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THE HATED PROPERTY TAX:
SALIENCE, TAX RATES, AND TAX REVOLTS

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The Hated Property Tax: Salience, Tax Rates, and Tax Revolts
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ABSTRACT

Because of the manner in which it is normally paid, the property tax is almost certainly the most salient major tax in the U.S. The property tax is also the least popular tax and the only major tax whose revenues have declined as a share of income. We hypothesize that high salience explains the unpopularity of the property tax, the level of the property tax, and prevalence of property tax revolts. To identify variation in the salience of the property tax over local jurisdictions and over time, we exploit conditionally random variation in tax escrow. Tax escrow is a method of paying the property tax that makes it much less salient--as we demonstrate using survey evidence. We find that areas in which the property tax is less salient are areas in which property taxes are higher and property tax revolts are less likely to occur. We present several specification tests, including spatial correlation tests and instruments based on bank branches, that suggest that our results are valid. An implication of our results is that voters facing a non-benevolent government may wish to keep taxes' salience high even if, as a result, they hate their salient taxes.

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I. Introduction

People hate the property tax more than other taxes. There are fairly regular "tax revolts" against the property tax, many of which are based on local or statewide referenda. Property tax limits, whether imposed by referenda or by state legislatures, often remain binding for a number of years--even decades. In contrast, successful revolts against other taxes, such as the income, sales, or corporate tax, are rare and often temporary. Although limits on other taxes are often considered and occasionally enacted, it appears that the public rarely has the will to insist upon their enforcement. In part because of tax revolts, tax limits, and general antipathy towards the property tax, property tax revenue has declined greatly as a share of all taxes collected in the U.S. It has also declined as a share of U.S. GDP.

There are multiple possible explanations for the phenomena mentioned above. Since they are not mutually exclusive explanations, we do not attempt to rule any explanation out. However, in this paper, we do argue that one explanation--the salience of the property tax--is important. From the property tax, we draw implications about how salience affects the political economy of taxation more generally.

The classic way for property owners to pay property taxes in the U.S. is for them to write one or at most a few checks a year to a local jurisdiction: one check per year is most common, two checks per year is second most common, 4 checks per year is the next most common.¹ The amount of these checks is typically so large that a household must either save in advance or increase their debt in order to write the check without overdrawing their bank account. We argue that this process of paying taxes makes property taxes very salient. In contrast, most people pay their income and payroll taxes entirely through payroll withholding. Most get a *refund* at the end of the tax year. Thus, although a person's gross-of-tax annual income, net-of-tax income per pay period, and tax refund may be salient, his income and payroll taxes themselves are not salient. He is never obliged to compute the total or to pay the total directly. Sales and excise taxes are also probably less salient than property taxes. If a person is to understand how much he has paid in sales and excise taxes over the past year, he must aggregate them himself over a very large number of purchases. Even if the tax on each purchase is salient--and with excise taxes, it is not (Chetty, Looney, and Kroft 2009)--the total is not salient.

We are mainly interested, in this paper, in the salience of the property tax, as opposed to the gross-of-tax price of property. This is because we are interested in whether the salience of the property tax explains: (i) popular animosity toward the property tax; (ii) property tax rebellions and other measures that place binding limits on property taxes; (iii) the level of the property tax relative to

¹ Among those who pay their property taxes by check or cash, 65 percent pay them once per year. The remaining households pay them more frequently--twice per year being the second most common response.

household incomes. In this paper, we do not explore how the salience of the property tax affects incidence and efficiency through the demand for property. (Why we choose not to explore these effects will become clear in a moment.)

Interest in how salience affects the political economy of taxation is not new. The idea goes back at least as far as John Stuart Mill, who coined the term "fiscal illusion." Buchanan argued that a lack of salience would increase the size of government. Milton Friedman stated that he regretted the introduction of payroll tax withholding, which he helped to design, because he believed that it allowed the government to become too large. He does not clarify the mechanism by which withholding had this effect, but it is probable that he thought people did not resist taxes that were not salient to them.² A number of politicians and commentators have argued against the Value-Added Tax on similar grounds: Because it is less salient than an equivalent retail sales tax, they argue, voters allow it to grow "too large." Most commentators on salience do not rigorously model the mechanisms through which salience affects the politics of taxation, so it is sometimes hard to discern what mechanism they have in mind.³ Our reading suggests, however, that most commentators intuit that lack of tax salience makes voters underestimate the level of taxes or increases in taxes. We understand this intuition, but note that it assumes voters have a certain kind of political naïveté. In the appendix, we sketch a model in which such naïveté is unnecessary but in which, instead, salience gives voters--as opposed to politicians--greater control over the budget agenda.

In order to gather evidence on how the salience of the property tax affects its political economy, we need to exploit variation in the salience of the property tax that is arbitrary conditional on observable factors that directly affect outcomes. The outcomes that interest us are the level of property taxes and the occurrence of property tax limits. Thus, observable factors on which we must condition include household income, property value, the presence of school-aged children in the household, and so on.

We find this conditionally arbitrary variation in tax escrow, which is the method by which about 31 percent of people pay their property taxes.⁴ (51 percent of those with a mortgage pay their property

² Friedman says, "It never occurred to me at the time that I was helping to develop machinery that would make possible a government that I would come to criticize severely as too large..." in Milton Friedman and Rose Friedman, *Two Lucky People: Memoirs*. Chicago: University of Chicago Press, 1998, page 123.

³ There are notable exceptions of explicit modeling that we discuss below, including Finkelstein, 2009.

⁴ Although we independently formed the idea that tax escrow reduces the salience of property taxes, we discovered while writing this paper that the idea is in fact not new. Ordeshook (1979) introduces the idea, using logic that is similar to ours. He also attempts to test whether people who have tax escrow dislike property taxes less. His empirical tests are, however, primitive by current standards. His samples are very small and non-representative. He does not have sufficient data to control for confounding factors. He does not look into why some people have tax escrow or attempt to isolate the conditionally random

taxes through tax escrow).⁵ As mentioned above, most people (69 percent) pay their property taxes in a way that makes them highly salient: they write at most a few checks each year. Other people have their property taxes divided into equal monthly amounts and folded into their monthly mortgage payments. This is called tax escrow. Among those who use tax escrow, 46 percent have their monthly payments (mortgage plus property tax) automatically deducted from a bank account.⁶

Tax escrow decreases the salience of the tax itself, which is what interests us for political economy. Why? In order to deduce what property taxes they are paying, households have to study their tax escrow statements deliberately and sort out how much of each payment reflects the mortgage and how much reflects the property tax. This deduction is not at all easy because a household's tax escrow payment is based on pre-accumulating an amount based on *last* year's tax bill plus a "cushion." The cushion varies but can be anywhere up to one sixth of the previous year's tax bill.⁷ Moreover, 85 percent of households who use tax escrow have variation in their monthly payments that comes not just from taxes but also from the adjustable rates in their mortgages, their homeowners' insurance, and their private mortgage insurance. Indeed, the typical tax escrow statement is so confusing that there are many financial websites--including one set up by the Department of Housing and Urban Development (HUD)--

variation. Nevertheless, we wish to acknowledge that the idea of using tax escrow to test property tax salience appears to have originated with him.

⁵ 92 percent of home buyers use a mortgage to buy their homes, but some mortgages have been paid off. This is the main reason why 51 percent of those with a mortgage pay through tax escrow but only 31 percent of owners pay through tax escrow. It is possible for a homeowner without a mortgage to set up tax escrow for himself, but this is rare (5 percent of homeowners have tax escrow that is not combined with mortgage payments). All of these calculations are based on the Survey of Consumer Finances, 2001. We use data from years around 2000 for simple descriptive statistics like these ones. This is because the most recent Census data that we use is from the 2000 Census.

⁶ Authors' calculations based on Survey of Consumer Finances, 2001.

⁷ The following quotation from Anderson and Dokko (2009) provides an excellent explanation of why tax escrow is confusing to many people. "Because exact property tax bills are not known when the escrow account is created at closing, lenders must estimate the anticipated annual property tax bill. Typically, escrow managers working on behalf of lenders use the previous year's property tax payment as an estimate of the anticipated property tax bill but may apply judgment to adjust the estimate for changes in property tax rates. Lenders collect a minimum of 1/12th of this estimated tax bill each month, although they often collect an extra 'cushion' amount to ensure an adequate account balance. The account balance fluctuates over time, falling when the lender makes scheduled disbursements. For a given year, the 'cushion' amount is defined as the lowest balance in the escrow account. The Department of Housing and Urban Development's (HUD) Real Estate Settlement Procedures Act (RESPA) limits the maximum 'cushion' amount to 1/6th of estimated annual property taxes. A borrower ensures an adequate 'cushion' over the course of the year by making an initial deposit into the escrow account at closing. Monthly escrow payments are typically fixed within any year. Monthly payments for the following year, however, may be adjusted due to changes in estimated tax bills or changes in the 'cushion' amount. For example, if an escrow account has a 'cushion' amount below the maximum, a lender could increase the cushion amount and increase the borrower's monthly payment by 1/12th of the 'cushion' increase."

devoted solely to explaining how tax escrow bills relate to mortgage, tax, and other payments.⁸ In short, a tax escrow household that wants to focus on its property taxes must make some effort to compute them--the household cannot simply attribute changes in its monthly payments to a change in the property tax.

Tax escrow does not merely reduce salience by making it hard for households to deduce their property taxes. Tax escrow also means that, once a household has deducted its monthly tax payment, it has to add up the payment over 12 months--as opposed to remembering the check they paid most lately (and perhaps multiplying it by 2 or 4). Also, since the total tax escrow payment is in the same range every month, households do not need consciously to save or dissave in order to pay their taxes. Because they do not need to save or dissave, they can be fairly inattentive. Finally, 46 percent of tax escrow households use automatic payment deduction: they can afford to be *highly* inattentive. This is akin to payroll tax withholding, which allows people to be inattentive to income and payroll taxes.

Below, we demonstrate via survey evidence that people with tax escrow are significantly less aware of the property taxes they pay: they make substantially larger mistakes when self-reporting their property taxes paid. We compare their self-reports to their actual taxes paid, which are public information.

Moreover, we demonstrate that there is substantial arbitrary variation in tax escrow once we have accounted for the observable variables that banks use to write a mortgage. Based on our research and conversations with lending experts, we believe that the arbitrariness comes mainly from differences among lenders' administrative costs of running escrow accounts. (As a specification check, we use local lender information to form instrumental variables for tax escrow.)

With consumption and sales taxes, it can be rather tricky to assess the effect of salience on politics because methods that make taxes themselves *less* salient usually make gross-of-tax prices or net-of-tax income *more* salient. Making a good's gross-of-tax price more salient appears to reduce demand for the good (Chetty, Looney, and Kroft 2009). Making net-of-tax income more salient (as opposed to gross-of-tax income) may well reduce labor supply. Thus, when salience changes, so too does the tax base: consumption or income. This makes it possible to confound the effects of tax salience that run purely through politics and public choice with effects of tax salience that run through the tax base. Moreover, as noted by Chetty, Looney and Kroft (2009) and Finkelstein (2009), when a tax is less salient, its deadweight loss can--but not necessarily--be decreased. Thus, it is possible that non-salient taxes are higher simply because it is more efficient for them to be high than for other taxes to be high.

⁸ See, for instance, <http://www.hud.gov/offices/hsg/ramh/res/respafaq.cfm>.

We discuss this point in more detail below.

Variation in tax salience that arises through tax escrow does not present these multiple channels for effects on property tax revenue: Variance in tax salience that is driven by tax escrow must affect tax rates almost purely through politics. This is because tax escrow has little or no effect on demand for property (and, thus, little effect on incidence or deadweight loss). Why is this? Tax escrow begins only *after* a property is purchased, when households are unlikely (and somewhat unable) to adjust their demand for property. At the time of a property purchase, the gross-of-tax property price is equally salient to those who will and will not--immediately after the purchase--have tax escrow. At that time, all purchasers (regardless of tax escrow) are required to write a check that bundles their first property tax payment, their down payment, and numerous fees. Thus, we do not believe that, all else equal, households with tax escrow have different demand for property. This allows us to isolate the relationship between tax salience and political support for taxes--excluding effects that operate through the tax base or through optimal taxation. (Of course, we cannot *guarantee* that none of the effects of tax escrow operate through the tax base or optimal taxation. However, the fact that tax escrow does not "kick in" until after the purchase necessarily means that our evidence is driven mostly by politics.)

Although there have been some very impressive recent empirical studies of tax salience (such as Saez (2010), Chetty, Looney and Kroft (2009), Finkelstein (2009), Jones (2009)), we believe that ours makes a few major contributions. First, it is so far the only empirical study of how salience affects a truly major, ubiquitous tax in the medium- to long-term. Second, we are able to observe not only the outcomes of political economy (tax rates) but some of the intermediating mechanisms (the enactment of tax limits). We are even able to observe expressed beliefs about property taxes. Third, as just mentioned, we are able to focus rather purely on how salience affects politics. In short, we think of our contribution as follows. On the one hand, our identification strategy is somewhat less tidy than those of papers that rely on explicit experiments or policy experiments that play out over a short period of time. On the other hand, we tackle an important tax, whose politics are unusually observable and play out over a fairly long horizon. We also generate results that are representative of the entire U.S., so concern about external validity should be small.

The plan of the remainder of the paper is as follows. In section II, we describe closely related papers and our contribution. In section III, we provide background on the property tax: how it is paid, how tax escrow works, and so on. Section IV demonstrates that Americans dislike the property tax more than any other tax, that property tax revolts and limits are common, and that--perhaps as a result--the property tax has been declining as a share of all taxes paid and as a share of GDP. We also consider two

explanations, other than salience, why people so dislike the property tax. In section V, we show that people with tax escrow report the property taxes they pay less accurately than people who write checks to pay their taxes. In section VI, we describe the data we use for our main analysis. Key data are drawn from special tabulations of 1980, 1990, and 2000 censuses which we commissioned for this study. We present our main results in section VII. In section VIII, we present specification tests, multiple tests for omitted variables bias including spatial correlation tests, and instrumental variables estimates based on bank branch variables. In sections IX and X, respectively, we show results on the enactment of property tax limits and we conclude.

II. Related Literature

The first discussion of tax salience and politics is often attributed to John Stuart Mill (1848) who argued that individuals fail to perceive "indirect taxes"--that is, taxes that are rolled into a gross-of-tax price(s) that individuals see. His argument for "fiscal illusion" runs as follows:

The unpopularity of direct taxation, contrasted with the easy manner in which the public consent to let themselves be fleeced [by indirect taxes] in the prices of commodities, has generated in many friends of improvement a directly opposite mode of thinking to the foregoing. They contend that the very reason which makes direct taxation disagreeable, makes it preferable. Under it, every one knows how much he really pays.... If all taxes were direct, taxation would be much more perceived than at present; and there would be a security which now there is not, for economy in the public expenditure.

Although Mill does not explicitly say that lack of salience causes people to underestimate taxes, he implies it. After all, if people suffer from illusions about taxes, they could perceive them to be lower than they actually are, but they could also perceive taxes to be *higher* and *overreact* to them. Mill apparently believed, however, that people assume that the revenue from non-salient, indirect taxes goes to producers (presumably to pay their factors of production) whereas the revenue of salient taxes goes to the government.

Amilcare Puviani (1903) makes a richer case for fiscal illusion. He postulates a non-benevolent government whose objective is maximizing revenue. Under his theory, government intentionally manipulates the form of taxes to make them non-salient.⁹ He lays out a menu of manipulations that government can use to generate fiscal illusions (illusions about both taxation and spending). Three of the manipulations are particularly relevant for our analysis: (i) bundling a tax into a gross-to-tax price; (ii) breaking a tax into many pieces so that individuals must sum up for themselves if they are to know what they are taxed; (iii) tax complexity so that individuals must make various computations and actively seek

⁹Like Mill, he implicitly assumes that people will underestimate, not overestimate, taxes that are not salient.

auxiliary information if they are to know what they are taxed.

The best-known and most extensive analysis of fiscal illusion is due to Buchanan, who also assumes that government is non-benevolent and self-aggrandizing--a Leviathan.¹⁰ He notes that fiscal illusion, in which he includes lack of salience, is not irrational--rather, it is a misperception to which people can respond rationally.¹¹ Buchanan also argues that the withholding system greatly decreases the salience of the income tax--an argument that is relevant to tax escrow, which replicates some of the features of a withholding system.

Tax salience, thus, has a distinguished history as a theory. There is a fairly rich empirical literature that attempts various tests of fiscal illusion. Most of the studies are focused on income taxes, payroll taxes, or spending. See Dollery and Worthington (1996) for a good review of studies that existed as of their writing. However, tests of the effects of tax salience that use modern methods of identification are not common.

Chetty, Looney and Kroft (2009) test how the salience of a good's gross-of-tax price affects demand for it, in the short term. They design an experiment in which gross-of-tax prices (and the summation that transforms the net-of-tax price into the gross-of-tax price) is prominently shown on the price tags in a few U.S. grocery stores. (Normally, U.S. retail stores' price tags show net-of-tax prices and nothing else.) During the experiment, consumers purchase fewer of the goods whose gross-of-tax prices are shown. This is in comparison to the same items in comparable grocery stores and in comparison to other "control" items in the experimented-upon grocery stores. Thus, the test is rigorous in experimental design: it would be difficult to argue that the controls fail to replicate the counterfactual. As with other experiments, a disadvantage is external validity--the experiment is of short duration and people who initially find the novel price tags confusing (and avoid purchases for that reason alone) might eventually get adjusted to them and recommence their purchases. Thus, the authors also study how consumers respond to increases in excise and sales taxes on beer. Excise taxes are bundled into the gross-of-tax price, while sales taxes are charged at the check-out counter. Chetty, Looney and Kroft find

¹⁰ See numerous works by Buchanan but especially Chapter 10 of Buchanan 1967.

¹¹ On this point, Buchanan says: "The individual who behaves irrationally makes inconsistent choices; he does not behave in such a way that an external observer can make predictions, even should his utility function remain unchanged. By contrast, the individual who behaves in the presence of an illusion will act consistently; given the same choice situation on two separate occasions he will tend to make the same decision, provided that 'learning from experience' does not dispel the illusion and provided that his utility function does not shift in the interim. Conceptually, the external observer can make predictions here if he knows the effects of illusion on choice behavior. This amounts to saying that 'theorizing' about individual behavior under illusion is possible, whereas 'theorizing' about individual behavior that is genuinely irrational is not possible." However, as noted by Chetty, Looney and Kroft (2009), a person for whom a tax is not salient should eventually learn from experience because his choices will not satisfy his budget constraint in the manner that he expects.

that people decrease their beer purchases more in response to excise tax-driven increases in the gross-of-tax price than to equivalent increases in sales taxes.

Salience affects incidence and efficiency. It also affects politics. Chetty, Looney and Kroft study the former set of questions; we study the latter set.¹²

Finkelstein (2009) studies the response to the shift from collecting highway and bridge tolls in cash to collecting them via transponders. When a person uses a transponder, the amount of the toll is deducted from an account that is paid at intervals. This presumably makes the toll amount less salient than it is when the person must stop at the toll booth and pay in cash. Finkelstein shows that demand responds less to toll increases when transponders are more prevalent. She also shows evidence on the politics of tolls: toll increases are more likely to occur in election years when transponders are more prevalent. This decrease in sensitivity to the election cycle suggests that politicians are less afraid of voter backlash from a toll increase when that increase is less salient.

