Success and Design of Local Referenda for Land Conservation

H. Spencer Banzhaf
Wallace E. Oates
James N. Sanchirico

Abstract

From 1998 to 2006, over three-quarters of the more than 1,550 U.S. referenda targeting open space passed. We analyze the success of the conservation movement at holding referenda in areas with greater ecological value and greater likelihood of supporting conservation. To do so, we first analyze the patterns in where referenda are held and in which finance mechanisms they employ. Controlling for these two selection patterns, we then investigate the factors determining the success of the referenda. Our findings suggest that conservation groups are pursuing a successful strategy, targeting communities with above-average probabilities of passing referenda and higher ecological value. Nevertheless, our results suggest that overlooked opportunities exist in minority and middle-class neighborhoods, in suburban fringe areas, and in the Southeast. © 2010 by the Association for Public Policy Analysis and Management.

INTRODUCTION

Open spaces contribute to a number of important ecosystem services: They provide habitat for endangered species and other valuable flora and fauna, protect nearby water from non–point source pollution, reduce urban heat islands and pollution, sequester carbon, and provide desirable views and recreation opportunities. Research has repeatedly demonstrated that households recognize and value these services.[1] Yet because open spaces are public goods, the private actions driving urban sprawl do not fully account for them.

A variety of governmental and nonprofit agencies have attempted to step in and protect open spaces. In the U.S., the federal government protects lands through the holdings of the National Park Service, Forest Service, the Bureau of Land Management, and through the Department of Agriculture's Conservation Reserve Program, which covers about 35 million acres of farmland at an annual cost around $2.3 billion. At the other end of the spectrum, private nonprofits also play a role. For example, the Nature Conservancy has an annual budget of about $1.1 billion for its conservation work. In between, grassroots conservation efforts using voter initiatives have been

[1] For reviews of this literature, see Banzhaf (2010) and Bergstrom and Ready (2009). Bell, Huber, and Viscusi (2009) recently estimated values for water quality nationally, and have pointed out that the distribution of individuals' values for conservation is skewed, with the mean higher than the median. This in turn suggests that conservation measures succeeding at the ballot box may not conserve as much land as would be justified by a benefit-cost criterion.

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establishing open space funds managed by local governments.[2] Over the period from 1998 to 2006, there were 1,550 such conservation initiatives in the U.S. They authorized almost $34 billion in conservation funds, or $3.7 billion per year on average—more than the Conservation Reserve Program and Nature Conservancy combined.

Moreover, these ballot measures have been strikingly successful. Over three-quarters pass, usually by a wide margin. Although passage typically requires a simple majority, the median measure receives approximately 61 percent of the votes. Clearly, these measures are not arbitrary or capricious. Rather, they are the outcome of work by local activists acting in consultation with national conservation organizations like the Trust for Public Land (TPL) and the Conservation Fund. Both organizations have, in fact, published manuals that provide detailed guidance on "the how and where" of designing and introducing conservation referenda (Hopper & Cook, 2004; McQueen & McMahon, 2003). More importantly, the two organizations have 55 and 28 regional and local offices, respectively, to coordinate and guide local conservation efforts. Their activities include using screening tools and professional polling to assess the potential for conservation measures in various communities; consulting on conservation financing options; exploring legal issues; designing political campaigns; drafting ballot language; and fundraising. Through these activities, the TPL claims that it has helped local communities in 47 states protect 2.5 million acres, and the Conservation Campaign, which it founded in 2000, directly contributed to 303 conservation campaigns.

These conservation initiatives, therefore, are the result of a combination of top-down planning and management by national organizations and bottom-up work by enterprising land trusts and activists.[3] Understanding the outcomes and the process by which these initiatives appear is critical for understanding the conservation landscape in the United States. In this paper, we address this issue by analyzing the patterns observable in the types of communities holding conservation initiatives and the types of finance mechanisms they employ. Recently, Nelson, Uwasu, and Polasky (2007) have looked at similar patterns, describing the characteristics of such communities. We use the same general modeling strategy, but address questions not previously considered in the literature. In particular, we assess the *performance* of the conservation movement in managing the direct democracy process.

Promoting conservation at the ballot box is a costly activity, drawing on the finances of national organizations and the work of local volunteers. Accordingly, we hypothesize that if conservation organizations are managing the initiative process as described above, they will use their resources to steer referenda to locations where they are most likely to advance their conservation objectives. We further hypothesize that these objectives include, other things equal, conserving more land and conserving land with greater ecological value. In this paper, we empirically test for both of these patterns.

First, we hypothesize that conservation organizations direct their efforts toward areas with more conservation value, as proxied by nearby surface water and endangered species. Conservation is especially valuable in such areas (or development is especially damaging), because of the effects of runoff on water quality and the habitat for threatened species. Thus, if national organizations are maximizing an ecological objective, or if grassroots members are motivated by such objectives, we would expect to find a pattern with conservation efforts directed to such areas.

[2] More generally, the use of direct democracy is quite pervasive in the United States. Gerber and Phillips (2005), for example, report that more than half of all states and cities provide for either initiatives or referenda and that more than 70 percent of the U.S. population resides in a state or city with some form of direct democracy (p. 311).
[3] The confluence of these two processes is what we are calling the "conservation movement."

In fact, our results do suggest that local conservation efforts are being steered toward ecologically valuable areas. Jurisdictions with more endangered species and more surface water are more likely to host conservation initiatives. For example, municipalities holding referenda have over twice as much surface water and 10 percent more species than other municipalities.

Second, we hypothesize that conservation organizations are using the initiative process efficiently and effectively to conserve more land. A testable implication of this hypothesis is that they systematically target communities where referenda are more likely to pass. Similarly, we would expect them to use finance mechanisms that are more likely to be successful in the given community. We address these questions by linking our model of the selection process with a model of voting outcomes. Again, there is evidence that the movement successfully navigates this dimension of the process as well. The predicted "yes" vote for conservation referenda is 6 to 7 percentage points higher in those communities that do in fact hold them. Nevertheless, there is room for improvement. We show that our econometric model is capable of selecting communities that have even higher success rates than those observed. In particular, potentially successful missed opportunities are in minority communities, in the Southeast, and in well-educated communities with higher homeownership rates.

Our work is closely related to other recent work on conservation initiatives. Kline (2006), Kotchen and Powers (2006); Nelson, Uwasu, and Polasky (2007); and Sundberg (2006) have looked at the question of which communities are most likely to approve conservation initiatives if they happen to hold one. These papers do not consider the question of performance, however. Rather, they focus on the demand for conservation—that is, who wants this conservation, as revealed by their voting outcomes.[4] Nevertheless, in studying this question, some of these papers have recognized the fact that the communities holding referenda may be selected in ways that make them unrepresentative of the nation as a whole. If selection occurs on *unobservable* factors that cannot be controlled for econometrically, then it will bias the estimated relationship between local factors and approval of referenda. Nelson, Uwasu, and Polasky (2007) and Kotchen and Powers (2006) correct for this potential bias by using the selection correction procedure proposed by Heckman (1979). Nelson, Uwasu, and Polasky (2007) do so for a national sample of communities, Kotchen and Powers (2006) for New Jersey and Massachusetts only. They do not find evidence of selection on unobservables.

Although our analysis is closely related to these works, a distinct difference is that we seek to understand the selection process, as it provides insights into the direct democracy process. In particular, we ask whether conservation organizations systematically steer initiatives (of particular types) to communities with *either* observable *or* unobservable factors that make the initiatives more likely to succeed as well as more ecologically valuable. In contrast, previous work has focused on who approves referenda, controlling for selection on unobservables as a "nuisance." In other words, the literature heretofore has focused on understanding outcomes while controlling for the statistical problems posed by selection. We reverse that logic, trying to understand the selection process, including selection on areas with more promising outcomes as well as areas with more ecological value.

Although our primary motivation is to assess the patterns of referenda and their efficiency in achieving conservation objectives, the similarity in our modeling

[4] In this sense, this work is related to research into households' willingness to pay for conservation. Since Deacon and Shapiro (1975), a number of authors have used referenda as a window into household preferences. See also Kahn and Matsusaka (1997), Kline and Wichelns (1994), and Vossler and Kerkvliet (2003).

approach with the previous literature does afford an opportunity to revisit the question of who votes for conservation. A second look at this question is merited for three reasons. First, although employing the method of Heckman (1979) to control for sample selection bias, neither Nelson, Uwasu, and Polasky (2007) nor Kotchen and Powers (2006) used exclusion restrictions in their estimation, that is, factors that affect the selection process without affecting the voting outcome. Yet such exclusion restrictions are essential for identifying potential bias. Second, while attempting to control for selection in geographic patterns, they essentially assume that the type of financing mechanism used (debt vs. taxes) is randomly assigned. We use a polychotomous selection model of Dubin and McFadden (1984) that extends Heckman's (1979) model to a choice of the type of referendum as well as whether to hold one. Finally, we use the most complete data set to date, using more recent years and all national jurisdictions, rather than a sample. Although *ex ante* there are good reasons to revisit the question, we find no evidence of selection bias on unobservables in the estimates of voting outcomes, which is consistent with the previous work. We do find evidence of rational selection on observables consistent with our hypotheses.

The structure of the paper is as follows. In the second section, we introduce the formal model and describe our empirical strategy. The third section describes the data. In the fourth section, we discuss our results, both for the patterns of where referenda occur and where they are likely to be successful. With these results, we assess in the fifth section the performance of the conservation movement in making use of local referenda and indicate some further opportunities suggested by our analysis. We then conclude the paper with a brief summary and further thoughts.

EMPIRICAL STRATEGY

Following Deacon and Shapiro (1975) and others, we utilize the following model of referenda selection and outcomes:

$$y_{ijt} = \boldsymbol{x}'_{it}\boldsymbol{\beta_j} + \varepsilon_{ijt} \tag{1}$$

where y_{ijt} is the log-odds ratio of the outcome of a referendum of type j in community i in year t [that is, ln(percent yes/percent no)], x_{it} is a vector of characteristics for community i in year t, β_j indicates the effect of x on the outcome of a referendum of type j, and ε_{ijt} is the disturbance term. For this analysis, the four referenda alternatives j are (1) no referendum ($j = 0$), (2) a referendum using bond financing, (3) a referendum using property taxes, and (4) a referendum using alternative financing (including income taxes, sales taxes, real estate transfer taxes, and other mechanisms). y_{ijt} is observed for community i if and only if

$$v_{ijt} = \max_k\{v_{ikt}\} \text{ and } j \neq 0 \tag{2}$$

where v_{ijt} is the "utility" of holding referendum type j in community i. In other words, a choice process that is governed by local activists, national organizations, and local rules selects the most preferred of all possible alternatives. These community preferences are described and approximated by the following linear function:

$$v_{ijt} = \boldsymbol{x}'_{it}\boldsymbol{\gamma_j} + \boldsymbol{z}'_{it}\boldsymbol{\delta_j} + u_{ijt} \tag{3}$$

where $\boldsymbol{z}_{it}$ is a vector of additional variables.

