# Capitalization of Property Tax Relief in Home Prices: Evidence from Virginia Elections

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## Abstract

This study examines the extent to which property tax relief impacts home prices. Specifically, we investigate this in the context of two state-wide ballot measures in Virginia that provided property tax relief intended to aid the elderly and disabled veterans respectively. Using residential MLS microdata from Virginia, we find that once the 2010 tax relief measures passed on election day, property values had risen sharply in response to the sudden increase in demand of homeownership among the targeted groups. As part of our identification strategy, we find that areas with higher proportions of either seniors or veterans experienced the highest price appreciation. Further, we explore numerous alternative hypotheses and specifications that might explain this discontinuity. Our findings indicate that the 2010 tax relief measures were largely capitalized into home prices just after the election, which represents a critical unintended consequence of property tax relief as a policy tool more generally.

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## 1. Introduction

Property taxes are critical revenue sources for local and state governments,[1] and like any tax, the property tax is often used as a policy tool to achieve specific economic and social policy objectives. Most commonly, state and local governments have enacted property tax relief with the intention of aiding specific groups based on age, income, disability and/or veteran status. While these measures differ in both the scope and extent across states and municipalities, targeted tax relief measures were in place in all 50 states and the District of Columbia as of 2012.[2] The key question of this study is whether or not property tax relief programs affect the incentives and behavior of the groups they target, unintentionally altering the market for real estate in ways that may, in part, offset the objectives of the policy. Specifically, if property tax relief increases the demand for homeownership among these targeted groups on the margin, is there a corresponding capitalization of this tax relief in local home prices that prevents the target group from realizing the full benefit of the tax savings?

In this study, we examine the effect of property tax relief on home prices using a recent permanent change in policy via amendments to Virginia's Constitution, selected directly by the voters. On Election Day 2010 (November 2), two ballot measures were proposed to Virginia voters statewide. The first ballot measure, Question 1, was an initiative to make it easier for localities to exempt the elderly and disabled from property taxes.[3] This is a sizable portion of

[1] According to the Lincoln Institute, property taxes accounted for an average of 29% of local governments' total tax revenues, amounting to $1,390 per capita or nearly a half-trillion dollars nationally in 2011. See https://www.lincolninst.edu/subcenters/significant-features-property-tax/census/

[2] For more information, see the Lincoln Institute of Land Policy's summary of tax relief programs by state here: https://www.lincolninst.edu/subcenters/significant-features-property-tax/Report_Residential_Property_Tax_Relief_Programs.aspx

[3] The exact text of the Question read: "*Shall Section 6 of Article X of the Constitution of Virginia be amended to authorize legislation that will permit localities to establish their own income or financial worth limitations for purposes of granting property tax relief for homeowners not less than 65 years of age or permanently and totally disabled?*"

Virginia's population according to the U.S. Census, as 12.1% of Virginia's population is over the age of 65. The second ballot measure in 2010, Question 2, would directly exempt disabled veterans from paying property taxes statewide.[4] While this group is much more limited in number than seniors, Virginia is a state with a large military presence. According to the U.S. Department of Veteran Affairs, Virginia was home to 819,490 veterans in 2010, with 130,106 receiving disability compensation or pension payments.[5] A subset of the latter figure will be eligible for the property tax exemption, but the number may not be trivial, particularly in a number of Virginia communities that house large veteran populations.

Election day is an event not unlike firms' earnings announcements or macroeconomic data press releases, where broad information is revealed and markets respond accordingly. In the case of 2010, the election triggered an unambiguous shift in demand for homeownership, particularly among the groups that would now expect property tax relief in the future. Using micro-data from a multiple listing service in Virginia, we take a regression discontinuity approach to identify the impact of the passage of these election day constitutional measures on the real estate market. The empirical literature on property taxes and real estate prices has not yet examined the immediate capitalization of such tax changes or tax relief initiatives, which is the primary contribution of this paper. More broadly, evaluating the efficacy of property tax relief as a policy tool depends on answering this question.

From a public policy standpoint, it is important to understand a more complete picture of the impact of tax relief initiatives, which are widely supported by voters and policy-makers as a

[4] The exact text of the Question read: "*Shall the Constitution be amended to require the General Assembly to provide a real property tax exemption for the principal residence of a veteran, or his or her surviving spouse, if the veteran has a 100 percent service-connected, permanent, and total disability?*".
[5] For more details on the Virginia veterans snapshot, see the following:
http://www.va.gov/opa/publications/factsheets/ss_virginia.pdf

policy tool to aid selected groups in need. Empirically, our regression discontinuity design allows us to test whether the sudden increase in demand for homeownership for the affected groups increases home prices after the election. Given that the statewide initiative is arguably exogenous to particular locales, we use areas with few elderly or veterans and other years' elections as counterfactuals to further identify the causal impact of this treatment. We find that home prices had jumped sharply after the election, particularly in areas with high concentrations of senior citizens or veterans, whereas we find little impact in areas with fewer seniors or veterans. This effect is robust to numerous alternative specifications and counterfactuals, providing strong evidence that the effect is properly identified. The results suggest that an unintended consequence of this policy tool is that property tax relief is capitalized into home prices in areas where many of the affected groups live, effectively offsetting a portion of the benefit of tax relief to groups the policies were intended to help.

## 2. Property Tax Capitalization

Both property tax relief measures passed on Election Day 2010, which not only benefited seniors and disabled veterans, but also changed the incentives for these groups going forward. The most direct impact of these tax relief measures was that they make homeownership relatively more attractive to these groups on the margin, effectively increasing the demand for home ownership among seniors and disabled veterans. Empirically, the question remains whether home prices fully or partially capitalize the sudden change in demand.

Following the seminal work on property tax capitalization of Oates (1969), a number of empirical studies have examined the extent to which property taxes are capitalized into real estate prices. This literature has largely been motivated by exploring the Tiebout mechanism (see

Tiebout 1956), as well as the theoretical ambiguity of housing supply's response to changes in demand. In terms of simple supply and demand, if the housing supply curve is upward sloping or even perfectly inelastic (fixed), then a tax change that results in a change in demand will be directly capitalized into the property prices. Empirically, after controlling for other factors that explain variation in price, prices are said to be "fully capitalized" when the expected tax liabilities account for the remaining price differences. Full capitalization implies that property owners at the time of the tax change would receive the full benefit of tax relief or would bear the full burden of tax hikes. On the other hand, partial capitalization would imply that future owners would shoulder some of the benefits/costs. The key task for empiricists in this literature is to estimate the extent to which taxes (or changes in taxes) are subsequently capitalized into home prices, determining whether there is full, partial, or no capitalization.

The empirical literature on property tax capitalization has mixed results about the extent to which property taxes are capitalized into home prices. According to Sirmans et al (2008) review of the property tax literature, the most common result is partial capitalization.[6] However, Sirmans et al (2008) note that nine studies have found full capitalization of property taxes,[7] while seven have found no significant[8] property tax capitalization into home prices.[9] Although, to this point, the literature has largely focused on property tax differentials across localities (and subsequent changes to these differentials) to estimate the capitalization of property taxes into real estate prices. Yet, no study to date has examined statewide tax relief initiatives targeted at

[6] For examples of partial captialization, see Oates (1969), Gustely (1976), Steward (1978), Richardson & Thalheimer (1981), Goodman & Thibodeau (1998).
[7] For examples of (near) full capitalization, see Lewis & McNutt (1979), Reinhard (1981), Goodman (1983), Palmon & Smith (1998), McDonald & Yurova (2006).
[8] For examples of no capitalization, see Gronberg (1979), Johnson & Lea (1982), Haurin & Brasington (1996).
[9] See Sirmans et al (2008) for the full review of the property tax capitalization literature.

specific groups, which is a key gap in the literature filled by our study.[10] This is an important question for targeted property tax relief initiatives because if much of the tax relief is capitalized into home prices at the onset of the initiative, then it is the current homeowners (on election day) that primarily gain from this policy, particularly of homes in areas where these groups are more concentrated. While a subset of these homeowners that initially gain from tax relief may be from the targeted group, all future members of these groups will not really benefit from property tax relief if it is fully capitalized into their future home prices.

From an empirical standpoint, one benefit of the 2010 ballot measures is the fact that they are not driven by local fiscal concerns and apply to the entire state. By contrast, strictly local changes in property taxes may be more endogenous to the locality's fiscal situation, changing demographics, and a variety of other inter-related causal factors. For example, struggling, underfunded school systems may be primary driver of a particular local property tax hike, but examining the corresponding impact on real estate prices becomes more complicated as one would have to disentangle the school effect from the pure tax effect. Alternatively, the statewide ballot measures create an exogenous expectation of tax relief for the affected groups, largely independent of local fiscal concerns, as seniors and disabled veterans are only smaller subset of the population of taxpayers.

