The Determinants of Private Demand for Public Open Space: Evidence from U.S. Open-Space Referenda, 1998-2003

by

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Chapter 1: Introduction

> The trend toward larger lots and houses; the stark contrast in the profitability of real estate development versus agricultural land uses; lagging revitalization of urban centers and older suburbs; and local planning and zoning that hasn't kept up with such changes have all contributed to the [loss] of open space at unprecedented rates. The good news is that state and local governments are asking voters to protect the places most important to their communities, their quality of life and their children's futures—and voters are answering "yes" (Land Trust Alliance 2001).

Voters are indeed answering yes—almost 80 percent of the 971 open-space ballot questions held in the U.S. from 1998 to 2003 passed. For the analyst, however, the real questions lie deeper than this cheery statement implies. What, exactly, are voters saying yes to? Who is saying yes? Why are they saying yes? In short, how do the broad voting patterns in these referenda reflect the underlying demand for open space?

The opening quotation summarizes the conventional economic explanation for the need for open-space preservation. Open space is disappearing at "unprecedented rates" because of the development pattern known and hated as "urban sprawl," which economists consider to be a land market failure. Because open space is a public good, it is subject to the free-rider problem: open space provides benefits, such as pleasant scenery and ecosystem services, for which people do not pay.[1] Therefore, those services are not adequately internalized by land markets. The price of undeveloped land lies somewhere below its true social value, so households and firms consume more land than is socially desirable (Brueckner 2003). While there is some evidence that housing markets, left to their own devices, will produce some amount of open space due to negative spillover effects from development (Irwin and Bockstael 2002), these undeveloped areas are almost certainly not of the optimal size or quality.

[1] A public good is defined as a good that is non-excludable (people cannot be prevented from using it) and non-rival (one person's use does not diminish another person's use). Open space is not a pure public good, since its recreational uses may have some degree of excludability and rivalry. However, many of the other services it provides, such as aesthetic benefits and ecosystem services, are non-excludable and non-rival. Therefore, it makes sense to call it a public good, though it should be kept in mind that open space is not a pure public good.

In open-space referenda, citizens decide whether to tax themselves—and others—to fund the acquisition of undeveloped land. Therefore, such initiatives help ameliorate the market failure associated with sprawl by making citizens pay for the benefits of open space and by halting the encroachment of development. While open space may be preserved in other ways, such as regulation and development taxes, direct acquisition allows communities to prioritize the lands they want preserved. In addition, direct acquisitions avoid some of the difficulties that plague other conservation methods, such as choosing the "right" level of a development tax or the possibility of creating new market failures through regulation.

The rationale described above is the one championed by the Land Trust Alliance, and it is well supported in the literature; however, it is not the only story suggested by the literature. An alternative political-economic rationale for open-space preservation is that it increases the value of voters' most valuable asset, their homes. Open-space acquisitions can contribute to home value appreciation in two ways. First, acquisitions can restrict the local housing supply by blocking prospective development. Second, acquisitions create or preserve local public goods that may be capitalized into property values, as hedonic pricing models have shown. Therefore, when citizens vote for open space, they may be voting for an appreciation of their own property values rather than for environmental quality or recreation.

This thesis attempts to assess the relative strengths of the two rationales—which need not be mutually exclusive—in explaining the outcome of open-space referenda. Henceforth I refer to the Land Trust Alliance's story as the *conservation rationale* and the property value argument as the *asset price rationale*.

In addition to exploring the political economy of open space, this study attempts to characterize the effects of various community characteristics on voter support for open-space

acquisitions. As other researchers have done, I consider population growth, density, socioeconomic characteristics, and the attributes of the open space itself. To this usual list of explanatory variables I add the age profile of the community and the homeownership rate. Finally, my analysis fills a gap in the open space literature by examining the effects of financing mechanisms on demand for open space. Are some financing mechanisms preferable to others? In what ways do, say, the rate of property tax increase or the face value of a bond issue affect the likelihood of a "yes" vote?

A final contribution of this research is in assembling the largest and most comprehensive dataset so far in the open-space literature. The dataset combines detailed information on the financing and results of almost 800 open-space referenda with Census data on each of the jurisdictions holding those referenda.

This analysis finds that a wide range of factors, including demographic and socioeconomic community characteristics, the method of financing open-space acquisitions, the characteristics of the lands preserved, and the location and jurisdictional level of the referendum have an impact on the likelihood that a voter will vote "yes." I find particularly strong evidence that the proportion of citizens over age 65, the education level of the population, the level of homeownership, the financing mechanism, the presence or absence of farmland in the proposal, the region where the referendum takes place, and whether or not voting takes place on the county level are important determinants of referendum outcomes. I also find evidence, though less strong, that total population, land area, population density, the proportion of citizens under 5 years of age, and whether the vote creates a new tax or renews an existing one play a role as well. As will be discussed, the results do not unambiguously support either the conservation rationale or the asset price rationale.

The analysis begins with a review of the economic literature on open-space conservation in Chapter 2. In Chapter 3, I present a theoretical model of voter decision-making in an open-space referendum and describe the dataset and econometric specification. Chapter 4 provides descriptive statistics and takes up the issue of sample selection. Chapter 5 reports the estimated model and describes the major findings, and Chapter 6 discusses two case studies on open-space referenda in New Jersey and Massachusetts. I conclude with a summary of the contributions of this thesis in Chapter 7.

Chapter 2: Review of the Literature

A fairly sizeable economic literature has examined the structure of demand for open space. These studies may be classified under three general headings: hedonic property value analyses, contingent valuation (CV) surveys, and studies of open-space referenda. Each method has its share of advantages and disadvantages, which will be discussed in turn. Although this study belongs to the third category, hedonic pricing and CV studies address many of the same questions that referenda studies do, so all three strands in the literature are of interest.

2.1. Hedonic Property Value Studies

Hedonic property value studies begin with the hypothesis that proximity to local public goods, such as open space, provides a stream of benefits that is capitalized into housing prices. Such studies generally regress property values on a number of house characteristics, community characteristics, and public good variables. Differences in property values should reflect the market valuation of various local amenities, and consequently hedonic analyses frequently yield highly significant and robust estimates of amenity values. A significant disadvantage of hedonic property value analysis in the context of open-space studies is the potential for joint endogeneity between property values and open space.[2] In addition, the capitalization of the amenity value of open space may be a lengthy process, suggesting that time variance may confound this type of study (Riddel 2001).

Recent empirical work with hedonic models and open space has emphasized heterogeneities in the lands classified as open space. Using data from two British towns, Cheshire and Sheppard (1995) estimate hedonic models that distinguish between "open" land,

[2] In other words, causation may work both ways between home values and open space. The presence of open space may increase nearby property values, as these models assume. However, it is also possible that higher-value homes attract people who demand more open space, so more land ends up preserved in those areas. To the extent that this is true, hedonic models may attribute to open space home value differences that are really caused by other factors.

which has formal or informal public access, and "closed" land, which is privately owned. They find that the value of each land type, as reflected in its contribution to house prices, depends upon the relative scarcity of that land type in the community. Another study by Smith *et al* (2002) of the "research triangle" area in North Carolina distinguishes between "fixed-use" open space—including golf courses, public open space, and land on the right-of-way corridor for an interstate loop road—and "variable-use" open space—including vacant, agricultural and forested lands. They hypothesize that proximity to fixed-use parcels is more likely to be capitalized into housing values than proximity to variable-use parcels, and they find positive but not overwhelming evidence in favor of that hypothesis.

Similarly, Irwin (2002) finds that permanently preserved open space is associated with higher property values than forested or agricultural land that could potentially be developed. She concludes that "the public's demand for open-space preservation is motivated more by the fact that open space implies no development rather than being driven by particular features of open space landscapes."[3] Whether or not the claim is true, it is worth noting that Irwin's thesis seems more compatible with the asset price rationale than with the conservation rationale. If public demand for open space is not particularly sensitive to the features of the preserved landscapes, it seems unlikely that environmental or recreational benefits—which are themselves sensitive to landscape features—are the primary concern. As other categories of open-space literature have shown, however, landscape features do matter.

2.2. Contingent Valuation Studies

[3] One potential problem with this idea is the implicit assumption that permanence matters if what voters want is to block development but does not matter if what voters want is aesthetic, environmental or recreational benefits. I see no reason why this has to be true. A patch of forest that may be bulldozed at any time may be less valuable than a preserved patch of forest even if the "only" benefits it provides are aesthetic, environmental or recreational.

In contingent valuation (CV) surveys, researchers construct hypothetical markets to infer respondents' willingness to pay (WTP) for public goods such as open space. The CV method affords researchers enormous flexibility and freedom from many of the confounding variables that affect other kinds of investigation. However, CV surveys have frequently been criticized because the estimates they generate are sometimes inconsistent with economic theory. Furthermore, survey responses may deviate from responses in real situations, perhaps because subjects lack incentives to reveal their true preferences in hypothetical scenarios (Vossler *et al* 2003). For this reason, many of the more recent CV surveys dealing with open space have attempted to validate contingent valuation results with other methods. As was the case with the hedonic pricing literature, some CV surveys have also attempted to account for heterogeneity in open space.

Recognizing that incentives for truthful preference revelation may affect the results of CV surveys, Champ *et al* (2002) compare responses among three hypothetical payment mechanisms: individual contributions toward open-space acquisition, a provision point mechanism that required voluntary contributions from 30% of the population, and a one-time tax increase for open-space purchase. They find that the payment mechanisms do indeed matter: there is evidence of more affirmative responses with the tax relative to the individual contribution scenario, and weaker evidence of more affirmative responses with the tax relative to the provision point scenario. Although this study considers a different kind of variation in payment mechanism than mine does, this finding is an important motivation for my analysis. [4]

In addition, Champ *et al* find that a number of personal characteristics influence the likelihood of a response in favor of open-space acquisition. Dummy variables reflecting beliefs

[4] In Champ *et al*, the payment mechanisms vary in the degree to which other citizens are forced to bear some of the costs of open space. In my analysis, all of the mechanisms are imposed on everyone (like the tax in Champ *et al*), but the details of how the funds are extracted from the populace vary.

that open space should be acquired to preserve natural areas, beliefs that open space should be acquired to limit urban growth, and self-identified interest in the environment all have positive and significant coefficients. The distance from the respondent's home to the hypothetical open space parcel, along with dummy variables reflecting beliefs that government spending on open space is excessive and expectations of future move outside the survey area, have negative and significant coefficients.

In order to assess the validity of CV estimations, Vossler *et al* (2003) attempt to determine whether the results of a CV survey match the results of an open-space referendum in Corvallis, Oregon. They find that the survey results and referendum results are statistically different unless the "undecided" responses in the survey are treated as "no." In addition, WTP estimates based on survey data closely match WTP estimates based on election results only when "undecided" responses are treated as "no." Once again, financial considerations and personal characteristics influence demand for open space. The prospective tax increase faced by voters has a significant negative impact on WTP, while holding a college degree, having children, owning more than one property in Corvallis, and having recently visited a park or open space are all associated with higher WTP.

In a significant departure from the typical CV methodology, Kline and Wichelns (1998) attempt to avoid some of criticisms of CV by asking the Rhode Island residents they surveyed to assume that funding for open space had already been approved. Participants were surveyed on their relative preference for aesthetic, agrarian and environmental objectives and asked to choose between two hypothetical open space parcels with different physical characteristics. Using a logit model and survey data, with the log of the odds of a given parcel being chosen as the independent variable, Kline and Wichelns estimate coefficients on dummy variables for different

characteristics. The analysis yields positive and statistically significant coefficients for the following variables (in descending order of coefficient magnitude and hence desirability): beaches, fruit and vegetable farmland, crop or pasture farmland, rivers, rocky shores, and ponds. In addition, interaction dummies for endangered wildlife habitats and groundwater recharge areas are positive and significant. Finally, relative preferences for aesthetic, agrarian and environmental objectives are found to have significant impacts on preference orderings. Of course, a study without price variation might not properly be called a "contingent valuation" study, but Kline's and Wichelns' methodology is very similar because it analyzes responses to hypothetical scenarios.

2.3. Referenda Studies

A third category of studies attempts to infer characteristics of the demand for open space from the results of actual referenda and ballot initiatives. This method has the advantage of analyzing a well-defined choice setting with binding results, increasing the likelihood that the data will reflect people's true underlying preferences. Given the usual public debates attendant on ballot measures, we can expect participating voters-consumers to have excellent information on the prospective costs and benefits of open space. Perhaps the most significant drawback of this approach is that individual voting decisions cannot be observed, so private preferences must be inferred from aggregate-level data.

