VARIABLES	State Spending per capita (log)	Neighbor State Spending per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)
Pass Concurrent Year	0.258	-0.839	0.013	-0.343	0.040	0.091
	(0.455)	(0.547)	(0.060)	(0.547)	(0.054)	(0.669)
Pass 1 Year Ago	0.631	0.363	-0.023	0.175	-0.031	-0.946*
	(0.644)	(0.512)	(0.042)	(0.451)	(0.040)	(0.560)
Pass 2 Years Ago	-0.113	0.092	0.005	-0.042	-0.061	-0.344
	(0.525)	(0.382)	(0.026)	(0.323)	(0.040)	(0.559)
Pass 3 Years Ago	0.349	-0.183	0.023	0.005	-0.010	-0.287
	(0.416)	(0.470)	(0.048)	(0.598)	(0.035)	(0.525)
Pass 4 Years Ago	0.081	0.036	0.011	0.390	-0.024	-0.080
	(0.482)	(0.491)	(0.035)	(0.439)	(0.025)	(0.463)
Pass 5 Years Ago	0.004	-0.432	0.007	0.065	-0.029	-0.352
	(0.852)	(0.624)	(0.031)	(0.446)	(0.023)	(0.378)
Pass 6 Years Ago	-0.087	1.224***	0.049	0.287	-0.017	-0.293
	(0.456)	(0.442)	(0.042)	(0.441)	(0.028)	(0.410)
Pass 7 Years Ago	-0.369	0.950	-0.053	-0.211	0.005	0.109
	(0.660)	(0.724)	(0.055)	(0.517)	(0.022)	(0.370)
Observations	3,220	3,220	4,830	4,830	5,565	5,565
Adjusted R-squared	0.251	0.375	0.212	0.159	0.134	0.172
Vote Margin Polynomial	Cubic	Cubic	Cubic	Cubic	Cubic	Cubic
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the town level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Cross-sectional Relationship between Passing a Conservation Referendum with Own and Neighbor State Spending and Referendum Activity

	(1)	(2)	(3)	(4)	(5)	(6)
	Massachusetts				New Jersey	
VARIABLES	State Spending per Capita (log)	Neighbor State Spending per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)
Passed a Referendum	0.168	0.406**	0.265***	0.553***	0.159***	0.674***
	(0.230)	(0.175)	(0.039)	(0.156)	(0.049)	(0.161)
Demographics						
Median Income (log)	0.631	0.168	-0.931***	-1.325	0.720***	3.541***
	(0.986)	(1.206)	(0.267)	(1.074)	(0.268)	(0.878)
Bachelor's Degree or Higher (%)	0.012	0.031*	0.016***	0.041**	0.008	0.040**
	(0.015)	(0.018)	(0.004)	(0.016)	(0.005)	(0.018)
Under 18 Years Old (%)	-0.101**	-0.260***	-0.025*	-0.058	0.008	-0.037
	(0.042)	(0.058)	(0.013)	(0.052)	(0.014)	(0.045)
Over 65 Years Old (%)	0.006	-0.085**	0.032***	0.033	0.015**	0.027
	(0.033)	(0.038)	(0.008)	(0.034)	(0.007)	(0.024)
White Population (%)	0.013	0.021	0.006	0.047	0.011**	-0.001
	(0.027)	(0.039)	(0.009)	(0.035)	(0.005)	(0.016)
Black Population (%)	0.073	0.028	-0.008	-0.002	-0.001	0.014
	(0.054)	(0.071)	(0.016)	(0.063)	(0.005)	(0.017)
Population Density (log)	-0.827***	0.000	0.135***	0.519***	-0.047	0.268**
	(0.106)	(0.134)	(0.030)	(0.120)	(0.034)	(0.110)
Acres Available (log)	0.000***	1.058***	0.173***	0.762***	0.155***	0.645***
	(0.000)	(0.187)	(0.041)	(0.167)	(0.027)	(0.089)
Median House Price (log)	-1.134*	-0.494	0.593***	2.500***	-0.002	-1.319**
	(0.590)	(0.559)	(0.124)	(0.498)	(0.180)	(0.589)
Democratic Vote Margin	-0.021	-0.085***	-0.023***	-0.016	0.023***	-0.001
	(0.019)	(0.020)	(0.004)	(0.018)	(0.006)	(0.020)
Observations	349	349	349	349	565	565
R-squared	0.495	0.357	0.564	0.466	0.399	0.459
Years	1998-2011	1998-2011	1996-2016	1996-2016	1996-2016	1996-2016
Municipality Characteristics	Own	Avg Nbr	Avg Nbr	Avg Nbr	Avg Nbr	Avg Nbr