If u_{ijt} is distributed Type I extreme value, then the probability of any referendum type (including no referendum) being observed can be estimated with a multinomial logit model. In that case, the probability of observing alternative j in community i in period t is

$$P_{ijt} = \frac{\exp(\mathbf{x}'_{it}\boldsymbol{\gamma}_j + \mathbf{z}'_{it}\boldsymbol{\delta}_j)}{\sum_k \exp(\mathbf{x}'_{it}\boldsymbol{\gamma}_k + \mathbf{z}'_{it}\boldsymbol{\delta}_k)} \tag{4}$$

If the value of an element in $\boldsymbol{x}$ makes it more likely that a referendum of type j will be held in community i [by Equation (3)] and also makes it more likely that a referendum of type j will do well in that community [by Equation (1)]; that is, if γ and β are correlated, then this would be a case of selection on observables. For example, national land trusts might apply their screening model based on observed $\boldsymbol{x}$s to prioritize communities. Such effects pose no special econometric problem for estimating β. However, such relationships are of interest as a window into the planning, management, and behavior of conservation organizations in the direct democracy process, and so are relevant to our research and policy questions.

On the other hand, if the u and ε are correlated—that is, if the *unobservable* factors disposing a community to having a referendum (of type j) make it more likely to pass a referendum (of type j), then this is a case of selection on unobservables (to the econometrician). For example, we might imagine the knowledge of local experts or the gathering of special information such as polling data. In this case, least squares estimation of β in Equation (1) will be biased. In the case of a simple choice of whether or not to hold a referendum, the model of Heckman (1979) corrects for this bias by computing the conditional mean of ε given its estimated correlation with u. Importantly, nonparametric identification of this correlation requires some variables, here denoted as z, that appear in Equation (3) but not Equation (1). That is, these variables affect the probability a community holds a referendum (of a particular type), but not the success of a referendum (of that type) once held. Without such variables, the control through the selection equation is based solely on the assumption of a joint normally distributed error and no new information (see Wooldridge, 2001). We discuss our choice of zs below, following a discussion of the data.

Lee (1983) and Dubin and McFadden (1984) have generalized the selection model to multiple choices.[5] We follow Dubin and McFadden (1984) in assuming that the εs are correlated with a linear function of the us. Schmertmann (1996) and Bourguignon, Fournier, and Gurgand (2007) have found that, in Monte Carlo simulations, this model is the most robust to violations of the maintained assumptions. Under this restriction, an unbiased version of Equation (1) can be estimated by including a simple correction factor:

$$Y_{ijt} = \boldsymbol{x}'_{it}\boldsymbol{\beta}_j + \sum_{k/j} \sigma_k \left(\frac{\hat{P}_{ikt} \ln \hat{P}_{ikt}}{1 - \hat{P}_{ikt}} + \ln \hat{P}_{ijt} \right) + \varepsilon_{ijt} \tag{5}$$

where $\hat{P}$ is the estimated probability as computed by Equation (4) (Dubin & McFadden, 1984). However, as with other two-step models, this bias correction is likely to come at the expense of efficiency.

DATA

The data sets employed in this paper include the land vote data set on open space referenda, U.S. Census data on local demographics, USDA data on land uses and on the presence of endangered species, and political and fiscal data from a variety of sources. We discuss each of these data sources in turn.

[5] See Bourguignon, Fournier, and Gurgand (2007) for an excellent review and discussion.

Table 1. Cross-tabulation of jurisdictions and financing mechanisms.

	Jurisdiction				
	County	Municipal	Special district	State	Total
Bond	114	404	22	24	564
Property tax*	86	630	20	0	736
Income tax	0	63	0	0	63
Sales tax	62	48	0	1	111
Other †	11	50	10	5	76
Total	273	1,195	52	30	1,550

* Includes property tax surcharges.
† Includes real estate transfer tax.

Land Vote Data

The Trust for Public Land's "Land Vote" data set provides data on the number of yes and no votes cast in each conservation referendum and descriptors about the referendum itself, including the finance mechanism and in some cases the level of funding and the purpose of the preservation (ecological, recreational, historical).[6] We use data on all open space referenda in the U.S. from 1998 to 2006 at the municipal and county levels.[7] This is the longest data set assembled to investigate the direct democracy process for land conservation. Before using these data, we reviewed the written descriptions of each proposal and recoded the Land Vote data set where necessary.[8]

As noted above, the initiatives use a variety of finance mechanisms, and these may be tailored to suit the conditions and preferences of each community. Table 1 offers information on the type of finance mechanism, by type of jurisdiction. It reveals that bonds and property taxes are the two most common mechanisms, and that the vast majority of referenda are at the county or municipal level. Some 14 percent of these referenda explicitly mention ecological purposes in their language. Fifty-two percent mention recreation and 25 percent mention agricultural open space. A smaller share (5 percent) mention developed recreation such as parks and ball fields.[9]

Admittedly, these data on funding for open space preservation are only one aspect of direct democracy. On the other side of the coin are pro-development measures. Gerber and Phillips (2003, 2004) find that voters not only support local initiatives for growth controls, but also are willing to vote in favor of development measures, especially where they are endorsed by respected interest groups (like the Sierra Club). Although data on pro-development measures are only available for a small number of counties, future work might consider jointly modeling placement and outcomes for both pro-growth and pro-conservation measures.

[6] These data are available at http://www.tpl.org. See also Meyers (1999) and Meyers and Puentes (2001).
[7] Ideally, our data would go back to at least 1988. The fact that the data set does not include referenda prior to 1998 is a limitation, as some early adopters may appear as nonadopters. However, according to the Trust for Public Lands, 79 percent of referenda held between 1988 and 2006 were held in 1998 or later (see http://www.tpl.org/tier3_cd.cfm?content_item_id=12010&folder_id=2386/).
[8] In particular, we recoded a number of tax rates based on the description of the referendum. We also reclassified and recoded the referenda types.
[9] Arguably, one might drop the observations for parks. We have controlled for them in sensitivity analyses and found it does not affect the results.

Demographic and Land Use Data

We use the 2000 U.S. Census to collect demographic data on our communities.[10] Variables include population density; household income; age, race, and education profiles; housing ownership rates; and mean housing values. Table 2 describes these data at the jurisdiction level, differentiated by jurisdictions with and without referenda and by type of jurisdiction (county and municipality).

To measure the rural character of a county, the political clout of farmers, and the extent of an important type of open space, we collected county-level agricultural and land use data from the USDA's Economic Research Service. These data include the number of farms, acreage in farming, the average value of farmland, and the gross value of farm products. Data were collected for 1997 and 2002, and changes were computed for the number of farms and the acres in farming as a measure of pressure on farmland and perhaps other open space as well. These data are summarized in the second panel of Table 2.

Such demographic and land use data serve as predictors of where referenda are held, where they are successful, and the connection between the two. If conservation organizations are managing the initiative process efficiently and effectively, we would expect that referenda (or referenda of a given type) are more likely to occur in communities having those characteristics associated with their success.

Other characteristics speak to this question as well as to the question of the success of the initiative process at targeting areas with more conservation values. To address this issue, we attach data on the number of endangered species, obtained from the Environmental Protection Agency, and the area of a jurisdiction covered in surface water.[11] These data are summarized in the third panel of Table 2. If organizations are successful at targeting areas with more ecological value, we would expect to find a relationship between where referenda are held and these indicators. Moreover, surveys show that ecological values are the main reason most households desire to protect open space, followed by agrarian values (Kline & Wichelns, 1994, 1996; Rosenberger, 1998). Accordingly, voters may be more likely to approve referenda in areas with more ecological value. We test both hypotheses.

Political and Fiscal Data

The last type of data pertains to the political process and attitudes in each jurisdiction, summarized in the bottom panel of Table 2. We purchased 2000 county-level presidential elections data from USElectionAtlas.org. These data serve two purposes. First, voting patterns in the presidential election may be a predictor of referendum propensity and success. Second, *conditional* on ideology and party affiliation, within-state differences in voter turnout can serve as a proxy for political activity. Political activity, in turn, may be a factor in the propensity for an area to engage in ballot initiatives. Thus, voter turnout can serve as one of the z variables in Equation (3), helping to identify the propensity to hold referenda.

[10] A crucial step for the municipal-level models is to identify the universe of jurisdictions that *could* have held referenda. For each state, we matched the name of the jurisdiction holding a referendum to a census unit with the same name. Sixteen states were found to have all their referenda in what the U.S. Census refers to as "places." For these states, the set of communities is the set of all places. Twelve states were found to have all the referenda in Census "county subdivisions." For these states, the set of communities is the set of all county subdivisions. In six states, the two geographies were identical, so the choice was immaterial. And finally, two states (Illinois and New York) had a mix of subdivisions and places, with 23 referenda in subdivisions and 10 in places. In these cases, we used the subdivisions (as they were more common) and dropped the place geographies.

[11] Species data are observed at the county level. For our municipality model, all species in the surrounding county are assumed to be potentially affected by conservation practices. The data are available from http://www.epa.gov/espp/database.htm.

Table 2. Demographic, land use, elections, and finance data (mean values).

