

THE IMPACT OF THE TAX CUTS AND JOBS ACT ON RESIDENTIAL HOUSING MARKETS: EVIDENCE FROM NEW JERSEY

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ABSTRACT. The US tax code contains provisions that significantly reduce homeownership costs. These benefits were reduced under the Tax Cuts and Jobs Act of 2017, raising the real cost of property taxes and mortgages for a subset of taxpayers. This paper examines how individual homebuyers and residential housing markets responded to these changes. Using a unique constructed dataset of home loan records matched to deeds, this paper shows that homebuyers responded by purchasing smaller homes with lower property tax burdens, with the level of response indicating that the price elasticity of housing demand is approximately unit elastic. Homebuyers also reduced the size of their home loans (relative to sale price) by the equivalent of the response to a two percentage point increase in interest rates. Additionally, home prices in high-property tax areas fell by an amount corresponding to 60 percent of the increase in property tax liabilities.

1. INTRODUCTION

The US federal tax code contains significant tax benefits for homeowners. Homeowners are not taxed on the imputed rental income of their homes and yet are nonetheless able to deduct property taxes and interest on their home mortgage. Furthermore, homeowners are entitled to large exemptions on capital gains when they sell their homes. The often stated reasoning behind these benefits is that they encourage home-ownership and that there are substantial societal benefits from higher home-ownership rates and homeowners who are more invested in their communities. The Tax Cuts and Jobs Act of 2017 provides an opportunity to study

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the effect of tax incentives on the housing market, as it substantially reduced homeowner tax benefits for a subset of taxpayers.

The Tax Cuts and Jobs Act of 2017 (TCJA) was one of the largest US federal tax reforms in the last hundred years. It reduced the tax benefits of home-ownership in two major ways. First, it approximately doubled the standard deduction, reducing the fraction of itemizing taxpayers from 30% to 13%. Since only itemizers benefit from deducting property taxes and interest on a home mortgage, this raised the after-tax costs of home-ownership for taxpayers who stopped itemizing. Second, TCJA capped total state and local taxes (known by the acronym SALT) deductions to a maximum of \$10,000. This provision was politically contentious because the largest beneficiaries of SALT deductions were taxpayers in states primarily represented by the Democratic Party while the TCJA was passed by the Republican party with no support from Democrats. Since the passage of the TCJA, there have been several attempts by Congressional Democrats to repeal the SALT cap including a current attempt to add a SALT cap repeal into the proposed \$1.85 trillion spending bill. A return to a pre-TCJA system would provide an estimated \$171 billion in tax benefits (or approximately 6% of individual income tax revenue), 92% of which would accrue to taxpayers earning over \$100,000 a year*. Understanding the effect of the tax code on the housing market is thus both a salient policy and economic question.

This paper measures the impact of the TCJA on housing markets in New Jersey. New Jersey has the highest real estate property tax levels in the United States, with the average household paying over \$5,000 in property taxes per year[†]. New Jersey also has some of the highest state income tax rates, which coupled with the fact that New Jersey has the second highest median income means that New Jersey residents have particularly large state income tax bills. In tax year 2017 (prior to the passage of TCJA) 42% of New Jersey tax filers itemized their deductions (compared to 32% of all US tax filers) and the mean property tax deduction for New Jersey itemized returns was almost \$9,000 (compared to \$4,750 for all US itemized returns)[‡]. This means that if the TCJA did impact housing markets, New Jersey is

*According to the Joint Committee on Taxation

†According to data from the 2019 American Community Survey

‡According to the IRS Statistics of Income

one of the most likely places where such an impact would be observed.

If the TCJA affected housing markets, one of the measurable impacts would be housing prices. If the higher (after tax) cost of property taxes and home loans reduced demand for housing, this should be reflected in changing home prices. The reduced demand should come from home-buyers who faced less generous tax benefits after TCJA, so estimating how individual home buyers responded to the TCJA provides a richer picture of the impact of tax benefits on the housing market. Home-buyers who stopped itemizing after TCJA would face a higher real cost of property taxes and home loans while home-buyers who continued to itemize would at most be unable to fully deduct their property taxes.

To measure how home prices changed, the paper looks at the universe of residential homes in New Jersey. Because current home prices should reflect beliefs about future home prices, this paper use a repeat sales model where the outcome of interest is the growth in home price between sales. To the extent that TCJA was an unexpected shock, there should be differential price growth rates between homes purchased by home-buyers more or less impacted by the TCJA.

This paper finds an elasticity of home prices with respect to property taxes of -0.1 post TCJA, with no relationship between property taxes and home prices prior to TCJA. The lack of relationship between property taxes and home price growth prior to the passage of TCJA is consistent with future expected property taxes having been already capitalized into property prices. For the median home in the sample, the estimates imply that a \$1,000 increase in yearly property taxes would reduce a home's price by \$3,800. Given itemization behavior in New Jersey prior to the passage of the TCJA (and scaling by the change in the after-tax cost of property taxes) these results imply a roughly 60% capitalization rate of increased property tax costs into home prices. The results imply that home-buyers are responsive to changes in the after-tax cost of property taxes.

To measure individual home-buyer response, it is necessary to actually observe the house purchasing choices of home-buyers as well as relevant characteristics which determine tax benefits. This paper uses loan level data from the Home Mortgage Disclosure Act matched to deed and mortgage documents in New Jersey’s Middlesex County. This provides (among other things) features of a home-buyer’s home loan, their income, marital status, sale price, home characteristics, and property taxes. The data-set creates a complete picture of the choices which are relevant for evaluating the impact of the TCJA. In particular, this paper estimates a difference in differences model which compares groups who did not experience changes to the tax treatment of their home expenses post-TCJA with those who did experience changes to the tax treatment of their home expenses post-TCJA.

The difference-in-differences analysis finds that those households which were induced to stop itemizing by TCJA purchased homes that were 8% less expensive, had 5% lower property taxes, and were 7% smaller. These taxpayers also originated home-purchase loans that were 4.3 percentage points lower as a fraction of their home price. This is roughly equivalent to home-buyers’ responsiveness to a 2 percentage point increase in mortgage interest rates. Households that still itemized but are unable to fully deduct their state and local taxes due to the \$10,000 cap purchased homes that were 7% less expensive, had 3% lower property taxes, and were 6% smaller. This papers finds no evidence that these taxpayers reduced their relative home loan sizes. This is consistent with the fact that these taxpayers were unable to fully deduct their property taxes but were still able to fully deduct the interest on their home loans. This paper finds that homebuyers are responsive to changes to the tax treatment of home-ownership, and that less generous tax benefits resulted in home-buyers opting for smaller homes with lower property tax burdens. They also used less debt to finance their home purchase in response to the increase in the (after-tax) interest rate.

The rest of the paper proceeds as follows. [Section Two](#) discusses the effect of taxation on the housing market. [Section Three](#) discusses the specifics of the changes to the US federal tax code after the enactment of the Tax Cuts and Jobs Act. [Section Four](#) describes the details of real estate property taxation in New Jersey. [Section Five](#) describes the data. [Section Six](#) covers estimation strategy and main empirical results for the repeat sale home price analysis.

[Section Seven](#) presents the estimation strategy and main empirical results for the difference in differences analysis. [Section Eight](#) summarizes and concludes the results of the paper.

2. RELATED LITERATURE

The preferential treatment of homeowners relative to renters by the United States federal tax code and the impact this has on the housing market has been a topic of concern for decades. Aaron (1970) estimated the distributional impact of the deductibility of property taxes and mortgage interest payments from taxable income. He also estimated the impact of the federal government not taxing the imputed rental income from owner-occupied housing. He argued that this favorable tax treatment of homeowners lead to higher housing prices and that the benefits of the tax subsidies primarily accrued to upper income homeowners. Using a general equilibrium framework Sommer and Sullivan (2018) estimated that eliminating the deductibility of mortgage interest payments for owner-occupied housing would lead to a reduction in home prices, a reduction in housing consumption by the wealthy, and an increase in homeownership overall. Poterba and Sinai (2008) estimate that repealing the property tax deduction would increase the marginal user cost of housing by three percent, although they use the national average property tax rate so the impact may be expected to be much larger for high tax localities. Gyourko and Sinai (2003) argue that the benefits of the deductibility of mortgage interest payments and property taxes are distributed highly unevenly throughout the United States. In 1990 New Jersey received \$5,915 in net tax benefits per owner-occupied housing unit, while the national average was \$2,092 per owner-occupied housing unit, South Dakota had the lowest net tax benefit at \$917 per owner-occupied housing unit, and Hawaii had the highest net benefit at \$10,718 per owner-occupied housing unit. They argue that given that high-income high-tax-bracket homeowners tend to live in high-value homes with high property taxes, the deduction of property taxes and mortgage interest payments is at odds with an otherwise progressive tax code.

Starting with Oates (1969) there has been interest in isolating the impact of property taxes on housing prices. Oates attempted to control for local public goods by directly including measures of per pupil expenditure on education. However, this has largely been abandoned as

a strategy for isolating the impact of property taxes due to the difficulty of accurately measuring the provision of local public goods and the resulting concerns about biased results. Palmon and Smith (1998) estimate property tax capitalization using localities which are in the same school district but have different funding schemes for other public goods, resulting in different property tax rates. They find a property tax capitalization rate of 62 percent. Bradley (2017) estimates an intra-jurisdictional model where new homeowners experience temporary property tax savings due to inheriting the previous owners' capped assessed taxable value for the remainder of the calendar year following a sale. Bradley finds an enormous overcapitalization of 2900-3700 percent which he argues is due to a misapprehension by the new homeowners that the tax savings are permanent rather than temporary. This is an important consideration for my paper as well, since it is unclear how aware homebuyers are of the change to the federal tax code treatment of property taxes. De Bartolome and Rosenthal (1999) include the itemization behavior of homeowners in estimating the capitalization of property taxes into housing prices. In order to correct for the simultaneity of home prices and property tax burdens, they use the structural attributes of the home from four years prior to the observed sale. They find a capitalization rate of approximately 40 percent. Elinder and Persson (2017) look at the impact of a national property tax reduction in Sweden on home prices. They find little effect for all but the top one percent by price of homes, and for the top one percent they find a 50 percent capitalization rate.

The estimation method that I employ in this paper includes confining my estimates to homes which have been sold multiple times and using the growth in home price rather than the home price itself as the outcome variable. The use of repeat sales to measure the change in real estate prices started with Bailey, Muth, and Nourse (1963) with current methods attributable to Case and Shiller's seminal 1989 paper. Case and Shiller outline a method for decomposing property prices into municipality wide changes, individual changes in housing price, and noise in the price due to imperfections in the housing market. Harding, Rosenthal, and Sirmans (2007) provide a framework to deal with potentially endogenous explanatory variables. They estimate the impact that maintenance expenditures have on the the growth in home prices using a repeat sales model. In order to address concerns that maintenance expenditures may be endogenous to the growth in home prices, they instrument for maintenance expenditures using

time invariant characteristics of the home. Although structural attributes are an important explanatory variable for home prices, if they do not change between sales they should not be relevant in explaining how the price of the home changed.

Because homes with different property tax magnitude may be heterogeneously impacted by the TCJA and it is not obvious at which level of property taxes the difference should occur, a threshold estimation strategy is employed. In threshold estimation, an independent variable is believed to have a different impact on the dependent variable above and below some unknown level of the independent variable. In order to assess this possibility, an indicator variable for whether the independent variable is above or below a certain threshold interacted with the independent variable itself and the regression is estimated multiple times, varying only the threshold level. Generally, the threshold which minimizes the sum of squared errors is considered to be the "true" threshold, because it provides the greatest explanatory power to the data. Hansen (2017) describes estimation strategies, inference in a regression kink model with an unknown threshold, and testing for the presence of a threshold. Kourtellos, Stengos, and Tan (2014) describe estimation strategies in the presence of both an endogenous threshold variable and endogenous regressors. Their strategy, which is the primary one employed in this paper, involves a two stage least squares estimation repeated at various threshold levels and includes a Heckman correction term to account for the endogeneity of the threshold variable.

3. TAX CUTS AND JOBS ACT

The Tax Cuts and Jobs Act was signed into law on December 22nd of 2017. Features of the law which were relevant for home-owners went into effect starting in tax year 2018. Public awareness of a major bill and its contents started several months earlier*. Because the average time between making an offer and closing on a home is 47 days †, the paper assumes that only homebuyers who closed on their homes starting in January of 2018 were aware of the post-TCJA tax treatment of home-ownership.

The Tax Cuts and Jobs Act slightly lowered marginal tax rates for all income levels (see Table 3.1). It also substantially increased the standard deduction, from \$6,500 to \$12,000 for single filers and from \$13,000 to \$24,000 for joint filers. A federal income tax payer can choose between taking the standard deduction and then paying federal income taxes of (3.1) and itemizing their deductions and paying federal income taxes of (3.2).

(A) Marginal Tax Rates 2017					(B) Marginal Tax Rates 2018				
Rate	Single	Married Filing Separately	Married Filing Jointly	Head of Household	Rate	Single	Married Filing Separately	Married Filing Jointly	Head of Household
Taxable Income Over:					Taxable Income Over:				
10%	\$0	\$0	\$0	\$0	10%	\$0	\$0	\$0	\$0
15%	\$9,325	\$9,325	\$18,650	\$13,350	12%	\$9,525	\$9,525	\$19,050	\$13,600
25%	\$37,950	\$37,950	\$75,900	\$50,800	22%	\$38,700	\$38,700	\$77,400	\$51,800
28%	\$91,900	\$76,550	\$153,100	\$131,200	24%	\$82,500	\$82,500	\$165,000	\$82,500
32%	\$191,650	\$116,675	\$233,350	\$212,500	32%	\$157,500	\$157,500	\$315,000	\$157,500
35%	\$416,700	\$208,350	\$416,700	\$416,700	35%	\$200,000	\$200,000	\$400,000	\$200,000
39.6%	\$418,400	\$235,350	\$470,700	\$444,550	37%	\$500,000	\$300,000	\$600,000	\$500,000

TABLE 3.1. Marginal Tax Rates Before and After TCJA

$$(3.1) \quad \sum_{j=1}^n \tau_{f_j} \cdot \min [Y_{f_j, \max}, Y - \text{Std. Ded.}] \cdot \mathbb{1}[Y - \text{Std. Ded.} > Y_{f_{j-1}, \max}]$$

$$(3.2) \quad \sum_{j=1}^n \tau_{f_j} \cdot \min [Y_{f_j, \max}, Y - \sum_{l=1}^L \text{Itemized Ded.}_l] \cdot \mathbb{1}[Y - \sum_{l=1}^L \text{Itemized Ded.}_l > Y_{f_{j-1}, \max}]$$

*See Appendix Figure A.1 for Google Trends indices in the second half of 2017

†According to EllieMae, a mortgage application processor

Where τ_{f_j} is the j th marginal tax rate (ordered by the income tax schedule from lowest to highest relevant income threshold), $Y_{f_j, \max}$ is the last dollar of income that is taxed at the τ_{f_j} level, Y is the tax payer’s income, Std. Ded. is the standard deduction, and $\sum_{l=1}^L \text{Itemized Ded}_l$ is the sum of allowed deductions. By increasing the standard deduction the TCJA reduced the incentives to itemize deductions, as any taxpayer for whom $\sum_{l=1}^L \text{Itemized Ded}_l > \text{Std. Ded.}$ should optimally choose to take the standard deduction (ignoring the additional time cost of itemizing or the potential concerns about increased audit risk).

There is an additional caveat, which is that if an itemizing taxpayer ends up with a computed taxable income under equation (3.2) which is too low conditional on their income, then they will be subject to the Alternative Minimum Tax. Relative to the ordinary income tax schedule, Alternative Minimum Tax (AMT) provides taxpayers with lower marginal tax rates and an exemption but restricts deductions (including not allowing state and local tax deductions). Table 3.2 shows the Alternative Minimum Tax Schedule in 2017 and 2018.

TABLE 3.2. Alternative Minimum Tax Schedule

	Type of Filer			
	Single	Married Filing Jointly	Head of Household	Married Filing Separately
Pre Tax Cuts and Jobs Act (2017)				
Exemption	\$54,300	\$84,000	\$54,300	\$42,250
26% Bracket Maximum	\$187,800	\$187,800	\$187,800	\$93,900
28% Bracket	>\$187,800	>\$187,800	>\$187,800	>\$93,900
Exemption Phaseout Threshold	\$120,700	\$160,900	\$120,700	\$80,450
Post Tax Cuts and Jobs Act (2018)				
Exemption	\$72,900	\$113,400	\$72,900	\$56,700
26% Bracket Maximum	\$197,900	\$197,900	\$197,900	\$98,950
28% Bracket	>\$197,900	>\$197,900	>\$197,900	>\$98,950
Exemption Phaseout Threshold	\$518,400	\$1,036,800	\$518,400	\$518,400

The Tax Cuts and Jobs Act also reduced the generally tax preferred treatment of home-ownership in the US federal tax code. Prior to the passage of the TCJA, a taxpayer could

deduct all state and local taxes paid from their federal taxable income. This included state and local income taxes, state and local real estate taxes (including for non-primary residence homes) and any personal property taxes. Taxpayers could also choose to deduct all state and local sales taxes that they had paid, but only if they did not also deduct state and local income taxes (almost all itemizing taxpayers chose to deduct state and local income taxes instead of sale taxes). Following the passage of the TCJA, taxpayers could only deduct a total of \$10,000 in state and local taxes. Additionally, the TCJA reduced the generosity of the mortgage interest deduction allowance. Previously, home-owners could deduct any interest they had paid on their first \$1,000,000 of mortgage interest debt, but after the passage of the TCJA this was limited to the first \$750,000 of mortgage interest debt for homes which were purchased in 2018 and later (interest on mortgage debt for non primary residences could also be applied to this total).

After the passage of the TCJA, the fraction of the New Jersey population which itemized their federal income tax returns fell sharply as evidenced in Table 3.3. Prior to the passage of the TCJA, 86% of filers with incomes between \$100,000 and \$200,000 itemized their deduction, after the passage this was reduced to 31%. Similar declines were observed across all income levels.

TABLE 3.3. Tax Filing Status in New Jersey

	Income Range (In Thousands)				
	\$50- \$75	\$75 - \$100	\$100 - \$200	\$200 - \$500	\$500 - \$1,000
2016					
Number of Returns	587,690	398,770	700,750	270,290	42,280
Fraction Joint	32%	52%	76%	88%	89%
Itemized Deductions	47%	65%	86%	98%	98%
Subject to AMT	0.15%	1%	6%	78%	57%
2018					
Number of Returns	607,790	416,100	754,470	315,040	49,700
Fraction Joint	29%	49%	73%	87%	89%
Itemized Deductions	17%	24%	31%	48%	65%
Subject to AMT	<0.01%	<0.01%	0.2%	1.5%	2%

Source: IRS Statistics of Income

Additionally, of those tax payers who still chose to itemize, a large fraction were unable to fully deduct their state and local taxes due to the \$10,000 cap. In 2016, the mean state and local tax deduction for those with incomes between \$100,000 and \$200,000 was \$14,800, and so unsurprisingly in 2018 93% of taxpayers in that same income range who itemized were unable to fully deduct their state and local taxes (see Table 3.4). Average total deductions are higher in 2018 than in 2016, which is consistent with an increase in the threshold at which it becomes optimal to itemize rather than take the standard deduction.