Notes: Each column is a separate regression where the independent variables include a dummy variable indicating whether a municipality passed at least one referendum and municipality or neighbor demographic variables. "Own" demographic characteristics are the demographic variables for the municipality that holds a referendum averaged over the years indicated. "Average neighbor" demographic characteristics are the average of demographics variables of towns that border the municipality that holds a referendum, weighted by border length. Standard errors are shown in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Difference-in-Differences Estimates of the Effect of Passing a Conservation Referendum on Own and Neighbor State Spending and Neighbor Referendum Activity

	(1)	(2)	(3)	(4)	(5)	(6)
	Massachusetts				New Jersey	
VARIABLES	State Spending per capita (log)	Neighbor State Spending per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)	Neighbor Refs Passed per neighbor	Neighbor Funds Approved per capita (log)
Pass Concurrent Year	-0.072	-0.117	0.165***	1.097***	0.039***	0.425***
	(0.110)	(0.103)	(0.027)	(0.197)	(0.010)	(0.109)
Pass 1 Year Ago	0.087	0.150	0.011	0.237**	0.018**	0.305***
	(0.127)	(0.119)	(0.010)	(0.106)	(0.009)	(0.108)
Pass 2 Years Ago	0.135	-0.099	0.005	0.113	0.020**	0.427***
	(0.122)	(0.106)	(0.007)	(0.101)	(0.008)	(0.097)
Pass 3 Years Ago	-0.062	-0.088	0.002	0.092	0.020**	0.350***
	(0.112)	(0.097)	(0.009)	(0.115)	(0.008)	(0.104)
Pass 4 Years Ago	0.098	0.066	-0.001	0.127	0.005	0.133
	(0.136)	(0.115)	(0.008)	(0.100)	(0.007)	(0.090)
Pass 5 Years Ago	0.040	-0.043	-0.004	-0.036	-0.003	0.020
	(0.119)	(0.118)	(0.006)	(0.075)	(0.006)	(0.094)
Pass 6 Years Ago	-0.189*	0.058	0.009	0.047	0.006	0.115
	(0.101)	(0.108)	(0.008)	(0.087)	(0.006)	(0.085)
Pass 7 Years Ago	0.077	-0.013	0.066***	0.475***	0.002	0.117
	(0.158)	(0.126)	(0.014)	(0.106)	(0.006)	(0.089)
Observations	3,220	3,220	4,830	4,830	5,565	5,565
Adjusted R-squared	0.256	0.371	0.176	0.145	0.138	0.175
Vote Margin Polynomial	None	None	None	None	None	None
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the town level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

ONLINE APPENDIX

(not for publication)

This appendix provides supplemental figures, statistics, and results to our main paper.

Studies that use RD in their analysis typically present RD plots that fit separate lines to the relationship between a running variable, such as vote margin, and the dependent variable in question below and above a threshold to show the discontinuity in the outcome variable that results from treatment. While this is a good practice to build intuition for interpreting statistically estimated results, it is harder to do in our situation where a dynamic framework would call for multiple plots across time. The use of municipality and year fixed effects in our model further complicates the visualization of the relationships we estimate in one graph. Regardless, we present RD plots which are more akin to cross-sectional results than dynamic results for Massachusetts and New Jersey referendums that were held in the previous year in Figure A1.

Figure A1 shows regression discontinuity plots for state conservation spending per capita, neighbor state conservation spending per capita, neighbor conservation referendums passed per neighbor, and neighbor conservation funds approved per capita for Massachusetts and New Jersey. Dependent variables are grouped into 2% vote margin bins. The visualized relationships are not directly comparable with the coefficients we estimate from Equation (3) in the main paper due to the inability to present dynamic results and control for municipality and year fixed effects. The small discontinuities between municipalities that barely fail a referendum and those that barely pass a referendum for most of the dependent variables are consistent with our estimations for Massachusetts. The plots for New Jersey seem to show consistent discontinuities between treated and untreated municipalities which suggests treatment may affect neighboring municipality conservation activity which is not consistent with our New Jersey estimations.

Tables A1 and A2 show the yearly breakdown of aggregate local conservation referendum activity and state conservation spending activity where available for Massachusetts and New Jersey, respectively. These tables show the prevalence of conservation activity in each state from 1996-2016 for referendums and 1998-2011 for state conservation spending.

