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Recessionary Property Taxes: Evidence from Maryland

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Abstract

Property taxes are often credited for stabilizing local government revenues during contractions, but this revenue stabilization can have destabilizing effects on households. In this paper I explore how features designed to stabilize property tax revenues in Maryland affected households during the Great Recession. I find that property tax cuts attributable to a downward property reassessment reduced the probability a household would default on its mortgage, and increased home sales and purchase price premia. Conversely, properties that were not reassessed, because of the staggered reassessment process that phases in the effects of housing market fluctuations on revenues, had increased rates of mortgage default and lower turnover. I also report suggestive evidence that the counties that cut property taxes earlier in the recession suffered smaller spikes in unemployment and recovered more quickly.

Keywords: Property taxes, countercyclical policy, mortgage default

Highlights:

- Downward property reassessments during the Great Recession:
    1. Reduced mortgage defaults.
    2. Increased the number of property sales.
    3. Increased sales prices.
- Maryland counties that reassessed a greater share of their properties in 2009 experienced a shallower recession and quicker recovery to pre-recession employment levels.

About the Author

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Recessionary Property Taxes: Evidence from Maryland

Introduction

Countercyclical policy in the United States is generally implemented at the national level, through cuts in federal income taxes, increased deficit spending, or expansionary monetary policy. And yet, there is typically substantial variation in economic conditions across the country during contractions and there is a large local component to the housing market fluctuations that often accompany recessions (Fairchild et al. 2015). The fact of wide regional difference with local causes raises the question of whether there is also a role for local fiscal policy to supplement national interventions in curbing the worst effects of an economic downturn.

The most important tax instrument for local governments is the property tax. Local property taxes generated $473 billion in revenue in 2015, representing 30% of local government revenues.[1] Property taxes are largest source of local government revenue other than intergovernmental transfers.[2] Property taxes also represent a significant expense for homeowners. For example, the average property tax bill for New Jersey residents in 2015 was $8,353. Thus, the property tax is economically important for both local governments and households, and it also takes on outsized significance during recessions that are associated with falling housing prices, such as the Great Recession of 2008–2009.

In this report, I investigate how the real property tax affects the resilience of a local economy to a recession. The literature on the effects of property taxes during recessions has generally reached favorable conclusions about real property taxes, largely because it focuses on revenue stabilization from the perspective of local governments. Property tax revenues are more stable than sales and income tax revenues and, indeed (for reasons described in the following section), more stable than real property values.[3]

However, keeping property tax revenues stable as property values are falling implies rising effective tax rates on real property and, conversely, falling effective rates when property values rise. Thus, depending on the details of the local property tax regime, real property taxes are often procyclical, rather than countercyclical, from the household's perspective. For the many households which have limited cash reserves under even normal circumstances, the combination of fixed property tax liabilities and a decline in wealth from falling housing prices during a

[1] https://www.urban.org/policy-centers/cross-center-initiatives/state-local-finance-initiative/projects/state-and-local-backgrounders/property-taxes. The U.S. Census reports that, for the twelve months ending March 2013, property tax revenue was greater than any other source of state or local tax revenue. During that period, $477,773 million in property tax revenue was collected by states and localities. The second highest collection was the individual income tax at $322,391 million. *See* U.S. CENSUS BUREAU, QUARTERLY SUMMARY OF STATE & LOCAL TAX REVENUE tbl. 1 (2013), *available at* http://www.census.gov/govs/qtax.

[2] https://www.taxpolicycenter.org/briefing-book/what-are-sources-revenue-local-governments

[3] *See, e.g.*, Campbell and Sances (2013) (describing volatility in state tax revenue, particularly from personal income tax); Lutz (2008); Lutz et al. (2011); Doerner and Ihlanfeldt (2011); Alm et al. (2011); Kodrzycki (2014); Edgerton et al. (2004) (describing greater volatility of New York City's income tax base than its property tax base). On the desirability of relying on the property tax, see Alm (2013), Gamage (2008).

recession can leave them with very little liquidity and cause them cut back on other expenditures including mortgage payments and discretionary consumption. Cutting back on these expenditures, however, can have collateral effects on the surrounding economy as mortgage defaults lead to foreclosures and reduced spending can deprive the local economy of demand stimulus just when it is most needed.

Thus, whether the net effect of property tax revenue stability on business cycle fluctuations is positive or negative depends, first, on the different composition of household and government spending out of property taxes and, second, on the relative sensitivity of household spending to changes in their property taxes and the dependence of local government spending on contemporaneous revenues.[4] Although household spending is much more sensitive to fluctuations in income and expenses than the federal budget, state and local governments have more limited access to capital markets than the federal government and in some cases are limited by balanced budget restrictions from engaging in deficit spending, meaning that revenue shortfalls can lead to spending cuts. On the other hand, a surprising number of households are very illiquid and live paycheck-to-paycheck (Kaplan et al. 2014). Thus, it is an empirical question whether local economies are more resilient if government revenues, or household after-tax incomes, are more stable in a recession.

In this report, I attempt to shed light on this empirical question by focusing on the case of Maryland, where its practice of real property assessment generated plausibly exogenous real property tax cuts to different households at different times during the Great Recession. I use this difference in timing to estimate the effects of property tax cuts on households and the economic trajectory of local economies. In Section 1, I explain why property tax revenues are more stable than property values, focusing on the case of Maryland. I describe how changes in property taxes during recessions might be expected to affect households and the connection between revenue and expenditures at the local level. In Section 2, I describe my methodology for estimating the effect of property tax cuts on household and local economic outcomes. This methodology relies on certain important features of Maryland's property tax system, which is the basis for my research design. Section 3 describes the data I use to estimate the effects of property tax cuts during recessions, and Section 4 reports the results of my analysis.

1. Background

Property Taxes During Recessions

Part of the appeal of a real property tax is its potential for simplicity. Property could be appraised annually and then taxed at a single fixed rate. And yet, limitations on property taxes at both the property and jurisdiction level are ubiquitous and undermine both the equity and simplicity of the real property tax (Anderson 2006; Youngman 2007; Youngman 2016). At the property level, property tax liabilities typically depend in a complicated way on both the current value of the property and the evolution of this value over the previous several years. For example, it is

[4] Scholars have noted that the multiplier effects of government spending on output depend both on the state of the economy—whether it is in contraction or expansion—and on the components of government spending (Auerbach and Gorodnichenko 2012).

common for jurisdictions to impose limits on the rate at which a property's assessed value can increase either from year to year or over longer intervals.[5] These limitations are the result of widespread property tax "revolts" in the 1970s and 80s. These property-level limitations, which decouple property tax values from contemporary property tax liabilities, can create large differences in effective property tax rates for the properties with the same value (Hayashi 2014a), with properties that appreciate more rapidly generally having lower effective tax rates. The effect of these assessment limits is to smooth increases in the tax base over a period of years and reduce annual volatility in property tax liabilities. Thus, from both the perspective of the homeowners and the local government, these limits lead to greater predictability in the amount of property taxes collected.

However, these limitations generally only work in one direction. That is, many jurisdictions have restrictions on the rate in which property tax liabilities can increase, but they generally do not have limitations on the rate at which they can decrease. This is an artifact of the context in which these limitations arose: concerns about rapidly rising property values led voters to worry that individuals (particularly the elderly) on fixed incomes could be forced out of their homes. Because of this asymmetry, when the value of a property falls sharply (particularly if the fall was not preceded by a period of rapid appreciation) the tax liability for that property will often fall sharply as well. This feature has not historically drawn much attention or concern in part because significant declines in home values are rare and revenues can sometimes be held constant even in the face of declining property value through an increase in nominal rates. Voters also tend to be less concerned with rapidly declining property taxes than they are with rapidly increasing property taxes.

Although there is some research on the stabilizing effect of property taxes on local government revenues and local government expenditures during economic contractions, there is little work on the effect of property taxes on *households* during recessions.[6] At the same time, there is reason to think that property taxes would have meaningful effects on both household consumption and the ability of households to remain current on their mortgage payments, both of which were important factors affecting the depth of the Great Recession.

Effects on Households

The collapse in housing prices from 2007 to 2011 was one of the most important features of the Great Recession. This decline in home wealth pushed many households under water on their

[5] There are also a variety of limitations at the jurisdiction level : "Beginning with Proposition 13 in California in 1978, there has been a wave of tax and expenditure limitation measures across the United States" (Dye and McGuire 1997). For empirical research attempting to explain the reasons for the proliferation of tax and expenditure limitations, see Alm (1999) (finding that increasing state income and increases in property taxes and local revenues relative to state revenues are associated with increased likelihood of passing limits); Cutler (1999) (examining voting data related to passing and subsequent overrides of Proposition 2.5 in Massachusetts); Temple (1996) (arguing that state limits on local fiscal decisions are preferred by voters in localities with greater variation in socioeconomic characteristics because of greater dissatisfaction with the collective decision-making process); Vigdor (2004) (arguing that taxpayers support statewide tax limitations to lower rates in other communities).

[6] There is a robust literature on the effect of stimulus payments, including income tax rebates. See e.g., Shapiro (2003); Parker (2013); Agarwal (2007); Agarwal (2014). Alm et al. (2014) examine the effect of foreclosures on property taxes.

mortgages, increasing the likelihood of mortgage default and reducing households' consumption expenditures as they faced a decline in lifetime income. What role would we expect property taxes to play in exacerbating or mitigating these effects? There is reason to think that even temporary declines in property taxes would have a significant effect on these outcomes.

Because property taxes are a cash expense, fluctuations in taxes can have surprisingly large effects for illiquid taxpayers.[7] This is especially the case for households with significant amounts of "committed consumption" or whose wealth is in illiquid investments, such as retirement accounts that can only be accessed by paying a penalty. Even middle-income households can be liquidity constrained in this way, and illiquidity was an even greater problem during the Great Recession when the availability of home equity loans dried up, creating liquidity issues even for households that may have had positive home equity. As Chetty and Szeidl (2007) show, such liquidity constraints can result in temporary income shocks having first-order effects on household welfare as those households are unable to fully reoptimize and smooth that negative income shock across their consumption of housing and other goods. Recent research shows that illiquidity can have surprisingly large effects on a cluster of decisions, including whether to enroll in college (Manoli and Turner 2018), whether to file for bankruptcy (Gross et al. 2014), how much to spend on consumption (Souleles 1999), and the likelihood of mortgage default (Anderson and Dokko 2016).

There is evidence that, during the Great Recession, fluctuating mortgage payments had greater effects on household consumption than changes in property values. In fact, even some homeowners with *increasing* home values reported cutting their spending due to increasing mortgage payments. Hayashi (2018) reports evidence from the Health and Retirement Survey that 47.3% of the homeowners who reported increasing mortgage payments decreased their spending on other things in response; only 10.3% of the homeowners who reported that their mortgage payments had fallen increased their spending as a result. Strikingly, 44% of the households that reported increasing home values actually *decreased* their spending due to higher mortgage payments. The modest increase in cash expenses had a larger effect on household consumption than an increase in housing wealth. Di Maggio et al. (2017) find that a 50% decline in the size of household mortgage payments (due to expansionary monetary policy) induced a 35% increase in car purchases. They also find that these effects are heterogeneous, with larger effects for lower income and more highly leveraged households, indicating a very high marginal propensity to consume out of cash income for low-income and credit constrained households.

For most homeowners with a mortgage, property taxes are effectively included in their monthly mortgage payments, since those payments include contributions to escrow accounts out of which home insurance and property taxes are paid. We might expect then that changes in property taxes would have similar effects on these households as changes in interest rates. In terms of the effects of property tax cuts on household consumption, there is also good reason to think that

[7] There is also evidence that even predictable increases in property taxes are associated with higher rates of property tax delinquency, when those increases are less salient to the homeowner. See Bradley (2013). Anderson and Dokko (2016) find that early, lump sum property tax bills due shortly after origination increase the probability of mortgage default in the first year for subprime borrowers. Cabral and Hoxby (2012) argue that property taxes are less salient for homeowners with escrow, and Hayashi (2014) finds that mortgage escrow reduces the likelihood that homeowners challenge their property assessments.

cutting taxes for homeowners with mortgages will tend to have particularly beneficial stimulus effects. The Keynesian multiplier on household spending depends on household credit constraints; households that are unable to borrow have a higher marginal propensity to consume out of each dollar.[8] Homeowners who are underwater on their mortgages, such as many were during the Great Recession, will be unable to obtain home equity lines of credit or second mortgages and will therefore be especially credit constrained.

Effects on Counties

To think about the effect of property reassessment on local demand and economic output, it is helpful to focus on differences in the multiplier effects of spending by different economic actors.[9] For the sake of simplicity, suppose that all the prices of all real property in a county fell by the same percentage and consider three groups: the county government, high-income households that own more valuable homes, and middle-income households which own less valuable homes.

If property tax rates remain constant, the reassessment of real property during a recession will tend to lead to a reduction in property tax revenues. To the extent that counties are dependent on property tax revenues to fund current spending, this negative revenue shock would be expected to reduce county spending. Although local spending is not tied dollar for dollar with contemporaneous tax revenues, local governments are more constrained in their ability to deficit finance than the federal government. In this case, the net effect on local economic output requires balancing the effects of reduced local government spending and increased spending (if any) by households that have been reassessed and thereby received a property tax cut.

It is important which households have been reassessed. If more valuable properties are reassessed, this will tend to result in larger property tax cuts, and hence larger revenue shortfalls. Owners of these properties are likely to have higher incomes, be less credit and liquidity constrained, and have a lower marginal propensity to consume than the homeowners of less valuable properties.

Faced with a decline in the real property tax base due to reassessment of some portion of that base, counties may raise rates in order to stabilize their revenue. The effect of that rate increase will be to increase, in absolute terms, the property tax liabilities associated with homes that have not been reassessed, and to reduce the property tax cut for homes that were reassessed. Thus, there are important distributional effects set in motion when one part of the local real property tax base declines.

