The Value of Land Use Patterns and Preservation Policies*

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1 Introduction

Beyond the basic characteristics of a home such as its size and the size of the property upon which it sits, within a given real estate market, much of a home's value derives from the amenities provided by its location. These locational factors include convenience (distance to places of employment, shopping, highways, rail stations), amenities (local land-uses, open-space, parks), disamenities (distance to waste facilities, rail-lines, industrial zones), as well as regulatory impacts (zoning, historic districts). Policy-makers have long tried to impact property values through zoning and city/town/urban planning, as well as explicit policies to preserve/protect open-space, farmland, and wildlife habitat. This paper uses a fixed-effects, differences-in-differences, approach to examine the impacts of local land uses, zoning rules, and other locational factors on property values, as well as those of policies designed to preserve open-space and historic sites, and simultaneously provide for affordable housing. It focuses on the state of Massachusetts and that state's Community Preservation Act (CPA).

Briefly, the CPA is a policy enacted at the town level which allows towns to leverage a property tax surcharge with state matching funds for the purposes of Open Space Preservation, Historic Preservation, and Community (affordable) Housing. The policy, in place since 2001, has been enacted slowly over time by towns, so that, to date, 142 towns out of a possible 351 have enacted the CPA, and these enactments have been spread over 9 years (2001-2009). In fact, there are towns just now taking up the measure. One of the aims of this paper is to study the ex post impacts of CPA passage on property values.

Of course, while this paper is focusing on one state and one particular policy, this is hardly an issue that is isolated to Massachusetts. Since 1988, there have been some 1,686 conservation measures approved by voters (out of 2,233 total measures on ballots) in at least

43 states. Altogether, these measures have set aside some $53 Billion for conservation.[1] Massachusetts is also not the only state to have a matching funds program. New Jersey's Green Acres Program is just one other example of a similar policy which provides state aide to local communities seeking to preserve open space.

There is an extensive literature on the economic values of varying land-uses, mostly focusing on the value of open-space, variously defined.[2] This literature consistently finds that open-space in its many guises (cropland, pasture, forest, urban parks, etc.) is positively related to property values. What is less consistent is the magnitude of this effect. There is considerable heterogeneity both between studies and even in different areas within the same study (Heintzelman, 2009). Most often, this literature has used cross-sectional data to explore the value of open space, and is thus susceptible to omitted variables bias. A critical contribution of this piece is to use a 'panel' like dataset enabling me use a fixed-effects analysis which greatly reduces the range of possible omitted variables.

The literature on voter referenda for open-space preservation is considerably less deep. Kotchen and Powers (2006) and Nelson et. al. (2007) analyze what drives the appearance and success of these referenda in states and local communities. They find that preservation is a normal good - wealthier communities are more likely to vote for preservation. Kotchen and Powers (2006) also find that preservation is most likely in suburban (not urban, not rural) communities where development pressure is perceived to be highest. Only Heintzelman (2009) has previously studied the impacts of these referenda, and a small sample size prevents him from drawing firm conclusions about the impacts.

My results indicate that, on average, passage of the CPA *reduces* property values by about 1.5% in Massachusetts towns. However, when I allow the CPA effect to differ by county, I find some heterogeneity - it increases property values in some communities and

[1] Data from the LandVote database maintained by the Trust for Public Land, http://www.tpl.org/

[2] See McConnell and Walls (2005) for a survey or Waltert and Schlapfer (2007) for a meta-analysis of this literature. For more recent contributions see Heintzelman (2009) and Kuminoff (2008), amongst others.

reduces them in others. There is limited evidence on the extent to which different local spending priorities impact the overall effect. I also find that cropland and pasture, as well as low-density residential development, are the most preferred local land-uses, and that homes are more expensive as one increases distance to highways and active rail lines.

Section 2 provides a detailed background information on the Community Preservation Act. Section 3 describes the research methodology. Section 4 provides the results, Section 5 interprets and extends the basic results, and Section 6 concludes.

2 Policy Background

The Massachusetts Community Preservation Act was passed in 2000. It is a state program which provides matching funds to those towns who choose, through a referendum, to enact property tax surcharges of up to 3% and spend the additional funds (both those raised through the surcharge and the matching funds) on open-space preservation, historic preservation, and 'community' (affordable) housing. In practice, money has also been spent to provide recreational facilities.[3] Towns are required to spend at least 10% of funds raised on each of the three core areas, and are free to allocate the remaining 70% as they wish. In general, towns appoint a Community Preservation Committee to recommend projects to be funded, and final decisions must be approved by the town meeting. The funds are held in separate from general town accounts and are not available to address other local spending priorities. The tax surcharge may include any or all of three tax exemptions: for low income households, for the first $100,000 of property value, and for commercial and industrial properties. Finally, the adoption process is a two-stage process: first, the language of the referendum and parameters of the policy (surcharge, exemptions) are approved

[3] From 2001-2007, the state matched locally raised funds at a rate of 100%. In 2008, this fell to 67% and may be as low as 35% in 2009. The state matching funds come from a fee charged for deed transactions in the state.

either through the town meeting or through a petition drive; second, the referendum must be approved in a referendum vote.

