Voting For Public Funding of Open Space

Jeffrey O. Sundberg

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Abstract

Over one thousand conservation referenda have been on ballots across the country between 2000 and 2005. More than three-quarters of them have been approved by voters. This public form of land conservation could be a substitute or a complement to the private land conservation provided by land trusts. Land trusts frequently campaign in favor of these referenda. This paper finds that the presence of county or local land trusts results in a statistically significant increase in the higher percentage of 'yes' votes for such referenda in local elections. The finding is not explained by differences in funding mechanisms that might be more attractive to voters. Controlling for the impact of demographic variables does not reduce the estimated impact of land trust presence.

About the Author

Jeffrey O. Sundberg is Associate Professor of Economics and Business at Lake Forest College, and serves as Chair of the Environmental Studies Program. He received a B.A. from Carleton College and a Ph.D. in economics from Stanford University. His recent research interests include tax policy toward conservation easements and the factors determining membership in local land trusts.

Contact Information:
Prof. Jeffrey O. Sundberg
Department of Economics and Business
Lake Forest College
Box M9
555 N. Sheridan Road
Lake Forest, IL 60045

847-735-5139 (office)
847-735-6291 (fax)
jsundber@lakeforest.edu

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Introduction

Land conservation takes many forms, including the creation of parks and trails, efforts to slow the rate of conversion of agricultural land into housing, and the purchase or tax-favored donation of conservation easements to protect certain characteristics of an area while allowing continued private use. These and similar programs can provide substantial benefits that include recreational opportunities and facilities, environmental amenities, and appreciation of property values.[1] The existence of these and other benefits has led to a long history of land conservation at the federal, state, county and local level across the United States.

While many of the conservation efforts are proposed and funded as part of ordinary legislative and regulatory processes, it is common for state, county, and local taxpayers to have the opportunity to decide the fate of a conservation program by voting in a referendum. Over one thousand such referenda were placed on state, county, and local ballots in the U.S. between 2000 and 2005. More than three-quarters of these referenda were approved, providing over $30 billion in funding and indicating that there is strong support among voters for increasing government programs and funding for land conservation (Trust for Public Land 2006(2)). While this support might indicate dissatisfaction with either the current level of public support or the current form taken by that support, in either case it shows that voters appear to feel that land conservation is an important role for government, and they are willing to impose a financial burden on themselves as taxpayers in order to support that role.

A growing body of research explores voting data in order to develop intuition about the determinants of voter support for such initiatives. Kahn and Matsusaka (1997) analyzed data on California conservation referenda and determined that most of the variation in voting results at the county level could be explained by income and price, and that environmental goods appeared to be normal for most income levels. Kline and Wichelns (1994) found that land use factors, specifically high growth rates, were significant determinants of support for publicly-funded conservation programs. Solecki, Mason and Martin (2004), in a study of local voting results in New Jersey, found that communities near large open-space reserves, notably the Pinelands, were less likely to support a state-wide conservation referendum.

Other studies, including Romero and Liserio (2002, 2004) and Howell-Moroney (2004), evaluate the impact of land use factors on the existence of a conservation referendum, rather than on its success. Both find support for socio-economic factors, but they reach contradictory conclusions on the importance of land use patterns. A telephone survey of voters in New Hampshire found that significant numbers of voters felt that the protection of open space created public benefit and was an appropriate role for government; even those who voted against such a proposal frequently agreed, but felt that they were unable to bear the burden of additional taxes (Ducey, England and Smith, 2004).

Two recent studies examine the results of recent conservation referenda across the United States by looking at the factors correlated with a measure being placed on the

[1] See Sundberg (2006) for a review of the literature in this area.

ballot, and the approval rating received by such measures. Kotchen and Powers (2006) analyze referenda results between 1998 and 2003 from across the U.S. and find that the choice of fundraising mechanism is very important; voters are much more likely to vote in favor of a proposal that uses bond financing than tax financing, even though, as they point out, bonds have implications for tax burdens. They also find that voter approval is positively correlated with median household income, and that approval is higher for referenda that fund programs designed to protect farmland.

A second study by Nelson, Uwasu and Polasky (2005) used the same data set for a slightly different period (2000-2004). It also provides support for the argument that voters prefer to vote for bond issues. However, income and farmland preservation are replaced by local unemployment and education variables as significant determinants of voter support for conservation referenda.

While neither study offers much support for the argument that local demographic factors strongly influence the results of the election, both do provide very convincing evidence that demographic and land-use patterns influence the likelihood of a referendum appearing on a ballot. In particular, Kotchen and Powers find that wealthier areas are more likely to hold such referenda, while Nelson, Uwasu and Polasky find that the effect of income is initially positive, but decreases at very high income levels. The latter also find that local per capita membership in environmental organizations is a significant determinant in whether or not a jurisdiction holds a conservation referendum.