Property Taxes in Maryland

Real property in Maryland is subject to tax by both the State and by the jurisdiction in which the

[8] See Andres (2015); Demyanyk (2017); Gali (2007); Eggertsson (2012); Hayashi (1985).

[9] For the purposes of the analysis that follows, I assume that there is a nontradable goods and services component to regional economies such that negative shocks to spending by households within that regional economy or by the local government will show up as reduced economic output in that economy. These will include much retail, live entertainment, and services provided to households.

property is located (i.e., the county or Baltimore City) (Borek and Branson 1997). In general, real property is assessed in Maryland by the State Department of Assessment and Taxation every three years.[10] More frequent assessment is only permitted under certain circumstances, such as if the property is rezoned, a change in use occurs, or improvements adding at least $100,000 in value to the property are made.[11] If a property is assessed at a value higher than its previous assessed value (three years earlier), the increase in assessed value is phased-in as three equal increments beginning with the current year.[12] On the other hand, declines in property assessments take effect immediately, so a property that is assessed at a value lower than its previous assessed value will retain the same new assessed value for three years.

For example, consider a property valued at $300,000 on January 1, 2006. This assessment is based on property sales over the previous year. If the property is reassessed at $360,000 as of January 1, 2009, the property will have an assessed value of $320,000 in 2009, $340,000 in 2010, and $360,000 in 2011. If, on the other hand, the property is reassessed at $250,000 as of January 1, 2009, the property will have an assessed value of $250,000 for each of 2009, 2010, in 2011. Thus, household property tax liabilities are smoothed when they are increasing, but they step down immediately when those liabilities fall.

A property's assessment may be challenged by the property owner in the year in which she receives a notice of assessment (i.e., every three years). Property assessments may also be challenged following the transfer of the property. Property bills are sent out in July or August of each year, with the balance generally due in installments on September 30 and December 31.

The most important feature of Maryland's assessment practices, for the purpose of this paper, is that within each county only one third of the properties are assessed each year. Throughout this article I refer to the 2009, 2010 and 2011 "assessment groups" or "assessment cycles" to describe those properties that were reassessed in each of those years (and on the triannual cycles that correspond to those years). Within each county, properties in the same assessment cycle are geographically clustered together in regions. Figure 1 and Figure 2 show the regions of Maryland that are assessed in each cycle. Figure 1 overlays these regions with county boundaries, and Figure *2* overlays the regions with ZIP Code boundaries. The boundaries of the assessment cycle regions do not overlap with any geographical unit boundaries.

The legality of this triannual assessment system has periodically been in dispute. At certain times, triannual assessment has been politically popular because it reduced the frequency of reassessment. For example, in 1977 there was "deep resentment throughout the state [because of] overinflated property values that have increased homeowner assessments by 50% over the past three years." One state delegate said "[i]t's an issue that's driving people crazy-not just taking away their cigarette money, but the food out of their belly."[13] Infrequent assessment reduces the rate of increase in assessments.

[10] Sec 104(b), Prop. Tax Art.

[11] Maryland, Assessment Procedure, Maryland State Tax Rep. (CCH) Par. 20-700. Sec. 8-104(c)(1), Prop. Tax Art.

[12] Sec. 8-104(c)(2), Prop. Tax Art.

[13] In part for this reason, the director of SDAT asked the assembly to permit his office to reassess properties only every three years. Elizabeth Becker, Maryland Assembly Seeks Equitable Way to Raise Assessments on Property, The Washington Post, Feb. 6, 1977 at B2.

On the other hand, triannual reassessment means that properties of equal value may be assessed at very different values, and for that reason was the subject of litigation under the state constitution. The taxpayers who challenged triannual assessment argued that "because they were among the first to be assessed in 1979, they pay higher taxes than owners whose property was assessed in the second and third year of the implementation of the program."[14] Triannual assessment was ultimately upheld by the Maryland Tax Court in 1984.

2. Research Design

In this paper I explore the effects of rising effective property tax rates during the Great Recession on a household's willingness or ability to remain current on their mortgage payments, to sell their homes, and the resilience of different counties to the Great Recession. As Figure 3 shows, home prices generally fell in Maryland from 2007 to 2011, with the steepest decline occurring during the Great Recession that lasted from December 2007 to June of 2009 (shaded in the figure). As home prices fell, property tax liabilities in Maryland fell in annual stages, with the timing of a property's property tax cut depending on its assessment cycle. For homeowners who experienced property value declines but no reassessment, their effective property tax rates increased. In counties that raised nominal tax rates to offset the effect of property value declines on tax revenues, the property tax liabilities of households that were not reassessed may even have increased as their home values fell. As noted above, there are differences in the timing of reassessment and hence property tax cuts within counties and, indeed, even within ZIP Codes.

Consider, for example, the homes in ZIP Code 20874, which includes the cities of Germantown, Darnestown, and Seneca in Montgomery County. Zip Code 20874 has a number of homes in each of the three assessment groups. Figure 4 plots the median assessed home value for homes within each of those three groups within Zip 20874 on one axis, and the value of Zillow's median housing price index for the years 2008-2017 on the other axis. As property values declined from 2008 to 2011, the median assessed value of properties in the 2009 assessment group decline first, in 2009. There is then a significant decline in the median assessed value of properties in the 2010 group a year later and then finally a decline in the assessed value of properties in the 2011 group in 2011.

Table 7 shows aggregate assessed property values by county for fiscal years 2007–2017. Declines in appraised values do not begin to show up in aggregate at the county level until FY2011 and really plummet in the following two fiscal years. Note that values for FY2011 would reflect assessments as of January 1, 2010 and reassessments for properties that are on the 2010 cycle. Why do aggregate assessed values not decline for FY2010? Although properties reassessed on January 1, 2009 generally have lower assessed values than the same properties assessed on January 1, 2006, the difference is rather modest because home prices did not peak until 2007. Moreover, properties in the other two assessment cycles were still phasing in assessment increases due to rising property values from 2005 to 2008 and from 2004 to 2007.

Assessed values are only one input into household property tax liabilities and there are other

[14] Wendy Swallow, Maryland Court Rejects Challenge to Property Tax Assessment System, The Washington Post, Oct. 6, 1984 at F1.

factors affecting the final bill, including the property tax rate. Of the 24 counties in Maryland, 5 of them cut their property tax rate for FY2009 and 7 cut their rate in FY2010; only one county increased its tax rate in FY2010. Rates did not generally begin to increase at the county level until FY2012. Table 8 shows property tax rates by county for FY2007–FY2017. Property tax revenues began to fall in FY2011, with some of the effect of declining assessed values offset by increasing rates. Table 9 reports county-level property tax revenues.

Figure 5 incorporates all of these inputs into property tax liabilities by plotting the median property tax bill between 2008 and 2017 within ZIP Code 20874, for properties in each of the three assessment groups. Property taxes for all three groups increase from 2008 to 2009 but the increase is smaller for properties in the 2009 cycle. The median property in the 2010 group received a tax cut in 2010, and the median property in the 2011 group received a tax cut in 2011.

These differences in the timing of property tax cuts for properties within very close geographic proximity provide the basis for the inferences I draw in this report. The identifying assumption I make in order to conclude that the property taxes have a causal effect on mortgage default and home sales in the analysis that follows is that the timing of a property's reassessment affects the property's taxes, but is uncorrelated with other factors affecting the mortgage default or home sales decision, at the individual level, or the determinants of employment at the county level. Given that the schedule for reassessment was set long before the Great Recession, I think this assumption is plausible.

However, it may be that reassessment affects household decisions through channels other than its effect on property taxes. For example, reassessment may either provide the homeowner with new information about her home equity position or make that information more salient to her. A homeowner who does not pay close attention to her home value may only realize her home has fallen in value when she is reassessed. If the homeowner discovers she is in a negative equity position when she is reassessed, this effect would tend to make it more likely that a homeowner defaults, but also less likely to sell the property and move due to "lock-in" (Chan 2001).

It is a bit uncertain when to expect that property reassessment will affect household decisions. Consider, for example, the tax year 2017. Tax liabilities for that year reflect assessed values as of January 1, 2017, which are based on property sales from 2016. These assessments determine property taxes that are due on September 30, 2017 and December 31, 2017. If households are forward looking and rational, they may begin to adjust their behavior as soon as they are notified of their new property assessment. If the homeowner has a mortgage and pays her property taxes out of escrow (as is typically done), then the taxes computed on the basis of this new assessment will show up in her monthly payments well before the property taxes themselves are paid.

Homeowners who do not have mortgages and are not forward looking may not adjust their behavior until the new property tax payments come due at the end of September and December. In the analysis that follows, I generally estimate the effect of property reassessment on outcomes measured in the year of the reassessment. If many households do not respond to the tax cut until their taxes are paid, then some of the effects may not arise until the following calendar year.

3. Data

Property Assessment and Mortgage Defaults

The main sources of data are the annual property assessment records created by Maryland's State Department of Assessment and Taxation. Data for 2008–2017 tax years were obtained from CoreLogic and data for the 2018 tax season were obtained from the State of Maryland's Open Data portal. There were 2,345,204 million property lots in Maryland in tax year 2018, including residential, commercial and industrial properties. 1,954,396 of these lots were zoned for residential use.

The data for 2008–2017 include not only assessments and estimated market values and a collection of physical property characteristics, but also property tax liabilities for each year. As discussed above, if the property's market value in an assessment year is higher than in the previous assessment year, then this increase in value is phased in over three years. If the market value is less than the market value in the previous assessed year, then the assessed value will be this new, lower value, for three years. In addition to including information about property assessments and property characteristics, the 2018 data includes the last three transfers of each property, allowing me to construct a dataset of property sales by year.

Data on the universe of mortgage defaults from 2008 to 2017 were also obtained from CoreLogic. These data include court rulings such as notices of default and notices of sheriff's sales. The data include 96,162 notices of default in the period 2008–2011, the period which is the focus of this study.

Home Prices

Because properties are only reassessed every three years, measurement of property values during the intervening years is likely to be very inaccurate. One possibility is to impute the property's value in the intervening years using a linear interpolation between assessments. Due to volatile year-on-year change, this may not be very accurate. As an alternative measure of property values, I use zip-code level housing price indices from Zillow to estimate changes in property values from year to year. Three time series indices are available, with greater or lesser coverage across years and zip codes: home values at the 16.5th percentile, 50th percentile, and the 82.5 percentile, allowing me to look separately at different terciles of the home value distribution and more accurately estimate changes in individual property values than would be possible with only median home values, because I can match individual properties to their tercile of the property value distribution and use the appropriate index. Using Zillow's home prices indices also allows me to estimate property values in the year or two before the first assessment year in my panel (where interpolation is not possible).

Employment

At the county level, the key outcome of interest is monthly employment, which was obtained from the US Census' Quarterly Census of Employment and Wages. I use these data to calculate the depth of the recession in each county, as the percent change in unemployment from 2007 to

the employment trough of the recession (which is unique to each county). I also calculate the recovery of the county to pre-recession levels of employment. The QCEW are monthly data.

4. Empirical Results

The regression sample includes all owner-occupied residential properties in Maryland from 2008 to 2012. For 2009, there are 1,284,824 such properties. Properties fall out of the sample in the year after their first default, because I am interested primarily in explaining the first transition into mortgage default, and because there is likely to be serial correlation in defaults over time. I winsorize variables at the 0.1% level to reduce the effects of extreme data errors and outliers.

Table 1 reports summary statistics for the sample in tax year 2009. Looking at the mean characteristics of properties in the three assessment groups in 2009, the properties that were reassessed that year (the 2009 cycle) tended to have lower tax liabilities and assessed values than properties in the other two cycles, but also tended to have lower estimated market values based on changes in local housing price indices. Properties in the 2009 cycle are, on average, assessed at a little less ($8,683 on average) than their estimated market value. By comparison, properties in the 2010 cycle are over-assessed by $54,023 on average, reflecting the very steep decline in market values from 2007 to 2009. Properties in the 2011 assessment cycle were the most valuable, on average, and only over-assessed by $13,383 on average. The average change in value of properties in the three assessment cycles is comparable, suggesting that the level values of the properties in the three groups may be different but they were trending at the same rate during the first year of the recession.

The default rate for properties in the 2009 cycle is a higher than for properties in the other two cycles, and the share of properties sold in each cycle is comparable, ranging from 1.71% to 1.91%. There is a large difference in the sales premiums (relative to my estimated values) for properties sold in 2009 depending on their assessment cycle. The premium for properties reassessed in 2009 is negligible, whereas there is a 7.18% premium for properties that were to be reassessed the following year (2010) and a 3.89% premium for properties reassessed in 2011.

Table 2 reports the same summary statistics for 2010. Mean assessed value and property taxes for the 2009 and 2010 assessment cycles are much closer following the reassessment of the latter properties in 2010. Taxes and assessed values for properties in the 2011 assessment group remain higher until 2011. Property values in the three assessment cycles trended similarly from 2009 to 2010, as shown by the similar mean change in estimated values. Default rates and sales rates are slightly higher in the 2009 and 2010 assessment groups than for the 2011 group.

Summary statistics for the entire sample period from 2008 to 2012 are reported in Table 3.

Mortgage Default

At the household level, I estimate the effect of property tax relief on mortgage default. I cannot observe the date of nonpayment on a mortgage; the data only include the date on which documents were filed with the Maryland courts. In Maryland, mortgagees can provide

homeowners with a notice of intent to foreclose 45 days from the first default date. Only after 90 days of default can the lender file an order with the court which begins the judicial foreclosure process. Figures 6 through 8 illustrate the patterns of default timing in the years and months around the Great Recession.

Figure 6 shows the number of defaults, and the aggregate amount of principal on defaulted mortgages by month between 2009 and 2016. The graph shows the spike in defaults occurring in 2009 and 2010, a sharp decline in the middle of 2010, and then increasing defaults again through 2016. There were significant changes in foreclosure requirements that were made effective on July 1, 2010 which were designed to encourage homeowners to participate in mortgage modification and loss mitigation programs.[15] These new requirements were expected to increase the costs to the lender of foreclosure and lengthen the foreclosure process.