As of June 2009, 142 communities have adopted the CPA out of the 351 towns and cities in Massachusetts. In addition to these communities, some 58 communities have rejected the CPA at the referendum stage.[4] Figure 1 shows a map of the towns and cities of Massachusetts by whether they have passed or rejected the CPA. Figure 2 shows a map of enacting communities color -coded by the date of adoption. According the Community Preservation Coalition, an organization that advocates for communities to adopt the CPA, "Using CPA funds, municipalities have preserved 10,274 acres of open space, including important wetland resources such as lakes, rivers, and saltwater ponds. In the area of affordable housing, CPA funds have allowed for the creation or rehabilitation of more than 2,300 affordable housing units and the development of hundreds of innovative affordable housing programs. Finally, more than 1,300 appropriations for historic preservation projects and over 500 recreation projects have been approved under the program."[5] Of those communities that have passed the CPA, 52% choose the highest potential surcharge rate of 3%. The average surcharge rate is 2.227%. 75.35% of enacting towns exempted low income households and nearly 79% exempted the first $100,000 in home value. Only 3.5% of towns exempted commercial and industrial property. No communities that have ever passed the CPA have subsequently withdrawn from the program, and three towns have, subsequent to initial passage, passed a second referendum to increase the surcharge rate. According to preliminary data from the Massachusetts Department of Revenue (DOR), there is quite a bit of variation in how the CPA money that has been raised so far has been spent. On average, towns have spent about 35% of CPA funds on Open Space, 22% on Affordable Housing, 13.2% on recreation, and 29.8% on Historic Preservation.

[4] 19 Communities initially rejected the CPA and then later enacted it.

[5] "Summary of an Act to Sustain Community Preservation, SB 90", available at http://www.communitypreservation.org/CPALegislation.cfm.

Intuitively, it is not clear what impact we should expect of the CPA on property values as there are a number of possible effects acting simultaneously. A first thought is that towns are opting into the program, so presumably a majority of voters in the enacting towns think that, on average, the policy will be good for their town, and in turn, would be good for property values. For one thing, through the matching funds, towns are essentially able to purchase public goods at a reduced price - provided that all of the outcomes of the CPA are, in fact, public goods. Basic consumer theory tells us that consumers (in this case, towns) can not be made worse off by a decrease in prices. However, there is reason to believe that many voters may have other reasons to vote for the CPA, regardless of the impact on property values. For instance, renters, or those meeting surcharge exemptions, if in place, stand only to gain from the CPA as they receive additional public goods at no additional cost. This implies that a passing vote does not necessarily imply expectations of average improvements in social welfare.

Ignoring the political economy aspects of the problem, it is still not clear what the impact of the CPA should be. It simultaneously includes both an increase in taxes and an increase in goods provision. Following Brueckner (1982), average property values will be highest when the level of public goods provision is optimal (over-provision implies taxes too high, under-provision implies services (and taxes) too low). So, if the CPA is moving towns towards the optimum it will increase property values, but if it is pushing them beyond the optimum it will lower property values. In addition, while the tax-cost of the CPA is clear up front - consumers presumably have a very good idea of what the surcharge will imply about their annual tax burden, the benefits of the program, particularly at the time of the vote, are unclear. Much of the money being raised is simply being set aside for future purchases, and there is not ex-ante obligation for the town to publicize the expected uses of the money. This implies that consumers, in purchasing homes, may be very aware of the taxes they are paying, but less aware about the benefits being provided. There are also supply effects of the CPA - restrictions on development restrict to supply of housing, which should increase property values. However, the provisions for affordable housing may undercut these effect by providing for additional high-density residential development (which both increases supply of housing and provides a public 'bad' in the sense that high density residential housing generally reducing property values).

3 Data and Empirical Strategy

I employ a standard hedonic regression analysis to estimate the effects of land-use characteristics and CPA passage on residential transaction prices. I have data on all residential property sales in the state of Massachusetts for the years 2000-2007. This data includes the sales price, date, and location of the home as well as a number of structural characteristics including lot size, interior size, bedrooms, bathrooms, and some indication of the 'style' of the home. I use GIS to attach geographical information (land-use, zoning information, distance to highways, rail lines, rail stations). In addition, I include monthly, town-level, unemployment rate data from the Massachusetts Department of Revenue (DOR). Finally, I include town-level data on the CPA including the date of passage, the surcharge rate, and included exemptions, as well as preliminary information on CPA expenditures, also from the DOR. After accounting for erroneous observations and those missing critical pieces of information (most often the date of a home's construction), I am left with 623,163 observations.[6]

This paper, in a sense, is doing double duty by estimating traditional hedonic effects in addition to the treatment effect of the policy, and to successfully estimate both, I must overcome some econometric obstacles. A major issue in estimating hedonic models, generally, is the problem of omitted variables (Parmeter and Pope, 2009). There are almost

[6] The base dataset, from The Warren Group, contained 798,202 observations, and so I have been able to retain 78% of the original observations.

innumerable factors which go into the value of a home, and many of these characteristics are unobservable to the researcher. If these unobservables are correlated with any of the observed characteristics, ones estimates will be biased. Similarly, in estimating treatment effects, there may be selection bias if the outcome variable (in this case, property values) is correlated with a factor which, in turn, is correlated with an observation receiving the treatment (Greenstone and Gayer, 2009). A recent literature in environmental economics has sprung up to adapt quasi-experimental approaches from other fields of economics to environmental issues in order to deal with these issues.[7]

There are three broad classes of quasi-experimental approaches: Differences-in-Differences (Fixed-effects), Instrumental Variables, and Regression Discontinuity (Greenstone and Gayer (2009), Parmeter and Pope (2009)). In this paper I apply the first of these, the Differences-in-Differences approach. This approach takes advantage of the 'panel' nature of my dataset to help solve both of the problems (omitted variables, selection bias) identified above. By including census block, census block-group, or even property-level fixed effects, I am able to control for any constant but unobserved factors that act at the local level and may be correlated both with property values and the explanatory variables of interest. Suppose for instance that towns with higher average incomes are more likely to pass the CPA. In the absence of fixed effects, I would observe a spurious positive correlation between passage of the CPA and property values. However, by including the fixed effects, and since town relative average incomes are likely to be relatively constant over a reasonable sample period, I am now controlling for this factor (and any other constant characteristics). Essentially, my regression coefficients will be the average within-group (census block, block-group, or property) impact of each explanatory variable.