## 3. Data

We use residential real estate data from a multiple listing service (MLS) located in central Virginia, including Richmond and other surrounding areas. The coverage of our MLS data represents a typical housing market that includes urban, suburban, and rural sales. Richmond is a

[10] For a complete review of the property initiative literature, see Sirmans and Sirmans (2012).

medium-sized city located in the eastern part of central Virginia and the MLS covers much of the "Greater Richmond" area (or Richmond MSA). Our sample consists of 92,860 properties sold within this residential real estate market between 2006 and 2012. Among others, Levitt and Syverson (2008) point out that MLS data are entered by real estate agents and can be incorrect or incomplete. As a result, the data were carefully examined and outliers culled. We drop the top and bottom one percent of the sale price, square footage and time on market (just the top 1%) distribution from our sample. We further drop properties that have no bedrooms or bathrooms and those above the top one percent of the bedrooms, bathrooms, age of structure, and acreage.

[Table 1 about here]

Column 1 of Table 1 reports the summary statistics for all properties sold between 2006 and 2012 that are used in our general election estimates. The next two columns include the summary statistics for the 2009 gubernatorial election (column 2) that is used as a counterfactual (see below) for the main results that use the 2010 property tax exemption election (column 3). The average sales price for the full sample and the 2009 and 2010 years are similar ($229,505 for 2006 – 2012 and $217,842 for 2009 and 209,237 for 2010), but the average time on market is quite different (64 days compared to 80 and 77). This can be largely attributed to differences in the housing market pre- and post-crisis. Columns 4 and 5 provide summary statistics for the 2010 sample stratified by the proportion of individuals over age 65 in each zip code. Given that the 2010 initiative would affect the elderly, our hypothesis is that the increase in demand for home ownership would be the most pronounced in these areas. Zip codes with more than 14.6 percent of the population over 65 are classified as "high elderly", with the remainder classified as "low

elderly."[11] This cutoff is used because 14.6 percent represents the upper quartile of the proportion elderly distribution for our sample.[12] The high elderly sample generally has higher priced homes than the low elderly sample ($229,232 compared to $202,384). They are also more likely to be older structures, slightly bigger, on larger lots, more likely to have a basement, but less likely to have a garage. To illustrate where the most affected areas are likely to be located, Figure 1 is a map of all the zip codes in Virginia, with the zip codes available in the dataset color-coded either light blue (younger zip codes) or dark blue (older zip codes).

[Figure 1 about here]

Given that the other group affected by the 2010 ballot measures is disabled veterans, Columns 6 and 7 in Table 1 also include summary statistics for 2010 stratified by veteran status in each zip code.[13] High veteran zip codes are classified as at least 10.9 percent of the zip code consisting of veterans.[14] Home prices are very similar, the time on market is slightly longer, and the houses are much newer for high veteran zip codes compared to low veteran zip codes. Figure 2 includes a map of the zip codes classified as high and low veteran. The Zip code level data on age and veteran status used to stratify the sample are from the U.S. Census 2008-2012 ACS Five Year Estimates. Based on the characteristics for which we have data, it is clear from the summary statistics that homes sold in high veteran areas share a number of similarities with those sold in low veteran areas.

[Figure 2 about here]

[11] The results in this study are not particularly sensitive to how we define "high elderly," as the results are qualitatively similar when we associate high elderly areas as above the median threshold, and other thresholds.
[12] We also provide estimated effects for each quartile of the elderly distribution in the Results section.
[13] We are using data on veterans to proxy for the areas that are likely more affected by this ballot measure, given the limited data availability on disabled veterans that qualify for this tax exemption. This measure is far from perfect, but we expect an area's number of veterans to be correlated with number of disabled veterans.
[14] In this case, 10.9% is the median. However, the results below are qualitatively consistent for other thresholds. In a later section, we have a quartile breakdown of the effects.

## 4. Methodology – A Regression Discontinuity Approach

### *A. Regression Discontinuity Overview*

Regression discontinuity is a useful estimation strategy when estimating the impact of a treatment that is assigned in a discontinuous manner. Regression discontinuity operates by modeling the trends of the outcome variable across different values of a variable that determines treatment (referred to as the "running variable" in the regression discontinuity literature). The size of the effect is calculated as the difference between the intercepts of the two trends measured at the value of the running variable where the treatment begins. Regarding to the question posed in this paper, there is a discontinuous amount of information about specific policies that does not become known until after the election. Hence, a home's sale date is the running variable with the election date serving as the discontinuity.

The passage of the property tax relief amendment was not unforeseeable, given that both measures in 2010 passed overwhelmingly. However a search for newspaper articles referencing the property tax relief amendment during 2010 reveals that there was little discussion in the media until the week prior to the election, and virtually no polling data available on this issue in advance of the election.[15] A statewide newspaper search for 2010 news articles prior to October yielded only two articles from small newspapers, one on July 6th in *The Progress Index* and

[15] Several outlets endorsed the tax relief measures, however. The *Washington Post*, a national newspaper that has a wide circulation in Northern Virginia, endorsed Question 1 because it would "simplify the unwieldy current procedure" and allow localities greater flexibility to exempt seniors and disabled from local real estate taxes. The other newspaper endorsements largely emphasized their support for seniors on this issue; and, it was widely understood that this measure would help reduce the property tax burden for the elderly and disabled. Like Question 1, Question 2 was also widely endorsed for the purposes of directly aiding a group in need. The *Loudoun Times* endorsement was representative of media outlets around the state: "anytime we can find a nexus between providing targeted tax relief that supports the most vulnerable in society, the elderly, the disabled, and infirm veterans…you'll find us in a position of advocacy."

another on September 18th the *Danville Register & Bee*[16]. The week prior to the election, starting on October 28th, there were only nine articles discussing the ballot initiatives with an emphasis on the property tax amendments. Given the lack of media coverage, there was likely relatively limited knowledge of the amendment prior to the election. On election day, newspaper articles in conjunction with news broadcasts (and the act of voting itself) would increase the awareness of the amendments. For this reason we use the week of the election as the discontinuity in information regarding the property tax amendment. It is important to note, however, that the degree to which this measure was anticipated only makes our estimate at the discontinuity more conservative.

*B. Baseline RD Approach*

We begin by investigating the impact of the election on logged sale price using a standard two-trend regression discontinuity research design, seen below in equation (1).

$$ln(SalePrice_h) = \alpha + \beta_1(SaleWeek_h - C) + \beta_2\mathbf{1}(SaleWeek_h \geq C)(SaleWeek_h - C) + \beta_3\mathbf{1}(SaleWeek_h \geq C) + X_h + \varepsilon_h \quad (1)$$

When investigating the impact of the election initiatives on home prices we use the logged sales price of house h as the outcome. The sales week trend has been re-centered around the appropriate cutoff for each year's election (week 44). The coefficient on this trend ($\beta_1$) captures the market trend in sale price over time. We have also included this same trend interacted with an indicator variable equal to one when the sales week was at or past the election week cutoff. The coefficient ($\beta_2$) on this interaction term represents the difference in the market trend pre and post

[16] A search on newsbank.com for the following: elderly property tax in All Text and 1/1/2010 - 12/31/2010 in Date for the state of Virginia

election. The previously mentioned indicator variable equals one when the sales week is after the election, and is the estimated difference in the sale price due to the election. The coefficient ($\beta_3$) estimates the difference in the intercept at the discontinuity and can be thought of as the treatment effect. Finally, X represents the following controls: age of structure, square footage, number of bedrooms and bathrooms, size of garage (in number of cars), logged acreage, logged time on market, indicators for whether the structure is a condo/townhome, had a basement, no acreage, garage, was vacant, had a tenant, and zip code fixed effects. Because our variation is at the sales week level we cluster the standard errors on the sales week, but estimates are very similar when clustering by zip code. We estimate the impact of each election separately and include sixteen weeks of sales weeks prior to and after each election in our analysis, which corresponds to week 28 of the election year to week 8 of the following year. As a robustness check, we later increase the bandwidth to include six months prior to and after the election.

### *C. Identification Strategy and Sample Stratification*

The methodological approach outlined above yields an estimate of the treatment effect of the election on the overall sample of homes within that particular time frame. However, if the effect is properly identified, then we would expect the increase in demand for homeownership to be most pronounced (and lead to the most price appreciation) in the areas with the high concentrations of the tax relief's targeted groups. Conversely, if the property tax relief measures are driving the price appreciation for these groups, then we should also expect little price appreciation for areas with low concentrations of these groups. Therefore, we stratify our sample using the previously mentioned proportions elderly or veterans in each zip code to isolate the effect of the election in these areas. For the majority of our analysis we use a standard two-trend

design, but also provide estimates using a single trend and a quadratic trend. We use logged sales price as the outcome in all specifications.