Many studies of open-space referenda, including my own, follow the approach developed in a seminal paper by Deacon and Shapiro (1975). Their analysis focuses on two referenda in California, one having to do with governance of coastal development and the other reallocating tax dollars to public transit. Their methodology, however, is broad enough to accommodate any

public good that can be supplied through referenda. Beginning from a simple utility function, they develop a model of voting behavior that leads to a "log-odds" econometric specification. I present a modified version of their theoretical model in section 3.1.

Applying Deacon and Shapiro's framework, Fischel (1979) analyzes the results from a referendum in eight New Hampshire towns asking residents whether they would allow a pulp mill to locate in their town. Unlike most studies in the Deacon and Shapiro tradition, Fischel utilizes individual-level data collected from a voter survey, so his analysis provides an excellent test of the validity of drawing inferences about individual voters from aggregate data. He finds that distance from the Connecticut River, living in a "milltown," and employment in the construction industry are statistically significant predictors of "yes" votes. In this case, of course, the proposal being voted on is an environmental "bad." Consistent with Vossler *et al*, and with the common perception that individuals with higher socioeconomic status have a higher demand for environmental quality, the income variable and the college attendance and professional dummy variables are significant predictors of "no" votes. Fischel concludes that his technique of analyzing individual voter responses yields results similar to those of aggregate-level studies of referenda, bolstering the case for the generally simpler approach of using jurisdictional vote tallies and mean characteristics. This result provides some confidence about the validity of drawing inferences about individuals from state-, county- and local-level data.

A more recent paper that uses aggregate data from environmentally focused referenda is Kahn and Matsusaka (1997). They examine county-level results on 16 California referenda, two of which were for bond issues for parks and wildlife refuges. Like Fischel, they find income and education to be strong predictors of support for environmental initiatives.[5] Residence in an

[5] Since these referenda deal with environmental goods rather than bads (as in Fischel), income and education predicted "yes" rather than "no" votes.

urban county is usually positive and significant as well. Kahn and Matsusaka's findings also suggest that the effects of income on voting behavior may be nonlinear. The coefficients on income squared are negative, which the authors interpret to mean that publicly supplied environmental amenities become inferior goods at high levels of income. Kahn and Matsusaka also use the counties' levels of per capita income from construction, farming, forestry and manufacturing as proxies for the "cost" of environmental quality. The rationale for these proxies is that areas that are more economically dependent on extractive industries will be less likely to vote for environmental preservation, since environmental laws often adversely affect those industries. In most cases, these industry variables enter with negative and significant coefficients. Contrary to the commonsense notion that Democrats are more likely to support environmental preservation than Republicans, they do not find substantial effects of political ideology on referenda outcomes.

Kline and Wichelns (1994) are concerned with farmland preservation rather than open space, but their study provides an outstanding prototype for applications of Deacon and Shapiro's framework to open-space referenda. They use log-odds regressions with the town-level tallies from farmland preservation referenda in Pennsylvania and Rhode Island. Interestingly, income turns up insignificant for both regressions, and education is positive and significant only for Rhode Island. In Pennsylvania, towns experiencing rapid population growth and more urbanized towns were significantly more likely to support government purchase of development rights (PDR) for farmland. In Rhode Island, towns with declining farmland areas, fast-growing populations, fast-growing home values, and a high proportion of fragile "resource-sensitive" lands showed significantly higher support for farmland preservation. The significant coefficient on the "resource-sensitive" lands variable suggests that the characteristics of the land

offered for preservation probably have an impact on demand for open space. This result accords with the later study by Kline and Wichelns (1998) that finds that some physical characteristics are significantly preferred to others. Ideally, then, a study of open-space referenda should include variables for land characteristics. In the next chapter, I discuss my own attempt to include such variables in the analysis.

The paper that is perhaps most relevant to this thesis is Romero and Liserio (2002). Instead of the log-odds approach of Deacon and Shapiro, Romero and Liserio use the likelihood of passage and a simple proportion of "yes" votes as their independent variables. This method misses out on the advantages of the log-odds specification, which are discussed in section 3.1. What is more noteworthy in Romero's and Liserio's study is their attempt to characterize not only the determinants of "yes" votes in open-space referenda, but also the determinants of having a referendum in the first place. They use data from 132 American jurisdictions (towns, counties and even a few states) with open-space ballot questions in 1998 and 1999, together with a control group.[6] They find that low population and a high proportion of non-Hispanic Caucasians predict the appearance of open-space referenda. Income and population density are positive but insignificant in explaining the emergence of referenda.[7] In the likelihood-of-passage regression, all four explanatory variables are highly insignificant. In the regression on percentage of "yes" votes, only density is significant and enters with a positive sign. The authors interpret this result to mean that, contrary to the conventional wisdom of the conservation rationale, "less sprawled" communities are more likely to support open-space acquisition. However, this inference rests on the questionable assumption that low population density indicates sprawl. A low-density city

[6] Regrettably, they do not use a random control group, but the set of 28 "most sprawled cities" as identified by the Sierra Club. This almost certainly biases the control group in favor of higher-population cities, since those cities must be large enough to merit the Sierra Club's attention. It is likely that the non-random control group biases the regression in other ways as well.

[7] The insignificance of income may be due to multicollinearity with the percentage of non-Hispanic Caucasians.

may be "sprawled," but it may also be a compact city with a greenbelt within its borders. I will discuss this issue in more depth when interpreting density effects in section 5.1.

2.4 Implications for Research

Taken together, these papers suggest a number of potential directions and caveats for this study. Indicators of socioeconomic status clearly have their place in referenda analyses. Population growth is likely to be significant as well, to the extent that it feeds perceptions of open space loss. Given the connections between sprawl and open space, the level of and changes in population density seem likely to affect public preferences, but the interpretation of density should be approached with caution. Kahn and Matsusaka's study suggests that the prospective costs of environmental protection are important, and Champ *et al*'s work suggests that payment mechanisms may influence individual decisions as well. Neither Kline and Wichelns (1994) nor Romero and Liserio account for the costs or payment mechanisms of open space, but this thesis will move in that direction by including variables reflecting the financing mechanisms for open-space acquisitions. The work of Kline and Wichelns, along with several hedonic property value studies, recommend consideration of open-space characteristics when possible.

Liserio and Romano suggest in their conclusion that the economic slowdown that began in 2001 may mean that "the modern high water mark for the appearance and success of land preservation ballot measures" may have passed. Although far from conclusive, a decline in the appearance, pass rates or proportion of "yes" votes in these referenda after 2000 would certainly be suggestive of macroeconomic influences.[8] Many of the papers described here found significant fixed effects from political jurisdictions, and since the research here covers a broader

[8] Of course, this need not be the case; a decline in support for open space after 2000 could simply mean that the "low-hanging fruit" had been picked by then.

geographic area than any of them, regional and state fixed effects are especially important. Finally, Liserio and Romero and Bates and Santerre (2001) hint at the asset price explanation for open-space preservation, that is, the desire of homeowners to drive up the value of their homes, either by restricting the housing supply or creating new public goods. Accordingly, this thesis attempts to move beyond hints and provide some evidence to illuminate this debate.

Chapter 3: Theoretical and Empirical Methodology

3.1. Theoretical Model

The theoretical model is a simplified version of that in Deacon and Shapiro (1975). I assume that each voter *i* consumes a composite private good x^i, which is priced at p, and a level of open space q, which is a public good. Voter-consumers are subject to the budget constraint $I^i - S^i$, where I^i is money income and S^i is total tax liability. To capture the fact that q, S^i and p may change with the open-space policy, I add subscripts so that q_k, S^i_k, and p_k, correspond to different policy regimes denoted with k. Each individual's utility depends upon consumption of the private good and open space according to the utility function

$$U^i = U(x^i, q_k). \tag{1}$$

I write the utility-maximizing condition in indirect form as a function of open-space consumption, private good prices, and disposable income:

$$\max_{xi} U^i \ (x^i, q_k) \text{ subject to } I^i - S^i_k = p_k x^i \ \equiv \ V^i (q_k, p_k, I^i - S^i_k). \tag{2}$$

Now assume that voter-consumers have the opportunity to alter public policy by participating in an open-space referendum. Let $k = 1$ denote the acquisition of an open space through the referendum and let $k = 0$ represent the status quo. Each voter evaluates the highest attainable utility possible under each outcome,

$$V^i (q_0, p_0, I^i - S^i_0) \equiv \ V^i_0 \tag{3}$$
$$V^i (q_1, p_1, I^i - S^i_1) \equiv \ V^i_1, \tag{4}$$

and the difference in prospective utility between the two outcomes is

$$V^i_1 - V^i_0 \ = \Delta V^i (q_0, p_0, I^i - S^i_0, \Delta q, \Delta p, \Delta S^i), \tag{5}$$

where Δ denotes changes in the policy-influenced variables as a consequence of an open-space acquisition. For convenience, I follow Deacon and Shapiro in substituting the symbol *z* for the vector of arguments in equation (5):

$$V^i_1 - V^i_0 \ = \Delta V^i (z^i). \tag{5'}$$

Finally, I assume that the change in utility is also a function of individual tastes and preferences, which I assume to be captured by a vector of political and socioeconomic characteristics *y*:

$$V^i_1 - V^i_0 = \Delta V^i (z^i, y^i). \quad (6)$$

My interpretation of *y* is broad; it includes, for example, renter or homeowner status and perceptions of population growth in the community. Given equation (6), we now have a straightforward decision rule: vote yes on the referendum if $\Delta V^i = \Delta V^i (z^i, y^i) > 0$, and vote no otherwise. As in Fischel (1979) and Kahn and Matsusaka (1997), I have simplified Deacon and Shapiro's model to eliminate abstentions, since my dataset provides information only on "yes" and "no" votes. The decision to regard an unchanged utility level as a "no" vote is somewhat arbitrary, but Vossler *et al*'s (2003) finding that survey data agrees with voting data only when "undecided" responses are treated as "no" gives me some empirical justification for doing so.

Since I cannot observe individual voting decisions with my dataset, I adopt Deacon and Shapiro's assumption that the distribution of ΔV^i for each jurisdiction *m* is a function of the mean voter attributes z^*_m and y^*_m. Letting $P(Y \mid z^*_m, y^*_m)$ denote the probability of a "yes" vote, and assuming a logit model, it follows that

$$P(Y \mid z^*_m, y^*_m) = [1 + \exp(\Delta V_m)]^{-1}, \quad (7)$$

where ΔV_m is the expected change in utility for a randomly selected individual from jurisdiction *m,* which depends upon the vectors of mean community attributes z^*_m and y^*_m. Substituting the symbol P_y for the left-hand side of equation (7) and rearranging yields

$$\ln \{P_y / [1 - P_y]\} = \Delta V_m . \quad (8)$$

Finally, I assume a linear relationship between ΔV_m and its arguments:

$$\Delta V_m = B_0 + B_1 z^*_m + B_2 y^*_m. \quad (9)$$

Since z^*_m and y^*_m are vectors of characteristics, B_1 and B_2 are the corresponding vectors of coefficients. I now substitute equation (9) into equation (8) to yield the finished model:

$$\ln \{P_y / [1 - P_y]\} = B_0 + B_1 z^*_m + B_2 y^*_m + \nu_m, \qquad (10)$$

where ν_m is the error term.

Equation (10) may be interpreted as follows. The dependent variable is the log of the odds ratio of a "yes" vote: if the odds of a randomly selected individual voting "yes" are 2 to 1, this variable takes the value of ln(2). It is a function of mean community characteristics, including incomes, potential gains in open-space consumption, potential increases in the tax burden, the proportion of renters in the community, perceptions of population growth, and the age profile of the community. Since P_y is the probability of randomly choosing a "yes" voter, the estimations will use the proportion of "yes" votes in actual referenda for P_y. The explanatory variables will be mean values of characteristics listed above—or, when appropriate, mean values of proxies for those characteristics—for each jurisdiction. In addition, the models will include variables reflecting the financing mechanism for open-space acquisitions, which are embedded in ΔS, and hence z^*_m, in the model.

This "log-odds" approach has two distinct but interrelated advantages. First, it will never yield estimates of P_y that are less than 0 or greater than 1, which would obviously be unrealistic. Second, the effects of the independent variables diminish at the extremes of the distribution, which accords with the intuition that a given change in a variable—say income—will cause more individuals to change their minds in an "average" community than in a very rich or a very poor community. The model's chief disadvantage is that magnitudes (not the signs) of the coefficients in B_1 and B_2 are not as easily interpreted as we might like; many of us are probably not accustomed to thinking in terms of percent changes in odds. For that reason, when

discussing the estimations in Chapters 5 and 6 I will often transform a particular coefficient into the impact of a marginal change in the variable on the outcome of a referendum that began as a 50-50 tie.