One downside to this approach is that successful estimation will require sufficient within-

[7] See, for example, Parmeter and Pope (2009), Greenstone and Gayer (2009), and Klaiber and Smith (2009). For an excellent survey of general program evaluation methods, see Imbens and Wooldridge (2009).

group variation in each explanatory variable. Obviously, the smaller the groups the more factors that are being controlled for in the fixed-effect, but also the less variation that will be observed and the less statistical power I will have. As a result, I test the robustness of my results to changing the scale of the fixed-effect, and will look to balance these competing interests in determining the optimal scale.

What remains as potential confounding factors in this analysis - in particular the estimation of the treatment effect - are factors which are not constant over time. If there are any of these factors which are changing co-incident with both property values and the passage of the CPA in a community, than I could be mis-attributing changes in property values to the CPA. This would be of particular concern if I had only a small sample of communities being treated. With my large sample, while there may be these types of factors affecting individual communities, for me to mistake an effects for that of the CPA it would have to be happening in most of the 140 treatment communities at the same time as the CPA (which varys considerably amongst the treatment communities), which seems unlikely. To help with this matter, however, I do include a number of time-dependent controls. To net out any macro-level (trends for the full sample) trends, I include year dummy variables. I also include month dummies to account for seasonal effects. Finally, I normalize sales prices according the the Federal Housing Finance Agency's (FHFA) House Price Index. This is calculated at the U.S. Census MSA level (in Massachusetts, effectively, counties or groups of counties). Together, these three adjustments should fully de-trend and de-seasonalize the data, and allow me to isolate town-level effects, like the CPA.

In conducting a hedonic property-value analysis one must also be alert to spatial dependence and spatial auto-correlation.[8] A dataset exhibits spatial dependence if, in this context, property values for nearby properties are not determined independently of one another. That is, if one property's value depends on the value of its neighbor's. Spatial

[8] See LeSage and Pace (2009) for a complete treatment of this subject.

auto-correlation, similarly, is when the error terms for neighboring (or nearby) properties are not independent of one another. Both of these concerns can be expected in hedonic property-value models. A fully general spatial econometric estimation approach would assume a spatial weighting matrix which would, for any pair of properties describe how 'close' they are to each other, and, assuming that this matrix is correctly specified, one can control for both spatial dependence and spatial autocorrelation. Given the size of my dataset, however, so general an approach is extremely computationally intensive. Conveniently, however, there are some simpler ways to control for spatial issues. First, spatial dependence can be partially controlled for by the local-area fixed effects. In effect, this approach allows for spatial dependence within groups (as defined at the census block or block-group level), but not across groups. Secondly, spatial autocorrelation can be controlled for in a similar manner by allowing for error clustering within defined groups (not necessarily at the same spatial level at the fixed-effects groups), which simultaneously makes the calculated error terms robust to heteroskedasticity.[9]

Following Bertrand, Duflo, and Mullainathan (2004) and Parmeter and Pope (2009), the form of the estimated equation can then be written:

$$p_{ijt} = \lambda_t + \alpha_j + z_{jt}\beta + x_{ijt}\delta_{jt} + \eta_{jt} + \epsilon_{ijt} \qquad (1)$$

where p_{ijt} represents the price of property i in group j at time t; λ_t represents the set of time dummy variables; α_j represents the group fixed effects; z_{jt} represents the treatment variable (the CPA); x_{ijt} represents the set of other explanatory variables; and η_{jt} and ϵ_{ijt} represent group and individual-level error terms respectively.

Another issue in any analysis of land-use issues values is the proper measurement of land-use. Perhaps the most frequent measure is the distance to the nearest parcel of a certain

[9]Essentially, combined, these fixes allow for spatial weighting matrices containing '1's for all observations within groups and zeros elsewhere.

type. While this measure has clear merits I do not believe it is the whole story. Instead, I measure the total acreage of parcels of each type which intersect a buffer around the transacted properties.[10] This, I believe gives a more complete picture of possible impacts. Figure 3 provides an example of this measure. I do employ a distance measure for other factors such as the distance to highways, highway exits, active rail lines, and passenger rail stations.

4 Results

I begin by regressing the log of the normalized sales price (as discussed above) on the full range of possible explanatory variables, including home characteristics, local land-use characteristics, the zone in which the home is located, a series of other locational variables, the monthly unemployment rate, and, finally, the CPA status in the town in which the home is located on the date of the sale.[11] Table 1 provides summary statistics for the variables included in this analysis. I include two primary measures of CPA status - a simple dummy variable for whether or not the CPA had passed in that community prior to the sale date and secondly, the effective surcharge rate passed in the community (zero for those towns that had not yet enacted the CPA). As mentioned above, I also vary the geographic scale of the fixed effects to test the robustness of the estimates to this important assumption. Table 2 provides the results of these regressions.

Regressions 1 and 2 include the CPA dummy, while Regression 3 uses the surcharge rate. Regression 1 uses census block fixed effects, while Regressions 2 and 3 use census block-group fixed effects. I will focus mostly on Regressions 2 and 3 in the discussion below. This

[10] I do not have information on parcel boundaries, so instead use point estimates of each home's location based on 9-digit zipcodes.

[11] The semi-log specification is chosen to better allow comparisons to other literature in this area, specifically, Cropper, Deck, and McConnell (1988). However, recent evidence by Kuminoff, Parmeter, and Pope (2009), suggests that more flexible functional forms may be superior. This is a next step in this analysis.

is because the results at this broader geographic scale of fixed effects are generally more significant. This is intuitive, and consistent with Kuminoff, Parmeter, and Pope (2009). As we increase the scale of the fixed-effect, we perhaps open ourselves up to more omitted variables, but simultaneously allow for more variation in the included covariates which gives our estimates more power. At the block-group level, however, we still have 4,991 groups, each averaging only 125 observations.