If the effect is properly identified, then the results should also not be particularly sensitive to the choice of bandwidth, or number of weeks on either side of the discontinuity. In our primary specifications we include sixteen weeks of sales weeks (approx. 4 months) before and after the election, which corresponds to week 28 of the election year to week 8 of the year after the election. Later, we increase the bandwidth to include six months on either side of the election as an additional robustness check.

### *C. Broader Election (Season) Effect?*

The empirical literature has established that markets react to changes in the political landscape, particularly elections. Exploiting exogenous changes in prediction markets on election day, Snowberg et al (2007) found that markets across the board reacted strongly to both anticipated and revealed election information. In a close election in 2004, Snowberg et al (2007) found that equity prices, interest rates, oil prices, and the value of the dollar changed sharply in response to election news. More generally, going back to 1880, they find that Republican presidents raise stock valuations by 2-3 percent. Since the 1980s, Snowberg et al (2007) also find that electing Republican presidents also raises bond yields. Relatedly, Knight (2006) found that the party platforms of Bush and Gore during the 2000 presidential election were capitalized into equity prices, in that markets prices anticipated that certain industries benefit from a particular candidate.[17]

[17] For additional studies of politics/elections on markets, see Santa-Clara and Rossen (2003), Herron (2000), Lang and Shackleford (2000), Slemrod and Greimel (1999), and Sinai and Gyourko (1997).

Exploring whether there is an effect during other elections addresses a few potential issues. First, as implied by the previous literature above, the overall policy and macroeconomic environment may change in ways that affect the real estate market and could be an alternative explanation for our main results. Second, and relatedly, the 2010 election was an election where the Congress switched parties and the Republicans took control of the House of Representatives. Third, the election season itself could represent a seasonal aspect of home prices that explains the jump in prices around this time of year.

To address these concerns, we explore the impact of other elections on home prices using the same methodology as above. In many ways, the prior year's election (2009) provides a good counterfactual in contrast to 2010. In Virginia, 2009 was a post-crisis off-year election where there was no real estate-related measure on the ballot; but, there was a gubernatorial election in Virginia that took place that year. While off-year election turnout is generally low, both the 2009 and the 2010 elections in Virginia had very similar statewide turnout rates of approximately 35%. We also examine 2006 as an important counterfactual because it represents the opposite political shift in Congress (where the House of Representatives flipped from Republican to Democrat controlled in 2006), where we would expect to see the opposite effect as compared to 2010 if the Congressional switch is driving the 2010 result.[18] More broadly, if the results are properly identified, then testing whether there is a similar effect in other "off year" elections provides important counterfactuals, allowing us to distinguish the 2010 effect from another, possibly more general election season effect. The estimates from alternate elections and the

[18] If the Republicans taking the House of Representatives in 2010 somehow drastically affected the expectations of future policy and its subsequent effects on the real estate market, then reversing this should also have the opposite effect (i.e. a sudden drop in real estate prices).

estimates for the low elderly and low veteran stratifications provide "zero tests" for our methodology.[19]

## 5. Results

### *A. Baseline Results and Stratifications*

The 2010 property tax relief ballot measures had a significant effect on the real estate market just after the election. Table 2 reports the coefficient estimates from Equation 1 stratifying the sample by year and the proportion elderly and veterans in each zip code. The first column reports the estimated impact of the election in 2010 on the entire sample, resulting in a 6.1 percent increase in home prices. This represents the overall effect of the tax relief measures on the real estate market, implying that the targeted groups, while relatively small, still represent a sizable enough contingent to affect market prices substantially. The tax relief measures may also have a broader effect on the market because of the long term nature of a home as an asset, where tax relief later in life may bring down the expected lifetime cost of a home for all homeowners in the long run.

[Table 2 about here]

If the estimation approach is identifying a causal relationship between these tax relief measures and increased demand, then we should find the effect to be larger in areas where the overall change in demand for homeownership has increased the most, that is, greater proportions of veterans and the elderly. Indeed, Table 2 also shows that the impact is much larger when restricting the sample to zip codes with high proportions of elderly individuals, as seen in column

[19] An obvious exception would be the 2008 election, where the election season also coincided with a severe financial crisis and housing crash.

2 (a 12 percent increase in home prices). Alternatively, zip codes with lower proportions of elderly individuals report a much smaller, but significant increase in sale price of 4.2 percent as seen in column 3. Columns 4 and 5 include the estimates stratifying by proportion of veterans in each zip code. Zip codes with high proportions of veterans report a 9.1 percent increase in property prices while low veteran zip codes show no impact.

[Table 3 about here]

If this is merely an election season effect, we should see similar trends in the data for other years around the same timeframe. Columns 8 through 12 provide all the same results as above, but for the gubernatorial election year of 2009. These null results as well as the results in Table 3 further identify the 2010 results as causal, showing that there is no effect during the other election years, with the exception of 2008 (which happened to also coincide with a major financial crisis). For instance, in the off-year gubernatorial election year of 2009, the coefficients for the high elderly zip codes (Table 2 – column 9) reveal no impact, as evidenced by a 2.2 percent reduction in the sale price for the high elderly zip codes and 0.3 percent reduction for the low elderly zip codes, both of which are not statistically significant. The coefficients are also small and insignificant for the high and low veteran zip codes (columns 11 and 12).

[Figures 3 and 4 about here]

The estimated effects can also be seen graphically in Figures 3 through 4, cleanly illustrating the discontinuity in 2010 for the areas with high proportions of the tax relief's targeted groups. These figures are created using the coefficients from Table 2 and are stratified in the same manner. Note that the price jumps in the first panel of Figure 3 (High Elderly in 2010) just after the election. Figure 4 also shows an increase in home prices for the high veteran areas

in 2010 and the discontinuity appears to be more pronounced, representing a clear shift in home prices just after the election. None of the counterfactual stratifications in Figure 4 reveal large discontinuities or drastic changes in the post-election trend, nor do counterfactual elections of 2006, 2011 or 2012 graphed in Figures 5 and 6 reveal any impact on the real estate market. Taken together, the graphs show clear evidence of the upward shift in home prices in the areas expected to be impacted the most by property tax relief, providing additional evidence that the increase in home prices was due to the property tax amendments. Moreover, it is clear that the 2010 trend break is not merely a "November effect" or some recurring election season phenomenon, as the visual evidence further confirms no impact during the alternative elections for either group. Overall, the evidence for any general impact of elections or election season on local real estate prices is relatively thin. While there may be a more nuanced effect of elections on real estate (e.g. different impacts in certain geographical areas), we leave this for future research.

[Figures 5 and 6 about here]

## 6. Further Identification and Robustness

### *A. Alternative RD Specifications*

The primary results from the previous section are not very sensitive to choice of bandwidth (number of weeks used in the analysis). In Tables 4 and 5, we include estimates that modify the bandwidth and the pre and post-election trends for the elderly stratification and the veteran stratification respectively. The top panels in both tables include estimates for 2010 and the bottom panels for 2009. In column 1, we increase the bandwidth to six months in the pre and post-election time periods, which correspond to the 18$^{th}$ week of the election year through the

17th week of following year. A specification with a longer bandwidth yields a 7.5 percent increase for the high elderly areas and 5.9 percent increase for the high veteran areas. These are qualitatively similar, albeit a bit smaller, than the estimates using our preferred sample; however, there appears to be a trend break (from negative to positive) or non-linearity starting around the 8th week of the year for both the high and low elderly zip codes causing a leveling off of the trend resulting in a smaller discontinuity.

The primary results are also not sensitive to alternative specifications of the trends, as shown by Tables 4 and 5. The estimates using a single trend through the entire sample (column 2) or a quadratic trend (column 3) produce very similar coefficient estimates to the two-trend discontinuity effect. The younger zip codes using the longer bandwidth are no longer significant and the alternative trends are consistent with the default two-trend estimates in Table 2. In all cases, the 2009 estimates are small and are not statistically significant.

Table 6 stratifies the sample by the proportion elderly in the top panel and veteran in the bottom panel. The top quartile is what we have referred to as the elderly sample used in the paper thus far and reflects the highest estimate. The first quartile of the elderly distribution (columns 1) does reflect a change in property price following the election (which we will discuss below), however quartiles two and three show no difference. The veteran stratifications reveal that there is no effect in the first two quartiles, a large effect in the third quartile (14.7 percent increase), and a smaller but significant effect in the highest quartile (5.2 percent). It is possible that some low elderly zip codes may contain sizable proportions of veterans, and vice versa, which may result in noisier effects for these stratifications individually.