Variable	Counties Without Referenda	Counties with Referenda	Municipalities Without Referenda	Municipalities with Referenda
Demographic Data				
Median hhold. inc.	23,200	34,118	39,007	65,058
Median house value	76,371	153,464	92,474	214,565
Prop. owner-occupied	0.745	0.707	0.779	0.766
Prop. hholds. in pov.	0.165	0.301	0.119	0.059
Prop. pop >65	0.150	0.121	0.150	0.126
Prop. pop <18	0.256	0.250	0.257	0.250
Prop. pop white	0.832	0.805	0.892	0.893
Prop. no H.S. diploma	0.221	0.144	0.269	0.173
Prop. bach. degree	0.170	0.308	0.167	0.386
Density (pop./sq. mi.)	177.7	723.8	818.5	1528.8
Land Use Data				
Square miles	960.6	1053.0	34.2	29.8
Prop. pop. urbanized area	0.372	0.756	0.309	0.783
Prop. pop. on farm	0.052	0.010	0.054	0.005
Prop. land in farming	0.069	0.015	0.118	0.010
Pct. change farmland 97–02	0.010	−0.093	0.013	−0.087
Value of farmland ($/acre)	1,659	4,185	2,051	7,958
Value of farm produce	62,991	82,457	95,963	76,544
Ecological Data				
Prop. area water	0.040	0.105	0.028	0.072
Endangered species	3.32	6.91	3.92	4.33
Political Data				
Prop. vote Bush 2000	0.575	0.507	0.534	0.432
Prop. voter turnout	0.548	0.580	0.561	0.596
Per capita taxes	0.341	0.449	N/A	N/A
Per capita interest payments	0.028	0.044	N/A	N/A
Tax info unavailable (0/1)	0.051	0.023	N/A	N/A
Interest. info unavailable (0/1)	0.264	0.050	N/A	N/A
Referenda index (0–4)	2.057	2.121	2.255	2.182
Voter approval for tax increase (0/1)	0.240	0.353	0.288	0.340
Voter approval for general debt (0/1)	0.811	0.809	0.767	0.659
Voter approval for revenue bonds (0/1)	0.224	0.277	0.170	0.081
Home rule index (0–4)	2.512	2.852	2.405	1.631
N	2,895	177	27,274	838

The fiscal and political setting in which each jurisdiction operates is also important. First, we have identified, for all counties in the U.S., tax revenues and interest payments on existing debt from the Tax Foundation and the U.S. Census of Governments.[12] For counties with missing data, we adopt the practice of coding a dummy variable to capture their mean effect. Second, we have identified state-level rules governing local jurisdictions' freedom to hold referenda, raise taxes, and raise debt.

[12] We also obtained these data for municipalities, but there are many missing observations in the Census of Governments data set, and many observations that were impossible to match on the basis of their name. Accordingly, we were not able to use these data in the municipal-level models.

We include an index, developed by Geon and Turnbull (2006), which captures the relative autonomy granted to local jurisdictions in a state's constitution (from strong "home rule" to strong "Dillon's Rule").[13] We also develop an index of the propensity for states to hold referenda, coded from 1 to 4, based on a state-by-state review of referenda and initiatives in Krane, Rigos, and Hill (2001).[14] This handbook gives a description of the extent to which referenda have been used in each state historically. Finally, using the same source, we identified states that require voter approval for, respectively, increases in property taxes, increases in general debt, and increases in debt tied to dedicated revenue streams (revenue bonds).

The direct democracy literature also has shown that the role of interest groups and the attitudes and activity of local councils can affect the propensity of communities to use initiatives for conservation (Gerber & Phillips, 2003, 2005). Unfortunately, such information is not available at the national scale. We thus rely on explaining observed patterns of conservation initiatives with state-level fiscal rules for local jurisdictions, combined with local fiscal variables, demographics, geography, and presidential politics. As we report below, the combination of data appears successful at explaining and predicting national patterns.

Before finally discussing the results from the selection and outcome equations for both the county-level referenda and the referenda at the municipality level, we discuss potential complications with applying the Dubin and McFadden (1984) approach to the land vote data and our exclusion restrictions and the implications for our empirical strategy.

Potential Complications

Two factors complicate the application of the Dubin and McFadden (1984) approach to the land vote data. First, our data set is a panel of jurisdictions from 1998 to 2006. Thus, there are nine separate "choice occasions" in which a community might hold a referendum. To address this temporal issue, we include annual fixed effects in our estimation of Equations (3) and (5), but otherwise constrain coefficients to be constant across time.

A second complication is the possibility of multiple referenda within a jurisdiction in a single time period or over time. There are 45 jurisdictions that have multiple referenda in a single year. In this case, we treat each referendum as a separate choice occasion and re-weight them so that each community-year still has equal weight in the model.[15] There are also 321 jurisdictions that have multiple referenda over the entire nine-year period. Multiple referenda over time pose a complication because past referenda are likely to affect the probability of holding additional ones and their outcomes. In each jurisdiction-year, we include an indicator variable for the presence of prior referenda. Because our sample only goes back to 1998, however, we do not know the full history. To accommodate this fact, we interact this indicator variable with the year, so that the presence of previous referenda as of 1999 can have a different effect than the presence of previous referenda as of 2006.

[13] Dillon's Rule is based on a decision made by the jurist John Forrest Dillon in *Clinton v. Cedar Rapids and the Missouri River Railroad* (24 Iowa 455, 1868), in which he articulated the view that the authority of local governments proceeds from the states and that local governments have only the powers expressly granted to them. States have adopted Dillon's Rule to varying degrees.

[14] Our index is based on a subjective evaluation of the descriptions in Krane, Rigos, and Hill (2001). An alternative approach would be to use the number of local initiatives in each state. Although some studies have acquired such information for specific states such as California (Gordon, 2009), we know of no national database with such information.

[15] We considered modeling multiple referenda as a separate alternative, but there were too few cases to estimate the propensity for this choice.

We also account for the type of referendum held in the past. Patterns of referenda of different types over time might be part of a conscious strategy on the part of land trusts. For example, if a tax-financed referendum passes in one year, creating a revenue stream, communities may in a subsequent year adopt a revenue bond, borrowing against the previously dedicated tax revenues, to conserve more land immediately. Thus, in the selection equation, we differentiate past tax referenda from bond referenda. In the outcome equation, we interact current bond referenda with the existence of past successful bond referenda to capture the strategy of borrowing against future tax commitments.

Exclusion Restrictions and First Stage Estimation

As noted previously, nonparametric identification of the model requires exclusion restrictions: the vector of variables z that appear in the "first stage" selection equation but not in the outcome equation. Our z vector includes three types of variables. The first is county-level voting turnout in the 2000 presidential election. Turnout plausibly captures political activism, which in turn may be associated with a local jurisdiction's propensity to hold referenda. However, turnout *per se*, after controlling for *whom* the residents support in an election, is not likely to affect the way people vote on a referendum.

Second, we include a set of state-level dummy variables. These variables account for discontinuous effects at the border, after controlling for observed political preferences and other observable factors and for smooth functions of space (such as a function of latitude and longitude). In contrast to voter preferences that affect the outcome of a referendum, which are likely to be continuous across space, differences in state election laws, home rule, and other institutional factors that facilitate (or encumber) ballot initiatives of different types are discrete at the borders. For this reason, state-level dummies are an important factor for explaining the selection of referenda, but they can plausibly be excluded from the outcome equation after controlling for smooth functions of space as well as for demographics.

Unfortunately, a complete set of state dummy variables with effects differing by type of referenda and type of jurisdiction (county/municipality) is not possible because of insufficient variation in the data. As an alternative, we restrict these state dummy effects to be identical for all types of referenda and for both jurisdiction types. Consequently, they capture the state-specific propensity to hold conservation referenda in general; that is, these state dummy variables affect the hold/don't hold referenda decision but do not affect the specific type of referendum.

Finally, we include state-level variables whose effects are allowed to differ by jurisdiction type (county versus municipality) and type of referenda: The Geon–Turnbull (2006) index of home rule; our index of the ease of voter initiatives in each state based on Krane, Rigos, and Hill (2001); the dummy variables for required voter approval for tax increases, general debt, and revenue bonds; and a dummy variable for states that effectively have no functioning county governments.[16] These play the role of additional zs in the model.

The restriction that the state dummy variables have the same effect on counties and municipalities effectively implies that these two jurisdiction types must be pooled in the first stage. The model can be described succinctly by modifying Equation (3) with additional indices:

$$v_{icsjt} = x_{icst}\gamma_{cj} + z_{icst}\delta_{cj} + \varphi_s + \theta_{cjt} + u_{icsjt} \tag{3A}$$

[16] Among states in our data set, this last group includes Arizona, Connecticut, Maine, Massachusetts, Nevada, New Hampshire, Rhode Island, and Vermont.

for referenda of type j in community i of jurisdiction type c (county/municipality) in state s and year t. Note that all parameters are indexed by the jurisdiction type c and finance type j with the exception of the state effects φ. This indicates that with the exception of these state effects, the county and municipal models are independent of one another. Otherwise, all variables have different effects for each jurisdiction and, potentially, each type of finance mechanism. Moreover, we estimate two outcome equations (the second stage of the empirical strategy), one for the counties and one for municipalities.

The intuition of these exclusion restrictions is that these variables should affect the holding of referenda but not the outcomes. The variables are jointly significant at the 1 percent level in the first stage, suggesting they do help determine the propensity for local jurisdictions to hold conservation referenda of specific types. At the same time, they are jointly insignificant at any standard level in the county-level outcome equations, suggesting the exclusion restrictions are valid. Small subsets of the variables are significant in some of the municipality-level models, but including them in the second stage does not qualitatively change the other results. Accordingly, for the sake of consistency we continue to exclude them in the county and municipality outcome equations.

RESULTS

Propensity of Communities to Hold Referenda: Results from the Selection Equation

We begin our discussion of the results with the polychotomous selection model, which explains the propensity of communities to hold referenda of various types. Table 3 displays the estimated coefficients for Equation (3) for counties and municipalities, respectively. The table shows our estimates of γ and δ. Although the selection equation is estimated jointly to enforce common state effects, the parameters for the explanatory variables are different for each referendum type and each jurisdiction type [the indices c and j in Equation (3)]. Each column in the table gives the estimates for one of these categories. They can be interpreted as the effect of each variable on the likelihood of holding a referendum of that type, relative to no referendum, in a given year. The model has a good fit, with a pseudo-R^2 of 0.36.[17]

From these results, we can see directly whether the pattern of grassroots activism within the conservation movement combined with top-down management from national nonprofits is directing conservation efforts toward areas with more ecological value. We find that referenda are more likely to be held where there are more endangered species and more surface water, with both effects statistically significant in the municipality model. This suggests that the local conservation movement is indeed systematically seeking out areas with more ecological value. Furthermore, the correlation is even stronger if we omit the other regressors. As seen in Table 2, county-level referenda occur in counties with more than double the average number of endangered species, and municipalities holding referenda have 10 percent more endangered species than other municipalities. For both municipalities and counties, jurisdictions holding referenda have more than twice as much surface water as other jurisdictions. These patterns are consistent with policy and management objectives to provide ecosystem services.