TABLE 3.4. Tax Deductions in New Jersey

Mean Deductions	Income Range (In Thousands)				
	\$50- \$75	\$75 - \$100	\$100 - \$200	\$200 - \$500	\$500 - \$1,000
2016					
Total Deductions	\$19,400	\$22,200	\$28,200	\$47,100	\$93,300
State Income Tax	\$1,900	\$3,100	\$6,200	\$17,200	\$52,000
Property Tax	\$ 5,800	\$ 6,800	\$8,600	\$12,500	\$19,800
Interest on Mortgage	\$ 4,200	\$5,200	\$7,000	\$9,800	\$13,300
2018					
Total Deductions	\$23,200	\$24,700	\$29,000	\$36,000	\$51,700
State Income Tax	\$2,000	\$3,200	\$6,300	\$17,000	\$48,200
Property Tax	\$6,800	\$7,600	\$ 9,300	\$13,400	\$19,000
Interest on Mortgage	\$6,100	\$7,200	\$10,200	\$14,900	\$18,000
SALT Deducted	\$7,400	\$8,400	\$ 9,200	\$9,600	\$9,700

Source: IRS Statistics of Income

These less generous deductibility provisions (and more generous standard deductions) would raise the after tax cost of home-ownership for a large fraction of potential home-buyers in New Jersey. If these home buyers are aware and responsive to this change it may be reflected in the fall in home prices of homes which carry relatively high property tax burdens.

Table 3.5 shows a how a number of hypothetical returns would differ between 2017 and 2018. Property taxes and mortgage interest were chosen on the basis observed property taxes and mortgage interest payments in the IRS Statistics of Income data for New Jersey. Federal

TABLE 3.5. Hypothetical New Jersey Tax Returns Pre and Post TCJA

	Income					
	\$100,000	\$100,000	\$150,000	\$150,000	\$250,000	\$250,000
Return Type	Single	Joint	Single	Joint	Single	Joint
Property Taxes	\$8,000	\$8,000	\$9,000	\$9,000	\$12,000	\$12,000
State Income Taxes	\$3,700	\$2,200	\$6,800	\$4,900	\$14,000	\$11,100
Mortgage Interest	\$7,000	\$7,000	\$10,000	\$10,000	\$13,000	\$13,000
2017						
Optimal Deduction Behavior	Itemize	Itemize	Itemize	Itemize	Itemize	Itemize
Total Taxable Income	\$77,000	\$75,000	\$120,200	\$118,000	\$208,000	\$205,800
Federal Income Tax (Excluding FICA)	\$15,000	\$10,300	\$ 26,600	\$21,000	\$52,000	\$44,500
2018						
Optimal Deduction Behavior	Itemize	Std. Ded.	Itemize	Std. Ded.	Itemize	Std. Ded.
Excess SALT	\$1,700	NA	\$5,800	NA	\$16,000	NA
Total Taxable Income	\$83,000	\$76,000	\$130,000	\$126,000	\$227,000	\$226,000
Total Federal Income Tax (Excluding FICA)	\$14,200	\$8,700	\$25,500	\$20,000	\$55,000	\$42,800

Source: NBER TAXSIM

income taxes and state income taxes were calculated using the NBER TAXSIM program, as was optimal deduction behavior. In the pre-TCJA period, all households find it optimal to itemize their returns. In the post-TCJA period, only the households filing single returns find it optimal to itemize. Even the household which files jointly and makes \$250,000 while paying \$23,100 in SALT and \$13,000 in mortgage interest would find it optimal to take the standard deduction, because only the first \$10,000 of SALT is deductible. Of course, this is a simple example which does not include other potential deductions, but given that the sum of SALT and mortgage interest payments comprised 75% of all deductions in New Jersey in 2016 (and this fraction was even higher for high income households) it is instructive to consider the difference in outcomes even with only these deductions. Additionally, all households in this hypothetical ultimately pay less in federal income tax in 2018 than they did in 2017,

so even though home-ownership is less subsidized in the post-TCJA world, households are overall better off. This means that if housing and local public goods are normal goods, then any reduction in their consumption post-TCJA would be due to the substitution effect, and the observed change would be partially attenuated by the positive income effects of higher net of tax earnings.

4. NEW JERSEY PROPERTY TAXES

In New Jersey, taxes on real estate are levied only by municipalities, and represent a significant sources of revenue for municipalities. Municipalities in New Jersey received an average of 52% of their revenue from property taxes, compared to an average of 28% for municipalities in other states ^{*}.

Homes are taxed based on their assessed value as of October of the previous year, with some municipalities requiring quarterly tax payments and others biannual. Unlike in some states, the value on which homes can be taxed is not capped at the value at the time of purchase, so homes are taxed on the full current value of their home. Homes are regularly reassessed, with some municipalities reassessing all homes every year and all municipalities reassessing all homes at least every five years. As a result, the assessed value of a home does not change dramatically immediately after it is purchased. In the property tax data, the median reassessed home increased in assessed value by \$6,800 if the home had not been sold in the last year, and \$10,000 if it had been sold in the last year at fair market price [†].

5. DATA

All of the data used in this paper is publicly available data obtained from the New Jersey Department of the Treasury, the individual counties of New Jersey, or the Home Mortgage Disclosure Act. Yearly property tax records from 2012 to 2020 for all residential homes were obtained from the New Jersey Department of the Treasury. These yearly records include information on the location of the property, the value of the assessed property, the amount of property tax levied, any deductions or exemptions for the property, the total acreage of the property, as well as information on the name and address of the property owner, the

^{*}According to the New Jersey State League of Municipalities

[†]Fair market price as determined by the assessor

most recent sale date, and the most recent sale price. Deed records for all deeds between 2009 and 2019 are also obtained from the New Jersey Department of the Treasury. These are supplemented with additional deeds from the individual counties to expand the deed data to all deeds between 1991 and 2019. These deeds include information on the location of the property, the square footage of the building, the deed date, the sale price, whether the sale was between related parties, whether the assessor considered the sale to be at fair market price, whether the property is a condominium, the year in which the home was built, as well as the names and addresses of both the seller and the buyer. Because all properties are assigned a unique location identifier it is possible to link a deed with all other deeds associated with the same property in the sample period. This same identifier is used in the property tax data, so deeds are also linked to their property tax record.

Properties which were purchased between 2014 and 2019 and also were previously purchased a previous time since 1991 are included in the repeat sale model study. Previous sales must have both been at fair market prices and not between related parties, which leaves approximately 35% of deeds. Additionally, because of concerns about significant renovations between sales, only those properties which have the same square footage listed on both deeds are included. This does not account for renovations which do not involve home additions, but at least prevents properties which experienced substantial changes between sales from being included in the sample. Homes which were previously sold three or fewer years ago are not included in order to avoid homes which were "flipped" (that is, purchased and then quickly resold, either after significant renovation or because the home was previously purchased at below market rates).

A publicly available walkability index from the EPA is also used to identify the extent to which a home is in an urban location. The National Walkability Index calculates for each Census group how easily residents can reach public transportation services, the mix of residential and business property in the block (including types of businesses), and the number of street intersections (more street intersections indicating a more walkable area).

For the difference in differences estimation this paper combines several sources of data in order to create a mortgage loan level data set consisting of households which purchased homes in New Jersey's Middlesex County between 2014 and 2019. This paper combines the deed and property tax data described above with mortgage documents and data from

the Home Mortgage Disclosure Act. Mortgage documents are publicly available from the Middlesex County Clerk’s office. Optical Character Recognition software was used to extract the mortgaged property location, the name(s) of the mortgagor(s), the marital status of the mortgagor, the name of the lender, the date on which the mortgage was signed, and the size of the loan. Mortgages were matched to deeds using the property location on the mortgage document and the property location in the deed, the name of the buyer and mortgagor (if there are multiple buyers or mortgagors, at least one of the names must appear in both documents), and the date of the home sale and mortgage (the mortgage could be signed no later than two months after the deed date). This mortgage and deed data was then matched to the Home Mortgage Disclosure Act data set. The Home Mortgage Disclosure Act (HMDA) is a publicly available data set published by the Consumer Financial Protection Bureau. The Home Mortgage Disclosure Act requires all sufficiently large lending institutions (estimated to cover approximately 80 percent of the home loan market) to provide the federal government with information on every received home loan application. This includes, among other things, the census tract in which the property is located, the purpose of the loan, the gender and race of the applicant (and any co-applicants), the income of the applicant, the size of the loan, whether the property will be owner-occupied (and whether it will be a principle dwelling), and whether the loan application resulted in an originated loan. The HMDA data is matched to the mortgage and deed data on the name of the lender, the property location (using the census tract in the HMDA), and the size of the loan. This is sufficient to uniquely identify over 90 percent of originated loans in Middlesex County. This method is able to match approximately 60 percent of fair market home purchases to their corresponding HMDA record.

6. EMPIRICAL STRATEGY AND ESTIMATION OF REPEAT SALES MODEL

Following the repeat sales price index literature, suppose that the price of house i in municipality m sold at time t is

$$(6.1) \quad P_{i,t} = e^{\gamma_{m,t}} \cdot f(X_{i,t}, \beta_t) \cdot age_{i,t}^\alpha \cdot \left(\sum_{s=t}^T \delta^{s-t} \cdot g_t(\tau_{m,s} \cdot ATV_{i,s}) \right)^\mu \cdot e^{\varepsilon_{i,t}}$$

Where $e^{\gamma_{m,t}}$ is the component of price due to market conditions in municipality m at time t , $f(X_{i,t}, \beta_t)$ is the component of price due to structural characteristics of the home, $X_{i,t}$, and their shadow prices, β_t , $age_{i,t}$ is the age of home i at time t , $\tau_{m,s}$ is the property tax

rate in municipality m at time s , $ATV_{i,s}$ is the assessed taxable value of home i at time s , $\sum_{s=t}^T \delta^{s-t} g_t(\tau_{m,s} \cdot ATV_{i,m,s})$ is the present value of the after-tax stream of property tax bills, T is the time horizon over which the home will continue to be habitable, μ is the capitalization of property tax bills into housing prices, δ is the discount rate, and $e^{\varepsilon_{i,t}}$ is the error term.

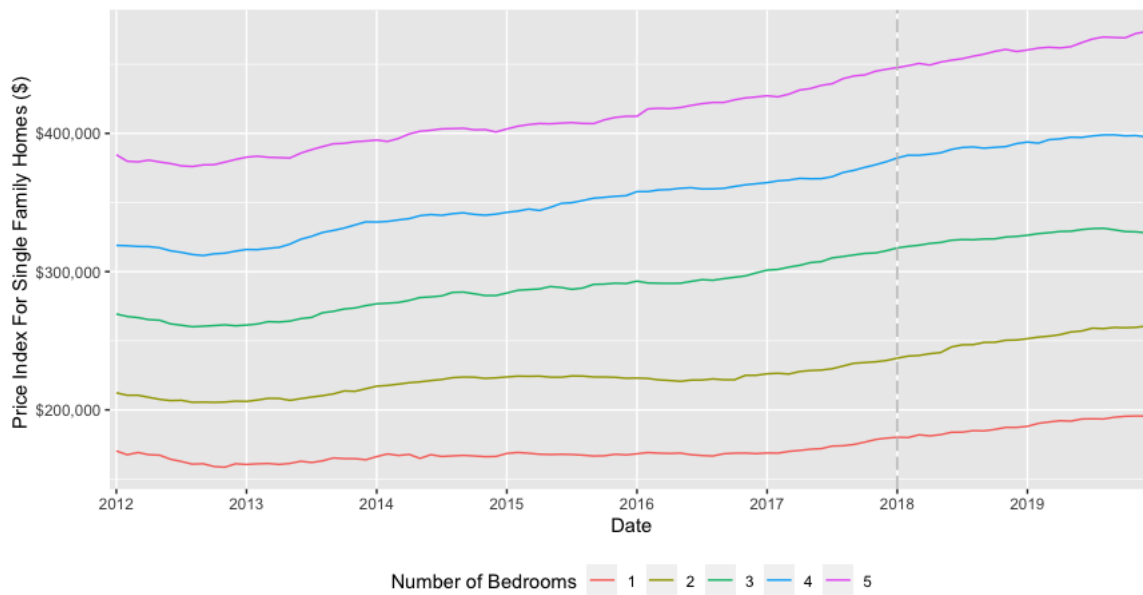
The function $g_t(\cdot)$ is allowed to vary by time of purchase to account for the fact that different tax regimes or beliefs about the future at the time of purchase will lead to different expectations of the future after-tax property tax burden. Because housing is a durable good, a potential home-buyer will take into consideration the home's resale value when determining the appropriate price for a home. That resale value will depend on the future benefits and costs of home-ownership. An unanticipated change in the tax treatment of housing will change $g_t(\cdot)$ which will in turn affect the price of a home.

Following the literature (and supported by the observed property characteristics), this paper assumes that homes' structural characteristics and home buyers' marginal willingness to pay for them are time invariant:

$$(6.2) \quad f(X_{i,t}, \beta_t) = f(X_i, \beta)$$

This assumption would be violated (in the case of a particular home) if a home were to undergo unobserved major renovations or (in the case of the housing market generally) if home buyers' preferences were to change over time. Figure provides some evidence to address the concerns that homebuyer tastes are changing over time. It shows the price index for homes sold in New Jersey between 2012 and 2020 by number of bedrooms. Over time this period, home price indices for different numbers of bedrooms grow in tandem. While number of bedrooms is a different measure than square footage, there is a strong correlation between number of bedrooms and square footage, so it provides suggestive evidence that homebuyer tastes for square footage are also not changing over time. This is relevant because the square footage of a home will be used as an instrumental variable for the size of the property tax bill.

FIGURE 6.1. Zillow Home Value Index In New Jersey



Suppose a home is sold in two distinct time periods, t and $t + u$. Then the price functions would be:

$$(6.3) \quad P_{i,t} = e^{\gamma_{m,t}} \cdot f(X_i, \beta) \cdot age_{i,t}^\alpha \cdot \left(\sum_{s=t}^T \delta^{s-t} \cdot g_t(\tau_{m,s} \cdot ATV_{i,s}) \right)^\mu \cdot e^{\varepsilon_{i,t}}$$

$$(6.4) \quad P_{i,t+u} = e^{\gamma_{m,t+u}} \cdot f(X_i, \beta) \cdot age_{i,t+u}^\alpha \cdot \left(\sum_{s=t+u}^T \delta^{s-t} g_{t+u}(\tau_{m,s} \cdot ATV_{i,s}) \right)^\mu \cdot e^{\varepsilon_{i,t+u}}$$

Dividing equation (6.3) by equation (6.4) and rearranging:

$$(6.5) \quad \frac{P_{i,t+u}}{P_{i,t}} = e^{\gamma_{m,t+u} - \gamma_{m,t}} \cdot \left(\frac{age_{i,t+u}}{age_{i,t}} \right)^\alpha \cdot \left(\frac{\sum_{s=t+u}^T \delta^{s-t-u} g_{t+u}(\tau_{m,s} \cdot ATV_{i,s})}{\sum_{s=t}^T \delta^{s-t} g_t(\tau_{m,s} \cdot ATV_{i,s})} \right)^\mu \cdot e^{\varepsilon_{i,t+u} - \varepsilon_{i,t}}$$

Taking logs:

$$(6.6) \quad \log(P_{i,t+u}) - \log(P_{i,t}) = (\gamma_{m,t+u} - \gamma_{m,t}) + \alpha(\log(age_{i,t+u}) - \log(age_{i,t})) \\ + \mu \left(\log\left(\sum_{s=t+u}^T \delta^{s-t-u} g_{t+u}(\tau_{m,s} \cdot ATV_{i,s}) \right) - \log\left(\sum_{s=t}^T \delta^{s-t} g_t(\tau_{m,s} \cdot ATV_{i,s}) \right) \right) + (\varepsilon_{i,t+u} - \varepsilon_{i,t})$$

The impact of the property tax on the change in home prices between sales is made up of two components. The first is the difference between the current discounted value of future property taxes and the discounted value of future property taxes at the time of the previous home sale. The second is the property taxes that were incurred by the previous home owner and were therefore relevant for their valuation of the home when they purchased it but which are not relevant for the new homeowner. If $g_t(\cdot) = g_{t+u}(\cdot)$ then the impact of the property tax on the change in home prices would reflect the fact that because the previous homeowner purchased the home in an earlier time period the previous homeowner discounted any overlapping property tax bills at higher rate than the current homeowner.

Because of inherent difficulties in estimating either the discount rate or beliefs about future property tax bill sizes, the property tax terms are substituted for the property tax bill in the year after sale.

$$(6.7) \quad \log(P_{i,t+u}) - \log(P_{i,t}) = (\gamma_{m,t+u} - \gamma_{m,t}) + \alpha(\log(age_{i,t+u}) - \log(age_{i,t})) + \\ \mu \cdot \log(\tau_{m,t+u} \cdot ATV_{i,t+u}) + (\varepsilon_{i,t+u} - \varepsilon_{i,t})$$

Additionally, because homes with lower property tax bills may not be impacted by the TCJA in the same way as homes with higher property tax bills, μ is allowed to take on different values below and above some unspecified threshold.

$$\begin{aligned}
 \log(P_{i,t+u}) - \log(P_{i,t}) = & (\gamma_{m,t+u} - \gamma_{m,t}) + \alpha(\log(ager_{i,t+u}) - \log(ager_{i,t})) + \\
 & \mu_1 \cdot \log(\tau_{m,t+u} \cdot ATV_{i,t+u}) \mathbb{1}[\log(\tau_{m,t+u} \cdot ATV_{i,t+u}) \leq \gamma] + \\
 & \mu_2 \cdot \log(\tau_{m,t+u} \cdot ATV_{i,t+u}) \mathbb{1}[\log(\tau_{m,t+u} \cdot ATV_{i,t+u}) > \gamma] + \\
 & (\varepsilon_{i,t+u} - \varepsilon_{i,t})
 \end{aligned}
 \tag{6.8}$$

Where γ is the property tax threshold.

Equation (6.8) is estimated using a two stage least square estimators, with the logarithm of property tax variables instrumented by a the logarithm of square footage, an inverse hyperbolic sine transformation of the acreage, and a walk-ability score. All of these instruments do not change between sales so should have no impact on the growth in home price. The inverse hyperbolic sine transformation is used instead of a log transformation because it has similar features to a logarithmic transformation but with the advantage that it transforms observations with a value of 0 to 0. Most condominiums have no private acreage (because in many cases, all outdoor space is owned jointly by the condominium owners). The μ variables are allowed to vary by year, on the assumption that the impact of property taxes on home prices should be different before and after the TCJA. In addition to the variables indicated above, indicators for the condo status of the property, whether or not the property was subject to a realty transfer tax (a 1% New Jersey tax on all property sales where the property price exceeds \$1,000,000), the deed month of the most recent sale fixed effects, the deed month of the prior sale fixed effects, locality (either county or municipality, depending on the specification) by deed year fixed effects, and fixed effects for the previous deed year by county.