Figure 7 shows the average number of mortgage defaults by month, broken out separately for years before 2010 and after 2010. In the pre-2010 period there is a small bump in the number of defaults that are recorded in October, November, and the first three months of the year. After 2010, there are many fewer defaults on average in the first five months of the year than the latter seven months. This difference may be an effect of the change in foreclosure requirements on household default decisions.

Figure 8 plots the average value of homes in default by month between 2007 and 2016. For much of the period, the average home in default had a value of approximately $230,000 but during the years of the recession much more valuable homes were going into default. The average value of homes in default increase between 2007 and 2009 before declining back to approximately $230,000 between 2010 and 2016.

Table 4 reports the result from a series of regressions estimating the effect of being reassessed on whether a household defaults on its mortgage in the year of assessment. I estimate cross-sectional regressions for 2009 and 2010, as well as a pooled regression for the years 2008 to 2012. For each of the cross-sectional regressions I estimate using OLS and conditional logit the relationship between assessments and defaults. I also use two-stage least squares to instrument for property taxes with an interaction of county fixed effects and an assessment indicator. The table reports coefficient estimates in the OLS and instrumental variables regressions, and odds ratios for the conditional logit.

The OLS regressions estimate Equation 1 on all owner-occupied residential properties that had not been in default in the prior year. The outcome d_i is a dummy variable and the dummy R_i indicates if the home was reassessed. I control for both the current value of the property and the change in market value of the property over the prior year. I also interact the reassessment dummy with the change in market value; some properties that were reassessed may have increased in value since their last assessment (in 2006 or 2007), and reassessment only helps property owners who have experienced a decline in value since the last assessment. The variables enter the logit function in the same way for the models estimated in columns (2) and (5).

[15] https://www.ballardspahr.com/alertspublications/legalalerts/2010-05-12_marylandmakesradicalchanges.aspx

$$d_i = \beta_1 R_i + \beta_2 \, \Delta MV_i + \beta_3 R_i * \Delta MV_i + \beta_4 MV_i + \epsilon_i \quad (1)$$

The OLS and conditional logit estimates for 2009 show, consistent with Figure 6, that more valuable properties defaulted during 2009, and that more valuable properties that had larger increases in value over the prior year were more likely to default. The direct effect of being assessed in 2009 is associated with an increased rate of default; however, the interaction of assessment with change in property value, which measures the change in tax upon reassessment, is also positive. For example, in column one, properties that were reassessed in 2009 that had fallen in value by more than $30,000 and therefore would have a property tax cut upon reassessment were less likely to default.

Columns (3) and (6) report coefficient estimates from a two stage least squares model of the effect of property taxes on mortgage default. I instrument the property's tax liability using the interaction of county fixed effects and the property's assessed value, which can be thought of as having two components: the market value of the property and the difference between the assessed value and the market value. Although the market value of the property is not likely to be a valid instrument for property taxes (failing the exclusion restriction), the second term, which depends on both the change in the home value and whether it has been reassessed so that the change is reflected in the assessed value, should be exogenous if reassessment timing is exogenous. Instrumenting for property tax liability in this way, I estimate that the effect of a $1,000 increase in property tax is associated with a 0.1 percentage point increase in the probability of default. Given a baseline default rate of 1.8% in 2009, this is a 5.6% increase in the default probability.

The results for 2010 are similar. The direct effect of reassessment on defaults is positive, but the interaction of reassessment with change in property value is also positive, indicating that for properties for which reassessment resulted in a sizable property tax cut the probability of default falls. The pooled OLS regression reported in column 7 shows the same effects: assessment is associated with an increase in defaults except for properties with significant declines in value.

Home Sales

In this section I report the effects of reassessment during the Great Recession on whether a property is sold, and on the purchase price premium. The mechanisms through which property reassessment might affect the frequency and price of home sales are complicated and I cannot disentangle them all in these data, but the results are suggestive. The first effect of a downward reassessment is to lower property taxes for the following three years. On the one hand, this reduces the carrying cost of the property for the current owner, but this reduction in property taxes is even more valuable for households who deduct property taxes for federal income tax purposes at a lower marginal rate, either because they are in a lower tax bracket or do not itemize. Although the margin is likely small, this could create an incentive to sell the property to someone for whom the carrying cost of the property is less.

A second effect of reassessment is that it might make much more salient to the current homeowner how their property has declined in value over the previous three years. If this decline in value has caused the homeowner to be underwater on her mortgage, or if the homeowner is

simply disinclined to recognize the loss on the value of her home for psychological reasons, reassessment could have an effect on household mobility and sales frequency directly, rather than (or in addition to) through its effect on taxes themselves.

Table 5 reports estimates from Equation 1, with the dependent variable being whether the property was sold in an arm's length transaction in the current year. In 2009, properties that were reassessed were more likely to be sold, although the effect does not vary significantly with the size of the recent change in property value. In 2010, there is no direct effect of reassessment on sale probability, but there is a positive effect for large declines in property value. Instrumental variables estimates are in columns (3) and (6) and show a positive effect of property taxes on home sales in 2009 but not in 2010.

The estimates for the entire pooled sample from 2008 to 2012 are reported in column (7). During this time period, more valuable homes and homes that appreciated more rapidly were more likely to be sold. Assessment was generally associated with an increase in the likelihood of being sold, and this effect is greater if the home declined in value over the prior year, suggesting that property tax savings locked in for three years increase the probability of sale. These estimates are consistent with those for the years 2009 and 2010; assessment increases the likelihood that a home is sold in an arm's length transaction, and the effect is greater if there has a been a recent decline in the property's value.

Table 6 reports the estimates from Equation 1 and a two-stage least squares regressions where the dependent variable is the purchase price premium in an arm's length sale. I calculate the percent difference between the sales price and the estimated home price, calculated using the last assessed price and adjusted for changes in the ZIP-Code level housing price index specific to the tercile of the housing price distribution for that property. For 2010, a $1,000 decline in property tax liability increases the purchase price premium by 3.4%. The effects of reassessment are not significant in all regressions, but generally point in the same direction. Reassessment is associated with a decline in the purchase price premium, unless the property has fallen significantly in value such that the reassessment results in a much lower tax bill. Consistent with the IV estimates in column (4), lower property taxes seem to be reflected in a higher sales price.

Employment

In this section I report preliminary evidence of how reassessment during the Great Recession affected the depth of the recession and the pace of recovery in each of Maryland's 24 counties. Although every county reassessed a significant share of the properties within its boundaries in each of 2009, 2010, and 2011, the value of the properties they reassessed differed. Since assessment groups are clustered geographically, the values of the properties within an assessment cycle are likely to be correlated. As a result, some counties may have reassessed, and thereby given tax cuts to, more valuable properties than others.

Figure 11 shows the aggregate assessed value of properties for each assessment cycle between 2008 and 2017. Although the time series track each other closely between 2013 and 2017, effects of cyclical reassessment over the previous five years are evident. In 2009, properties in the 2009 cycle group had an overall decline in assessed value while properties in the other two groups

were increasing. In 2010, there was a sharp decline in the assessed value of properties in the 2010 cycle, followed by a sharp decline in the assessed value of properties in the 2011 cycle in 2011.

The effects of reassessment during the housing market collapse had significant effects on the revenues collected from reassessed properties. Figure 12 shows the total property tax revenue collected from homes in each of the three assessment cycles between 2008 and 2017. The three timeseries track each other closely from 2013 to 2017 after housing prices stabilized. However, there are significant differences in the time trends of the three cycles between 2008 and 2012.

Note, for example, that the three groups look similar from 2008 to 2009, but that there is a significant decline in revenues from the 2010 assessment cycle group in 2010, as revenue from the other two groups are increasing. And then, in 2011, there is a much steeper decline in tax revenue from the 2011 assessment cycle group and from the other two groups. Thus, a county that has a significant number of high-value properties subject to reassessment during the downturn might expect a significant decline in property tax revenues unless it compensated by increasing the property tax rate, leading to an even greater property tax burden on the properties that are not subject to reassessment. What is the relation between the value of properties reassessed in 2009 in a county and the depth of, and recovery from, the Great Recession?

Figure 13 plots the relationship, at the county level, between the decline from pre-recession peak employment to the trough of the recession against the share of properties in the county reassessed in 2009. A linear regression line through the data suggests a negative relationship, so that counties that assessed a greater share of their properties in 2009 tended to have smaller increases in unemployment. Worcester County, in the upper left of the graph makes the line steeper than it would otherwise be, but the correlation is negative even if it is omitted. Figure 15 plots the same relationship, but with the share of all property value reassessed in 2009 on the horizontal axis.

Figure 14 shows the relationship between the recovery as of 12/16— the fraction of the decline in employment from the pre-recession peak to the trough that has been recovered by that date— and the share of properties in the county reassessed in 2009. There is a positive correlation between these two variables, with Worcester County again being something of an outlier. Figure 16 plots the same relationship, but with the share of all property value reassessed in 2009 on the horizontal axis.

Conclusions

Revenue stability comes at a cost to households. When property values fall but tax liabilities remain constant, effective tax rates rise. During a recession, the failure of taxes to fall with the base can strain households that may be suffering from falling incomes and credit constraints at the same time. In this paper I exploit the fixed and triennial reassessment of properties in Maryland counties to generate exogenous variation in property tax liabilities.

I find that reassessment associated with significant declines in property taxes reduces mortgages

default, but that reassessment associated with only modest changes in property taxes increased default in Maryland during the Great Recession. This interpretation of this direct effect of reassessment is not obvious, but one possibility is that the reassessment reveals or makes salient to the homeowner a negative equity position that encourages default. Property tax cuts resulting from reassessment increase the number of arm's length transactions and the premium at which properties are sold in these transactions. Through the purchase price premium, sellers are able to monetize a property tax benefit that can last for up to three years. Finally, I report preliminary and suggestive evidence that counties in Maryland that reassessed more of their properties in 2009, at the onset of the recession, experienced shallower recessions and a quicker recovery to pre-recession employment.

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Appendix: Tables and Figures