3.2 The Dataset

The goal of this study is to estimate equation (10) for a set of jurisdictions that held open-space referenda between January 1, 1998 and December 31, 2003. The data on open-space referenda come from an annual survey of state and local ballot measures for parks and open space. For the 1998 through 2000 survey years, these publications were known as *Voters Invest in Open Space* and published by the Land Trust Alliance (Land Trust Alliance 1999, 2000, 2001). For the 2001 through 2003 survey years, these publications were titled *LandVote* and jointly published by the Trust for Public Land and the Land Trust Alliance (Trust for Public Land and Land Trust Alliance 2002, 2003, 2004). These six reports account for 971 open-space referenda during the study period. For each referendum, the surveys list the jurisdiction, the proportion of votes "for" and "against," a brief description of the proposed initiative and funding mechanism, the change in the relevant tax rate where applicable, the duration of the financing plan where applicable, and the total funds committed by all of the successful referenda. Unfortunately, the total funds proposed in the unsuccessful measures are not listed, which limits the usefulness of that variable for this analysis. I discuss the implications of this gap in the data in Appendix 1.

Each of the ballot initiatives included in *Voters Invest in Open Space* and *LandVote* involve open-space acquisitions. Thematically related referenda, such as those dealing with growth controls, are excluded. Beyond that selection criterion there is a large degree of variation

in the ballot questions reported. Some proposals are for the purchase of specific parcels, while others simply commit funds for future acquisitions. Some proposals incorporate funds for maintenance or improvements, and others preserve areas with endangered species habitats or places of historical importance. As will be discussed shortly, I attempted to account for some of this variation in the creation of the dataset

The remainder of the data comes from the U.S. Census. From the Census website, I collected data on spatial, demographic and socioeconomic characteristics for the states, counties, cities, towns, townships, villages, and boroughs in the dataset. Of the 971 referenda reported by the TPL and LTA, 43 were conducted by park districts, which are governmental entities that provide recreational services to residents of a certain geographic area. Since the Census does not report data at the park district level, I had to exclude those referenda from the dataset. I dropped another 77 referenda from locations that I could not identify with certainty in the Census dataset. In most of those cases, there was some ambiguity in the place names reported by the TPL and LTA.[9] Finally, I excluded the 55 referenda that did not involve any kind of fiscal policy change (e.g. advisory measures) or for which the TPL and LTA did not provide the amount of the tax increase or bond issue. Thus, the final dataset included full information—Census data and financing details—for 796 of the 971 votes reported from 1998 to 2003.

3.3. Econometric Specification

I now turn to a detailed discussion of the variables I compiled for potential inclusion in the regression models. Definitions and sources of all variables, including some that do not

[9] For example, one referendum was reported in Washington Township, NJ—of which there are six!

appear in any of the regressions, are listed in Appendix 2. In each regression, the dependent variable is LOGODDS, the natural logarithm of the odds ratio of a "yes" vote. To calculate the odds ratio, I take the proportion of "yes" votes in decimal form for each referendum and divide by the quantity 1 minus the proportion of "yes" votes.

The first set of explanatory variables relates to spatial and demographic characteristics of each jurisdiction, which are considered part of y* in the theoretical model. The variable POPN is simply the jurisdiction's 2000 population. I have no strong priors about this variable and include it as a control. AREA is the land area of the jurisdiction in square miles. We might expect this coefficient to be negative. Both Fischel (1979) and Champ *et al* (2002) report diminishing support for environmental amenities with increasing distance from the amenity, and it seems likely that the mean voter lives farther from the proposed acquisition in larger jurisdictions. LOGDENS is the natural logarithm of population density in persons per square mile. Considering the large variation in density in the dataset—from 0.43 to 16,636 persons per square mile—I suspected that percentage changes in density would be more telling than absolute changes; therefore, I opted for the log specification of density. For reasons discussed in section 2.3, this measure is not ideal; it fails to distinguish between pervasive low-density development and a mixture of high-density development and undeveloped land. Unfortunately, this was the only density measure easily available for this study, but possibilities for more serviceable density variables in future research are discussed in section Appendix 1. My own expectation is that LOGDENS roughly tracks the proportion of land that is developed, so that open space will be relatively scarce in high-density areas. Assuming that the marginal value of open space is highest in such places, we might expect the coefficient on LOGDENS to come out positive.

Other spatial and demographic variables include the following. POPNCHG is the percentage change in population from 1990 to 2000. Based on the consensus of the literature, my strong prior is a positive coefficient on this variable. Since I do not regard LOGDENS as an appropriate proxy for sprawl, I include TRAVWORK, the median commuting time to work, as an alternative. It seems reasonable to expect that commuting times will be longer in a sprawled area than in a compact area, but this is not an ideal proxy either because of possible confounding factors (e.g. the degree of employment suburbanization). However, if TRAVWORK is a suitable proxy for sprawl, it may be expected to come through positive, at least according to the conservation rationale. Finally, I include three variables measuring the age profile of the community: UNDER5, UNDER18 and OVER65. All are expressed as percentages of the population in the given age category. Vossler *et al*'s (2003) finding that voters with children are more likely to support open-space acquisitions leads me to predict positive coefficients on UNDER5 and UNDER18. The likely voting patterns of senior citizens are not obvious. On the one hand, many seniors are on fixed incomes and may be especially unsupportive of tax increases. On the other hand, seniors may support open space because they likely have more leisure time to enjoy its recreational benefits (the conservation rationale) and may be more likely to be contemplating selling their homes in the near future (the asset price rationale).

The next set of variables pertain to socioeconomic status and appear in the theoretical model both within z* and within y*. Although I have data on both median household incomes and per capita incomes, I have opted instead for BA, the proportion of the population with a bachelor's degree or higher, as the primary proxy for socioeconomic status. Education tracks income closely,[10] but it also captures the effects of education *qua* education, which may include

[10] Within the dataset, the coefficient of correlation between BA and MEDHHINC (median household income) is 0.67.

greater knowledge of and reasoning ability in environmental and public policy issues. Since the literature consistently finds demand for open space to be increasing with education, the coefficient on BA should be positive.[11] HOMEVAL is the median value of owner-occupied housing units. Since home values also track income fairly closely,[12] this variable may simply create collinearity with BA, but it is worth including because there is at least one reason to believe it may have the opposite effect. The majority of referenda in the dataset involved property tax increases, property tax surcharges, or bonds, which tend to be repaid with property tax revenues. For that reason, HOMEVAL likely tracks the prospective ΔS faced by voters, which would imply a negative coefficient.

The final socioeconomic variable is HOMEOWN. It is not the actual homeownership rate in each jurisdiction, but rather the percentage of occupied housing units that are owner-occupied, which should be quite close to the homeownership rate.[13] This variable provides an excellent test of the asset price rationale. If the coefficient on HOMEOWN is strongly significant and positive, the implication would be that homeowners are systematically more likely to vote for open space, controlling for other dimensions of socioeconomic status. Assuming that HOMEOWN was not correlated with any omitted variables, such a result would support—or at least not refute—the asset price rationale, since it would imply that homeowners have an incentive to vote for open space that renters lack.

The next set of variables covers financing rates and mechanisms: Δp and ΔS in the theoretical model. The dummy variables PROPTAX, SURCHARGE, BOND, SALES and

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[11] The other reason for using education over income is that, having run many different versions of the model, I found that BA consistently had more explanatory power than MEDHHINC. MEDHHINC became insignificant in the presence of correlated variables, such as HOMEVAL, but BA remained significant regardless of the specification used.

[12] Within the dataset, the coefficient of correlation between HOMEVAL and MEDHHINC is 0.65.

[13] From this point on I will use the terms "homeownership rate" and "owner-occupancy rate" interchangeably, but readers should keep in mind that owner-occupancy is the actual measure used here.

INCOME denote, respectively, property tax increases, property tax surcharges, bond issues, sales tax increases, and income tax surcharges.[14] A final dummy variable, OTHER, covers the broad spectrum of finance mechanisms too rarely used to warrant their own variables: parcel taxes, real estate transfer taxes, retailers occupation taxes, lottery taxes, hotel taxes, and intragovernmental transfers, to name the more common ones. Since BOND is the least like the other variables, it will be the omitted category. A bond issue is obviously not free money; bonds must be repaid eventually, either through taxes (most commonly property taxes), cuts in other public services, or existing or forecasted budget surpluses. However, it is possible that voters perceive bonds in a more favorable light—perhaps because bonds alone can raise millions of dollars almost immediately—so I expect that the other mechanisms will have negative coefficients with respect to bonds.

The model will also include variables for the size of the tax increase or bond issue. PTAXRATE is the property tax increase in mills (one mill is $1 per $1,000 assessed value of the property), SURCHRATE is the property tax surcharge as a percent, BONDRATE is the face value of the bond in millions of dollars, SALESRATE is the increase in the percentage value of the sales tax, and INCRATE is the income tax surcharge as a percent. At first glance, these variables may appear to capture the price of open-space acquisitions, but in reality their interpretation is not so straightforward. Consider two jurisdictions, A and B, that are identical in their socioeconomic and demographic characteristics. Both are having open-space referenda, but A's tax rate is twice B's. On one extreme, the tax rates may be so different because A's land is twice as expensive, in which case the tax rate is capturing the price of open space. On the other extreme, the land may be equally expensive, but A may be buying twice as much of it, which

[14] One referendum in the dataset involved two funding mechanisms, a sales tax increase and a bond issue. That observation was simply assigned a "1" for both the SALES and BOND dummy variables.

would imply that the tax rate is actually measuring the quantity of the public good.[15] In either case, however, the coefficient on the tax rate variable should be negative. In the first case, where the tax rate measures the price, the law of demand implies a negative coefficient. In the second case, where the tax rate measures the quantity, voters in A are paying twice as much tax and getting twice as much open space. Assuming diminishing marginal utility of open space, however, they are getting less than twice as much utility from the acquisition. The benefit-cost ratio will be lower in A, implying fewer "yes" votes in A—and, by extension, a negative coefficient on the tax rate variable. In short, no matter what the interpretation of the tax and bond rate variables happens to be, the appropriate theoretical expectation is a negative coefficient.

A final finance-related variable is EXTEND, a dummy variable that takes the value of 1 if a ballot question renews an existing funding mechanism scheduled to expire rather than creating a new one. I expect this coefficient to be positive. If EXTEND takes the value of 1, it implies that voters have approved the same open-space financing mechanism once already, so it seems likely that they would vote for the same thing again.

Keeping in mind the repeated references in the literature to the importance of open space attributes, I constructed a series of dummy variables for particular characteristics. PARKREC indicates parks, playgrounds or other recreational services; FARM specifies which referenda included or consisted of farmland preservation measures; ENVIRO represents ecological benefits such as endangered species habitats; WATER signifies drinking water protection or groundwater recharge areas; and HISTPRES specifies referenda that had historical preservation measures attached to them. I based the values of these dummy variables on descriptions of the referenda in

[15] In reality, different tax rates are probably explained by a combination of price and quantity when everything else is controlled for. As I argue, however, both price and quantity effects should have the same result, so this should not matter.

the TPL and LTA's publications, and a list of terms corresponding to each variable appears in Appendix 2. Those descriptions were drawn in turn from the ballot language of each referendum.[16]

The final set of variables in the model is intended to cover government level, regional, state, and year fixed effects. STATE and COUNTY will be included in the model with LOCAL as the omitted category. I expect the coefficients on STATE and COUNTY to be negative for the same reason I expect the coefficient on land area to be negative. Open spaces acquired at the state or county level are likely to be further away for the average voter, implying greater travel costs for visits and less impact on property values. The four regional variables are NE (Northeast), MW (Midwest), SOUTH and WEST. My prior on these variables is comparatively lower support in the West due to the abundance of undeveloped and federally protected land in that region. In at least some of the models, I will drop the regional fixed effects and include state fixed effects in order to capture more precisely the variation in development patterns, laws and institutions, and political attitudes across the country. Finally, I include year fixed effects to investigate Romero and Liserio's (2002) hypothesis of declining support for open space during the economic slowdown earlier this decade. Negative coefficients on the year dummies after 2000 would not, of course, be conclusive evidence for macroeconomic effects; they might also imply that the "low-hanging fruit" had been picked.

Chapter 4: Descriptive Statistics and Selection Issues

4.1. Descriptive Statistics

[16] I have less confidence in these variables than in any of the others, since the ballot language may not adequately capture the services offered by the prospective open space purchase. For that reason, if the coefficients turn out insignificant, I would not take that result as evidence against the importance of these open space attributes.