Finkelstein compares outcomes before and after transponder systems are introduced, for routes that do and do not have tolls. This differences-in-differences strategy is convincing, so the main difficulty is extrapolating her toll results to taxes more generally. Unlike income, sales, and property taxes, tolls are unimportant taxes. They represent only 0.15 percent of U.S. governments' revenue (Spock and Liff, 1998). They are also user fees, which makes their politics fundamentally different than income, consumption, or property taxes. With all these other taxes, a taxpayer cannot associate his payments with benefits that he himself enjoys: his marginal payment mostly benefits other people. In general, we expect far less deadweight loss from user fees than from other taxes--especially if people can easily substitute other routes for the toll route. Finally, a toll usually has an extremely disproportionate effect on a readily identifiable subset of the population: people whose commute is far more efficient over the toll route than over alternative routes. This undoubtedly changes the politics of tolls: people who do not have such a commute are presumably glad to see toll increases since they decrease the state's need for revenue from other taxes. Such people dominate all states' voting populations.

Finkelstein presents a model of tax salience in which voters misperceive tolls at the time they

¹² Many people automatically intuit that decreased salience would have very similar consequences as a decrease in the elasticity of demand with respect to the price: reduced deadweight loss. However, Chetty, Looney and Kroft show that this intuition does not necessarily hold. Decreased salience does not necessarily decrease the demand for the taxed good or decrease the deadweight loss of a tax. The effects depend on how people respond to the fact that their purchases do not satisfy their budget constraint in the manner that they expect. People presumably do not fully anticipate the budget consequences of taxes that are so non-salient that they fail to respond to them at the time of purchase.

decide to drive on the highway/bridge and at the time they vote for legislators.¹³ Her model correctly notes that salience can affect legislators' choices of toll rates through two very distinct channels. Suppose government is benevolent. Then, if a less salient toll generates less deadweight loss, it is optimal for the benevolent government to set it at a higher rate than if it were salient and generated more deadweight loss. This argument clearly has little to do with the Puviani's, Buchanan's, or Mills's view of fiscal illusion and the size of government. Suppose, instead, that government is non-benevolent--revenue-maximizing, for instance. Then, if increasing a less salient toll makes fewer people switch from voting for the incumbent legislator to voting for his rival, legislators will increase non-salient tolls more than salient ones--owing to purely self-interested calculations of the expected revenues that they can tap. Through the lens of Finkelstein's theoretical framework, the present study is a clean test of the non-benevolent government hypothesis.

In Finkelstein's model, voters are naïve in the sense that, when they are unaware of what their legislator is doing (non-salience), they assume that he is doing nothing instead of suspecting that he is raising taxes. This naïveté conflicts somewhat with surveys, which indicate that voters routinely suspect politicians of trying to increase the size of government. Thus, in Appendix I, we sketch an alternative model in which naïveté is unnecessary: Our model depends only agenda control.

Sausgruber and Tyran (2005) design a laboratory experiment in which subjects earn "income" in a trading game. They then vote on a proposal to tax transactions and redistribute tax revenues. The experimenters either frame the tax as a more visible direct tax or an less visible indirect one. Sausgruber and Tyran find that indirect tax framing makes subjects systemically underestimate the burden of the taxes. Among inexperienced subjects (those who have not repeatedly voted and seen the consequences), 90 percent of those with the indirect tax framing vote for tax-redistribution proposals that are not in their self-interest. In contrast, among the same inexperienced subjects, 90 percent of those with direct tax framing vote against proposals that are not in their self-interest.¹⁴

III. Background on the property tax

Property taxes have a long history in the U.S. and have traditionally been used by local governments to fund local public goods, such as schools, policing, fire protection services, recreational

¹³ She allows the misperception to differ at these two points in time.

¹⁴ Sausgruber and Tyran also find some evidence that subjects learn about the burden of indirect taxes as the experiment is repeated again and again. However, this result does not have high external validity. In the laboratory, voting is repeated at very short intervals with all other conditions remaining exactly the same. Updating in the real world would naturally be much slower and more difficult: real tax proposals are far more complicated than the experimental ones; voting occurs only at long intervals; the real environment contains many confounding variables.

facilities, and *local* roads and transportation. In a Tiebout-like environment where households can choose among several or many local jurisdictions, capitalization tends to make property taxes equivalent to user fees.¹⁵ This well-known user fee equivalence leads economists to expect people to resent the property tax *less* than other taxes, which have no similar automatic mechanism forcing them into line with the benefits they fund. Although a Tiebout-like environment does not prevail everywhere, the general point holds: compared to other taxes, property taxes are somewhat closer to being true user fees.

In the U.S., over 95 percent of property taxes are collected by local governments--municipalities and school districts being the most important. The remaining 5 percent of property taxes are collected by state governments.¹⁶ In 2002, property taxes accounted for 46 percent of local governments' revenue. However, the degree to which local governments depend on property taxes varies from state to state. In Alabama, property taxes make up only 20 percent of local revenue; in the New England states, property taxes make up more than 80 percent of local revenue.¹⁷

The most accurate empirical way to determine the tax rate on a property is to add up all of the property taxes paid for it and divide that total by the property's market value. The procedure by which property taxes are established is, however, slightly more complicated. A property is linked to all of the local jurisdictions in which it is situated. This may be a single jurisdiction (as in most of New England), a municipality and school district (very common), or three or more jurisdictions (typically, a municipality, a school district, and a county). Each of these jurisdictions sets a property tax rate, on which residents can usually vote in local elections.¹⁸ The property's market value is established by the assessor. The assessor relies primarily on a firm that uses conventional estimation procedures based on data from recent property transactions: sales prices, neighborhood, and property characteristics.¹⁹ After

¹⁵ If a local government tries to overtax its residents given the services that it provides, people moving into the area will choose to live in other local jurisdictions that provide similar services with a lower tax. This will drive down property prices (and consequently property taxes) in the overtaxing jurisdiction until indifference between jurisdictions is reestablished. This process, capitalization, is an automatic mechanism that forces property taxes into line with the value of the public goods they fund. Although this result is mainly associated with Tiebout (1956), it goes back to Appendix G of Marshall's *Principles of Economics* (1948). Other classic references include Oates (1969) and Epple, Filimon, and Romer (1984).

¹⁶ However, this 95-to-5 ratio is somewhat deceptive because some states effectively redistribute a share of localities' property tax revenue so that--though local governments collect all of the property taxes--the state controls part of the revenue.

¹⁷ The source of the statistics in this paragraph is Emrath (2002).

¹⁸ The range of property taxes that can be considered locally is sometimes constrained by statewide property tax limits and other rules, as described below.

¹⁹ In some states, market values are re-assessed annually. In other states, market values are re-assessed only every two or three years. If a homeowner believes that the estimated market value of his home is erroneous, he may appeal the estimate. However, such appeals are often unsuccessful owing to the highly formulaic, data-driven nature of the estimation. They are most

this, an "assessment factor" may be applied to the market value and the property tax owed is equal to the property tax rate times the assessed value. The majority of assessment factors are applied linearly to the property value to calculate the assessed value, though in some cases there are more complicated formulas for translating market values into assessed values.²⁰ In any case, once the market values are estimated, assessment factors are applied, and tax rates are imposed, the total property taxes owed are computed. The total may encompass multiple jurisdictions' property taxes.²¹

Property taxes' effect on the gross-of-tax price of property is salient at the time that a property is purchased because all mortgage lenders compute the gross-of-tax price to determine whether a household can afford to buy a house.²² This calculation is one of the key things that a household sees when it considers a purchase. Households are informed about whether they can likely pay the monthly gross-of-tax price of a house, given their income. Households will not be able to obtain a mortgage if the lender considers the monthly gross-of-tax price too large for their income. For instance, if two properties have the same net-of-tax price but one has substantially higher property taxes, a household may well be told that it cannot purchase the property with the higher taxes.

As mentioned above, most people pay their property taxes simply by writing one or a few checks. However, about half of people with mortgages use tax escrow. Some home purchasers are required to use tax escrow: those purchasers whose mortgages are backed by the Federal Housing Administration, Department of Veterans Affairs, or certain other state and federal agencies (FHA/VA). Otherwise, the general guidance is that mortgages with a loan-to-value ratio of greater than 80 percent should have tax escrow. In fact, however, some lenders never use tax escrow--regardless of the loan-to-value ratio--while other lenders use tax escrow for nearly all borrowers, including those with loan-to-value ratios much

often successful when the contractor has employed data about a property that is not accurate--for instance, using incorrect data on square feet of living space.

²⁰ The vast majority of assessment factors have no content. For instance, the assessed value is always 0.75 of the market value in Connecticut. Clearly, we only need to divide the statutory property tax rate by 0.75 to get the tax rate on the property's market value. Some assessment factors have more content. It is fairly common for the elderly to have a lower assessment factor than others. For instance, in New York State, an assessment factor of 0 is applied to the first \$60,100 of property value for elderly households who are below a certain income. (This elderly assessment factor applies only to property taxes raised by New York school districts, not property taxes raised by municipalities.) California has a system of assessment factors that keep a property's assessed value equal to its market value when it was last sold plus a 2 percent (maximum) annual increase. This system is fairly unique, however. The assessment limit was established by California's Proposition 13.

²¹ That is, regardless of whether the bill is annual, biannual, or quarterly, individual jurisdictions do not send separate bills in locations where jurisdictions overlap. In most cases where multiple jurisdictions are involved, the bill itself shows the breakdown of taxes by jurisdiction. In other cases, a property owner might have to consult online records to see this breakdown.

²² It is less obvious that the property taxes themselves are salient.

lower than 80 percent.

According to experts, there are two main reasons why lenders' tendencies on tax escrow differ.²³ First, although tax escrow helps a lender to ensure that taxes on a property are being paid, it also involves the lender in substantial paperwork with local jurisdictions.²⁴ In areas where local jurisdictions have unautomated or idiosyncratic billing systems, the paperwork may differ from property to property, causing errors that can only be eliminated through vigilant attention to individual property tax bills. Thus, lenders whose initial location or core business is in an area where the paperwork is simple may have paid the set-up costs to handle tax escrow and may ask all borrowers to use it, even borrowers with low loan-to-value ratios or borrowers who live in an area where the paperwork is complex. The opposite is true of lenders whose initial location or core business is in an area where the paperwork is complex: they do not want to pay the set-up costs to handle tax escrow, so they do not ask borrowers to use it but instead charge them with handling their own tax bills—even if they have high loan-to-value ratios or live in an area with simple paperwork.

Second, lenders that do a lot of business in conforming loans may get in the practice of using tax escrow for all of their loans or at least those with loan-to-values ratios greater than 80 percent. Conversely, lenders that do a lot of business in non-conforming loans may get in the practice of not using tax escrow. This is because Fannie Mae and Freddie Mac, which buy and repackage only conforming loans, recommend but do not require that the loans they buy have tax escrow.²⁵ A lender that sells most of its loans to Fannie Mae and Freddie Mac may therefore pay the set-up costs for tax escrow and try to use it routinely. However, even among such lenders, there is considerable variation in behavior. This is because conforming loans are usually sold immediately after they are originated and Fannie Mae and Freddie Mac make *no* recommendation about when tax escrow can be dropped. Thus, some lenders who do a lot of business in conforming loans but who do not want to pay the set-up costs for tax escrow routinely arrange for tax escrow for only the initial property tax payment. Since non-conforming loans are not sold to Fannie Mae and Freddie Mac, no tax escrow recommendations apply to them, and

²³ For the content of this paragraph and the next, we rely on conversations with a number of mortgage lenders. We are especially grateful to Jane Dokko, an expert on tax escrow and mortgage underwriting criteria in the Household and Real Estate Finance division of the Federal Reserve Board of Governors.

²⁴ Strictly speaking, the lender who services the mortgage is involved in substantial paperwork.

²⁵ See Fannie Mae (2009).

estimates indicate that three quarters of non-conforming loans are originated without tax escrow.²⁶ Lenders who do a good deal of business in non-conforming loans often choose not to pay the set-up costs for tax escrow. Interestingly, these lenders cannot be stereotyped easily because non-conforming loans come from both ends of the property price and income distributions. Some non-conforming loans ("jumbos" and "super-jumbos") are associated with luxury properties sold to high income purchasers in areas with high property prices. Other non-conforming loans ("sub-prime") are associated with low value properties sold to borrowers with poor credit ratings, very high loan-to-value ratios, or substandard documentation of income.

It is worth noting that neither the Federal Reserve Bank nor any other government agency gathers information from lenders on their use of tax escrow. Thus, the tax escrow decision is one that a lender makes for itself, considering the benefits and costs. It is not a decision that could affect the lender's relationship with the Federal Reserve Bank or another agency.

In short, there is considerable variation among lenders in whether they recommend or require tax escrow when they make a loan. One might still be concerned that there was little or no conditionally random variation in tax escrow if borrowers "shopped" for tax escrow just as they shop for interest rates and closing costs. The evidence suggests that borrowers do not shop for tax escrow and would, in fact, have a very difficult time shopping if they tried to do it. When a potential borrower files a preliminary application for a mortgage, he can easily get quotes on interest rates, points, and closing costs from several lenders.²⁷ None of the quotes will, however, include information on tax escrow. The Federal Reserve Bank does not even recommend that people ask a question about tax escrow when shopping for a mortgage--though they recommend numerous other questions.²⁸ The US Department of Housing and Urban Development (HUD) and the Real Estate Settlement Procedures Act (RESPA) do require lenders to inform borrowers about tax escrow at the closing of a real estate purchase, but when people are signing the closing paperwork or close to it, it is generally too late to go back to comparison shopping without risking a house sale falling through. Moreover, experts believe that many borrowers are not informed about their tax escrow status during the closing and are never told that it is an option, not a requirement. Thus, we are confident that borrowers are not selecting lenders based on whether they will end up with

²⁶ As of July 2009, revisions to the Home Ownership and Equity Protection Act (HOEPA) require tax escrow for all "high-cost" mortgages. However, this law does not affect any of the data we analyze in this study.

²⁷ Borrowers can most easily get comparison quotes by using a mortgage broker or by using an online service such as LendingTree.com, mortgageloan.com, QuickenLoans.com, MSN Money's Mortgage Center, and bankrate.com.

²⁸ See http://www.federalreserve.gov/PUBS/MORTGAGE/MortB_1.HTM (accessed January 2010).

tax escrow. Anecdotal evidence suggests that only a tiny percentage of borrowers, on their own initiative, drop tax escrow if it was initially in their mortgage.²⁹ Dropping tax escrow, if initiated by the borrower, often costs between 0.25 and 0.375 points.³⁰ However, many owners accidentally drop or start tax escrow when they refinance their mortgage. (Owners nearly always refinance to obtain lower interest rates--not to change their tax escrow status.) Because the firms that offer attractive refinancing vary substantially in their tax escrow usage, two households that start with the same tax escrow may end up with different tax escrow status if one household refinances.

The key point is that, even with the same property and otherwise similar mortgages, a household may end up with tax escrow if its mortgage is from one lender and without tax escrow if its mortgage is from another lender. We show below that, conditional on all the variables that go into a mortgage (characteristics of the borrower, property, and loan itself), the incidence of tax escrow varies arbitrarily. We also show that individual lenders have tax escrow "tendencies" that explain a household's tax escrow status *conditional* on all the variables that go into a mortgage. Such arbitrary-to-the-household variation in lenders' tendencies allow us to form instrumental variables that we use for specification testing.

As already noted, just under half (46 percent) of households with tax escrow use automated payments in which the monthly mortgage plus tax amount is deducted from their bank account without their having to do any paperwork, check writing, or transaction-specific online work. Automated payment of property taxes in the absence of tax escrow is rare.³¹ Thus, for about half the households with tax escrow, property taxes are likely to be especially non-salient.

²⁹ We searched a large number of websites that dealt with mortgages and tax escrow. Numerous questions about tax escrow are posed in these fora, mainly regarding the tax escrow calculations, which people find confusing. However, the only mentions we could find of people getting rid of tax escrow on their own initiative were associated with a bank repeatedly failing to make property tax payments on time or otherwise evincing problems with paperwork. This is not surprising: we have already noted that paperwork issues are the main reason why some banks avoid tax escrow. Some banks let households drop tax escrow (without a fee) if paperwork is a persistent problem. However, even such changes appear to be rare. We know this because most changes of this type begin with a "qualified written request" under RESPA, and HUD processed only 6,658 RESPA-related requests and inquiries in 2009 (0.008 percent of mortgages). Only some of these were qualified written requests so dropping tax escrow must be rare. See U.S. Department of Housing and Urban Development (2009), p. 111.

³⁰ See Gutenberg (2009), "How Can I Avoid Tax Escrow On My Mortgage?" The Mortgage Professor's Website. Gutenberg advises against dropping of tax escrow except in the case of paperwork problems. Other financial advising sites also note that households are likely to lose money overall if they pay the fee for dropping tax escrow. See http://www.mtgprofessor.com/A%20-%20Escrows/how_can_i_avoid_escrows.htm.

³¹ In the 2001 Survey of Consumer Finances, 0.09 percent of households claim to use automated payments to pay their taxes--that is, their taxes not in combination with their mortgage. Since the question asks about automated payment of all taxes, not just property taxes, it is safe to say that the 0.09 percent figure overstates that share of households who pay their property taxes (not in combination with a mortgage) through automated payments.

IV. Dislike of the property tax, declining use of the property tax, and property tax "revolts"

In this section, we discuss how unpopular the property tax is. We also describe the long term decline in the use of the property tax, relative to other taxes and to household income. This decline may be due to voters' continuous resistance, but it has also evinced itself in referenda and other events in which property tax limits are enacted. We describe these and discuss reasons other than salience why people dislike the property tax.

A. The property tax is the least popular tax

As mentioned above, economists often suppose that the property tax will be most liked among taxes because of its (partial) equivalence to a user fee. In a way, the evidence does bear out this supposition. When asked "Which tax gives you the *least* value for money?," people are *least* likely to say the property tax.³² Similarly, local government is consistently the *most* popular answer to the questions "Which level of government do you think spends your tax dollars most wisely?" and "From which level of government do you feel you get the most for your money?"³³ Similarly, when asked "How many cents of every tax dollar that goes to your [federal/state/local] government would you say is wasted?," people rate their local government as least wasteful.³⁴ In short, on value-for-money grounds, the property tax does better than other taxes such as the income and sales tax.

Nevertheless, from the 1970s through today, the property tax has consistently been the least popular tax. Interestingly enough, this lack of popularity does not depend much on the question that is asked. Some surveys ask which tax the respondent most "dislikes"; others ask which tax it would be best to increase if a tax increase were necessary; still others ask which tax is "worst--that is, the least fair."

The question that has been asked most consistently over more than two decades is, "What do you think is the worst tax--that is, the least fair--federal income tax, federal Social Security tax, state income tax, state sales tax, local property tax, other/don't know?" Figure 1 shows answers to this question from 1972 to 2005.³⁵ In both 1972 and 2005, about 38 percent of adults stated that the property tax was the

³² For more detail and the exact wording of the question, see Appendix Table 1. The source is *Los Angeles Times* poll, December 1978.

³³ See Advisory Commission on Intergovernmental Relations (1972 through 1994, annual).

³⁴ The Gallup poll asked this question for the federal, state, and local governments in 1981, 2001, and 2009. See Gallup (2009). The authors' survey of Ohio residents suggests that 99% of people know that the property tax goes at least in part to fund local government activities.