Because the property tax bill size in an endogenous variable, the indicator variable for whether or not the property tax bill is above or below a threshold will also be endogenous. Following Kourtellos, Stengos, and Tan (2014), the following correction term is included in (6.8):

$$\begin{aligned}
& \Lambda(\gamma, \widehat{\text{Prop. Tax}}, \text{Prop. Tax}) = \\
(6.9) \quad & - \frac{\phi(\gamma - \widehat{\text{Prop. Tax}})}{\Phi(\gamma - \widehat{\text{Prop. Tax}})} \cdot \mathbb{1}(\text{Prop. Tax} < \gamma) + \frac{\phi(\gamma - \widehat{\text{Prop. Tax}})}{1 - \Phi(\gamma - \widehat{\text{Prop. Tax}})} \cdot \mathbb{1}(\text{Prop. Tax} \geq \gamma)
\end{aligned}$$

Where $\phi()$ and $\Phi()$ are the normal distribution's probability distribution function and cumulative distribution function, respectively.

The the estimated equation is

$$\begin{aligned}
(6.10) \quad & \log(P_{i,t+u}) - \log(P_{i,t}) = \alpha_1 + \mu_{1t} \cdot (\tau_{m,t+u} \cdot ATV_{i,t+u}) \cdot \mathbb{1}[\tau_{m,t+u} \cdot ATV_{i,t+u} \leq \gamma] + \\
& \mu_{2t} \cdot (\tau_{m,t+u} \cdot ATV_{i,t+u}) \cdot \mathbb{1}[\tau_{m,t+u} \cdot ATV_{i,t+u} > \gamma] + \Lambda(\gamma, \widehat{\text{Prop. Tax}}_{t+u}, \text{Prop. Tax}) + \\
& \delta_{1,t} \mathbb{1}[\text{Condo Status}_{t+u}] + \delta_{2,t} \mathbb{1}[(\text{Realty Transfer Tax} \cdot \text{Prev Realty Transfer Tax})_{t+u}] + \\
& \text{Deed Year}_{l,t+u} + \text{Yrs Since Sold}_{c,k} + \text{Prev Deed Year}_{c,t} + \text{Year Built}_{t+u} + \text{Deed Month}_{p,t+u} + \\
& \text{Prev Deed Month}_{p,t} + \text{Locality}_l
\end{aligned}$$

Subscripts $t + u$ and t indicate effects which are allowed to vary by the current deed year and the previous deed year, respectively. Subscripts c indicate effects which are allowed to vary by county. Subscripts l indicate effects which are allowed to vary by either county or municipality, depending the specification.

Equation (6.10) is estimated for all property tax threshold levels γ between \$1,000 and \$20,000 which are multiples of \$500.

There may be concern that houses which are sold repeatedly over the sample period are different from houses which are sold once. Below are tables of summary statistics by year for houses which are sold once between 2016 and 2019 and also one other time since 1991 and houses which are sold once between 2016 and 2019 and at no other time since 1991.

Homes which are sold repeatedly do appear to be approximately 10% smaller than homes which are not sold repeatedly. They are also slightly more expensive and approximately the same age. Despite being slightly more expensive, they also appear to generate less property taxes than homes which are only sold once. This may indicate that homes in high tax communities sell less frequently, perhaps indicating that high tax localities attract longer term

residents. To the extent that repeat sale homes are different than non repeat sale homes, it is encouraging that the ways in which they differ is consistent across years.

TABLE 6.1. Summary Statistics 2016 Home Sales

	Sale Price	Square Footage	Year Built	Acreage	Prop. Taxes Year After Sale
Repeat					
Mean	\$418,500	1743	1963	9.7	\$8,875
Median	\$354,000	1583	1966	0.16	\$7,997
Standard Deviation	\$297,000	802	32	364	\$4,655
<i>N</i>	6,309				
Non-Repeat					
Mean	\$400,536	1937	1963	12.5	\$9,456
Median	\$335,000	1768	1965	0.19	\$8,498
Standard Deviation	\$306,362	870	32	620	\$5,247
<i>N</i>	19,449				

TABLE 6.2. Summary Statistics 2017 Home Sales

	Sale Price	Square Footage	Year Built	Acreage	Prop. Taxes	Year After Sale
Repeat						
Mean	\$414,000	1720	1963	12.3		\$8,843
Median	\$355,000	1566	1967	.15		\$7,987
Standard Deviation	\$266,500	787	32	591		\$4,518
<i>N</i>	7,495					
Non-Repeat						
Mean	\$380,000	1901	1963	14.5		\$9,232
Median	\$320,000	1729	1965	.19		\$8,321
Standard Deviation	\$284,300	896	31	874		\$5,028
<i>N</i>	21,821					

TABLE 6.3. Summary Statistics 2018 Home Sales

	Sale Price	Square Footage	Year Built	Acreage	Prop. Taxes	Year After Sale
Repeat						
Mean	\$415,000	1707	1964	25.4		\$8,758
Median	\$350,000	1544	1969	0.15		\$7,859
Standard Deviation	\$287,000	805	31	1038		\$4,834
<i>N</i>	9,872					
Non-Repeat						
Mean	\$399,000	1920	1963	17.6		\$9,393
Median	\$335,000	1731	1965	.19		\$8,384
Standard Deviation	\$308,000	913	32	1023		\$5,331
<i>N</i>	26,093					

TABLE 6.4. Summary Statistics 2019 Home Sales

	Sale Price	Square Footage	Year Built	Acreage	Prop. Taxes	Year After Sale
Repeat						
Mean	\$403,000	1729	1965	10.5		\$8,708
Median	\$340,000	1556	1971	0.16		\$7,826
Standard Deviation	\$286,000	837	31	651		\$4,894
<i>N</i>	11,150					
Non-Repeat						
Mean	\$392,500	1905	1964	18.9		\$9,270
Median	\$330,000	1723	1966	0.18		\$8,273
Standard Deviation	291,600	910	33	1107		\$5,344
<i>N</i>	29,029					

Results for the threshold estimations are included below. Figure 6.2 shows results using county level fixed effects and Figure 6.3 shows results using municipality level fixed effects. Figures 6.5 and 6.7 show the threshold estimations with 2019 95% confidence intervals. Figures 6.6 and 6.8 show the threshold estimations with 2018 95% confidence intervals. Figure 6.4 shows the sum of square errors at various thresholds for both county and fixed effects.

It is clear in Figure 6.2 and Figure 6.3 that estimates for the impact of property taxes on housing price growth are more negative in 2018 and 2019 (after the passage of the TCJA) than in 2016 and 2017. Additionally, the estimates for 2018 and 2019 tend to move in tandem, as do the estimates for 2016 and 2017, which provides supportive evidence for a structural change starting in 2018. Coefficients for 2018 and 2019 appear to be more negative when using municipality fixed effects than when using county fixed effects, suggesting that there are larger intra-municipality effects than inter-municipality effects. That is, more of the change is occurring due to home-buyers purchasing properties which carry lower property tax burdens within a municipality rather than opting for municipalities which have lower property tax rates.

As would be expected, the municipality fixed effects generally has lower sum of squared errors than the county fixed effects model, since a municipality comprises a local market for homes and thus average conditions in the municipality provide a substantial amount of explanatory power in home price growth. The sum of square errors is minimized at $\gamma = \$3,500$ for the county fixed effects model, and at $\gamma = \$5,500$ for the municipality fixed effects model. However, because this sum of squared errors is not separately estimated the pre- and post- TCJA era, it is difficult to draw conclusive evidence based on this result.

Tables 8 show the point estimates at various γ levels for all years. Results for 2018 and 2019 are most negative (and most significant) at $\gamma = \$5,000$ and $\gamma = \$20,000$. This suggests that the most impacted properties may be where the average purchasers are likely to no longer be itemizers and properties where the average purchaser vastly exceeds the \$10,000 SALT cap. Additionally, although results are statistically significant for some of the 2018 and 2019 results, they are never statistically significant for the 2017 and 2016 results. This is driven by point estimates for 2016 and 2017 which are closer to 0 (rather than by larger standard errors), suggesting that property taxes depressed property values more after the implementation of the TCJA than they did before. Additionally, estimates do not appear to be systematically

decreasing over time, so this does not appear to be a continuation of a pre-existing trend. The fact that estimates are more negative for homes purchased in 2019 than those purchased in 2018 may be evidence that home-buyers became more aware of the change in the tax law over time.

For properties with property taxes above \$5,000, the median property tax bill was \$8,700. In the data, the median property with approximately \$8,700 in yearly property taxes sold for \$337,000. Taking the 2018 and 2019 estimates at $\gamma = \$5,000$, the results would imply that a 10% increase in yearly property taxes (approximately \$870) would decrease property prices by 1.1%, which for the median property would be \$3,700. Given that approximately 70% of New Jersey homeowners itemized their deductions and assuming a discount rate of 3%, this suggests a capitalization rate of approximately 60%.

TABLE 6.5. Repeat Homes Sales 2016-2019 : Property Taxes Above
Threshold
 $\gamma = \$5,000$ or $\gamma = \$10,000$

	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$
	Municipality F.E.	County F.E.	Municipality F.E.	County F.E.
	$\gamma = \$5,000$		$\gamma = \$10,000$	
2019	-0.108** (0.040)	-0.158*** (0.039)	-0.086* (0.044)	-0.044 (0.043)
2018	-0.111** (0.042)	-0.147** (0.042)	-0.020 (0.066)	0.003 (0.062)
2017	-0.029 (0.044)	-0.023 (0.050)	0.065 (0.054)	0.010 (0.070)
2016	-0.027 (0.049)	0.002 (0.054)	0.0147 (0.116)	0.0004 (0.088)

Observations: 34,609

	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$	$\Delta \log(\text{price})$
	Municipality F.E.	County F.E.	Municipality F.E.	County F.E.
	$\gamma = \$15,000$		$\gamma = \$20,000$	
2019	-0.083* (0.038)	-0.043 (0.028)	-0.157** (0.054)	-0.093** (0.0347)
2018	-0.039 (0.055)	-0.014 (0.043)	-0.072 (0.075)	-0.073 (0.048)
2017	0.027 (0.036)	0.003 (0.032)	0.010 (0.047)	0.004 (0.036)
2016	0.087 (0.070)	0.031 (0.050)	0.104 (0.079)	0.038 (0.051)