The CPA dummy coefficient gives the percentage change in price for a binary change to the value of the dummy variable. This indicates that passage of the CPA results in a 1.43% to 1.77% reduction in home prices. Similarly the surcharge rate coefficient gives the percentage change in price for a unit increase in the surcharge rate, and implies a 0.65% reduction. These results are broadly consistent with each other since most towns choose a 3% surcharge.

Strangely, the monthly unemployment rate is positively related to home prices. This result is robust to changing the specification of the property value/unemployment rate relationship. This must reflect some omitted variable that is causing a spurious correlation. Thankfully, however, omitting the unemployment rate from the analysis does not change the estimate of the CPA coeffcient, which indicates that whatever is driving this result, it is not affecting our estimate of the CPA effect.

The distance variables suggest, as we would expect, that people will pay a premium for increased distance from highways and active rail lines. The estimates for exits and stations, included in an attempt to separate convenience aspects of transportation from the associated dis-amenities are not significant, although when using the block-group fixed effects, the station variable is of the right sign. All of the home characteristic variables are positive and significant with the exception of age which is negative, but decreasing at a decreasing rate. Condominiums are cheaper than single-family homes and relative to an excluded 'other-style' category, Colonials and Contemporaries are more expensive while ranches and flats are less expensive.

The type of 'zone' a home is in also affects its value. Relative to an excluded 'other' category, commercial, industrial, high-density residential, and conservation zoning, not surprisingly, generally have negative impacts on home prices, while most other residential categories are positive or insignificant. The conservation zoning result is perhaps most interesting. It suggests that the limitations inherent with such zoning policies are harming property values, and this may help explain the negative impact of the CPA - if passage of the CPA implies that a significant sample of homes will be subject to increased restrictions on development, this may reduce average prices.

Finally, many of the land-use coefficients are significant. Cropland, pasture, and low-density residential land-uses are positively related to home prices. High and medium density residential development, as well as commercial, urban open space, transportation, and waste land-uses are negatively related to home prices. Industrial development is also negatively related, but it is not quite significant at the 90% level. All of these results are to be expected, except, perhaps for the urban open space result. There may be congestion effects associated with use of these parks which are driving this result. The results presented also highlight the effect of changing the geographic level of the fixed effect. When fixed effects are calculated at the census block level, the lack of variation within blocks seems, indeed, to lead to insignificant estimates of the land-use effects, but this is reversed when expanding the fixed-effects to the census block-group level.[12]

Given the size of my dataset and the relatively large sample period, there are a significant number of properties which sell more than once in my sample. Limiting analysis just to these observations gives us a true fixed-effects model and completely eliminates any concerns about omitted variables (other than, as discussed above, factors changing coincident with

[12] There are 69,320 census blocks represented in my data, with an average of only 9 observations per block. There are only 4,991 census block groups represented in the data, with an average of about 125 observations per block-group.

the referendum). This gives the cleanest possible estimate of the referendum effect, and results are presented in Table 3. The result from the full-sample analysis, that the CPA negatively impacts property values is confirmed in this analysis, and the magnitude is almost identical to that estimated above. This analysis also includes variables representing the running sum of reported CPA expenditures in each of four areas (open-space, affordable housing, recreation, and historic preservation). All seem to be positively related to property values, but only historic preservation spending is significant. An alternative specification which included the share of each category as a percentage of total reported spending gave no statistically significant results.

5 Discussion

The regression coefficients described above indicate a negative and significant impact of CPA passage on property values of about 1.5%, on average. It is straightforward to put this number in perspective. For the average home, this reduction amounts to a reduction in price of about $1,991. On the other hand, the average increase in taxation from the CPA is about $112 per year. The present value cost of this additional tax, at a 5% interest rate is $2,352 and so the tax is being capitalized into property values at a rate of about 85%. This rate of tax capitalization is somewhere between the consensus estimates from the tax capitalization literature by Palmon and Smith (1998) and Oates (1966) of between 56% and 66% and that predicted by Ricardian equivalence - 100%.

As with any regression coefficient, however, this estimate of the referendum effect is simply an average effect across the sample. To see the extent of variation away from this estimate, I interact the CPA dummy with county dummies and with the land-use measures. Table 4 provides the estimates of the interaction terms from this regression. [13] There

[13] The estimates for the other variables, the same as those in Table 2 are very similar to those in the base regression.

are significant negative impacts of the CPA in two counties, Middlesex and Norfolk, and significant positive effects in Hampshire, Nantucket, and Plymouth counties. The point estimates range from a 3.7% decline in values in Middlesex County to a 4.7% increase in values in Plymouth County. The large negative impacts in Middlesex and Norfolk counties may be helping to drive the overall negative average effect of the CPA since Middlesex and Norfolk are two of the three largest counties in terms of number of observations. There are no immediate explanations available to explain this result, although a *possible* explanation for the Middlesex result is a very large share (31%) of existing CPA spending has been on affordable housing, the second-highest in the sample. The Land-Use interaction results are also very interesting. We see that high-density residential and industrial land have positive impacts on the CPA effect, while low-density residential land has a negative impact on the CPA effect. This suggests that those homes in more densely developed areas stand to benefit more from the CPA than those in less densely developed areas, which is consistent with intuition since open-space is presumably more scarce in more densely developed areas. More generally, this observed heterogeneity in impact is consistent with prior literature (Heintzelman (2009), Geoghegan (2003), Anderson and West (2006)), which has found the same sorts of heterogeneity in estimating the value of open space preservation.