³⁵ The question was asked almost annually in the poll supported by the Advisory Commission on Intergovernmental Relations. The poll was conducted from 1972 to 1994. After the Advisory Commission was disbanded, Gallup (the organization that had most recently done polling for the Commission) asked the question again in 2003 and 2005. The data from 1972 to

worst tax. In between those years, it was cited as the worst tax by a fairly consistent share of adults, never dropping below 25 percent and averaging about 30 percent. Home owners are slightly more to say that it is the worst than renters.³⁶ The tax next most likely to be cited as "the worst" is usually the federal income tax, but it runs a distant second to the property tax.³⁷

B. Property tax revolts, property tax limits, and other visible evidence of resistance of property taxes

There are many ways in which voters who dislike property taxes may use politics to restrain them. They can vote for changes in their local governments' property tax rates.³⁸ They can pressure their state legislators to replace some of their local property taxes with revenues from sales or income taxes.³⁹ Most dramatically, voters can petition to put property tax limits on statewide referenda. These referenda often change a state's constitution, making it difficult for the legislature or courts to reverse the limit. Most of the famous property tax limits in recent U.S. history, such as California's Proposition 13 and Massachusetts' Proposition 2½ were passed via such referenda. The petitions are often started not by well-known politicians but by fairly ordinary citizens around whom popular sentiment coalesces.⁴⁰ When a tax limiting law is enacted through a referendum and generates fairly immediate and substantial reductions in property tax revenues, it is often described as a "tax revolt."

Of course, "tax revolt" is a subjective phrase. There is no objective standard that makes one change in taxes a "revolt" and another merely a "reduction." However, the phrase "tax revolt" implies that the tax change stems from popular anger and that it is a substantial reduction in taxes, not merely a

1994 are a 3-year moving average of the responses (except in 1972 and 1994, when an uncentered 2-year average is used). A moving average is used for those years because the sample was not terribly consistent from year-to-year. (For more on this, see the reports based on the polls.) Between 1972 and 2005, the question changed only very slightly: starting in 1988, the Social Security tax was offered as a response option. As shown in Figure 1 (compare the lines during the years when the poll asked the question both ways), offering "Social Security tax" as a response slightly decreased the share of people who answered that the property tax was worst.

³⁶ In Figure 1, the line showing home owners' responses is always 1 to 5 percentage points above the line for all adults.

³⁷ One can see this in Appendix Figure 1, which shows snapshots of the survey responses in 1972/3 and 2005.

³⁸ In some areas, voters may be able to petition to get a property tax rate proposal on the local ballot. In other areas, voters can only elect representatives who will vote on property tax rates.

³⁹ This generally occurs through the state legislature voting to raise the exemption level on local property and then reimbursing localities for the loss in revenue.

⁴⁰ For instance, Howard Jarvis, who initiated Proposition 13, was an appliance manufacturer and former newspaperman. He, his wife, and their acquaintances personally collected tens of thousands of signatures to put the proposition on the ballot. He founded the Howard Jarvis Taxpayers Association, a popular organization that continues though he is now dead. Barbara Anderson, who initiated Proposition 2½, was a housewife at the time. She is now the head of a popular anti-tax group called Citizens for Limited Taxation. See Jarvis and Pack (1979). See also Citizens for Limited Taxation (2010).

tweaking of the tax code. Thus, we can learn something about the political economy of various types of taxes by tracing the use of the phrase "tax revolt". We recorded the number of all U.S. newspaper articles that used the phrase "tax revolt." We then computed the percentage of these articles that focused on the property tax, as opposed to another tax or taxes in general.⁴¹ Figure 2 shows this percentage. It may readily be seen that most events described as tax revolts concern property taxes rather than other taxes. From 1972 to 2005, the share of "tax revolt" articles that focused on property taxes averaged 63 percent and generally stayed in the range between 53 percent and 72 percent. This suggests that property taxes are more likely than other taxes to generate popular resistance. We would argue that an important reason for this exceptionality is the salience of property taxes.

Figure 3 shows that events that are subjectively described as property tax revolts are in fact associated with the enactment of property tax limits. It shows the number of laws enacted that limit property taxes, by year (left-hand vertical axis). It also shows the number of newspaper articles that use the phrase "tax revolt" and that focus on property taxes, by year (right-hand vertical axis). One may observe that the two lines exhibit similar patterns: there was a great surge in tax property limit laws in the late 1970s, a smaller surge around 1989-91, and a yet smaller surge around 1973. (The 1973 surge is not matched by a surge in newspaper articles because the newspaper archive has poor coverage for the first half of the 1970s.) A total of 51 property tax limit laws were enacted between 1978 and 1980, and a total of 34 laws were enacted between 1990 and 1992. There are scarcely any years, however, when there were not at least a few property tax limits enacted. Since limits are rarely rescinded once enacted, the total number of property tax limit laws in 2000 was 3.5 times the number in 1970.

What is a property tax limit law? Experts generally divide property tax laws into 7 categories: specific property tax rate limits, overall property tax rate limits, property tax revenue limits, assessment increase limits, limits on general local government revenue, limits on general local government expenditures, all full disclosure and truth-in-taxation laws. In our analysis, we consider whether a state has one of the 7 types of limits. For more details on how laws are categorized, see Appendix II.

C. The decline in the use of the property tax

Probably owing to popular animosity toward property taxes (as evinced by surveys) and the limits on them enacted through referenda and other laws, property taxes have declined as a share of GDP. In 1970, they were equal to 3.3 percent of GDP. By 2000, they were only 2.5 percent of GDP. This is in

⁴¹ The source is Google's historical newspaper archive. The coverage of this archive is more complete for recent years than for the 1970s, so statistics for older years are measured with more error. If an article concerns several types of taxes--such as income, sales, and property taxes--it is not counted as an article that focuses on the property tax. The statistic also excludes the newspaper articles that describe tax revolts outside of the U.S.

sharp contrast to other taxes, which *increased* from 28.9 percent of GDP in 1970 to 35.5 percent of GDP by 2000.

These statistics imply that property taxes have fallen as source of government revenue, and this is shown in Figure 4. In 1960, property taxes made up 31.0 percent of state and local governments' revenue and 10.7 percent of all governments' revenues (that is, state, local, and federal). By 1970, property taxes were only 26.4 percent of state and local governments' revenue. By 1980, property taxes had fallen to being only 18.6 percent of state and local governments' revenue and 7.3 percent of all governments' revenue. Between 1980 and 2000, they continued to fall, but slowly--ending up at 17.4 percent of state and local revenue and 6.6 percent of all government revenue.

We review these statistics to make a simple point. Animosity towards and resistance to the property tax did not merely generate media attention, popular referenda, and legislated limits. Resistance to the property tax seems actually to have limited its extent while other taxes grew. This is despite the fact that--recall--the average person thinks that he gets more for his property tax dollar than other tax dollars. In short, the political economy of the property tax is demonstrably different than the political economy of other taxes. We attribute this difference to the salience of the tax.

D. Other explanations for resistance to the property tax

There are, of course, reasons other than salience why the property tax may be unpopular. These explanations are not mutually exclusive with salience, but they are alternatives. We have already dismissed one alternative explanation: that people believe that they get less value for money from their property tax payments. The reverse appears to be true. Two other explanations for the unpopularity of the property tax are worthy of consideration, however: one, people dislike property taxes because they consider the assessment process to be arbitrary or otherwise unfair; two, people dislike property taxes because, in areas where property prices have risen a lot, homeowners (especially the elderly who bought their houses long ago) can find it difficult to pay their property taxes because their unrealized housing wealth is large relative to their cash income. That is, some homeowners may find themselves to be property-rich and cash-poor.

While we readily concede that these alternative explanations for resistance to the property tax may matter, our empirical tests of the link between salience and property tax levels are not plausibly confounded by these alternatives. Tax escrow is not correlated with arbitrariness in assessment or property-rich/cash-poor status. Thus, even if we assume that these alternative explanations are important, our tests of the effect of salience are valid.

Is it likely that the property tax is unpopular mainly because people consider the assessment

process to be arbitrary or otherwise unfair? A first answer to this question comes from polling data. When people are asked why they feel that the property tax is "not a good tax," only 16 percent choose the response "It is based on estimates of home value that are not always fair." Furthermore, although this question has been asked only occasionally in surveys, the percent who choose this response has been trending downwards over time.⁴²

The downward trend is not surprising because, in fact, assessment procedures have become far more standardized, scientific, and transparent over time. In the 1960s, most assessments were performed by local assessors using fairly subjective processes along with objective data on property characteristics (square feet and so on). A property owner who thought his assessment was unfair could not readily access information on other owners' assessments. Assessment procedures often differed from locality to locality within a state. In contrast, all states now impose the same assessment procedure on all their localities. Counties contract with one of several well-established assessment firms to generate all of their assessments, following their state's rules. The firms estimate hedonic regressions using recent arms-length market prices along with property characteristics. In most states, people can easily look up their own and their neighbors' assessments--not just the total value assessed but also the detailed information used by the assessment firm. People who are dissatisfied with their assessments use this information to appeal, and appeals that are based on objective information are often successful. While the assessment process still produces errors (any hedonic regression would), it is undoubtedly less arbitrary than in the past. Thus, if unfair assessments were the main reason why the property tax was unpopular, we would expect to see its unpopularity falling over time. We do not see this.

Is it likely that the property tax is unpopular mainly because some people find that they are property-rich and cash-poor? Again, a first answer to this question comes from polling data. When people are asked why they feel that the property tax is "not a good tax," only 15 percent choose the response "It taxes any increase in the value of a home over the original purchase price, even though that increase is only on paper and not in the homeowner's hands unless he sells he house."⁴³ Moreover, the elderly--who are by far the most likely to suffer the property-rich/cash-poor problem--are significantly less likely to choose this answer to the question of why the property tax is "not good": only 6 to 10

⁴² The question asked in the Advisory Commission on Intergovernmental Relations' annual survey is as follows. "Here are some of the reasons that people give us for feeling that the property tax is not a good tax. Which one of these do you feel is the most important reason for dissatisfaction with the property tax?" Unfortunately, this question was asked only in 1974, 1977, and 1980.

⁴³ The percent who choose this response has varied between 12 and 15 percent over time.

percent of those 60 years and older choose this answer.

Increasingly, states have enacted tax breaks for elderly homeowners and homeowners whose assessed values have risen substantially. Also, many states now allow property-rich, cash-poor taxpayers to accumulate tax liability and pay it off only when the property is sold.⁴⁴ Such programs should reduce dislike of the property tax among those who are property-rich and cash-poor, but again we do not see falling off in dislike.

E. Summing up

Of course, we do not expect people to say that they dislike the property tax *because* it is more salient than other taxes.⁴⁵ Presumably if they became aware that they disproportionately disliked the property tax simply because it was disproportionately salient, their dislike for it would fall. From the occasional surveys in which people explain why the property tax is "not good," the general take-away is that they think it is too burdensome. Such answers are consistent with the property tax's salience, especially in light of the fact that people also think that their property taxes generate more value for money than other taxes. In other words, salience may increase the perceived burdensomeness or offensiveness of a tax, all else equal.

V. Data Sources

In this section, we briefly describe our data sources. Our primary analysis relies on data from the 1980, 1990, and 2000 U.S. Censuses of Population and Housing. We begin with data at the census block group level.⁴⁶ We associate each block group with all of the local jurisdictions that have the power to raise property taxes: its county, municipality, and school district. Using the 1982, 1992, and 2002 Censuses of Government, we identify how much property tax revenue is raised by each of these jurisdictions, and we identify the jurisdiction type that is primarily responsible for raising local property taxes.

Most of the variables we use are familiar ones from Summary Tape Files 1 and 3 of the Censuses. The financial variables include average household income, the average value of owner-occupied properties, the average monthly owner cost of housing, the percent with a mortgage, and the percent who rent their homes. Note that, by having both the value of properties and the monthly owner

⁴⁴ The former type of tax break is often called a circuit breaker. The latter arrangement is called property tax deferral. See Baer (2003).

⁴⁵ No survey has asked this question or a similar one, so far as we know.

⁴⁶ In the 1980s census, the block group/enumeration district level is used. In the 2000 census, the average census block group contained 559 households. The corresponding numbers for 1980 and 1990 are 459 and 459.

cost (which is mainly mortgage payments), we are able to form a proxy for owners' loan to value ratios.⁴⁷ That is, we have a good proxy for the propensity of home owners in an area to have tax escrow recommended for their mortgage. We also use variables that record the percentage of local mortgages that are FHA/VA or subprime. We describe these variables below. We selected all of the above variables because we expect them to covary with tax escrow and because they could affect the political economy of property taxation through channels other than salience. For similar reasons, we use the percent of households who moved into their home 0 to 1 years ago, 2 to 5 years ago, 6 to 10 years ago, 11 to 20 years ago, 21 to 30 years ago, and 31 or more years ago.⁴⁸ Notice that the last category is a good proxy for the share of households that no longer have mortgages since nearly 100 percent of first mortgages (not including refinancing) are for 30 years.⁴⁹ Other variables we use include the percent of people who are non-white, the percent who are Hispanic, the percent with a household head age 65 or older, the percent of households with a child age 18 or younger, average household size, and whether the area is rural or urban.

Our most important variables from the census are on tax escrow and property taxes collected. We commissioned special tabulations of the censuses that gave us block group level information on these variables.⁵⁰ Naturally, the tax escrow question is asked only of households who are home owners and who have a mortgage. We compute the percentage of all households who have tax escrow, of home owners who have tax escrow, and of mortgage-holding owners who have tax escrow. We compute local property tax rates by dividing households' total reported property taxes by households' total reported property value. This is the most accurate property rate data on homeowners that one can collect for the entire U.S.⁵¹

⁴⁷ Monthly owner costs are the sum of payments for mortgages and similar debts on the property; property taxes; insurance; utilities, fuels, and condominium and similar fees.

⁴⁸ These are the categories provided by the census questionnaire.

⁴⁹ Refinanced mortgages are often only 15 years in length. In computing this number, we also excluded mortgages acquired from a previous owner. The sources are the 2001 Survey of Consumer Finances and the 2001 Residential Finance Survey.

⁵⁰ We are grateful to the Lincoln Land Policy Institute for supporting the purchase of the special tabulations. Questions on tax escrow and property tax paid have consistently been asked in the Census, but they have not been made available in the publicly released summary tape files. The exact wording of the questions is as follows. The question, "Does your regular monthly mortgage payment include payments for real estate taxes on this property?," is asked of owners who report having a mortgage or similar debt on their property. The possible answers are "yes" or "no." The question, "What were the real estate taxes on this property last year?," is asked of owners (regardless of whether they have a mortgage). The answer to this is a dollar amount (exact, not categorical).

⁵¹ See Emrath (2002)

We have already reviewed some key descriptive statistics on property tax limits by state, year, and type of limit. These data come mainly from Center for Urban Policy and the Environment at Indiana University on behalf of the Advisory Commission on Intergovernmental Relations (1995). To extend these data to the year 2000, we use Winters (2008) and Tax Analysts (1996 through 2001, annual).

Our subprime lending data come from Mayer and Pence (2008), who generously provided it to us. They constructed the data based on HUD lending data, as described in their paper. Our FHA/VA mortgage data are from the Home Mortgage Disclosure Act Loan Application Registers, which are data on all loan applications. These data are reported by banks and other mortgage originators to the Federal Financial Institutions Examination Council (FFIEC). Both the subprime and FHA/VA variables are at the census tract level.

Finally, we use the 2001 Survey of Consumer Finances ("SCF", Board of Governors of the Federal Reserve System, 2001) and the 1981, 1991, and 2001 Residential Finance Surveys ("RFS", 1983, 1991, 2001) to compute a variety of descriptive statistics on property taxes, mortgages, tax escrow, and home values.

VI. Does tax escrow actually reduce tax salience?

So far, our hypothesis that property taxes are less salient to homeowners who use tax is escrow is just an hypothesis. In this section, we offer some direct evidence based on a survey we conducted.

We surveyed homeowners in nine counties from the state of Ohio.⁵² We selected the counties because they were fairly representative of the state and because their county assessors publish complete, readily usable information on property taxes collected, assessed value, property addresses, and tax bill addresses for all homeowners.⁵³ Thus, before beginning the survey, we already knew what taxes households paid and whether they had tax escrow.⁵⁴

Our survey asks the homeowner a few simple confidence-building questions which allow us to check their general accuracy. For instance, we ask when they purchased the property and what services

⁵² The counties are a mixture of urban and rural, and they represent all parts of the state. The counties are Franklin (the primary county in the Columbus metropolitan area), Cuyahoga (the primary county in the Cleveland metropolitan area), Champaign (a fairly rural county with county seat Urbana), Erie (coincides with the Sandusky metropolitan area), Fulton (a secondary county in the Toledo metropolitan area), Lawrence (a secondary county in the Huntington-Ashland metropolitan area), Mahoning (the primary county in the Youngstown metropolitan area), Miami (a secondary county in the Dayton metropolitan area), and Williams (a fairly rural county with county seat Bryan).

⁵³ Most of this information is available for all Ohioans, but the counties we selected have a larger set of variables available.

⁵⁴ If a household has tax escrow, its billing address is a bank or tax escrow firm.

(local, state, or both) the property tax supports. We then ask two very important questions.⁵⁵ The first, which was on *all* homeowners' surveys, was: "Approximately how much did you pay in property taxes for your house during the 2008 year? (Simply give us your best estimate. You need not go to the trouble of consulting your records.)" This question allows us to check the accuracy of homeowners' recall of their property tax payments. The second question, which was on half of the surveys, was "Does your regular monthly mortgage payment include payments for property taxes on your house?" This question allows us to check whether the assessors and homeowners have the same understanding of whether tax escrow is being used.

After stratifying the population of homeowners on county, property value, and tax escrow status, we drew a stratified random sample of 2,000 homeowners and sent them the survey. The response rate to the survey was 53 percent.⁵⁶ We find that owners with tax escrow report their taxes more incorrectly than those without tax escrow. Figure 5 contains histograms of the difference between reported and actual taxes paid for the two groups: those with and without escrow. It is clear that those with tax escrow have reported-versus-actual differences that are approximately a mean preserving spread of those without escrow. In particular, the standard deviation of the reported-actual difference is \$2215 for those with tax escrow but only \$781 for those without escrow. Put in property tax *rate* terms, the standard deviation of the reported-actual difference is 14.3 mils for those with tax escrow but only 3.2 mils for those without escrow. We believe that this evidence strongly confirms our hypothesis that property taxes are less salient to homeowners with tax escrow.

We refine this evidence in Table 1, where we regress the reported-actual property tax differences on (i) the variables we used for stratified sampling and (ii) a series of variables that describe the property and the socio-demographics of its Census block group. By partialing out these covariates, we more accurately assess the effect of tax escrow itself on salience. The left-hand side of Table 1 shows that, on average, the absolute difference between reported and actual taxes is off by \$868 more for those with tax escrow than for those without it. The corresponding effect in property tax *rates* is 5.2 mils. These estimates are statistically significantly different from zero at the 0.01 level.

We can also use our survey to assess the accuracy of the self-reported property tax information in

⁵⁵ The full survey is in Appendix III.