Figure 1: Assessment Regions Overlaid with County Boundaries

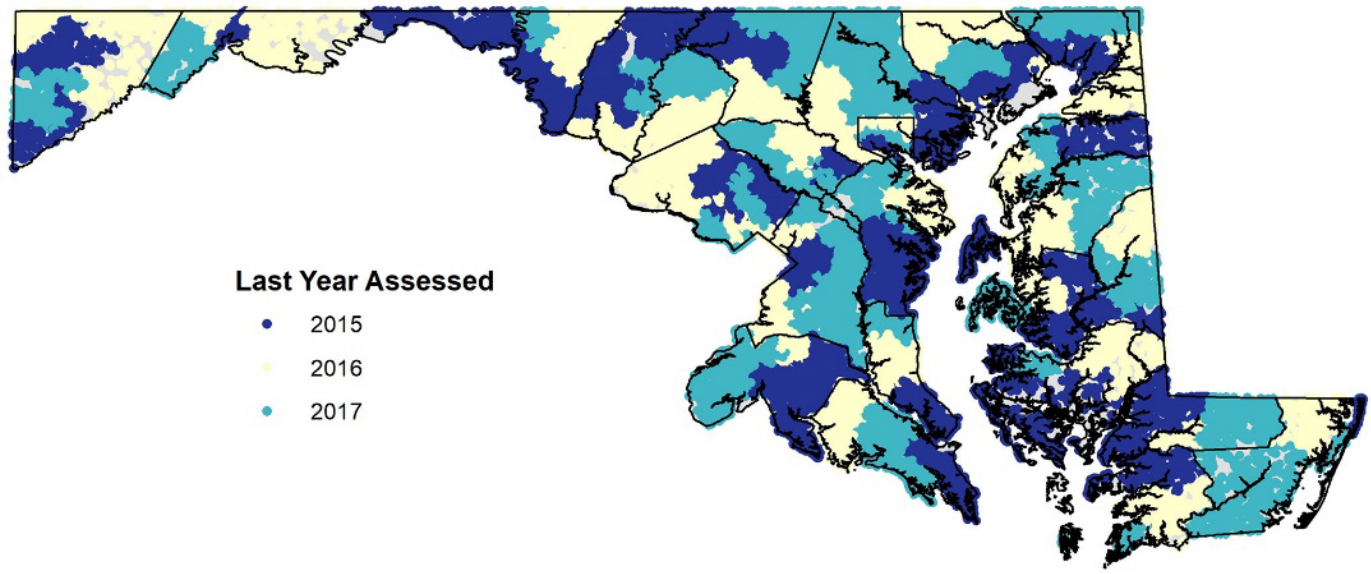

Figure 2: Assessment Regions Overlaid with Zip Code Boundaries

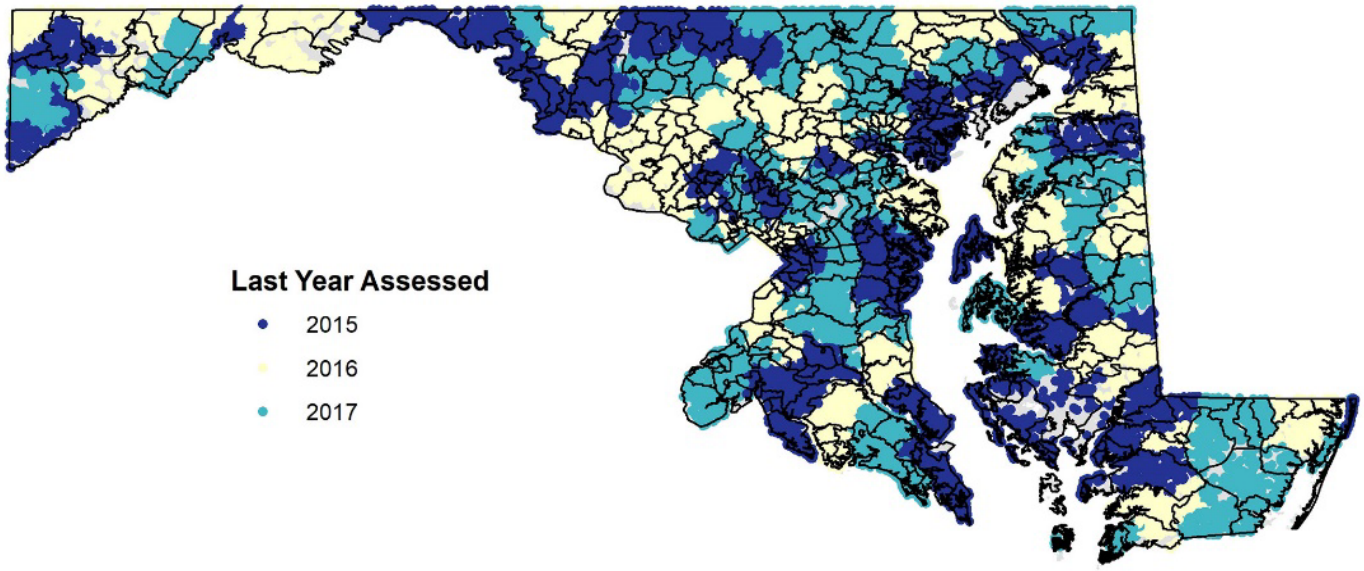

Figure 3: Maryland House Price Index and the Great Recession

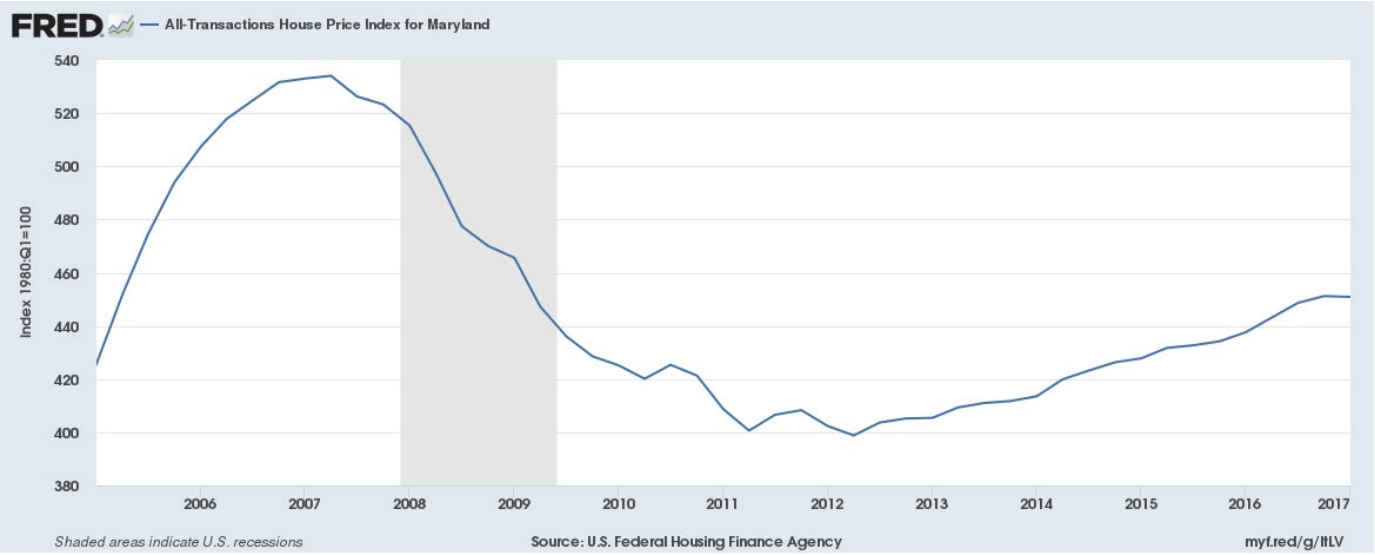

Figure 4: Median Assessed Value by Assessment Cycle – Zip 20874

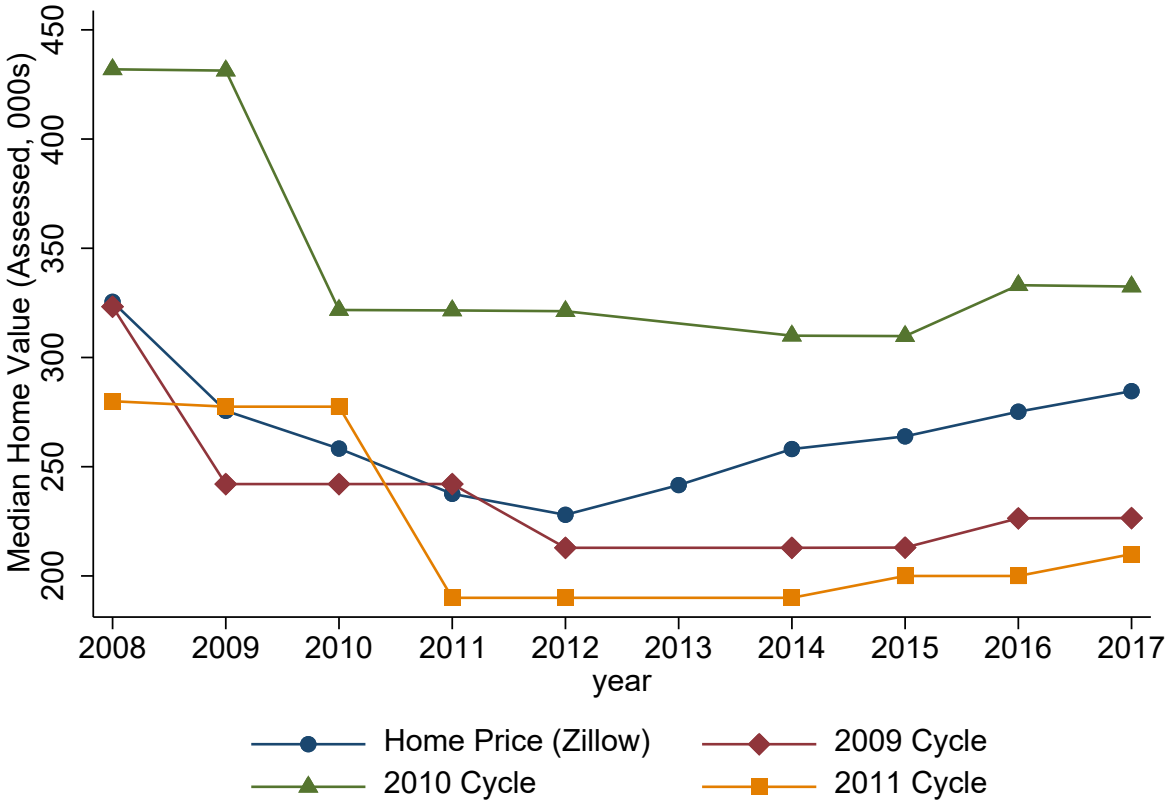

Figure 5: Median Property Tax by Assessment Cycle – Zip 20874

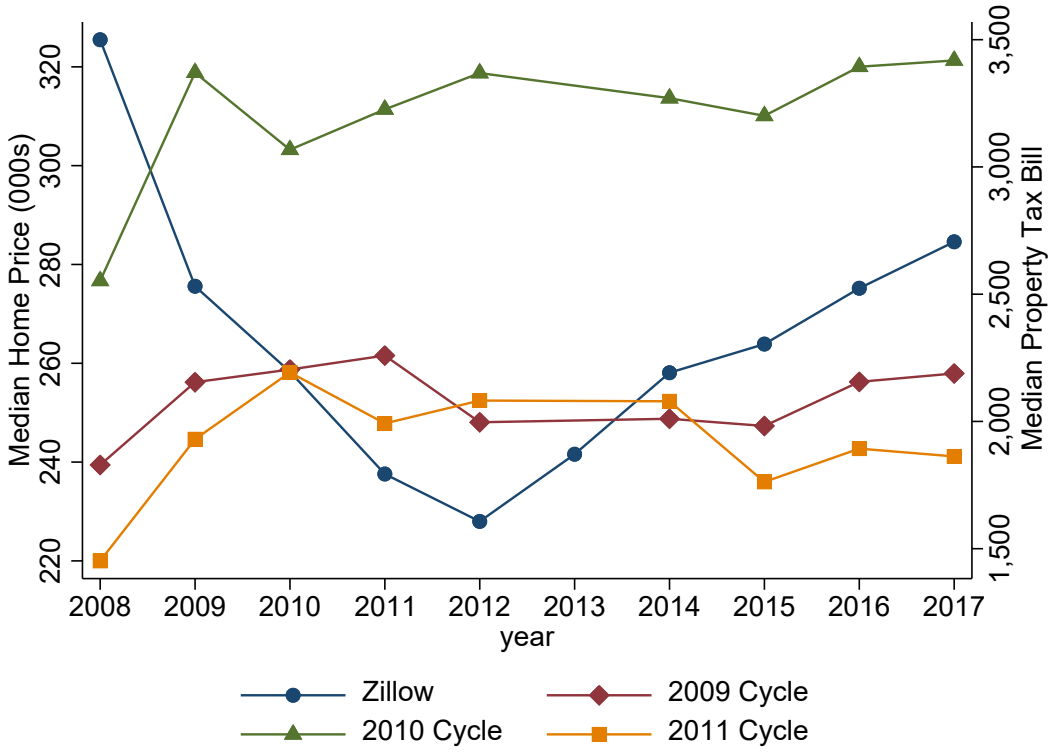

Figure 6: Mortgage Defaults and Defaulted Principal by Month/Year

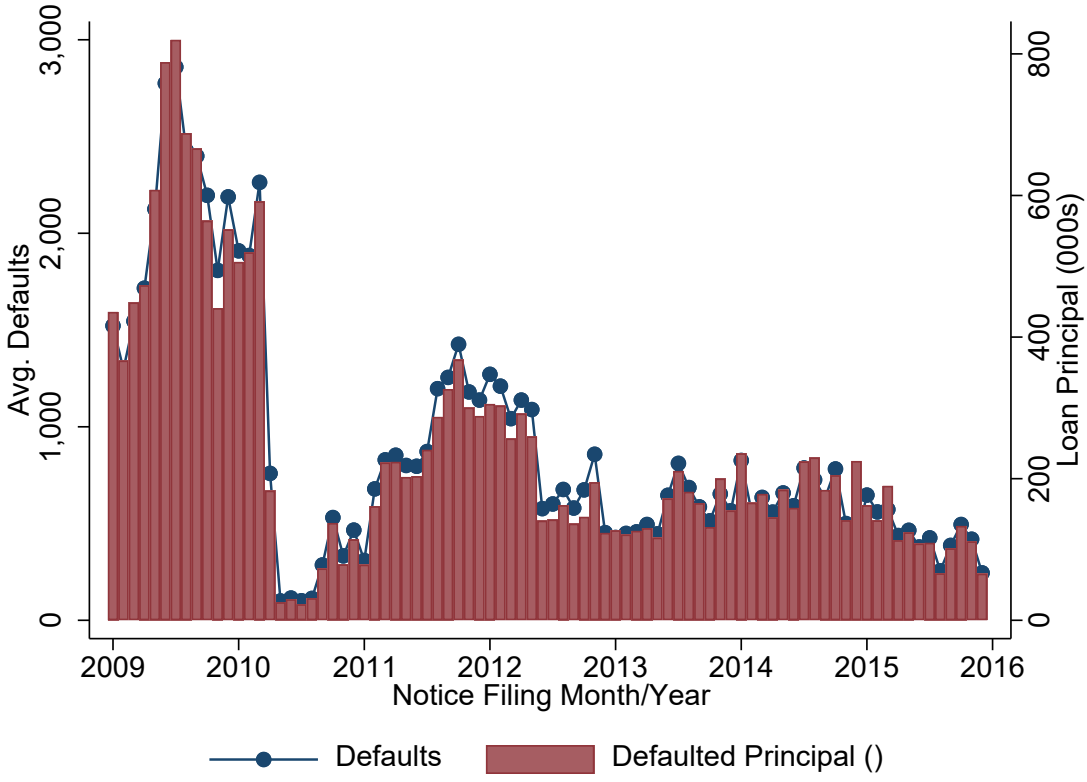

Figure 7: Average Number of Defaults by Month, Before and After 2010