The research published to date has greatly advanced our understanding about some of the factors that influence voter preferences toward conservation, and their willingness to support these proposals. However, the studies mentioned have not examined one very important potential factor, namely the existence of and possible roles played by land trusts. These organizations pursue many of the same goals for which conservation ballot measures are designed, and could be seen by voters as either complementary or as substitutes for direct public funding for conservation. The next section of this paper provides some background information on land trusts and proposes several hypotheses regarding the possible relationship between these groups and the success of ballot initiatives. The following section describes a data set developed to test these hypotheses and provides an interpretation of the results.

The Land Trust Movement and Conservation Referenda

Land trusts are non-profit organizations, typically organized as IRS 501(c)(3) corporations, which operate primarily for the purpose of permanently preventing land development. Actions may take the form of the direct acquisition of land, through purchase or by accepting a donation; the acceptance of a conservation easement, which prevents some forms of development while allowing the land to remain in use and under private ownership; or the facilitation of land transfers to governmental organizations, who may not have the staff or financial resources necessary to acquire property in a timely fashion.

While land trusts have operated in the U.S. since the late nineteenth century (Brewer 2003, 13), the number and scope of their operation has increased dramatically in the last twenty-five years. In 1981, approximately four hundred land trusts were in

existence (Brewer 2003, 32); the number subsequently grew to over 1200 by 1998, and over 1500 by 2003. The number of acres protected by land trust activity, primarily in the form of conservation easements, more than doubled during that recent five-year period, to over 9.4 million acres.[2]

Land trust activity is determined by the employees, board members and donors of the organization, rather than by governmental agencies. However, land trusts that are organized as charitable corporations do receive a public subsidy, in the form of tax incentives to donors and tax exemptions for the organization. As such, they represent a form of public spending for land conservation, though the effects of that spending are determined by private individuals rather than public agencies.

The focus of this paper is on the impact of regional, county and local land trusts that work directly in the political jurisdictions that place conservation referenda on the ballot, and were active in the area before the ballot measure was in place. Previous activity by a land trust might affect voter attitudes toward a conservation referendum for a variety of reasons. A resident in an area currently served by a land trust may receive various public benefits because of the land trust's activities; she or he may also receive private benefits if they choose to become a member of the land trust. Such benefits may affect their willingness to accept a larger tax burden through the passage of a conservation ballot measure. They may feel that benefits are currently underprovided, or they may feel that the ballot measure would complement land trust activity to either make it less costly or more effective. The presence of a land trust will make such a voter more, or at least no less, likely to support the ballot measure than if no land trust was present.

Of course, private subsidized land protection activity could also be considered a substitute for similar public activity. If so, then the existence of a land trust will reduce voter support for the ballot measure. Finally, there is also the possibility that the land trust and the ballot measure provide different kinds of conservation activity, which voters may not consider substitutes; in this case the presence of a trust may not influence the likelihood of a resident to vote for or against the proposal.

Land trusts could also affect voter attitudes through work on the referendum itself. Since land trusts[3] are given not-for-profit status in order to pursue public, rather than private, goals, it is unlikely that many land trusts see such referenda as creating unwanted competition in the business of land protection. Trusts often campaign for ballot measures to enhance public funding for land protection, and in some cases even work with elected officials to design measures that are thought more likely to be acceptable to voters. The Trust for Public Land, a national land trust that helps government agencies acquire land and easements, advertises that it has assisted in campaigns for over 300 ballot measures since 1994. In 2000, the Trust for Public Land developed a group called The Conservation Campaign (TCC) designed to help land trusts improve the likelihood of a successful ballot measure (Trust for Public Land 2006(1)). TCC offers advice on the design of ballot measures, sample language from successful

[2] Figures for 1998 and 2003 calculated are provided by the Land Trust Alliance (2005). The numbers represent only local and regional land trusts; national land trusts own or hold easements on more than 25 million additional acres.

[3] Throughout the remainder of the paper, the term land trust is used to refer to regional, county or local land trusts, and does not include trusts that are national in scope.

measures, and other kinds of assistance to groups that wish to assist in the design and campaign for these referenda (The Conservation Campaign 2006).

While it is clear that land trusts work to improve the likelihood of success for conservation referenda, the impact of that work is unclear. For example, consider the following statement in a document provided by the Arizona Open Land Trust:

> The Arizona Open Land Trust partnered with other conservation organizations to successfully campaign for the open space bond. Overwhelming support for the open space bond measure is evident by the 67% voter approval (Arizona Open Land Trust 2005).

While this sounds very positive, it needs to be examined in an appropriate context. More than 75% of similar referenda have passed across the country over the last decade, and voter approval has averaged 60%; many referenda have received similar levels of voter support. The studies mentioned previously have highlighted the importance of other factors, such as financing techniques, in increasing voter approval. Evaluating the impact of land trusts on conservation referenda requires controlling for other factors that are also important to voters.