Descriptive statistics for the dataset appear in Tables 4-1 through 4-7. Perhaps most striking is the extraordinarily high pass rate of these referenda: over four-fifths of the ballot questions in the sample passed, and the average measure won the support of 60 percent of the electorate (Table 4-1). The mean percentage voting "yes" was significantly higher than the sample mean in 1999 and 2000 but significantly lower in 2001, perhaps indicating some business cycle effects (Table 4-2). The referenda are highly concentrated in the Northeast, which claimed two-thirds of the ballot measures in the sample. The proportions of "yes" votes do not differ significantly from the sample mean in any region, but this may only be the case because the relatively small numbers of observations outside the Northeast give rise to wide confidence intervals (Table 4-3). The sample is also heavily concentrated among local ballot initiatives, with very few happening at the state level, perhaps suggesting that open space is most efficiently supplied as a local public good (Table 4-4a). In addition, the level of government at which referenda are conducted appears to vary by region. The Northeast, with 66 percent of all referenda, accounts for only 30 percent of state-level and 22 percent of county-level referenda. The West, by contrast, accounts for only 14 percent of the sample but has 44 percent of the state and 27 percent of the county referenda (Table 4-4b). These trends are clear evidence of institutional variation in open-space provision across the country, which forms an important part of the context in which voters make their decisions.

Property taxes and bonds represent the bulk of the financing plans within the sample; each mechanism accounts for 33 percent of the referenda (Table 4-5). Property tax surcharges constitute an additional 16 percent, with the remainder divided among sales taxes, income tax

Descriptive Statistics for U.S. Open-Space Referenda, 1998-2003

Sources: Land Trust Alliance 1999, 2000, 2001; Trust for Public Lands and Land Trust Alliance 2002, 2003, 2004; United States Bureau of the Census-State and County Quickfacts; United States Bureau of the Census- American Fact Finder; United States Bureau of the Census- U.S. Gazetteer.

Table 4-1: Referenda Results, Full Sample

	N	Percentage Passing	Percentage Voting "Yes"					
			Mean	SD	95% Conf. Int.		Min	Max
Sample	796	80.15	60.35	12.81	59.46	61.24	18.3	91

Table 4-2: Referenda Results by Year

	N	Percentage Passing	Percentage Voting "Yes"			
			Mean	SD	95% Conf. Interval	
1998	121	84.30	60.78	10.24	58.93	62.62
1999	83	92.77	64.58	12.79	61.79	67.37
2000	158	87.34	63.17	11.19	61.41	64.93
2001	178	69.10	55.58	14.32	53.46	57.69
2002	149	77.85	60.54	13.44	58.36	62.71
2003	107	76.64	60.12	11.89	57.84	62.40

Table 4-3: Referenda Results by Region

	N	Percentage Passing	Percentage Voting "Yes"			
			Mean	SD	95% Conf. Interval	
NE	528	80.30	60.61	13.20	59.49	61.74
MW	62	79.03	57.97	11.89	54.94	60.99
SOUTH	96	83.33	62.22	11.89	59.81	64.63
WEST	110	77.27	58.81	11.97	56.55	61.07

Table 4-4a: Referenda Results by Jurisdictional Level

	N	Percentage Passing	Percentage Voting "Yes"			
			Mean	SD	95% Conf. Interval	
STATE	23	86.96	62.55	9.61	58.40	66.71
COUNTY	140	78.57	58.71	12.03	56.70	60.72
LOCAL	633	80.25	60.64	13.07	59.62	61.65

Table 4-4b: Jurisdictional Levels by Region

	N	NE		MW		SOUTH		WEST	
		N	%	N	%	N	%	N	%
STATE	23	7	30.43	3	13.04	3	13.04	10	43.48
COUNTY	140	31	22.14	31	22.14	40	28.57	38	27.14
LOCAL	633	490	77.41	28	4.42	53	8.37	62	9.79

Table 4-5: Referenda Results by Funding Mechanism

	N	Percentage Passing	Percentage Voting "Yes"			
			Mean	SD	95% Conf. Interval	
PROPTAX	264	84.85	60.17	10.77	58.86	61.47
SURCHARGE	131	56.49	51.26	11.61	49.25	53.27
BOND	264	90.53	65.95	11.61	64.55	67.36
SALES	49	65.31	54.15	12.88	50.45	57.85
INCOME	22	81.82	61.21	11.25	56.23	66.20
OTHER	67	77.61	60.94	13.83	57.21	64.67

Table 4-6: Descriptive Statistics for Funding Rates

Variable	Unit	Mean	SD	Min	Max
PTAXRATE	Mills	.28	.34	.001	2.5
SURCHRATE	Percent	2.51	.78	.5	3
BONDRATE	Millions $	49.13	242.12	.025	2300
SALESRATE	Percent	.44	0.40	.03	2
INCRATE	Percent	.22	.14	.00125	.5

Table 4-7: Frequencies of State Dummy Variables

Variable	N	Variable	N	Variable	N
AK	1	**MA**	138	**OH**	16
AL	1	**MD**	5	**OK**	3
AR	2	**ME**	8	**OR**	8
AZ	7	**MI**	12	**PA**	38
CA	16	**MN**	6	**RI**	24
CO	54	**MO**	5	**SC**	8
CT	22	**MT**	2	**TX**	23
DE	1	**NC**	16	**UT**	2
FL	30	**NH**	20	**VA**	8
GA	13	**NJ**	227	**WA**	7
IA	1	**NM**	9	**WI**	3
IL	18	**NV**	3	**WY**	1
KS	1	**NY**	35		

surcharges, and other mechanisms (Table 4-5). In agreement with the stated priors, the proportion of "yes" votes is significantly higher than the sample mean among bond issues and significantly lower among sales taxes and property tax surcharges (though not, interestingly, property taxes). Table 4-6 presents summary statistics for the size of tax increases and bond issues. The variation here is quite pronounced. Property tax increases, for example, range from

a modest .001 mill (which would cost the average U.S. homeowner a mere 12 cents per year) to a quite large 2.5 mills (which would cost the same person nearly $300).

Table 4-7 gives the frequencies of the state dummy variables. Thirty-nine states are represented in the dataset. New Jersey and Massachusetts were by far the most prolific states for open-space referenda during the period under study. Because of the large number of observations in these two states, I conduct case studies of both of them in Chapter 6. Other states with a sizeable number of referenda were Colorado, Pennsylvania and New York, which were, respectively, third, fourth and fifth.

Two other dummy variables appearing in the final regressions but not reported in these tables are EXTEND and FARM. Twenty-nine referenda, which comprise 4 percent of the dataset, involved extensions of existing programs. One hundred twenty-four referenda, or 16 percent of the dataset, involved farmland preservation.

4.2. Selection Issues

The appearance of an open-space referendum in a particular jurisdiction is not a random event, but an outgrowth of political, economic, and often environmental factors that motivate citizens or public officials to place these measures on the ballot. Therefore, a thorough characterization of the demand for open space must include not only what factors predict a “yes” vote, but also what factors predict having a vote in the first place. For that reason, Romero and Liserio’s (2002) effort to include a selection model in their study was commendable, although their methodology was highly problematic. Given the complexity and difficulty of constructing an appropriate random control group from among the tens of thousands of jurisdictions in the U.S., I do not attempt a formal selection model here. However, it is possible to undertake a

statistical comparison of the jurisdictions in the dataset to the United States as a whole. To do so, I calculate the 95% confidence intervals for the sample means of relevant Census variables. If the mean value for the U.S. as a whole (or, in the case of percentages, simply the percentage value for the U.S. as a whole) lies outside of this confidence interval, I conclude that the sample differs significantly from the U.S. as a whole for that variable.

The results of this analysis appear in Table 4-8. In almost every category, the sample differs significantly from the country as a whole. The jurisdictions that had open-space referenda grew over twice as fast, on average, as the U.S. between the 1990 and 2000 Censuses. High growth and its attendant development may be a "trigger" for the appearance of open-space

Table 3-8: Descriptive Statistics for Jurisdictions Represented in Open Space Dataset, as Compared to Nationwide Statistics

Variable		Mean	SD	95% Conf. Int.		Min	Max
POPNCHG (%)	*Sample*	27.72*	129.30	18.73	36.72	-52.22	3433.73
	U.S.	13.1					
UNDER5 (%)	*Sample*	6.49*	1.43	6.39	6.59	1.7	12.9
	U.S.	6.8					
UNDER18 (%)	*Sample*	25.14*	5.92	24.73	25.55	8	35.6
	U.S.	25.7					
OVER65 (%)	*Sample*	12.59	5.59	12.20	12.98	1.5	54.5
	U.S.	12.4					
HS (%)	*Sample*	88.62*	6.28	88.18	89.06	51.5	99.4
	U.S.	80.4					
BA (%)	*Sample*	37.73*	15.09	36.68	38.78	8.3	91.4
	U.S.	24.4					
HOMEOWN (%)	*Sample*	75.24*	13.78	74.28	76.20	9.8	98.4
	U.S.	66.2					
HOMEVAL ($100,000)	*Sample*	2.102*	122.3	2.024	2.180	.157	10+
	U.S.	1.196					
MEDHHINC ($)	*Sample*	62569*	21126	61099	64039	21180	159691
	U.S.	41994					
POVERTY (%)	*Sample*	6.48*	4.90	6.14	6.83	.7	37.4
	U.S.	12.4					
TRAVWORK (minutes)	*Sample*	27.55*	5.83	27.15	27.96	8.3	47.8
	U.S.	25.5					

**Indicates that sample mean is significantly different from the national figure at the 5% level.*

referenda, as the conservation rationale suggests. Interestingly, the sample means for the percentage of the population under 5 and under 18 were significantly lower than the U.S. figures. It does not seem obvious why referenda tend to emerge in communities with fewer children, but at any rate the disparity involved is not large. The percentage of senior citizens in the population is the only variable in which the sample mean does not differ significantly from the national figure.

The differences between the sample and the U.S. as a whole become more stark as we turn to socioeconomic variables. The average citizen in a jurisdiction that had an open-space referendum is far more likely to have graduated from high school, to hold a college degree, and to own his or her own home. The median home value is 76 percent higher, the median family income is 49 percent higher, and the poverty rate is 48 percent lower in the sample. In short, open-space referenda are emerging in disproportionately well-educated and affluent communities. This trend may bolster the case for open space as a normal good, but it is also possible that open space is simply more scarce in high-income areas. The high rates of homeownership in the sample may be evidence for the asset price rationale. Without a regression, however, it is impossible to tell whether homeownership itself is driving the appearance of referenda or homeownership is high in the sample merely because income is also high. Finally, the median commuter in the sample spends significantly more time getting to work than the median commuter in the U.S. This may be evidence of greater sprawl in the sample, but as noted before, TRAVWORK needs to be interpreted with caution.[17]

In sum, a comparison of the sample to the U.S. reveals that open-space referenda happen in jurisdictions that are wealthier, faster-growing, perhaps slightly older, and perhaps more

[17] Unfortunately, there seems to be no sensible way to compare density, since the average population density for the U.S. would include the Everglades, Gates of the Arctic National Park, and other enormous swathes of undeveloped land.

sprawled than the nation as a whole. Although this analysis is not as convincing as a formal selection model, I suspect that a regression with a random control group would yield many of the same findings. Against this background, I now turn to the predictors of "yes" votes in the jurisdictions that had referenda.

Chapter 5: Results and Discussion

To ensure the robustness of the results, I have run several different versions of the basic log-odds regression presented in section 3.3. I present two specifications in this chapter, but several more specifications appear in Appendix 3 (Tables A-2 and A-3), and I will refer to these additional versions of the model as needed. The first column of Table 5-1 shows the estimated model for the full dataset with state and year fixed effects, and the second column shows the estimated model with local-level ballot measures only, once again with state and year fixed effects. I include the local-only specification to address the concern that local-level referenda may be sufficiently different from county- and state-level referenda that they should not be combined into a single model. According to Fischel (2004), voters in county and state referenda face an entirely different "decision structure" than voters in local referenda—for example, the size and proximity of the public goods offered may be quite dissimilar—suggesting that the STATE and COUNTY dummy variables may not be enough to capture the differences between these jurisdictional levels. Furthermore, it is only appropriate to include the AREA variable in a sample with a uniform jurisdictional level, since counties and states are by definition larger than towns and cities. As it turns out, the differences between this model and the full-sample model are slight.