⁵⁶ We find that homeowners with tax escrow are about 10 percent less likely to reply than those with no tax escrow. This may be because they are less confident about how much property tax they paid--in this case, we will *overestimate* tax salience among those with tax escrow.

the census data we use for our main analysis.⁵⁷ Although our survey evidence indicates that we find that home owners with tax escrow estimate their property taxes paid less accurately, their estimates are not systemically higher or lower. That is, the average difference between reported and actual taxes, as opposed to the average *absolute* difference, is not statistically significantly different for owners with and without tax escrow. This is shown in the right-hand side of Table 1. The evidence suggests that tax escrow causes people to make mistakes but not to systemically over- or under-estimate their property taxes.

Finally, one might be concerned that people do not accurately report their tax escrow status in the census. Comparing survey respondents' self-reported tax escrow status to what we deduce from the county assessors' data, we find that tax escrow status is the same 96 percent of the time. (We do not actually expect it to match 100 percent of the time since assessors themselves report that they have incorrect billing addresses for two to three percent of home owners.) We conclude that people do know whether they have tax escrow and report it accurately.

VII. Results: Salience and Tax Rates

A. Salience and tax rates - main results

Does tax salience affect the property tax rates that households face? In this section, we present our main results on this question. In particular, we show regressions of the average property tax rate on the percentage of households who have tax escrow. We control for all of the covariates available in the Census that are likely to affect property taxes--these covariates were listed in detail in the data section. The regressions are at the level of the Census block group.

The regression specification is as follows:

$$(1) \quad \text{PropTaxRate}_{it} = \beta_0 + \beta_1 \text{PctTaxEscrow}_{it} + X_{it} \beta_2 + \varepsilon_{it}$$

where *PropTaxRate* is the average property tax rate in block group *i* in year *t*, *PctTaxEscrow* is the percentage of households with tax escrow, and *X* is the set of conditioning covariates. See Appendix Table 2 for descriptive statistics on all the variables included in the regressions.

PropTaxRate is expressed in mils (thousandths), which is the most common way to describe a property tax rate in the U.S. A 10 mil property tax rate is equivalent to a 1 percent property tax rate. Property tax rates vary over a fairly narrow range, in practice. They are also right skewed. This is shown by the fact that the average property tax rate is typically quite close to its 10th percentile. In 2000, the

⁵⁷ If anything, the census should obtain *more* accurate information than our survey because, one, it is an official U.S. government survey and carries substantial authority and, two, the question does not suggest that a "best estimate" is fine. It asks for the amount of property taxes paid last year, period.

average property tax rate in the U.S. was 11.5 mils, the 10th percentile was 10.4 mils, and the 90th percentile was 19.7 mils. In 1990, the average rate was 10.5 mils, the 10th percentile was 9.3 mils, and the 90th percentile was 19.2 mils. In 1980, the average rate was 10.3 mils, the 10th percentile was 8.4 mils, and the 90th percentile was 19.7 mils. Our main regressions will be least squares because they will allow us to do complex clustering for the standard errors: see below. However, because of the skewness in the dependent variable, we also show results from median regressions with bootstrapped standard errors.

We try three alternative measures of tax escrow: the percentage of mortgage-holding households with tax escrow, the percentage of all property owners with tax escrow, and the percentage of all households (owners and renters) with tax escrow. We expect the coefficients on these measures to be somewhat different. For instance, if renters are just as influential in the political economy of the property tax, then we expect the "all households" measure to be the best at explaining property tax rates. Conversely, if all owners--including long-time owners who no longer have mortgages--are influential but renters do not bother to participate politically, we expect the "all owners" measure to be the best at explaining property taxes. The standard deviation of *PctTaxEscrow* varies with the measure. It ranges between 24 and 30, depending on the year, for mortgage-holding households. It ranges between 21 and 26 for property owners. It ranges between 20 and 23 for all households.

Because block groups in the same jurisdiction are not fully independent observations, but block groups and jurisdictions do not cross county lines, we cluster the standard errors at the county level.⁵⁸ The standard errors we compute are also robust to heteroskedasticity, which is useful because we expect households with tax escrow to report their property tax payments less accurately.

We focus on results that weight each block group by its population. These results are nationally representative, so we consider them to be preferable. However, since block groups are designed to have fairly similar populations, weighting does not affect the results much.⁵⁹

We run separate regressions for the 2000, 1990, and 1980 Censuses. Census block groups cannot be linked across censuses, so estimating a panel regression is not possible. Even if it were, a panel specification would not make sense. We do not expect current property tax rates to respond quickly to current tax escrow status. There is no model of salience and taxes that would lead us to expect a quick

⁵⁸ We thank Douglas Miller for confirming that county-level clustering is appropriate in this situation. We note, as well, that we obtained similar results using multi-way clustering at the jurisdiction and county level (Cameron, Gelbach, and Miller, 2009).

⁵⁹ Unweighted results are available from the authors upon request.

response. We believe that cross-section regressions are inherently most appropriate for our test. They effectively test whether the accumulated lack of salience over the fairly recent past affects property tax rates.

Table 2 shows the main estimated coefficients. (The full set of estimated coefficients are displayed in Appendix Tables 3 through 5). For the 2000 Census, a standard deviation increase in tax escrow among mortgage holders generates a 0.59 mil increase in the property tax rate. A standard deviation increase in tax escrow among all owners or among all households generates about a 0.86 increase in the tax rate. These are not inconsiderable tax rate increases when we recall that there is only a difference of 1.1 mils between the 10th percentile tax rate and the average tax rate.

For the 1990 Census, a standard deviation increase in tax escrow among mortgage holders generates a 1.17 mil increase in property tax rates. A standard deviation increase in tax escrow among all owners generates an increase of 1.16 mils in property tax rates. The magnitudes for the 1980 Census are--roughly speaking--between the 2000 and 1990 magnitudes. As we have interpreted them, the 1990 results are larger than the 2000 results for two reasons. First, a given change in tax escrow status generates somewhat larger effects in 1990 than in 2000. Second, the standard deviation of tax escrow is lower in 2000 than in 1990.

Overall, we find that areas in which property taxes are less likely to be salient are areas with higher property tax rates. Broadly speaking, our results suggest that a standard deviation increase in tax escrow raises property tax rates by anywhere from half to all of the distance between the 10th percentile of rates and the average rate.

C. Interpreting the magnitude of our results as elasticities of tax rates with respect to tax salience

Measures of uncertainty (in this case, uncertainty about property tax rates) correspond most closely to how non-salience is modeled in existing studies and the model we sketch in the Appendix. From our Ohio survey, we have an estimate of how tax escrow affects individuals' reporting errors about the property taxes they pay. From the previous section, we have an estimate of how tax escrow affects property tax rates. By combining these two estimates, we can estimate the effect of an increase in uncertainty about property taxes on the level of property taxes. When we do this we are implicitly using tax escrow as an instrument for both uncertainty and the level of property taxes. This is an imprecise exercise because our two estimates are not derived from the same dataset, but it is nonetheless informative.

We compute estimates of:

$$\frac{(PropTaxRate_{it}|TaxEscrow_{it} = 1) - (PropTaxRate_{it}|TaxEscrow_{it} = 0)}{AbsVal Error in Rptd PropTaxRate_{it}|TaxEscrow_{it} = 1) - (AbsVal Error in Rptd PropTaxRate_{it}|TaxEscrow_{it} = 0)}$$

using our Table 2 Census 2000 estimates for the numerators and our Table 1 estimates for the denominators.

The computation indicates that, for every 1 mil increase in the absolute value of individual's property tax reporting errors, their property tax rate increases by about 0.7 mils.

Alternatively, we could measure uncertainty by the standard deviation of reporting errors. Recalling that the standard deviation of tax rate errors is 14.3 for tax escrow households and 3.2 for non-tax-escrow households, a 1 mil increase in the standard deviation of reporting errors generates an increase in the property tax rate of about 0.4.

VIII. Specification tests

In this section, we demonstrate that our main results are robust to reasonable changes in estimation. More importantly, we discuss the nature of the residual variation in tax escrow--that is, the variation that remains once we condition on the covariates in our regression. This variation is crucial to our empirical strategy and deserves scrutiny. We (a) show that apparently identical households do and do not have tax escrow, suggesting that it is arbitrary; (b) show that variables omitted from our main regressions but possibly observable to banks are uncorrelated with the residual variation in tax escrow; (c) show that banks' idiosyncratic tendency to use tax escrow explains substantial variation in tax escrow and argue that they give us valid instruments; (d) show that the instrumental variables results confirm our main results; and (e) argue that nearly all omitted variables that would be problematic would exhibit spatial autocorrelation and show that the tax escrow residuals do not exhibit such autocorrelation.

Before proceeding with these tests, it is worth considering how our estimates are likely affected if, after we have conditioned on observable variables, there remains some variation in tax escrow status that is correlated with unobserved determinants of the political economy of property taxes. We believe that the resulting omitted variables bias would make us *less* likely to find that lower salience generates higher property tax rates. Unobserved variables that increase the probability of tax escrow are likely to be characteristics of a person that indicate, to a lender, that he will be less reliable about paying property taxes on his own. For instance, lenders might subjectively assess how attached a person is to his community because they might believe that less attached people are less likely to pay local taxes in the event of negative circumstances such as unemployment. If this is so, lenders will be more likely to require tax escrow of those who are less attached. But, people who are less attached to their community are presumably also less interested in local public goods and therefore less willing to pay property taxes

to support them. Similar logic applies if we think that lenders are subjectively assessing the stability of person's income stream or family life.

A. Robustness of the results to variation in the estimation

The first row of Table 3 shows the estimates from the base specification for the year 2000 data--the same estimates shown in Table 2. The second row Table 3 shows results from median regressions. The estimated coefficients on tax escrow are very similar to the corresponding estimates from least squares regressions. We conclude, therefore, that the skewness of the distribution of property tax rates does not have an important effect on our main results.

We would like to be able to control for *exogenous* differences in local public goods quality that might make people more willing to purchase more local public goods. For instance, if local public schools--for some exogenous reason--make very productive use of tax dollars, people will probably be more likely to vote in favor of property tax increases. In our main regressions, we do not attempt to do this, for two reasons. First, we have few measures of public goods quality that are reasonable accurate. Second, we do not observe the exogenous component of public goods quality, we only observe public goods quality, some of which is endogenous. If lack of salience causes property tax rates to be higher, spending on public goods will be more generous, and quality is therefore likely to be higher. Therefore, controlling for observable quality amounts to controlling for a variable that is partially determined by the dependent variable. When we overcontrol, our estimates will understate the true effect of tax salience.

The only reasonably good measure of local public goods quality that is available for the majority of U.S. block groups is the percentage of students who test at or above the proficient level in the public schools associated with the block group. This measure is available for 85 percent of block groups. The third row of Table 3 shows the estimated coefficients on tax escrow hardly change when this quality variable is added. This alleviates the concern that exogenous differences in quality explain our main results.

B. The similarity of tax escrow and non-tax-escrow households

Here, we show that there is almost complete overlap in the support of the distribution of "treated" households (those with tax escrow) and the support of the distribution of control households (those without tax escrow). Overlap in support gives us very similar control households for every treated household, thereby lessening the importance of the functional form of our regressions. Put another way, the more similar are the distributions of treated and control households, the more we can simply compare the difference in outcomes between treated and control households who are observationally very similar, if not identical. If the unobserved variables are like the ones we observe, the similarity between the

treated and control households is also evidence that tax escrow status is arbitrary.

To demonstrate the extent of overlap in the distributions of households with and without tax escrow, we turn to the RFS. The RFS has excellent information on every aspect of a mortgage: the parameters of the mortgage itself, the financial characteristics of the borrower, and of course tax escrow status. Much of the mortgage information in the RFS is obtained directly from the lender, who is required to look up the loan. Thus, the mortgage information (including the tax escrow information) is accurate--it does not depend on a home owner's ability to recall the terms of his loan. In fact, the RFS arguably contains every variable that a bank would need to decide whether to recommend tax escrow. In addition, the RFS contains variables that the owner himself reports, akin to variables we find in the Census: income, current market value of the property, monthly housing costs (by type), mortgage status, tax escrow status.⁶⁰

We use the RFS as follows. First, using probit regression and a propensity score algorithm, we regress a household's tax escrow status (1 if tax escrow, 0 otherwise) on every loan and household characteristic that a bank would plausibly use to determine whether to recommend tax escrow for the loan. The estimated propensity score maximizes the power of the observable variables to explain tax escrow status. Then, we demonstrate that the distributions of the propensity scores for the treated (tax escrow) and control households overlap almost completely.

Since the RFS contains loan and owner characteristics that the Census does not have, we also estimate a probit regression for tax escrow using only the RFS variables for which we have analogs in the Census. We then compare the estimated propensity scores with all the relevant RFS variables and with only the Census-type variables. By doing this, we learn whether conditioning on the more limited set of variables is roughly equivalent to the conditioning we can achieve when we know virtually all relevant loan and borrower characteristics.

Appendix Table 6 shows the regression coefficients from the propensity score equations, with the full set of RFS variables (left-hand column) and the limited set of Census-type variables (right-hand column). We show results based on the 2001 RFS, but results from the 1991 RFS and 1981 RFS are similar. The Census-type financial variables are: tax escrow status; monthly housing cost; household income; the current market value of the property (estimated by the owner); the year the property was

⁶⁰ The RFS contains two reports of the tax escrow status on a loan: the bank's and the owner's self-report. They agree 96 percent of the time.

acquired; whether the loan is sub-prime; and an approximate loan-to-value ratio.⁶¹ In addition, there are indicators for the approximate loan-to-value ratio being in the first, second, or third quartiles. The Census-type demographic variables are: Hispanic ethnicity, a non-black race indicator, and an indicator for a member of the household being 65 or older. The additional RFS variables, which are not available in the Census are: whether the owner previously owned a home, mortgage insurance type indicators,⁶² the original amount of the mortgage loan, the assessed value of the property at the time the loan was made, the current unpaid balance on the mortgage, the interest rate on the mortgage, points paid on the mortgage, the actual loan-to-value ratio (at the time the mortgage was originated), an indicator for loan-to-value being 80 percent or below, and an indicator for loan-to-value being between 80 and 95 percent.

Appendix Figures 2 through 4 show the results of the exercise. Appendix Figure 2 shows that the treated and control distributions of the propensity score, estimated using all relevant RFS variables, share the same support. (The range of common support is literally 0.02 to 0.96). The distributions peak in the same range: a propensity score of about 0.4. The treated distribution generally lies above the control distribution to the right of 0.4, but the control distribution has mass up through propensity scores of 0.90 and above. Conversely, the control distribution generally lies above the treated distribution to the left of 0.4, but the treated distribution has mass down through propensity scores of 0.10 and below. In other words, when we have nearly all of the relevant information on a mortgage, there is still a great deal of variation in tax escrow status among observably identical households.⁶³

When we restrict the probit regression to the variables available in the Census, we get propensity score distributions that look similar. The easiest way to see this is to compare the distribution of the propensity score estimated with all the relevant variables to the parallel distribution based on Census-type variables only. Appendix Figure 3 and 4, respectively, shows this comparison for households with and without tax escrow. In both figures, the all-relevant-variables and Census-type-only distributions look similar, but the Census-type-only distribution has somewhat less weight in the tails. This is unsurprisingly because explanatory power falls by about half when we drop the variables that are

⁶¹ We create a pseudo loan-to-value ratio using data on current mortgage payments, current property values, and simple assumptions about the interest rate and increase in the property's value from purchase to the current time. We assume an average interest rate of 6 percent on a 30 year mortgage that commenced when the property was purchased. We also assume that the current property value is equal to the property value at the time of purchase inflated by the state's house price FHFA index.

⁶² The types are Federal Housing Administration (FHA) insurance, Department of Veterans Affairs (VA) insurance, Rural Housing Service/Rural Development (formerly FmHA) insurance, private mortgage insurance (PMI), state or local housing finance agency insurance.

⁶³ The regression has an R-squared of 0.11.

available only in the RFS.

Another way to test whether we rely on random variation in our main analysis is to estimate the probit regression using only variables available in the Census, compute the estimated residuals from that regression, and test whether those residuals are statistically related to variables only available in the RFS (not the Census) that are likely determinants of a household's attitude towards property taxes. These are effectively omitted variables in our estimates based on Census data--for instance, our baseline estimates in the previous section.

For example, an interesting variable is whether the owner previously owned another property. People with prior owning experience are likely to be more sophisticated borrowers and more sophisticated about property taxes. We find that people with prior owning experience are no more or less likely to have tax escrow. That is, when the residuals from the regression with Census-type variables (only) are regressed on tax escrow status, the coefficient is not statistically significantly different from zero. We find that this is also true of a number of other variables: see Appendix Table 7.

C. Instruments

We have argued that different banks have--for reasons that are exogenous with respect to the individual borrower--different tendencies to include tax escrow in their mortgages. Specifically, we argued that if a bank does a lot of business in areas where processing tax escrow is easy, then the bank will find it profitable to set up tax escrow servicing for most of its mortgages--even those located in areas where processing is harder. Conversely, if a bank does not have a critical mass of business in areas where tax escrow processing is easy, it will tend not to have tax escrow set up for its mortgages, even mortgages for which Fannie Mae recommends it.

If people tend to obtain mortgages from banks with proximate branches, then the existence of a local branch of a certain bank should have some ability to predict whether a mortgage holder has tax escrow. (85 percent of borrowers obtain a mortgage through a local lender that has a brick and mortar office.⁶⁴) Variables based on the local existence of banks' branches should be legitimate instruments for tax escrow so long as banks do not select branch locations based on determinants of property taxes that we are unable to observe.

Is this restriction likely to be fulfilled? That is, do banks have local information that inform their location of branches (and that affect property taxes) that we do not have? We believe that the answer is "possibly but not likely" because we have access to the same disaggregated marketing data that the banks

⁶⁴ The source is the Residential Finance Survey (2001). The percentage is higher for earlier years. According to the Survey of Consumer Finances (2001), the vast majority of these brick and mortar offices are within 50 miles of the borrower.

have.⁶⁵ Such data are based almost entirely on Census variables for which we can control: household income, home value, and so on. Of course, once it has established a branch, a bank's experience with the location may cause it to close the branch. The branch may be unexpectedly unprofitable, for instance. However, we believe that such variation in experience, given the marketing data, is likely to be due to factors such as competition with other banks, idiosyncratic convenience of the branch's location, and so on. These factors may affect the profitability of a particular bank's branch but they are unlikely to be important determinants of property taxes. That is, such factors are likely to be *useful* sources of variation in the instruments.

Fortunately, complete data on bank branches (and those of thrifts and savings and loans) are available from the Federal Reserve. We form a set of variables equal to each bank holding company's share of branches in the local county. To avoid the problem of a large number of weak instruments, we drop the market share variable for any bank holding company that does not operate branches in at least 30 counties.⁶⁶ This leaves us with 78 bank market share variables.

It turns out that these variables explain substantial variation in local tax escrow: the joint F-statistic on them as excluded instruments in a first-stage equation is always above 200. This is despite the fact that we control at the block group level for all of the covariates in the Census likely to affect property taxes (listed in detail above). Moreover, the F-statistic on the excluded instruments and the IV results do not change when we add all available financial variables from the most disaggregated marketing data available to banks (see below).

We draw a few conclusions. First, the bank branch variables are not weak instruments. Second, there is empirical evidence for the narrative told by lenders about the idiosyncratic nature of banks' tax escrow tendencies. Third, while the bank branch variables may not be ideal instruments--since it is impossible to test fully the validity of the exclusion restriction, they almost certainly reduce the likelihood of omitted variables bias.