Observations: 34,609

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

FIGURE 6.2

Threshold Estimation Coefficients with County Fixed Effect

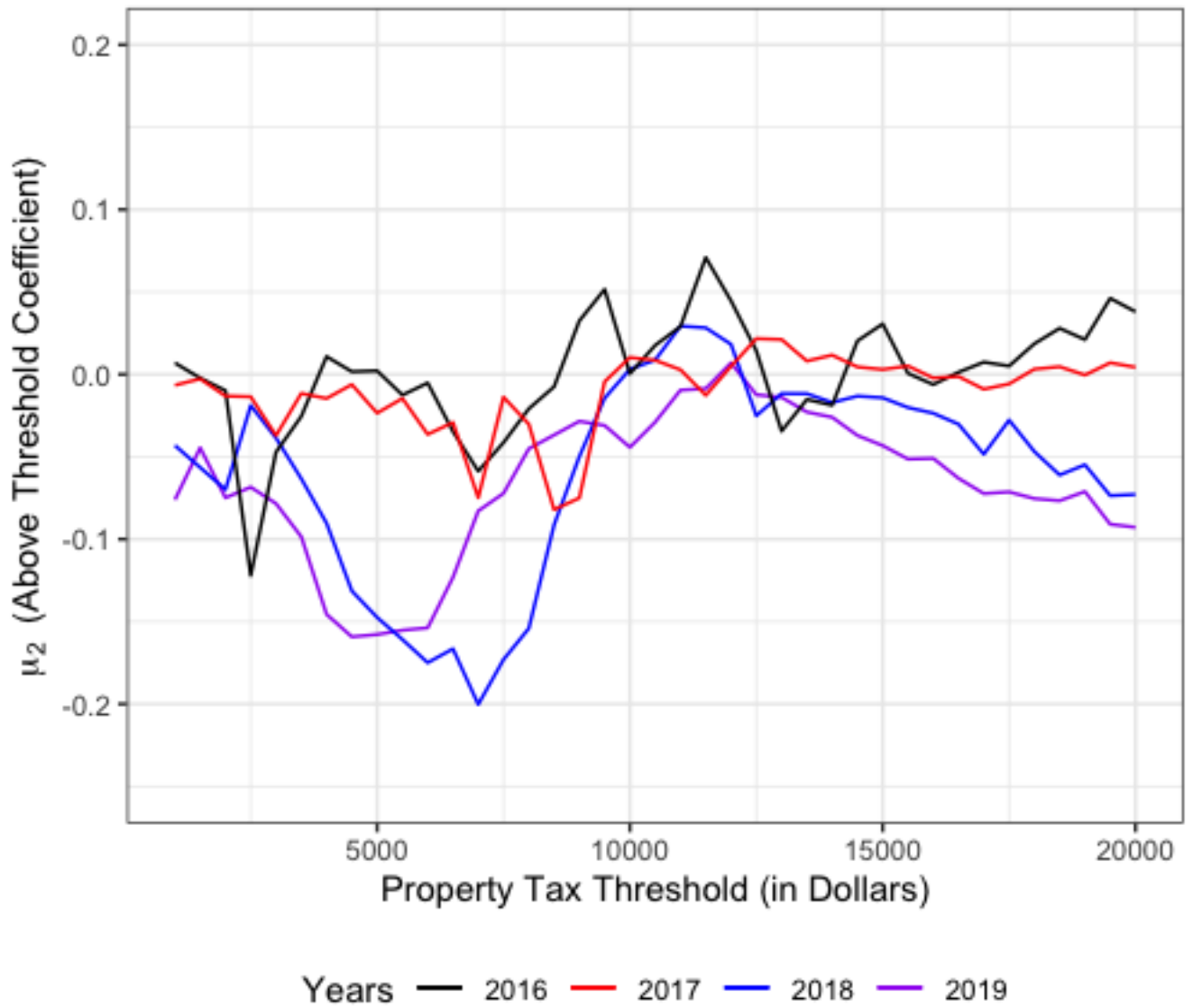


FIGURE 6.3

Threshold Estimation Coefficients with Municipality Fixed

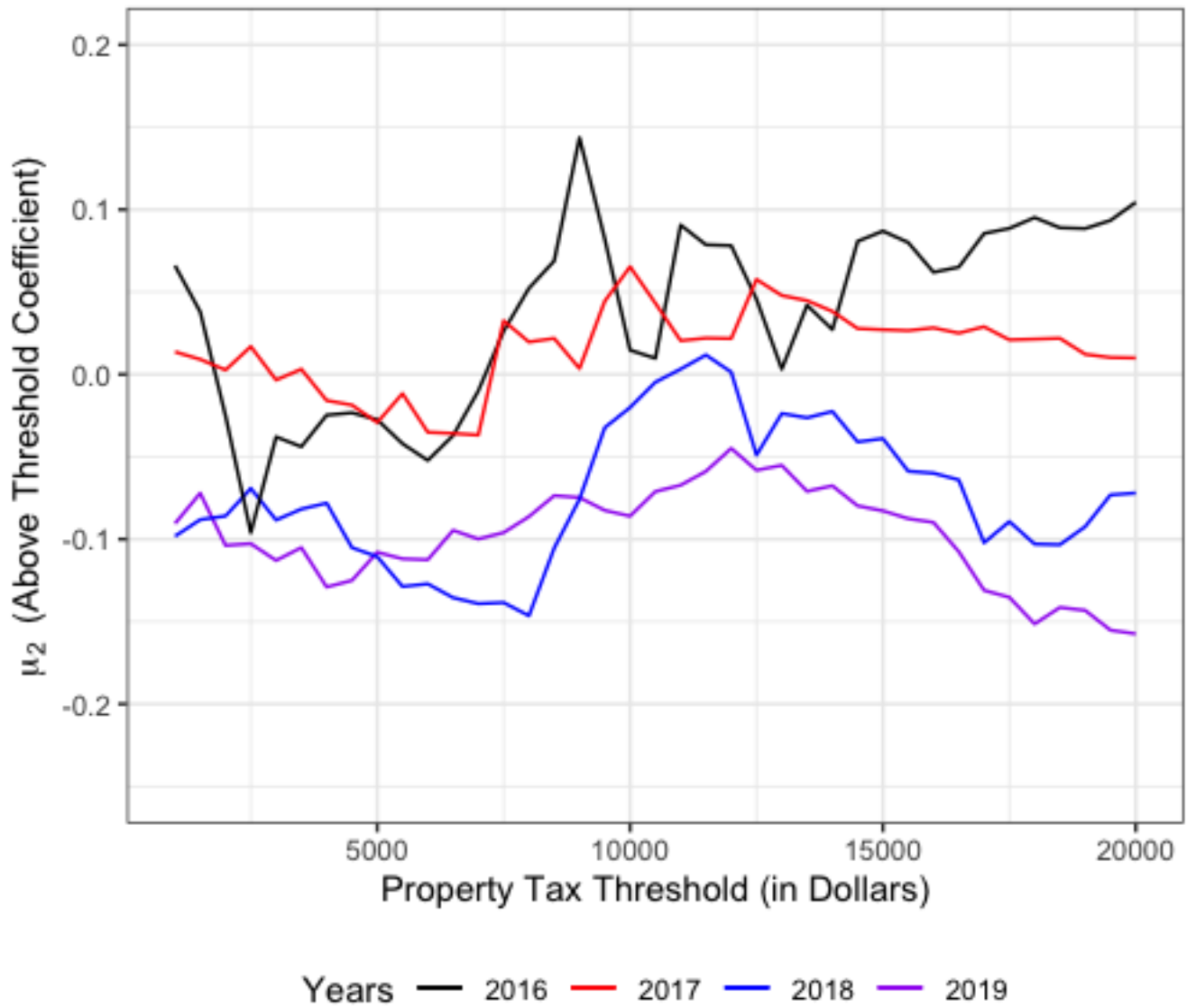


FIGURE 6.4

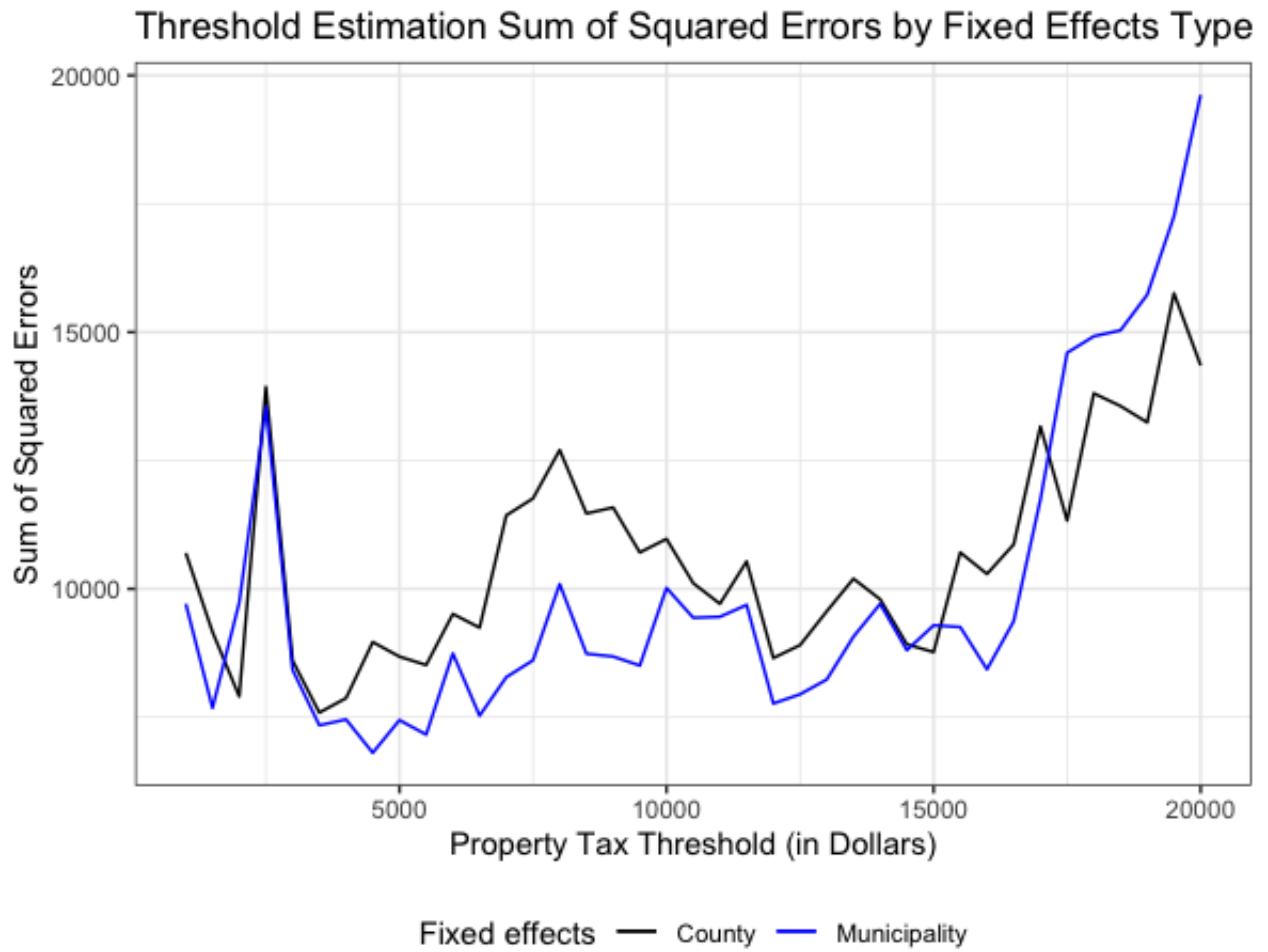
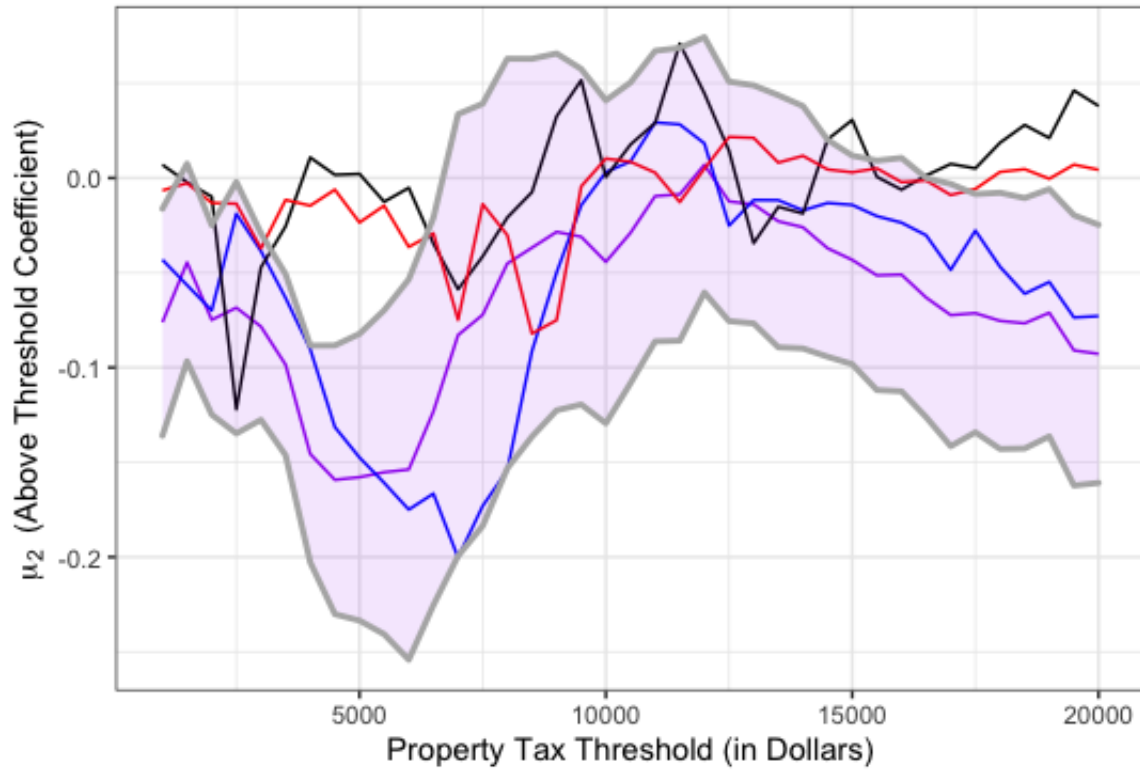


FIGURE 6.5. With 2019 95% Confidence Intervals

Threshold Estimation Coefficients with County Fixed Effects

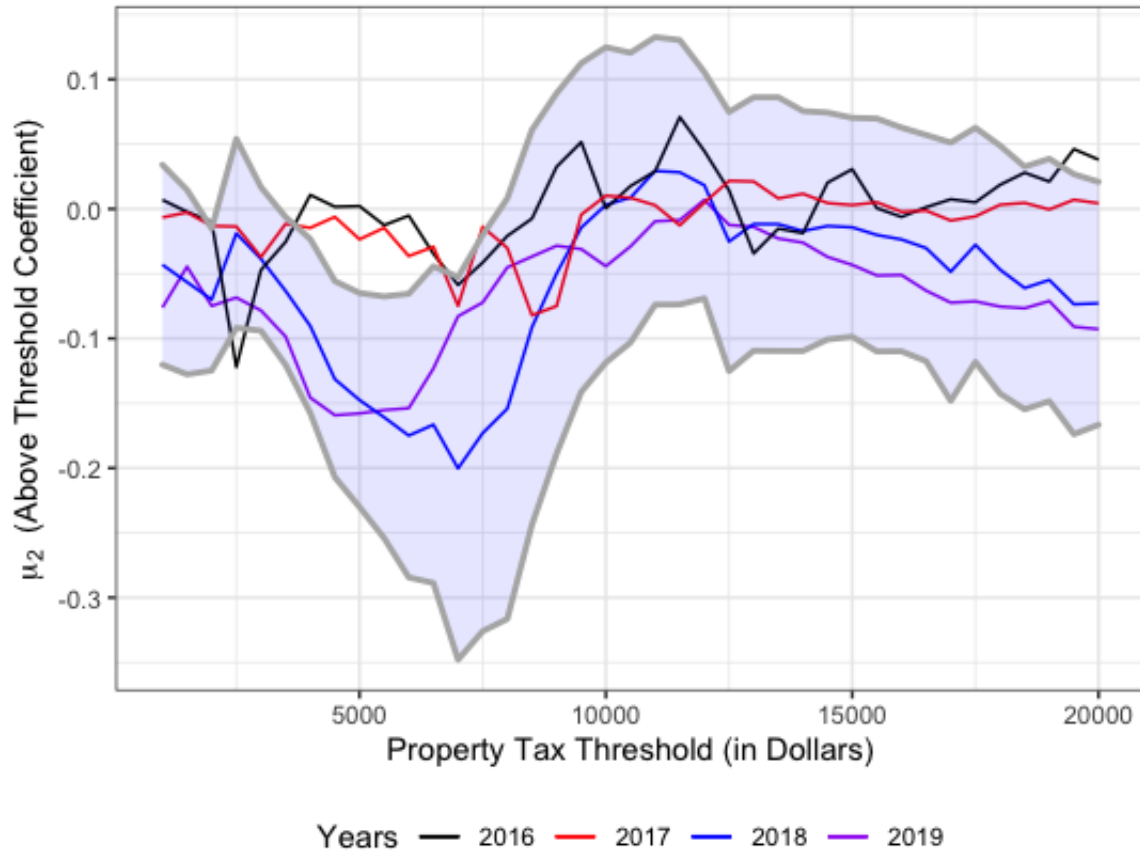


Years — 2016 — 2017 — 2018 — 2019

With 2019 95% confidence intervals

FIGURE 6.6. With 2018 95% Confidence Intervals

Threshold Estimation Coefficients with County Fixed Effects



With 2018 95% confidence intervals

FIGURE 6.7. With 2019 95% Confidence Intervals

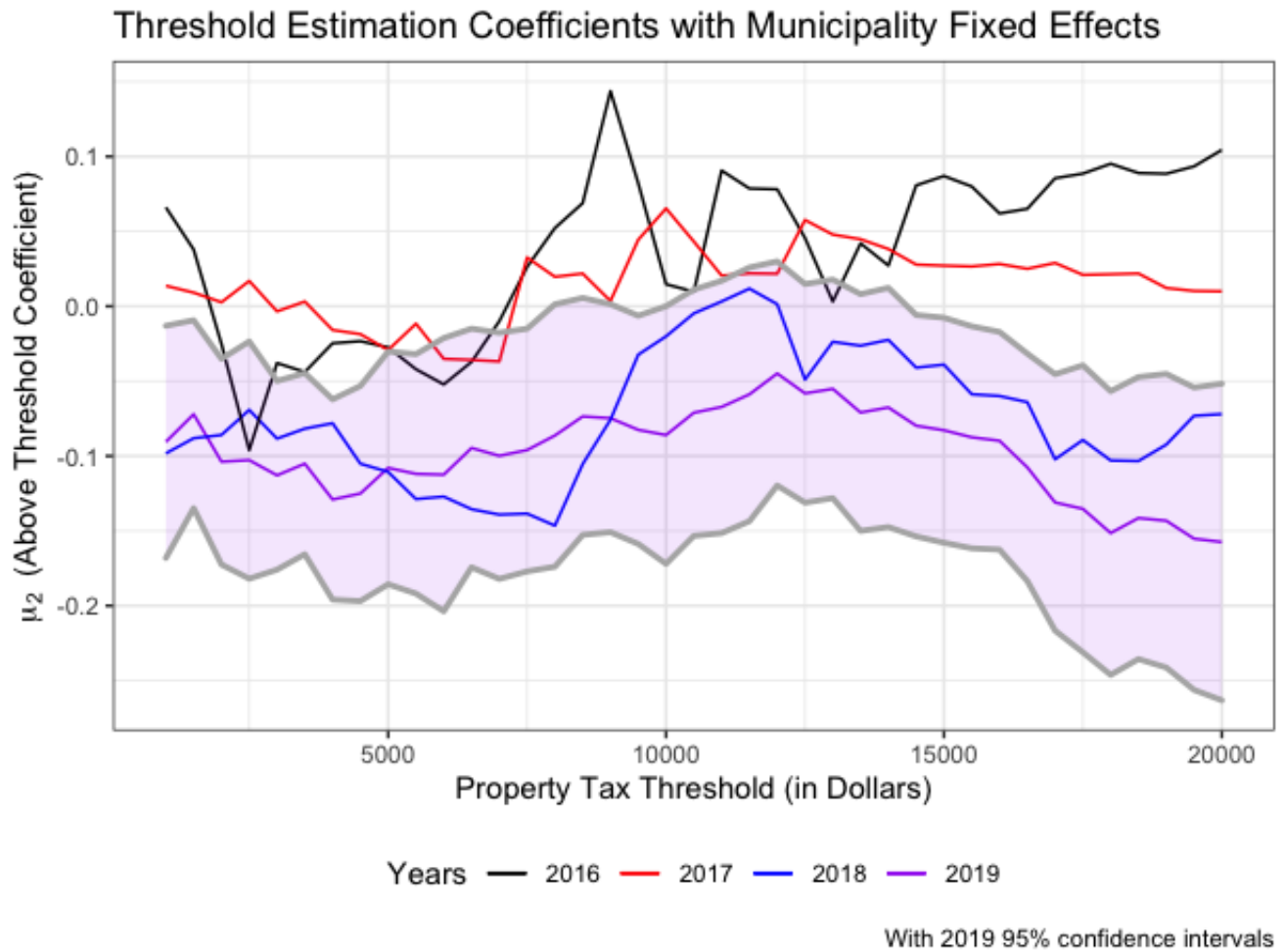
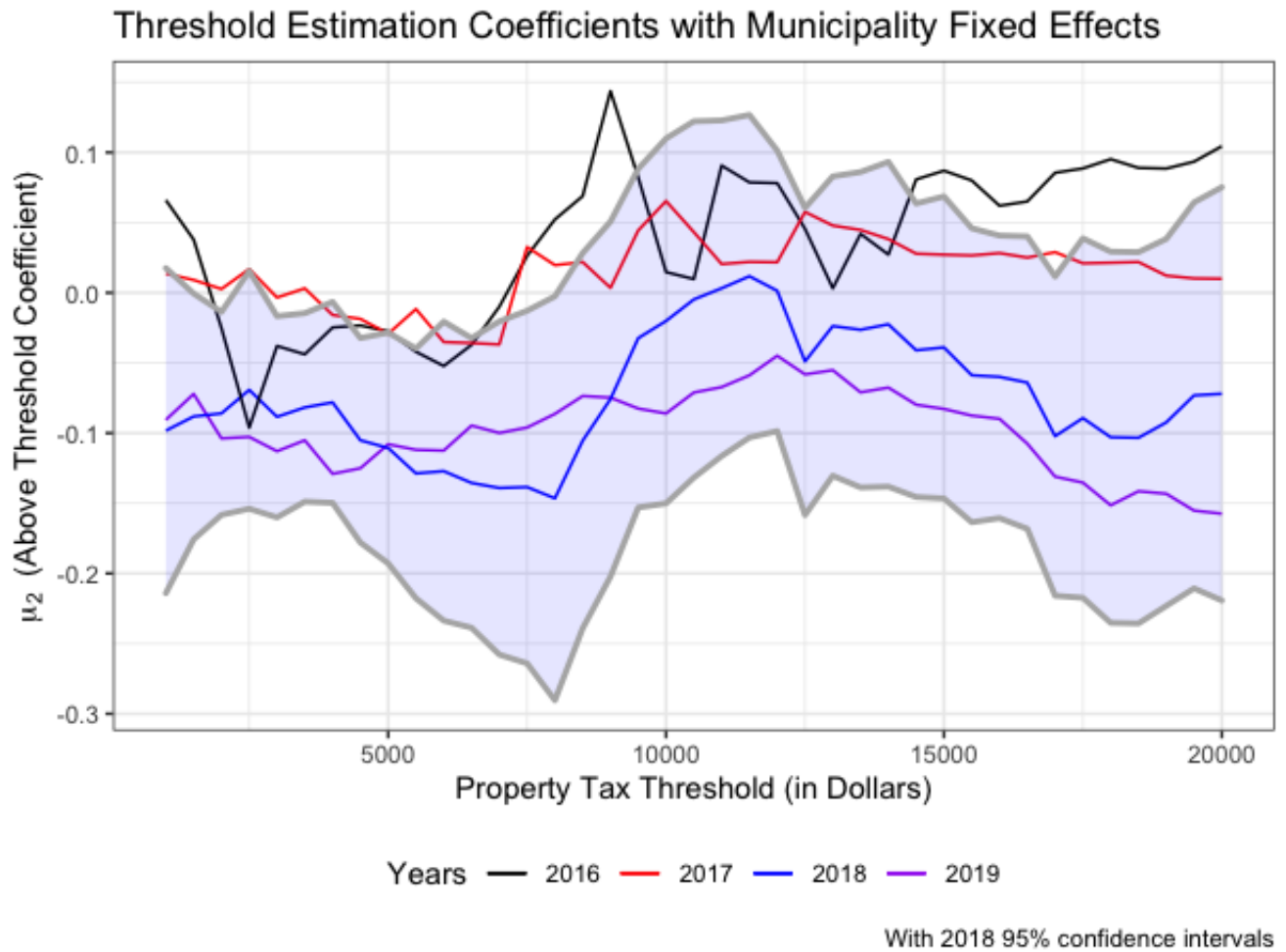


FIGURE 6.8. With 2018 95% Confidence Intervals



7. DIFFERENCE IN DIFFERENCES ESTIMATION IN MIDDLESEX COUNTY

This paper employs a difference-in-differences strategy to determine the responsiveness of households who move to the changed tax incentives under the TCJA. The assumption is that households make the decision to move independent of changes to the tax treatment of property tax and mortgage interest, but that conditional on moving they will take into account these changes. The NBER TAXSIM software is used to determine optimal deduction behavior for each household under 2017 (pre-TCJA) and 2018 (post-TCJA) tax systems. Mortgage documents which were obtained from the county clerks office included the marital status of borrowers and assumption was made that individuals file jointly if they are married. Additionally, this paper assumes that the only sources of deductions are property taxes and state income taxes. This means that households with other substantial deductions that make them optimally itemize rather may be incorrectly classified as itemizers under the post TCJA tax regime (less than 3% of the sample was estimated to be a non-itemizer under the pre TCJA tax regime). This means that the estimates in this section represent a lower limit to the responsiveness of households to the TCJA since some households will be classified as having been exposed to a larger change than the true change to the tax treatment of their home.

There is both a binary treatment estimation and a continuous treatment estimation. In the binary treatment estimation, households which optimally itemize their deductions in both the pre and post TCJA era and do not exceed the \$10,000 limit on state and local taxes (which in New Jersey are comprised of property and income taxes) are the untreated group. There are two separate sets of treated groups. The first group is comprised of households which optimally itemize their deduction pre TCJA but not post TCJA. For these households, the real cost of both their property taxes and mortgage interest payments is higher in the post TCJA world because it is no longer reduced by a factor of $(1 - \tau_f)$ as it was before TCJA was passed. The second group is comprised of households which optimally itemize their deductions both in the pre and post TCJA era, do not have home loans in excess of \$750,000, would not have had any Alternative Minimum Tax Liability under the pre-TCJA tax regime, but whose state and local taxes exceed the \$10,000 limit. For these households, the marginal cost of an additional dollar of property taxes equal to \$1 in the post TCJA era but only equal to $(1 - \tau_f)$ in the pre-TCJA era.