I opted to focus on the specifications with state fixed effects because the state dummies provide a good robustness check for the other variables. Since many variables—such as education, density, and jurisdictional level—vary systematically by state, we can place more confidence in those coefficients that remain significant after state fixed effects are added. In other words, this specification seems less vulnerable to omitted variable bias than one without

state fixed effects.[18] The specifications I present in Table 5-1 include year fixed effects as well. While some of those coefficients were significant, they revealed no intelligible pattern, so I do not report the coefficients here.[19]

5.1. Spatial and Demographic Factors: Population, Area, Density, Growth, and Age

The estimated models reveal some evidence that the population and land area of a jurisdiction influence preferences for open space, but the impacts are small and not very robust. The coefficient on POPN, while insignificant in the specifications with the full dataset, is positive and significant at the 10 percent level or better across all of the specifications with the local observations only. Since the local jurisdictions share a common geographic and political classification, the latter specifications are probably more trustworthy. However, the magnitudes involved are extremely small. According to the results in the second column of Table 5-1, an increase of 10,000 people implies less than a half-percent increase in the proportion of "yes" votes, beginning from a tie.[20] The positive coefficient on population may stem from the fact that voters in a referendum, in addition to imposing taxes on themselves, also impose taxes on their

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[18] Suppose, for example, that education varies systematically by state but has no impact on support for open space. Suppose also that there is another factor that varies in a similar systematic way which does predict support for open space. A model without state fixed effects might erroneously attribute variation caused by this omitted factor to education. A model with state fixed effects would be more likely to attribute the variation to the state dummy variables, making education insignificant.

[19] The consistent result was positive coefficients on the dummy variables for 1999 and 2002. This pattern does not seem to correspond to business cycle effects, since 1998 and 2000 were boom years (but insignificant or negative) and 2002 was a slump year (but significant and positive). Even if there were a clear pattern, however, we would not be able to attribute it confidently to business cycle effects because we would not be able to rule out competing explanations, such as the "low-hanging fruit" hypothesis.

[20] As mention in section 3.1, I will attempt to make the coefficients more meaningful by translating them into the impact of a marginal change in the explanatory variable on the outcome of a referendum that began as a 50-50 tie. The algebra required for this transformation is straightforward. Let P_y be the proportion of "yes" votes, and let $B_j\Delta x_j$ be the impact of a change of Δx_j in the independent variable x_j. If we begin from a 50-50 tie, then the odds ratio is equal to 1. The left-hand side of equation (10) is equal to zero, and the right-hand side is also expected to be equal to zero. After the change in x_j, then, we expect the log of the new odds ratio to be equal to the impact of the change in x_j:

$$\ln \{P_y / [1 - P_y]\} = B_j\Delta x_j.$$

We may then solve for the expected change in P_y:

$$P_y = \exp\{B_j\Delta x_j\} / [1 + \exp\{B_j\Delta x_j\}].$$

fellow citizens. A larger population implies that, for a given increase in their own tax burdens, voters will get more of the public good.

The coefficient on AREA is negative but insignificant in the presence of state and year fixed effects and negative and significant at the 10 percent level without them (Table A-3). This result supports the prior expectation about land area—i.e. that the median voter should be more distant from the open space in a larger jurisdiction and hence less likely to vote "yes"—but seems too weak to warrant any definitive conclusions.

Table 5-1: Log-Odds Regression for Full Dataset and Local-Only Dataset; State and Year Fixed Effects Included

	Full dataset		Local only	
	Coefficient	S.E.	Coefficient	S.E.
POPN	– .00002	.00003	.00157*	.00084
AREA			– .00381	.00251
LOGDENS	– .04806	.03729	– .12121**	.05613
POPNCHG	– .00016	.00028	– .00020	.00031
UNDER5	.06652*	.03599	.06580*	.04021
UNDER18	– .00261	.00724	.00005	.00791
OVER65	.02497***	.00858	.02437**	.00968
HOMEVAL	.06914	.04757	.04131	.05347
BA	.00775**	.00356	.00832**	.00398
HOMEOWN	– .00952**	.00374	– .00966**	.00442
PROPTAX	– .61022**	.23864	– .68283**	.34859
SURCHARGE	– .54170	.46954	– .54076	.50626
SALES	– .62301***	.22366	– .44076	.37477
INCOME	– .59821	.45825	– .63551	.50540
OTHER	– .17480	.15292	– .20687	.20175
PTAXRATE	.05396	.26056	– .34885	.39311
SURCHRATE	– .07478	.10726	– .08472	.11422
BONDRATE	– .00001	.00046	– .00252	.00506
SALESRATE	– .21377	.29677	– .25162	.65056
INCRATE	– 1.5283	1.5422	– 1.5577	1.6409
EXTEND	.52363***	.19928	.47169	.28904
FARM	.30327***	.10920	.31707**	.13115
STATE	– .31208	.33282		
COUNTY	– .28323**	.12702		
Constant	1.9795***	.55086	2.8252***	.70294
	N = 796 R^2 = 0.3471		N = 663 R^2 = 0.3605	

*0.05 < p ≤ 0.1 ** 0.01 < p ≤ 0.05 *** p ≤ 0.01

Population density, however, seems to matter much more—and not in the way predicted. In all

specifications of the local-only model, and in one specification of the full-dataset model, higher population density is associated with lower odds of a "yes" vote (Tables A-2 and A-3). Since population density at the state or county level is an extremely crude measure of the density perceived by voters—after all, it incorporates large cities as well as small towns, state parks as well as high-rise apartments—the local-only dataset once again seems more trustworthy here.

According to what I have been calling the conservation rationale, voters in high-density areas should be more likely to vote "yes" because the marginal value of open space is greater in those areas. However, there are at least three possible factors pushing in the opposite direction, any or all of which may help to explain the negative coefficient on the density variable. First, high population density need not correspond to scant open space if development is compact. In the case of "urban sprawl"—a term that conjures up images of strip malls and vast parking lots—population density may be low and open space scarce. If the lower-density jurisdictions in the sample are actually sprawled, rather than abundant in open space, then the negative coefficient makes sense. As discussed in section 3.3, however, the measure of population density I have used here is not very useful in addressing this question, as it is based on the area within political boundaries and not on developed area. A more sophisticated analysis of density could certainly yield some interesting insights, but is beyond the scope of this study.

Another possible explanation for the negative coefficient on density is land prices. Since land is more scarce in densely populated areas, it should be more expensive, *ceteris parabus*. If land is more expensive, the price of acquiring and protecting it will be higher, reducing the quantity of preserved land that voters demand.

Finally, the negative coefficient on density may be due to sorting. Individuals who intrinsically prefer proximity to open space over other housing characteristics should be more

likely to settle in low-density areas. If voters living in lower-density areas place a higher value on open space than those living in higher-density areas, then lower density will predict more "yes" votes.

Perhaps the most surprising finding in this set of variables is that population growth during the 1990s has no statistically significant impact on voter support for open-space acquisitions. The coefficient is not only highly insignificant across all specifications, but it also consistently has the wrong sign. My prior expectation was a positive sign, since fast-growing areas seem likely to be losing open space at a faster rate and hence to demand more preservation. As will be discussed later, the high-growth regions of the United States, namely the South and West, are significantly less likely to approve open-space acquisitions, for reasons that are not captured in any of the other variables in the model. However, neither regional dummies nor state fixed effects change the theoretically unexpected sign of the POPNCHG variable (Tables A-2 and A-3). This result seems to directly contradict a primary tenet of the conservation rationale. The rate of population growth, a rough proxy for the rate at which land is being consumed for development, does not seem to be related to voters' willingness to pay for land preservation.[21]

The age profile of a jurisdiction, in contrast, is a significant determinant of the proportion of "yes" votes. The most robust result is a positive coefficient on the percentage of population over age 65, which is significant at 10 percent or better in all but one of the specifications (see Tables A-2 and A-3). The interpretation of this coefficient is ambiguous, and it may count either for or against the conservation rationale. On the one hand, senior citizens have more leisure time than the population at large, so they may have more to gain from the recreational benefits of open space. On the other hand, there are many reasons to suspect that senior citizens may be

[21] One spatial variable has yet to be mentioned—TRAVWORK, the median commuter's travel time to work. In early versions of the regressions, this variable was never even marginally significant. Since its value as a proxy for sprawl was uncertain in the first place, I do not include it in any of the final models.

more likely than the population at large to be anticipating selling their homes. Decreasing needs for space as children settle on their own, a desire to move to warmer climes, or the prospect of moving to a condominium, nursing home or assisted living facility may all cause older voters to look toward selling their homes. A local public good that increases the value of this asset, especially one that will be financed by taxes the voter will no longer pay when the house is sold, may look particularly appealing to older voters. In either case, there seems to be little reason to worry about "grey peril"— the reputed tendency of senior citizens to vote against local public goods—in the case of open space conservation.[22]

The coefficient on UNDER5 is also uniformly positive and, while larger in magnitude than OVER65, less significant and robust. The presence of larger numbers of very young children may shift preferences in favor of open-space referenda, though the evidence is relatively weak. It seems reasonable that voters might be more likely to use and demand local parks if they have young children. The coefficient on UNDER18 is insignificant across all specifications and inconsistent in sign, so there is no reason to believe on the basis of these estimates that the proportion of minors in a jurisdiction makes a difference in preferences for open space.

5.2. Socioeconomic Factors: Property Values, Education, and Homeownership

As expected, the coefficient on education is positive and significant at the 5 percent level or better across all specifications. Since education is not the same as income, this result cannot confirm that open space is a normal good, but it is at least suggestive of that conclusion.[23] In

[22] A final possible explanation for the coefficient on OVER65 was brought to my attention by Keith Ericson. Senior citizens may simply be more involved with community affairs, perhaps because they have more leisure time or because of generational effects. (The generation that came of age during the World War II era is widely perceived as more civic-minded than succeeding generations.) Therefore, seniors who vote for open space may have a community preservation or "bequest value" motive in mind.

[23] To confirm this interpretation, I also ran versions of the model with income instead of education and home values. The coefficients on income were invariably positive as well, although income appears to have less explanatory

addition, it is possible that education confers greater knowledge and awareness of the issues at hand in open-space referenda, whether one subscribes to the conservation rationale or the asset price rationale. An increase in the number of bachelor's degree holders equivalent to 10 percent of the population would nudge a 50-50 tie up to a 52-48 win. The coefficient on HOMEVAL was also positive, but insignificant across all specifications. As explained in section 3.3, HOMEVAL could have a dual role in shaping voting patterns: it is both a proxy for socioeconomic status and a determinant of the price of open space when property taxes are involved. The positive but insignificant coefficient on HOMEVAL suggests that property values are more important in the model as the former than as the latter.[24]

The final socioeconomic variable included in the model is HOMEOWN, the percentage of occupied housing units that are owner-occupied. In every specification, higher owner-occupancy rates mean significantly lower support for open-space acquisition; in fact, the negative coefficient on homeownership is one of the most robust findings in the entire study. This is clear evidence against the asset price rationale.[25] If the purpose of open-space acquisition was, in voter's minds, primarily to increase the value of their own property (either directly or through restrictions of the housing supply), then people should be *more* likely to vote "yes" in high-homeownership communities.

What accounts for the negative sign on HOMEOWN? There are at least three possibilities. The first is that renters do not pay property taxes and therefore may perceive a lower cost than homeowners. Of course, the higher property taxes should be transmitted to the

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power than BA (perhaps for reasons discussed in section 2.3). Unlike BA, MEDHHINC becomes insignificant when HOMEVAL is added and makes less of a contribution to the model's R^2. Following Kahn and Matsusaka (1997), I also attempted a regression with an income and an income-squared variable, but both came through insignificant. Therefore, my results support neither the contention that open space is a luxury good nor the contention that open space becomes an inferior good at high levels of income.

[24] As will be discussed in the New Jersey case study in section 6.1, this story changes completely in an all-property tax sample.

[25] In the words of Stephen Sheppard, it is a "counter-cynical" finding.

renters in the form of higher rents; for that reason, this argument is known as "renter illusion." Dollery and Worthington (1999) and Gemmell *et al* (2002) find evidence of renter illusion in their studies of local tax regimes in Australia and Great Britain, respectively. In addition to any illusionary effects, renters may also perceive a lower cost because they tend to be much more transient occupants of housing units than homeowners. If the ballot measure calls for a long-term increase in property taxes, whether to build a trust fund or pay off a bond, then renters are less likely to be around for the duration of the tax increase. Homeowners, on the other hand, may be faced with decades of higher taxes. Therefore, homeowners are likely to have an incentive to vote "no" that renters do not have. A third possible explanation for the negative effects of homeownership lies in differential access to privately provisioned open space. Renters are far more likely than homeowners to live in multi-unit structures,[26] which implies less access to private lawns, gardens and woods. To the degree that private grounds substitute for public open space, homeowners have less reason to demand publicly acquired lands than renters.