⁶⁵ In particular, we tried Geolytics marketing data which are popular with banks and retailers. These data, which are the most disaggregated and sophisticated available, are available at the block group level.

⁶⁶ Among banks that operate branches in 30 or more counties, 96 percent operate in multiple U.S. states. Among banks that operate branches in 30 or more counties, the average number of counties of operation is 121, with a standard deviation of 249.

We drop banks that operate branches in a small number of counties because we are concerned that the market-share-of-branches variables might pick up county level unobserved variables that are determinants of property taxes. Most obviously, consider a bank that operates branches in only one county. The bank branch variable would then act like an indicator for that county's tax escrow tendencies, regardless of their source. The greater the number of counties in which a bank operates, the less its market share variable can function as an indicator for individual counties' unobserved variables.

The bottom rows of Table 3 show the instrumental variables results.⁶⁷ The estimated effects of tax escrow are substantially larger than the size of the effects estimated in the base specification. That is, they suggest even more strongly that a lack of salience generates higher property tax rates. These greater magnitudes are in line with expectations: if unobserved determinants of tax escrow are things like a borrower's stability or attachment to the community (as we have argued), these unobserved variables will bias the tax escrow effect downwards. Instrumental variables should alleviate this bias.

In the very bottom row of Table 3, we add several marketing variables to the covariates for which we control. The variables we add are those used by retail and other establishments to "profile" an area.⁶⁸ Such variables could plausibly determine property taxes *and* explain why bank set up branches in certain areas. (In other words, the variables are potential omitted variables.) We find that adding the marketing variables has hardly any effect on the instrumental variables estimates, suggesting that the bank branch instruments were already, conditional on the Census-based controls, not correlated with marketing profiles.

D. Tests of Spatial Autocorrelation

We believe that nearly all of the plausibly problematic omitted variables--unobserved variables that affect both tax escrow status and tax rate-type outcomes--would exhibit spatial autocorrelation. This is both because households might co-locate based on such omitted variables (for instance, preferences for local amenities) and because of institutional factors that are geographically concentrated (for instance, houses in a certain area tend to be built by the same builders and are therefore alike in hard-to-observe ways). For instance, suppose that an area has land that naturally lends itself to recreation--beautiful views, excellent opportunities for hiking, and so on. Suppose that people interested in recreation are disproportionately likely to locate in the area and that they support higher local property taxes because they wish to support parks. Since they plan to pay higher property taxes, they may prefer to use tax escrow and try to get their lender to use it. A scenario like this would be a problem for our identification strategy, but note that nearly all such scenarios would naturally generate spatial correlation. That is, so long as the amenity potential of land or buildings is spatially correlated--which it surely is--a "marker" for such problems would be spatial correlation in *residual* tax escrow status.

⁶⁷ We use the GMM version of the "ivregress" command in Stata.

⁶⁸ The variables are based on consumption as well as census data, and they come from Geolytics. They are: an indicator for a "higher price" product market; an indicator for a luxury priced product market; the share of homes that are expensive, the share of homes that are trailers, the share of homes that are new; the share of homes that are old; the share of residents who are long time, the share of residents who are recent movers; the share of households that are old and rich; the share of households that are young and rich.

Thus, a reasonable test of whether tax escrow status is randomly assigned *conditional* on the observable variables for which we control is a test of the spatial autocorrelation of residual tax escrow status. Specifically, we regress the percentage of households with tax escrow in a Census block on the full set of variables for which we control (including the full set of bank branch variables), and we then compute residuals.⁶⁹ We test these residuals for spatial autocorrelation using the two most-often used statistics, Moran's I and Geary's C. If residual tax escrow status is approximately randomly assigned, we should not reject the null hypothesis of no spatial autocorrelation.

Moran's I (Moran 1950) is a test of spatial autocorrelation in continuous data based on cross-products of deviations from the mean. If the continuous variable x (the percent of households with tax escrow, in our case) is located at latitude i and longitude j , then Moran's I is:

$$I = \frac{n}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i (x_i - \bar{x})^2}$$

where n is the number of observations, \bar{x} is the mean of the x variable, and w_{ij} is the distance between points i and j . The w_{ij} make up a spatial weight matrix. In the absence of spatial autocorrelation, the expectation of Moran's I statistic is $-1/(n-1)$, which tends to zero as n increases. A Moran's I statistic greater than $-1/(n-1)$ indicates positive spatial autocorrelation, and a Moran's I statistic less than $-1/(n-1)$ indicates negative spatial autocorrelation. The minimum possible Moran's I is -1 and the maximum possible is 1 .

Geary's C is defined as:

$$C = \frac{n-1}{2 \sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} (x_i - x_j)^2}{\sum_i (x_i - \bar{x})^2}$$

Geary's C varies between 0 and 2. A value of 1 meaning no spatial autocorrelation, a value closer to 0 means positive spatial autocorrelation, and a value closer to 2 means negative spatial autocorrelation. In comparison to Moran's I, which is a measure of global spatial autocorrelation, Geary's C is more sensitive to local spatial autocorrelation.

For our tax escrow residuals, Moran's I is equal to 0.015, which is not statistically significantly different from zero: the p-value is 0.441. Geary's C is equal to 1.014, which is also not statistically significantly different from zero: the p-value is 0.516. Both of these results suggest that, conditional on the observable variables, tax escrow status has so little spatial autocorrelation that it is unlikely to reflect

⁶⁹ See Appendix Table 2 for the list of control variables. Because we have demonstrated that they affect tax escrow, we also include the full set bank branch variables, including bank holding companies that appear in fewer than 30 counties.

omitted variables that would bias our main results.

IX. Salience and tax limits

In this section, we attempt to get inside the "black box" of the political economy of property taxes. So far, we have found that greater salience generates lower property tax rates. These low rates can be the result of various political mechanisms. Residents of a jurisdiction can simply vote for lower rates in their local elections. State legislators can enact bills that reduce property taxes. However, the mechanism that is probably most interesting is popular voting on statewide referenda to limit property taxes. We find these referenda revealing for two reasons. First, they are based on a popular vote (as opposed to a vote by representatives) so they directly reveal voters' choices. Second, they are focused on property taxes themselves. This is in contrast to local elections or legislative bills, which often bundle property taxes with other public choices.

Since property tax limits are at the state level, our investigation of them can only exploit state-by-year variation. The regressions are straightforward. We estimate a least squares regression in which the dependent variable is the number of limit types that are in force in a state:

$$(2) \quad \text{NumLimitTypes}_{jt} = \delta_0 + \delta_1 \text{PctTaxEscrow}_{jt} + X_{jt} \delta_2 + I_t^{\text{year}} \delta_3 + \epsilon_{jt}$$

where the index j is for states. The other indices are as before. I_t^{year} is a set of dummy variables for years (1980 and 1990, 2000 is the omitted category). NumLimitTypes is the number of limit types in effect.

Appendix II explains the method by which experts categorize property tax limits into 7 categories. The types of limits reinforce one another by eliminating ways in which a particular limit may be evaded. For instance, local government revenue limits make it much harder to evade a tax rate limit. Thus, a state with more types of limits in place is one on which people have voted for tighter constraints on property taxation. Our measure of the number limit types, which we view as a measure of limit strictness, ranges between 0 and 7. Because different states have different numbers of functional jurisdiction types, we count a limit type as being in place if it affects at least one local jurisdiction type. As a rule, we see the limit on the type of jurisdiction that is primarily responsible for property taxation.

We also estimate regressions in which the dependent variable is an indicator for the existence of a binding overall rate limit or specific limit on type of jurisdiction (county, municipality, school district) that is primarily responsible for raising property taxes in the state. However, because limits tend to persist and there are only 50 states, there is not a great deal of variation in the indicator variable. We thus expect it to be less informative than the NumLimitTypes variable, which can express more of the continuum of political resistance to property taxes.

The regression in question is:

$$(3) \quad \text{Prob}(\text{BindingTaxLimit})_{jt} = \gamma_0 + \gamma_1 \text{PctTaxEscrow}_{jt} + \mathbf{X}_{jt} \boldsymbol{\gamma}_2 + \mathbf{I}_t^{\text{year}} \boldsymbol{\gamma}_3 + \nu_{jt}$$

We estimate it by least squares, but Probit regression generates similar results. *BindingTaxLimit* is the indicator for a binding overall rate limit or a specific limit on the type of jurisdiction primarily responsible for raising property taxes in the state.⁷⁰

We estimate equations (2) and (3) as pooled regressions using observations from the 3 census years and the 50 states. We include year fixed effects because there may be circumstances that cause one year simply to have more antipathy to the property tax than other years. We do not, however, include state fixed effects because the resulting equation would be unsuitable given that lack of salience is expected to erode gradually the capacity of the public to resist property taxes. Moreover, when the public does resist by enacting a legal limit, that limit is likely to stay in place for a number of years. Thus, we are comfortable relying on variation among states within a year but we are not comfortable relying on variation over time within a state. Put another way, we do not believe that political economy models of tax salience support a specification in which the difference between, say, 1990 and 1980 limits in a state is plausibly just a function of the difference between 1990 tax escrow and 1980 tax escrow in that state.

Of course, the three observations that we have for each state are not independent--precisely because salience probably operates gradually and limits, once enacted, are fairly persistent. Because of this lack of independence, we cluster the standard errors at the state level. We also employ standard errors that are robust to heteroskedasticity.

We weight states by their population to make the results nationally representative. This makes sense to us because many more people--who reside in many more local jurisdictions--must vote in favor of a tax limit in a state where there are many more voters. Thus, enacting a limit is substantially more meaningful in a larger state: the perceptions of a larger number of people are involved. Nonetheless, we have also computed results in which each state gets an equal weight. These results have signs that are same as those we describe below, but the coefficient estimates are less precise.⁷¹

Table 4 shows the results of estimating equations (2) and (3). (The full set of estimated coefficients are displayed in Appendix Tables 8 and 9). The number of limits estimates indicate that an

⁷⁰ We choose the primarily responsible type of jurisdiction because different states have different numbers of functional local jurisdiction types. Recall, for instance, that Massachusetts has only one functional local jurisdiction type: municipalities.

⁷¹ These results are available from the authors.

increase of one standard deviation in the tax escrow percentage generates a *decrease* of 0.93 to 1.24 in the number of limits in force. In other words, when tax escrow in a state rises by a standard deviation (suggesting that property tax salience falls), a state's voters support about 1 fewer limits. The mean number of limits in the regression is 2.3 with a standard deviation of 1.2. Thus, the decrease in the enactment of limits is considerable.

The estimated coefficient on the percentage of tax escrow among all households indicates that a one standard deviation increase in tax escrow reduces the probability of a binding limit by 35 percentage points. The coefficients on tax escrow among mortgage holders and home owners are not statistically significant at conventional levels (they are only statistically significant at the 0.15 level), but the effects they indicate are in the range of a 18 to 24 percentage point decrease in the probability of a binding limit for a decrease in tax escrow of one standard deviation.

Summing up, the evidence of this section suggests that statewide referenda that limit property taxes are an important mechanism through which more salient property taxes end up being lower. This reinforces the conclusion of the previous sections, in which we found that greater salience reduces property tax rates.

X. Conclusions

Our results indicate that, when property taxes are more salient, they are lower and more likely to be explicitly constrained by legal limits. These results support models in which non-salient taxes are underestimated by voters *and* models in which salience helps voters to exercise agenda control. Do our results confirm one species of model more than the other? Our evidence on property tax rates and limits is equally compatible with both species of model. However, our survey of Ohio homeowners suggests that, although people with tax escrow are substantially less certain about the property taxes they pay, they do not systematically underestimate the taxes they paid. This evidence supports the agenda-setting model rather than models in which non-salient taxes are underestimated in equilibrium.

Because the variation in tax salience that we exploit (tax escrow) does not affect property prices, our results do not support a model in which higher rates for less salient taxes occur because the government's takes account of taxes' deadweight loss.⁷² That is, our results cannot be easily reconciled with a model in which the government tries to maximize the median voter's welfare or to maximize a social welfare function that places most weight on individuals' private utility.

⁷² It is not necessarily true, in any case, that less salient gross-of-tax prices imply lower deadweight loss of taxation. Of course, government might benevolently seek to maximize revenue if society has a "higher use" for the revenue than do individuals who are currently of voting age.

A primary implication of our results is that a non-benevolent government will wish to decrease the salience of taxes and that voters facing a non-benevolent government will wish to keep taxes' salience high--even if the forms of taxation that are highly salient cause inconvenience and animus such as that generated by the property tax. For instance, our results suggest that voters may wish to resist value-added taxes and other taxes folded into gross-of-tax prices, schemes in which taxes are automatically withdrawn or withheld, and taxes that are spread over many small "easy digested" bills.

XII. References

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Figure 1
 Percentage of adults and homeowners who say property tax is the "worst tax"

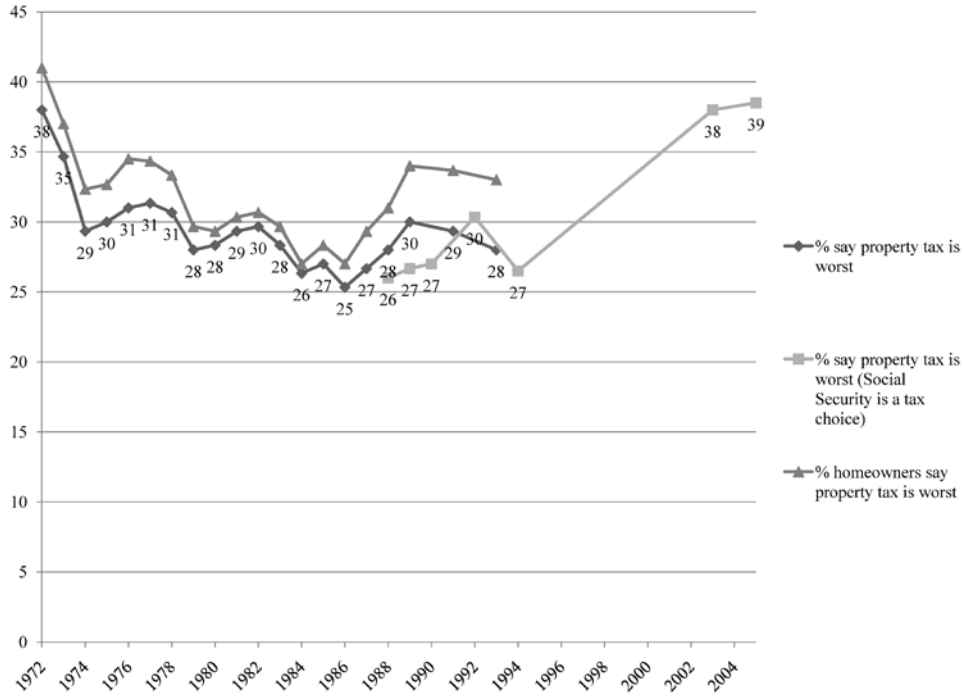


Figure 2
 Percentage of newspaper articles containing the phrase "tax revolt" that are focused on property taxes



Figure 3
 Number of laws limiting property taxes enacted this year compared to
 Number of newspaper articles containing the phrase "tax revolt" &
 focused on property taxes

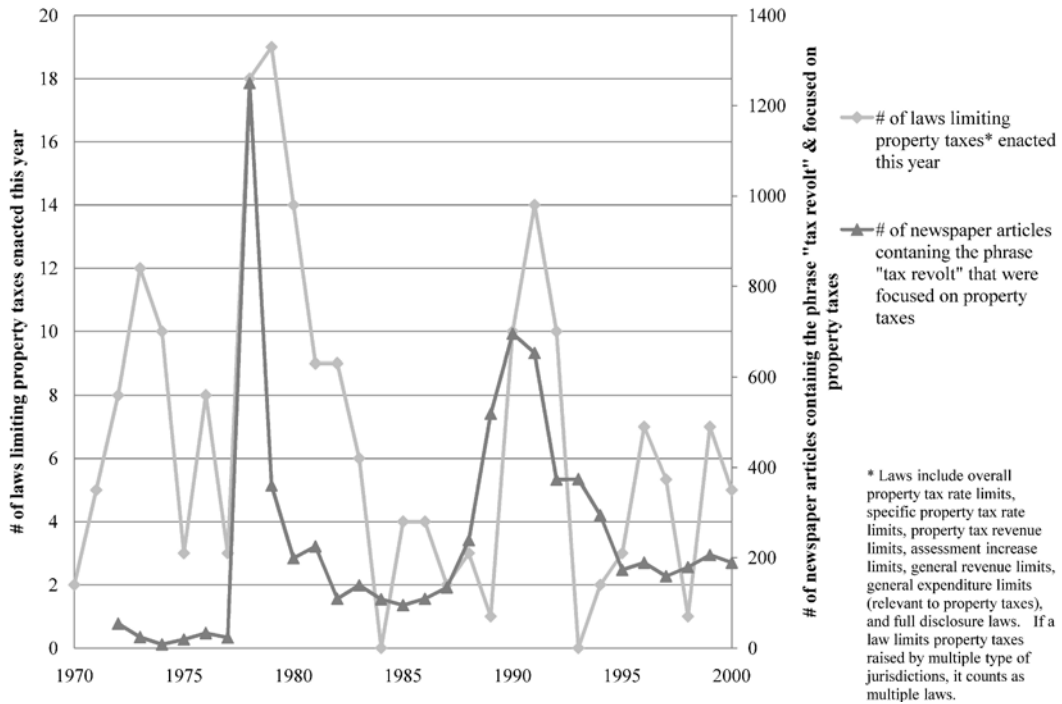


Figure 4
 Percentage of government revenue from property taxes

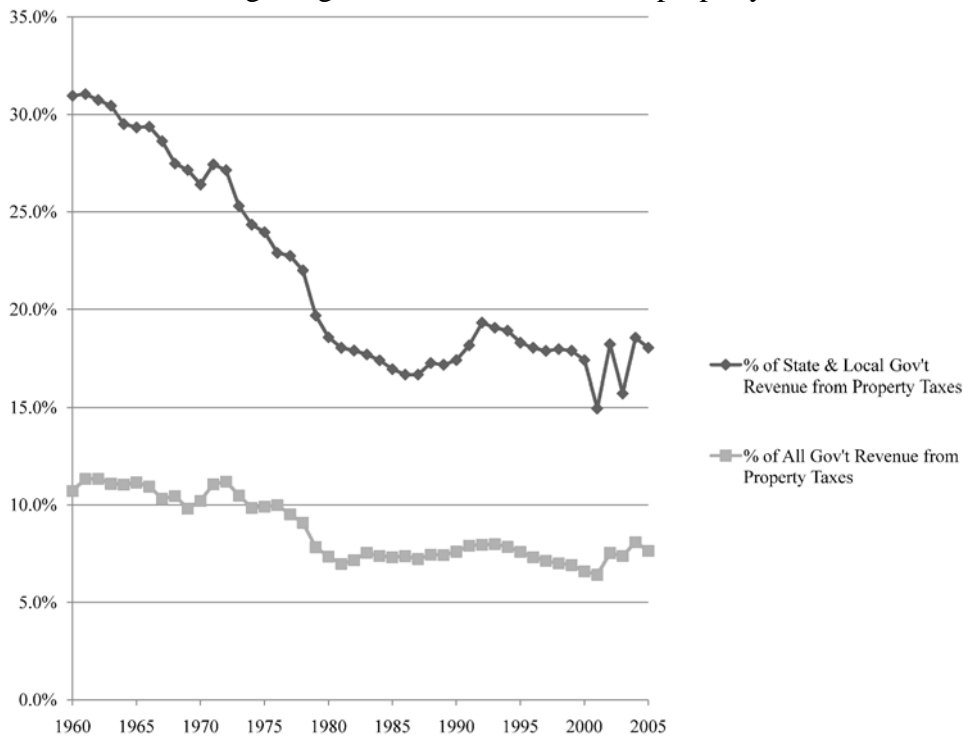
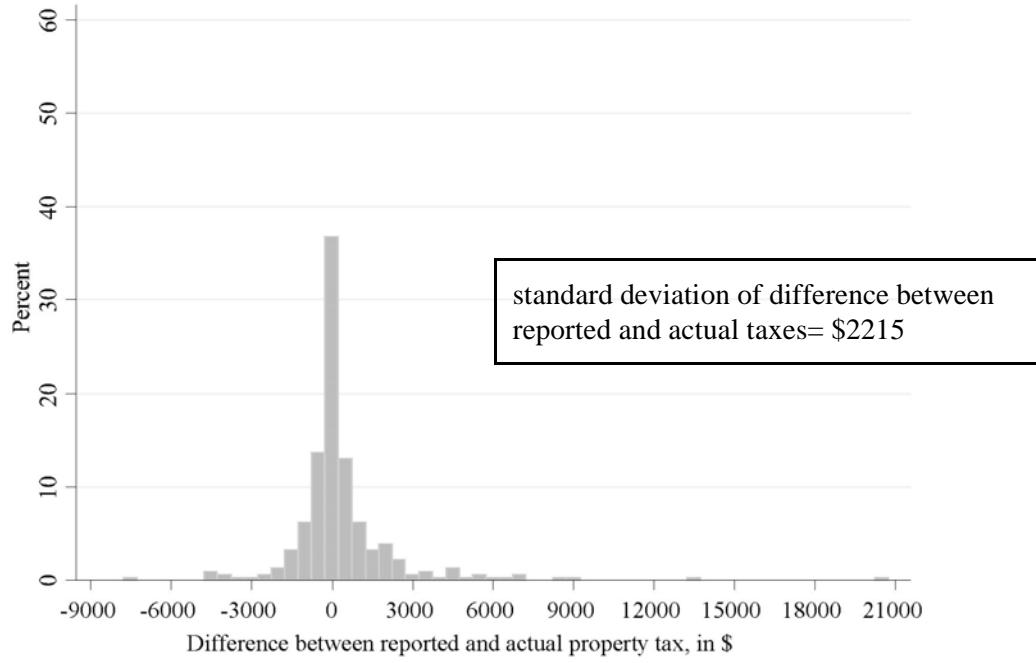