Similar to the true fixed-effects analysis including only repeat-sales, I tried including data on spending in the full-sample regressions. I attempt a number of specifications, and very few of them yield any significant results. One result that is consistent across specifications, however, is that total spending is negative and significant while its square is positive and significant. When these terms are included, the magnitude of the estimate for the effect of the CPA is reduced, although it is still significant and negative. This suggests that larger programs have larger negative effects, which is consistent with the result from estimating the effect of the rate rather than just the CPA dummy. If I leave out the total spending variables and instead include only categorical spending variables (rather than categorical shares), expenditures on Open Space, Affordable Housing and Recreation have negative impacts, although only that for Affordable Housing is significant, while expenditures on Historic Preservation are positive, but insignificant. This gives some evidence that, of the four categories, affordable housing is the least preferred and most likely to decrease property values.

Moving to the measures of land-use, it is interesting to discuss these results with the aid of a simple heuristic - what is the effect on sales price if 1 acre of land near a home changes from an open space category (pasture, cropland, or woodland) to a developed category (residential, commercial, industrial). Table 5 presents the results of asking this question for the median home in the state-wide sample.[14] Notice, as an example, that replacing an acre of pasture with an acre of commercial development would reduce price by almost $180. Of course, most commercial developments are at a considerably larger scale, implying much larger price effects. The most preferred land-uses, which are also statistically significant, are Pasture and Cropland, implying, perhaps, that there is something preferable about farmland as opposed to other low-density uses - even conversion to low-density residential development would lower neighboring home prices.

6 Conclusions

This paper provides evidence that preservation policies, while generally providing public goods, and even when approved through a voter-referendum, may not be positively capitalized into home values. Using the quasi-experimental method of differences-in-differences analysis, I find that, in the case of the Massachusetts Community Preservation Act, passage of the CPA has had an overall negative impact on property values of about 1.5% in towns that pass the CPA. This effect is observed to be heterogeneous across counties

[14]Only changes in prices from increases in acreage are presented. The results for decreases are, obviously, *almost* identical and are thus omitted for simplicity.

and according to local land-use characteristics, with more densely developed areas seeing more benefits than those less densely developed. Nonetheless, the land-uses that are at least partially being targeted for preservation under the CPA do appear to have value for homeowners, relative to more developed uses. While it remains somewhat of a puzzle why towns would pass policies that are negatively affecting property values, it can explain why, in many towns, passage of the CPA is controversial, and why more than half the towns in Massachusetts still have not adopted the policy.[15] There is some evidence that spending on Community Housing helps to drive down the impact of the CPA, which is consistent with intuition, but more work needs to be done to fully establish that point.

[15]Of the 140 communities that passed the CPA before 2008, the median margin was 58% to 42%. In addition, 58 towns rejected the measure, and another 151 towns have not put it to a vote.

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Table 1: Summary Statistics

Variable	Definition	Mean	Std. Dev.
monthurate	Monthly Town-Level Unemployment Rate	4.539716	1.655781
rddistance	Distance to Highway	0.006755	0.013825
exitsdist	Distance to Highway Exit	0.044549	0.049956
trnarcdist	Distance to Active Rail Line	0.015873	0.018856
trnnoddist	Distance to Passenger Rail Station	0.054687	0.065783
lotsizesf	Lot Size (Square Feet)	22746.07	97456.32
grbldgarea	Interior Building Area (Square Feet)	2224.684	2764.99
bedrooms	Bedrooms	2.738458	1.243927
bathrooms	Bathrooms	1.524233	0.852707
halfbaths	Halfbaths	0.474044	0.568962
cropland	Cropland (Acres)	2.566178	30.74757
pasture	Pasture (Acres)	0.395627	3.215353
forest	Forest (Acres)	729.9053	2406.253
freshwetland	Freshwater Wetlands (Acres)	1.164864	10.98079
mining	Open Pit Mining (Acres)	0.106971	2.477815
open	Vacant Open Land (Abandoned/Non-Vegetated, Acres)	5.666941	168.714
multires	Multi-Family Residential (Acres)	33.58175	216.771
highdensres	High-Density Residential (Lots less than 1/4 Acre, Acres)	181.0062	451.5845
meddensres	Medium Density Residential (Lots 1/4 to 1/2 Acre, Acres)	108.7597	262.7586
lowdensres	Low Density Residential (Lots more than 1/2 Acre, Acres)	17.32016	86.9929
saltwetland	Saltwater Wetland (Acres)	1.605651	32.49791
commercial	Commercial Land (Acres)	13.47407	53.30502
industrial	Industrial Land (Acres)	2.3377	14.32137
urbanopen	Urban Open Space (Parks, Acres)	3.843223	23.92888
transporta n	Transportation (Roads, Highways, Rail Corridors/Stations, Parking, Acres)	16.7739	87.48042
waste	Waste Facilities (Acres)	0.043256	0.821047
freshwater	Freshwater/Coastal Embayments (Acres)	6.736147	52.85323
forestag	Forested Agriculture (Orchards, Acres)	0.380751	6.11992
age	Age of Home (Years)	74.38416	227.0078
Condominium	Condominium	0.301492	0.458906
CapeCod	Cape Cod Style Home	0.116604	0.320948
Ranch	Ranch-Style Home	0.141441	0.348476
Townhouse	Townhouse	0.042015	0.200623
Colonial	Colonial Home	0.191235	0.393274
Contemporary	Contemporary Home	0.020652	0.142218
Apartment	Apartment-Style Condominium	0.141835	0.348881
zonecom	Zoned Commercial	0.06622	0.248667
zoneind	Zoned Industrial	0.023409	0.151199
zonecons	Zone Conservation	0.006045	0.077517
zonelowres	Zoned Low-Density Residential	0.037022	0.188816
zonelowmed s	Zoned Low-Medium Density Residential	0.193629	0.395142
zonemedres	Zoned Medium Density Residential	0.161949	0.368404
zonemedhig s	Zoned Medium-High Density Residential	0.074448	0.262499
zonehighres	Zoned High Density Residential	0.263548	0.440558
zoneagres	Zoned Agriculture/Residential	0.036277	0.186979
zonemulti	Zoned Multiple-Uses	0.114448	0.318355