For the binary treatment, the estimated difference in differences equation is:

$$(7.1) \quad Y_{i,t} = \beta_0 + \beta_1 \text{Treatment}_i + \beta_2 \text{Treatment}_i \cdot \text{Post TCJA} + \beta_3 \text{Post TCJA} + \delta X_{it} + \varepsilon_{it}$$

The estimated outcomes of interest $Y_{i,t}$ are the home purchasing price, the home loan size, the home loan size as a fraction of sale price, and the yearly property tax. The treatment groups and the control group are as described in the previous paragraph.

In the continuous treatment estimation, this paper exploits variation in marginal tax rates within treated groups and employs a continuous difference in differences approach. The degree of property tax and mortgage subsidization is increasing in marginal tax rates, so a household in a higher tax bracket which is induced to stop itemizing by TCJA experiences a larger real increase in property tax and mortgage costs than a household in a lower tax bracket which also stops itemizing after TCJA. Additionally, households which continue to itemize and do not have state and local taxes in excess of \$10,000 experienced a small (on average 2%) decrease in marginal tax rates, slightly raising the real cost of deductible home expenses. The continuous difference in differences specification is

$$(7.2) \quad Y_{i,t} = \beta_0 + \beta_1 \Delta\tau_i + \beta_{3,t} \Delta\tau_i \cdot \text{Deed Year} + \beta_{4,t} \text{Deed Year} + \delta X_{it} + \varepsilon_{it}$$

Where $\Delta\tau_i$ is the change in the real marginal cost of property taxes (or interest on a home loan). A household which itemized before and after TCJA and did not exceed the SALT cap would have $\Delta\tau_i = \tau_{i,2017} - \tau_{i,2018}$. A household which itemized before TCJA but not after would have $\Delta\tau_i = \tau_{i,2017}$ since prior to TCJA they received a reduction in the real cost of their itemized deductions. Similarly, a household that itemized before and after TCJA but exceeded the SALT cap would when considering property taxes have $\Delta\tau_i = \tau_{i,2017}$ since the marginal dollar of property taxes would not be deductible (even though some portion of their property taxes may have been deductible).

Tables 7.1, 7.2, and 7.3 show summary statistics by treatment group. Compared to both of the treatment groups, the control group is unsurprisingly less wealthy, and purchases smaller, less expensive homes which carry lower yearly property taxes. This group is overwhelmingly single, because married couples who choose to itemize will almost certainly have more than

\$10,000 in SALT (otherwise, it is unlikely that they will find it optimal to itemize).

Figures 7.3 through 7.8 show pre and post TCJA trends for home-buyers who do not optimally itemize under TCJA (but would have before TCJA), home-buyers who optimally itemize before and after TCJA but who have SALT of less than \$10,000, and home-buyers optimally itemize before and after TCJA and who have SALT of more than \$10,000. In the first year after the passage of TCJA home-buyers who stop itemizing or exceed the SALT limit purchase less expensive, smaller homes with lower property taxes. Additionally, as can be seen in figure 7.2, homebuyers who do not optimally itemize post TCJA take out smaller loans (as a fraction of their sale price). This is consistent with the fact that the after-tax cost of home loans has risen for this group. Homeowners who continue to itemize appear to have no change in the relative size of their home loans, consistent with the after-tax cost of home loans remaining the same for both homebuyers with SALT less than \$10,000 and homebuyers with SALT in excess of \$10,000.

These post-TCJA trends appear to somewhat reverse in 2019. Falling home loan interest rates in 2019 and rising stock values may be an explanatory factor. Higher stock values may be more beneficial for both the no longer itemizing group and the group with SALT greater than \$10,000 than the itemizers with less than \$10,000 in SALT. This is due to these two groups of homebuyers having significantly higher incomes than the itemizers with SALT less than \$10,000 and higher incomes correlate in the general population with larger savings.

For the continuous difference in differences estimations, figures 7.9 to 7.14 show trends for home loans and property taxes decomposed by change in $\Delta\tau_i$ from equation (7.2) of home loans (figures 7.9 to 7.12) and property taxes (figures 7.13 and 7.14). For the purposes of graphically representing trends changes in costs, $\Delta\tau_i$ from equation (7.2) is rounded to the nearest 10%. In order account for the seasonality of the residential real estate market, figures 7.9 to 7.14 show a twelve month moving average. This has the downside that values for time periods within six months of the start of 2018 (when the Tax Cuts and Jobs Act was enacted) are dependent on transactions before and after the tax regime change. To somewhat remedy this, trends which only include the data from before the passage of the TCJA are also shown.

TABLE 7.1. Characteristics of Home Buyers

	Mean	SD	10th Pctile	90th Pctile
Control Group:				
Itemizing, SALT < \$10,000				
Income	\$69,767	\$17,025	\$50,000	\$92,000
Percent Married	3.7%			
Number of Observations	2,296			
Treatment Groups:				
No Longer Itemizing				
Income	\$107,393	\$77,555	\$57,000	\$164,000
Percent Married	60%			
Number of Observations	8,931			
Itemizing, SALT > \$10,000				
Income	\$137,420	\$60,529	\$85,000	\$196,000
Percent Married	45%			
Number of Observations	5,963			

TABLE 7.2. Characteristics of Purchased Homes

	Mean	SD	10th Pctile	90th Pctile
Control Group:				
Itemizing, SALT < \$10,000				
Home Sale Price	\$256,745	\$58,047	\$190,000	\$335,000
Home Loan (in Dollars)	\$223,981	\$57,609	\$159,125	\$303,036
Yearly Property Tax Post Sale	\$6,197	\$1,205	\$4,591	\$7,779
Treatment Groups:				
No Longer Itemizing				
Home Sale Price	\$310,925	\$86,946	\$213,000	\$412,000
Home Loan (in Dollars)	\$256,290	\$64,044	\$170,000	\$334,650
Yearly Property Tax Post Sale	\$7,731	\$2,293	\$5,193	\$10,576
Itemizing, SALT > \$10,000				
Home Sale Price	\$454,273	\$131,122	\$300,000	\$625,000
Home Loan (in Dollars)	\$384,487	\$102,707	\$250,800	\$512,800
Yearly Property Tax Post Sale	\$10,966	\$3,059	\$7,540	\$14,897

TABLE 7.3. Physical Characteristics of Purchased Homes

	Mean	SD	10th Pctile	90th Pctile
Control Group:				
Itemizing, SALT < \$10,000				
Square Feet	1316	328	924	1737
Age of Home (Years)	56	27	25	97
Acreage	0.14	0.44	0	0.23
Treatment Groups:				
No Longer Itemizing				
Square Feet	1574	497	1026	2171
Age of Home (Years)	50	25	20	86
Acreage	0.17	0.52	0	0.34
Itemizing, SALT > \$10,000				
Square Feet	2157	658	1382	2998
Age of Home (Years)	41	24	14	68
Acreage	0.26	0.44	0	0.47