In addition to targeting areas with more ecological value, well-managed conservation efforts would target areas where they are more likely to be successful. We turn to this issue below, after reporting the second stage results of the outcome

[17] Our model has similar success with out-of-sample predictions. If we estimate the model only through 2005, communities that actually went on to hold referenda in 2006 are predicted to have an average probability of doing so of 5.6 percent, whereas communities that did not go on to hold referenda have predicted probabilities of only 0.5 percent.

Table 3. Multinomial selection equations.

	Multinomial Coefficients for Each Referendum Type, Relative to No Referendum					
	Counties			Municipalities		
	Bond	Property Tax	Other	Bond	Property Tax	Other
Demographic Variables						
Median household income ($1,000s)	−0.0187	0.1428***	0.0842*	−0.02368***	0.01828***	−0.00968
	(0.0387)	(0.0434)	(0.0490)	(0.00571)	(0.00525)	(0.00779)
Prop. in poverty	0.262	−0.639	−7.280**	−5.77882***	−8.32969***	−1.48166
	(1.413)	(1.179)	(3.225)	(1.04067)	(1.85800)	(1.36466)
Prop. no high school diploma	−15.8883***	−12.0917**	−1.8479	1.77082**	−1.35829	0.09748
	(5.7687)	(5.2725)	(6.0654)	(0.87280)	(1.19447)	(0.96695)
Prop. bachelor degree	5.5412*	−7.4280**	1.7866	5.65210***	1.37435**	3.44366***
	(2.9211)	(3.6729)	(4.9542)	(0.54182)	(0.61273)	(0.76906)
Prop. owning home	9.8615***	−9.9070**	−0.6308	−0.42403	−0.30082	−0.39310
	(3.6924)	(4.1537)	(4.0219)	(0.35011)	(0.41293)	(0.50392)
Prop. white	−0.8510	1.7130	0.8165	0.64634	−1.06415**	0.75053
	(1.8613)	(2.1011)	(3.1231)	(0.50888)	(0.43519)	(0.78030)
Prop. age >65	−6.6173	7.1174	−9.9156*	−8.45337***	−2.39475*	−6.49782***
	(5.2790)	(7.3229)	(5.7768)	(1.37977)	(1.33792)	(1.80698)
Prop. age <18	−9.6127	−8.1380	−18.1567*	−1.33354	−2.81137**	−0.94993
	(7.3746)	(9.6573)	(10.7721)	(0.99477)	(1.38525)	(1.45599)
Land Use Variables						
Median house value ($1,000s)	0.0003	−0.0009	0.0029	0.00029	−0.00194***	0.00038
	(0.0057)	(0.0043)	(0.0057)	(0.00077)	(0.00070)	(0.00082)
Prop. living in urbanized area	2.6926*	−0.8626	3.0127**	1.91912***	0.56438***	1.29438***
	(1.3904)	(0.8906)	(1.4040)	(0.24449)	(0.17723)	(0.28566)
Prop. farmers	−40.3762	−19.0192	−5.5338	−31.37480***	1.42880	−2.53456
	(30.1451)	(18.4077)	(14.8750)	(11.22179)	(1.70072)	(2.72885)
Pop. density	0.0003**	−0.0003	−0.0003	−0.00020***	−0.00019***	−0.00027***
	(0.0001)	(0.0002)	(0.0003)	(0.00004)	(0.00004)	(0.00007)
Value of farmland ($1,000s)	−0.0612	0.0205*	0.0682*	−0.00249	0.01700***	−0.02984
	(0.0437)	(0.0122)	(0.0414)	(0.01234)	(0.00291)	(0.02727)
Value of farm produce ($1,000s)	0.0001	0.0011	−0.00001	0.00073*	−0.00321***	0.00143***
	(0.0011)	(0.0008)	(0.0009)	(0.00041)	(0.00095)	(0.00027)
Pct. change farmland	0.0214	−0.1953	1.9608***	0.00664	0.04217	0.98625***
	(0.3088)	(0.4073)	(0.7571)	(0.17557)	(0.12153)	(0.31492)
Prop. area farmland	1.3187	−0.0956	0.9131	−0.25679	−0.70660	−0.18400
	(0.8379)	(0.8850)	(0.9327)	(0.16989)	(0.54046)	(0.14629)
Land area (sq. miles)	0.0001	−0.0001	0.0001	0.00303***	0.00229***	0.00288***
	(0.0001)	(0.0002)	(0.0001)	(0.00058)	(0.00072)	(0.00063)

Ecological Variables						
Endangered species	0.0331	−0.0419	0.0218	0.03816**	0.21578***	0.02188
	(0.0427)	(0.0530)	(0.0318)	(0.01803)	(0.02728)	(0.02007)
Prop. area water	0.2185	0.6911	1.3379	0.74680*	0.00938	2.27093***
	(0.9401)	(1.2238)	(1.4034)	(0.38922)	(0.38097)	(0.54110)
Political Variables						
Voter turnout	−1.6599	−1.3504	5.7107	3.72877***	6.18752***	3.54084**
	(3.5253)	(3.7467)	(4.8070)	(1.17645)	(1.03213)	(1.63276)
Referenda index	0.1818	−0.1063	0.2656	0.04154	−0.49743	−1.09147***
	(0.3810)	(0.4752)	(0.4341)	(0.28427)	(0.49797)	(0.36726)
Voter approval for tax increase	−3.1227**	4.1595**	0.8671	−3.07127**	3.82327**	0.67168
	(1.4690)	(1.9206)	(1.6289)	(1.38851)	(1.62112)	(1.37223)
Voter approval for general debt	11.0470***	13.4775***	11.9447***	9.68246***	12.90798***	11.54182***
	(0.6192)	(0.7010)	(0.9077)	(0.54967)	(0.59303)	(0.60680)
Voter approval for revenue bonds	−12.3901***	−14.7139***	−11.1590***	−11.66116***	−16.10160***	−12.81763***
	(1.4961)	(1.4843)	(1.6365)	(1.62623)	(1.76475)	(1.60967)
Home rule index	−0.7979	−0.2183	0.0398	−1.20307***	−0.64644	−0.77134*
	(0.5012)	(0.4630)	(0.5464)	(0.41809)	(0.44334)	(0.42885)
No county power	−1.5280	−13.0684***	1.3200	−3.82555***	−2.11767***	−2.26456***
	(1.5167)	(1.67272)	(1.6767)	(0.73298)	(0.77262)	(0.87373)
Prop. voting Bush	−2.9013	−3.5529	2.8325	1.30572***	−0.22702	0.72743
	(1.8353)	(2.3109)	(2.2018)	(0.33063)	(0.54225)	(0.60989)
Tax revenues	0.0822	−0.7823	−0.3460	−2.08644***	0.07468	−0.61025
	(0.3769)	(0.5312)	(0.5999)	(0.33557)	(0.42782)	(0.46316)
Interest payments	−0.5492	1.4913**	−0.8673	—	—	—
	(1.9710)	(0.6527)	(1.2199)			
Missing tax revenues dummy	−0.8344	0.2688	−14.9602***	—	—	—
	(1.6590)	(1.2298)	(5.3244)			
Missing interest payment dummy	−0.1358	−1.0385	−0.6810	—	—	—
	(0.6772)	(0.8586)	(0.5401)			
Presence of county sales tax	0.4175	−0.4392	0.2611	—	—	—
	(0.3905)	(0.3833)	(0.4735)			
Prior open space referendum	0.4143	−0.1197	0.3122	—	—	—
	(0.4659)	(0.7149)	(0.6602)			
Prior tax ref.	−1.6316***	0.3144	−0.7290	—	—	—
	(0.5007)	(0.7191)	(0.6370)			
Additional Controls						
Latitude	−0.7659**	−2.2256***	−1.0929***	−0.44701*	−2.48777***	−0.05194
	(0.3488)	(0.6072)	(0.4191)	(0.23891)	(0.52180)	(0.30773)
Longitude	0.5099***	1.1886***	0.6473***	0.35091***	1.61326***	0.15436
	(0.1581)	(0.2813)	(0.1892)	(0.11248)	(0.28538)	(0.14170)
Latitude*Longitude	−0.0079**	−0.0230***	−0.0111**	−0.00483*	−0.03023***	0.00042
	(0.0037)	(0.0066)	(0.0046)	(0.00260)	(0.00634)	(0.00357)
County dummy	35.4048***	132.5649***	18.2253	—	—	—
	(11.1255)	(23.5606)	(13.1292)			
State fixed effects			*Jointly significant at the 1% level*			
Year fixed effects			*Jointly significant at the 1% level*			
Year/prior interactions			*Jointly significant at the 1% level*			

Note: Robust standard errors in parentheses.

***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

equation (that is, our estimates of β). However, we first make some additional observations about our first stage results related to this issue. In particular, we note several factors that are associated with the likelihood of conservation initiatives. Education is a strong predictor, with college graduates increasing the likelihood of an initiative and high school dropouts decreasing it (see also Nelson, Uwasu, & Polasky, 2007). A large share of children in the community reduces the probability of an initiative, also found by Kotchen and Powers (2006).

Unlike the previous literature that did not distinguish the financing types, we find that homeownership increases the probability of a bond referendum but reduces the probability of a property tax referendum in the county model. Communities with a greater proportion of the population living in an urbanized area as of 2000 also are more likely to hold referenda. Finally, requirements that voters approve any debt taken on by a county or municipal government also increase the likelihood that an initiative occurs there. This suggests that initiatives to purchase open space are not simply end runs around local councils, as with the urban growth boundaries studied by Gerber and Phillips (2005), but may be an integral part of the process, indeed required by state laws. Whether these patterns help make passage of the measures more likely remains to be seen.

Finally, as noted by Kotchen and Powers (2006) and Nelson, Uwasu, and Polasky (2007), unbiased estimates of β require that there be no selection on unobservables, that is, that β and γ are uncorrelated or that the correlation be corrected for. For this purpose, it is important that the exogenous instruments [the z_i in Equation (3)] are statistically significant in the first stage. In fact, we find that these variables are jointly highly significant (p-value < 0.01). Moreover, as noted previously, it appears that our set of exclusion restrictions is valid and provides substantial exogenous variation in the data. The effect of these controls for selection on the outcome equation is discussed in the following subsection, but some of them are interesting in their own right. For example, referenda are more likely when voter approval is required for general debt (but not when it is also required for revenue bonds); property tax referenda are more likely where voter approval is required for tax increases.