Figure 5
Does tax escrow change the salience of property taxes?

a. Homeowners *with* tax escrow



b. Homeowners *without* tax escrow

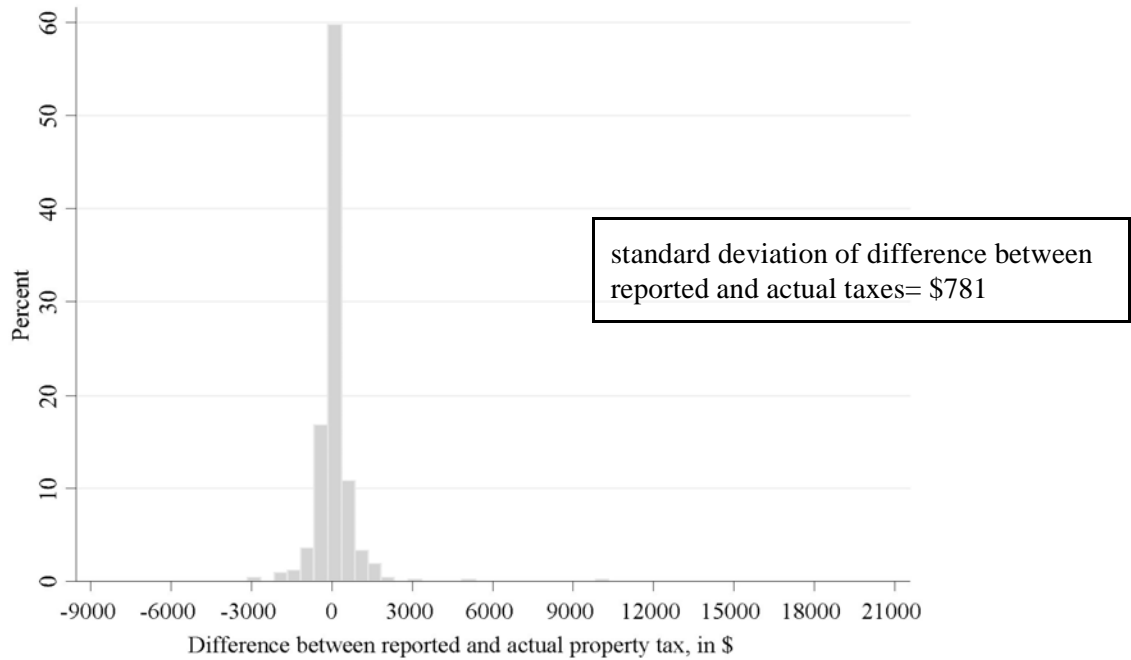


Table 1
The effect of tax escrow on the salience of property taxes

covariate:	Dependent variable: absolute value of the difference between reported and actual property taxes		Dependent variable: difference between reported and actual property taxes	
	indicator for tax escrow	868.0*** (132.4)	827.2*** (141.7)	216.0 (152.4)
county by home value fixed effects	yes	yes	yes	yes
additional assessor-based and survey-based covariates (see notes)		yes		yes
additional Census block group-based covariates (see notes)		yes		yes

covariate:	Dependent variable: absolute value of the difference between reported and actual property tax <i>rates</i> (in mils)		Dependent variable: difference between reported and actual property tax <i>rates</i> (in mils)	
	indicator for tax escrow	5.2*** (0.7)	5.1*** (0.7)	1.0 (0.8)
county by home value fixed effects	yes	yes	yes	yes
additional assessor-based and survey-based covariates (see notes)		yes		yes
additional Census block group-based covariates (see notes)		yes		yes

number of observations (both panels above)	724	678	724	678
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Source: Authors' calculations based on a January 2010 survey of Ohio home owners. See text and Appendix 1 for detail.
Notes: The table shows regressions in which the dependent variables are differences between homeowners' reported 2008 property tax payments and their actual payments. All regressions control for county by assessed home value fixed effects because these were the categories on which survey sampling was based. Assessed home values were recorded, for the purpose of sampling, in categories. The first seven covariates shown in the table are based on the survey data or Ohio assessor data. The remaining variables are averages for Census 2000 block groups. There are fewer observations in the regressions with Census covariates owing to the fact that some homes were not built at the time Census 2000 was taken. *** p<0.01, ** p<0.05, *p<0.10.

The additional Ohio assessor-based and survey-based variables are: the most recent sales price of the house; and indicators for whether the residents have lived in the house 2-5 years, 5-10 years, 10-15 years, 15 plus years.

The additional Census block group-based variables are: average home value; average household income, its square, its cube, and its fourth power; an indicator for rural area; share of households with a child 18 years or younger; share of people who are non-white; average household size; average monthly cost (owners with a mortgage); share of households with a member over 65 years old; share of all newly originated mortgages that are subprime; the loan to value ratio, its square, its cube, and its fourth power.

Table 2

Effect of tax escrow (proxy for nonsalience) on tax rates
 dependent variable: property tax rate in mils
each cell in the table shows the result of a separate regression

	group over whom tax escrow status is measured		
	mortgage holders	home owners	all households
Year 2000 data	0.026 ^{***} (0.004)	0.042 ^{***} (0.005)	0.041 ^{***} (0.005)
Year 1990 data	0.042 ^{***} (0.005)	0.047 ^{***} (0.007)	0.075 ^{***} (0.009)
Year 1980 data	0.033 ^{***} (0.003)	0.021 ^{***} (0.005)	0.024 ^{***} (0.007)

Notes: Least squares regressions with standard errors clustered at the county level (see footnote 52). Full regression results reported in Appendix Tables 3-5. Standard errors are in parentheses. Observations are at the block group level and are weighted by population. For descriptive statistics, see Appendix Table 2. *** p<0.01, ** p<0.05, *p<0.10.

Table 3

Effect of tax escrow (proxy for nonsalience) on tax rates
 Specification tests based on year 2000 data
 dependent variable: property tax rate in mils
each cell in the table shows the result of a separate regression

	group over whom tax escrow status is measured		
	mortgage holders	home owners	all households
Base specification (see Table 5):	0.026 ^{***} (0.004)	0.042 ^{***} (0.005)	0.041 ^{***} (0.005)
Median regression:	0.028 ^{***} (0.006)	0.038 ^{***} (0.007)	0.037 ^{***} (0.010)
Specification with school quality variable:	0.025 ^{***} (0.007)	0.045 ^{***} (0.009)	0.051 ^{***} (0.008)
Instrumental variables specification (bank branch instruments, see text): coefficient on share with tax escrow	0.094 ^{***} (0.012)	0.154 ^{***} (0.016)	0.133 ^{***} (0.034)
F-statistic on excluded bank branch instruments	13.1 (prob>F=0.0000)	15.9 (prob>F=0.0000)	13.6 (prob>F=0.0000)
Instrumental variables specification with extra marketing covariates (bank branch instruments, see text): coefficient on share with tax escrow	0.092 ^{***} (0.012)	0.155 ^{***} (0.016)	0.131 ^{***} (0.033)
F-statistic on excluded bank branch instruments	13.0 (prob>F=0.0000)	15.7 (prob>F=0.0000)	13.6 (prob>F=0.0000)

Notes: First and third rows show least squares regressions with standard errors clustered at the county level (see footnote 52). Second row shows median regression with bootstrapped standard errors clustered at the county level. The method used is Powell's (1984) censored least absolute deviations estimator (CLAD, see Jolliffe *et al* 2010), a generalization of the least absolute deviations estimator (Stata's qreg). Fourth and sixth rows show instrumental variables (gmm) regressions with robust standard errors clustered at the county level. Standard errors are in parentheses. Fifth and seventh rows show F-statistic on the excluded bank branch instruments in the first stages associated with the instrumental variables estimation shown in the row immediately above. Observations are at the block group level and are weighted by population. For descriptive statistics, see Appendix Table 2. *** p<0.01, ** p<0.05, *p<0.10.

Table 4
 Effect of tax escrow (proxy for nonsalience) on tax limit measures
 dependent variable noted in rightmost column
each cell in the table shows the result of a separate regression
 group over whom tax escrow status is measured

	mortgage holders	home owners	all households
number of property tax limit types (between 1 and 7)	-0.041 ^{***} (0.011)	-0.055 ^{***} (0.015)	-0.061 ^{**} (0.024)
indicator for a binding overall limit or a specific tax limit on jurisdiction type that primarily raises property taxes	-0.008 (0.005)	-0.011 (0.007)	-0.017 ^{**} (0.008)

Notes: Least squares regressions in which the dependent variable is noted in the right hand column. Full regression results reported in Appendix Tables 8 and 9. Observations are at the state-by-year level and weighted by population. The regression pools observations from 1980, 1990, and 2000. Errors are clustered at the state level and are robust to heteroskedasticity. For descriptive statistics, see Appendix Table 2. *** p<0.01, ** p<0.05, *p<0.10.

Appendix I: Models of tax salience and the politics of taxation

A. Existing models of tax salience and the politics of taxation

Most existing models of how tax salience affects the politics of taxation are based on the idea that when taxes are not salient, voters punish politicians less when taxes rise relative to benefits. Politicians are usually modeled as maximizers of government revenue or some roughly equivalent objective. (Romer and Rosenthal (1978) point out that this objective function does not require terribly self-interested politicians, especially for local public goods such as schools. Politicians may well believe that it is in society's long-term best interest to fund schools at a higher level than the voters would prefer.)

Finkelstein's model fits under this heading. While we will not review it at length here, let us make a few comments. First, as already noted, Finkelstein's model presents two distinct reasons why lack of salience might generate higher tax rates. The first reason--higher rates are efficient for taxes that generate less deadweight loss (a distinct possibility with less salient taxes)--does not apply to our application. It does not apply because tax escrow does not generate variation in salience until *after* a property purchase is made. Her second reason is that, when a tax is less salient, voters will reward politicians less for lowering it and punish politicians less for raising it, all else equal. This logic leads to her empirical tests based on the political cycle. In our application, there is no political cycle--local voting on budgets and taxes tend to take place every year--so what interests us is the argument that voters do not respond to changes in taxes that are non-salient.

If politicians are revenue maximizers, they will always prefer taxes that are higher than those preferred by their median constituent (Romer and Rosenthal, 1978 and 1979). Thus, the primary content of the Finkelstein model, for our application, is that politicians will propose greater increases in non-salient taxes, constituents will ignore these increases when they vote, jurisdictions will end up with higher taxes than the median constituent prefers, and constituents will underestimate non-salient taxes. The underestimation is a property of the equilibrium outcome, not an inherent property of non-salience. Thus, the Finkelstein model largely captures the logic of Mills, Puviani, and Buchanan despite the fact that, in her model, voters respond symmetrically to non-salience (they fail to reward as well as fail to punish).

We believe that models of the type just described provide the primary explanation for findings that non-salient taxes are set higher than salient ones. Nevertheless, we do find one dimension of such models troubling: they assume that voters--when they do not perceive a change in taxes--believe that one has not taken place. Voters are thus assumed to be somewhat naive. If a voter knows that politicians are revenue-maximizing and that they will attempt to raise taxes that are non-salient, a voter should suspect--in the absence of information--that politicians are continually increasing non-salient taxes to the extent possible without drawing attention to the increases. A sophisticated voter should assume that a politician has increased non-salient taxes unless he offers evidence to the contrary.

Although voters might certainly be naive, polling data suggests that voters *are* routinely suspicious that government is trying to expand more than they would like it to do. For instance, the Gallup poll routinely asks whether respondents expect taxes to rise or fall in the coming year. A consistent majority responds "rise," although the size of the majority fluctuates. Similarly, when asked whether government is "too big" or is attempting too many things, a consistent majority responds "yes," although--again--the size of the majority fluctuates.

Thus, we wish to sketch a model in which voters are not naive in the manner described above but in which reduced tax salience nevertheless generates higher taxes.

B. An model of tax salience and agenda-setting power

In the influential models of Romer and Rosenthal (1978, 1979) and their many successors (see especially Lupia 1992), government is able to increase taxes above the level preferred by the median constituent because it controls the agenda. There are two crucial elements in all these models. The first crucial element is that the government is the only entity able to present a budget that is an alternative to

the status quo. If a majority of voters do not vote for the alternative budget, it defaults to the status quo. The status quo is the second crucial element.

A key finding of the agenda-setting models is that the more unappealing the status quo is--in particular, the lower is the default budget relative to the median voter's preferred budget--the more the government can exploit its ability to propose the alternative budget. The government will propose an alternative budget that is higher than median voter's preferred budget yet it will be supported by the median voter so long as the status quo budget is sufficiently low.

Previous authors have considered whether politicians can manipulate the status quo and how much information about the alternative budget is released to voters. However, previous authors have not directly considered how salience affects the "rules" of the model. Yet, salience clearly matters because voters' diffuse information and weak individual incentives to aggregate information are the key justifications for voters being unable to propose an alternative budget and being unable to change the status quo.

Based on our knowledge of property taxes, how they are voted upon, and how limits on them are enacted, we believe that tax salience affects the "rules" of agenda setting. Referenda on property tax limitations give voters concrete ways to (i) constrain the alternative budget and (ii) change the status quo. For instance, Massachusetts' Proposition 2½ changed the jurisdictions' status quo by prescribing the rate at which property tax revenue would ordinarily rise in the absence of a supermajority vote. California's Proposition 13 constrained governments to propose property tax rates no higher than 1 percent.

What is important is that referenda have the *potential* to deprive government of some of its agenda control by giving voters opportunities to set budget alternatives and status quos. In an agenda setting model, such increased voter control would generate lower taxes.

However, voters tend not to support referenda propositions that are complex or that have consequences that are hard for them to predict (Moe 2006). When voters find a proposition difficult to understand, they typically vote against it--even if they would vote for it if they fully understood its implications. Thus, the mere possibility that referenda on property taxes can take place does not mean that they will make it onto ballots or receive support, even if the propositions in question would move the outcome closer to the median voter's preferred outcome.

Thus, we argue that salience plays the following role. First, salience of one's own property taxes allow one to support a property tax limitation that moves the outcome towards one's preferred tax. This is key: a person is only likely to know whether a 1 percent limit, for instance, would decrease or increase his property taxes if he knows what those taxes are. Second, when property taxes are generally salient in a jurisdiction, people will be more likely to share enough information that they can choose limits attractive to the median voter. It is difficult for voters to coordinate information even when taxes are salient; it is far more difficult to them to coordinate when the average constituent has only a vague sense of his property taxes.

In short, we propose an agenda setting model in which greater tax salience increases the probability that voters will successfully propose *their own* alternative budget and alternative status quo. The competition between voters' proposal and government's proposal will force the proposals from both sides toward the median voter. That is, the higher is salience, the greater is the probability that voters will propose a budget and affect the status quo, and smaller is the ability of government to exploit its agenda setting capability. Through this mechanism alone (in which people are not assumed to be naïve about politicians and tax salience), greater tax salience will produce lower taxes.

Appendix II: Property Tax Limit Categorization

Experts categorize property tax limits into seven categories:

- (i) specific property tax rate limits, which cap the tax rate that a specific type of local government--for instance, school districts--may use.
- (ii) overall property tax rate limits, which cap the tax rate that all local governments *combined* may use. These are important because local governments--counties, municipalities, and school districts--often overlap. Without such an overall limit, local governments could potentially evade a specific limit by reducing the tax rate of the restricted type of local government, raising the tax rate of another type of local government, and conducting intergovernmental transfers that negate the intention of the limit.
- (iii) property tax revenue limits, which cap the total revenue collected by the property tax.
- (iv) assessment increase limits, which cap the annual rate at which property assessments may increase. They also occasionally roll assessments back to those in a particular starting year.
- (v) limits on the general revenues of local governments, where those local governments are mainly supported by property taxes. Such limits prevent local governments from employing fees, sales taxes, or other revenue-raising devices to evade a property tax limit.
- (vi) limits on the general expenditures of local governments, where those local governments are mainly supported by property taxes. Such limits have approximately the same effect as general revenue limits.
- (vii) full disclosure or truth-in-taxation laws, which force local governments to inform taxpayers of *any* manner in which current proposals are likely to raise the property taxes they pay. These laws also force local governments to hold public hearings on any such proposals. Full disclosure laws are intended to prevent local government from evading property tax limits by obscure means, such as changing assessment ratios (which effectively change the tax rate).

It will be seen that several types of limits exist mainly because each type of limit offers potential channels for evasion. Multiple types of limits make it more likely that property taxes are indeed restricted.