FIGURE 7.1. Pre TCJA Trends in Loan to Sale Price Ratios

Figures are twelve month rolling averages

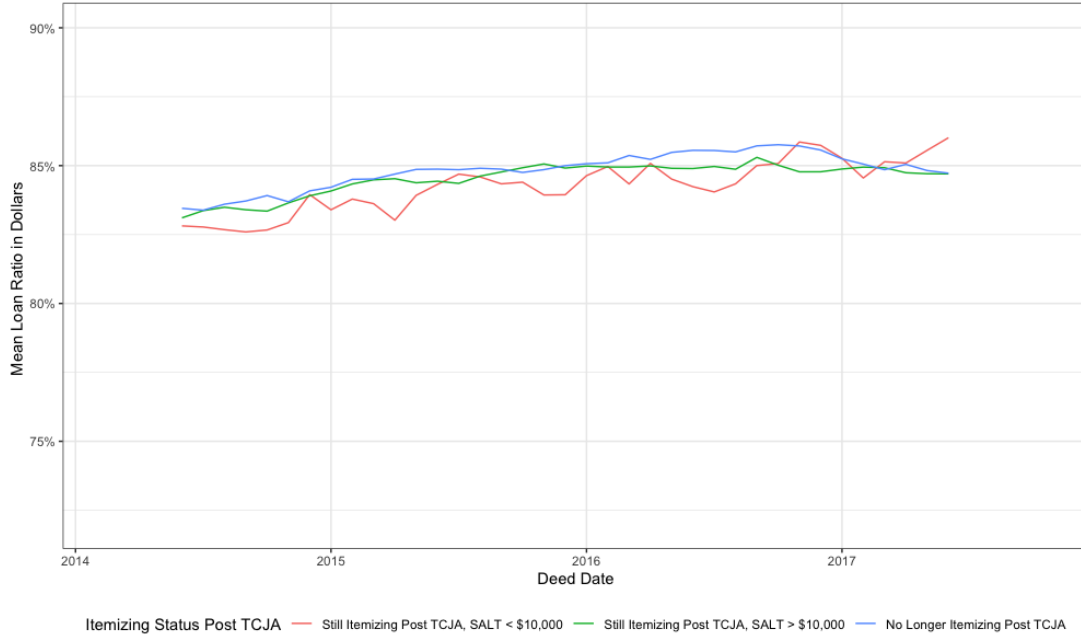


FIGURE 7.2. Pre and Post TCJA Trends in Loan to Sale Price Ratios

Figures are twelve month rolling averages

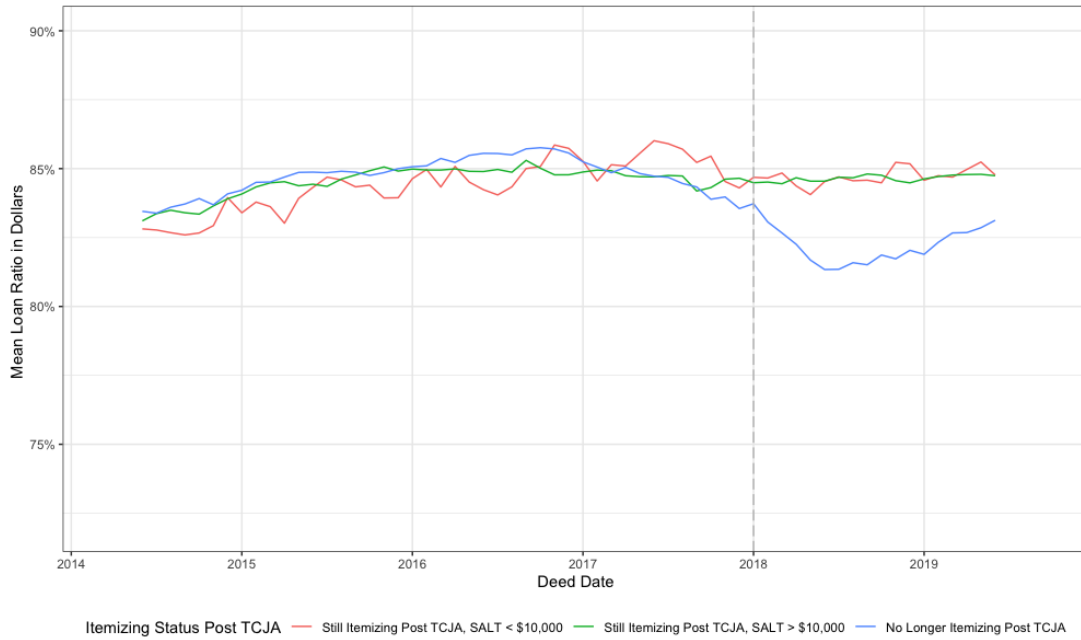


FIGURE 7.3. Pre TCJA Trends in Yearly Property Tax Bills

Figures are twelve month rolling averages

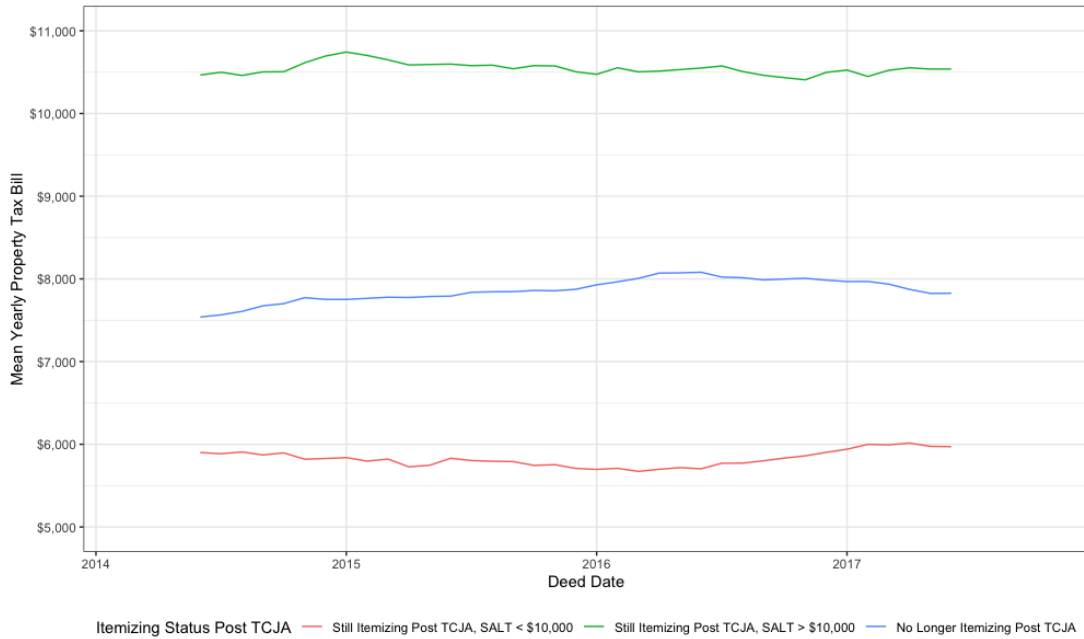


FIGURE 7.4. Pre and Post TCJA Trends in Yearly Property Tax Bills

Figures are twelve month rolling averages

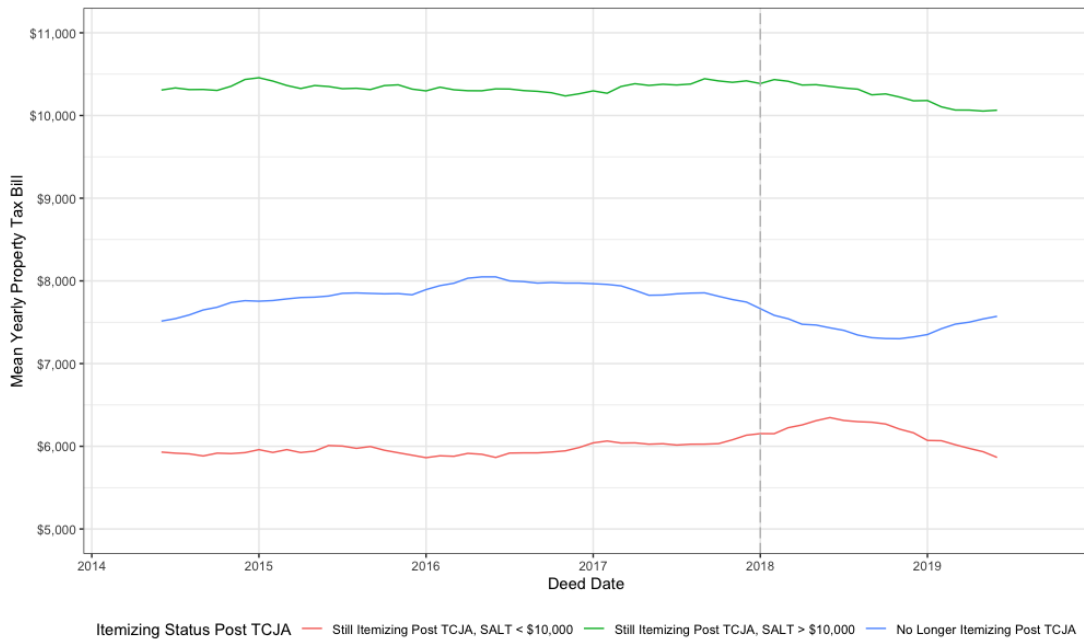


FIGURE 7.5. Pre TCJA Trends in Sale Prices

Figures are twelve month rolling averages

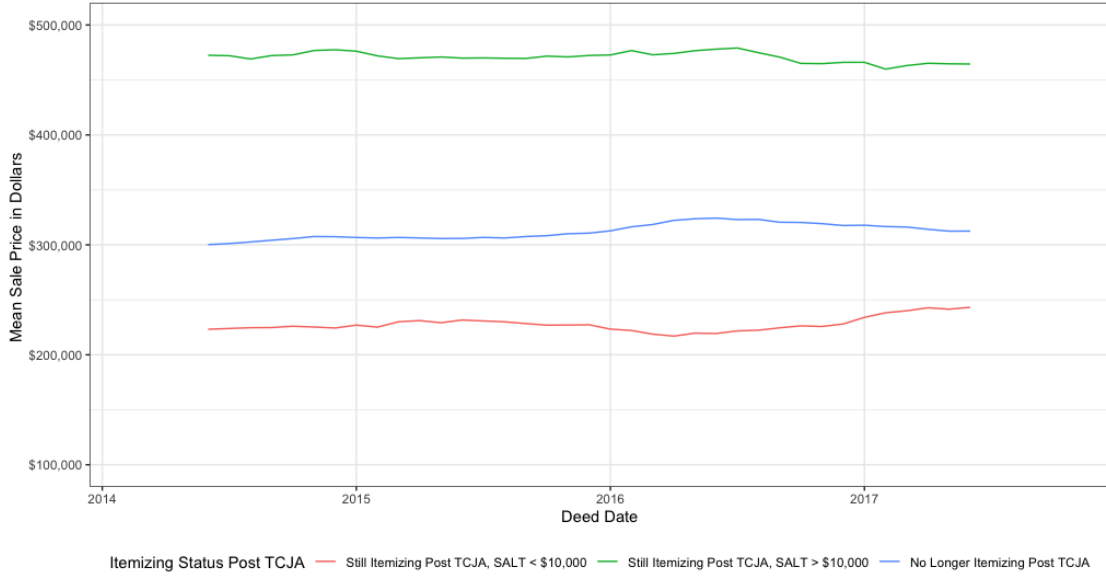


FIGURE 7.6. Pre and Post TCJA Trends in Sale Prices

Figures are twelve month rolling averages

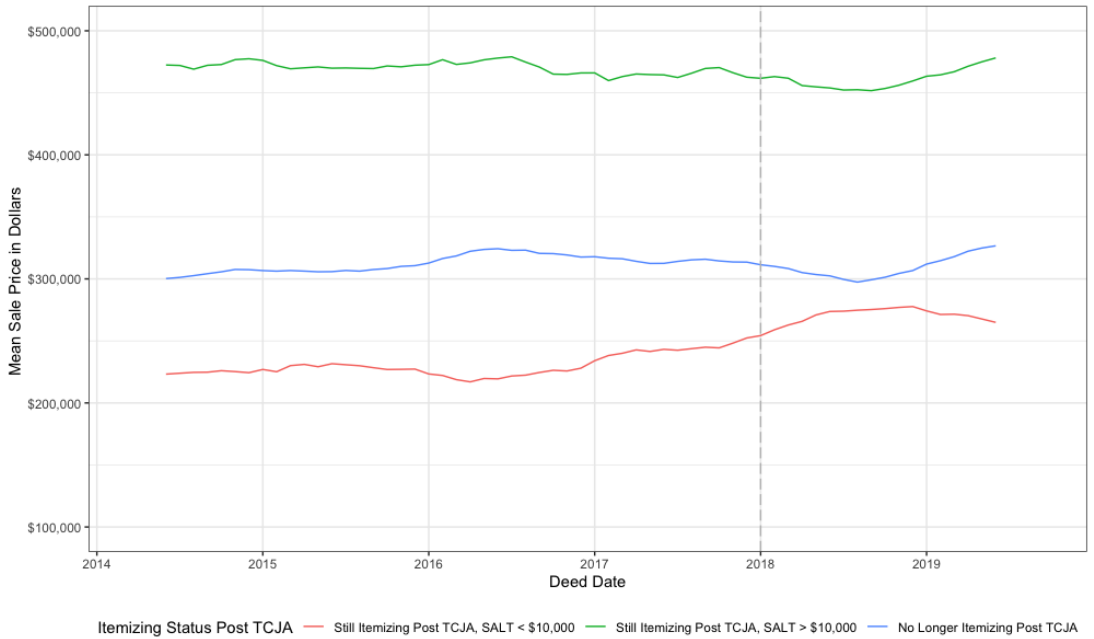


FIGURE 7.7. Pre TCJA Trends in Square Footage of Homes

Figures are twelve month rolling averages

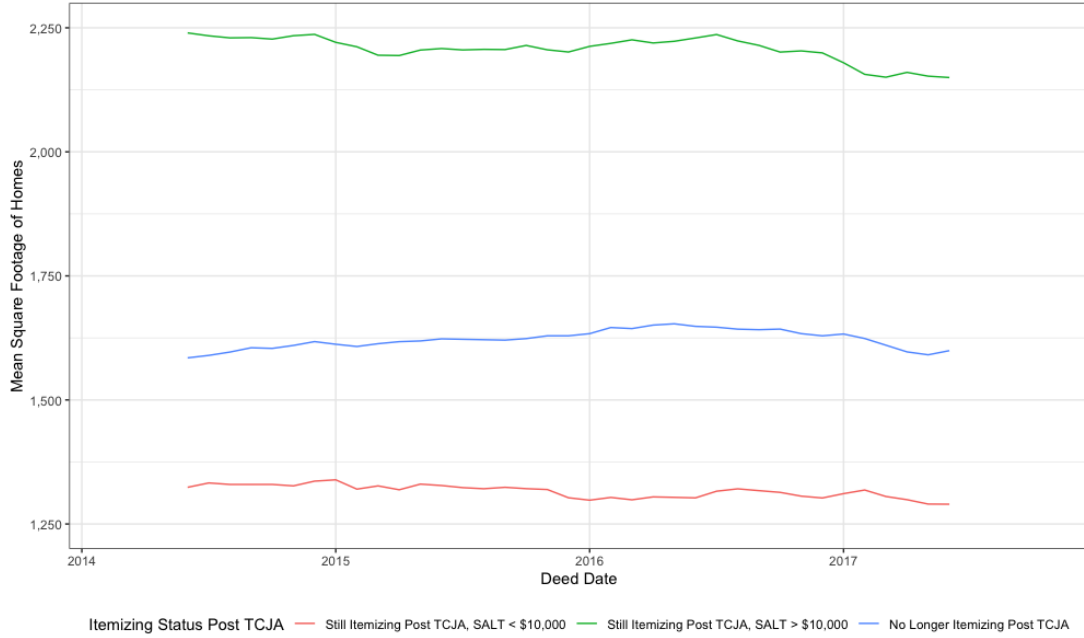


FIGURE 7.8. Pre and Post TCJA Trends in Square Footage of Homes

Figures are twelve month rolling averages

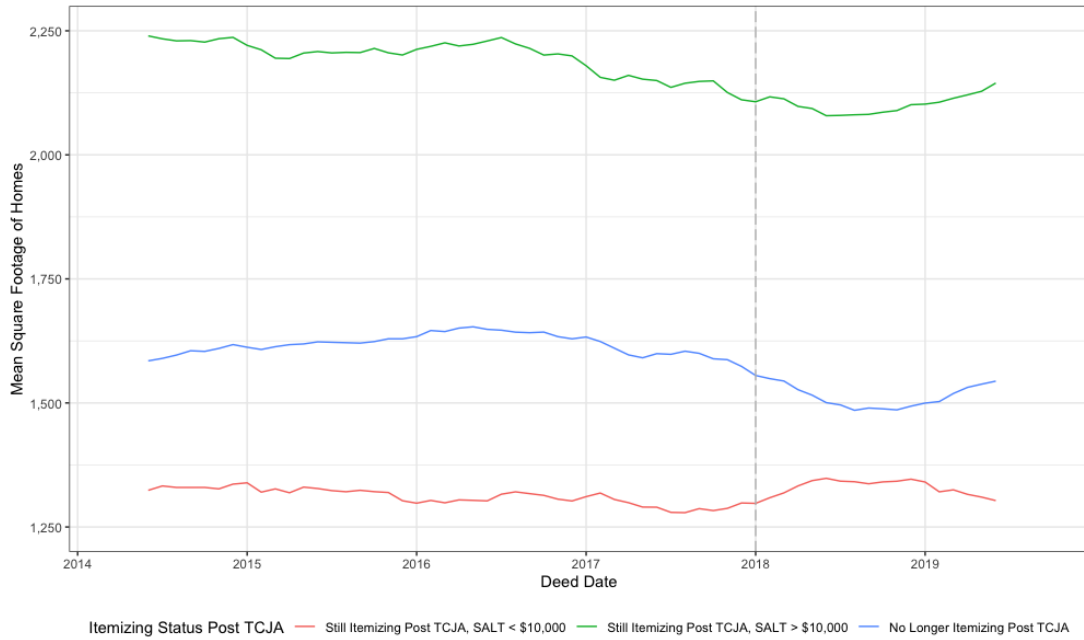


FIGURE 7.9. Pre TCJA Trends in Ratio of Home Loan to Sale Price

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%

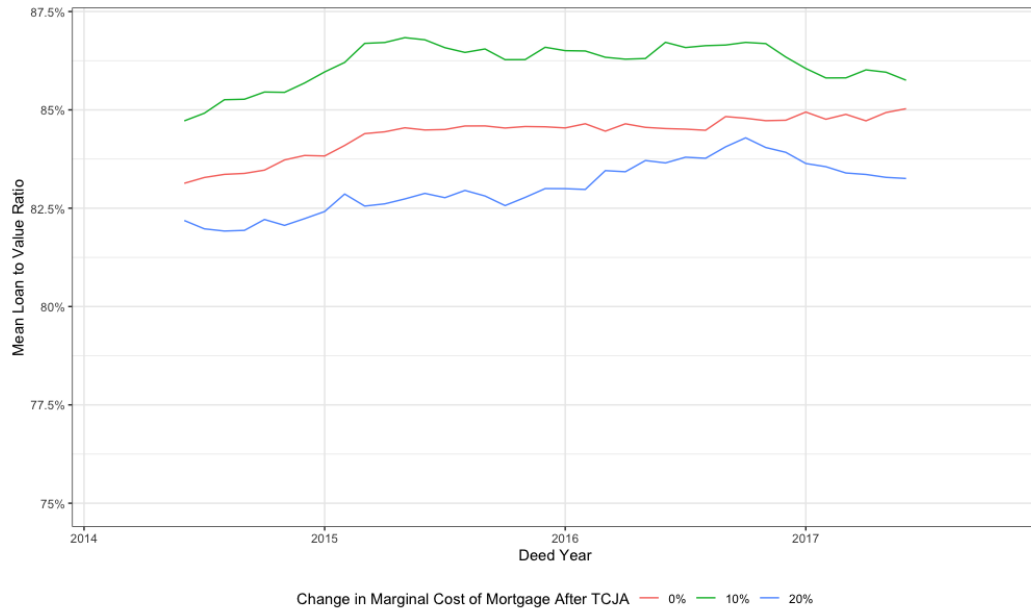


FIGURE 7.10. Pre and Post TCJA Trends in Ratio of Home Loan to Sale Price

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%

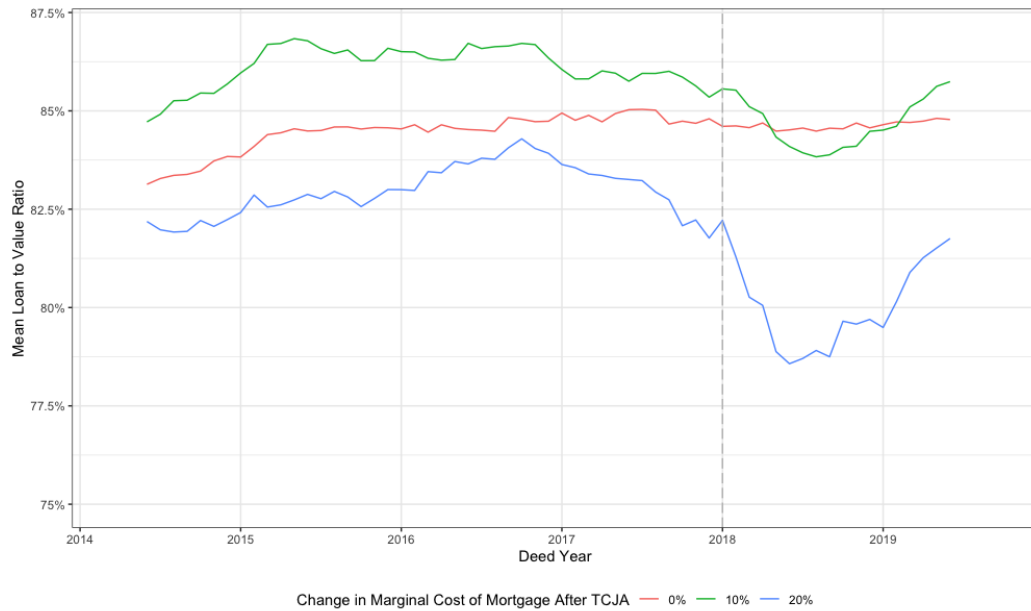


FIGURE 7.11. Pre TCJA Trends in Home Loan Size

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%

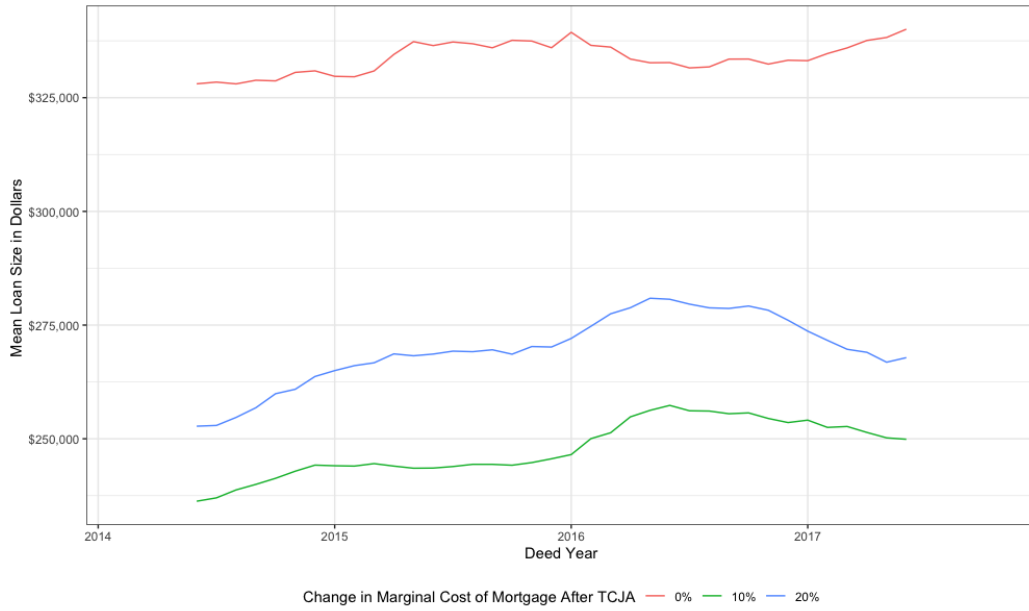


FIGURE 7.12. Pre and Post TCJA Trends in Home Loan Size

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%

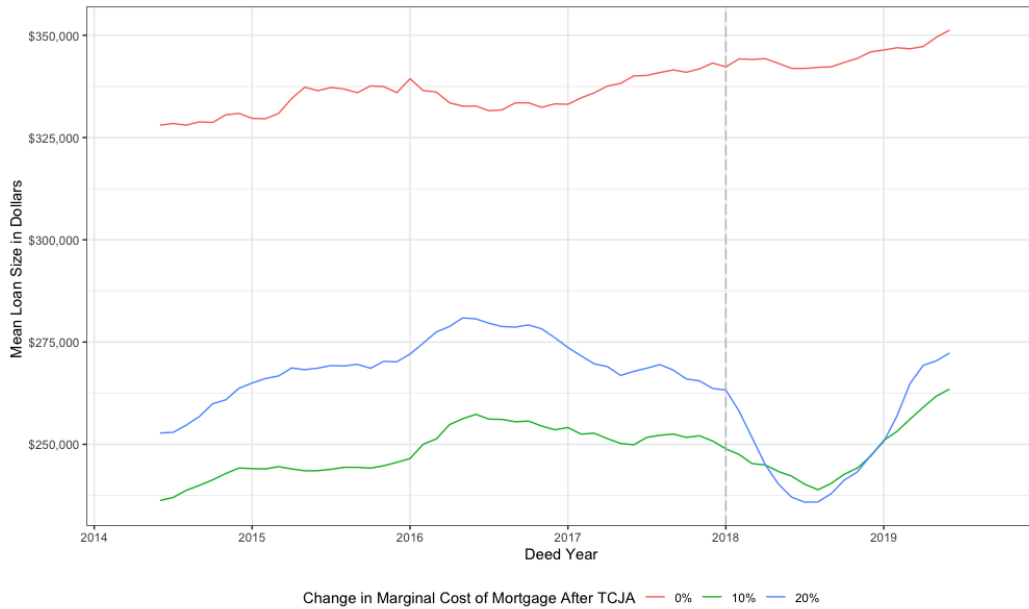


FIGURE 7.13. Pre TCJA Trends in Property Tax Size

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%

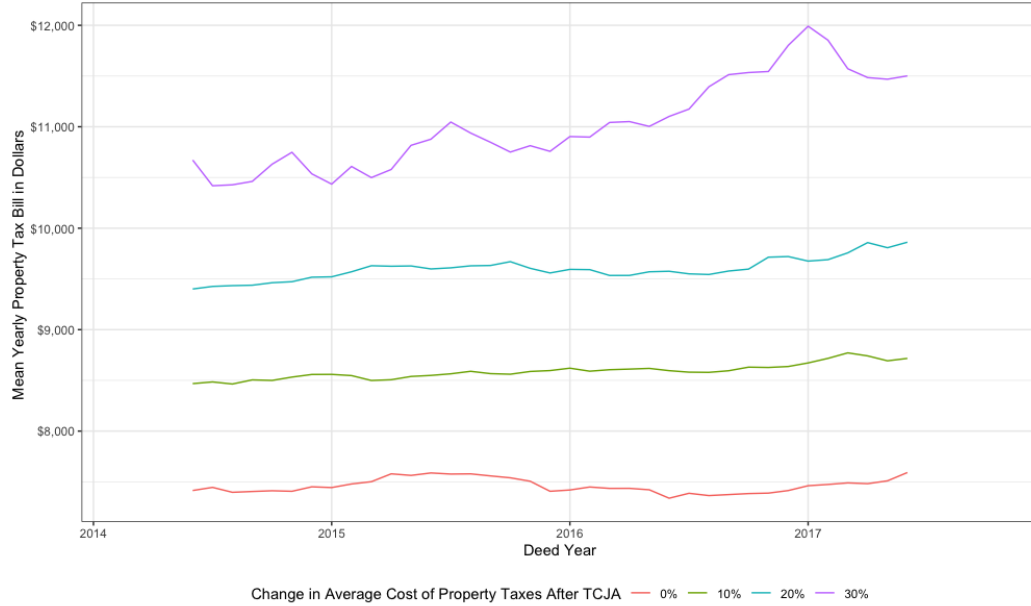
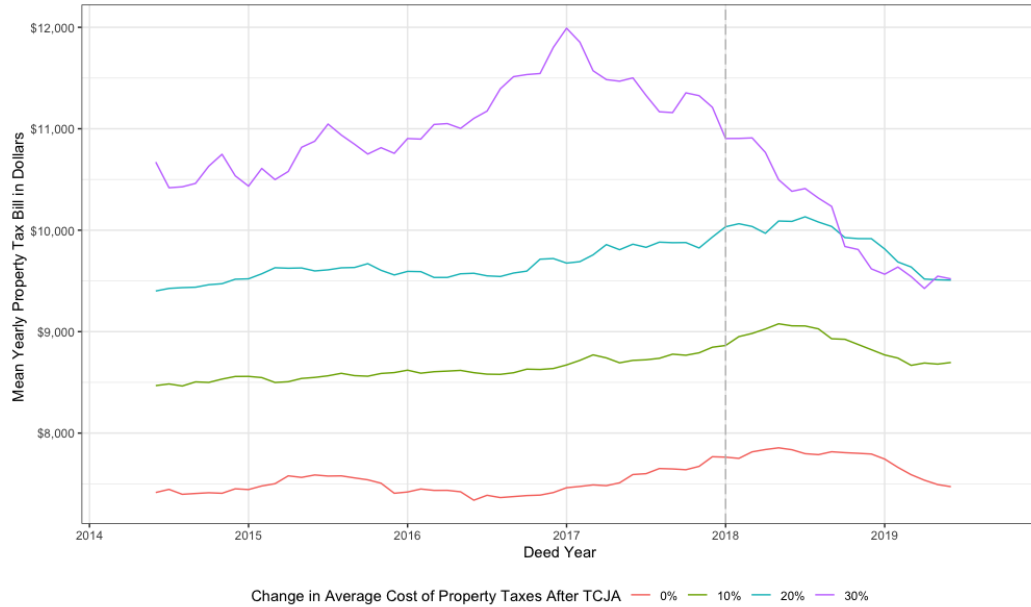


FIGURE 7.14. Pre and Post TCJA Trends in Property Tax Size

Figures are twelve month rolling averages, change in marginal costs are rounded to nearest 10%



Tables 12 through 19 show the results of the difference in differences estimation. Households which were induced to stop deducting reduced their home loan size by approximately 4.3% as a fraction of home price. This result is roughly the same as the impact of a 2% increase in the 30 year fixed mortgage rate which suggests that home buyers are highly responsive and aware of changing tax incentives. That the effect is not large in overall magnitude may be due to the fact that even with reduced tax preferential treatment, home loans are relatively less expensive or more accessible than other sources of household financing. This may be in part due to particularly low home loan interest rates and high rates of return on other investments during the time period that is being studied. Households who do not optimally itemize under TCJA also take out loans which are approximately \$19,000 lower as a result of TCJA, even when accounting for their home purchase price. Households also purchase homes with slightly smaller property tax bills. For households which have SALT in excess of \$10,000, there is no evidence that they change the relative size of their home loans. This is consistent with the fact that their tax benefits for home loans have not changed. Additionally, while they purchase homes which are between \$15,000 and \$38,000 lower (depending on the specification), there is no change in their property tax bills. This seems to be because essentially all other potential home-buyers for a given property would also be unable to fully deduct their property taxes, and so while home prices fall there is no readjustment in terms of yearly property tax bills.