Success of the Referenda: Outcome Equation

Tables 4 and 5 report the estimates from our outcome equations [Equation (1)], for counties and municipalities, respectively. Each table reports six models, three specifications of explanatory variables, each with and without our controls for sample selection bias (based on the parameters estimated in Table 3). Model I is more parsimonious, whereas Model II considers more subtle effects from the finance variables, such as the interaction between a bond referendum and a previously successful tax referendum (to capture the strategy of basing a revenue bond on a previously authorized dedicated revenue stream). It also considers interactions between the level of homeownership and the choice of bond or property tax financing. Model III considers information about the expressed purpose of the referendum, including ecological, recreational, and historical conservation. Overall, the models have a good fit by cross-sectional standards, with R^2s of about 0.40 to 0.50 for the county models and about 0.25 for the municipality models.

The evidence for the importance of sample selection on unobservables is mixed. Comparing point estimates, several estimates change on the order of $\pm 1/3$, including the age, homeownership, and (in the municipality model) poverty variables. Most interestingly, in both models, controlling for selection substantially increases the estimated community preferences for bonds and property taxes. Alternatively, it lowers the preferences for the omitted category of "other finance" relative to these two finance mechanisms. This suggests that selection into this category based on unobservable characteristics may be biasing the estimates. However, joint tests of

Table 4. Results from county outcome equation.

	Model I		Model II		Model III	
	1A No selection	1B Polychot. Selection	IIA No Selection	IIB Polychot. Selection	IIIA No Selection	IIIB Polychot. Selection
Constant	−3.92308	−5.06115*	−4.57347*	−5.45815**	−4.58896*	−5.55282**
	(2.49407)	(2.57301)	(2.59654)	(2.68977)	(2.54839)	(2.73554)
Demographic Variables						
Med. hhold. inc. ($1,000s)	−0.00807	−0.00736	−0.00909	−0.00949	−0.00680	−0.00563
	(0.00976)	(0.01185)	(0.01019)	(0.01333)	(0.01002)	(0.01356)
Prop. in poverty	−0.154	−0.284	−0.261	−0.383	−0.527	−0.674
	(0.345)	(0.495)	(0.410)	(0.588)	(0.419)	(0.612)
Prop. no high school diploma	1.18054	0.76120	1.18743	1.00341	0.82540	0.49748
	(1.40407)	(1.57007)	(1.44321)	(1.76280)	(1.45328)	(1.84811)
Prop. bach. degree	1.45621*	1.53498	1.51310*	1.73680	1.35000	1.58117
	(0.74687)	(1.01096)	(0.78874)	(1.11288)	(0.82580)	(1.11215)
Prop. owning home	1.73953	2.29905*	2.29447*	2.75720*	2.26891*	2.75217*
	(1.08320)	(1.34642)	(1.21804)	(1.50045)	(1.16740)	(1.52048)
Prop. white	−0.56208	−0.74735	−0.50856	−0.69395	−0.37168	−0.59634
	(0.43662)	(0.60390)	(0.43680)	(0.62930)	(0.45258)	(0.66223)
Prop. age >65	−1.11995	−1.75886	−1.58459	−2.04600	−1.68335	−2.05714
	(1.58553)	(1.79865)	(1.59999)	(1.91931)	(1.52421)	(1.84447)
Prop. age <18	−4.42009*	−5.95188**	−4.50704*	−5.52036**	−4.4709**	−5.61295**
	(2.33826)	(2.79715)	(2.32592)	(2.72358)	(2.26533)	(2.73334)
Land Use Variables						
Med house value ($1,000s)	0.00031	0.00001	−0.00029	−0.00052	0.00022	−0.00009
	(0.00114)	(0.00129)	(0.00124)	(0.00157)	(0.00123)	(0.00167)
Prop. living urb. area	0.44712	0.55244*	0.46582	0.55682	0.42358	0.54508
	(0.27787)	(0.32521)	(0.29773)	(0.38744)	(0.27790)	(0.36203)
Prop. farmers	−4.06533	−6.39261	−4.71843	−6.56674	−4.29431	−6.32723
	(2.99967)	(4.56322)	(3.32425)	(5.01176)	(3.12079)	(5.12909)
Pop. density	0.00007	0.00006	0.00005	0.00005	0.00006	0.00005
	(0.00008)	(0.00010)	(0.00008)	(0.00010)	(0.00008)	(0.00011)
Val. farmland ($1,000s)	0.00223	0.00368	−0.00101	0.00033	−0.00727	−0.00552
	(0.00858)	(0.01411)	(0.00918)	(0.01433)	(0.01003)	(0.01618)
Value farm produce ($k)	−0.00013	−0.00005	−0.00019	−0.00013	−0.00004	0.00008
	(0.00023)	(0.00048)	(0.00024)	(0.00049)	(0.00023)	(0.00039)

(*Continued*)

Table 4. (*Continued*).

	Model I		Model II		Model III	
	1A No selection	1B Polychot. Selection	IIA No Selection	IIB Polychot. Selection	IIIA No Selection	IIIB Polychot. Selection
Pct. change farmland	0.18108**	0.20308**	0.20669***	0.21992**	0.20945***	0.22478**
	(0.07497)	(0.08385)	(0.07300)	(0.08976)	(0.07320)	(0.09002)
Prop. area farmland	0.16656	0.20724	0.23267	0.28361	0.16617	0.21165
	(0.19380)	(0.23285)	(0.20531)	(0.26301)	(0.21871)	(0.29968)
Land area (sq. miles)	0.00002	0.00001	0.00002	0.00001	0.00002	0.00001
	(0.00002)	(0.00004)	(0.00002)	(0.00004)	(0.00002)	(0.00004)
Ecological Variables						
Endangered species	0.00522	0.00561	0.01215	0.01172	0.00950	0.00805
	(0.00935)	(0.01061)	(0.00966)	(0.01209)	(0.00909)	(0.01163)
Prop. area water	0.02852	0.00053	0.11397	0.06832	−0.01402	−0.02253
	(0.22553)	(0.26623)	(0.23273)	(0.25158)	(0.22996)	(0.25495)
Political Variables						
Bond	0.36886***	0.68479***	0.46047	0.59885	0.57154	0.70308
	(0.08268)	(0.24350)	(0.65503)	(0.83889)	(0.66099)	(0.87948)
Bond* prop. own			−0.32259	−0.21166	−0.52704	−0.48175
			(0.91529)	(1.13973)	(0.92538)	(1.21161)
Rev. bond			0.23598	0.35409	0.38457**	0.48519**
			(0.18616)	(0.22793)	(0.18935)	(0.24451)
Property tax	0.03253	0.48516	0.57189	0.79058	0.17608	0.35921
	(0.11133)	(0.35287)	(0.81896)	(0.86927)	(0.83325)	(0.92535)
Property tax* own			−0.79485	−0.49814	−0.29169	0.15291
			(1.15430)	(1.24367)	(1.16976)	(1.31980)
Tax revenue			0.14792	0.15215	0.13896	0.15018
			(0.15899)	(0.18281)	(0.16513)	(0.20319)
Interest payments			−1.28527**	−1.02842	−1.40838**	−1.01980
			(0.63464)	(1.02322)	(0.69816)	(1.16669)
Missing tax rev.			0.49133*	0.49480	0.62461**	0.59732
			(0.26346)	(0.45257)	(0.29265)	(0.48250)
Missing interest			.04261	0.01271	−0.03855	−0.04533
			(0.19066)	(0.35462)	(0.20947)	(0.36138)
Interest* Bond ref.			2.67311**	2.66111*	2.72676**	2.73409
			(1.31445)	(1.54644)	(1.30352)	(1.71989)
Not election Tues.					−0.01420	−0.01890
					(0.09386)	(0.10151)
Prop. voting for Bush	0.36506	0.45715	0.27244	0.35421	0.18923	0.25177
	(0.46676)	(0.54927)	(0.49985)	(0.56195)	(0.49632)	(0.57082)

Additional Controls						
Latitude	0.08959	0.11115*	0.09970*	0.11083*	0.11241**	0.12398*
	(0.05933)	(0.06053)	(0.05969)	(0.06455)	(0.05643)	(0.06507)
Longitude	−0.03476	−0.04746*	−0.03756	−0.04559	−0.03961	−0.04880
	(0.02559)	(0.02780)	(0.02601)	(0.03127)	(0.02459)	(0.03169)
Lat.* Lon.	0.00086	0.00112*	0.00092	0.00106	0.00104*	0.00120
	(0.00064)	(0.00066)	(0.00064)	(0.00073)	(0.00061)	(0.00074)
NJ	0.28265**	0.26625	0.43696***	0.38712*	0.54262***	0.47081*
	(0.12966)	(0.18572)	(0.14551)	(0.20693)	(0.17577)	(0.24404)
MA	−0.5630**	−0.52072	−0.55640**	−0.48140	−0.83441**	−0.66753
	(0.22087)	(0.33474)	(0.24536)	(0.33893)	(0.33386)	(0.49630)
Prior referendum	0.59252	0.53084	0.50650	0.53133	0.22944	0.25611
	(0.46562)	(0.45654)	(0.47625)	(0.48306)	(0.37008)	(0.45663)
Agricultural purpose					−0.20587**	−0.22524*
					(0.09975)	(0.12697)
Ag purp.* farmers					−5.95284	−6.69141
					(7.11676)	(9.32167)
Recreation purpose					−0.16588**	−0.15972*
					(0.08141)	(0.08625)
Rec. develop					−0.03388	−0.01454
					(0.10113)	(0.11091)
Ecological Purpose					−0.06726	−0.07589
					(0.08260)	(0.10189)
Historical Purpose					0.01873	0.06873
					(0.13916)	(0.15376)
Watershed Purpose					0.08554	0.13371
					(0.09837)	(0.11686)
Watershed* prop. water					0.31457	0.10708
					(0.49386)	(0.60235)
Control function Bond	—	−0.03828	—	−0.01700	—	−0.00928
		(0.03894)		(0.03996)		(0.04302)
Control function prop. tax	—	−0.06620	—	−0.06177	—	−0.08284*
		(0.04426)		(0.04948)		(0.04809)
Control function Other	—	0.04600	—	0.04193	—	0.03575
		(0.03991)		(0.04795)		(0.04637)
R^2	0.40	0.42	0.43	0.44	0.48	0.49

Note: Robust standard errors in parentheses. Standard errors for selection models based on a bootstrap with 100 draws, jointly sampling the selection and outcome equations. All models also include year fixed effects and year/prior interactions.