5.3. Financing: Mechanisms, Rates, and Extensions

According to the results, the funding mechanism chosen plays a very important role in determining the outcome of a referendum. Voters are significantly less likely to vote for a property tax or sales tax increase than for a bond issue. To give an idea of the magnitude of this effect, consider a referendum that, under a bond issue, would elicit a 50-50 tie from the electorate. Based on the coefficient from Table 5.1, changing the funding mechanism to a property tax, holding all else constant, would shift the vote to 35 percent in favor and 65 percent opposed. Changing to a sales tax would elicit a 36.4-to-63.6 loss. There is also evidence that

[26] I only have data on the percentage of housing units in multi-unit structures for states and counties, so I was unable to include the variable in my estimations. Within that subset, however, the coefficient of correlation between HOMEOWN and the percentage of housing units in multi-unit structures was –0.79.

property tax surcharges and other tax increases are less likely than bonds to win voter approval, but the effect disappears with the addition of state fixed effects (Table A-2). Most of the referenda involving property tax surcharges took place in Massachusetts,[27] so it seems that the sensitivity of PTAXSURCH to state fixed effects does not threaten this interpretation. The sign on the income tax dummy was negative as well, although it was not significant in any specification, perhaps because of the small number of observations (22 out of 796). On the local level, only PROPTAX was significant when state fixed effects were included (Table A-3), most likely because the other mechanisms of taxation are concentrated at the state and county levels.

The general trend from these coefficients is that voters are less likely to approve taxes than bonds. At first glance, this may not make much sense. After all, bonds are not free; they must be paid off through either an increase in taxes (often at the local level it is property taxes), or, if paid from the general account, must be offset by some future reduction in other services. Moreover, communities that float a bond will have to pay interest, while those that establish a trust fund through taxes will earn interest. An open-space bond will also likely limit the community's ability to take on more debt later, though voters may not be particularly concerned about this consequence. It may be tempting to attribute bond preference to voter irrationality or discounting of costs. The hypothesis cannot be tested with the data available here, but we might speculate that voters are subject to some degree of "bond illusion," or that they simply discount the future tax payments or losses of services that the bond issue would require.

If irrationality or cost discounting do not account for bond preference, there are at least two more potential explanations. First, bonds are more likely than taxes to enable an immediate acquisition, since they generate all of the funding "up front." Under a bond, voters may have

[27] Of the 131 referenda involving property tax surcharges, 116 (89 percent) took place in Massachusetts. This heavy concentration is the product of particular legislation in Massachusetts, which will be examined in more detail in a case study in section 6.2.

more years to enjoy the benefits of the open-space acquisition, and given a nonzero discount rate they should place a higher value on immediate benefits than on otherwise equivalent future benefits. In addition, voters probably have better information on the public goods they are purchasing under a bond. The benefit of buying a particular parcel immediately is more certain and better known than the benefit of establishing a trust fund that will buy an unspecified parcel at an unspecified point in the future. While this argument has a solid grounding in economic theory, it cannot be the whole story, because communities that raise taxes without municipal bonds sometimes receive loans from the state. In New Jersey, for example, the Green Acres Planning Incentive Program provides some communities that raise their property taxes with a low-interest loan to enable immediate purchase of lands (Trust for Public Lands and Land Trust Alliance 2004). For such communities, the benefit of bonds over property taxes is much less clear.

A final explanation for bond preference is that funding mechanisms reflect the unobserved variables of municipal indebtedness and institutional borrowing constraints. Local governments are limited by law in how much they may borrow. Therefore, the variable BOND may actually be reflecting jurisdictions that have not yet reached their legal borrowing limits. Voters who live in those jurisdictions may be more willing to vote for additional government spending, in whatever form, than voters in more highly indebted jurisdictions. Unfortunately, this hypothesis is difficult to test with the data at hand, but it may be possible to shed some light on it by constructing a logit regression with BOND as the dependent variable. I consider this possibility in the discussion of extensions in Appendix 1.

The theoretical expectation of negative coefficients on the tax and bond rate dummies is by and large borne out in the data, but rather surprisingly, none of the coefficients are significant

in any specification. This result is difficult to account for. One possible explanation is the presence some unobserved factors in this large and heterogeneous dataset, as the same coefficients turn up negative and significant in one-state subsets of the data (see both case studies in Chapter 6). In those subsets, many of the unobserved factors that vary by state, such as the overall structure of the tax system, are held constant. Therefore, I will postpone further discussion of the tax rate variables for the case studies.

The final variable of interest with regard to financing is EXTEND, the dummy variable representing the renewal of an existing tax increase rather than the creation of a new one. As expected, this coefficient is positive and significant. Voters are apparently more willing to extend an existing tax than to approve a new one, perhaps because their expectations have adjusted to accommodate the open space tax or because they have better information on the benefits generated in the case of an existing tax.

5.4. Open-Space characteristics

With one notable exception, none of the open-space characteristics dummies are of any value in explaining referenda results. The coefficients on PARKREC, ENVIRO, WATER and HISTPRES failed to be significant in any of the earlier versions of the model, so they are not included in the regressions presented here. As stated earlier, this should not be interpreted as evidence against the importance of such open-space characteristics; rather, it may be due to measurement error in the data. An exploration of open-space characteristics that is more systematic than the summaries of ballot language provided by the TPL and LTA might find results where this study does not.

The dummy variable for farmland, however, is positive and significant across all specifications. In fact, the coefficient is larger and more significant with state fixed effects than

without (Tables A-2 and A-3), which is an important finding because the referenda that included farmland were heavily concentrated in a handful of states.[28] If the positive impact of farm preservation were an artifact of the distribution of farmland referenda, this result would have disappeared with state fixed effects. The positive sign on the FARM variable suggests that voters place a particular value on agricultural land that does not extend to other types of open space. While farmland preservation's environmental virtues may be questionable, farmland provides a number of benefits that ordinary open space does not, including maintaining rural jobs and economies, preserving an agrarian aesthetic or "rural character," and meeting the rising demand for locally grown food. The perceived economic and cultural importance of farmland is reinforced by publicity from nonprofit organizations, such as the American Farmland Trust, and from events such as the annual Farm Aid concert.

5.5. Government Level and Regional Effects

Government level and regional fixed effects are also important determinants of voting patterns in open-space referenda. The coefficient on STATE comes through negative but insignificant – perhaps because of the small number of state-level observations – but the COUNTY coefficient is negative and significant (Table A-2). The coefficient may be interpreted to mean that having a referendum at the county level reduces the odds ratio by approximately one-quarter, which would turn a tie into a 43.4-56.6 vote. The lower odds of a "yes" vote at the county level may be the product of the median voter's greater distance from the parcel under consideration as compared with a local acquisition. In other words, this coefficient might be interpreted much like the negative sign on AREA in the local-only models.

[28] Of the 124 referenda that included farmland preservation, 86 were in New Jersey, 10 were in Pennsylvania, 6 were in Colorado, 5 were in New York, 4 were in Rhode Island, and 3 were in Michigan. Eight additional states had one or two farmland measures, and 27 of the states in the dataset had no farmland conservation in any referenda.

In the models that dropped state fixed effects and included regional fixed effects (see Tables A-2 and A-3), the odds of voting "yes" are substantially lower for voters in the Midwest, South and West than for voters in the Northeast. In both the full dataset and the local dataset, the magnitude is largest for the West, followed by the Midwest. The full-dataset model predicts that a ballot initiative that won 50 percent of the vote in the Northeast would, all other conditions being equal, win only 31.7 percent of the vote in the West, 34.3 percent in the Midwest, and 37.5 percent in the South. This result seems to confirm the intuition that the marginal value of open space is lower in regions of the country with relatively greater areas of undeveloped land.

Note that this interpretation need not conflict with the earlier interpretation of the negative coefficient on LOGDENS. The effects of development and density on voter support for open space could well be negative at the local level and positive at the regional level. Sorting based on open-space preferences—a possible explanation for the negative coefficient on LOGDENS—seems to be a more plausible story on the local level than on the regional level. We might expect open-space preferences to guide a decision between living in the center of a city and a suburb of the same city to larger extent than a decision between living in the Northeast and the West. At the same time, the availability of open space for recreational purposes may be a more compelling motivation at the regional level than at the local level. Voters in the Northeast, where there are probably fewer open-space options within driving distance, may be more concerned about preserving recreational amenities than their counterparts in the West. In short, it does not seem at all contradictory that higher density appears to predict lower support for open space at the local scale and higher support for open space at the regional scale.

Chapter 6: Case Studies

This chapter focuses on case studies of the two best-represented states in the dataset: New Jersey and Massachusetts. Both states have recently passed legislation that enables local communities to raise taxes for open-space acquisitions and that creates incentives for them to do so. Therefore, the referenda in each of these subsamples took place within a common policy framework, permitting an analysis that avoids some of the problems with institutional heterogeneity mentioned earlier. Restricting the analysis to specific legislative programs enables a cleaner test of many of the independent variables, particularly those pertaining to tax rates. These case studies confirm many of the results presented earlier and also illuminate some interesting nuances.

6.1. New Jersey: Open Space and Property Taxes

Over one quarter of the referenda in the sample—220 ballot questions—are for property tax increases in New Jersey. Most of those referenda fall under the state's Green Acres Planning Incentive Program. Under this legislation, communities may dedicate property tax increases to an open space trust fund and receive a matching grant from the state. In addition, local governments may receive an up-front loan from the state at two percent interest to make immediate acquisitions possible (TPL and LTA 2004).

For this regression, I use the same model as in the full dataset with a few slight modifications. The funding mechanism dummy variables are obviously no longer relevant, and the only funding rate variable is PTAXRATE, which measures the property tax increase in mills. Here I add one additional dummy variable, NEWTAX. When a community is voting to approve its first dedicated property tax increase under the Green Acres Planning Incentive Program,

NEWTAX takes the value of 1, and otherwise it takes the value of zero.[29] The Census variables are included exactly as in the previous regressions.

Table 6-1 presents the results for New Jersey property tax increases. Total population, population growth, and the proportion of the population under 5 and under 18 years of age have no significant impact on the odds of a "yes" vote. The density variable, while entering once again with a negative sign, is not significant, perhaps because New Jersey is more densely settled throughout and hence exhibits less variation in density than the country as a whole. OVER65 enters with a positive and significant coefficient again, supporting the findings in the last chapter, although the question of seniors' motivations for voting "yes" remains unresolved. High rates of owner occupancy, as before, predict lower support for publicly funded open-space acquisitions. Since long-term property tax increases may be perceived as costlier by homeowners than by renters, this result is not surprising.

Table 6-1: Log-odds Regression for Voting in New Jersey Property Tax Increases, Year Fixed Effects Included

	Coefficient	S.E.
POPN	– .00014	.00045
LOGDENS	– .05733	.05590
POPNCHG	– .00132	.00338
UNDER5	– .05150	.06889
UNDER18	.04234	.02691
OVER65	.02900**	.01209
HOMEVAL	– .28261***	.09890
BA	.02175***	.00626
HOMEOWN	– .01090*	.00576
PTAXRATE	– .98426*	.50704
NEWTAX	.81314***	.25064
FARM	.26953**	.11806
Constant	.99687	.86998
	N = 220 R^2 = 0.2455	

*0.05 < p ≤ 0.1
** 0.01 < p ≤ 0.05
*** p ≤ 0.01

The socioeconomic variables HOMEVAL and BA, however, tell a different story in the case of New Jersey property taxes. In the full sample, both coefficients were positive, but the home value coefficient was insignificant, possibly due to correlation with education. This time,

[29] The NEWTAX variable is not to be interpreted as the opposite of the EXTEND variable in previous regressions. EXTEND does not represent an increase in taxes within the confines of an existing program, but the renewal of an existing tax that would otherwise have expired.

the variables move in opposite directions. Voters with high property values are *less* likely to vote "yes," while voters with bachelor's degrees are *more* likely to vote "yes." This result is particularly remarkable in light of the fact—which is not itself surprising—that property values and education are more tightly correlated in the New Jersey sample than in the nationwide sample.[30] Both signs are fully consistent with economic theory. The arguments why education should increase demand for open space are now familiar. Voters with higher property values, however, bear a relatively larger tax burden when acquisitions are financed with property taxes. Faced with a higher price for open space, these voters may demand less of it. The coefficients suggest that a $10,000 appreciation in property values, or a decrease in the number of bachelor's degree holders equivalent to 1.3 percent of total population, would turn a 50-50 tie into a 49-51 loss for open space.

The coefficient on PTAXRATE is negative and significant at the 10% level, consistent with the coefficient on property values and with economic theory. Along with property values, the amount of the tax increase determines the change in tax burden faced by voters. The model predicts that adding an extra .1 mill ($0.10 per $1000 assessed value) to the tax hike would reduce support for the measure to 47.6 percent, beginning once again from a tie. The coefficient on NEWTAX, the variable that signifies the creation of a dedicated tax increase under the Green Acres program, is positive, significant and very large. This result, too, is consistent with theory. Assuming diminishing marginal utility of open space, voters should place the most value on the first few units of open space preserved under the program. One note of caution is in order on the PTAXRATE and NEWTAX variables. The coefficients presented here were estimated with year

[30] The coefficient of correlation between HOMEVAL and BA is 0.68 in the full sample and 0.83 in the New Jersey sample. I say that this fact is unsurprising because the non-socioeconomic variables that contribute to differences in property values on a nationwide scale – such as climate and proximity to urban centers – vary much less within a small state.

fixed effects included. If those fixed effects are dropped, the coefficients retain the appropriate signs but become insignificant. All of the other coefficients that are significant in this estimation remain significant when year fixed effects are dropped, suggesting that the PTAXRATE and NEWTAX coefficients are less robust results than others. The estimations with and without year fixed effects are presented in Appendix 3 (Table A-4). Finally, the coefficient on farmland preservation is positive and significant, as it was in the full sample. The potential explanations advanced earlier apply to New Jersey as well.