Figures 7.15 through 7.18 show the difference in differences coefficient and 95% confidence intervals from estimating equation 7.2. In particular, figures 7.15 and 7.16 estimate

$$(7.3) \log(\text{Sale Price}) = \beta_0 + \beta_1 \Delta\tau_i + \beta_{3,t} \Delta\tau_i + \beta_{4,t} \text{Deed Year} * \text{Deed Month} + \log(\text{Income}) + \text{Muni}_j + \varepsilon_{it}$$

The estimation shows that after the passage of TCJA, homebuyers who experienced higher marginal costs of previously deductible expenses significantly reduced their home prices. These results are partially explained by homebuyers purchasing smaller homes with lower property tax burdens. Estimates are approximately 58% larger for taxpayers who no longer itemize compared to taxpayers who itemize but have SALT in excess of \$10,000. This is consistent with the fact that the latter group is both able to partially deduct their property taxes and are still able to deduct the interest on their home loan. Figures 7.17 and 7.18 estimate

$$(7.4)$$

$$\text{Loan To Sale Price Ratio} = \beta_0 + \beta_1 \Delta\tau_i + \beta_{3,t} \Delta\tau_i + \beta_{4,t} \text{Deed Year} * \text{Deed Month} + \log(\text{Income}) + \text{Muni}_j + \varepsilon_{it}$$

The estimation shows no change in the home loan choices of homebuyers who still itemize, consistent with the fact that they are still able to deduct the interest on their home loan. Homebuyers who stopped itemizing have large responses to the size of their home loan. Given that both groups purchased less expensive homes, it appears that this is not a liquidity response.

TABLE 7.4. Difference in Differences Estimation Of Home Loan Size For Homebuyers Who No Longer Optimally Itemize

	Dependent Variable: Loan Amount (Dollars)			
	(1)	(2)	(3)	(4)
Post 2018, Opt. Not Item. Post TCJA	-\$32,575*** (\$3,989)	-\$19,755*** (\$3,046)	-\$19,747*** (\$3,047)	-\$19,723*** (\$2,974)
Post 2018	\$37,958*** (\$3,706)	\$17,904*** (\$2839)	\$17,905*** (\$2,839)	\$17,902*** (\$2,775)
Opt. Not Item. Post TCJA	\$43,978*** (\$2,574)	\$13,282*** (\$2,008)	\$13,304*** (\$2,016)	\$13,299*** (\$1,975)
30 Year Fixed Mortgage Rate	-\$34,466*** (\$2,325)	-\$18,029*** (\$1,787)	-\$18,030*** (\$1,787)	-\$18,848*** (\$1742)
Home Sale Price		Yes	Yes	Yes
Income			Yes	Yes
Municipality F.E.				Yes
Constant	\$349,560*** (\$9,432)	\$165,237*** (\$7,634)	\$165,254*** (\$7,636)	\$173,058*** (\$8,040)
R2	0.07176	0.4608	0.4608	0.4910
Number Of Observations	7155			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.5. Difference in Differences Estimation Of Home Loan Size For Homebuyers Who Still Optimally Itemize But With SALT > \$10,000

	Dependent Variable: Loan Amount (Dollars)			
	(1)	(2)	(3)	(4)
Post 2018, SALT > \$10,000	-\$31,355*** (6109)	-\$4,902 (3005)	-\$4,691 (2998)	-\$4,315 (3007)
Post 2018	\$33,445*** (5522)	\$8,622** (2716)	\$8,622** (2710)	\$8,160** (2719)
SALT > \$10,000	\$184,820*** (4054)	\$29,865*** (2357)	\$27,456*** (2405)	\$27,083*** (2443)
30 Year Fixed Mortgage Rate	-\$22,070*** (4204)	-\$8,751*** (2065)	-\$8,945*** (2061)	-\$9,217*** (2058)
Home Sale Price		Yes	Yes	Yes
Income			Yes	Yes
Municipality F.E.				Yes
Constant	300918.7887*** (16868.6930)	78539.1269*** (8472.9703)	77537.3710*** (8455.8793)	93537.5675*** (10218.5718)
R2	0.4038	0.8565	0.8572	0.8593
Number of Observations	4756			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.6. Difference in Differences Estimation Of Ratio of Home Loan to Sale price For Homebuyers Who No Longer Optimally Itemize

	Dependent Variable: $\frac{\text{Home Loan Size}}{\text{Sale Price of Home}}$			
	(1)	(2)	(3)	(4)
Post 2018 and Opt. Not Item. Post TCJA	-0.0241** (0.0092)	-0.0435*** (0.0083)	-0.0432*** (0.0083)	-0.0455*** (0.0081)
Post 2018	0.0051 (0.0085)	0.0355*** (0.0077)	0.0355*** (0.0077)	0.0376*** (0.0076)
Opt. Not Item. Post TCJA	-0.0234*** (0.0059)	0.0230*** (0.0055)	0.0238*** (0.0055)	0.0250*** (0.0054)
30 Year Fixed Mortgage Rate	-0.0185*** (0.0053)	-0.0434*** (0.0049)	-0.0434*** (0.0049)	-0.0457*** (0.0048)
Home Sale Price		Yes	Yes	Yes
Income			Yes	Yes
Municipality F.E.				Yes
Constant	0.9427*** (0.0217)	1.2217*** (0.0208)	1.2223*** (0.0208)	1.2528*** (0.0219)
R2	0.0134	0.1932	0.1935	0.2362
N	7155			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.7. Difference in Differences Estimation Of Ratio of Home Loan to Sale price For Homebuyers Who Still Optimally Itemize But With SALT>\$10,000

	Dependent Variable: $\frac{\text{Home Loan Size}}{\text{Sale Price of Home}}$			
	(1)	(2)	(3)	(4)
Post 2018, SALT>\$10,000	0.0056 (0.0074)	-0.0053 (0.0071)	-0.0049 (0.0071)	-0.0062 (0.0071)
Post 2018	0.0035 (0.0067)	0.0138* (0.0064)	0.0138* (0.0064)	0.0146* (0.0064)
SALT>\$10,000	-0.0172*** (0.0049)	0.0467*** (0.0055)	0.0415*** (0.0057)	0.0412*** (0.0057)
30 Year Fixed Mortgage Rate	-0.0140** (0.0051)	-0.0195*** (0.0049)	-0.0199*** (0.0049)	-0.0209*** (0.0048)
Home Sale Price		Yes	Yes	Yes
Income			Yes	Yes
Municipality F.E.				Yes
Constant	0.9252*** (0.0204)	1.0170*** (0.0199)	1.0148*** (0.0199)	1.0685*** (0.0240)
R2	0.0054	0.0934	0.0970	0.1131
Number of Observations	4756			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.8. Difference in Differences Estimation Of Yearly Property Tax Bill For Homebuyers Who No Longer Optimally Itemize

	Dependent Variable: Yearly Property Tax Bill			
	(1)	(2)	(3)	(4)
Post 2018, Opt. Not Item. Post TCJA	-\$358*	-\$373**	-\$342**	\$105
	(140.82)	(138.97)	(130.52)	(72.430)
Post 2018	\$235	\$195	\$225	-\$484***
	(130.84)	(129.14)	(121.50)	(67.574)
Opt. Not Item. Post TCJA	\$1,679***	\$1,511***	\$1,334***	\$273***
	(90.857)	(90.465)	(85.446)	(48.094)
30 Year Fixed Mortgage Rate	-\$571***	-\$537***	-\$523***	\$111**
	(82.082)	(81.038)	(75.990)	(42.416)
Income		0.004503***	0.004319***	0.00006628
		(0.0003241)	(0.0003058)	(0.0001728)
Home Sale Price				0.02173***
				(0.0001714)
Municipality F.E.			Yes	Yes
Constant	\$8,412***	\$7,973***	\$7,110***	\$63
	(332.92)	(330.05)	(338.66)	(195.77)
R2	0.07785	0.1021	0.2166	0.7594
Number Of Observations	7155			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.9. Difference in Differences Estimation Of Yearly Property Tax Bill For Homebuyers Who Still Optimally Itemize But With SALT>\$10,000

	Dependent Variable: Yearly Property Tax Bill			
	(1)	(2)	(3)	(4)
Post 2018, SALT>\$10,000	-\$272 (184)	-\$274 (184)	-\$123 (176)	\$259** (91)
Post 2018	\$26 (160)	\$107 (166)	\$12 (159)	-\$512*** (82)
SALT>\$10,000	\$5174*** (122)	\$5180*** (122)	\$4016*** (129)	\$497*** (74)
30 Year Fixed Mortgage Rate		-\$222 (126)	-\$216 (121)	\$173** (62)
Income			\$0.0158*** (0.0008)	-\$0.0009* (0.0004)
Home Sale Price				\$0.0221*** (0.0002)
Municipality F.E.			Yes	Yes
Constant	\$6,168*** (105)	\$7,041*** (508)	\$5,948*** (489)	-\$276 (311)
R2	0.3915	0.3919	0.4426	0.8531
Number of Observations	4756			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.10. Difference in Differences Estimation Of Home Sale Price For Home-buyers Who No Longer Optimally Itemize

	Dependent Variable: Home Sale Price		
	(1)	(2)	(3)
Post 2018, Opt. Not Item. Post TCJA	-\$26,506*** (5340)	-\$27,234*** (5215)	-\$20,597*** (4999)
Post 2018	\$41,461*** (4961)	\$39,498*** (4847)	\$32,689*** (4652)
Opt. Not Item. Post TCJA	\$63,465*** (3445.5)	\$55,070*** (3395.4)	\$48,832*** (3272.6)
30 Year Fixed Mortgage Rate	-\$33,983*** (3112.7)	-\$32,282*** (3041.6)	-\$29,229*** (2910.5)
Income		0.2262*** (0.01217)	0.1957*** (0.01171)
Constant	\$381,101*** (12625.0)	\$359,071*** (12388.0)	\$324,253*** (12971.0)
Municipality F.E.			Yes
R2	0.07437	0.1171	0.1979
Number Of Observations	7155		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7.11. Difference in Differences Estimation Of Home Sale Price For Home-buyers Who Still Optimally Itemize But With SALT>\$10,000

	Dependent Variable: Home Sale Price		
	(1)	(2)	(3)
Post 2018, SALT>\$10,000	-\$38,525*** (\$7,753)	-\$30,006*** (\$7,160)	-\$15,233* (\$6,523)
Post 2018	\$36,151*** (\$7,008)	\$30,768*** (\$6,469)	\$21,238*** (\$5,893)
SALT>\$10,000	\$225,672*** (\$5,145)	\$160,232*** (\$5,263)	\$142,240*** (\$4,883)
30 Year Fixed Mortgage Rate	-\$19,397*** (\$5,336)	-19081*** (\$4,923)	-\$15,043*** (\$4,461)
Income		0.8868*** (0.0308)	0.6885*** (0.0286)
Municipality F.E.		Yes	
Constant	\$323,866*** (21407.9082)	\$262,423*** (19867.8375)	\$243,919*** (21893.1169)
R2	0.3844	0.4760	0.5750
Number of Observations	4756		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

FIGURE 7.15. Continuous Difference in Differences Estimation of Home Sale Price For Home-buyers Who No Longer Optimally Itemize

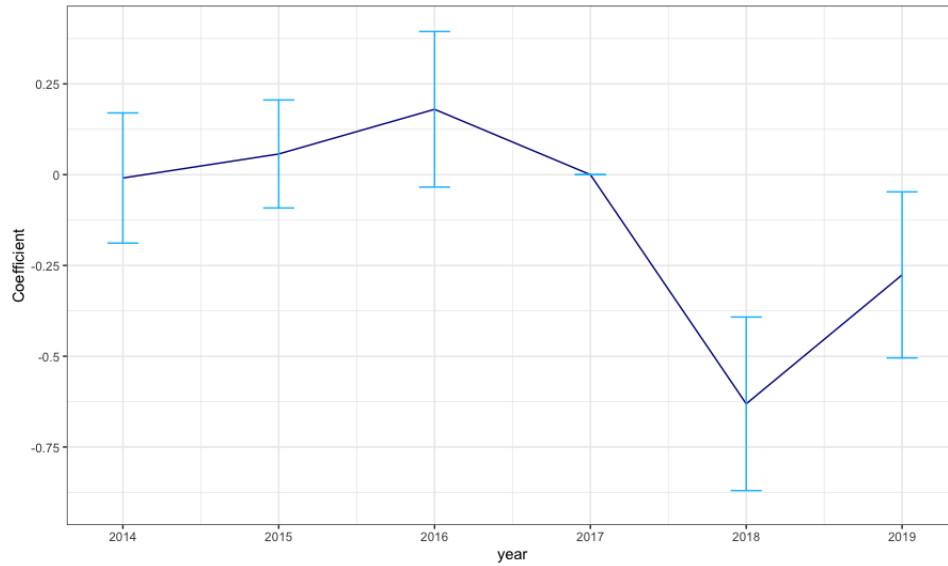


FIGURE 7.16. Continuous Difference in Differences Estimation of Home Sale Price Home-buyers Who Still Optimally Itemize But With SALT > \$10,000

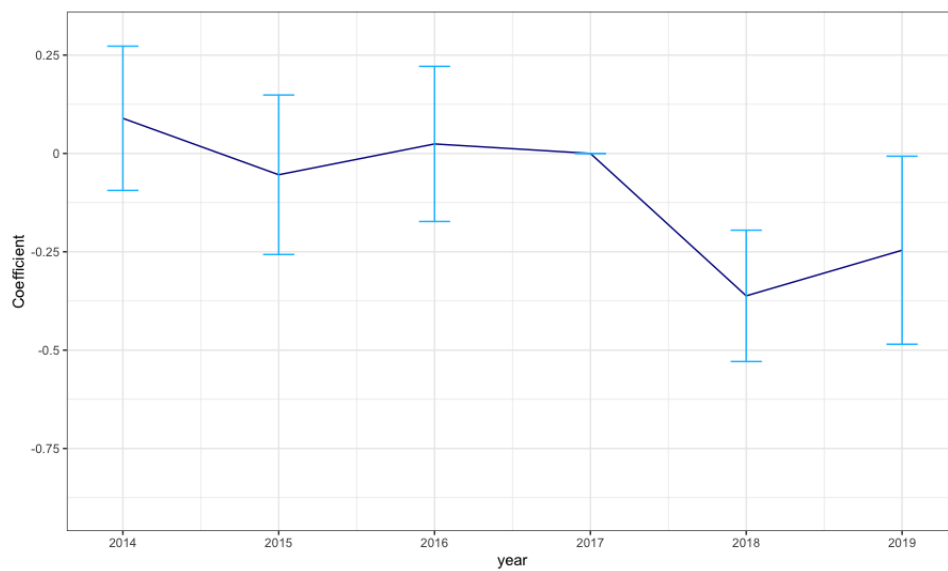


FIGURE 7.17. Continuous Difference in Differences Estimation of Home Loan Ratio For Home-buyers Who No Longer Optimally Itemize

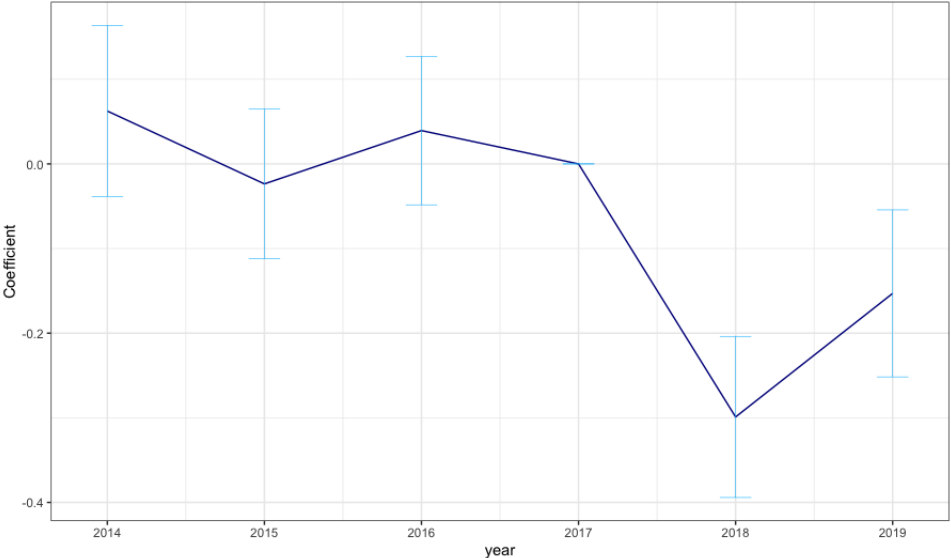
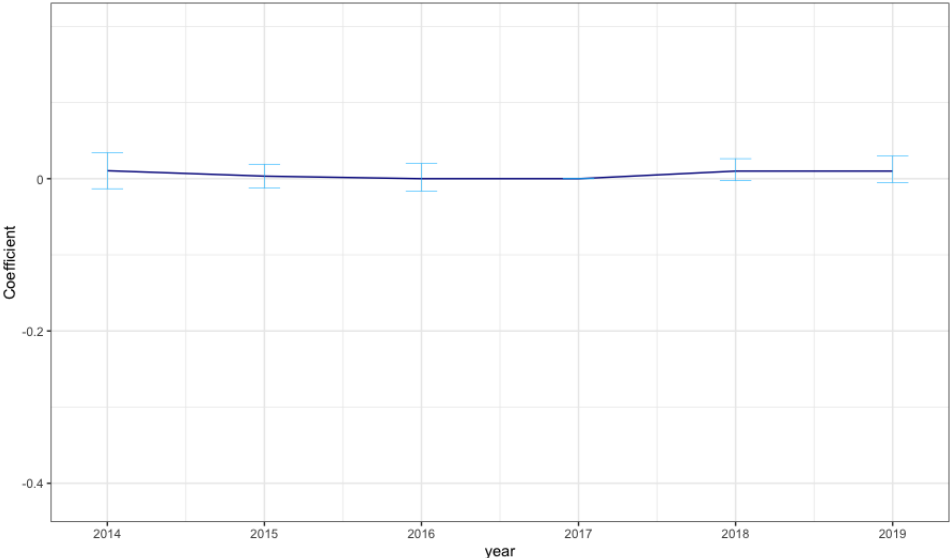


FIGURE 7.18. Continuous Difference in Differences Estimation of Home Loan Ratio For Home-buyers Who Still Optimally Itemize But With SALT > \$10,000



8. CONCLUSION

This paper examines the impact of the TCJA on homes and home buyers. The TCJA reduced tax benefits for homeowners, both by explicitly capping property tax and mortgage interest deductions, and by doubling the standard deduction which discouraged taxpayers from itemizing their deductions. This paper attempts to isolate the impact of property taxes on residential housing markets by exploring how property prices changed after the enactment of the Tax Cuts and Jobs Act. It also estimates the response from individual home-buyers in terms of the types of homes that they purchased and their home financing choices. Understanding how homebuyers and housing markets responded to these changes is relevant for determining the ways in which government policy can shape housing markets.