Each type of limit must be imposed separately on each type of local government (and, occasionally, the state government). Thus, a state could potentially pass 21 types of limits (7 types of limit times 3 types of local governments). However, in some states, one or two types of local government are functional so the maximum number of limits is 7 or 14. For instance, in Massachusetts, only municipalities are really functional jurisdictions--school districts are "dependent" and counties perform hardly any functions. In addition, some of the limit types are redundant and thus not seen in combination.¹ Thus, the maximum number of limit types that voters might logically enact is realistically something more like 7 to 15 than 21. Keeping this in mind, note that the average state had 7 limit types in force by the year 2000. (When we do our main analysis, we will only consider whether a state has one of the 7 basic types of limits, not the number of local jurisdiction types to which it applies. This will cut down the possible number of limits by a factor of 3. This is necessary to make valid cross-state comparisons.)

¹ For instance, general revenue limits and general expenditure limits serve very similar functions. Also, a property tax revenue limits in combination with a rate limit is equivalent to an assessment limit in combination with a rate limit. A well thought-out combination of specific tax rate limits is equivalent to an overall tax rate limit.

Appendix III: Text of survey of Ohio homeowners

The following survey is part of a Stanford University research project on property taxation. We would be grateful if you take a moment to answer the questions below. Your answers will be anonymous and used purely for research, not for marketing or any other purpose. Please return your completed survey using the provided postage-paid envelope. If you would prefer, you may use your unique survey number located at the top right-hand corner of this page to complete the survey online at [insert link].

Do you own the house at which you received this survey?

Yes

No

How many years have you lived at your current house?

1

2-5

5-10

10-15

15+

Do your property taxes pay for local services, state services, or both?

local services

state services

both state and local services

do not pay property taxes

Does your regular monthly mortgage payment include payments for property taxes on your house?

Yes, taxes included in mortgage payment

No, taxes paid separately

No, have no mortgage/renting house

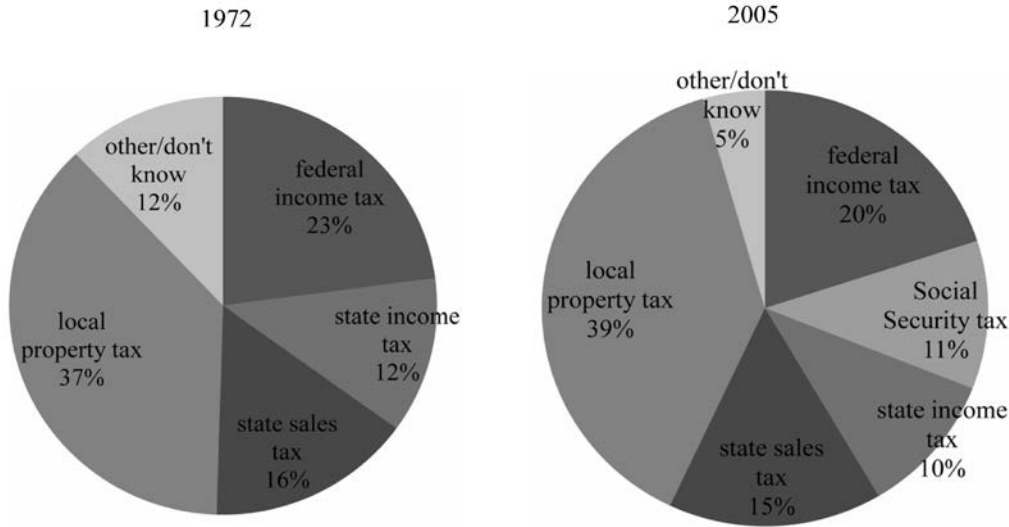
Approximately how much did you pay in property taxes for your house during the 2008 year? (Simply give us your best estimate. You need not go to the trouble of consulting your records.)

\$ _____

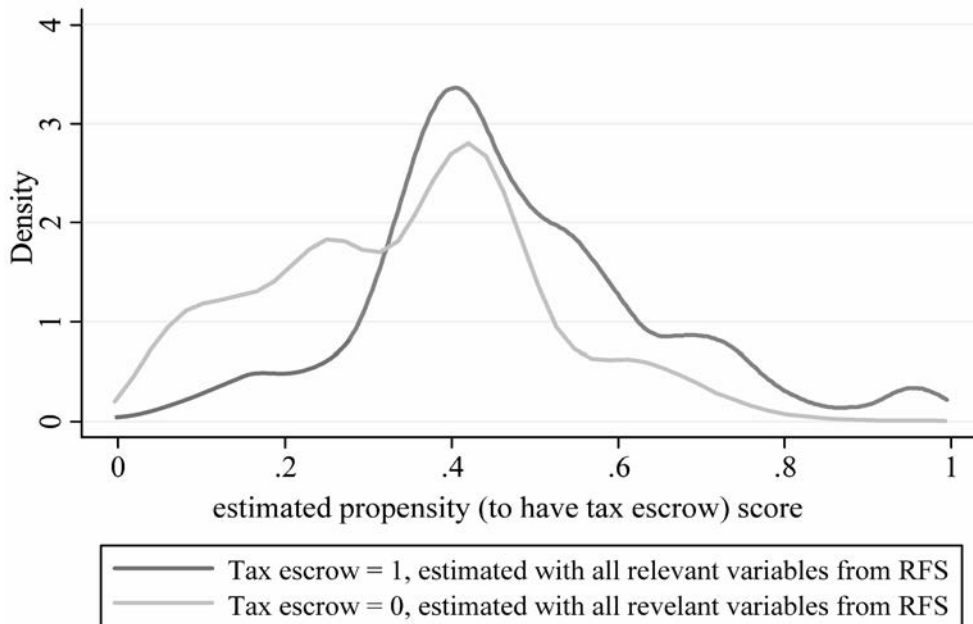
Note that one half of the surveys did not include the question, "Does your regular monthly mortgage payment include payments for property taxes on your house?"

Appendix Figure 1
 Survey evidence on the "worst tax", 1972 and 2005

What do you think is the worst tax--that is, the least fair--federal income tax, federal Social Security tax, state income tax, state sales tax, local property tax, other/don't know?



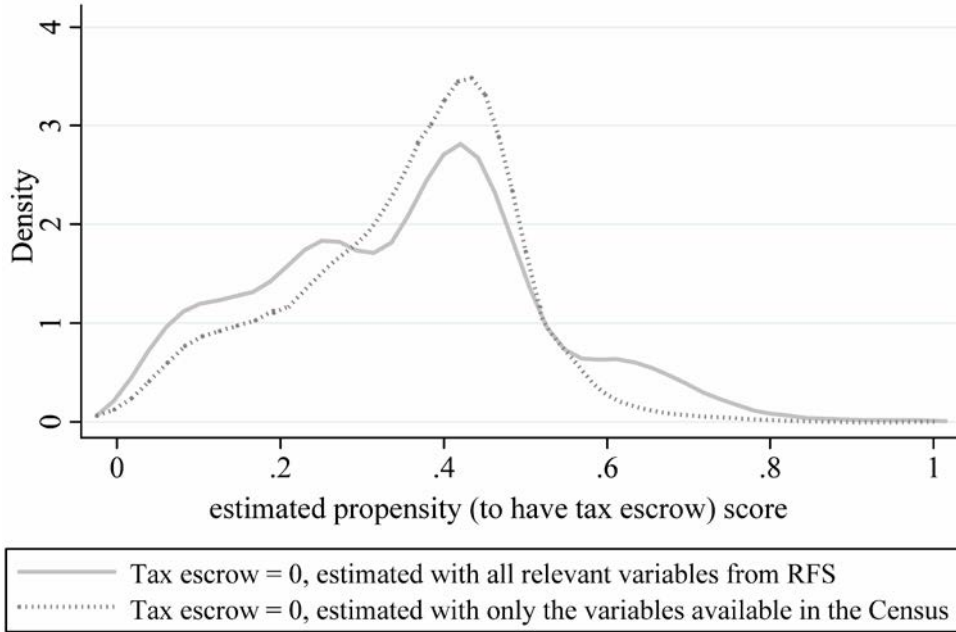
Appendix Figure 2
 Distribution of the estimated propensity to have tax escrow for homeowners with and without tax escrow



kernel = epanechnikov, bandwidth = 0.0276

Appendix Figure 3

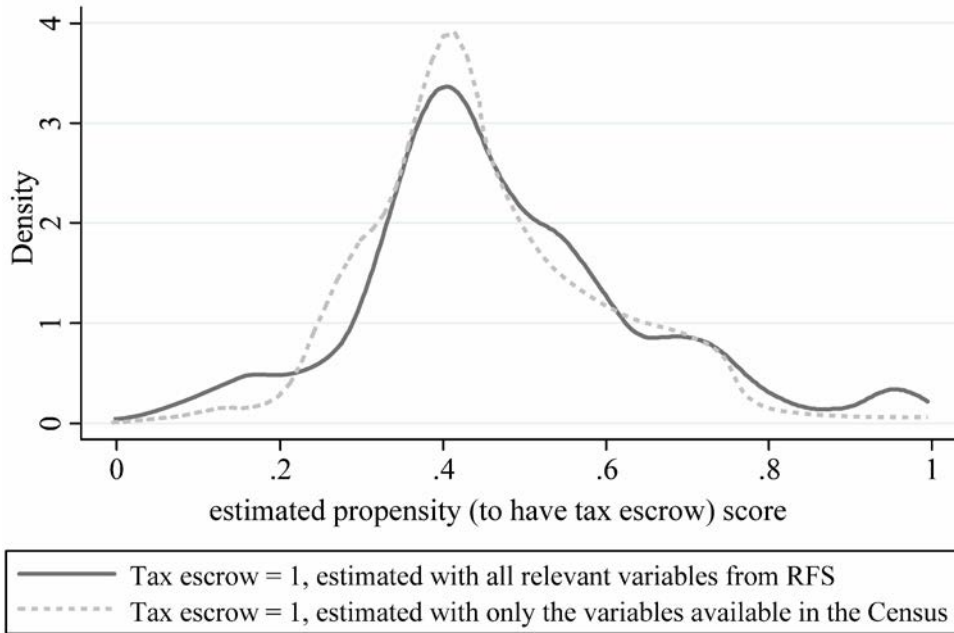
Distribution of estimated propensity to have tax escrow among homeowners without tax escrow, all RFS and only Census variables



kernel = epanechnikov, bandwidth = 0.0276

Appendix Figure 4

Distribution of estimated propensity to have tax escrow among homeowners with tax escrow, all RFS and only Census variables



kernel = epanechnikov, bandwidth = 0.0276

Appendix Table 1
Responses to poll questions related to property taxes

Question	Answers and percentage of respondents
Which one of these taxes gives you the <i>least</i> for your money's worth? ¹	26% Social security tax 22% Federal income tax 21% State tax (sales/income) 16% Property tax 15% Not sure/all of them
From which level of government do you feel you get the <i>least</i> for your money? ²	46% Federal 21% State 19% Local 13% Don't know/no answer
From which level of government do you feel you get the <i>most</i> for your money? ³	23% Federal 20% State 38% Local 20% Don't know/no answer
Which level of government do you think spends your tax dollars most wisely--federal, state, or local? ³	11% Federal 19% State 43% Local 27% Don't know/refused
How many cents of every tax dollar that goes to your [federal/state/local] government would you say is wasted? ⁴	45 cents Federal 38 cents State 34 cents Local
Some of the biggest taxes people have to pay are.... No one likes to pay taxes, but thinking about those taxes, I'd like you to rank them, starting with the one you dislike most. ⁵	29% Income tax 9% Social Security tax 23% Sales tax 36% Property tax 3% Other/don't know/refused
Suppose your state government must raise taxes substantially, which of these do you think would be the best way to do it? ⁶	45% Sales tax 25% Income tax 10% Property tax 6% Other 14% Don't know
Of the taxes I name which would you least like to see increase...? ⁷	26% Local property taxes 10% State sales taxes 7% State income taxes 22% Federal income taxes 9% Taxes on gasoline 18% Social Security taxes 7% Don't know

Sources: 1: *Los Angeles Times* poll, December 1978. Authors' calculations based on Survey of Consumer Finances, 2001. 2: Advisory Commission on Intergovernmental Relations (1994). 3: Advisory Commission on Intergovernmental Relations (1993). 4: 1981 results from Gallup Poll (2009). 5: International Communications Research poll, February 2003. 6: Advisory Commission on Intergovernmental Relations (1976); see also note 31. 7: Princeton Survey Research Associates (1990).

Appendix Table 2

Descriptive statistics for variables used in this study

<u>variable</u>	<u>year</u>	<u>geographic level</u>	<u>units</u>	<u>mean</u>	<u>std dev</u>
property tax rate	2000	block group	mils	1.15	0.58
share of mortgage holders with tax escrow	2000	block group	percentage 0-100	61.54	22.82
share of home owners with tax escrow	2000	block group	percentage 0-100	44.52	21.41
share of all households with tax escrow	2000	block group	percentage 0-100	55.84	20.46
share of all newly originated mortgages that are subprime	2000	block group	percentage 0-100	12.43	9.39
share of households that rent	2000	block group	percentage 0-100	29.87	22.09
average household income	2000	block group	thousands	58.09	29.38
average home value for owners	2000	block group	thousands	152.21	113.12
indicator for rural area	2000	block group	indicator 0/1	0.22	0.38
share of households with a child 18 years or younger	2000	block group	percentage 0-100	38.26	11.94
share of households with a member over 65 years old	2000	block group	percentage 0-100	23.05	10.39
average monthly housing cost, owners with mortgages	2000	block group	thousands	1.18	0.54
share of people who are non-white	2000	block group	percentage 0-100	23.20	25.26
average household size	2000	block group	number	2.69	0.50
share of households with a mortgage	2000	block group	percentage 0-100	40.19	20.98
share of households that moved into house 3-5 years ago	2000	block group	percentage 0-100	24.73	10.86
share of households that moved into house 6-10 years ago	2000	block group	percentage 0-100	18.01	7.94
share of households that moved into house 11-20 years ago	2000	block group	percentage 0-100	19.60	8.54
share of households that moved into house 21-30 years ago	2000	block group	percentage 0-100	13.47	8.49
share of households that moved into house over 30 years ago	2000	block group	percentage 0-100	13.88	11.63
property tax rate	1990	block group	mils	1.05	0.60
share of mortgage holders with tax escrow	1990	block group	percentage 0-100	59.34	27.93
share of home owners with tax escrow	1990	block group	percentage 0-100	40.66	24.60
share of all households with tax escrow	1990	block group	percentage 0-100	55.06	23.25
share of all newly originated mortgages that are subprime	1990	block group	percentage 0-100	11.68	11.25
shares of households that rent	1990	block group	percentage 0-100	31.40	22.01
average household income	1990	block group	thousands	39.93	21.30
average home value for owners	1990	block group	thousands	107.18	84.88
indicator for rural area	1990	block group	indicator 0/1	0.29	0.45
share of households with a child 18 years or younger	1990	block group	percentage 0-100	38.86	12.27
share of households with a member over 65 years old	1990	block group	percentage 0-100	23.43	10.99
average monthly housing cost, owners with mortgages	1990	block group	thousands	0.81	0.41

Appendix Table 2

Descriptive statistics for variables used in this study

<u>variable</u>	<u>year</u>	<u>geographic level</u>	<u>units</u>	<u>mean</u>	<u>std dev</u>
share of people who are non-white	1990	block group	percentage 0-100	17.88	24.75
average household size	1990	block group	number	2.79	0.52
share of households with a mortgage	1990	block group	percentage 0-100	36.75	20.66
share of households that moved into house 3-5 years ago	1990	block group	percentage 0-100	24.20	12.43
share of households that moved into house 6-10 years ago	1990	block group	percentage 0-100	15.12	8.13
share of households that moved into house 11-20 years ago	1990	block group	percentage 0-100	24.42	10.97
share of households that moved into house 21-30 years ago	1990	block group	percentage 0-100	13.25	9.71
share of households that moved into house over 30 years ago	1990	block group	percentage 0-100	13.73	12.05
property tax rate	1980	block group	mils	1.03	0.69
share of mortgage holders with tax escrow	1980	block group	percentage 0-100	57.90	28.83
share of home owners with tax escrow	1980	block group	percentage 0-100	39.87	25.57
share of all households with tax escrow	1980	block group	percentage 0-100	61.24	21.06
shares of households that rent	1980	block group	percentage 0-100	29.65	20.80
average household income	1980	block group	thousands	21.25	8.64
average home value for owners	1980	block group	thousands	54.83	31.56
indicator for rural area	1980	block group	indicator 0/1	0.27	0.43
share of households with a child 18 years or younger	1980	block group	percentage 0-100	42.91	13.24
share of households with a member over 65 years old	1980	block group	percentage 0-100	84.08	11.35
average monthly housing cost, owners with mortgages	1980	block group	thousands	0.31	0.13
share of people who are non-white	1980	block group	percentage 0-100	14.84	24.28
average household size	1980	block group	number	2.91	0.50
share of households with a mortgage	1980	block group	percentage 0-100	43.11	22.01
share of households that moved into house 3-5 years ago	1980	block group	percentage 0-100	28.27	9.52
share of households that moved into house 6-10 years ago	1980	block group	percentage 0-100	16.34	7.23
share of households that moved into house 11-20 years ago	1980	block group	percentage 0-100	17.35	9.21
share of households that moved into house 21-30 years ago	1980	block group	percentage 0-100	9.57	7.75
share of households that moved into house over 30 years ago	1980	block group	percentage 0-100	6.92	7.00
number of property tax limit types	1980, 1990, 2000	state	number	2.33	1.24
overall tax limit or specific tax limit on jurisdiction type that primarily raises property taxes	1980, 1990, 2000	state	indicator 0/1	0.32	0.47
share of mortgage holders with tax escrow	1980, 1990, 2000	state	percentage 0-100	59.62	11.07

Appendix Table 2

Descriptive statistics for variables used in this study

<u>variable</u>	<u>year</u>	<u>geographic level</u>	<u>units</u>	<u>mean</u>	<u>std dev</u>
share of home owners with tax escrow	1980, 1990, 2000	state	percentage 0-100	41.84	9.06
share of all households with tax escrow	1980, 1990, 2000	state	percentage 0-100	57.17	7.24
shares of households that rent	1980, 1990, 2000	state	percentage 0-100	30.21	4.18
share of all newly originated mortgages that are subprime	1980, 1990, 2000	state	percentage 0-100	8.52	6.01
average household income	1980, 1990, 2000	state	thousands	41.37	16.40
share of households with a member over 65 years old	1980, 1990, 2000	state	percentage 0-100	41.18	27.90
average home value for owners	1980, 1990, 2000	state	thousands	108.96	60.04
share of households that are rural	1980, 1990, 2000	state	percentage 0-100	25.62	13.00
share of households with a child 18 years or younger	1980, 1990, 2000	state	percentage 0-100	39.83	3.58
average monthly housing cost, owners with mortgages	1980, 1990, 2000	state	thousands	0.81	0.41
share of people who are non-white	1980, 1990, 2000	state	percentage 0-100	18.97	9.65
average household size	1980, 1990, 2000	state	number	2.79	0.17
share of households with a mortgage	1980, 1990, 2000	state	percentage 0-100	39.96	4.59
share of households that moved into house 3-5 years ago	1980, 1990, 2000	state	percentage 0-100	25.61	3.38
share of households that moved into house 6-10 years ago	1980, 1990, 2000	state	percentage 0-100	16.58	1.86
share of households that moved into house 11-20 years ago	1980, 1990, 2000	state	percentage 0-100	20.48	3.28
share of households that moved into house 21-30 years ago	1980, 1990, 2000	state	percentage 0-100	12.25	2.58
share of households that moved into house over 30 years ago	1980, 1990, 2000	state	percentage 0-100	11.78	4.73