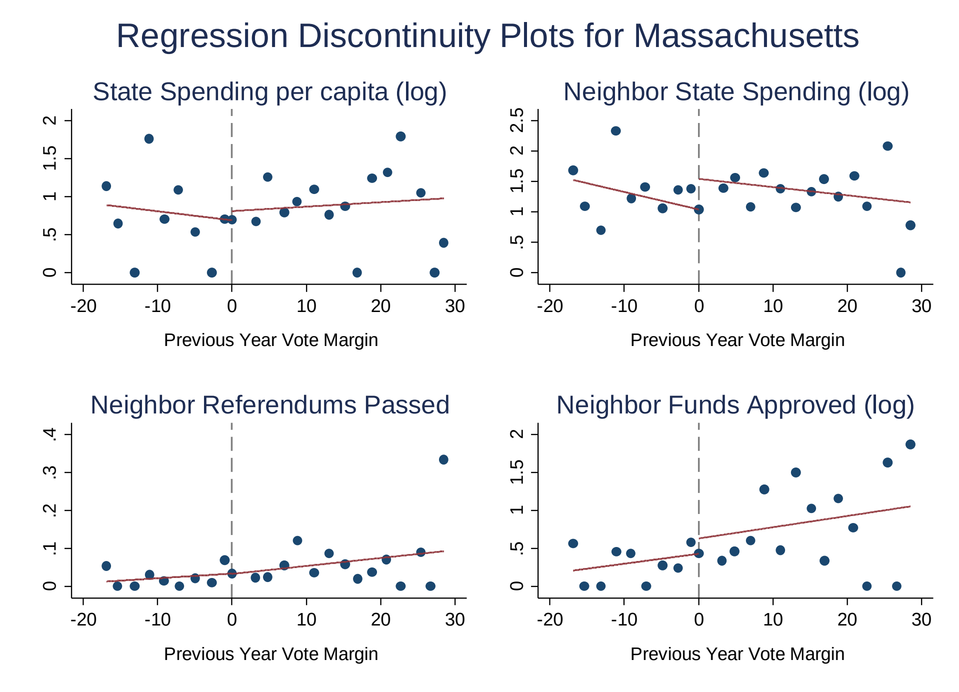
Table A3 serves as a robustness check to Table 3 in the main paper by controlling for different vote margin polynomials for Massachusetts. In general, these regressions confirm the insignificant results found with a cubic polynomial. The regressions that use a linear polynomial of vote margin show positive and significant crowding-in results for neighboring conservation activity 1-2 years after a passed referendum, but this result is not robust to controlling for quadratic and cubic vote margin polynomials.

Table A4 serves as a robustness check to Table 3 in the main paper by controlling for different vote margin polynomials for New Jersey. Controlling for linear and quadratic vote margin polynomials do not reveal any statistically significant results other than a significant coefficient for neighbor referendums passed two years after at the 10% level. This estimate is not robust to controlling for linear and cubic vote margin polynomials, however.

Table A5 serves as a robustness check to Table 3 in the main text by including town level sociodemographic variables in the dynamic regression discontinuity model. Sociodemographic variables add explanatory power to the model with significant coefficient estimates, however, coefficient estimates for the dynamic effect of passing a referendum remain insignificant.

Table A6 serves as a final robustness check to Table 3 in the main text by pooling together referendum activity in Massachusetts and New Jersey. Standard errors are slightly lower for pooled coefficient estimates compared to individual state results, however, coefficient estimates are still statistically insignificant and inconsistent throughout time.

Figure A1


Regression Discontinuity Plots for Massachusetts
State Spending per capita (log)
Neighbor State Spending (log)
Neighbor Referendums Passed
Neighbor Funds Approved (log)
Previous Year Vote Margin
Previous Year Vote Margin
Previous Year Vote Margin
Previous Year Vote Margin