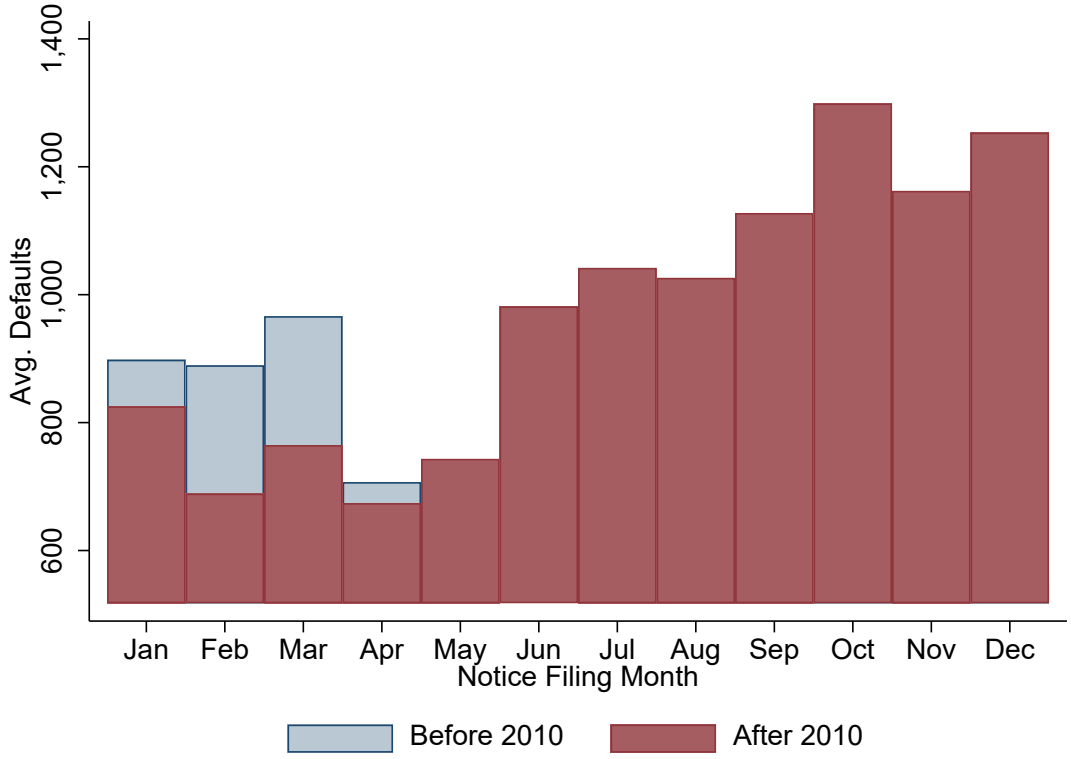

Figure 8: Average Value of Homes in Default by Notice Month/Year

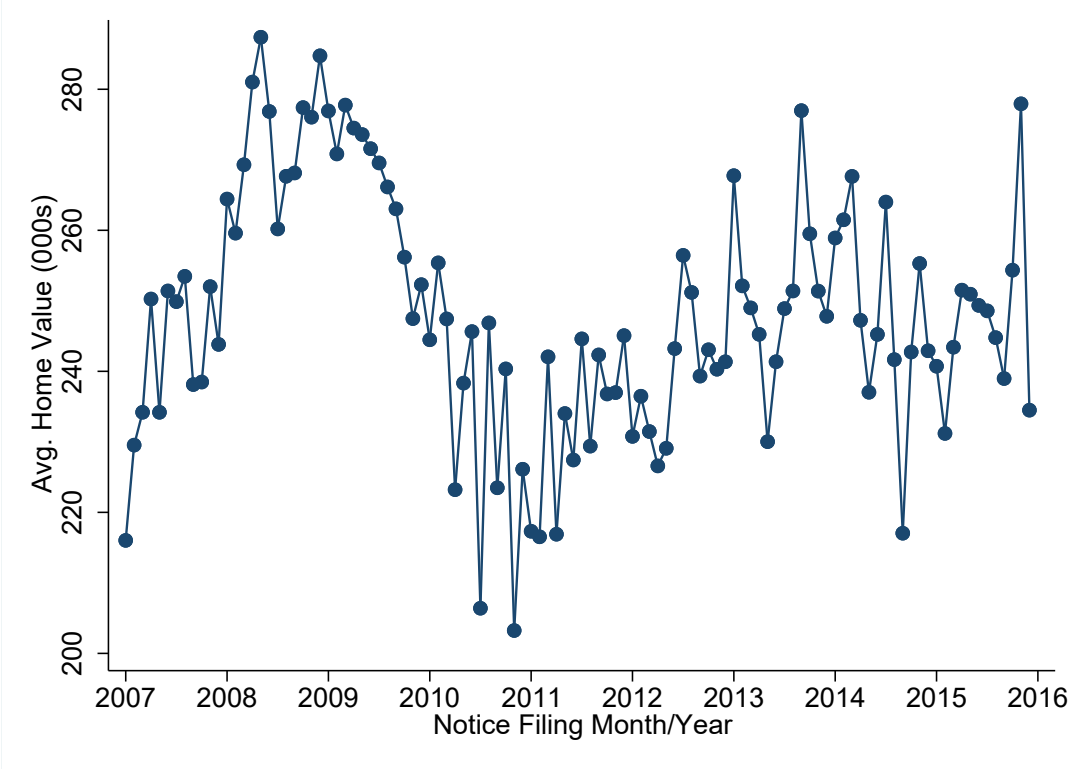

Figure 9: Property Tax Deductions by Zip Code Assessment Cycle

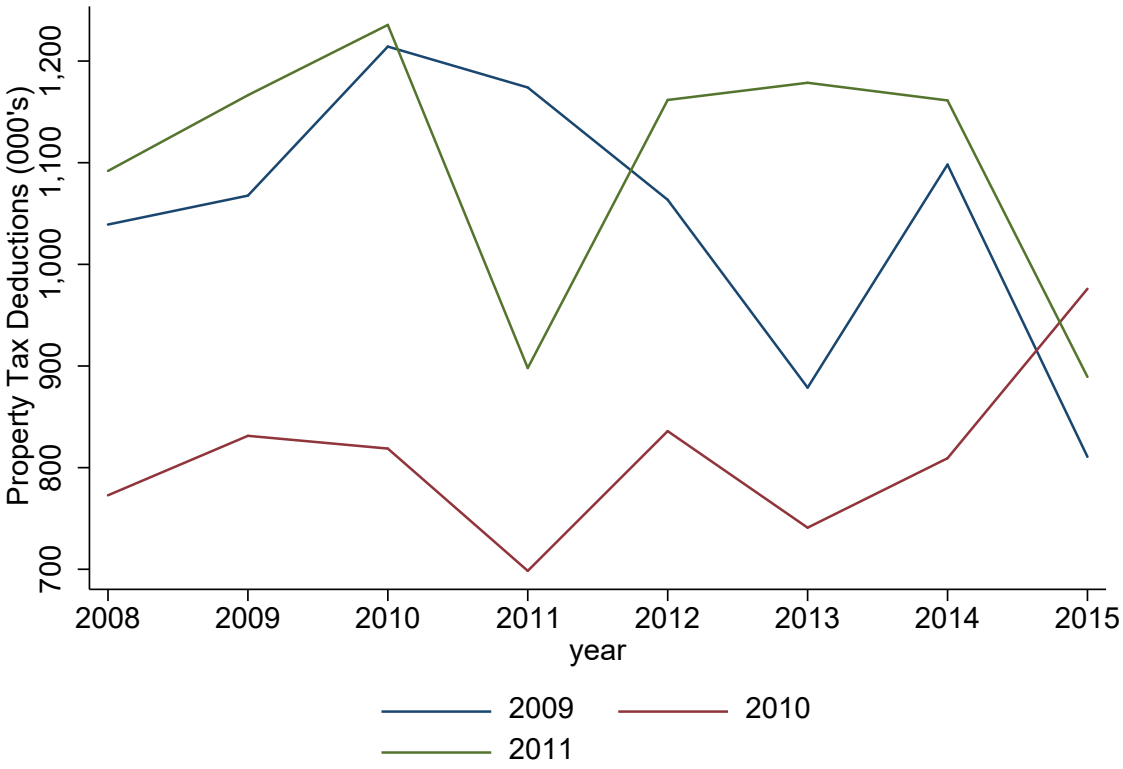

Figure 10: Returns with Property Tax Deductions by Zip Code Assessment Cycle

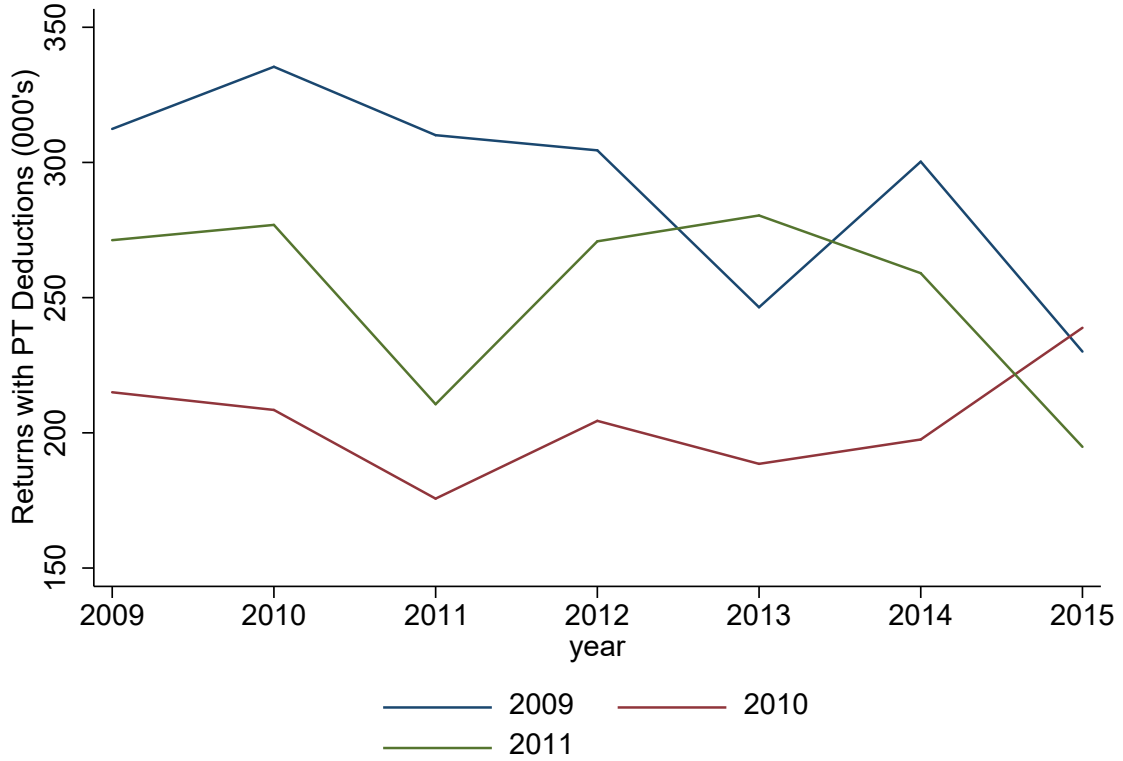

Figure 11: Aggregate Assessed Value by Assessment Cycle

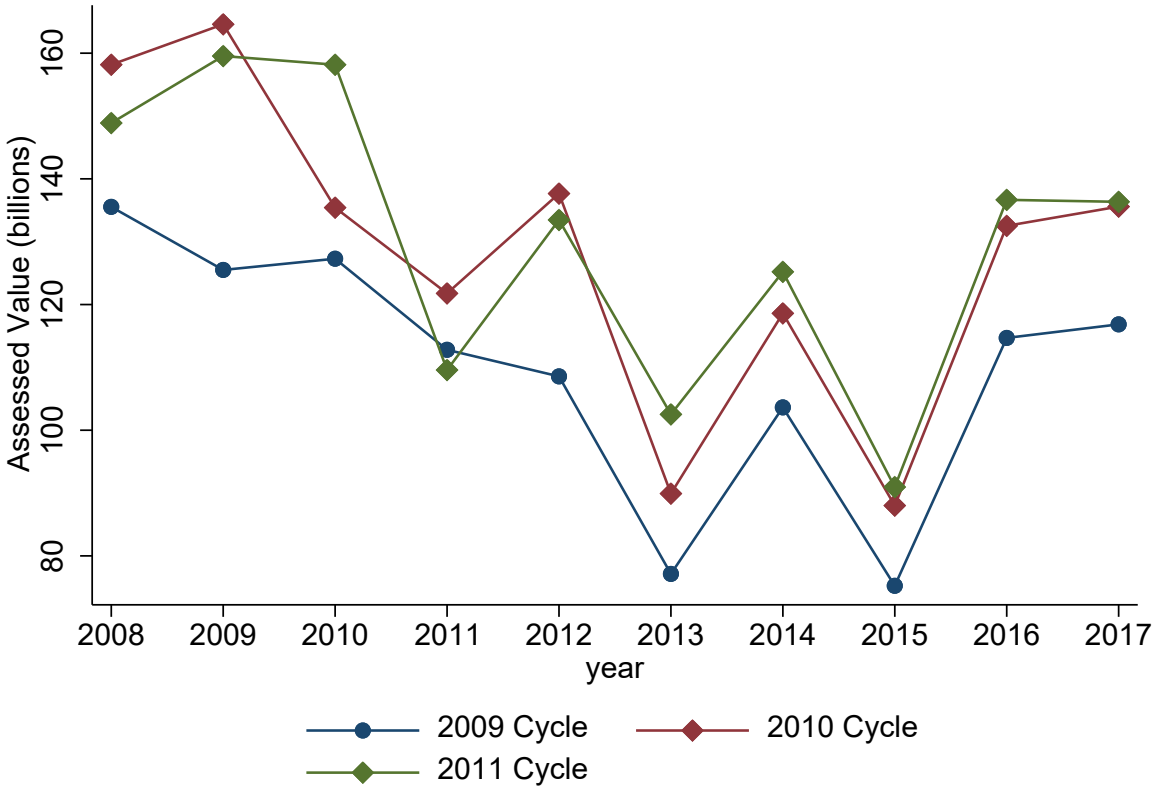

Figure 12: Aggregate Property Tax Revenues by Assessment Cycle

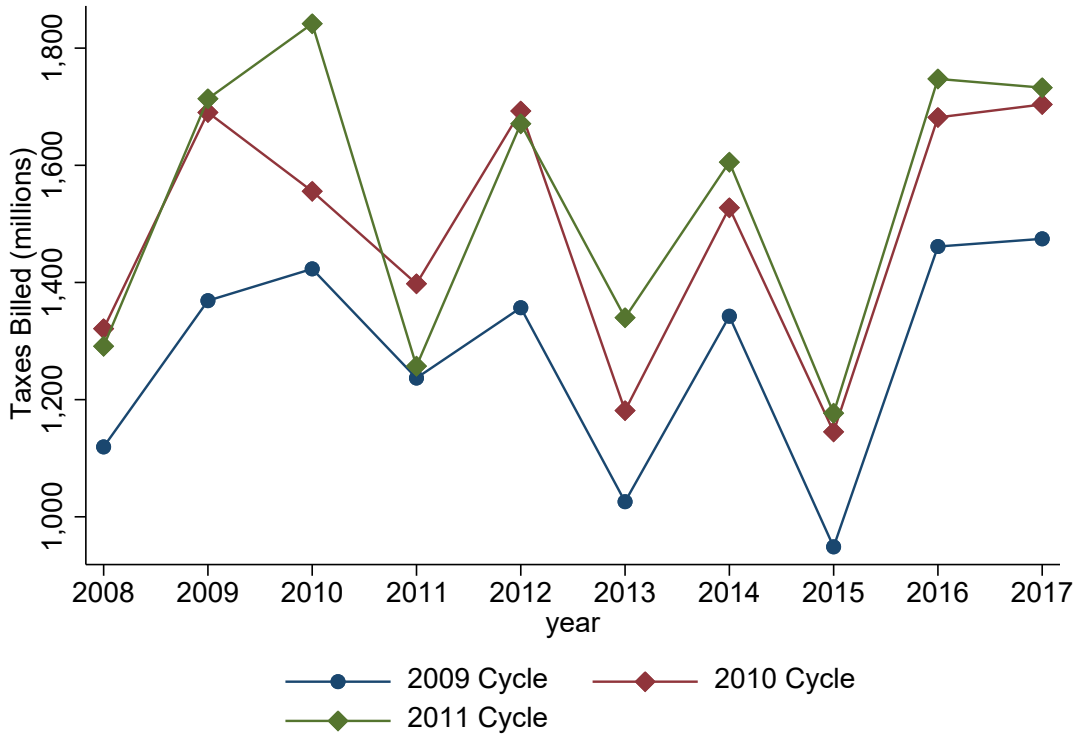

Figure 13: County Increase in Unemployment by Share of Properties Reassessed in 2009