***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 5. Results from municipal outcome equation.

	Model I		Model II		Model III	
	IA. No Selection	IB. Polychot. Selection	IIA. No Selection	IIB. Polychot. Selection	IIIA. No Selection	IIIB. Polychot. Selection
Constant	−1.76052	−1.89595	−1.64726	−1.84521	−1.50303	−1.64453
	(1.41476)	(1.44183)	(1.49737)	(1.53067)	(1.50991)	(1.54022)
Demographic Variables						
Med. hhold. inc. ($ks)	−0.00300	−0.00304	−0.00308	−0.00313	−0.00303	−0.00307
	(0.00232)	(0.01185)	(0.00233)	(0.00235)	(0.00234)	(0.00238)
Prop. in poverty	−0.09360	−0.05135***	−0.24624	−0.20108	−0.29648	−0.24231
	(0.59007)	(0.00495)	(0.61532)	(0.70455)	(0.62791)	(0.71295)
Prop. no High school diploma	−0.07703	−0.12427	−0.12203	−0.14608	−0.18210	−0.19834
	(0.72443)	(1.57007)	(0.72226)	(0.62286)	(0.73042)	(0.62178)
Prop. bach. Degree	0.81983***	0.75930	0.77860***	0.75233**	0.76891**	0.73853**
	(0.29757)	(1.01096)	(0.29984)	(0.30343)	(0.30412)	(0.30200)
Prop. owning Home	0.33504	0.34250	0.14972	0.21729	0.09218	0.20366
	(0.25899)	(1.34642)	(0.40526)	(0.39509)	(0.43936)	(0.38874)
Prop. white	−0.73769***	−0.71643	−0.7398***	−0.71763***	−0.81167***	−0.74066***
	(0.24668)	(0.60390)	(0.24503)	(0.24135)	(0.23206)	(0.24278)
Prop. Age >65	0.18469	0.22489	0.18500	0.19691	0.81327	0.16773
	(0.44023)	(1.79865)	(0.44046)	(0.44665)	(0.56905)	(0.44014)
Prop. Age <18	−1.45276**	−1.45351	−1.42922**	−1.44568**	−1.17318	−1.45452**
	(0.65781)	(2.79715)	(0.65668)	(0.72209)	(0.64010)	(0.69469)
Land Use Variables						
Med. house val. ($ks)	0.00011	0.00012	0.00013	0.00014	0.00016	0.00017
	(0.00026)	(0.00129)	(0.00026)	(0.00026)	(0.00026)	(0.00027)
Prop. living in urb. area	−0.08992	−0.10691	−0.09217	−0.10014	−0.07444	−0.08526
	(0.07230)	(0.32521)	(0.07323)	(0.07164)	(0.07406)	(0.07218)
Prop. farmers	−2.5442**	−2.55271	−2.61137**	−2.61101**	−3.79780**	−3.81636**
	(1.26548)	(4.56322)	(1.27306)	(1.22512)	(1.66076)	(1.89522)
Pop. density	−0.00004***	−0.00004	−4e-5**	−0.00004**	−4e-5**	−0.00004**
	(0.00002)	(0.00010)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Val. farmland ($1,000s)	0.00134	0.00098	0.00151	0.00123	0.00143	0.00111
	(0.00126)	(0.01411)	(0.00126)	(0.00346)	(0.00123)	(0.00331)
Value farm prod. ($k)	−0.00027**	−0.00027	−0.00025**	−0.00025*	−0.00022*	−0.00023
	(0.00012)	(0.00048)	(0.00012)	(0.00014)	(0.00012)	(0.00015)
Pct. change farmland	0.07860	0.07277	0.08482	0.07939	0.07292	0.06713
	(0.06792)	(0.08385)	(0.06865)	(0.06616)	(0.06803)	(0.06608)

Prop. area farmland	−0.01143	−0.01319	−0.01542	−0.01547	−0.01396	−0.01401
	(0.01972)	(0.23285)	(0.02014)	(0.03086)	(0.02096)	(0.03478)
Land area (sq. miles)	0.00018	0.00014***	0.00017	0.00015	0.00019	0.00017
	(0.00042)	(0.00004)	(0.00042)	(0.00040)	(0.00042)	(0.00040)
Ecological Variables						
Endangered species	−0.00368	−0.00465	−0.00415	−0.00490	−0.00427	−0.00494
	(0.00551)	(0.01061)	(0.00549)	(0.00590)	(0.00546)	(0.00588)
Prop. area water	0.13952	0.14817	0.14869	0.15845	0.16103	0.16682
	(0.10214)	(0.26623)	(0.10229)	(0.10962)	(0.10467)	(0.11225)
Political Variables						
Bond	0.20167***	0.41674*	0.18553	0.41421	0.19679	0.37380
	(0.05246)	(0.24350)	(0.26545)	(0.31899)	(0.26702)	(0.32515)
Bond* prop. own			0.02570	−0.00917	−0.00122	−0.02119
			(0.34400)	(0.32459)	(0.34953)	(0.32360)
Rev. bond			−0.14971	−0.11254	−0.14743	−0.11074
			(0.12180)	(0.12802)	(0.12472)	(0.13516)
Property tax	−0.21114***	0.02291	−0.48219*	−0.20651	−0.48148*	−0.21740
	(0.07738)	(0.35287)	(0.29055)	(0.39069)	(0.28979)	(0.40262)
Prop. tax* own			0.34058	0.25312	0.34044	0.25026
			(0.35502)	(0.33706)	(0.35851)	(0.34140)
Not election Tues.					0.01896	0.01685
					(0.04564)	(0.04541)
Prop. voting for Bush	0.07066	0.09648	0.06948	0.08307	0.02231	0.04066
	(0.22745)	(0.54927)	(0.22720)	(0.20756)	(0.22768)	(0.21492)
Additional Controls						
Latitude	0.08017**	0.07936	0.08223**	0.08154**	0.07897**	0.07764**
	(0.03291)	(0.06053)	(0.03343)	(0.03587)	(0.03381)	(0.03649)
Longitude	−0.03579**	−0.03632	−0.03617**	−0.03673**	−0.03404**	−0.03437**
	(0.01508)	(0.02780)	(0.01527)	(0.01641)	(0.01536)	(0.01661)
Lat.* Lon.	0.00097***	0.00097	0.00099***	0.00099***	0.00094***	0.00093**
	(0.00036)	(0.00066)	(0.00036)	(0.00038)	(0.00036)	(0.00039)
NJ	0.14293**	0.10213	0.13696*	0.11475	0.11856	0.08633
	(0.07230)	(0.18572)	(0.07325)	(0.10457)	(0.07581)	(0.10708)
MA	−0.14197*	−0.18170	−0.14082*	−0.16410	−0.09001	−0.12396
	(0.08292)	(0.33474)	(0.08332)	(0.11491)	(0.09215)	(0.11855)
Prior referendum	−0.13814	−0.19880	−0.13845	−0.20175	−0.12348	−0.18691
	(0.08607)	(0.45654)	(0.08867)	(0.23180)	(0.09374)	(0.24184)

(*Continued*)

Table 5. (*Continued*).

	Model I		Model II		Model III	
	IA. No Selection	IB. Polychot. Selection	IIA. No Selection	IIB. Polychot. Selection	IIIA. No Selection	IIIB. Polychot. Selection
Agricultural purpose					0.07411	0.07461
					(0.04834)	(0.04665)
Ag. purp.* farmers					2.04142	2.04971
					(2.02268)	(2.38481)
Recreation purpose					0.04376	0.03785
					(0.03733)	(0.03824)
Rec. develop					−0.08631	−0.07739
					(0.10788)	(0.10158)
Ecological purpose					−0.09571	−0.09472
					(0.08810)	(0.10163)
Historical purpose					−0.1184**	−0.12091***
					(0.04979)	(0.04700)
Watershed purpose					0.07714	0.07888
					(0.07336)	(0.07665)
Watershed* prop. water					0.10575	0.07457
					(0.28995)	(0.30832)
Control function bond	—	−0.01060	—	−0.01305	—	−0.00717
		(0.03894)		(0.02477)		(0.02516)
Control function Prop. tax	—	−0.01228	—	−0.01225	—	−0.01150
		(0.04426)		(0.02296)		(0.02361)
Control function other	—	0.03093	—	0.02576	—	0.02386
		(0.03991)		(0.02163)		(0.02219)
R^2	0.24	0.24	0.24	0.24	0.25	0.25

Note: Robust standard errors in parentheses. Standard errors for selection models based on a bootstrap with 100 draws, jointly sampling the selection and outcome equations.

***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

the three Dubin–McFadden (1984) correction terms for selection on the type of referendum (bond, property tax, other finance) are always insignificant. Thus, we cannot reject a simpler model of no selection on unobservables.[18] This is an important finding, as it serves as a validity test for previous research into the factors determining which communities approve referenda.

However, the characteristics of communities that approve conservation referenda are not only of interest in themselves. To understand the management of the local initiative process and its implications for conservation policy, it is necessary to understand the connection between these patterns and the patterns in where referenda are held. We explore this connection in more detail in the following section. For now, we simply note several important features of this aspect of the question.

With respect to the characteristics of the communities, we find that many of the characteristics associated with the likelihood of holding a referendum are also associated with its passage. In particular, we find, as did Nelson, Uwasu, and Polasky (2007), that college graduates are more likely to support conservation, with the effect statistically significant in the municipality models. In addition, we find that communities with fewer children are more likely to support open space referenda, which Kotchen and Powers (2006) also found in their municipality model. Of particular interest, we find that the effect of owning a home is positive in all models. The effects are strongest in the county models but are significant in a few of the municipality models for some types of referenda.[19] This suggests that the effect of supply restrictions on property values may dominate the “renter effect” in public goods provision.[20] In the previous literature, only Nelson, Uwasu, and Polasky (2007) considered this variable, and they found inconclusive effects. Finally, we also find that areas with higher population density are less likely to support the open space measures, at least in the municipality model.