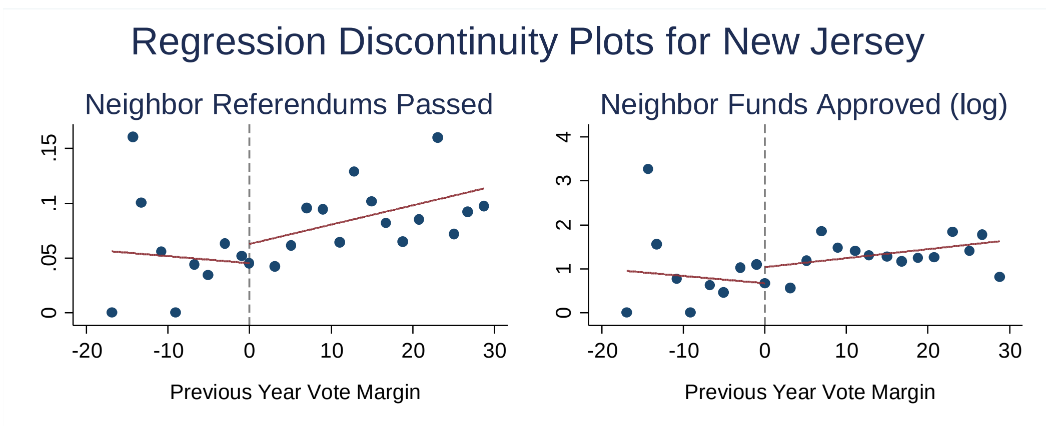

Regression Discontinuity Plots for New Jersey
Neighbor Referendums Passed
Neighbor Funds Approved (log)
Previous Year Vote Margin
Previous Year Vote Margin

Table A1: Referendum and State Spending Conservation Statistics for Massachusetts

Year	Referendums Held	Referendums Passed	Conservation Funds Approved	State Spending
1996	1	0	$0	-
1997	5	5	$18,398,000	-
1998	18	17	$101,431,459	$4,758,851
1999	0	0	$0	$54,716,714
2000	3	3	$17,415,000	$43,344,154
2001	67	35	$109,830,772	$51,897,637
2002	46	22	$47,546,162	$74,827,403
2003	6	4	$6,395,006	$12,779,610
2004	18	17	$48,858,902	$13,997,265
2005	31	28	$94,592,119	$27,484,753
2006	36	18	$30,629,839	$43,118,496
2007	17	11	$23,677,068	$35,980,955
2008	21	14	$15,425,933	$47,758,589
2009	4	2	$2,747,987	$45,240,840
2010	7	6	$9,404,884	$42,221,711
2011	4	3	$1,417,860	$21,985,087
2012	11	7	$28,113,508	-
2013	2	0	$0	-
2014	13	6	$19,154,148	-
2015	4	3	$12,499,016	-
2016	4	2	$2,309,939	-
Average	15	10	$28,087,981	$37,150,862

Table A2: Referendum and State Spending Conservation Statistics for New Jersey

Year	Referendums Held	Referendums Passed	Conservation Funds Approved
1996	7	6	$54,383,998
1997	8	6	$28,882,368
1998	55	46	$234,091,328
1999	38	36	$116,858,202
2000	43	42	$168,405,307
2001	49	43	$115,493,091
2002	30	24	$123,695,970
2003	37	28	$98,943,898
2004	40	29	$64,091,930
2005	29	20	$45,275,606
2006	23	14	$39,362,914
2007	24	11	$82,538,428
2008	21	13	$37,753,200
2009	7	2	$3,404,981
2010	5	3	$1,724,147
2011	8	4	$10,162,888
2012	9	7	$68,695,485
2013	8	6	$28,094,534
2014	2	1	$2,616,721
2015	3	3	$2,053,726
2016	16	13	$50,149,292
Average	22	17	$65,556,096

Table A3: Robustness Check of the Effect of Passing a Conservation Referendum on Neighbor Referendum Activity in Massachusetts