To address this potential issue, in Table 7 we report the results for the sample stratified into zip codes that have both high elderly and high veteran populations compared to those with low elderly and low veteran populations. Effectively, this removes the possibility of the other treatment effect "contaminating" the untreated group, so to speak. The results in Table 7 show that the election's effect on home prices are stronger for the high sample of both elderly and veteran, with a 14.7 percent increase in home prices in those areas. Alternatively, Table 7 also shows no change in home prices after the election for the low sample. Graphically, it is clear from Figure 7 that when the sample is stratified by both elderly and veteran areas, the effect of the 2010 election is most pronounced. Compared to low elderly and low veteran areas, the high elderly and veteran areas show a marked break in trend, reflecting the increase in demand for homeownership in the latter areas.

*B. Supply*?

Finally, we examine whether there is a discontinuity in the supply of homes on the market, or a significant decrease in homes listed on the market that could be driving this price change around the time of the 2010 election. Figure 8 shows the average number of new listings per week that went on the multiple listing service during the months around the election. While the number of new listings is not exactly flat, it is clear that there is no substantial decrease in listings that can explain the price jump around this time period. Hence, if the supply of new homes is not explaining the price jump, then this provides additional evidence that our methodological approach properly identifies the demand shock that is the primary driver of the discontinuity in real estate prices.

## 7. Conclusion

While property tax relief measures are often intended to aid specific groups, an unintended consequence of this kind of tax relief is that, on the margin, it increases demand for homeownership among these groups. In our study, we examined two property tax relief measures in Virginia that were specific to the elderly and disabled veterans, finding that they had an immediate effect on home prices after the voters approved them on election day. Specifically, we found that home prices overall rose by 6.1% in response to the increase in demand for home ownership, and the effect was as much as a 12% price appreciation in areas with high concentrations of seniors and 9% in high veteran areas, where the demand for home ownership was likely to rise the most. Conversely, the measures had little if any effect in areas with few seniors or veterans, which one would expect if the effect of the tax relief measures was properly identified by our methodological approach. Moreover, we find limited evidence that elections or the election seasons themselves have a significant, general impact on the real estate market.

A rough, back-of-the-envelope calculation suggests that the 2010 ballot measure was fully capitalized into home prices in high elderly zip codes. The estimated impact measured in levels can be calculated by taking the relative impact (12 percent for high elderly and 9.1 percent for high veteran) and multiplying it by the 2009 average or median home price ($218,000 mean and $195,000 median), amounting to an effect between $23,400 to $26,160 for the high elderly zip codes and $17,550 to $19,838 for high veteran zip codes. The average Virginia homeowner in 2014 will pay $1,862 on property taxes.[20] The present value from exempting a 65-year-old homeowner from paying taxes assuming a life expectancy of 19 additional years[21] and a discount

[20] http://www.tax-rates.org/virginia/property-tax
[21] The average 65-year-old Virginian has a life expectancy of 18.9 additional years - http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6228a1.htm

rate of 5 percent is $22,500. This is an overestimate of the present value since not all homebuyers following the election were age 65, meaning that many would have shorter time periods of exempt property taxes. Although simple, this calculation does imply that much of the benefits of the 2010 tax relief amendment initially went to current homeowners. Insofar as tax relief pushes up prices, the next generation of elderly or disabled veterans may not internalize the full benefits of tax relief. As a matter of public policy, this should be a consideration as policy-makers and voters determine the efficacy of targeted tax relief programs.

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# Tables

## Table 1: Summary Statistics

| | | | | Elderly (2010) | | Veteran (2010) | |
|---|---|---|---|---|---|---|---|
| | **2006-2012** | **2009** | **2010** | **Low** | **High** | **Low** | **High** |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Sale Price (Mean) | $229,505 | $217,842 | $209,237 | $202,384 | $229,232 | $209,821 | $208,627 |
| | (126,619) | (115,327) | (127,112) | (119,360) | (145,624) | (135,392) | (117,851) |
| Sale Price (Median) | $204,000 | $195,000 | $185,000 | $182,000 | $190,000 | $184,000 | $185,000 |
| Time on Market | 64.42 | 79.79 | 76.67 | 75.52 | 80.05 | 74.28 | 79.18 |
| | (69.70) | (78.02) | (71.99) | (71.15) | (74.32) | (71.04) | (72.91) |
| Age of Structure | 29.10 | 29.01 | 29.58 | 27.91 | 34.46 | 35.02 | 23.90 |
| | (26.72) | (26.59) | (26.86) | (27.24) | (25.08) | (30.00) | (21.70) |
| Square Footage | 1,936 | 1,906 | 2,000 | 1,985 | 2,043 | 1,951 | 2,052 |
| | (803) | (793) | (843) | (834) | (867) | (852) | (830) |
| Number of Bedrooms | 3.39 | 3.38 | 3.42 | 3.43 | 3.38 | 3.36 | 3.48 |
| | (0.78) | (0.76) | (0.80) | (0.81) | (0.79) | (0.83) | (0.77) |
| Number of Bathrooms | 2.25 | 2.23 | 2.32 | 2.31 | 2.34 | 2.27 | 2.36 |
| | (0.88) | (0.85) | (0.96) | (0.94) | (1.00) | (1.01) | (0.89) |
| Acreage (no 0s) | 1.26 | 1.12 | 1.26 | 1.02 | 2.01 | 1.12 | 1.41 |
| | (3.06) | (2.57) | (3.00) | (2.50) | (4.08) | (3.12) | (2.86) |
| No Acreage | 0.35 | 0.28 | 0.26 | 0.25 | 0.28 | 0.24 | 0.27 |
| | (0.48) | (0.45) | (0.44) | (0.43) | (0.45) | (0.43) | (0.44) |
| Vacant | 0.45 | 0.47 | 0.55 | 0.56 | 0.54 | 0.54 | 0.56 |
| | (0.50) | (0.50) | (0.50) | (0.50) | (0.50) | (0.50) | (0.50) |
| Tenant Occupied | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 |
| | (0.15) | (0.14) | (0.13) | (0.13) | (0.12) | (0.14) | (0.12) |
| Basement | 0.15 | 0.15 | 0.16 | 0.15 | 0.21 | 0.18 | 0.14 |
| | (0.36) | (0.35) | (0.37) | (0.36) | (0.40) | (0.39) | (0.35) |
| Condo or Townhouse | 0.09 | 0.08 | 0.09 | 0.10 | 0.08 | 0.13 | 0.05 |
| | (0.29) | (0.27) | (0.29) | (0.30) | (0.28) | (0.34) | (0.23) |
| Garage Size (# Cars) | 0.88 | 0.87 | 0.95 | 0.98 | 0.86 | 0.83 | 1.08 |
| | (1.00) | (0.99) | (1.01) | (1.01) | (1.02) | (0.99) | (1.03) |
| Prop. Veteran in Zip Code | 10.76 | 10.89 | 10.74 | 10.40 | 11.72 | 8.91 | 12.65 |
| | (2.67) | (2.71) | (2.49) | (2.45) | (2.32) | (1.62) | (1.66) |
| Prop. Over 65 in Zip Code | 12.56 | 12.71 | 12.37 | 10.73 | 17.14 | 11.61 | 13.16 |
| | (3.85) | (3.88) | (3.59) | (2.02) | (2.83) | (2.91) | (4.04) |
| N | 92,860 | 6,581 | 6,303 | 4,694 | 1,609 | 3,222 | 3,081 |

*Source:* Central Virginia MLS

*Notes:* Column 1 includes homes sold from the 1st week of 2006 to the 52nd week of 2012. All other columns include the analysis weeks from the 28th week of the stated year to the 8th week of the following year. Summary statistics for 2010 have been stratified by proportion elderly and veteran in each zip code.