The possible relationship between land trust activity and conservation referenda results can be characterized by three different hypotheses. Hypothesis *A* states that the presence of land trusts has a significant and positive impact on the voter approval of conservation referenda. Hypothesis *B* states that land trust presence is correlated with the use of more favorable financing techniques that result in higher voter approval. Hypothesis *C* states that any apparent positive impact from land trust presence is not the result of correlation with demographic characteristics that result in higher voter approval. If such endogeneity between land trust presence and demographics exists, any positive relationship could be merely spurious, rather than causal.

These are not mutually exclusive hypotheses. For example, the presence of an active land trust may reduce the likelihood that voters approve a proposal if they are seen as substitutes; however, the land trust may use its resources to help craft a proposal that has a higher chance of being approved by voters.

The first step in testing these hypotheses is to estimate the possible link between the presence of a land trust and the results of conservation referenda. This is done by estimating a model of voter approval, similar to that used in the voting results research mentioned above. In these studies, the dependent variable is typically the "log-odds ratio", a logit analysis of the fraction of voters in favor of a proposal, where

$$\text{logit}(Y_i) = \ln[P(Y_i)/(1-P(Y_i))] \quad [1]$$

where $P(Y_i)$ is the percentage of votes cast in favor of proposal i.[4] The equation estimated is

$$\text{logit}(Y_i) = \beta_0 + \beta_1 D_i + \beta_2 M_i + \beta_3 L_i + u_i. \quad [2]$$

D represents a vector of demographic and land use variables specific to the political jurisdiction voting on proposal i; M represents a vector of characteristics specific to the proposal itself that might affect the willingness of voters to support it; and L is the presence of one or more land trusts directly working in the relevant political jurisdiction.

[4] This method was used in a voting referenda study by Deacon and Shapiro (1975) and is still commonly used in referenda studies, including those listed previously.

Estimating [2] provides insight into all three hypotheses. If the estimated coefficient β_3 is negative and significant, it provides evidence that voters see government action and land trust activity as substitutes. If the estimated coefficient is not statistically different from zero, government action to conserve land and land trust activity will be assumed to be independent in the eyes of voters. If the estimate coefficient is positive and significant, Hypothesis *A* cannot be rejected, and further testing is warranted.

A positive and significant relationship may indicate that land trusts, perhaps with the guidance of TCC, are effective in crafting ballot measures that are more attractive to voters. If that is the case, significant differences in the characteristics of such ballot measures should be observable when the sample of jurisdictions with land trust activity is compared to the sample without similar activity. Any such differences, in combination with the estimated coefficients β_2, will provide guidance as to the impact of the land trust via proposal design in addition to its direct land protection activity. If significant differences in financing technique are not correlated with land trust presence, Hypothesis *B* can be rejected.

Finally, a positive and significant relationship between voter approval and the presence of a land trust or trusts may simply indicate a community that is predisposed toward land conservation. A limited amount of work has been done on the variables correlated with land trust presence and land trust membership. Albers and Ando (2003) examined state-level variation in the number of land trusts, but did not identify factors determining why land trusts might have arisen in specific locations. Sundberg (2006) finds that the membership level in local land trusts is correlated with demographic factors that include educational attainment and population; the growth of local housing is negatively correlated with membership. Of course, such growth might be more likely to lead to the creation of a land trust, even if it is somewhat less successful in attracting members.

It is reasonable to think that the same demographic factors that lead voters to hold and support a referendum for conservation might lead residents to organize a county or local land trust, creating a potentially serious endogeneity problem. An analysis of the impact of land trusts while controlling for the possible endogeneity between demographic factors and the presence of land trusts will provide a test of Hypothesis *C*. The following section describes the data that are used to evaluate the hypotheses.

Description of Data

Data for the empirical research are taken from three sources. Referenda details and voting results are available from the LandVote data base, maintained by the Trust for Public Lands and available from TPL. These data are available for state, county, and local elections; this research focuses on local elections, since those are the elections in which local land trust efforts can be expected to have the most impact. Data collected include the election results, the amount of funding at stake, and the type of mechanism used to collect revenue.

Demographic and limited land-use data are available from the U.S. Census. These data are collected for those political jurisdictions represented in the LandVote database that are included in this analysis. Data collected include population and income

statistics, educational attainment, and housing data. Data are from the 2000, 1990, and 1980 Censuses, using a commercial data source that corrects early Census data to ensure consistent geographic definitions for 2000 political boundaries.

Information about land trust activity and membership is available from the Land Trust Alliance's census of land trusts (2000 and 2003). This represents the most complete list of land trusts currently available, and provides a description of the geographic area in which the land trust operates. In many, but by no means all, cases the entry also includes information about the number of members belonging to the trust, along with other operating information.