Table 2: Base Regression Regression Results: Full Sample

	Regression 1		Regression 2		Regression 3	
Dependent: Log(Normalized Sale Price)	Coef.	$P > \|t\|$	Coef.	$P > \|t\|$	Coef.	$P > \|t\|$
CPA Dummy	-0.017712**	0.000000	-0.014293**	0.000000	-	-
CPA Surcharge Rate	-	-	-	-	-0.006478**	0.000000
Monthly Town-Level Unemployment Rate	0.005706**	0.000000	0.004321**	0.000000	0.004306**	0.000000
Distance to Highway	5.016914**	0.000000	3.092564**	0.000000	3.092980**	0.000000
Distance to Highway Exit	0.435095	0.283000	0.107410	0.698000	0.108376	0.695000
Distance to Active Rail Line	1.393850**	0.001000	1.592044**	0.000000	1.592469**	0.000000
Distance to Passenger Rail Station	0.082186	0.838000	-0.334947	0.207000	-0.335552	0.206000
Lot Size (Square Feet)	0.0000002**	0.000000	0.0000002**	0.000000	0.0000002**	0.000000
Interior Building Area (Square Feet)	0.000037**	0.000000	0.000027**	0.000000	0.000027**	0.000000
Bedrooms	0.026195**	0.008000	0.022174*	0.030000	0.022167*	0.030000
Bathrooms	0.098838**	0.000000	0.109057**	0.000000	0.109052**	0.000000
Halfbaths	0.090489**	0.000000	0.119301**	0.000000	0.119303**	0.000000
Cropland (Acres)	0.000072†	0.094000	0.000107**	0.002000	0.000107**	0.002000
Pasture (Acres)	-0.000135	0.714000	0.001028**	0.002000	0.001028**	0.002000
Forest (Acres)	-0.000001	0.565000	-0.000001	0.414000	-0.000001	0.413000
Freshwater Wetlands (Acres)	-0.000083	0.308000	-0.000108	0.204000	-0.000108	0.205000
Open Pit Mining (Acres)	0.000088	0.760000	0.000161	0.674000	0.000160	0.675000
Vacant Open Land (Abandoned/Non-Vegetated, Acres)	0.000044	0.350000	0.000084	0.115000	0.000084	0.113000
Multi-Family Residential (Acres)	-0.000001	0.989000	-0.000019	0.655000	-0.000020	0.653000
High-Density Residential (Lots less than 1/4 Acre, Acres)	-0.000042**	0.000000	-0.000054**	0.000000	-0.000054**	0.000000
Medium Density Residential (Lots 1/4 to 1/2 Acre, Acres)	-0.000039**	0.000000	-0.000031**	0.005000	-0.000031**	0.005000
Low Density Residential (Lots more than 1/2 Acre, Acres)	0.000002	0.911000	0.000073**	0.006000	0.000073**	0.006000
Saltwater Wetland (Acres)	-0.000048	0.646000	0.000014	0.883000	0.000014	0.883000
Commercial Land (Acres)	-0.000014	0.880000	-0.000321**	0.000000	-0.000321**	0.000000
Industrial Land (Acres)	-0.000283†	0.070000	-0.000205	0.106000	-0.000205	0.106000
Urban Open Space (Parks, Acres)	0.000096	0.198000	-0.000197*	0.042000	-0.000197*	0.042000
Transportation (Roads, Highways, Rail Corridors/Stations, Parking, Acres)	-0.000105**	0.000000	-0.000125**	0.000000	-0.000125**	0.000000
Waste Facilities (Acres)	-0.001467	0.248000	-0.003337*	0.013000	-0.003336*	0.013000
Freshwater/Coastal Embayments (Acres)	0.000036	0.303000	0.000056	0.192000	0.000056	0.193000
Forested Agriculture (Orchards, Acres)	-0.000324	0.161000	-0.000083	0.674000	-0.000083	0.674000
Age of Home (Years)	-0.001221**	0.000000	-0.001226**	0.000000	-0.001226**	0.000000
Age of Home, Squared (Years)	0.000001**	0.000000	0.000001**	0.000000	0.000001**	0.000000
Condominium	-0.258532**	0.000000	-0.285377**	0.000000	-0.285342**	0.000000
Cape Cod Style Home	0.001201	0.678000	0.007413*	0.031000	0.007410*	0.032000
Ranch-Style Home	-0.047462**	0.000000	-0.046788**	0.000000	-0.046800**	0.000000
Townhouse	0.082135**	0.000000	0.100989**	0.000000	0.100953**	0.000000
Colonial Home	0.086620**	0.000000	0.108828**	0.000000	0.108820**	0.000000
Contemporary Home	0.140396**	0.000000	0.185871**	0.000000	0.185839**	0.000000
Apartment-Style Condominium	-0.064018**	0.000000	-0.070467**	0.000000	-0.070480**	0.000000
Zoned Commercial	-0.047746**	0.010000	-0.107241**	0.000000	-0.107244**	0.000000
Zoned Industrial	0.000820	0.966000	-0.070211*	0.013000	-0.070165*	0.013000
Zone Conservation	0.018438	0.553000	-0.062074†	0.077000	-0.062120†	0.077000
Zoned Low-Density Residential	0.060452**	0.010000	0.037769	0.170000	0.037801	0.170000
Zoned Low-Medium Density Residential	0.050195**	0.006000	0.011081	0.657000	0.011108	0.656000
Zoned Medium Density Residential	0.018721	0.279000	-0.015775	0.511000	-0.015741	0.512000
Zoned Medium-High Density Residential	0.000614	0.974000	-0.027562	0.270000	-0.027513	0.271000
Zoned High Density Residential	-0.002307	0.890000	-0.048648*	0.035000	-0.048618*	0.035000
Zoned Agriculture/Residential	0.029114	0.168000	-0.002787	0.924000	-0.002798	0.923000
Zoned Multiple-Uses	-0.042602*	0.036000	-0.105038**	0.000000	-0.105033**	0.000000
Constant	11.451090**	0.000000	11.556800**	0.000000	11.556790**	0.000000
Year Dummies	Yes		Yes		Yes	
Month Dummies	Yes		Yes		Yes	
Fixed Effects Level	Census-Block		Block-Group		Block-Group	
Number of Obs	623163		623163		623163	
Adj R-squared (Within)	0.2946		0.3687		0.3687	