VARIABLES	(1) State Spending per Capita (log)	(2) Neighbor State Spending per capita (log)	(3) Neighbor Referendums Passed per neighbor	(4) Neighbor Funds Approved per capita (log)	(5) State Spending per Capita (log)	(6) Neighbor State Spending per capita (log)	(7) Neighbor Referendums Passed per neighbor	(8) Neighbor Funds Approved per capita (log)
Pass Concurrent Year	0.175	-0.214	0.040	0.147	0.152	-0.542	0.098*	0.292
	(0.275)	(0.291)	(0.035)	(0.319)	(0.352)	(0.412)	(0.050)	(0.434)
Pass 1 Year Ago	0.102	-0.132	0.040*	0.691***	0.482	0.444	0.000	0.331
	(0.312)	(0.298)	(0.023)	(0.245)	(0.456)	(0.424)	(0.032)	(0.347)
Pass 2 Years Ago	-0.096	0.007	0.047***	0.538***	-0.248	0.029	0.004	0.082
	(0.306)	(0.223)	(0.016)	(0.201)	(0.440)	(0.315)	(0.021)	(0.256)
Pass 3 Years Ago	-0.072	-0.219	0.042*	0.364	0.259	-0.007	0.016	-0.013
	(0.266)	(0.237)	(0.022)	(0.292)	(0.343)	(0.372)	(0.035)	(0.455)
Pass 4 Years Ago	0.008	-0.337	0.019	0.312	-0.139	-0.009	-0.001	0.160
	(0.286)	(0.297)	(0.023)	(0.286)	(0.405)	(0.404)	(0.027)	(0.377)
Pass 5 Years Ago	-0.268	-0.419	-0.006	-0.217	-0.050	-0.367	-0.014	-0.197
	(0.395)	(0.356)	(0.022)	(0.263)	(0.627)	(0.510)	(0.025)	(0.338)
Pass 6 Years Ago	-0.206	0.078	0.022	0.196	0.110	0.411	0.040	0.378
	(0.317)	(0.305)	(0.023)	(0.246)	(0.436)	(0.350)	(0.033)	(0.354)
Pass 7 Years Ago	0.154	0.291	0.025	0.283	0.481	0.762	-0.040	-0.088
	(0.375)	(0.367)	(0.034)	(0.279)	(0.530)	(0.536)	(0.047)	(0.396)
Observations	3,220	3,220	4,830	4,830	3,220	3,220	4,830	4,830
Adjusted R-squared	0.252	0.373	0.201	0.156	0.251	0.375	0.205	0.156
Vote Margin Polynomial	Linear	Linear	Linear	Linear	Quadratic	Quadratic	Quadratic	Quadratic
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the municipality level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A4: Robustness Check of the Effect of Passing a Conservation Referendum on Neighbor Referendum Activity in New Jersey

VARIABLES	(1) Neighbor Referendums Passed per neighbor	(2) Neighbor Funds Approved per capita (log)	(3) Neighbor Referendums Passed per neighbor	(4) Neighbor Funds Approved per capita (log)
Pass Concurrent Year	0.022	0.353	0.041	0.401
	(0.027)	(0.313)	(0.041)	(0.500)
Pass 1 Year Ago	0.015	0.038	-0.019	-0.500
	(0.025)	(0.332)	(0.032)	(0.449)
Pass 2 Years Ago	-0.013	0.152	-0.053*	-0.316
	(0.023)	(0.297)	(0.030)	(0.421)
Pass 3 Years Ago	-0.005	-0.023	-0.024	-0.371
	(0.018)	(0.263)	(0.025)	(0.402)
Pass 4 Years Ago	-0.003	0.110	-0.009	0.078
	(0.017)	(0.242)	(0.020)	(0.357)
Pass 5 Years Ago	-0.001	-0.077	-0.016	-0.224
	(0.016)	(0.257)	(0.019)	(0.297)
Pass 6 Years Ago	-0.017	-0.162	-0.019	-0.347
	(0.017)	(0.236)	(0.021)	(0.306)
Pass 7 Years Ago	0.016	0.165	-0.008	-0.136
	(0.015)	(0.244)	(0.018)	(0.293)
Observations	5,565	5,565	5,565	5,565
Adjusted R-squared	0.137	0.174	0.136	0.174
Vote Margin Polynomial	Linear	Linear	Quadratic	Quadratic
Year Fixed Effects	Yes	Yes	Yes	Yes
Municipality Fixed Effects	Yes	Yes	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the municipality level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A5: The Effect of Passing a Conservation Referendum and Demographics on Own and Neighbor State Spending and Neighbor Referendum Activity