The primary source of demographic data is the 2000 U.S. Census, so the study examines only voting results during the period from 2000 to 2005. Voting results are limited to traditional elections, rather than town meetings, and elections were removed from the database when the purposes were not considered land conservation (for example, several referenda on funding to convert abandoned railroad beds into bike trails were removed from the database). While some of the referenda provide funding for a variety of sources, the database separates the amount of conservation funding requested from the total requested; on average, over 80% of the funds requested by the referenda are for conservation purposes, as defined within the LandVote database. After the referenda data were assembled, U.S. Census data were collected for the appropriate political jurisdiction. A small number of observations were dropped when appropriate Census figures could not be identified, typically because an election occurred in one of several localities with identical names within the same state.

Finally, the jurisdictions with referenda were compared to a database that included all land trusts responding to the 2000 and/or 2003 Land Trust Alliance census of land trusts. The description of each trust's area of activity was used to code it as local, county, or regional. Local refers to trusts that operate entirely or primarily in one jurisdiction;[5] county refers to trusts operating in several or more jurisdictions within the same county; and regional refers to trusts that operate across county lines. Regional trusts range from groups that work in an area within two counties to multi-state groups. Regional trusts are frequently defined by geographic features, such as watersheds or mountains, rather than political jurisdiction. In these cases, maps and other resources were used to determine the counties in which the trust operated.

The land trust database was then compared to the referenda database, and each election was matched with the local, county, and regional land trusts operating within that jurisdiction (if any). Land trusts listed in the 2000 census are used for elections occurring in 2000, 2001 and 2002; trusts listed in the 2003 census are used for elections in the last three years of the study. Each jurisdiction is coded with dummy variables that have a value of 1 if a regional, county, or local land trust operates in the jurisdiction. The number of each type of land trust is also entered as a jurisdiction-specific variable. The number of members belonging to the relevant land trusts is only collected in cases where all land trusts of one type within a jurisdiction report their membership. Since many jurisdictions are served by more than one county or more than one regional land trusts, and a significant fraction of land trusts did not report their membership, the sample of elections with membership totals is much smaller than the full sample.

[5] Local referenda can take place in cities, towns, townships, or park districts; jurisdiction is used generically to refer to all of these.

Empirical Analysis and Discussion

The complete data set has 781 observations, covering referenda from 2000 to 2005. Each observation corresponds to one local election during that period. The data set covers 34 states and 634 different jurisdictions. Table 1 provides some background detail about the referenda in the data set.

The data are presented in aggregate form. Since referenda in Massachusetts and New Jersey each account for over twenty percent of the observations, each state is presented separately. Over 75% of the referenda were successful in the full sample; the number was significantly lower in Massachusetts. As would be expected from the previous result, the fraction of "yes" votes was lower in Massachusetts compared to the rest of the data set.[6] Even though a referendum was just as likely to succeed in New Jersey as in the other states, the fraction of "yes" votes was lower there than in the remainder of the sample (though still higher than in Massachusetts).[7]

The frequency of the various financing options are similar to those reported by Kotchen and Powers (2006), which is not surprising since four of the six years in each data set overlap. The differences in financing method across states are very striking. Referenda in both Massachusetts and New Jersey appear to largely have been the result of state incentives tied to specific types of financing. Nearly 98% of the referenda in Massachusetts rely on a property tax surcharge; this accounts for almost all of the property tax surcharges in the data set. New Jersey referenda almost universally required property tax rate increases, while more than two-thirds of the sample from other states used bond finance.

Other differences among states are evident when looking at the fraction of referenda that occur in jurisdictions in which one or more land trusts operate. Land trusts in areas that had conservation referenda in New Jersey were much more likely to be regional in scope, while land trusts in similar areas in Massachusetts were more likely to be county-based, and even more likely to be local.[8] Over 90% of the referenda occurred in towns where at least one regional, county, or local land trust appeared to be active.[9]

Since election results consist of averaged, grouped data from different localities, equation [2] is estimated using weighted least squares. Following Kahn and Matsusaka (1997), the log-odds observations are weighted by $(n_i F_i(1-F_i))^{1/2}$, where n_i refers to the number of votes cast in referendum i and F_i refers to the fraction of those votes cast in favor of the proposal. This places more weight on the results from large jurisdictions. In addition, the standard errors are calculated so as to be robust with respect to clustering at the jurisdiction level, since some had more than one referendum during the time period studied.

Table 2 presents the results of estimating equation [2] for the data set. Several of the demographic variables are found to be significant in determining the percentage of

[6] The correlation between "yes" votes and passage is not as high as might be expected, since some ballot measures required more than a simple majority of votes cast in order to pass.

[7] All differences mentioned here statistically significant at the 5% level.

[8] These are characteristics of land trusts throughout each state, not just in the areas that had referenda.