Other effects are not as consistent as those in the selection model. We find that income and poverty effects are small and offsetting, perhaps consistent with Kline’s (2006) finding that middle-class neighborhoods are most supportive. We also do not find that the level of farmland has an effect, although we do find that areas losing farmland are *less* likely to support conservation referenda, a statistically significant effect in the county model. This is the opposite of the findings in Kline and Wichelns (1994) and Nelson, Uwasu, and Polasky (2007), who find that areas losing more farmland are more likely to support it. These differences may follow from our richer set of land use variables, such as levels of farmland and the economic value of farming activities. Alternatively, both diminishing farmland and lower support for conservation may follow from unobserved values of alternative land uses.

[18] We also considered simpler Heckman selection models of the hold/don’t hold decision (such as those used in Kotchen & Powers, 2006, and Nelson, Uwasu, & Polasky, 2007) with our exclusion restrictions. The estimated correlation of the inverse Mills ratio is significant at the 5 percent level in the municipality models, but it did not substantially alter the estimated point estimates.

[19] The effects of home ownership on “other” referenda can be read directly off the row for “Prop. owning home” in Tables 6 and 7. For Model I, the effect is the same for all types of referenda; for Models II and III, the effect for bond and property tax referenda must also include the interaction term. For the municipality models the point estimates are always positive for all types and are significant for property tax referenda in Models II and III. For the county model, the point estimates are also always positive, and the effects are significant for bond referenda.

[20] According to previous empirical work, communities with more renters appear as a rule to support higher levels of public services (Oates, 2005). This could be due to renters suffering from “renter illusion”: Because they never see a property tax bill, renters may believe that they do not bear any of the tax burden. Alternatively, it may be that they do not, in fact, bear much of the burden if those taxes are negatively capitalized into land values (Martinez-Vazquez & Sjoquist, 1988; Epple & Romer, 1991). This logic applies to any public good, but land conservation is a special case, with additional effects. By definition, land conservation also reduces the supply of land available for development; this provides a second pathway to rising land values benefiting existing landowners, irrespective of any real public good (Fischel, 2001).

We also find that Democratic votes in the presidential election are not associated with support of open space measures, and if anything the opposite is true. Interestingly and somewhat surprisingly, despite the existence of matching funds in Massachusetts, we find support actually appears *lower* there than in other states (unlike New Jersey).

Finally, we note that there is little evidence that people in more sensitive ecological areas are more likely to support referenda. The number of endangered species is insignificant and has point estimates near zero in all models. Water resources are also insignificant, although only marginally so in the municipal model. Nevertheless, recall that the selection models do indicate that referenda are occurring disproportionately in these areas. Accordingly, one should not conclude from this that conservation referenda are not valuable tools for providing ecosystem services.

What are the effects of the properties of the referendum on the outcome? Our methodology differs from previous work in considering the selection of finance mechanisms; yet we confirm that referenda making use of bond financing fare better among the electorate than those using other forms of financing (Kotchen & Powers, 2006; Sundberg, 2006; Nelson, Uwasu, & Polasky, 2007). This is easiest to see in Model IA, where the effect of bonds is positive and significant and the effect of property taxes is close to zero for counties and negative and significant for municipalities. Because of the interactions with other variables, the effect is harder to see in the table for Models II and III, but it does exist. For example, using Model IIA, our estimated parameters imply that financing a referendum with bonds instead of property taxes should increase the percent voting yes on a referendum by an average of 6 and 10 percentage points in counties and municipalities, respectively. The difference is statistically significant in all models except county Model IB. However, we find that accounting for the strategy of revenue bonding by interacting indicators for past successful tax referenda with a current bond referendum yields mixed results. In the county model, the strategy appears successful, but there is no evidence of such success in the municipal model. The advantage bond referenda have over tax referenda seemingly contradicts the "Ricardian equivalence" theorem of local public finance, which claims that households should be indifferent to tax and bond finance under some conditions (Daly, 1969). It may be that those conditions do not hold in practice (see Banzhaf & Oates, 2008, for discussion).

Model III includes variables describing the stated purpose of the referendum, including conserving agricultural land, providing recreational amenities, and protecting watersheds. We find that recreation and agricultural conservation are less attractive to people, but otherwise find little effect of the purpose of the referendum. Watershed protection has a positive sign, but is not significant statistically. Other ecological purposes have little effect, but if anything are negative. These findings reinforce those from Models I and II that neither more endangered species nor more water in a community leads to greater support at the ballot box.

ASSESSING THE MANAGEMENT OF THE CONSERVATION MOVEMENT

Our selection model can be interpreted as describing the types of communities where the conservation movement is concentrating its efforts, whether through a top-down or a bottom-up process. Our outcome model can be interpreted as predicting the types of communities that are most likely to approve such measures. In this section, we compare the results of these two models to assess the performance of conservation planning.

We begin with the observation that although the selection model found no strong statistical evidence of selection on *unobservable* factors *after controlling for econometrically observable factors*, we do find important selection on observable variables. Communities that hold referenda are precisely the ones more likely to vote in favor of them.

Table 6. Predicted outcomes by actual types.

	Average Predicted Proportion of Yes Votes for the Following Referenda Types		
Actual Type	Bond	Property Tax	Other
County−Level Model			
None	56.4%	50.7%	51.1%
Some referendum	62.8%	57.5%	57.4%
Bond	64.7%	59.4%	59.3%
Property tax	62.3%	56.9%	56.9%
Other	60.8%	55.5%	55.2%
MunicipalityLevel Model			
None	59.9%	49.8%	55.1%
Some referendum	66.3%	56.4%	61.6%
Bond	65.8%	55.6%	61.2%
Property tax	66.9%	57.3%	62.3%
Other	65.1%	54.9%	60.4%

Given these results, we assess the performance of the conservation movement using Model II without controlling for selection on unobservables. Table 6 shows the predicted outcomes for referenda of various types. Each row represents community-years that do not in fact hold referenda, which do hold some type of referenda, and, finally, which hold referenda of each specific type. Each column represents the predicted success of a referendum of a given type. Comparing the first two rows of the table, note that the predicted vote "yes" is 6 to 7 percentage points higher in those communities that held referenda than in those that did not. There is less evidence, however, that referenda of particular types are used in jurisdictions where that type would be the most appealing: Bond referenda appear to have the potential to be more successful in all cases.

If we view referenda as arising organically out of the local community, this implies that community leaders are in fact representing and responding to local preferences. Alternatively, if we view referenda as occurring in neighborhoods targeted by regional or national land trusts, this result implies that these organizations are quite effective at strategically targeting the time and place for referenda. Either interpretation is consistent with the finding of Sundberg (2006) that communities with more land trusts are more likely to support conservation at the polls. In fact, the insignificance of the selection terms suggests that this strategic targeting is based on observable factors and the movement is not targeting based on additional, local knowledge from, for example, polling data. Thus, rather than being a negative result, we view our selection results to be an interesting finding on the underlying mechanisms of the direct democracy process.

Although the movement has been relatively successful, our model suggests that it is still missing important opportunities for conservation. Consider the following exercise. We reestimate our models using data only through 2005 (omitting the 2006 data). In 2006, 133 municipal referenda actually occurred. These are communities for which we can assess different selection criteria according to their actual outcomes. Suppose, for example, that a planner had to prioritize the top 50 of these 133 referenda in 2006. The 50 communities that have the highest predicted probability of holding a referendum according to our selection model can be taken to represent the movement's current selection patterns. These 50 referenda had an actual average approval rate of 57 percent in 2006, and 34 of 50 exceeded 50 percent.

Using our model estimated on data through 2005, we can also forecast the 50 communities most likely to have passed referenda in 2006. Our model improves upon the movement's actual selections, choosing 50 communities that went on to have an actual approval rate of 64 percent, with 44 exceeding 50 percent. Twenty-four communities appear in both sets, but the two sets differ in their other selections.[21] In other words, *even based on out-of-sample predictions*, our model appears capable of identifying more promising communities than the current selection process. Thus, despite the relative success of the conservation movement in targeting areas where referenda are likely to be successful, our data and model reveal additional opportunities. Nor does there appear anything particularly special about 2006 in this respect; similar results are obtained for a 1998 to 2004 model forecasted to 2005 to 2006. Accordingly, our model could serve as a potential management tool to aid national conservation organizations in selecting promising communities for conservation referenda, or to aid local groups in determining the potential success of efforts in their communities.

Just what are these opportunities? Which important variables does the conservation movement appear to be placing less weight on in its selection patterns, and which does it seem to overemphasize? We can address this question by directly comparing the communities that appear most promising according to our outcome model to the communities actually chosen. There were 169 unique counties and 821 unique municipalities that held referenda from 1998 through 2006. We compare this set to the 169 counties and 821 municipalities that our model predicts to be most likely to approve a referendum in 2006. We then code a choice variable as $+1$ if our model selects it and the conservation planning process did not, -1 if the reverse is true, and 0 for any community that the two approaches agree on (that is, where our model would select it and it did indeed have a referendum or where our model would not select it and it indeed did not have a referendum). We then estimate an ordered probit on these data to explain the differences in the two selection patterns.

The results are displayed in Table 7. All variables except for dummies are renormalized to have a mean of 0 and standard deviation of 1, to facilitate comparisons between coefficients. High coefficients indicate that higher values of the variable represent opportunities missed by current selection practices. Negative coefficients indicate that current selection practices overstate the importance of the variable, or, alternatively, that current selection practices miss opportunities in communities with lower values of the variable. Coefficients near zero indicate little need for improvement along that dimension.

Overall, the results in the table suggest that land trusts may be "over-stereotyping" by over-selecting rich, Democratic-leaning, white communities in the Northeast. Six factors seem to stand out. First, for both counties and municipalities, there appear to be excellent opportunities in more minority communities.[22] Second, taking both

[21] It might seem simpler to compare the *predicted* outcomes of the 133 communities actually holding referenda to the 133 that we choose using our model. However, this would not be appropriate as we would have to pick the 133 with the highest predicted outcomes, which by definition could never lose out to another set of 133. By comparing actual outcomes rather than predicted outcomes, we are holding a true "horse race" of our model's selections versus the movement's historical selections. To make this comparison, however, we are forced to look at a subset of the actual 133.

[22] Prop. white is negative in both outcome models (Tables 6 and 7), yet, as seen in Table 2, the racial composition of selected communities is quite close to the national average. There are 1,324 municipalities in our data that have more than 50 percent minorities; our model would select 321 of them to hold referenda, but only ten in fact did. Of those ten, the average positive vote was 70 percent, compared to 60 percent nationally. Of communities with less than the median of 96 percent white, 80 percent approved their referenda, whereas 75 percent did among those with more than the median share of whites.