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 3: Base Regression Regression Results: Repeat Sample

Dependent: Log(Normalized Sale Price)	Coef.	P > $\|t\|$
CPA Dummy	-0.017790**	0.000000
Open Space Spending (Million$)	0.0022	0.139000
Affordable Housing Spending (Million$)	0.0002	0.667000
Recreation Spending (Million$)	0.0018	0.725000
Historic Preservation Spending (Million$)	0.0051†	0.071000
Monthly Unemployment Rate	0.007464**	0.000000
Constant	11.784510**	0.000000
Year Dummies	Yes	
Month Dummies	Yes	
Fixed Effects Level	Property	
Number of Obs	155836	
Adj R-squared (Within)	0.0114	

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 4: County and Land-Use Interaction Results

Interaction Term (*Referendum)	Coefficient	t-stat	P > $\|t\|$
Barnstable (Baseline)	-0.0058474	-0.64	0.519
Berkshire	0.0239911	0.67	0.501
Bristol	0.0187450	1.14	0.252
Dukes	0.0123199	0.35	0.725
Essex	-0.0134161	-0.9	0.369
Franklin	-0.0092139	-0.23	0.818
Hampden	-0.0171248	-1.46	0.144
Hampshire	0.0251612†	1.71	0.087
Middlesex	-0.0377506**	-3.2	0.001
Nantucket	0.1106750*	2.11	0.035
Norfolk	-0.0295369**	-2.67	0.008
Plymouth	0.0476539**	3.79	0
Worcester	-0.0165742	-1.03	0.305
Cropland	0.0000005	0.01	0.993
Pasture	0.0005590	0.82	0.413
Forest	-0.0000005	-0.29	0.772
Freshwater Wetlands	-0.0001827	-0.84	0.4
Open Pit Mining	0.0002478	0.64	0.523
Vacant Open Land	-0.0000907	-1.52	0.13
Multi-Family Residential	0.0000231	0.44	0.659
High-Density Residential	0.0000232*	2.54	0.011
Medium Density Residential	-0.0000083	-0.58	0.561
Low Density Residential	-0.0000809**	-5.31	0
Saltwater Wetland	0.0001514	1.62	0.105
Commercial Land	0.0002659	1.41	0.158
Industrial Land	0.0002948†	1.79	0.073
Urban Open Space	-0.0003786	-1.32	0.188
Transportation	-0.0000240	-0.42	0.672
Waste Facilities	-0.0041133	-1.16	0.247
Freshwater/Coastal Embayments	0.0000708	0.77	0.444
Forested Agriculture	-0.0000144	-0.05	0.959

Significance levels : $\dagger$: 10% $*$: 5% $**$: 1%

Table 5: Effect of Land-Uses on Price of the Median Home

Type	Change in Price (Increase 1 Acre)
Cropland (Acres)**	$14.17
Pasture (Acres)**	$136.52
Forest (Acres)	-$0.12
Freshwater Wetlands (Acres)	-$14.38
Open Pit Mining (Acres)	$21.31
Vacant Open Land (Abandoned/Non-Vegetated, Acres)	$11.11
Multi-Family Residential (Acres)	-$2.58
High-Density Residential (Lots less than 1/4 Acre, Acres)**	-$7.10
Medium Density Residential (Lots 1/4 to 1/2 Acre, Acres)**	-$4.12
Low Density Residential (Lots more than 1/2 Acre, Acres)**	$9.70
Saltwater Wetland (Acres)	$1.82
Commercial Land (Acres)**	-$42.62
Industrial Land (Acres)	-$27.21
Urban Open Space (Parks, Acres)*	-$26.12
Transportation (Roads, Highways, Rail Corridors/Stations, Parking, Acres)**	-$16.57
Waste Facilities (Acres)*	-$442.26
Freshwater/Coastal Embayments (Acres)	$7.47
Forested Agriculture (Orchards, Acres)	-$10.97