[9] A trust is defined as being "active" if the town is part of its self-described area of operation. While the trust may not be protecting any property in the area at that time, it is likely to take an interest in events such as conservation referenda, and it may have or be recruiting members in the town.

votes cast in favor of the proposals. The estimated coefficient on population is positive and significant, though rather small, consistent with results in the papers mentioned above. One reasonable interpretation of this finding is that the voter's share of the total cost declines with population, or at least with the number of parcels of property, making the voter more likely to support the proposal.[10]

The change in the housing stock from 1980 to 2000, as a fraction of the 1980 level, has a positive coefficient, though only significant at the 10% level, while the square of that term is negative and significant at the 5% level. Using the estimated coefficients and the actual values for the variables indicates that the combined effect of the two measures of housing stock growth has a positive effect on the fraction of yes votes.

The next set of findings needs to be discussed as a group. Median household income and the percentage of adults over age 25 with a college degree are positively correlated, with a correlation coefficient of 0.640. Each variable, as well as the square of income, has an estimated coefficient that is significantly different from zero, but only when all three variables are included in the regression. Educational attainment has a positive and significant impact on the level of support for the proposals, which is consistent with the findings of Kahn and Matsusaka (1997) and Nelson, Uwasu and Polasky (2005). Kotchen and Powers (2006) did not present results for an education variable. However, the estimated coefficient on income is negative, which is counter-intuitive. While the coefficient on income squared is positive, it is small enough that the combined effect of income and income squared is negative when evaluated at the 25th, 50th, and 75th percentile of the income distribution, and that effect increases with income. While this could be the result of an interaction with the education effect, when the combined effect of income and education is estimated, the impact on voter approval is still negative.

The land area of the jurisdiction, measured in square miles, has a small, but very significant negative impact. One interpretation of the finding is that small areas have relatively little available land, making land conservation more challenging and potentially more expensive. Population density and the percentage of population living on farms were not significant, nor were variables measuring their changes over time.

In general, the demographic variables provide results that are reasonably intuitive, with the exception of the income variable. Referenda receive more yes votes in jurisdictions with large land areas and large population, high percentage growth in the housing stock over the previous twenty years, and high educational attainment.

As with previous research, the choice of financing mechanisms is found to be very important to voters. Dummy variables that correspond to increases in property tax rates, to property tax surcharges, and to sales tax increases have coefficients between -.30 and -.39, and are all significant at the 1% level. The dummy variable for bond finance is omitted. Voters are much more willing to borrow money than they are to vote for tax increases, even though they presumably know that the resulting bond payments will also result in higher taxes. A coefficient of -0.3 on a dummy variable indicates that changing the dummy variable from 0 to 1 will decrease the ratio of yes to no votes by approximately 25%. If the average odds ratio is 1.5 (based on the average of 60% yes

[10] The nonrival nature of most of the benefits of land conservation make it unlikely that higher population reduces the benefit to a particular voter in any significant way, such as through crowding.

votes), the odds ratio declines to 1.125, which is equivalent to reducing the fraction of yes votes to 53%.

While the estimated coefficient for the property tax surcharge is both large and strongly significant, it must be remembered that the dummy variable for property tax surcharge is virtually identical to a state-level dummy variable for Massachusetts. This suggests that it is possible that some other state-level effect is being captured by the property tax surcharge variable. In a similar, though somewhat less extreme, fashion, a property tax rate increase is used in 99% of the referenda in New Jersey, accounting for over 80% of the referenda in which it was used in the full data set. The income tax mechanism also has a negative coefficient, but it is not significant. Income taxes are used in less than four percent of the referenda in the full sample.

Some of the referenda were proposals to extend or renew existing conservation programs. Voters were much more likely to approve such proposals. While this effect is strong, nearly as large in absolute value as the predicted effect from using tax financing, such cases account for less than five percent of the total number of referenda. It is possible that prior approval of a referenda is correlated with demographic variables; however, re-estimation of equation [2] without the renew variable does not result in statistically significant changes in any of the estimated coefficients on the other independent variables.

The possible impact of land trusts on referenda could be examined several different ways. Lacking information about specific land trust activities, possible factors to consider include the existence or number of land trusts whose area of operations includes a particular jurisdiction, or the number of members belonging to those land trusts. Limited membership data are available, drastically reducing the sample size, so this study considers the presence of land trusts. Regressions were also run using the number of land trusts of each type as explanatory variables; the estimated coefficients were statistically significant, but the explanatory power of the regression using dummy variables is higher.

Considerable crossover among land trusts of different types within jurisdictions could lead to difficulty in differentiating the effects of one type of trust from another. Analysis indicates that this is unlikely to be a problem. Over twenty-five percent of the referenda take place in towns where only a regional land trust is active; over forty percent take place in areas with an active county, but not local, land trust.