Table 7. Differences in forecasted optimal selections and actual selections.

	County Model		Municipality Model	
	Coefficient	Std. Error	Coefficient	Std. Error
Demographic Variables				
Med. household inc.	−0.0933	(0.1123)	−0.2900***	(0.0307)
Prop. in poverty	−0.1810**	(0.0765)	−0.0755***	(0.0214)
Prop. no high school dip.	0.3915***	(0.0826)	−0.0180	(0.0231)
Prop. bachelor degree	0.5686***	(0.0830)	0.2469***	(0.0234)
Prop. owning home	0.1682**	(0.0736)	0.1118***	(0.0184)
Prop. white	−0.4044***	(0.0640)	−0.5908***	(0.0170)
Prop. age >65	0.0548	(0.0648)	0.1246***	(0.0167)
Prop. age <18	−0.2275***	(0.0562)	−0.3058***	(0.0186)
Land Use Variables				
Median house value	−0.2904***	(0.0761)	0.0303	(0.0239)
Prop. living in urban area	0.0639	(0.0717)	−0.3106***	(0.0207)
Prop. farmers	0.0389	(0.0729)	−0.0230	(0.0185)
Pop. density	1.7433***	(0.2629)	−0.0576***	(0.0192)
Value of farmland	−0.0991	(0.1031)	−0.0282***	(0.0124)
Value of farm produce	−0.1234***	(0.0435)	−0.0918***	(0.0154)
Pct. change farmland	0.0460	(0.0372)	0.1039***	(0.0133)
Prop. area farmland	0.1012	(0.0617)	−0.0333**	(0.0138)
Land area (sq. mi.)	0.1454***	(0.0459)	0.0495***	(0.0123)
Ecological Variables				
Endangered species	0.0682	(0.0497)	−0.0406**	(0.0201)
Prop. area water	−0.0628	(0.0432)	0.0830***	(0.0119)
Political Variables				
Prop. voting Bush	0.0607	(0.0551)	0.0505***	(0.0173)
Additional Controls				
Latitude	2.1870***	(0.3770)	0.1761	(0.1082)
Longitude	−1.8613***	(0.3957)	−0.3302***	(0.1274)
Latitude* longitude	2.8810***	(0.5659)	0.4689***	(0.1620)
NJ			−1.8852***	(0.0701)
MA			−2.2713***	(0.0830)
1st intercept	−2.1905***	(0.0668)	−2.5868***	(0.0272)
2nd intercept	2.1275***	(0.0738)	2.4923***	(0.0292)
Pseudo-R^2	0.251		0.369	

Notes: The coefficients represent estimates from ordered probit models estimated separately for counties and municipalities. All variables except dummies are normalized to have a mean of 0 and a standard deviation of 1 for ease of interpretation. Higher coefficients indicate our model suggests that higher values for the variable should be given greater weight than it is given in current selection processes.

***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

the latitude and longitude variables into account, there appear to be missed opportunities in southeastern states such as the Carolinas, Georgia, and Florida. New Jersey and Massachusetts appear to be especially tapped out, at the municipality level at least, with large numbers of referenda failing to pass. Third, the importance of college-educated communities may still be underweighted, even though Table 2 indicates that communities holding referenda already have about twice the proportion of college graduates as those that do not hold referenda. Fourth, the importance of avoiding communities with children does not seem to be appreciated in the current selection procedure. Fifth, the selection process might be more successful if it placed less weight on high-income areas, but at the same time more weight on avoiding high-poverty areas, suggesting that the most important missed opportunities are among middle-class neighborhoods. Sixth, Democratic-leaning areas appear to be overemphasized, even after conditioning on geography. Not surprisingly, the proportion voting for President Bush was negative in the selection equation, but it is actually positive in the outcome equation. Finally, if we look at just the municipality model, and focus only on identifying communities that are most likely to pass their referenda, it appears that land trusts are placing too much priority on both high-density urban areas and areas with high but shrinking farmland. The middle ground of the suburban fringe appears to be underweighted.

Of course, land trusts have other objectives, such as the ecological and amenity values of the type of land conserved. Indeed, as we emphasized previously, jurisdictions holding referenda have more endangered species and more surface water than the average jurisdiction. We can consider these twin objectives of conservation efforts—emphasizing areas where they will be successful and where they will have greater ecological payoffs—with the following simple exercise. To explore the reduced form relationship between these various objectives, we reconsider Equation (3), the "utility" of holding a conservation referendum in a specific community. In particular, we now reduce the variables to just three, the log-odds ratio of the predicted "yes" vote on a referendum [that is, Equation (1), again using the results from Model IIA in Table 5] and our two indicators of ecological value, water and species. We regress the log-odds ratio of the predicted probability of holding a referendum (that is, the predicted results from Table 3) on these three variables. Because water and species were included in the estimation of Equation (1), their indirect effect on referenda success is included in the variable indicating predicted success. Thus, the interpretation of these variables considered separately is the additional "utility" to the conservation movement of ecological values, holding predicted success constant. Table 8 presents our estimates. It shows that more ecological value, as proxied by water and species, and greater predicted success both make a community more likely to hold a referendum under the current practices of the conservation movement, as it operates under current institutional conditions. According to these results, at the means in the data, when considering a community in which to target a referendum, the conservation community is indifferent between an additional 3.2 percentage points in area covered by water, an additional 1.1 more endangered species found in the area, or an additional 1 percentage point increase in the predicted "yes" vote on the measure. Of course, if possible, the conservation community would most likely prefer more of all these attributes.

CONCLUSIONS

We have developed a joint model of the presence and the outcomes of open space referenda. The model analyzes the consequences of local factors, such as demographics and land uses, and factors associated with the referendum itself, such as fiscal mechanisms and conservation purposes. In studying outcomes, we control for the fact that the sample is likely to be selected through the targeting of efforts to those jurisdictions that are most likely to pass the referendum. Using a polychotomous sample selection model (Dubin & McFadden, 1984; Bourguignon, Fournier, & Gurgand, 2007), we also control for the fact that when a jurisdiction votes on a referendum of a particular fiscal type, it likely has chosen the method of finance most likely to succeed.

We find that conservation referenda are more likely to be held in communities where there are more surface water and more endangered species, suggesting greater ecological values. They also are more likely to be held where they are more likely to succeed. The latter correlation appears to be driven by observable demographic and land use factors. Interestingly, unobservable factors do not appear to contribute to this pattern. This may be because national and regional organizations are targeting promising communities for such referenda by using the same observable factors as

Table 8. Effect of ecological values and predicted success on probability of holding a conservation referendum.

	Coefficient	Standard Error
Endangered species	0.0604	0.0025***
Proportion covered in surface water	2.3304	0.1703***
Log-odds ratio of predicted yes vote	2.5743	0.0398***
Constant	−8.5273	0.0185***

Notes: The table shows the reduced form relationship between the likelihood of holding a conservation referendum and ecological value and likely success. More specifically, it displays the results of regressing the log odds of the probability a community will hold a referendum (that is, the predicted values from the model in Table 3) on the log-odds of the predicted yes vote (the predicted values from Model IIA in Table 5) plus two indicators of ecological value.

*** Significant at 1 percent level.

are available to analysts such as ourselves. They do not appear to be successfully taking into account other local factors that would influence outcomes. In any case, this finding supports previous work on the demand-side factors for conservation, which had not taken these selection effects into account or had not done so fully (Kline, 2006; Kotchen & Powers, 2006; Nelson, Uwasu, & Polasky, 2007; Sundberg, 2006).

Be that as it may, the conservation movement has apparently been quite successful at targeting communities based on observable factors. Communities actually holding referenda are predicted by our models to have higher average support than those communities that do not hold them, by 6 to 7 percentage points at the polls. Nevertheless, our model's out-of-sample forecasts are capable of identifying even more promising opportunities for conservation in terms of success rates. This gap may be a failure of the conservation community to fully optimize its efforts, perhaps due to the public good nature of information or other constraints. In that case, our analysis may suggest a lacuna that can be filled by other policy mechanisms. Alternatively, it may not represent a failure, but simply other objectives. Our analysis indicates that the conservation community is willing to trade off 1 percentage point in the expected victory margin in a community for 3.2 percentage points more in water cover or 1.1 percentage points more in endangered species.

From a broader policy perspective, direct democracy is, of course, only one approach to local conservation of open space. Much of the responsibility for controlling local growth processes rests with traditional representative political institutions like city councils. This raises the intriguing and important question of whether or not direct democracy at the local level produces outcomes that differ from those of representative government. In their study of the determination of urban growth boundaries in California municipalities, Gerber and Phillips (2005) provide an answer to this question. They find that the measures adopted through the ballot box are significantly more stringent than those adopted by city councils: Voter-initiative measures are both more restrictive and more difficult to amend.

This scenario leads to the basic issue of which approach produces the more economically efficient outcomes for society. As is well known, median-voter outcomes (generally associated with electoral processes) are not, in general, efficient, as the mean and median preferences do not normally coincide. Some scholars have argued that median-voter outcomes typically do not deviate very far from efficient outcomes (Wittman, 1989). However, Bell, Huber, and Viscusi (2009) have recently pointed out that for ecosystem protection, preferences are generally skewed to the right, with mean willingness-to-pay substantially greater than the median. If this is generally true, it may well be that direct democracy, although an effective conservation tool, may not lead to efficient levels of conservation (if used in isolation). This is consistent with the Gerber–Phillips finding that referendum outcomes tend to be more restrictive than those emerging from city councils. In this context, Gordon (2009) has shown recently that local voter initiatives tend to occur more frequently in large and diverse jurisdictions with more recent movers. She suggests this indicates that principal–agent and various information problems are likely to be more serious in such jurisdictions, raising basic efficiency questions about the outcomes from representative institutions. From the broader perspective of societal welfare, it is therefore far from clear which approach tends to produce the more efficient outcomes.

H. SPENCER BANZHAF is Associate Professor, Department of Economics, Andrew Young School of Policy Studies; Faculty Research Fellow, National Bureau of Economic Research, Cambridge, MA; and Senior Research Fellow, Property and Environment Research Center, Bozeman, MT.

WALLACE E. OATES is Professor, Department of Economics, University of Maryland, and University Fellow, Resources for the Future, Washington, D.C.

JAMES N. SANCHIRICO is Professor, Department of Environmental Science and Policy, University of California at Davis, and Nonresident Fellow, Resources for the Future, Washington, D.C.

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