In sum, the results of property tax referenda in New Jersey support many of the findings presented in the full sample and confirm, in ways that the full sample did not, theoretical expectations about the impact of the change in the tax burden. Senior citizens, college-educated voters, and renters are more likely than others to support a property tax increase for open space. High prospective tax burdens, manifested in either high property values or large property tax increases, reduce support for such measures. First-time tax hikes and measures that include farmland preservation are more likely, *ceteris parabus*, to win voter support.

6.2. The Massachusetts Community Preservation Act

Passed by Massachusetts lawmakers in 2000, the Community Preservation Act (CPA) is similar to New Jersey's Green Acres program in that it promises state matching funds to communities that raise their property taxes for open-space acquisitions. Instead of an increase in the property tax millage, however, the CPA authorizes communities to levy a surcharge of up to 3 percent on homeowners' total property tax bill. In addition, the funds raised locally and matched by the state are not intended for open space alone, but also for historic preservation and the provision of affordable housing. The law requires that at least 10 percent of the total funding

be spent on each of these three objectives, with the remaining 70 percent allocated among those uses at the local community's discretion (TPL and LTA 2002). *LandVote* does not report precisely what proportion of funds generated by these measures goes to open space, perhaps because the final destination of all funding may not be determined at voting time. When estimates are provided, they are generally close to one-third of total funding (TPL and LTA 2003, 2004).

An estimated voting model for the Massachusetts CPA is presented in Table 6-2. The model incorporates the customary series of Census variables and the property tax surcharge rate for each referendum, which ranges from 0.5 percent to 3 percent. Once more, I do not reject the null hypothesis that the level and growth of population have no effect on the likelihood of a "yes" vote. The density coefficient is negative once again, but not significant. As argued above, this finding may be the result of relatively higher and more uniform density in Massachusetts as compared to the U.S. as a whole.

Table 6-2: Log-odds Regression for Voting in Massachusetts Community Preservation Act, Education Variable Dropped, Year Fixed Effects Included

	Coefficient	S.E.
POPN	– .00014	.00104
LOGDENS	– .08521	.06314
POPNCHG	– .00652	.00439
UNDER5	.09386	.07838
UNDER18	– .06467**	.03199
OVER65	– .03506**	.01483
HOMEVAL	.13652***	.04114
HOMEOWN	.00605	.00690
SURCHRATE	– .13860**	.06545
Constant	2.8893***	.77395
	N = 116 R^2 = 0.1865	

* $0.05 < p \leq 0.1$
** $0.01 < p \leq 0.05$
*** $p \leq 0.01$

In the case of the CPA, the community's age profile has a startlingly different impact than it did in New Jersey and nationwide. The coefficient on UNDER5 is insignificant, but the coefficients on UNDER18 and OVER65 are significant and negative. The proportion of senior citizens in the population has exactly the opposite effect in this particular case. The explanation

for this finding may lie in the different bundle of goods offered by the CPA referenda. If the asset price rationale holds, then voters may have less to gain in terms of appreciated property values from a package of open space, historic preservation and affordable housing than they would from open space alone. Historic preservation does not provide the same aesthetic and environmental benefits that open space does, and affordable housing, depending on the form it takes and its proximity to existing housing, may actually depress property values for some voters. Without the benefit of asset appreciation, senior citizens—who are far more likely than other voters to live on fixed incomes—may be more likely to reject the tax increase. Voters with children under 18 are also likely to face greater financial constraints than other voters, which could motivate them to reject property tax increases.

The impact of socioeconomic variables on voting in the CPA also differs from the New Jersey case. HOMEVAL and BA both enter with a positive sign, but when both variables are included, BA becomes insignificant due to high correlation with HOMEVAL. Taken alone, either variable is positive and significant; HOMEVAL is reported in Table 6-2. These results are consistent with the finding that demand for open space increases with rising income and education, but are not consistent with the negative sign on property value in the New Jersey case. This discrepancy may arise from the difference in the funding mechanism. With a property tax increase, the prospective change in a voter's absolute tax burden is directly proportional to the value of his or her property. With a property tax surcharge, however, the prospective change in tax burden depends not only on property value, but also on the existing tax rate. Since the relationship between property values and the tax burden is less direct in this case, HOMEVAL's role as a proxy for socioeconomic status may overrule its role in determining the size of the tax burden.

Interestingly, homeownership does not have a statistically significant impact on voting results in the Massachusetts case. The small sample size may be to blame here, since with fewer observations it is harder to disentangle homeownership as a proxy of socioeconomic status from homeownership as homeownership.[31]

Finally, increasing the size of the property tax surcharge has a significant, negative impact on the likelihood of a "yes" vote, in accordance with theoretical expectations. Starting from a 1% surcharge that created a 50-50 tie vote, increasing the surcharge rate to 2% should reduce the percentage in favor to 46.5%, and a 3% tax would reduce support to 43.1%.

Like the New Jersey case, this analysis of the Massachusetts Community Preservation Act confirms that demand for open space and other public goods depends positively on socioeconomic status and negatively on the rate of the tax increase. Perhaps because of differences in the financing mechanism and the package of public goods offered, however, the community's age profile and median home value have substantially different impacts. In particular, the bundle of goods offered under the CPA may have less positive impact on asset values than a simple open-space acquisition, which may explain the completely opposite demand pattern among senior citizens.

[31] As has been discussed, homeownership is positively correlated with other socioeconomic variables, such as income. As has been shown, higher socioeconomic status predicts more support for open space. However, homeownership has additional significance in these regressions—as a potential measure of access to private substitutes for open space, of renter illusion effects, or of the transience of home-occupiers—which have caused it to have the opposite sign of the other socioeconomic variables in these regressions. With fewer observations, however, it becomes more difficult to distinguish statistically between these opposing meanings of homeownership.

Chapter 7: Conclusions

This study has made at least two substantive contributions to the literature on the private demand for publicly supplied open space. First, and perhaps most importantly, it has undertaken the first detailed analysis of the ways in which financing mechanisms influence voter support for open space. The result is unambiguous. Voters are *less* likely to approve tax increases—especially property tax and sales tax increases—than they are to approve bond issues, despite the fact that bonds are never "free money." For citizens and policymakers interested in preserving open space, advocating for a bond issue may be the best way to improve the chances of voter approval. There is also evidence that voter support is inversely related to the rate of a tax increase, but the effect only emerges when the dataset is restricted to a particular state. Finally, voters appear more willing to renew an existing finance program than to embark on a new one.

The second important contribution of this study is providing evidence for the debate between two conflicting interpretations of open-space acquisition: the conservation rationale and the asset price rationale. Providing evidence for a debate is not, however, the same thing as settling a debate. The lack of any significant effect of population growth on voter support, along with a negative relationship between population density and demand for open space, count against the argument that open-space acquisition is a rational response to the loss of environmental, scenic and recreational amenities to development. At the same time, the extremely robust negative relationship between homeownership rates and "yes" votes is a direct blow to the view that open-space acquisition is a veiled attempt to raise the value of voters' assets. To further complicate these results, referenda seem to emerge (but not necessarily to pass) in fast-growing and high-homeownership jurisdictions. Communities with "greyer" populations are more likely to vote for open space, but it is not clear what senior citizens'

principal motivation is, so this finding could be evidence for either view. While the debate will undoubtedly continue, these mixed results seem to advise against an absolutist view on one side or the other. As with so many issues, the answer may be "both…and" rather than "either…or."

In addition to these two original contributions, this study has reinforced many of the previous findings in the open-space literature. Education and income appear positively correlated with demand for open space, although education seems to do a better job of explaining variation in voter support than income does. At least one physical characteristic of open-space parcels—farmland—has been shown to significantly affect citizens' demand for undeveloped land. Perhaps with an eye to preserving rural character, saving farm jobs or ensuring a supply of locally-grown produce, voters favor farmland over other types of land, at least in the relatively small set of states where farmland referenda have taken place. Finally, geographic-area fixed effects heavily influence the outcomes of open-space referenda. Voters demand more open space in the Northeast than in other areas of the country, as evidenced by the large number of ballot questions in that region and the overwhelmingly negative fixed effects of the South, Midwest and West.

Appendix 1: Extensions and Directions for Future Research

Many of the findings in this study suggest additional questions that merit further research. One such question is what factors predict the emergence of one financing mechanism over another. As mentioned in section 5.3, a possible explanation for bond preference is institutional constraints on borrowing. To start addressing this question, I estimate a logit model BOND as the dependent variable. The independent variables are the usual battery of Census variables and FARM. In Table A-1 I present the results of the regression with state fixed effects included. A version without state fixed effects is also reported in Appendix 3 (Table A-6), but given the sign swings and vast discrepancy in pseudo-R^2s between the models (0.58 with state fixed effects and 0.16 without), it seems appropriate to focus only on the model with state fixed effects.

Table A-1: Logit Model for Appearance of Bond Issue

	Coefficient	S. E.
POPN	.00012*	.00006
LOGDENS	.59188***	.16086
POPNCHG	– .00086	.00108
UNDER5	.08517	.15508
UNDER18	.01464	.04333
OVER65	– .03236	.04019
HOMEVAL	.29075*	.16602
BA	.02260	.01391
HOMEOWN	.00774	.01608
FARM	1.4279***	.48313
STATE	1.5537	1.0147
COUNTY	– .45849	.45000
Constant	– 9.0238***	2.1386
	N = 760 Pseudo R^2 = 0.5779	

* $0.05 < p \leq 0.1$
** $0.01 < p \leq 0.05$
*** $p \leq 0.01$

According to the estimation reported in Table A-1, four factors (other than the state) influence the appearance of bond measures: population, density, home values, and farmland preservation. The positive coefficients on HOMEVAL and POPN seem to support the borrowing constraint hypothesis. Larger jurisdictions with higher property values will have a larger tax base to draw from, which should correspond with greater borrowing

capacity, *ceteris parabus*.[32] The positive signs on LOGDENS and FARM are more difficult to interpret. The density variable may be picking up institutional differences between urban and rural structures of government. We might speculate that borrowing is less constrained in cities than in comparably-sized towns, though I have no evidence in support of this hypothesis. The positive association between farmland preservation and bond issues is even more mysterious. Perhaps there is greater institutional support for farmland than for open space more generally, either in legislation or in the activities of nongovernmental organizations, which feeds into greater ease of borrowing for farmland. As this very preliminary model indicates, an exploration of why funding mechanisms appear where they do may be a promising avenue for future research.

Another area for further study is the effects of density and sprawl on the demand for open space. The very rough metric of persons per square mile is not adequate. An ideal study might consider two measures of density: the number of persons per square mile of developed land (the compactness of development), and the ratio of developed to undeveloped land (the extent of development). Such an analysis would be of particular service to the conservation-vs.-asset price question, since any confirmed link between sprawl and demand for open space would be strong evidence for the conservation rationale.

A third area for future research is the inclusion in referenda models of the total amount of funding up for grabs. Due to limitations of the dataset, that option was not available, but according to List (2004a) the TPL and LTA are working on a more comprehensive dataset that will include this information. A variable for total funding seems to be the last important missing piece for an econometric analysis of open-space finance.

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[32] The lower significance of HOMEVAL appears to be caused by collinearity with BA. It is telling, however, that this time the effect sticks to HOMEVAL rather than BA. Especially for local jurisdictions, for which property taxes are so important, HOMEVAL should be more directly proportional to the tax base.

Finally, the preliminary results on sample selection in section 4.2 call for a more rigorous analysis of the factors that contribute to the emergence of open-space referenda. The jurisdictions that had open-space referenda between 1998 and 2003 clearly differed from the U.S. as a whole, but my discussion of those differences in the absence of a model was necessarily somewhat speculative. A formal selection model, complete with an appropriate control group, would be an excellent complement to this study of referenda results.

Appendix 2: Definitions of Variables

Source Key: TPL/LTA- Land Trust Alliance 1999, 2000, 2001; Trust for Public Lands and Land Trust Alliance 2002, 2003, 2004.
CQF- United States Bureau of the Census. State and County Quickfacts.
CAFF- United States Bureau of the Census. American Fact Finder.
CG- United States Bureau of the Census. U.S. Gazetteer.

General note: all percentages are actual percentage values, not decimals.