The coefficient on the regional dummy is insignificant, while the coefficients on the county and local dummies are positive, and statistically significant at the 5% and 1% levels respectively.[11] The insignificant coefficient on regional trust presence is perhaps unsurprising; while regional trusts in many cases have the most resources, they also have the most opportunities, and may choose to participate more heavily in county or state-wide referenda rather than promoting local referenda. In addition, some regional trusts have relatively few resources yet try to work in a large area, making it more difficult to concentrate much energy or money on an election. Voters may use similar logic to decide that a regional land trust is a poor substitute for local conservation efforts.

The presence of county and/or local trusts is correlated with higher voter approval of conservation referenda. The estimated coefficients have the effect of increasing the

[11] The estimated coefficients, their sign, and the level of statistical significance are robust to the inclusion or exclusion of various demographic and referendum characteristics.

odds ratio by 11.5% and 25%. Again using the average voter approval of 60% as a base, this is equivalent to increasing the fraction of yes votes to 63% and 65%. Since many referenda occurred in areas served by both local and county land trusts, the combined figure based on the estimated coefficients would be 68%.

This positive impact may be for any and all of the reasons discussed earlier; trusts may work to design more attractive referenda, and they may actively promote passage of the measure among their members and the general public. At the same time, a smaller area that supports voluntary land conservation efforts, in the form of donations to a land trust, may also be more willing to support public land conservation efforts, with or without the activity of the trust. Finally, trusts may have pursued projects that have persuaded voters that conservation is a worthwhile government activity.

The results of equation [2] do not allow rejection of Hypothesis *A* in the cases of county and local land trusts. Hypothesis *B* proposes that land trust presence is correlated with financing techniques that positively influence the proportion of "yes" votes. If land trusts wish to influence election results, one method would be to attempt to help local government craft proposals that use bonds rather than taxes.

Table 3 shows the fraction of referenda that use bond financing, broken down into referenda in areas with no county or local land trusts, county and local, just county, and just local. The numbers refer only to the referenda in states other than Massachusetts and New Jersey, which are excluded because of their nearly uniform use of a particular method of financing. The use of bonds is higher for referenda in jurisdictions served by local, but not county, land trusts compared to those without land trusts or served by county land trusts. Referenda in areas served by county but not local land trusts are less likely to use bonds compared to other areas. None of these differences are statistically significant at the 5% level. Hypothesis *B* is therefore rejected for county and local land trusts. The presence of land trusts does not result in the use of more favorable financing techniques. This appears to occur despite the willingness of national groups to assist in the design of attractive proposals, or it may indicate that jurisdictions are able to take advantage of those resources without the participation of a land trust.

A test of Hypothesis *C* requires controlling for possible endogeneity between the demographic factors that are correlated with voter approval and land trust activity. As in the previous section, only county and local land trusts will be evaluated. The entire sample will be used for this test, since the financing differences evident in Massachusetts and New Jersey are not relevant to this hypothesis.

To evaluate the impact of demographic factors without the influence of the land trust dummy variable, equation [2] is re-estimated without the land trust variables; the results appear as equation [2a]. A second equation is then estimated, using the residuals as the dependent variable and the land trust dummy variables as independent variables. The results of both stages of estimation are presented in Table 4.

Removing the land trust dummy variables from the log-odds ratio regression does not result in any significant changes in the estimated coefficients for most variables, or their statistical significance. The housing change and income variables are exceptions. Estimating [2a] without the land trust dummy variables causes the estimated coefficients on housing growth and its square to become insignificant; the coefficient on income is still negative, but only significant at the 10% level, rather than the 1% level. The coefficient on the square of income is no longer significant. While it is plausible to think

that local growth results in more favorable votes, the earlier studies using the LandVote database do not find such a result. In the case of the income variables, finding no significant effect is much more intuitive than the negative effect that appeared in equation [2]. It is also comparable to the results of Nelson, Uwasu and Polasky (2005), who found no significant coefficient for median income.

The second equation finds that a small portion of the residual from [2a] can be explained by the presence of county and local land trusts. The estimated coefficients are not significantly different from those estimated in equation 2. This estimation does not allow rejection of Hypothesis *C*; the positive effect of a land trust's presence has not been shown to be the result of endogeneity between land trust presence and demographic variables that are correlated with favorable voter response to conservation referenda.

Conclusion

The presence of county and local land trusts is a significant factor in raising the percentage of 'yes' votes in conservation referenda. Their impact is not the result of more attractive financing techniques, since no significant differences exist in proposals between referenda in jurisdictions with and without such trusts, nor does it appear to be the result of casual correlation with demographic variables that explain both land trust activity and high voter approval.