	(1)	(2)	(3)	(4)	(5)	(6)
	Massachusetts				New Jersey	
VARIABLES	State Spending per capita (log)	Neighbor State Spending per capita (log)	Neighbor Referendums Passed per neighbor	Neighbor Funds Approved per capita (log)	Neighbor Referendums Passed per neighbor	Neighbor Funds Approved per capita (log)
Pass Concurrent Year	0.297	-0.835	0.011	-0.394	0.038	0.048
	(0.450)	(0.548)	(0.060)	(0.544)	(0.054)	(0.658)
Pass 1 Year Ago	0.658	0.347	-0.027	0.094	-0.036	-1.010*
	(0.655)	(0.513)	(0.042)	(0.450)	(0.040)	(0.563)
Pass 2 Years Ago	-0.109	0.050	-0.001	-0.140	-0.064	-0.396
	(0.535)	(0.390)	(0.026)	(0.319)	(0.040)	(0.561)
Pass 3 Years Ago	0.346	-0.241	0.017	-0.093	-0.012	-0.320
	(0.423)	(0.469)	(0.049)	(0.594)	(0.035)	(0.525)
Pass 4 Years Ago	0.060	-0.062	0.006	0.301	-0.024	-0.088
	(0.483)	(0.497)	(0.034)	(0.432)	(0.025)	(0.461)
Pass 5 Years Ago	-0.068	-0.555	0.002	-0.017	-0.028	-0.346
	(0.865)	(0.621)	(0.031)	(0.446)	(0.022)	(0.367)
Pass 6 Years Ago	-0.150	1.121**	0.043	0.196	-0.014	-0.274
	(0.458)	(0.446)	(0.042)	(0.441)	(0.027)	(0.400)
Pass 7 Years Ago	-0.425	0.803	-0.058	-0.279	0.010	0.154
	(0.662)	(0.698)	(0.056)	(0.511)	(0.021)	(0.357)
Demographics						
Median Household Income (log)	-0.715	-2.410***	0.043	0.805*	-0.090*	-0.553
	(0.690)	(0.878)	(0.044)	(0.475)	(0.049)	(0.679)
Bachelor's Degree or Higher (%)	0.027	0.050*	-0.002*	-0.007	0.002	0.027
	(0.019)	(0.029)	(0.001)	(0.011)	(0.002)	(0.024)

Table A5: (Continued)

Under 18 Years Old (%)	-0.019	-0.075	-0.004**	-0.073***	-0.002	-0.034
	(0.044)	(0.071)	(0.002)	(0.021)	(0.002)	(0.033)
Over 65 Years Old (%)	-0.025	-0.040	-0.010***	-0.128***	-0.008***	-0.103***
	(0.039)	(0.054)	(0.002)	(0.021)	(0.002)	(0.027)
White Population (%)	0.025	0.027	0.004***	0.063***	0.001	0.009
	(0.026)	(0.044)	(0.002)	(0.016)	(0.001)	(0.019)
Black Population (%)	-0.005	-0.001	0.005	0.049	-0.005**	-0.053*
	(0.054)	(0.066)	(0.003)	(0.033)	(0.002)	(0.029)
Population Density (log)	-0.274	-0.261	0.070	-0.479	-0.108**	-1.129*
	(1.123)	(1.866)	(0.059)	(0.608)	(0.045)	(0.649)
Acres Available (log)	0.000	3.141	-0.249***	-4.237***	-0.158**	-2.310**
	(0.000)	(2.152)	(0.086)	(1.152)	(0.077)	(1.087)
Median House Price (log)	1.369***	1.000*	-0.038	0.171	0.006	0.143
	(0.521)	(0.599)	(0.026)	(0.259)	(0.023)	(0.348)
Democratic Vote Margin	0.023**	0.031***	0.001**	0.020***		
	(0.009)	(0.011)	(0.000)	(0.005)		
Observations	3,220	3,220	4,830	4,830	5,565	5,565
Adjusted R-squared	0.253	0.380	0.217	0.168	0.142	0.181
Vote Margin Polynomial	Cubic	Cubic	Cubic	Cubic	Cubic	Cubic
Municipality Characteristics	Own	Avg Neighbor	Avg Neighbor	Avg Neighbor	Avg Neighbor	Avg Neighbor
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the town level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A6: The Effect of Passing a Conservation Referendum on Neighbor Referendum Activity

	(1)	(2)
	Massachusetts and New Jersey	
VARIABLES	Neighbor Referendums Passed per neighbor	Neighbor Funds Approved per capita (log)
Pass Concurrent Year	0.020	-0.054
	(0.039)	(0.404)
Pass 1 Year Ago	-0.017	-0.300
	(0.027)	(0.365)
Pass 2 Years Ago	-0.028	-0.239
	(0.026)	(0.338)
Pass 3 Years Ago	0.005	-0.145
	(0.027)	(0.360)
Pass 4 Years Ago	-0.001	0.216
	(0.020)	(0.305)
Pass 5 Years Ago	-0.012	-0.101
	(0.017)	(0.262)
Pass 6 Years Ago	0.008	-0.095
	(0.022)	(0.269)
Pass 7 Years Ago	-0.015	-0.057
	(0.025)	(0.287)
Observations	10,395	10,395
Adjusted R-squared	0.134	0.130
Vote Margin Polynomial	Cubic	Cubic
Year Fixed Effects	Yes	Yes
Municipality Fixed Effects	Yes	Yes

Notes: Each column is a separate regression. Standard errors are shown in parentheses and are clustered at the town level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.