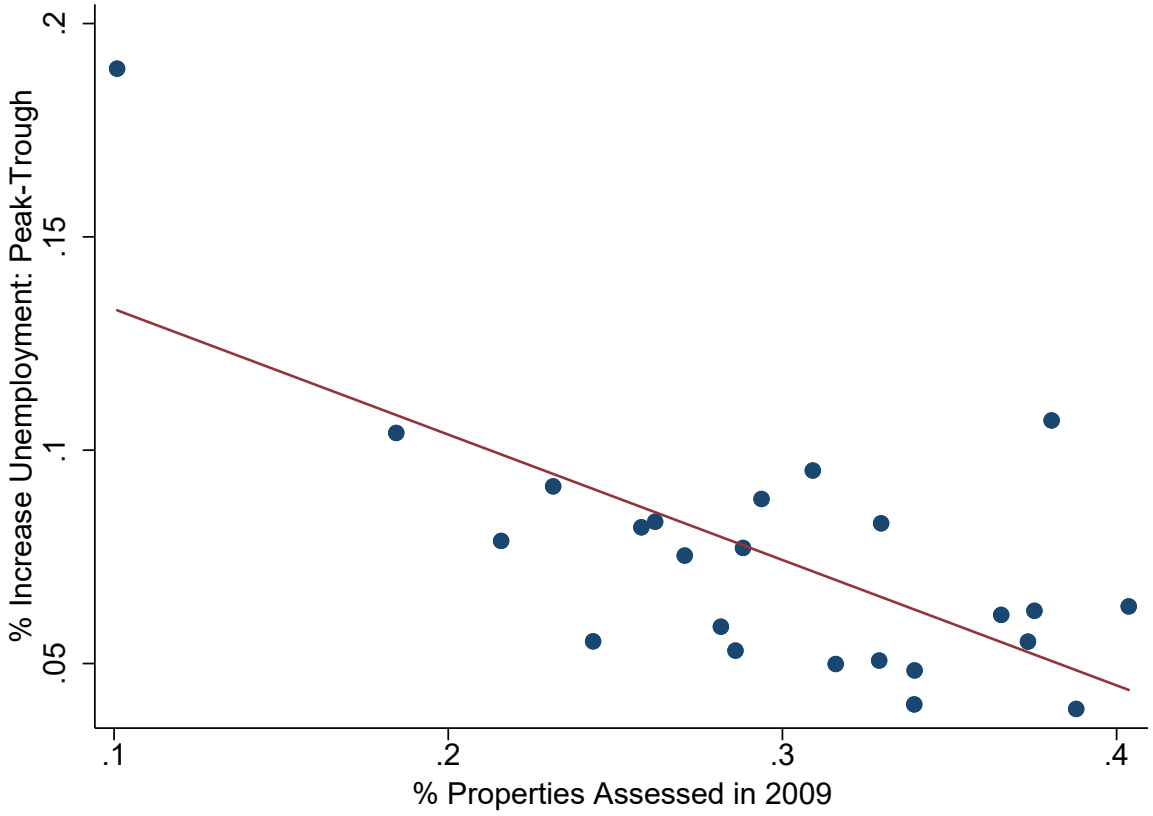

Figure 14: County Recovery of Pre-recession Employment by Share of Property Value Reassessed in 2009

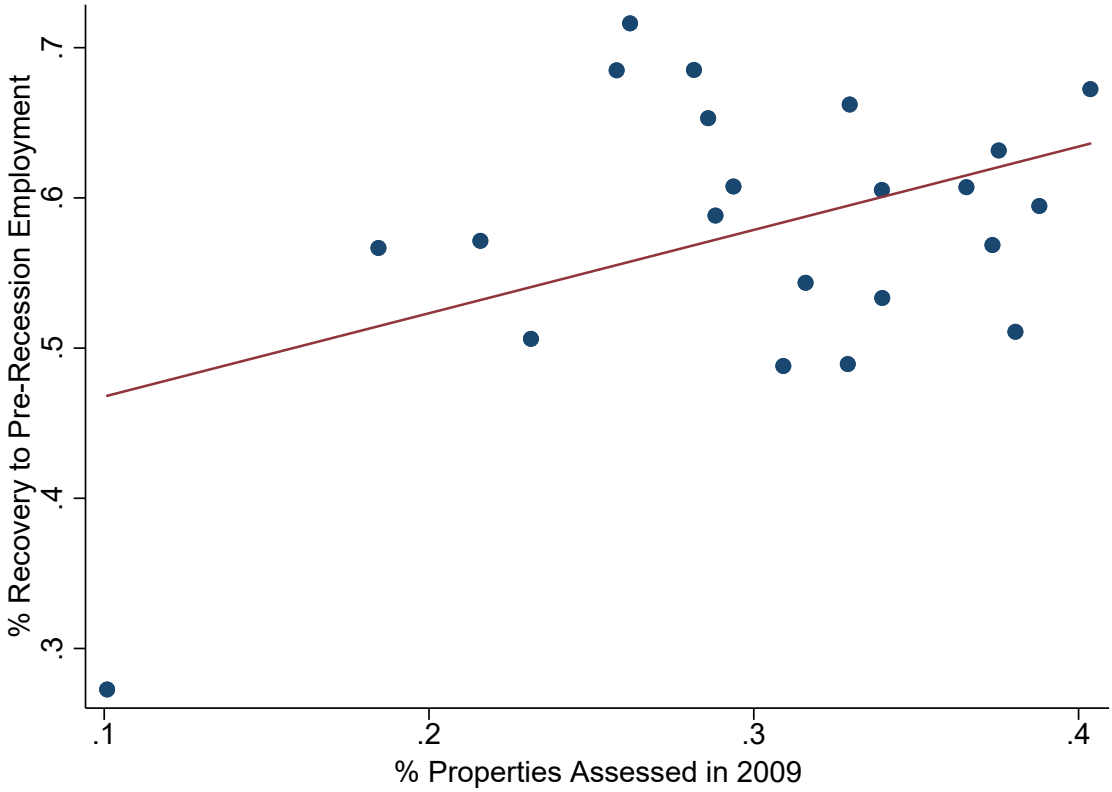

Figure 15: County Increase in Unemployment by Share of Property Value Reassessed in 2009

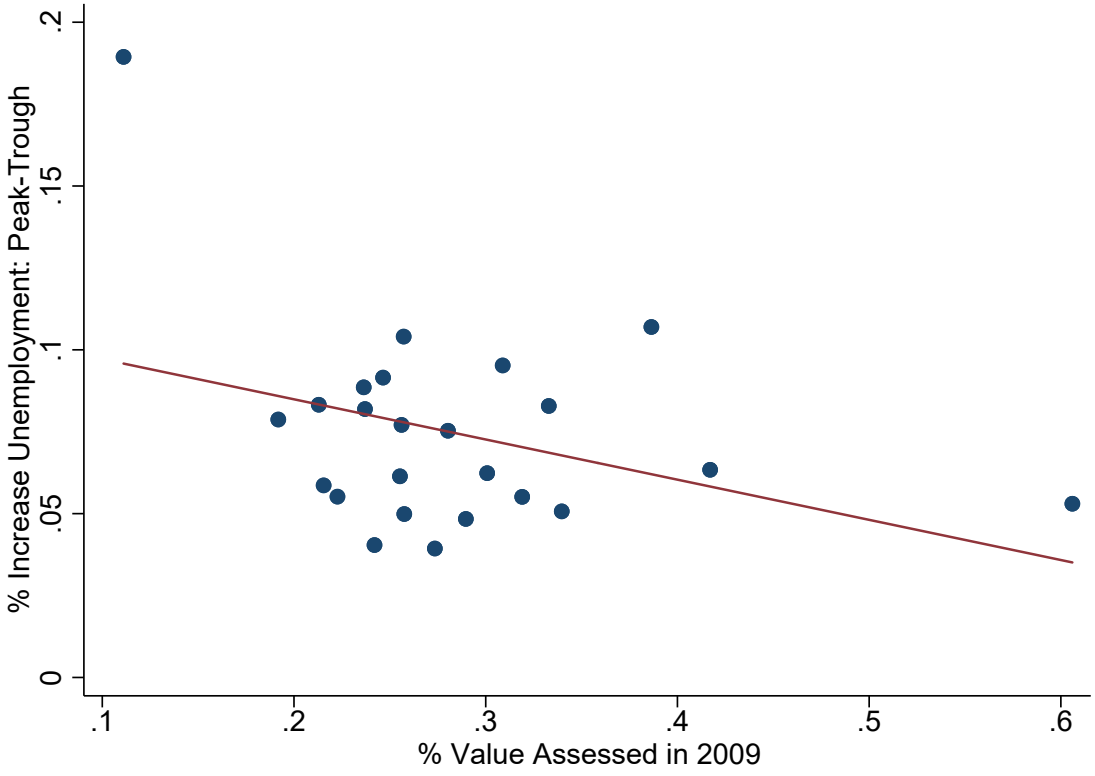

Figure 16: County Recovery of Pre-recession Employment by Share of Property Value Reassessed in 2009

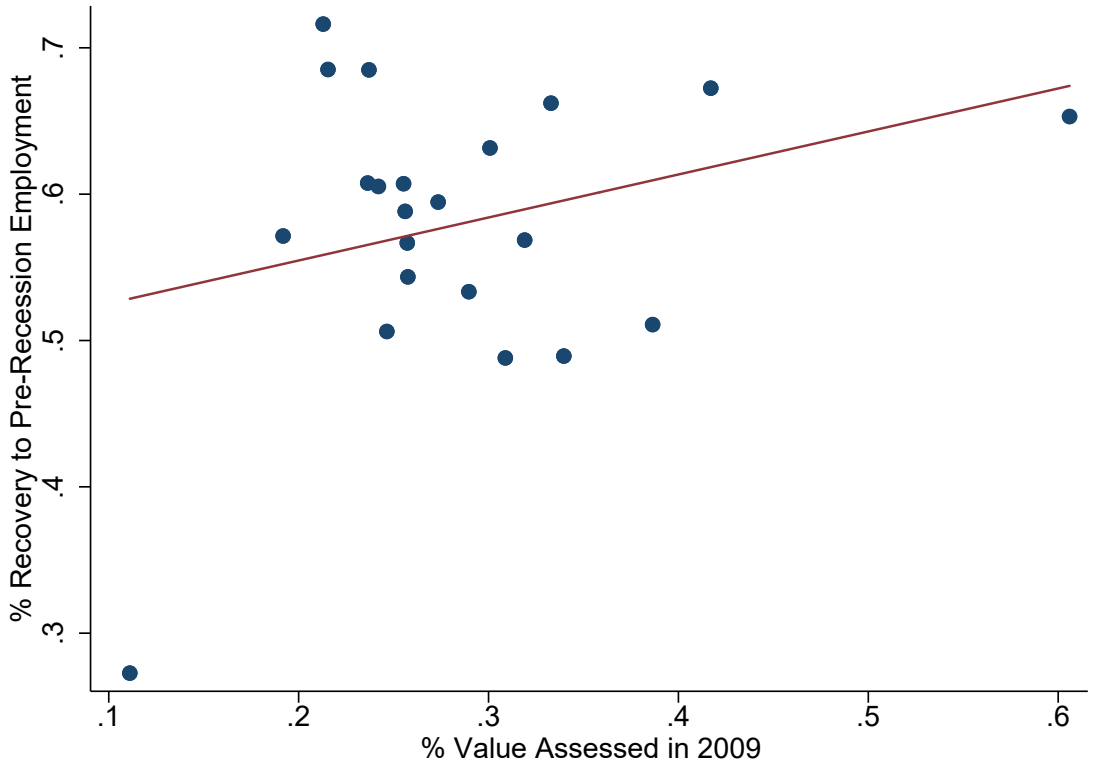

Figure 17: Histogram of Counties by % Increase in Unemployment from Peak to Trough