While land trusts do appear to have a positive impact on voter approval, that impact is relatively small and would not appear to have greatly influenced the average outcome, given the very high voter approval typically found in such elections. Given typical election results, land trust presence is unlikely to have much impact on average when a referendum requires a simple majority, but the additional votes that appear to be created might be very important in cases where approval by two-thirds of those casting votes is required. This finding adds to the existing knowledge of the factors determining voter approval for conservation referenda, but much work remains to be done.

Further research might better explain the specific impact of land trusts. Trusts might be very effective in improving voter interest and/or turnout, or in helping develop subtle aspects to the proposal that make voters more inclined to be in favor of it. For example, a proposal might be designed to protect a specific parcel of land that has particularly high conservation value, or it may protect a particular kind of habitat that is important to the local area. Further research into the demographic factors that are correlated with land trust activity might also provide insight into the causal or casual nature of the results.

References

Albers, Heidi and Amy Ando. 2003. "State-Level Variation in the Number of Land Trusts." *Land Economics* 79(3): 311-327.

Arizona Open Land Trust. 2005. "Arizona Open Land Trust's Priority Protection Program."

Brewer, Richard. 2003. *Conservancy: The Land Trust Movement in America*. Lebanon, NH: University Press of New England.

Deacon, Robert and Perry Shapiro. 1975. "Private Preference for Collective Goods Revealed Through Voting on Referenda." *American Economic Review* 65(5): 943-55.

Ducey, Mark, Richard England, and Andrew Smith. 2004. "Citizen Attitudes about Preserving Open Space: Results from a Voter Survey in Twelve New Hampshire Towns." University of New Hampshire Center for Integrative Regional Problem Solving Report.

Howell-Moroney, Michael. 2004. "What Are the Determinants of Open-Space Ballot Measures? An Extension of the Research." *Social Science Quarterly* 85(1): 169-179.

Kahn, Matthew and John Matsusaka. 1997. "Demand for Environmental Goods: Evidence From Voting Patterns on California Initiatives." *Journal of Law and Economics*, XL: 137-173.

Kline, Jeffrey and Dennis Wichelns. 1994. "Using Referendum Data to Characterize Public Support for Purchasing Development Rights to Farmland." *Land Economics* 70(2): 223-233.

Kline, Jeffrey and Dennis Wichelns. 1996. "Public Preferences and Farmland Preservation Programs." *Land Economics* 72(4): 538-549.

Kline, Jeffrey and Dennis Wichelns. 1998. "Public Preferences Regarding the Goals of Farmland Preservation Programs: Reply." *Land Economics* 74(4): 566-569.

Kotchen, Matthew and Shawn Powers. 2006. "Explaining the appearance and success of voter referenda for open-space conservation." *Journal of Environmental Economics and Management* 52: 373-390.

Land Trust Alliance. 1998. *1998 National Directory of Conservation Land Trusts*. Washington, DC: Land Trust Alliance.

Land Trust Alliance. 2005. National Land Trust Census. Available online at

www.lta.org/about.t/census.shtml, accessed on 7/19/05.

Nelson, Erik, Michinori Uwasu, and Stephen Polasky. 2005. "Voting on open space: an analysis of the decision to hold a referendum and of referendum results." Working paper. Department of Applied Economics, University of Minnesota.

Romero, Francine and Adrian Liserio. 2004. "Continuing the Open-Space Preservation Dialogue: A Response to Howell-Moroney." *Social Science Quarterly* 85(1): 180-186.

Romero, Francine and Adrian Liserio. 2002. "Saving Open Spaces: Determinants of 1998 and 1999 "Antisprawl" Ballot Measures." *Social Science Quarterly* 83(1): 341-352.

Rosenberger, Randall S. 1998. "Public Preferences Regarding the Goals of Farmland Preservation Programs." *Land Economics* 74(4): 557-565.

Solecki, William, Robert Mason and Shannon Martin. 2004. "The Geography of Support for Open-Space Initiatives: A Case Study of New Jersey's 1998 Ballot Measure." *Social Science Quarterly* 85(3): 624-639.

Sundberg, Jeffrey. 2006. "Private Provision of a Public Good: Land Trust Membership." *Land Economics* 82(3), forthcoming.

The Conservation Campaign. *About Us*. Available online at http://www.conservationcampaign.org/cms/index.php?id=273, accessed 6/16/06.

Trust for Public Land. 2004. *Voters Approve $3.25 Billion in Open Space Funding.* Available online at www.tpl.org/tier3_cd.cfm?content_item_id=17295 &folder_id=186, accessed 7/18/05.

Trust for Public Land. 2006. *About TPL*. Available online at http://www.tpl.org/tier2_sa.cfm?folder_id=170, accessed 6/16/06.

Trust for Public Land. 2006. *LandVote Measure Summary, 1994-2005*. Available online at http://www.tpl.org/tier3_cdl.cfm?content_item_id=15266&folder_id=2607, accessed June 18, 2006.