**Table 2: Election Impact on Home Prices for Different Sample Stratifications**

| | 2010 | | | | |
|---|---|---|---|---|---|
| | Full Sample | High Elderly | Low Elderly | High Veteran | Low Veteran |
| | (1) | (2) | (3) | (4) | (5) |
| Discontinuity | 0.061*** | 0.120*** | 0.042** | 0.091*** | 0.029 |
| | (0.015) | (0.036) | (0.015) | (0.016) | (0.024) |
| Trend | -0.005*** | -0.008*** | -0.003** | -0.006*** | -0.003** |
| | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) |
| Post-Trend | -0.004** | -0.001 | -0.005*** | -0.004** | -0.005** |
| | (0.002) | (0.003) | (0.002) | (0.002) | (0.002) |
| Constant | 11.838*** | 11.830*** | 11.895*** | 11.662*** | 11.775*** |
| | (0.040) | (0.429) | (0.044) | (0.094) | (0.050) |
| N | 6,304 | 1,609 | 4,694 | 3,081 | 3,222 |
| | **2009** | | | | |
| | (8) | (9) | (10) | (11) | (12) |
| Discontinuity | -0.009 | -0.022 | -0.003 | -0.003 | -0.014 |
| | (0.013) | (0.027) | (0.014) | (0.020) | (0.016) |
| Trend | 0.001 | 0.004 | -0.000 | 0.001 | 0.001 |
| | (0.001) | (0.003) | (0.001) | (0.002) | (0.001) |
| Post-Trend | -0.006*** | -0.010** | -0.004** | -0.005* | -0.006** |
| | (0.002) | (0.005) | (0.002) | (0.003) | (0.002) |
| Constant | 10.645*** | 11.591*** | 10.813*** | 11.551*** | 10.830*** |
| | (0.041) | (0.090) | (0.037) | (0.042) | (0.047) |
| N | 6,585 | 1,791 | 4,790 | 3,334 | 3,247 |

*Source:* Central Virginia MLS

*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the following year. Estimates are stratified by proportion elderly, proportion veteran, and year. The outcome is ln(Sale Price). Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

## Table 3: Election Impact on Home Prices by Year

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Full Sample** | | | | | | | |
| Discontinuity | 0.007 | 0.012 | -0.040*** | -0.009 | 0.061*** | 0.009 | 0.023 |
| | (0.009) | (0.015) | (0.011) | (0.013) | (0.015) | (0.017) | (0.024) |
| Trend | -0.002** | -0.004*** | -0.003*** | 0.001 | -0.005*** | -0.003** | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) |
| Post-Trend | 0.003*** | 0.002 | -0.000 | -0.006*** | -0.004** | 0.002 | -0.003 |
| | (0.001) | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Constant | 11.592*** | 11.803*** | 11.762*** | 10.645*** | 11.838*** | 12.410*** | 11.371*** |
| | (0.029) | (0.025) | (0.031) | (0.041) | (0.040) | (0.039) | (0.040) |
| N | 10,650 | 8,484 | 6,456 | 6,585 | 6,304 | 7,095 | 7,948 |
| **High Elderly** | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Discontinuity | 0.016 | 0.043 | -0.053* | -0.022 | 0.120*** | 0.022 | -0.011 |
| | (0.024) | (0.027) | (0.029) | (0.027) | (0.036) | (0.028) | (0.036) |
| Trend | -0.001 | -0.005** | -0.005** | 0.004 | -0.008*** | -0.005** | -0.002 |
| | (0.002) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) | (0.002) |
| Post-Trend | 0.002 | -0.000 | 0.004 | -0.010** | -0.001 | 0.004 | 0.003 |
| | (0.003) | (0.002) | (0.003) | (0.005) | (0.003) | (0.003) | (0.003) |
| Constant | 11.742*** | 11.565*** | 11.751*** | 11.591*** | 11.830*** | 11.463*** | 11.751*** |
| | (0.068) | (0.119) | (0.058) | (0.090) | (0.429) | (0.094) | (0.088) |
| N | 2,912 | 2,253 | 1,739 | 1,791 | 1,609 | 1,772 | 2,213 |
| **High Veteran** | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Discontinuity | 0.007 | 0.015 | -0.019 | -0.003 | 0.091*** | 0.003 | -0.005 |
| | (0.017) | (0.023) | (0.018) | (0.020) | (0.016) | (0.017) | (0.029) |
| Trend | -0.002 | -0.003 | -0.003* | 0.001 | -0.006*** | -0.004*** | 0.000 |
| | (0.001) | (0.002) | (0.002) | (0.002) | (0.001) | (0.001) | (0.002) |
| Post-Trend | 0.003 | 0.001 | -0.002 | -0.005* | -0.004** | 0.002 | -0.003 |
| | (0.002) | (0.002) | (0.003) | (0.003) | (0.002) | (0.002) | (0.003) |
| Constant | 11.677*** | 11.590*** | 11.780*** | 11.551*** | 11.662*** | 12.808*** | 12.021*** |
| | (0.072) | (0.097) | (0.037) | (0.042) | (0.094) | (0.060) | (0.049) |
| N | 5,035 | 4,237 | 3,241 | 3,334 | 3,081 | 3,513 | 4,054 |

*Source:* Central Virginia MLS

*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the following year. Estimates are provided for the full sample, high proportion elderly and high proportion veteran zipcodes by year. The outcome is ln(Sale Price). Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects. Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

## Table 4: Alternative Specifications – Elderly

| | High Elderly Zip Codes | | | Low Elderly Zip Codes | | |
|---|---|---|---|---|---|---|
| | Long BW | Single Trend | Quadratic | Long BW | Single Trend | Quadratic |
| | *log(price)* | *log(price)* | *log(price)* | *log(price)* | *log(price)* | *log(price)* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | **2010** | | | | | |
| Discontinuity | 0.075** | 0.120*** | 0.121*** | 0.017 | 0.046** | 0.043*** |
| | (0.029) | (0.036) | (0.035) | (0.017) | (0.019) | (0.015) |
| Trend | -0.007*** | -0.009*** | -0.009*** | -0.006*** | -0.006*** | -0.006*** |
| | (0.001) | (0.002) | (0.002) | (0.001) | (0.001) | (0.001) |
| Post-Trend | 0.003* | | | 0.004*** | | |
| | (0.002) | | | (0.001) | | |
| Constant | 11.559*** | 11.822*** | 11.829*** | 10.983*** | 11.859*** | 11.886*** |
| | (0.147) | (0.425) | (0.427) | (0.056) | (0.042) | (0.043) |
| N | 2,811 | 1,609 | 1,609 | 8,103 | 4,694 | 4,694 |
| | **2009** | | | | | |
| | (7) | (8) | (9) | (10) | (11) | (12) |
| Discontinuity | -0.001 | -0.021 | -0.017 | -0.001 | -0.002 | -0.001 |
| | (0.030) | (0.038) | (0.032) | (0.015) | (0.016) | (0.014) |
| Trend | -0.003*** | 0.000 | -0.001 | -0.001 | -0.002 | -0.002** |
| | (0.001) | (0.002) | (0.003) | (0.001) | (0.001) | (0.001) |
| Post-Trend | 0.004* | | | -0.002* | | |
| | (0.002) | | | (0.001) | | |
| Constant | 11.565*** | 11.556*** | 11.575*** | 10.845*** | 10.814*** | 10.812*** |
| | (0.129) | (0.088) | (0.086) | (0.029) | (0.037) | (0.037) |
| N | 2,965 | 1,791 | 1,791 | 7,875 | 4,790 | 4,790 |

*Source:* Central Virginia MLS

*Notes:* Estimates are from a regression discontinuity in all specifications. All specifications use a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the following year aside from the Long BW that uses weeks 18 in the stated year to week 17 of the following year. Single trend includes only one trend throughout all the data, quadratic includes a single trend and its square. The outcome is ln(Sale Price). Estimates are stratified by proportion elderly and year. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

## Table 5: Alternative Specifications - Veteran

| | High Veteran Zip Codes | | | Low Veteran Zip Codes | | |
|---|---|---|---|---|---|---|
| | Long BW | Single Trend | Quadratic | Long BW | Single Trend | Quadratic |
| | *log(price)* | *log(price)* | *log(price)* | *log(price)* | *log(price)* | *log(price)* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | **2010** | | | | | |
| Discontinuity | 0.059*** | 0.093*** | 0.092*** | 0.002 | 0.033 | 0.031 |
| | (0.017) | (0.019) | (0.016) | (0.023) | (0.026) | (0.024) |
| Trend | -0.007*** | -0.008*** | -0.008*** | -0.005*** | -0.006*** | -0.006*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Post-Trend | 0.004** | | | 0.004** | | |
| | (0.001) | | | (0.001) | | |
| Constant | 11.612*** | 11.639*** | 11.659*** | 10.914*** | 11.743*** | 11.766*** |
| | (0.079) | (0.090) | (0.093) | (0.067) | (0.049) | (0.051) |
| N | 5,264 | 3,081 | 3,081 | 5,650 | 3,222 | 3,222 |
| | **2009** | | | | | |
| | (7) | (8) | (9) | (10) | (11) | (12) |
| Discontinuity | 0.012 | -0.003 | 0.000 | -0.017 | -0.012 | -0.011 |
| | (0.020) | (0.023) | (0.021) | (0.018) | (0.022) | (0.018) |
| Trend | -0.002** | -0.001 | -0.001 | -0.001 | -0.002 | -0.002* |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Post-Trend | -0.000 | | | -0.001 | | |
| | (0.001) | | | (0.001) | | |
| Constant | 11.720*** | 11.532*** | 11.539*** | 10.873*** | 10.832*** | 10.830*** |
| | (0.092) | (0.037) | (0.040) | (0.040) | (0.047) | (0.047) |
| N | 5,415 | 3,334 | 3,334 | 5,425 | 3,247 | 3,247 |