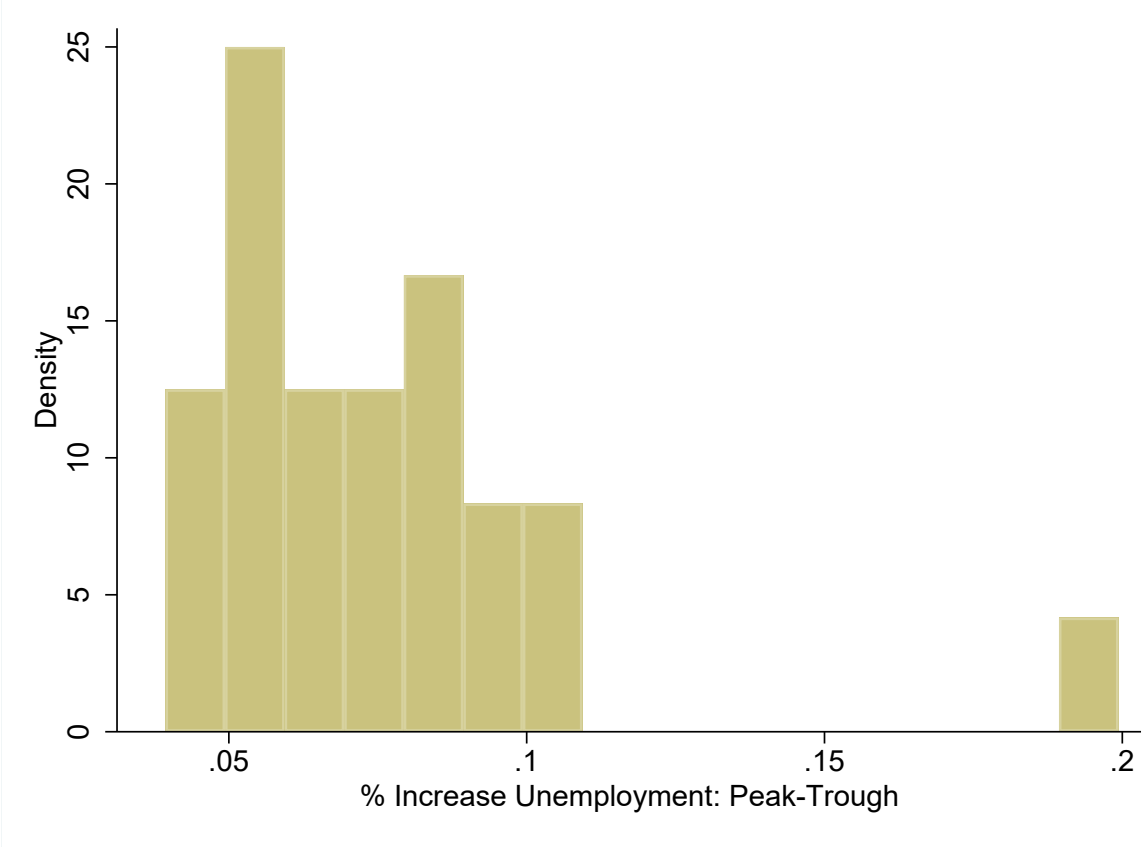

Table 1: 2009 Summary Statistics

	Mean	Median	Std.Dev.
2009 Assessment Cycle			
Tax	$3,290	$2,936	$1,837
Assessed Value	$302,664	$265,240	$206,874
Default	2.02%		14.10%
Property Sale	1.97%		13.90%
Sales Premium (Over AV)	0.91%	0.76%	24.30%
Estimated Value	$310,539	$272,170	$178,874
Estimated Overassessment	-$8,683	$0	$14,181
Change in Estimated Value	-$36,934	-$30,313	$43,384
ETR (Estimated Value)	1.12%	1.02%	0.42%
2010 Assessment Cycle			
Tax	$3,902	$3,253	$2,479
Assessed Value	$384,538	$321,410	$260,339
Default	1.67%		12.80%
Property Sale	1.71%		13.00%
Sales Premium (Over AV)	7.18%	8.48%	18.60%
Estimated Value	$334,421	$287,492	$196,809
Estimated Overassessment	$54,023	$49,209	$67,723
Change in Estimated Value	-$38,576	-$33,558	$27,435
ETR (Estimated Value)	1.24%	1.08%	0.58%
2011 Assessment Cycle			
Tax	$3,881	$3,264	$2,555
Assessed Value	$364,816	$318,066	$254,809
Default	1.63%		12.60%
Property Sale	1.92%		13.70%
Sales Premium (Over AV)	3.89%	-0.67%	71.00%
Estimated Value	$360,317	$307,730	$222,807
Estimated Overassessment	$13,383	$3,889	$35,323
Change in Estimated Value	-$38,642	-$33,404	$28,385
ETR (Estimated Value)	1.14%	1.00%	8.37%
Observations	1,284,527		

Table 2: 2010 Summary Statistics

	Mean	Median	Std.Dev.
2009 Assessment Cycle			
Tax	$3,429	$3,090	$1,879
Assessed Value	$308,309	$270,050	$190,301
Default	0.64%		7.99%
Property Sale	1.92%		13.70%
Sales Premium (Over AV)	2.37%	2.20%	27.10%
Estimated Value	$297,275	$255,457	$175,342
Estimated Overassessment	$9,758	$7,420	$19,623
Change in Estimated Value	-$14,153	-$10,819	$21,560
ETR (Estimated Value)	1.23%	1.10%	0.45%
2010 Assessment Cycle			
Tax	$3,593	$3,113	$2,132
Assessed Value	$315,776	$262,900	$212,597
Default	0.60%		7.70%
Property Sale	1.92%		13.70%
Sales Premium (Over AV)	7.26%	7.54%	30.10%
Estimated Value	$315,052	$263,500	$195,508
Estimated Overassessment	-$1,688	$0	$12,223
Change in Estimated Value	-$14,637	-$11,038	$22,307
ETR (Estimated Value)	1.22%	1.13%	0.45%
2011 Assessment Cycle			
Tax	$4,147	$3,513	$2,703
Assessed Value	$362,744	$301,260	$264,277
Default	0.55%		7.42%
Property Sale	1.85%		13.50%
Sales Premium (Over AV)	10.50%	0.34%	93.10%
Estimated Value	$347,499	$293,635	$220,445
Estimated Overassessment	$23,820	$31,534	$51,588
Change in Estimated Value	-$13,439	-$11,533	$17,038
ETR (Estimated Value)	1.14%	1.10%	9.45%
Observations	1,265,143		

Table 3: 2008-2012 Summary Statistics

	Mean	Median	Std.Dev.
2009 Assessment Cycle			
Tax	$3,204	$2,799	$1,857
Assessed Value	$301,984	$260,990	$206,779
Default	1.04%		10.10%
Property Sale	1.80%		13.30%
Sales Premium (Over AV)	4.56%	3.25%	44.80%
Estimated Value	$298,915	$258,440	$181,066
Estimated Overassessment	-$928	$0	$31,547
Change in Estimated Value	-$22,489	-$16,905	$65,422
ETR (Estimated Value)	1.17%	1.07%	1.91%
2010 Assessment Cycle			
Tax	$3,601	$3,051	$2,246
Assessed Value	$341,561	$284,100	$239,084
Default	0.88%		9.36%
Property Sale	1.79%		13.30%
Sales Premium (Over AV)	9.25%	8.50%	35.70%
Estimated Value	$321,291	$270,633	$201,481
Estimated Overassessment	$17,313	$10,560	$47,352
Change in Estimated Value	-$20,677	-$16,138	$22,896
ETR (Estimated Value)	1.23%	1.11%	0.58%
2011 Assessment Cycle			
Tax	$3,622	$3,033	$2,405
Assessed Value	$334,919	$281,200	$250,194
Default	0.86%		9.25%
Property Sale	1.90%		13.60%
Sales Premium (Over AV)	7.73%	2.87%	64.70%
Estimated Value	$337,295	$286,627	$225,383
Estimated Overassessment	-$1,687	$0	$43,139
Change in Estimated Value	-$25,391	-$17,608	$33,612
ETR (Estimated Value)	1.14%	1.05%	5.68%
Observations	6,370,931		

Table 4: Effects of Reassessment on Mortgage Default

	(1) OLS 2009	(2) Logit 2009	(3) IV 2009	(4) OLS 2010	(5) Logit 2010	(6) IV 2010	(7) Pooled OLS
Tax			0.001***			0.000	
			(0.000)			(0.000)	
Estimated Value	-0.000	0.961***	-0.000***	-0.000***	0.977***	-0.000***	-0.000***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Change in Estimated Value	0.001***	0.807***	0.001***	0.000	0.861***	0.000***	-0.000***
	(0.000)	(0.003)	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)
Assessed in Current Year	0.003***	1.213***		0.001***	1.053		0.001***
	(0.001)	(0.028)		(0.000)	(0.033)		(0.000)
Assessed # Change in Est. Value	0.001***	1.011**		0.000**	1.046***		0.000
	(0.000)	(0.004)		(0.000)	(0.012)		(0.000)
2010							-0.012***
							(0.000)
2011							-0.012***
							(0.000)
2012							-0.015***
							(0.000)
Constant	0.007*	0.025***	0.017***	-0.002	0.010***	0.007***	0.010***
	(0.004)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)	(0.002)
Observations	1,207,819	1,202,564	1,193,432	1,188,310	1,176,404	1,173,613	4,671,699
R-squared	0.010		0.010	0.002		0.002	0.008
Zip FE	YES	YES	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES	YES	YES
YEAR FE							YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Effects of Reassessment on Property Sales

VARIABLES	(1) OLS 2009	(2) Logit 2009	(3) IV 2009	(4) OLS 2010	(5) Logit 2010	(6) IV 2010	(7) Pooled OLS
Tax			0.001***			0.000	
			(0.000)			(0.000)	
Estimated Value	-0.000***	1.005***	-0.000***	-0.000	1.005***	-0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Change in Estimated Value	0.000	1.047***	0.000	0.001***	1.036***	0.000	0.000***
	(0.000)	(0.004)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)
Assessed in Current Year	0.001*	1.090***		0.000	1.026		0.001***
	(0.001)	(0.026)		(0.001)	(0.018)		(0.000)
Assessed # Change in Est. Value	0.000	0.996		-0.001***	0.977***		-0.000***
	(0.000)	(0.005)		(0.000)	(0.007)		(0.000)
Constant	0.015***	0.017***	0.020***	0.014***	0.017***	0.015***	0.009***
	(0.004)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.002)
Observations	1,187,273	1,184,978	1,173,211	1,195,575	1,191,683	1,180,963	10,053,171
R-squared	0.002		0.003	0.003		0.003	0.003
Zip FE	YES	YES	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES	YES	YES
YEAR FE							YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Effects of Reassessment on Sales Premium

VARIABLES	(1) OLS 2009	(2) IV 2009	(3) OLS 2010	(4) IV 2010	(5) Pooled OLS
Tax		0.003		-0.034***	
		(0.006)		(0.010)	
Estimated Value	-0.000	-0.001	-0.003***	0.002*	-0.005***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
Change in Estimated Value	0.029***	0.019**	0.047***	-0.000	-0.006***
	(0.010)	(0.007)	(0.010)	(0.003)	(0.001)
Assessed in Current Year	-0.084***		-0.001		-0.026***
	(0.021)		(0.012)		(0.002)
Assessed # Change in Est. Value	-0.012**		-0.044***		0.001
	(0.005)		(0.008)		(0.001)
Constant	0.288***	0.075***	0.442***	0.079***	0.218***
	(0.031)	(0.009)	(0.060)	(0.012)	(0.017)
Observations	20,980	20,692	22,433	22,132	213,834
R-squared	0.078	0.079	0.140	0.087	0.048
Zip FE	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES
YEAR FE					YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Aggregate Appraised Value by County/Fiscal Year

County	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Allegany	$ 2,586,972	$ 2,846,492	$ 3,065,071	$ 3,484,452	$ 3,672,486	$ 3,671,981
Anne Arundel	$ 58,289,078	$ 69,284,375	$ 79,234,802	$ 84,100,226	$ 82,254,827	$ 76,998,283
Baltimore City	$ 23,270,049	$ 27,026,288	$ 31,476,196	$ 36,152,390	$ 37,123,845	$ 35,496,276
Baltimore	$ 59,388,359	$ 69,109,693	$ 78,638,141	$ 85,888,670	$ 86,294,582	$ 81,261,214
Calvert	$ 8,627,574	$ 10,627,594	$ 12,450,810	$ 13,459,525	$ 13,316,625	$ 12,425,111
Caroline	$ 1,998,513	$ 2,370,861	$ 2,765,323	$ 3,095,753	$ 3,079,802	$ 2,846,998
Carroll	$ 14,928,927	$ 17,379,874	$ 19,772,165	$ 21,539,976	$ 20,353,779	$ 19,143,906
Cecil	$ 7,538,061	$ 8,813,334	$ 10,080,287	$ 10,800,442	$ 10,767,002	$ 10,177,098
Charles	$ 12,412,526	$ 15,121,431	$ 17,610,478	$ 18,938,637	$ 17,941,362	$ 16,687,708
Dorchester	$ 2,266,874	$ 2,695,155	$ 3,102,840	$ 3,391,676	$ 3,416,216	$ 3,108,058
Frederick	$ 21,956,977	$ 26,254,477	$ 29,825,708	$ 31,678,985	$ 29,464,122	$ 26,861,626
Garrett	$ 3,272,030	$ 3,764,637	$ 4,232,240	$ 4,573,168	$ 4,858,041	$ 4,846,248
Harford	$ 18,994,224	$ 21,990,003	$ 25,200,084	$ 27,465,303	$ 27,595,623	$ 26,409,869
Howard	$ 34,805,181	$ 40,562,971	$ 46,143,463	$ 48,528,784	$ 46,468,365	$ 43,424,892
Kent	$ 2,143,116	$ 2,499,547	$ 2,880,110	$ 3,180,936	$ 3,246,033	$ 3,119,848
Montgomery	$ 141,896,429	$ 164,467,981	$ 182,975,851	$ 183,562,521	$ 175,163,507	$ 163,840,448
Prince George's	$ 59,911,071	$ 71,568,514	$ 85,687,003	$ 95,828,317	$ 95,961,368	$ 83,077,561
Queen Anne's	$ 6,111,806	$ 7,299,651	$ 8,358,833	$ 8,987,459	$ 8,688,003	$ 8,486,036
St. Mary's	$ 7,966,644	$ 9,530,468	$ 11,328,477	$ 12,601,733	$ 12,920,612	$ 12,307,028
Somerset	$ 1,116,304	$ 1,333,556	$ 1,564,620	$ 1,685,922	$ 1,698,004	$ 1,615,002
Talbot	$ 6,696,088	$ 7,875,276	$ 9,099,478	$ 10,085,641	$ 10,079,566	$ 9,672,774
Washington	$ 9,570,528	$ 11,348,229	$ 13,202,049	$ 14,297,018	$ 13,646,825	$ 12,725,241
Wicomico	$ 5,141,070	$ 5,873,614	$ 6,698,775	$ 7,258,815	$ 7,184,163	$ 6,629,389
Worcester	$ 14,185,180	$ 17,038,234	$ 20,092,743	$ 18,968,635	$ 17,864,742	$ 17,221,019