Table 1

Referenda Characteristics and Land Trust Presence

	Full Sample n = 781	Massachusetts n = 165	New Jersey n = 201	All Other States n = 415
Fraction of "Yes" votes among votes cast	.596	.542*,+	.587+	.623
Successful Referenda	76.3% (596)	63.0%+ (104)	79.1% (159)	80.2% (333)
Financed by bond	35.0% (273)	2.4%+ (4)	0%+ (0)	64.8% (269)
Financed by property tax rate increase	31.8% (248)	0%*,+ (0)	99.0%+ (199)	11.8% (49)
Financed by property tax surcharge	21.5% (168)	97.6%*,+ (161)	0% (0)	1.7% (7)
Regional land trust presence	68.9% (538)	46.7%*,+ (77)	89.1%+ (179)	68.0% (282)
County land trust presence	55.3% (432)	61.8% (102)	46.8% (94)	56.9% (236)
Local land trust presence	21.3% (167)	41.8%*,+ (69)	5.0%+ (10)	21.2% (88)

* indicates that the difference in proportion compared to New Jersey is significant at the 5% level

+ indicates that the difference in proportion compared to all other states is significant at the 5% level

Table 2

Weighted Least Squares Regression Analysis for Log-odds Ratio

	Estimated Coefficient	t statistic
Local Demographic Variables		
- Population (in 000s)	.0002**	3.83
- % change in housing, 1980-2000	.059	1.84
- % change in housing, squared	-.003*	-2.31
- % of residents with BA (age 25 and above)	.013**	3.16
- median household income (in 000s)	-.013**	-2.65
- median income, squared	.00005*	2.04
- Land area (in square miles)	-.0003**	-6.60
- Population density	-.000005	-0.26
- Farm population (% of total)	1.067	0.87
Referenda Dummy Variables		
- Fall election	.034	0.54
- Property tax	-.389**	-4.09
- Property tax surcharge	-.380**	-5.26
- Sales tax	-.307**	-3.40
- Income tax	-.134	-1.17
- Other mechanism	-.008	-0.08
- Renewal of existing program	.263**	2.57
Land Trust Dummy Variables		
- Regional land trust	-.058	-1.18
- County land trust	.109*	2.35
- Local land trust	.222**	3.65
Dummy Variables		
- New Jersey state dummy	.327**	3.61
- 2001	-.226**	-3.08
- 2002	-.136	-1.86
- 2003	-.129	-1.68
- 2004	-.173**	-2.76
- 2005	-.131	-1.75
- Constant	.805**	4.73
R^2	.2418	
Number of observations	781	

* indicates statistically significant at the 5% level

** indicates statistically significant at the 1% level

Table 3

Correlations Between Land Trust Presence and Financing Method
(Sample Excluding Massachusetts and New Jersey)

	Number of Referenda	Proportion of Referenda Using Bond Financing	Proportion of Referenda Using Property Tax Increases
No County or Local Land Trust	147	.646	.129
County and Local Trusts Present	56	.714	.125
County Trust Only	180	.589	.111
Local Trust Only	32	.875	.094

None of the differences in proportion are statistically significant at the 5% level.

Table 4
Weighted Least Squares Regression Analysis for Log-odds Ratioand Residuals

	Equation 2a		Residuals	
	Estimated Coefficient	t statistic	Estimated Coefficient	t statistic
Local Demographic Variables				
- Population (in 000s)	.0003**	6.06		
- % change in housing, 1980-2000	.036	1.16		
- % change in housing, squared	-.002	-1.46		
- % of residents with BA (age 25 and above)	.012**	2.82		
- median household income (in 000s)	-.009	-1.81		
- median income, squared	.00004	1.38		
- Land area (in square miles)	-.0004**	-8.74		
- Population density	-.00001	-0.75		
- Farm population (% of total)	.812	0.70		
Referenda Dummy Variables				
- Fall election	.051	0.80		
- Property tax	-.435**	-4.59		
- Property tax surcharge	-.348**	-4.55		
- Sales tax	-.370**	-4.36		
- Income tax	-.185	-1.67		
- Other mechanism	-.018	-0.20		
- Renewal of existing program	.297**	3.16		
Land Trust Dummy Variables				
- Regional land trust			-.046	-1.05
- County land trust			.084*	1.97
- Local land trust			.163**	3.08
Dummy Variables				
- New Jersey state dummy	.277**	2.98		
- 2001	-.220**	-2.96		
- 2002	-.157*	-2.01		
- 2003	-.150*	-1.98		
- 2004	-.171**	-2.61		
- 2005	-.151	-1.95		
- Constant	.790**	4.51	-.050	-1.15
R^2	.2094		.0341	
Number of observations	781		781	

* indicates statistically significant at the 5% level
** indicates statistically significant at the 1% level