*Source:* Central Virginia MLS

*Notes:* Estimates are from a regression discontinuity in all specifications. All specifications use a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the following year aside from the Long BW that uses weeks 18 in the stated year to week 17 of the following year. Single trend includes only one trend throughout all the data, quadratic includes a single trend and its square. The outcome is ln(Sale Price). Estimates are stratified by proportion veteran and year. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

## Table 6: Election Impact on Home Prices by Quartile

| | Quartile | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th |
| | *log(price)* | *log(price)* | *log(price)* | *log(price)* |
| | **Elderly Stratification** | | | |
| | (1) | (2) | (3) | (4) |
| Discontinuity | 0.067** | 0.021 | 0.058 | 0.120*** |
| | (0.026) | (0.017) | (0.035) | (0.036) |
| Trend | -0.006** | -0.003* | -0.003 | -0.008*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Post-Trend | -0.001 | -0.005** | -0.007** | -0.001 |
| | (0.003) | (0.002) | (0.003) | (0.003) |
| Constant | 11.305*** | 11.709*** | 11.776*** | 11.830*** |
| | (0.074) | (0.205) | (0.082) | (0.429) |
| N | 1,498 | 1,631 | 1,565 | 1,609 |
| | **Veteran Stratification** | | | |
| | (7) | (8) | (9) | (10) |
| Discontinuity | 0.028 | 0.007 | 0.147*** | 0.052** |
| | (0.025) | (0.037) | (0.029) | (0.020) |
| Trend | -0.001 | -0.004* | -0.007*** | -0.004*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Post-Trend | -0.008*** | -0.002 | -0.007** | -0.002 |
| | (0.003) | (0.004) | (0.003) | (0.002) |
| Constant | 11.254*** | 11.988*** | 11.129*** | 11.672*** |
| | (0.162) | (0.060) | (0.140) | (0.096) |
| N | 1,453 | 1,590 | 1,543 | 1,717 |

*Source:* Central Virginia MLS

*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Estimates are for 2010 and are stratified by proportion elderly and veteran into quartiles. The outcome is ln(Sale Price). Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

**Table 7: Election Impact on Home Prices with Stratifications by Both Veteran and Elderly**

| | 2009 | | 2010 | |
|---|---|---|---|---|
| | High Elderly High Veteran | Low Elderly Low Veteran | High Elderly High Veteran | Low Elderly Low Veteran |
| | (13) | (14) | (6) | (7) |
| Discontinuity | 0.006 | 0.003 | 0.147*** | 0.024 |
| | (0.038) | (0.021) | (0.038) | (0.025) |
| Trend | 0.003 | -0.000 | -0.010*** | -0.003* |
| | (0.004) | (0.002) | (0.003) | (0.002) |
| Post-Trend | -0.013** | -0.006** | 0.002 | -0.004* |
| | (0.006) | (0.002) | (0.004) | (0.002) |
| Constant | 11.585*** | 10.820*** | 11.901*** | 11.793*** |
| | (0.101) | (0.052) | (0.478) | (0.054) |
| N | 1,163 | 2,619 | 1,033 | 2,646 |

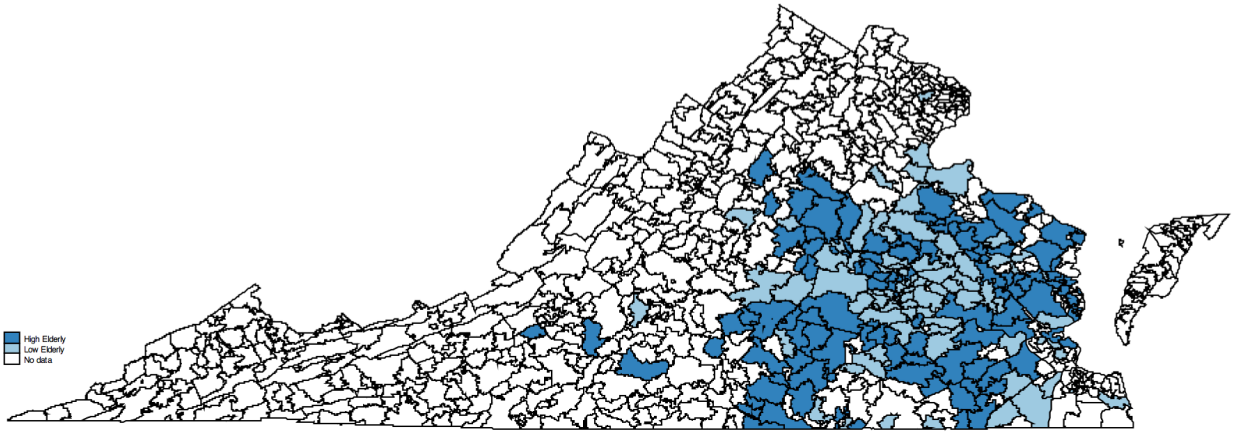
*Source:* Central Virginia MLS

*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the following year. Estimates are stratified by high/high and low/low proportion elderly and veteran and by year. The outcome is ln(Sale Price). Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

Standard errors clustered on close week in parenthesis. * 10%, ** 5%, *** 1%.