County	FY2013	FY2014	FY2015	FY2016	FY2017
Allegany	$ 3,624,666	$ 3,579,448	$ 3,547,929	$ 3,532,916	$ 3,551,502
Anne Arundel	$ 73,705,939	$ 73,865,355	$ 75,319,059	$ 77,607,370	$ 81,106,243
Baltimore City	$ 33,133,118	$ 32,548,629	$ 33,877,108	$ 35,701,626	$ 38,133,035
Baltimore	$ 77,724,847	$ 75,469,078	$ 75,084,608	$ 76,481,580	$ 78,752,954
Calvert	$ 11,678,345	$ 11,334,235	$ 11,274,400	$ 11,334,748	$ 11,499,919
Caroline	$ 2,705,356	$ 2,550,357	$ 2,499,663	$ 2,484,606	$ 2,484,170
Carroll	$ 18,269,133	$ 17,999,418	$ 17,967,373	$ 18,130,197	$ 18,489,411
Cecil	$ 9,586,913	$ 9,280,440	$ 9,252,797	$ 9,303,122	$ 9,350,770
Charles	$ 15,809,223	$ 15,414,254	$ 15,465,732	$ 15,718,928	$ 16,370,791
Dorchester	$ 3,001,778	$ 2,861,600	$ 2,782,627	$ 2,773,657	$ 2,760,580
Frederick	$ 25,596,214	$ 25,433,656	$ 25,856,626	$ 26,739,905	$ 27,862,421
Garrett	$ 4,636,840	$ 4,621,273	$ 4,260,262	$ 4,257,322	$ 4,302,146
Harford	$ 25,821,377	$ 25,569,637	$ 25,695,399	$ 25,964,093	$ 26,480,556
Howard	$ 42,459,610	$ 42,755,118	$ 43,875,445	$ 45,767,761	$ 47,734,585
Kent	$ 3,021,073	$ 2,976,520	$ 2,909,297	$ 2,905,825	$ 2,899,135
Montgomery	$ 159,469,990	$ 161,008,847	$ 165,097,133	$ 172,106,721	$ 179,140,567
Prince George's	$ 76,308,869	$ 73,074,771	$ 73,896,653	$ 76,612,580	$ 81,938,105
Queen Anne's	$ 7,967,775	$ 7,636,884	$ 7,582,753	$ 7,594,933	$ 7,758,144
St. Mary's	$ 11,937,100	$ 11,806,248	$ 11,801,792	$ 11,910,055	$ 12,034,355
Somerset	$ 1,410,142	$ 1,417,905	$ 1,357,895	$ 1,369,900	$ 1,363,237
Talbot	$ 9,261,945	$ 8,789,477	$ 8,470,761	$ 8,339,903	$ 8,361,570
Washington	$ 12,297,143	$ 11,906,479	$ 11,794,130	$ 11,884,566	$ 12,066,290
Wicomico	$ 6,171,303	$ 5,832,822	$ 5,690,278	$ 5,737,704	$ 5,777,701
Worcester	$ 15,454,392	$ 14,526,197	$ 14,527,882	$ 14,498,234	$ 14,811,576

Table 8: Tax Rates by County/Fiscal Year

COUNTY	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Allegany	0.983	0.983	0.983	0.983	0.983	0.982
Anne Arundel	0.918	0.891	0.888	0.876	0.880	0.910
Baltimore City	2.288	2.268	2.268	2.268	2.268	2.268
Baltimore	1.100	1.100	1.100	1.100	1.100	1.100
Calvert	0.892	0.892	0.892	0.892	0.892	0.892
Caroline	0.870	0.870	0.870	0.870	0.870	0.870
Carroll	1.048	1.048	1.048	1.048	1.048	1.028
Cecil	0.960	0.960	0.960	0.940	0.915	0.940
Charles	1.026	1.026	1.026	1.026	1.026	1.067
Dorchester	0.896	0.896	0.896	0.896	0.896	0.976
Frederick	1.064	1.064	1.064	1.064	1.064	1.064
Garrett	1.000	1.000	1.000	0.990	0.990	0.990
Harford	1.082	1.082	1.082	1.064	1.042	1.042
Howard	1.140	1.150	1.150	1.150	1.150	1.150
Kent	0.972	0.972	0.972	0.972	1.022	1.022
Montgomery	0.916	0.916	0.915	0.916	0.915	0.959
Prince George's	1.319	1.319	1.319	1.319	1.319	1.319
Queen Anne's	0.800	0.770	0.770	0.770	0.767	0.847
St. Mary's	0.857	0.857	0.857	0.857	0.857	0.857
Somerset	0.940	0.940	0.920	0.900	0.884	0.884
Talbot	0.500	0.475	0.449	0.432	0.432	0.448
Washington	0.948	0.948	0.948	0.948	0.948	0.948
Wicomico	0.942	0.881	0.814	0.759	0.759	0.769
Worcester	0.700	0.700	0.700	0.700	0.700	0.700

COUNTY	FY2013	FY2014	FY2015	FY2016	FY2017
Allegany	0.981	0.980	0.979	0.978	0.977
Anne Arundel	0.941	0.950	0.943	0.923	0.915
Baltimore City	2.268	2.248	2.248	2.248	2.248
Baltimore	1.100	1.100	1.100	1.100	1.1
Calvert	0.892	0.892	0.892	0.892	0.952
Caroline	0.890	0.940	0.960	0.980	0.98
Carroll	1.018	1.018	1.018	1.018	1.018
Cecil	0.991	0.991	0.991	0.991	0.991
Charles	1.121	1.205	1.205	1.205	1.205
Dorchester	0.976	0.976	0.976	0.976	0.976
Frederick	1.064	1.064	1.060	1.060	1.06
Garrett	0.990	0.990	0.990	0.990	0.99
Harford	1.042	1.042	1.042	1.042	1.042
Howard	1.190	1.190	1.190	1.190	1.19
Kent	1.022	1.022	1.022	1.022	1.022
Montgomery	1.003	1.021	1.008	0.999	1.038
Prince George's	1.319	1.319	1.319	1.374	1.374
Queen Anne's	0.847	0.847	0.847	0.847	0.847
St. Mary's	0.857	0.857	0.857	0.852	0.852
Somerset	0.884	0.915	0.915	1.000	1
Talbot	0.491	0.512	0.527	0.536	0.547
Washington	0.948	0.948	0.948	0.948	0.948
Wicomico	0.840	0.909	0.952	0.952	0.952
Worcester	0.770	0.770	0.770	0.835	0.835

Table 9: Property Tax Revenues by County/Fiscal Year

COUNTY	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Allegany	$ 30,141,707	$ 32,492,011	$ 34,266,623	$ 39,552,052	$ 41,236,282	$ 41,271,372
Allegany	$ 30,740,703	$ 32,434,205	$ 35,262,339	$ 39,691,592	$ 42,100,002	$ 42,049,578
Anne Arundel	$ 470,163,000	$ 497,486,000	$ 540,602,000	$ 557,796,000	$ 577,937,000	$ 593,914,000
Baltimore City	$ 592,065,000	$ 626,420,000	$ 693,767,000	$ 770,320,000	$ 813,613,000	$ 769,094,000
Baltimore	$ 662,307,000	$ 712,863,000	$ 767,103,000	$ 813,970,000	$ 837,092,000	$ 844,069,000
Calvert	$ 98,994,236	$ 109,907,718	$ 126,502,446	$ 137,559,596	$ 150,043,755	$ 150,000,845
Caroline	$ 17,775,491	$ 19,369,182	$ 21,320,919	$ 23,245,019	$ 23,892,084	$ 23,932,023
Carroll	$ 158,112,936	$ 148,644,728	$ 158,112,936	$ 174,354,873	$ 189,079,529	$ 201,573,213
Cecil	$ 80,546,737	$ 86,399,908	$ 96,078,658	$ 101,463,330	$ 101,274,085	$ 102,575,768
Charles	$ 144,342,192	$ 161,343,642	$ 181,396,190	$ 190,131,537	$ 193,939,891	$ 196,368,356
Dorchester	$ 22,344,833	$ 26,057,854	$ 26,903,025	$ 28,964,359	$ 29,938,117	$ 31,029,064
Frederick	$ 220,103,311	$ 244,968,090	$ 271,247,190	$ 289,144,746	$ 289,330,130	$ 280,654,804
Garrett				$ 43,583,752	$ 46,044,612	$ 47,860,017
Harford	$ 218,160,400	$ 243,355,073	$ 269,385,374	$ 286,733,047	$ 290,004,412	$ 295,910,417
Howard	$ 383,551,777	$ 426,302,542	$ 467,389,345	$ 494,218,364	$ 504,884,233	$ 504,771,008
Kent	$ 20,519,221	$ 23,105,492	$ 25,655,349	$ 27,447,599	$ 30,680,082	$ 30,405,080
Montgomery	$ 1,126,632,925	$ 1,146,965,583	$ 1,296,974,051	$ 1,371,964,491	$ 1,358,968,819	$ 1,395,693,492
Prince George's	$ 549,681,586	$ 610,202,347	$ 659,038,907	$ 732,832,234	$ 733,197,993	$ 722,138,728
Queen Anne's	$ 46,208,342	$ 50,007,054	$ 55,374,053	$ 59,242,742	$ 60,097,959	$ 65,918,832
St. Mary's	$ 63,198,955	$ 77,889,130	$ 87,183,424	$ 94,282,545	$ 99,250,867	$ 99,515,305
Somerset				$ 15,784,761	$ 15,697,433	$ 15,486,336
Talbot	$ 25,051,218	$ 26,371,828	$ 27,436,368	$ 28,324,937	$ 29,154,652	$ 30,002,020
Washington	$ 101,968,710	$ 112,455,338	$ 121,717,428	$ 129,232,852	$ 125,823,260	$ 124,884,530
Wicomico	$ 58,063,142	$ 59,220,846	$ 60,328,149	$ 60,211,126	$ 60,575,912	$ 59,008,117
Worcester	$ 99,594,792	$ 116,778,663	$ 134,015,561	$ 127,176,751	$ 121,990,826	$ 121,290,966

COUNTY	FY2013	FY2014	FY2015	FY2016	FY2017
Allegany	$ 40,882,732	$ 41,334,050	$ 40,209,077		
Allegany	$ 40,302,290	$ 43,948,120	$ 41,737,685	$ 41,078,799	$ 42,106,441
Anne Arundel	$ 620,348,000	$ 637,623,000	$ 657,850,000	$ 666,491,000	$ 697,495,000
Baltimore City	$ 806,258,000	$ 810,824,000	$ 816,199,000	$ 852,114,000	$ 869,964,000
Baltimore	$ 847,439,000	$ 850,367,000	$ 866,698,000	$ 891,823,000	$ 916,768,000
Calvert	$ 145,034,029	$ 141,760,716	$ 141,620,683	$ 141,789,058	$ 151,766,977
Caroline	$ 24,106,972	$ 24,718,235	$ 24,922,043	$ 25,339,865	$ 25,320,390
Carroll	$ 208,296,512	$ 203,601,066	$ 197,220,876	$ 195,465,262	$ 201,438,220
Cecil	$ 104,706,894	$ 103,397,531	$ 102,727,666	$ 106,810,382	$ 106,490,517
Charles	$ 200,484,806	$ 211,634,897	$ 216,073,564	$ 223,238,990	$ 234,670,748
Dorchester	$ 31,930,405	$ 30,078,941	$ 29,892,908	$ 28,882,696	$ 29,469,789
Frederick	$ 259,687,605	$ 367,892,085	$ 271,031,681	$ 282,362,326	$ 293,611,922
Garrett	$ 49,609,030	$ 48,466,651	$ 45,775,336	$ 45,919,783	$ 47,690,172
Harford	$ 286,926,355	$ 285,239,614	$ 286,911,796	$ 293,100,653	$ 298,947,432
Howard	$ 523,266,142	$ 539,731,584	$ 559,405,539	$ 586,123,532	$ 608,458,370
Kent	$ 30,174,622	$ 30,212,617	$ 30,188,083	$ 29,951,731	$ 29,986,484
Montgomery	$ 1,463,855,656	$ 1,528,302,790	$ 1,528,093,085	$ 1,593,880,896	$ 1,792,921,614
Prince George's	$ 707,228,408	$ 709,669,105	$ 720,937,819	$ 779,978,896	$ 827,354,415
Queen Anne's	$ 65,554,079	$ 64,701,622	$ 64,671,292	$ 64,946,443	$ 66,501,901
St. Mary's	$ 100,809,676	$ 103,137,047	$ 104,543,652	$ 105,081,992	$ 106,810,985
Somerset	$ 14,822,293	$ 14,946,799	$ 14,448,793	$ 15,343,255	$ 16,021,379
Talbot	$ 32,741,855	$ 33,660,872	$ 34,726,851	$ 35,280,376	$ 36,531,210
Washington	$ 122,470,175	$ 121,449,621	$ 118,532,386	$ 118,695,180	$ 120,495,940
Wicomico	$ 60,969,775	$ 61,053,654	$ 62,893,633	$ 61,938,432	$ 62,647,428
Worcester	$ 121,348,615	$ 117,173,133	$ 117,097,119	$ 127,411,911	$ 130,179,520