Appendix Table 3
Effect of tax escrow (proxy for nonsalience) on tax rates, year 2000 data
dependent variable: property tax rate in mils

share mortgage holders with tax escrow	0.026 (0.004)		
share home owners with tax escrow		0.042 (0.005)	
share households with tax escrow			0.041 (0.005)
share households that rent	0.049 (0.003)	0.043 (0.004)	0.016 (0.006)
share mortgages that are subprime	-0.021 (0.006)	-0.022 (0.006)	-0.018 (0.006)
share mortgages that are FHA/VA	-0.008 (0.001)	-0.009 (0.001)	-0.007 (0.001)
average household income	0.215 (0.008)	0.206 (0.008)	0.224 (0.009)
average household income squared	-1.47E-03 (1.13E-04)	-1.33E-03 (1.07E-04)	-1.50E-03 (1.17E-04)
average household income cubed	4.03E-06 (4.38E-07)	3.52E-06 (4.07E-07)	4.16E-06 (4.62E-07)
average household income to 4th power	-3.81E-09 (5.50E-10)	-3.25E-09 (1.05E-09)	-3.98E-09 (2.10E-09)
loan to value ratio	3.447 (0.245)	3.093 (0.235)	2.790 (0.243)
indicator: loan to value in 2nd quartile	1.242 (0.064)	1.232 (0.069)	1.295 (0.067)
indicator: loan to value in 3rd quartile	3.008 (0.107)	3.056 (0.111)	3.124 (0.110)
indicator: loan to value in 4th quartile	4.612 (0.159)	4.835 (0.159)	4.868 (0.159)
average home value	-0.031 (0.002)	-0.030 (0.002)	-0.031 (0.002)
indicator for rural area	-1.581 (0.087)	-1.652 (0.088)	-1.766 (0.095)
share with a child 18 years or younger	-0.007 (0.007)	-0.007 (0.007)	-0.009 (0.007)
share with member over 65 years old	0.021 (0.003)	0.030 (0.004)	0.023 (0.003)
average monthly housing cost	6.854 (0.690)	6.288 (0.747)	6.528 (0.774)
share who are non-white	-0.050 (0.003)	-0.050 (0.003)	-0.049 (0.003)
average household size	0.764 (0.154)	0.801 (0.159)	0.789 (0.159)
share with a mortgage	0.013 (0.005)	0.000 (0.007)	-0.008 (0.006)
share moved in 3-5 years ago	0.003 (0.003)	0.001 (0.003)	0.001 (0.003)
share moved in 6-10 years ago	0.017 (0.003)	0.017 (0.004)	0.015 (0.003)
share moved in 11-20 years ago	0.051 (0.004)	0.053 (0.005)	0.049 (0.004)
share moved in 21-30 years ago	-0.054 (0.007)	-0.047 (0.007)	-0.052 (0.007)
share moved in over 30 years ago	0.029 (0.005)	0.043 (0.007)	0.030 (0.005)
constant	-10.552 (0.851)	-9.657 (0.819)	-8.700 (0.697)

Notes: Least squares regressions with standard errors clustered at the county level (see footnote 52). Standard errors are in parentheses. Observations are at the block group level and are weighted by population. For descriptive statistics, see Appendix Table 2.

Appendix Table 4

Effect of tax escrow (proxy for nonsalience) on tax rates, year 1990 data
dependent variable: property tax rate in mils

share mortgage holders with tax escrow	0.042 (0.005)		
share home owners with tax escrow		0.047 (0.007)	
share households with tax escrow			0.075 (0.009)
share households that rent	0.024 (0.004)	0.022 (0.003)	-0.039 (0.005)
share mortgages that are subprime	-0.003 (0.007)	-0.002 (0.007)	0.005 (0.005)
share mortgages that are FHA/VA	-0.031 (0.005)	-0.031 (0.005)	-0.030 (0.005)
average household income	0.300 (0.005)	0.313 (0.005)	0.311 (0.008)
average household income	-2.53E-03 (1.01E-04)	-2.60E-03 (8.54E-05)	-2.54E-03 (1.11E-04)
average household income	8.40E-06 (4.59E-07)	8.60E-06 (3.86E-07)	8.38E-06 (4.45E-07)
average household income	-9.30E-09 (7.20E-10)	-9.51E-09 (5.79E-10)	-9.16E-09 (6.12E-10)
loan to value ratio	2.722 (0.228)	2.735 (0.235)	2.343 (0.192)
indicator: loan to value in 2nd quartile	1.415 (0.120)	1.424 (0.128)	1.285 (0.147)
indicator: loan to value in 3rd quartile	2.893 (0.289)	2.924 (0.299)	2.704 (0.307)
indicator: loan to value in 4th quartile	3.757 (0.336)	3.793 (0.359)	3.553 (0.343)
average home value	-0.024 (0.003)	-0.026 (0.002)	-0.028 (0.001)
indicator for rural area	-0.867 (0.210)	-1.082 (0.214)	-1.159 (0.244)
share with a child 18 years or younger	-0.023 (0.004)	-0.024 (0.004)	-0.026 (0.003)
share with member over 65 years old	0.007 (0.006)	0.014 (0.007)	0.004 (0.005)
average monthly housing cost	3.418 (0.229)	3.505 (0.193)	3.461 (0.103)
share who are non-white	-0.043 (0.004)	-0.044 (0.004)	-0.043 (0.004)
average household size	0.660 (0.107)	0.682 (0.120)	0.602 (0.113)
share with a mortgage	-0.001 (0.008)	-0.011 (0.010)	-0.040 (0.010)
share moved in 3-5 years ago	0.030 (0.010)	0.030 (0.010)	0.030 (0.010)
share moved in 6-10 years ago	0.046 (0.011)	0.047 (0.010)	0.045 (0.009)
share moved in 11-20 years ago	0.007 (0.011)	0.007 (0.011)	0.010 (0.010)
share moved in 21-30 years ago	-0.030 (0.013)	-0.021 (0.011)	-0.022 (0.011)
share moved in over 30 years ago	0.042 (0.012)	0.059 (0.010)	0.047 (0.011)
constant	-7.521 (0.136)	-7.251 (0.145)	-4.994 (0.264)

Notes: Least squares regressions with standard errors clustered at the county level (see footnote 52). Standard errors are in parentheses. Observations are at the block group level and are weighted by population. For descriptive statistics, see Appendix Table 2

Appendix Table 5

Effect of tax escrow (proxy for nonsalience) on tax rates, year 1980 data
 dependent variable: property tax rate in mils

share mortgage holders with tax escrow	0.033 (0.003)		
share home owners with tax escrow		0.021 (0.005)	
share households with tax escrow			0.024 (0.007)
share households that rent	0.036 (0.006)	0.036 (0.007)	0.028 (0.009)
share mortgages that are FHA/VA	-0.011 (0.003)	-0.011 (0.003)	-0.011 (0.003)
average household income	0.542 (0.058)	0.614 (0.062)	0.640 (0.064)
average household income	-9.99E-03 (1.31E-03)	-1.15E-02 (1.41E-03)	-1.21E-02 (1.50E-03)
average household income	6.42E-05 (1.12E-05)	7.55E-05 (1.25E-05)	8.07E-05 (1.35E-05)
average household income	-1.31E-07 (3.18E-08)	-1.59E-07 (3.61E-08)	-1.72E-07 (3.97E-08)
loan to value ratio	8.725 (1.207)	8.669 (1.218)	8.655 (1.216)
indicator: loan to value in 2nd quartile	-0.576 (0.152)	-0.589 (0.156)	-0.591 (0.156)
indicator: loan to value in 3rd quartile	-0.378 (0.332)	-0.407 (0.336)	-0.420 (0.337)
indicator: loan to value in 4th quartile	0.561 (0.499)	0.541 (0.504)	0.515 (0.506)
average home value	-0.098 (0.010)	-0.106 (0.010)	-0.109 (0.010)
indicator for rural area	-1.920 (0.390)	-2.454 (0.392)	-2.526 (0.380)
share with a child 18 years or younger	-0.066 (0.006)	-0.069 (0.006)	-0.068 (0.007)
share with member over 65 years old	-0.007 (0.006)	-0.011 (0.006)	-0.011 (0.006)
average monthly housing cost	33.632 (3.319)	34.206 (3.298)	34.635 (3.303)
share who are non-white	-0.066 (0.005)	-0.066 (0.005)	-0.065 (0.005)
average household size	1.495 (0.118)	1.453 (0.118)	1.394 (0.118)
share with a mortgage	-0.087 (0.008)	-0.091 (0.010)	-0.084 (0.009)
share moved in 3-5 years ago	0.040 (0.009)	0.040 (0.009)	0.038 (0.009)
share moved in 6-10 years ago	0.070 (0.016)	0.070 (0.016)	0.069 (0.016)
share moved in 11-20 years ago	0.066 (0.019)	0.067 (0.019)	0.068 (0.019)
share moved in 21-30 years ago	0.075 (0.020)	0.085 (0.020)	0.088 (0.020)
share moved in over 30 years ago	0.079 (0.012)	0.080 (0.013)	0.078 (0.013)
constant	-14.625 (1.466)	-13.357 (1.418)	-14.119 (1.467)

Notes: Least squares regressions with standard errors clustered at the county level (see footnote 52). Standard errors are in parentheses. Observations are at the block group level and are weighted by population. For descriptive statistics, see Appendix Table 2.

Appendix Table 6

Determinants of tax escrow status

probit regression results with dependent variable: tax escrow (0/1)

mortgage is subprime	-0.829 (0.087)	-0.884 (0.083)
household income	4.41E-06 (8.70E-07)	4.19E-06 (8.40E-07)
household income squared	-2.11E-11 (5.11E-12)	-2.23E-11 (4.98E-12)
household income cubed	2.87E-17 (8.75E-18)	3.29E-17 (8.57E-18)
household income 4th power	-1.12E-23 (4.16E-24)	-1.36E-23 (4.09E-24)
estimated loan to value ratio	-0.499 (0.270)	1.050 (0.124)
indicator: est loan to value in 1st quartile	-0.102 (0.096)	-0.240 (0.045)
indicator: est loan to value in 2nd quartile	-0.001 (0.074)	-0.171 (0.045)
indicator: est loan to value in 3rd quartile	0.045 (0.058)	-0.069 (0.046)
current home value	-0.001 (0.000)	-0.001 (0.000)
rural area	-0.296 (0.044)	-0.352 (0.042)
household member over 65 years old	-0.071 (0.049)	-0.101 (0.047)
annual housing cost	-1.21E-06 (1.13E-05)	7.14E-06 (1.10E-05)
non-white	0.395 (0.320)	0.395 (0.305)
household size	0.046 (0.032)	0.035 (0.031)
moved in 3-5 years ago	-0.053 (0.043)	0.074 (0.040)
moved in 6-10 years ago	-0.157 (0.045)	-0.009 (0.041)
moved in 11-20 years ago	-0.233 (0.049)	-0.113 (0.045)
moved in 21-30 years ago	-0.156 (0.061)	-0.034 (0.056)
moved in over 30 years ago	-0.176 (0.108)	-0.105 (0.103)
previously owned a home	-0.069 (0.031)	
mortgage insurance	-0.737 (0.039)	
original amount of the mortgage	4.41E-06 (9.26E-07)	
assessed value of property at purchase time	3.04E-07 (3.98E-07)	
current balance on mortgage	-4.39E-06 (7.53E-07)	
current interest rate on mortgage	-0.072 (0.005)	
points on mortgage	0.210 (0.016)	
actual loan to value ratio	0.868 (0.169)	
indicator: loan to value ratio 0.95 or greater	-0.601 (0.050)	
indicator: loan to value ratio 0.80 or smaller	0.284 (0.047)	
constant	0.498 (0.194)	-0.898 (0.158)

Notes: Probit regressions using data on property owners from the Residential Finance Survey 2001. Standard errors are in parentheses. Observations are at the household level.

Appendix Table 7

Correlations between tax escrow residuals and potential determinants of property taxes
 dependent variable: residual from probit regression of tax escrow on Census-type variables

each row shows the results from a separate univariate regression

<u>covariate in the univariate regression</u>	<u>estimated coefficient (standard error)</u>
previously owned a home	-0.024 (0.014)
property is in an economic development area	0.021 (0.091)
owner lives on the property as a <i>primary</i> residence	0.152 (0.122)
property occupied by low income persons (qualifies for low income housing law)	0.053 (0.046)
most people in the neighborhood are age 55+	-0.005 (0.024)
year that the house was built	-0.001 (0.002)

Notes: Least squares regressions using data on property owners from the Residential Finance Survey 2001. Standard errors are in parentheses. Each row shows the result from a separate univariate regression. The dependent variable in each regression is the residual from the probit regression of tax escrow status on Census-type variables. For the specification, see the right-hand column of Appendix Table 3. Observations are at the household level.

Appendix Table 8
Effect of tax salience on the number of property tax limit types
dependent variable: number of property tax limit types (between 1 and 7)

share mortgage holders with tax escrow	-0.041 ^{***} (0.011)		
share home owners with tax escrow		-0.055 ^{***} (0.015)	
share households with tax escrow			-0.061 ^{**} (0.024)
share households that rent	-0.057 (0.037)	-0.046 (0.037)	-0.039 (0.052)
share mortgages that are subprime	0.042 (0.035)	0.038 (0.036)	0.054 (0.035)
share mortgages that are FHA/VA	0.002 (0.013)	0.003 (0.013)	0.003 (0.012)
average household income	-0.190 (0.207)	-0.194 (0.211)	-0.270 (0.200)
average household income	0.003 (0.004)	0.002 (0.004)	0.003 (0.004)
average household income	-6.898e-06 (2.333e-05)	-4.770e-06 (2.363e-05)	-5.566e-06 (2.379e-05)
average household income	-5.462e-09 (4.149e-09)	-9.169e-09 (4.183e-08)	-1.086e-08 (4.299e-08)
loan to value ratio	-0.040 (0.037)	-0.050 (0.037)	-0.068* (0.040)
indicator: loan to value in 2nd quartile	0.715 (1.754)	0.652 (1.754)	0.395 (1.730)
indicator: loan to value in 3rd quartile	-0.670* (0.391)	-0.699* (0.397)	-0.657* (0.379)
indicator: loan to value in 4th quartile	-0.729 (0.535)	-0.751 (0.547)	-0.619 (0.512)
average home value	0.002 (0.614)	-0.077 (0.626)	0.114 (0.563)
indicator for rural area	0.013 (0.013)	0.013 (0.013)	0.020 (0.014)
share with a child 18 years or younger	-0.059 ^{***} (0.011)	-0.055 ^{***} (0.011)	-0.060 ^{***} (0.012)
share with member over 65 years old	0.049 (0.095)	0.049 (0.095)	0.073 (0.097)
average monthly housing cost	-2.152 (2.249)	-1.593 (2.275)	-2.061 (2.476)
share who are non-white	-0.026* (0.015)	-0.024 (0.015)	-0.026 (0.016)
average household size	-0.852 (2.342)	-0.970 (2.337)	-1.235 (2.508)
share with a mortgage	-0.024 (0.037)	0.004 (0.038)	-0.011 (0.044)
share moved in 3-5 years ago	-0.100 (0.100)	-0.099 (0.102)	-0.079 (0.105)
share moved in 6-10 years ago	0.032 (0.064)	0.032 (0.063)	0.019 (0.063)
share moved in 11-20 years ago	-0.168 ^{**} (0.074)	-0.158 ^{**} (0.074)	-0.125 (0.079)
share moved in 21-30 years ago	0.148 (0.097)	0.122 (0.097)	0.089 (0.104)
share moved in over 30 years ago	-0.236 ^{**} (0.090)	-0.243 ^{***} (0.090)	-0.205 ^{**} (0.097)
year fixed effects	yes	yes	yes

Notes: Least squares regressions in which the dependent variable is the number of different types of property tax limiting laws that a state has in effect. Observations are at the state-by-year level and weighted by population. The regression pools observations from 1980, 1990, and 2000. Errors are clustered at the state level and are robust to heteroskedasticity. For descriptive statistics, see Appendix Table 2.

Appendix Table 9

Effect of tax salience on the existence of a binding property tax limit
 dependent variable: indicator for a binding overall limit or
 a specific tax limit on jurisdiction type that primarily raises property taxes

share mortgage holders with tax escrow	-0.008 (0.005)		
share home owners with tax escrow		-0.011 (0.007)	
share households with tax escrow			-0.017** (0.008)
share households that rent	0.017 (0.015)	0.019 (0.015)	0.019 (0.013)
share mortgages that are subprime	-0.004 (0.015)	-0.005 (0.015)	-0.002 (0.015)
share mortgages that are FHA/VA	0.001 (0.008)	0.001 (0.007)	0.001 (0.007)
average household income	-0.034 (0.063)	-0.033 (0.063)	-0.044 (0.060)
average household income	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
average household income	7.400e-06 (7.073e-06)	7.842e-06 (7.073e-06)	8.164e-06 (6.963e-06)
average household income	-1.329e-08 (1.360e-08)	-1.403e-08 (1.354e-08)	-1.515e-08 (1.336e-08)
loan to value ratio	-0.006 (0.013)	-0.008 (0.013)	-0.016 (0.013)
indicator: loan to value in 2nd quartile	-0.194 (0.556)	-0.202 (0.557)	-0.233 (0.550)
indicator: loan to value in 3rd quartile	-0.426*** (0.149)	-0.431*** (0.147)	-0.424*** (0.145)
indicator: loan to value in 4th quartile	-0.740*** (0.187)	-0.747*** (0.185)	-0.737*** (0.183)
average home value	-0.832*** (0.225)	-0.849*** (0.222)	-0.825*** (0.224)
indicator for rural area	-0.006 (0.004)	-0.007 (0.005)	-0.006 (0.004)
share with a child 18 years or younger	-0.009 (0.007)	-0.008 (0.007)	-0.010 (0.007)
share with member over 65 years old	-0.057 (0.036)	-0.057 (0.036)	-0.054 (0.034)
average monthly housing cost	1.749** (0.830)	1.870** (0.879)	1.933** (0.833)
share who are non-white	0.009 (0.008)	0.009 (0.008)	0.009 (0.008)
average household size	0.779 (0.885)	0.758 (0.889)	0.695 (0.837)
share with a mortgage	0.010 (0.014)	0.015 (0.014)	0.014 (0.012)
share moved in 3-5 years ago	0.079 (0.049)	0.079 (0.050)	0.079 (0.049)
share moved in 6-10 years ago	0.050* (0.025)	0.050* (0.026)	0.047* (0.025)
share moved in 11-20 years ago	0.058** (0.027)	0.059** (0.028)	0.060** (0.026)
share moved in 21-30 years ago	-0.017 (0.043)	-0.022 (0.042)	-0.029 (0.041)
share moved in over 30 years ago	0.071 (0.052)	0.069 (0.054)	0.072 (0.051)
year fixed effects		yes	yes

Notes: Linear probability (least squares) regressions in which the dependent variable is the number of different types of property tax limiting laws that a state has in effect. Observations are at the state-by-year level and weighted by population. The regression pools observations from 1980, 1990, and 2000. Errors are clustered at the state level and are robust to heteroskedasticity. For descriptive statistics, see Appendix Table 2.