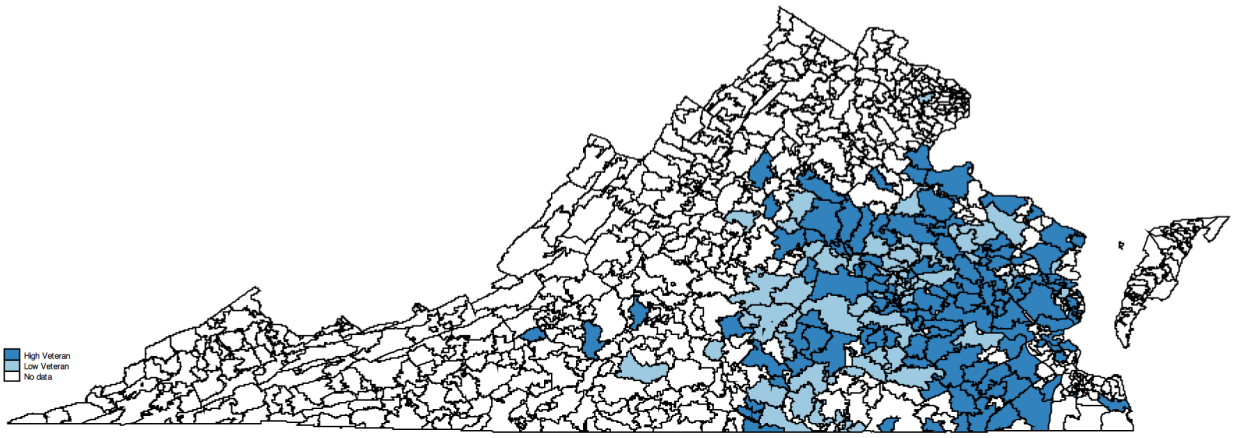
# Figures

**Figure 1: Elderly Stratification Zip Codes**



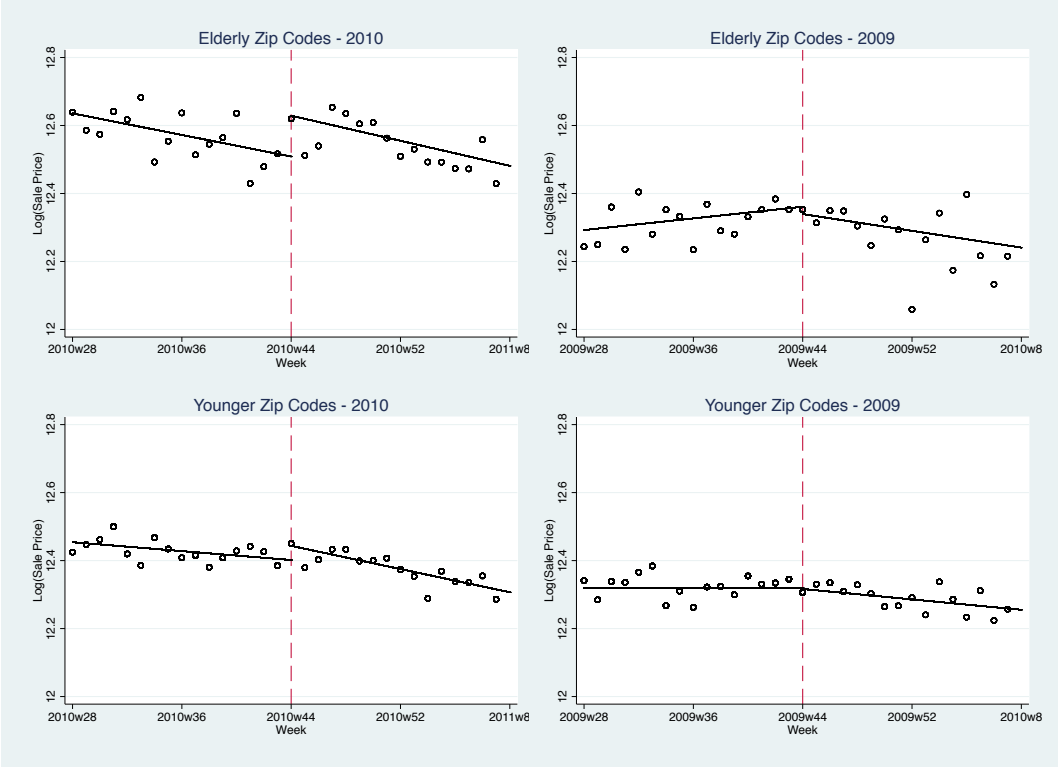

*Map Source:* U.S. Department of Commerce, U.S. Census Bureau, Geography Division 2010 TIGER/Line Shapefile, Virginia, 2010 Census 5-Digit ZIP Code Tabulation Area (ZCTA5)
*Source:* Zip code level proportion over 65 from U.S. Census 2008-2012 ACS Five Year Estimates
*Notes:* Zip codes with more than 14.6 percent over age 65 are colored dark blue, those with less than 14.6 are light blue, and zip codes not used in the analysis are white.

## Figure 2: Veteran Stratification Zip Codes



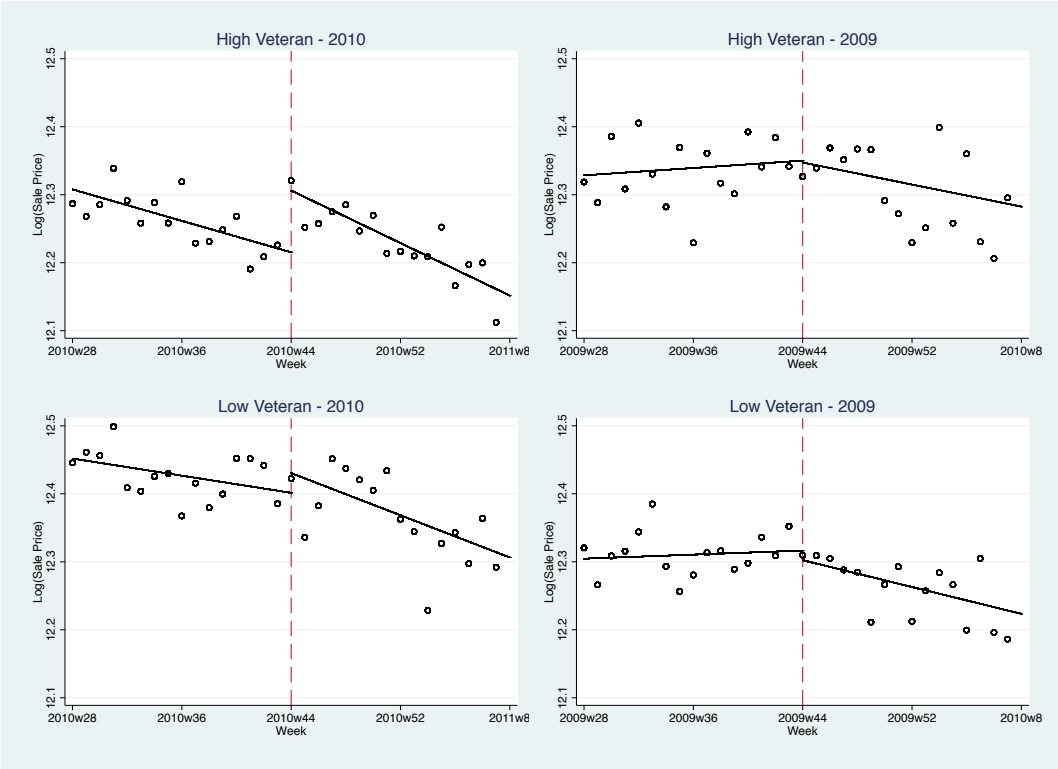

*Map Source:* U.S. Department of Commerce, U.S. Census Bureau, Geography Division 2010 TIGER/Line Shapefile, Virginia, 2010 Census 5-Digit ZIP Code Tabulation Area (ZCTA5)
*Source:* Zip code level proportion veteran from U.S. Census 2008-2012 ACS Five Year Estimates
*Notes:* Zip codes with more than 10.9 percent veterans are colored dark blue, those with less than 10.9 are light blue, and zip codes not used in the analysis are white.

## Figure 3: Election Impact on Home Prices for Elderly Stratifications



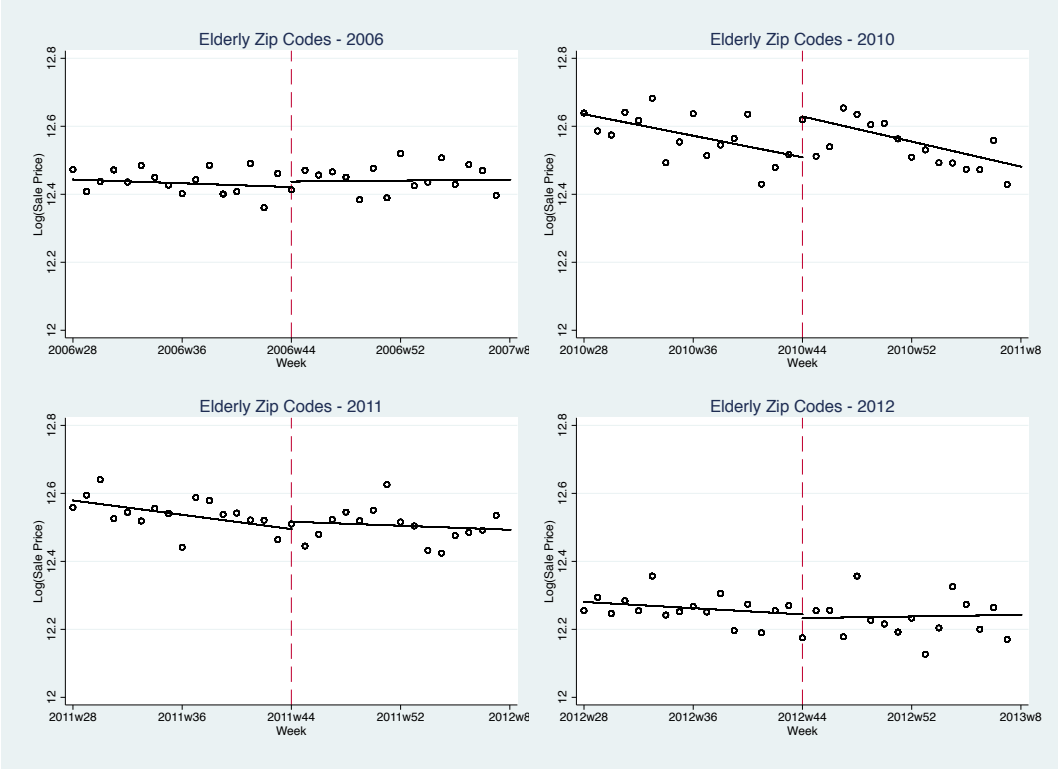

*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure is created using coefficients from Table 2 and are stratified by proportion elderly and year. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