Using a repeat sales model, this paper finds evidence that a 1% increase in property taxes was associated with a 0.11% decrease in property values after the passage of the TCJA. For the median home in the sample, this is equivalent to a \$870 increase in yearly property taxes reducing property values by \$3,370. Assuming a 3% discount rate, this finding implies that approximately 60% of the increased (after federal tax) property tax burden was capitalized into housing prices. The magnitude of these results also implies that homebuyers in 2018 and 2019 believed that the SALT cap would be permanent. If homebuyers believed that the SALT cap would expire in 2025 (as the TCJA bill states) then the results would imply that over 200% of the increased property tax burden was capitalized into housing prices. Given that it was a stated legislative priority for Republicans in 2018 to make the SALT cap permanent (although they ultimately did not succeed in doing so) it is understandable that homebuyers would believe that the SALT cap would be permanent. An alternative explanation would be that while homebuyers were aware of the changes to the federal tax treatment of property taxes, they were not aware that some of the provisions had an expiration date.

This paper also estimates the responsiveness of individual homebuyers by creating a unique data set that matches deed and mortgage records to data from the Home Mortgage Disclosure Act, a publicly available mortgage loan-level data set that covers the overwhelming majority of mortgages in the United States. This paper finds that homebuyers who would have itemized under the pre-TCJA tax system but who take the standard deduction under the post-TCJA

tax system responded to the change by purchasing smaller, less expensive homes with lower property taxes and financed less of their purchase using mortgage debt (even after conditioning on home price). Homebuyers that itemized under both the pre and post TCJA tax systems but that had SALT deductions in excess of \$10,000 also responded by purchasing smaller, less expensive homes with lower property taxes but did not change the fraction of their purchase which was financed by mortgage debt. This lack of response in the dimension of mortgage debt is consistent with the fact that this second group was still able to fully deduct the interest on their home loan. In the short run, despite these adjustments on the part of homebuyers, there was no change in municipalities' property tax revenues because of the process by which New Jersey property taxes levels are determined. However, in the long run, homeowner preferences for lower post-TCJA property taxes may manifest themselves in lower municipality budgets and a corresponding lower provision of local public goods. This may be welfare reducing given that many public schools are primarily funded by property taxes and that education is generally believed to have positive externalities. How concerning this is will also depend on the degree of economic segregation between municipalities. If a municipality has a high degree of income variance then subsidizing the property tax cost of a high income taxpayer may benefit lower income households in the form of more funding for schools (and other local public goods). However, if municipalities are more homogeneous in terms of income, then such subsidies for high income taxpayers will not have positive benefits for lower income households.

This paper finds that homebuyers and property prices had strong responses to changes to the tax treatment of homeownership under the TCJA. The magnitude of these responses indicate that tax policy has a real impact on housing decisions, and suggests that reducing such benefits may in the long run reduce housing consumption. It also suggests that reducing tax benefits for homeownership will also lead to lower property taxes and therefore a lower provision of local public goods.

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APPENDIX A. APPENDIX FIGURES

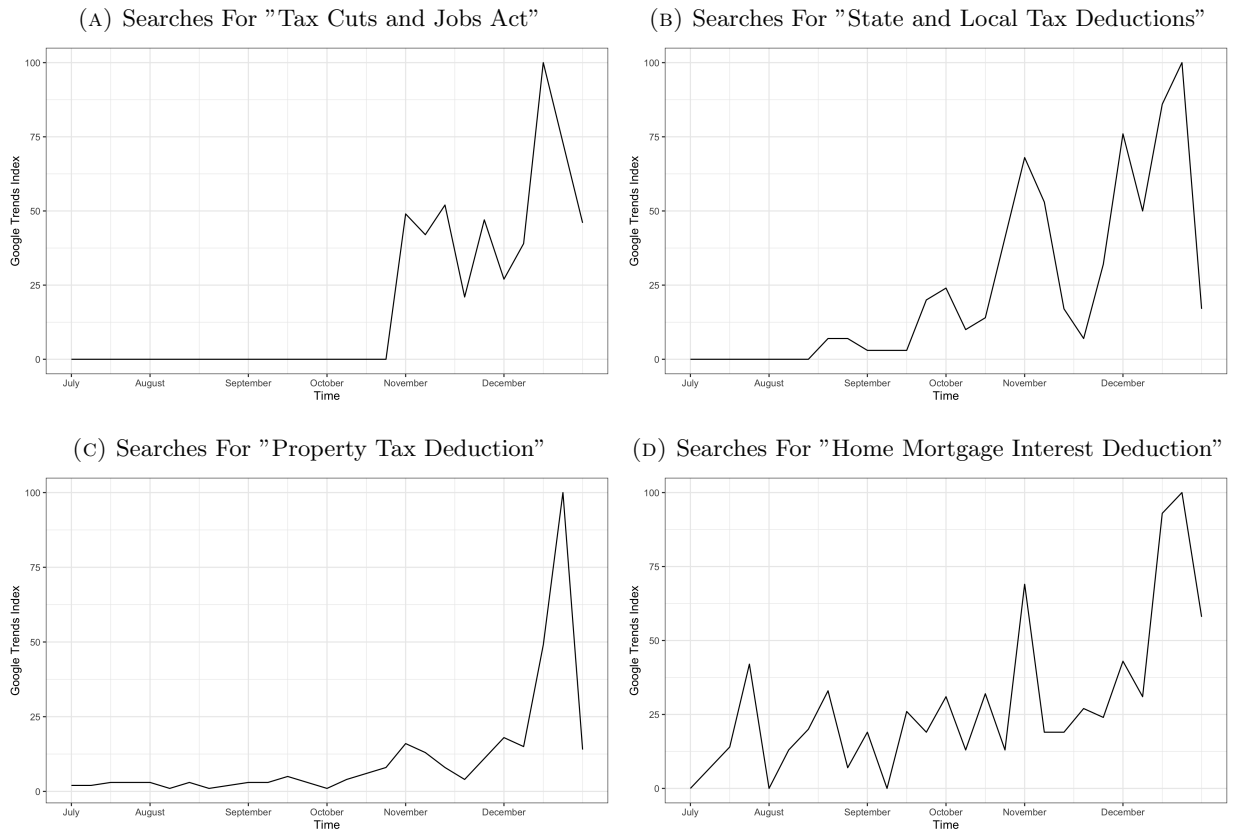


FIGURE A.1. Google Trends Searches in 2017

FIGURE A.2. Yearly 2017 Property Tax Bills

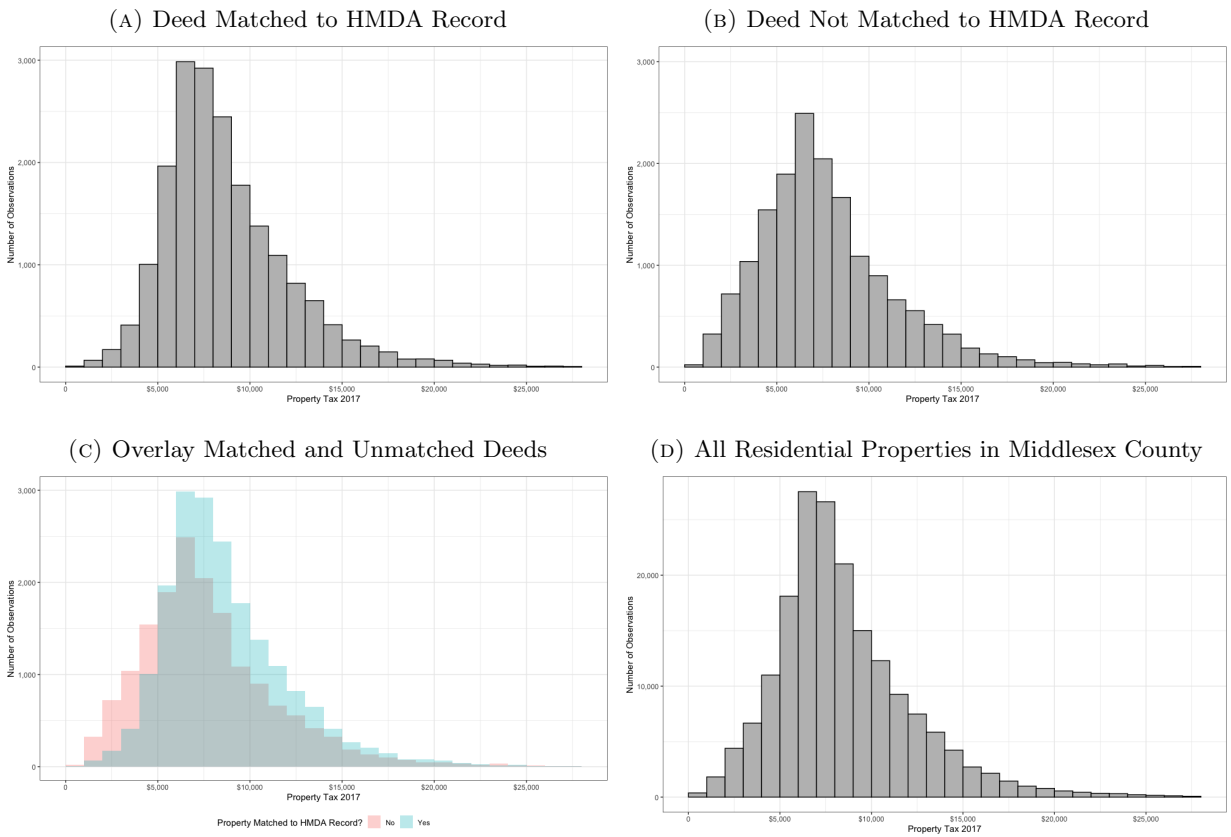


FIGURE A.4. Year in Which Home was Built

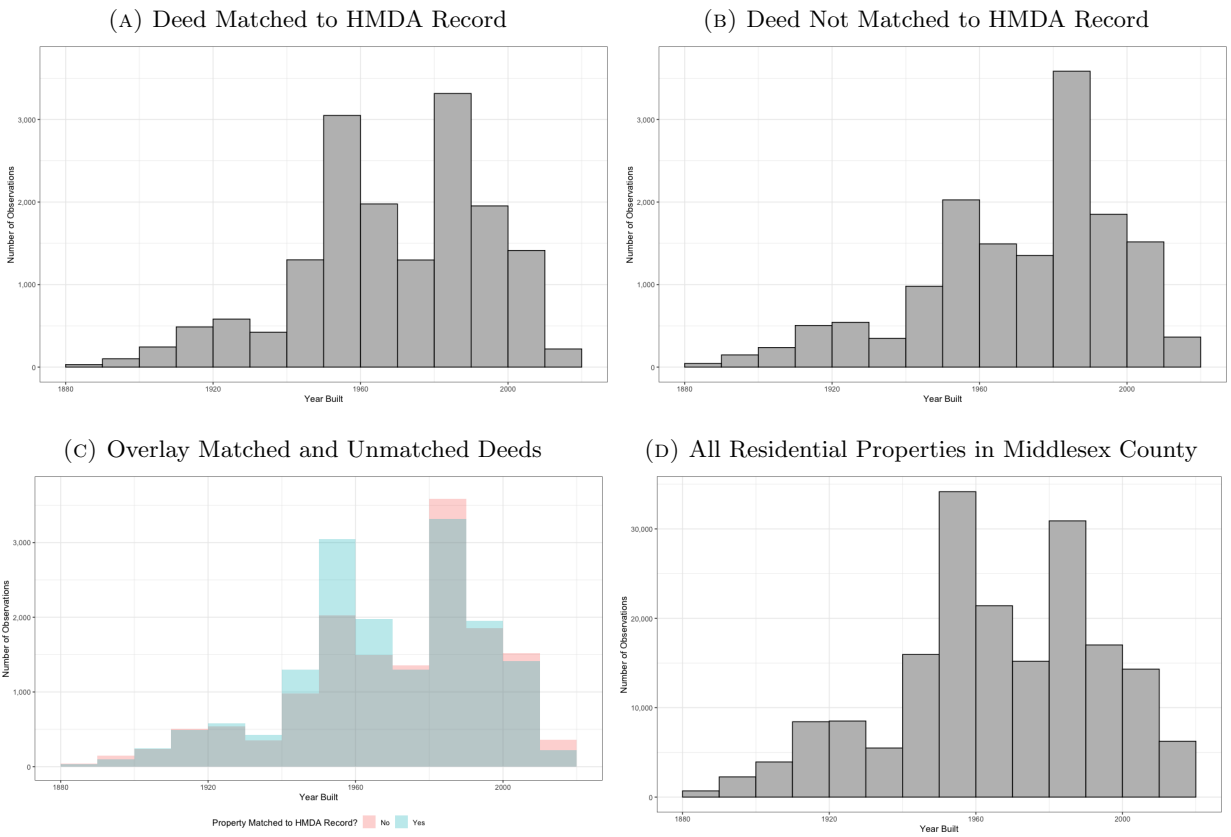
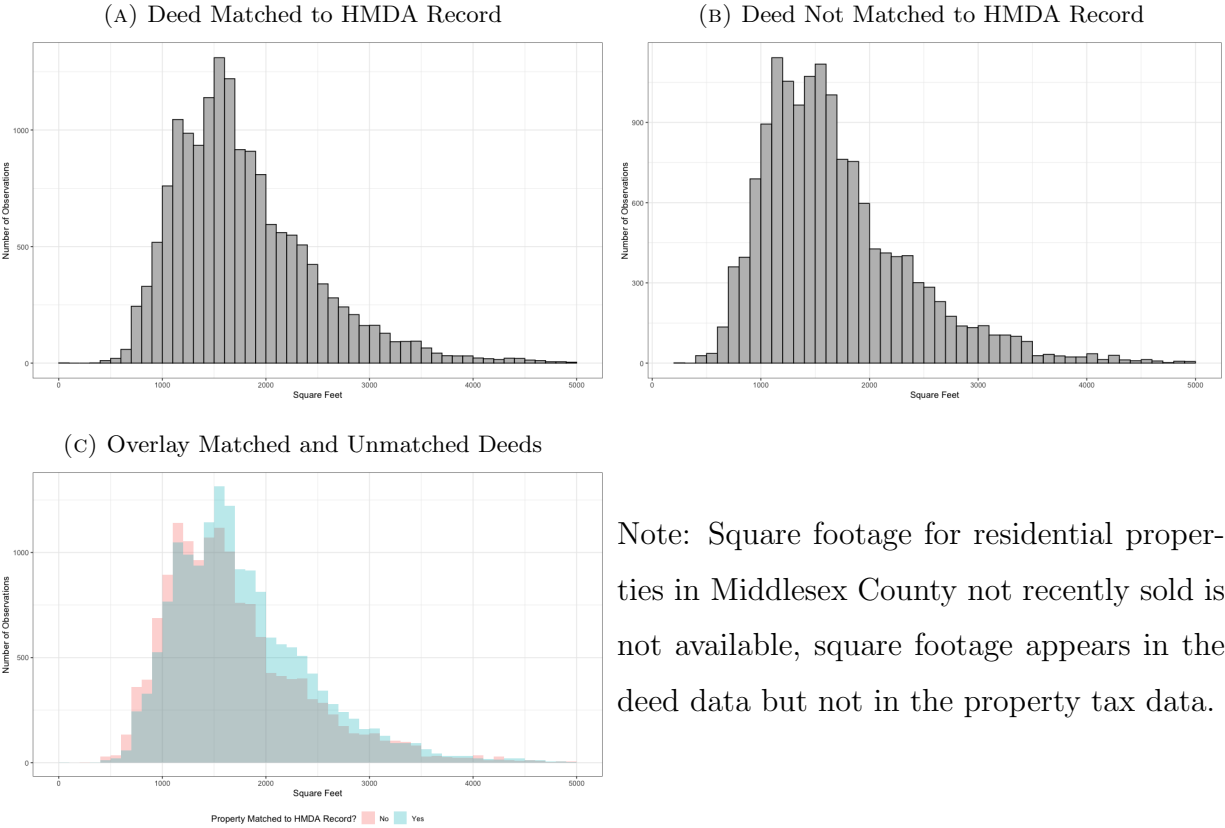


FIGURE A.6. Square Footage of Homes Sold Between 2014 and 2019 in Middlesex County



Note: Square footage for residential properties in Middlesex County not recently sold is not available, square footage appears in the deed data but not in the property tax data.

APPENDIX B. APPENDIX TABLES

TABLE B.1. Number of Sales and HMDA Loans in Middlesex County by Year

Deed Year	Total Sales	Total Fair Market Sales	Home Purchase HMDA Loans	Home Purchase HMDA Loans Owner Occupied	$\frac{\text{HMDA Loans}}{\text{Total Sales}}$
2014	8,057	5,093	6,159	5,679	0.76
2015	8,376	5,323	6,847	6,357	0.81
2016	9,537	5,915	7,747	7,173	0.82
2017	10,319	6,609	8,394	7,683	0.81
2018	9,852	6,558	7,969	7,267	0.81
2019	9,217	6,502	7,885	7,259	0.85

Total sales excludes sales which likely did not result in a new residential occupant for the property (such as transfers between immediate family members, transfers between a corporation and its subsidiary, transfers where the property was sold for less than \$100.00, or transfers to a bank due to foreclosure). It does include sales where the assessor believes that the property was not sold at a fair market price (such as sales by estate executors, the first sale following a foreclosure, sales where the proceeds pay debts, or sales where significant improvements have been made since the last assessment). Home purchase HMDA loans excludes refinancing and home equity loans.