Variable	Definition	Source
	Dependent Variable	
LOGODDS	Log of the odds ratio of a "yes" vote. Odds ratio is the percentage of "yes" votes divided by the percentage of non-"yes" votes.	TPL/LTA
	Independent Variables	
POPN	2000 population, in thousands	CQF, CAFF
AREA	Area in square miles	CQF, CAFF
LOGDENS	Natural logarithm of 2000 population density in persons per square mile (i.e. ln(1000*POPN/AREA))	CQF, CAFF
POPNCHG	Percent change in population, 1990 to 2000	CQF, CAFF, CG
TRAVWORK	Median travel time to work in minutes, all commuters over 16 years of age, 2000	CQF, CAFF
UNDER5	Percentage of population under 5 years old, 2000	CQF, CAFF
UNDER18	Percentage of population under 18 years old, 2000	CQF, CAFF
OVER65	Percentage of population over 65 years old, 2000	CQF, CAFF
HOMEVAL	Median value of owner-occupied housing units, in hundreds of thousands of dollars, 2000	CQF, CAFF
HS	Percentage of population with a high school diploma or higher, 2000	CQF, CAFF
BA	Percentage of population with a bachelor's degree or higher, 2000	CQF, CAFF
MEDHHINC	Median household income in dollars, 2000	CQF, CAFF

POVERTY	Percentage of population below the poverty line, 2000	CQF, CAFF
HOMEOWN	Percentage of occupied housing units that are owner-occupied, 2000	CQF, CAFF
PROPTAX	1 for property tax increase; 0 otherwise	TPL/LTA
SURCHARGE	1 for property tax surcharge; 0 otherwise	TPL/LTA
BOND	1 for general obligation bond; 0 otherwise	TPL/LTA
SALES	1 for sales tax increase; 0 otherwise	TPL/LTA
INCOME	1 for income tax surcharge; 0 otherwise	TPL/LTA
OTHER	1 for parcel tax, real estate transfer tax, retailers occupation tax, lottery tax, hotel tax, transfer, or any other financing mechanism; 0 otherwise	TPL/LTA
PTAXRATE	Property tax increase in mills	TPL/LTA
SURCHRATE	Property tax surcharge in percent	TPL/LTA
BONDRATE	Bond amount in millions of dollars	TPL/LTA
SALESRATE	Sales tax rate change in cents	TPL/LTA
INCRATE	Income tax rate in percent	TPL/LTA
EXTEND	1 if measure renews an open-space tax nearing expiration; 0 otherwise	TPL/LTA
NEWTAX	1 if measure is a first-time property tax increase under New Jersey's Green Acres Planning Incentive Program; 0 otherwise	TPL/LTA
FARM	Description includes one or more of the following terms: farmland, farmland preservation, agricultural land, farmland conservation easements, farmland development rights.	TPL/LTA

[Note: the only parcel characteristic dummy used in the analysis was FARM, but I have included the definitions of the other variables as well.]

PARKREC	Description includes one or more of the following terms: parks, parkland, park improvements, playgrounds, recreation, recreation areas, pathways, trails, biking trails, hiking trails, passive recreation, park renovation, park improvement, sports fields, athletic fields, playfields, soccer fields, golf course, playing fields.	TPL/LTA
HISTPRES	Description includes one or more of the following terms: historical resources, historical preservation, historical buildings, historic parks, historic lands.	TPL/LTA
ENVIRO	Description includes one or more of the following terms: protect wildlife habitat, wildlife habitat, wildlife,	TPL/LTA

	environmentally sensitive land, environment, sensitive habitats, protection of natural habitat, natural resources.	
WATER	Description includes one or more of the following terms: water, water quality projects, preserve water quality, drinking water supplies, watersheds, protection of river corridors, waterways.	TPL/LTA
STATE	1 for state-level referendum; 0 otherwise	TPL/LTA
COUNTY	1 for county-level referendum; 0 otherwise	TPL/LTA
LOCAL	1 for referenda at the city, town, township, borough or village level; 0 otherwise	TPL/LTA
NE	1 for CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT; 0 otherwise	
MW	1 for IA, IL, KS, MI, MN, MO, OH, WI; 0 otherwise	
SOUTH	1 for AL, FL, GA, NC, OK, SC, TX; 0 otherwise	
WEST	1 for AK, AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY; 0 otherwise. [Note: only states that had referenda are represented.]	
AK…WY	State dummies (all correspond to postal abbreviation)	
YEAR98-YEAR03	Year dummies	

Appendix 3: Full Regression Tables

Table A-2: Log-odds Regressions for Full Dataset

			With state fixed effects		With state & year fixed effects	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
POPN	– .00001	.00003	– .00002	.00003	– .00002	.00003
LOGDENS	– .07373**	.03583	– .05990	.03772	– .04806	.03729
POPNCHG	– .00026	.00029	– .00025	.00028	– .00016	.00028
UNDER5	.04554	.03552	.06612*	.03627	.06652*	.03599
UNDER18	– .00530	.00725	– .00149	.00731	– .00261	.00724
OVER65	.01543*	.00854	.02379***	.00868	.02497***	.00858
HOMEVAL	.00468	.04598	.06304	.04824	.06914	.04757
BA	.01120***	.00350	.00822**	.00360	.00775**	.00356
HOMEOWN	– .01077***	.00370	– .01000***	.00379	– .00952**	.00374
PROPTAX	– .95897***	.12585	– .62256***	.24200	– .61022**	.23864
SURCHARGE	– 1.3891***	.30438	– .58016	.46701	– .54170	.46954
SALES	– .59102***	.21535	– .55741**	.22631	– .62301***	.22366
INCOME	– .29670	.41440	– .55087	.46434	– .59821	.45825
OTHER	– .30098**	.14662	– .15702	.15420	– .17480	.15292
PTAXRATE	.22945	.22737	.09192	.26303	.05396	.26056
SURCHRATE	– .07794	.11187	– .09012	.10811	– .07478	.10726
BONDRATE	.00005	.00048	– .00006	.00047	– .00001	.00046
SALESRATE	– .15243	.30146	– .32987	.29994	– .21377	.29677
INCRATE	– 2.2241	1.6060	– 2.3154	1.5517	– 1.5283	1.5422
EXTEND	.36324*	.20310	.53088***	.20138	.52363***	.19928
FARM	.19267*	.10708	.26383**	.10697	.30327***	.10920
STATE	– .30615	.31740	– .34419	.33556	– .31208	.33282
COUNTY	– .26605**	.11805	– .25297**	.12819	– .28323**	.12702
MIDWEST	– .65178***	.15477				
SOUTH	– .50997***	.11470				
WEST	– .76639***	.14552				
Constant	3.2161***	.44882	2.1948***	.55164	1.9795***	.55086
	N = 796 R^2 = 0.2385		N = 796 R^2 = 0.3234		N = 796 R^2 = 0.3471	

* $0.05 < p \leq 0.1$ ** $0.01 < p \leq 0.05$ *** $p \leq 0.01$

Table A-3: Log-odds Regressions for Cities, Towns, Boroughs, Villages and Townships

			With state fixed effects		With state & year fixed effects	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
POPN	.00078**	.00039	.00164*	.00084	.00157*	.00084
AREA	– .00110*	.00066	– .00404	.00253	– .00381	.00251
LOGDENS	– .13704***	.05127	– .13825**	.05652	– .12121**	.05613
POPNCHG	– .00023	.00032	– .00027	.00031	– .00020	.00031
UNDER5	.04506	.04018	.07066*	.04041	.06580*	.04021
UNDER18	– .00433	.00788	.00147	.00798	.00005	.00791
OVER65	.01368	.00973	.02253**	.00980	.02437**	.00968
HOMEVAL	.01359	.05170	.03749	.05419	.04131	.05347
BA	.01107***	.00397	.00853**	.00403	.00832**	.00398
HOMEOWN	– .01169***	.00438	– .01063**	.00447	– .00966**	.00442
PROPTAX	– .94917***	.15885	– .73901**	.35280	– .68283**	.34859
SURCHARGE	– 1.3879***	.33077	– .51988	.50094	– .54076	.50626
SALES	– .50699	.34377	– .32940	.37878	– .44076	.37477
INCOME	– .31245	.44568	– .58263	.51177	– .63551	.50540
OTHER	– .30561	.18929	– .13492	.20321	– .20687	.20175
PTAXRATE	– .05893	.36338	– .24498	.39719	– .34885	.39311
SURCHRATE	– .09320	.12002	– .10403	.11505	– .08472	.11422
BONDRATE	.00233	.00456	– .00028	.00510	– .00252	.00506
SALESRATE	.23095	.60326	– .31875	.65672	– .25162	.65056
INCRATE	– 2.4071	1.7189	– 2.5061	1.6477	– 1.5577	1.6409
EXTEND	.26125	.29309	.42996	.28839	.47169	.28904
FARM	.22572*	.12919	.29555**	.10697	.31707**	.13115
MIDWEST	– .64018***	.23540				
SOUTH	– .61472***	.19851				
WEST	– .82565***	.20687				
Constant	3.7321***	.55020	3.1198***	.7085	2.8252***	.70294
	N = 663 R^2 = 0.2395		N = 663 R^2 = 0.3362		N = 663 R^2 = 0.3605	

* $0.05 < p \leq 0.1$ ** $0.01 < p \leq 0.05$ *** $p \leq 0.01$

Table A-4: Log-odds Regressions for New Jersey Property Tax Increases

	No fixed effects		With year fixed effects	
	Coefficient	S.E.	Coefficient	S.E.
POPN	– .00062	.00047	– .00014	.00045
LOGDENS	– .06360	.05811	– .05733	.05590
POPNCHG	– .00132	.00360	– .00132	.00338
UNDER5	– .02668	.07322	– .05150	.06889
UNDER18	.04557	.02860	.04234	.02691
OVER65	.02887**	.01272	.02900**	.01209
HOMEVAL	– .27893***	.10341	– .28261***	.09851
BA	.02194***	.00655	.02175***	.00626
HOMEOWN	– .01465**	.00607	– .01090*	.00576
PTAXRATE	– .53282	.53043	– .98426*	.50704
NEWTAX	.16738	.13944	.81314***	.25064
FARM	.31229***	.11925	.26953**	.11806
Constant	1.0170	1.15	.99687	.86998
	N = 220 R^2 = 0.1192		N = 220 R^2 = 0.2455	

* $0.05 < p \leq 0.1$ ** $0.01 < p \leq 0.05$ *** $p \leq 0.01$

Table A-5: Log-odds Regressions for Massachusetts Community Preservation Act

	No fixed effects		Without education, with year fixed effects	
	Coefficient	S.E.	Coefficient	S.E.
POPN	– .00020	.00103	– .00014	.00104
LOGDENS	– .08638	.06234	– .08521	.06314
POPNCHG	– .00506	.00457	– .00652	.00439
UNDER5	.09583	.07723	.09386	.07838
UNDER18	– .06476**	.03158	– .06467**	.03199
OVER65	– .03336**	.01469	– .03506**	.01483
HOMEVAL	.09763*	.05857	.13652***	.04114
BA	.00409	.00409		
HOMEOWN	.00487	.00696	.00605	.00690
SURCHRATE	– .13014**	.06543	– .13860**	.06545
Constant	2.6856***	.73299	2.8893***	.77395
	N = 116 R^2 = 0.1893		N = 116 R^2 = 0.1865	

* $0.05 < p \leq 0.1$ ** $0.01 < p \leq 0.05$ *** $p \leq 0.01$

Table A-6: Logit Regression for Bond Issues

	Regional Fixed Effects		State Fixed Effects	
	Coefficient	S. E.	Coefficient	S. E.
POPN	.00004	.00005	.00012*	.00006
LOGDENS	.10500	.08157	.59188***	.16086
POPNCHG	– .00052	.00066	– .00086	.00108
UNDER5	– .06508	.08689	.08517	.15508
UNDER18	.03016	.01941	.01464	.04333
OVER65	– .01570	.02205	– .03236	.04019
HOMEVAL	– .37969***	.12224	.29075*	.16602
BA	.03355***	.00847	.02260	.01391
HOMEOWN	– .00771	.00871	.00774	.01608
FARM	– .50784*	.26575	1.4279***	.48313
STATE	1.3032*	.66733	1.5537	1.0147
COUNTY	– .26886	.27342	– .45849	.45000
MIDWEST	1.0849***	.31089		
SOUTH	2.2805***	.31433		
WEST	.71978***	.28064		
Constant	– 1.876*	1.0528	– 9.0238***	2.1386
	N = 796 Pseudo R^2 = 0.1592		N = 760 Pseudo R^2 = 0.5779	

* $0.05 < p \leq 0.1$ ** $0.01 < p \leq 0.05$ *** $p \leq 0.01$

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