## Figure 4: Election Impact on Home Prices for Veteran Stratifications



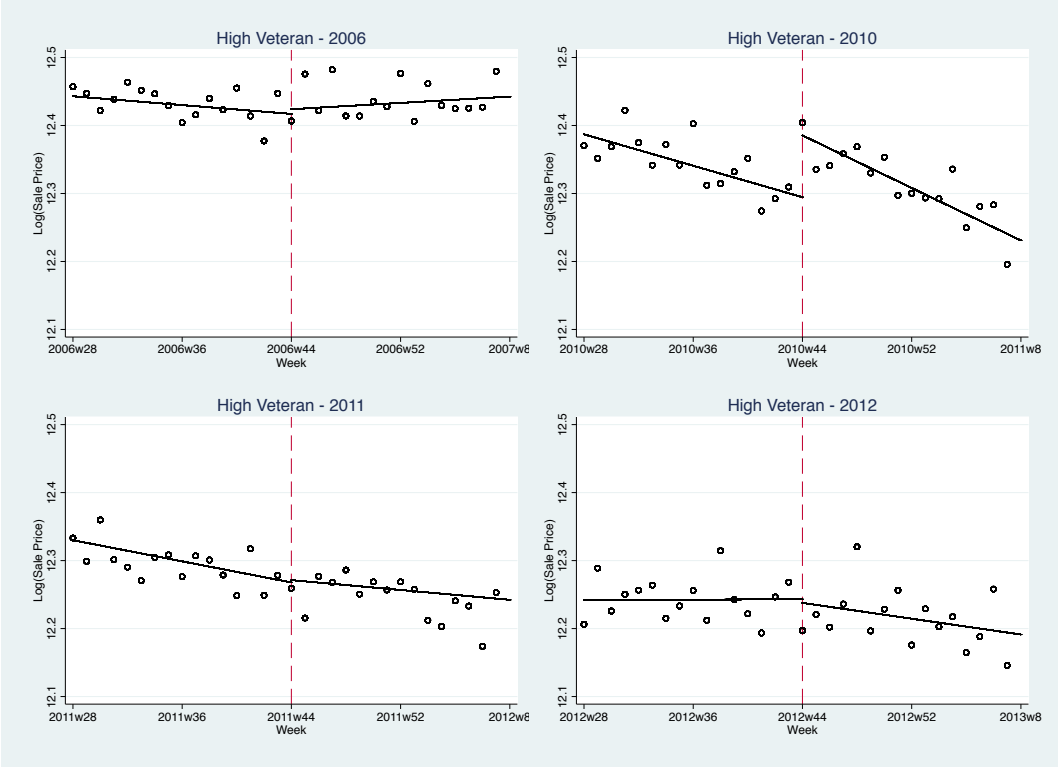

*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure is created using coefficients from Table 2 and are stratified by proportion veteran and year. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

## Figure 5: Elderly Estimates for Different Years



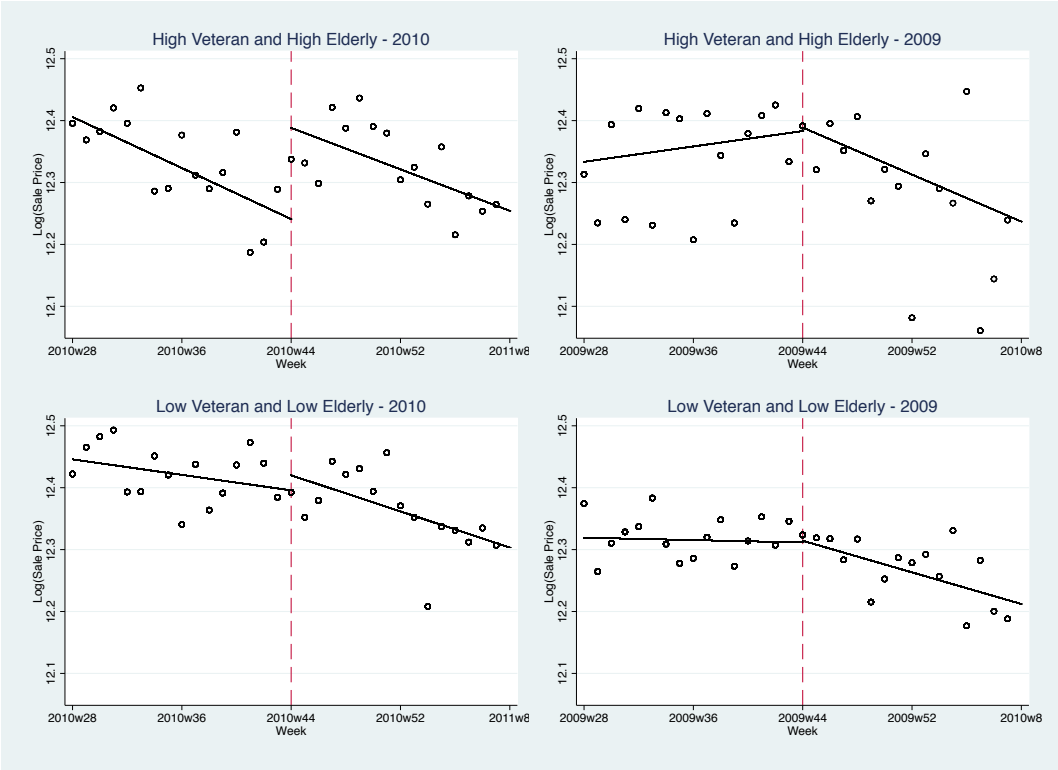

*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure includes results for high proportion elderly zipcodes in the treatment year (2010) and alternative years. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

## Figure 6: Veteran Estimates – Alternative Years



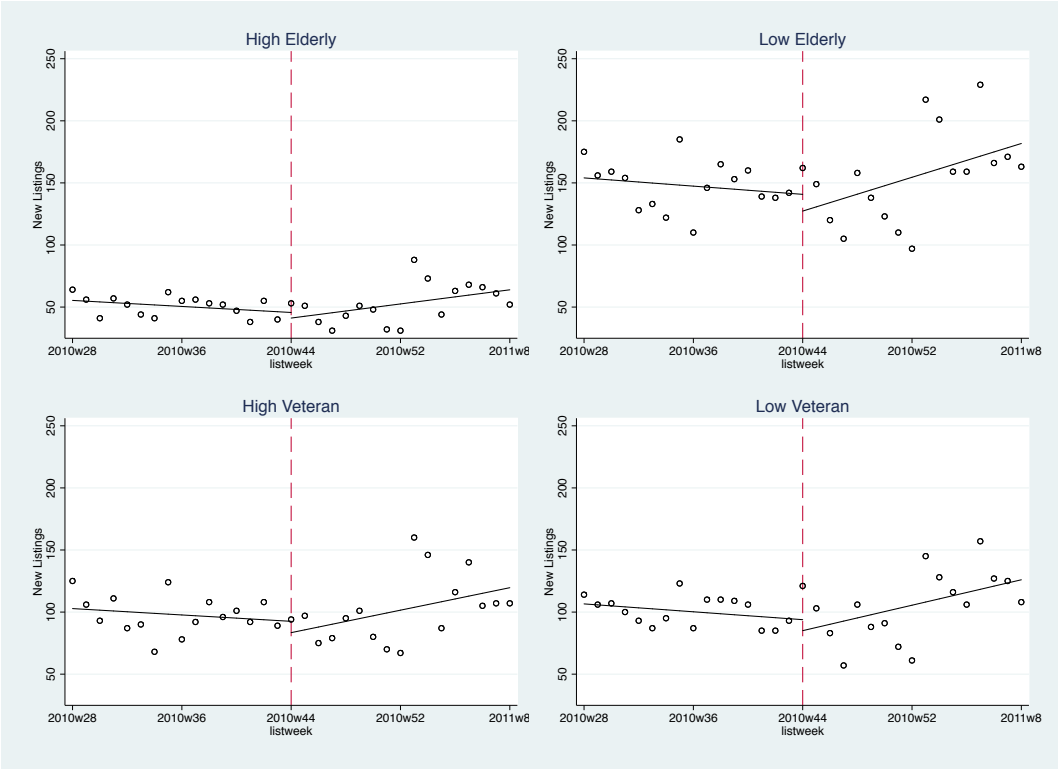

*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure includes results for high proportion veteran zipcodes in the treatment year (2010) and alternative years. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

**Figure 7: Election Impact on Home Prices with Stratifications by Both Veteran and Elderly**




*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure is created using coefficients from Table 2 and are stratified by splitting the sample into high (low) proportion elderly and high (low) proportion veteran. Controls include age of structure, square footage, logged acreage, logged time on market, number of bedrooms and bathrooms, garage (number of cars), indicators for whether the structure is a condo or townhouse, has a basement, no acreage, is vacant, currently has a tenant, and zip code fixed effects.

## Figure 8: Trends in New Listings – 2010




*Source:* Central Virginia MLS
*Notes:* Estimates are from a two-trend regression discontinuity using a cutoff at week 44 and a bandwidth of week 28 in the stated year to week 8 of the next year. Figure includes results for high proportion elderly and veteran zipcodes in the treatment year (2010).