Significance levels : † : 10% * : 5% ** : 1%

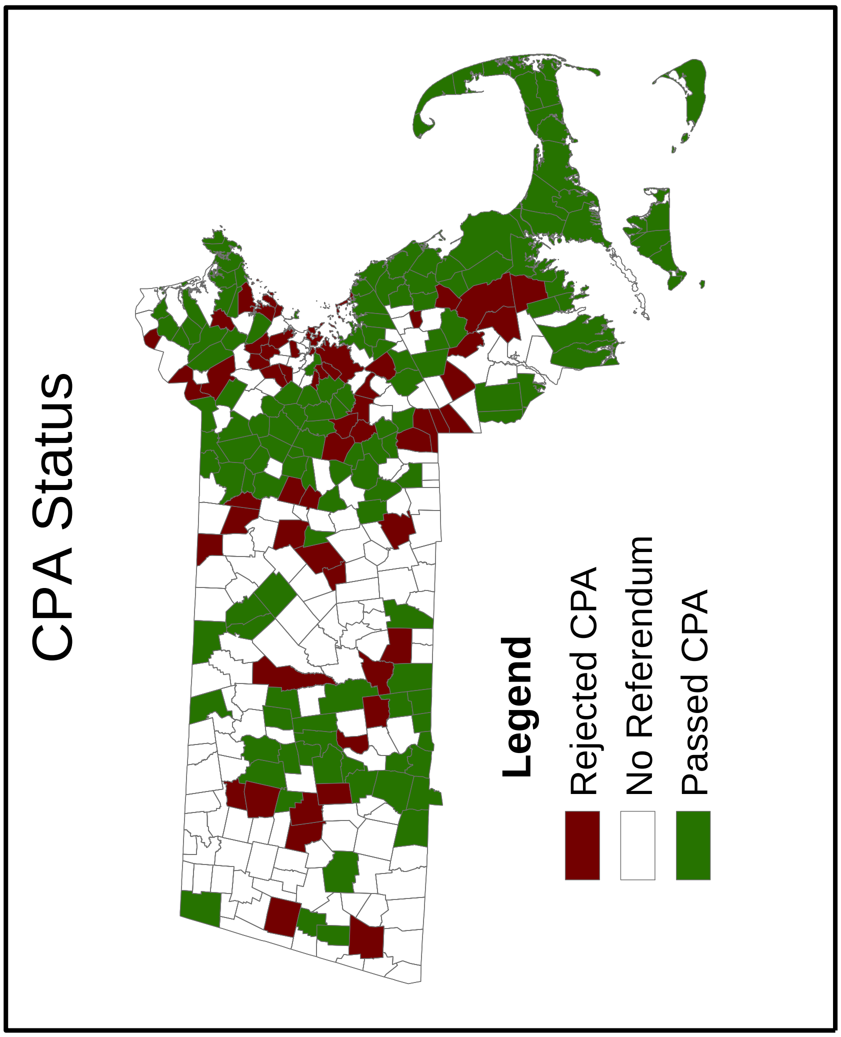

Figure 1: CPA Status

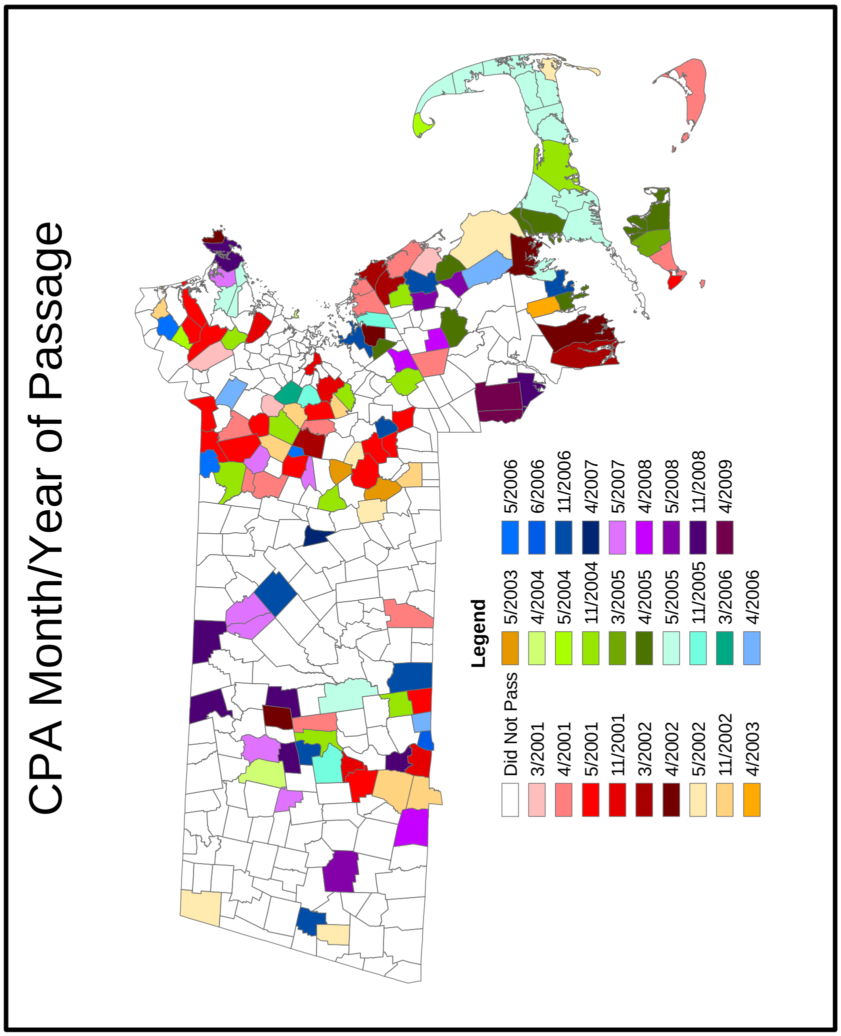

Figure 2: Month/Year of CPA Passage

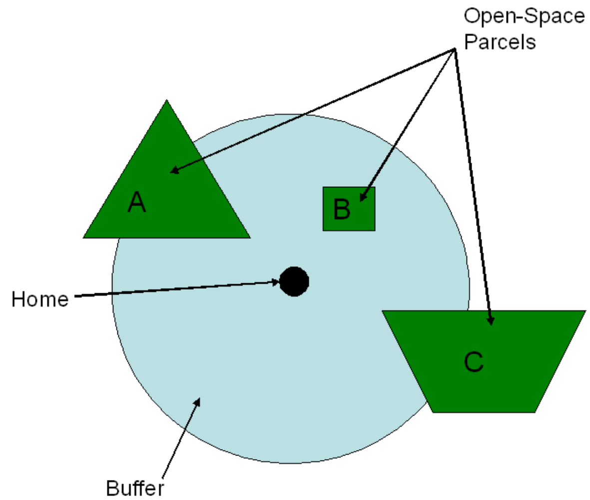

Figure 3: CPA Status