Property Taxes and Elderly Mobility

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Abstract

The 2000-05 housing market boom in the U.S. has caused sharp increases in residential property taxes. Housing-rich but income-poor elderly homeowners often complain about rising tax burdens, and anecdotal evidence suggests that some move to reduce their tax burden. There has been little systematic analysis, however, of the link between property tax levels and the mobility rate of elderly homeowners. This paper investigates this link using household-level panel data from the Health and Retirement Study (HRS) and a newly collected data set on state-provided property tax relief programs. These relief programs generate variation in effective property tax burdens that is not due solely to arguably endogenous local community choices about taxes and expenditure programs. The findings provide evidence suggesting that higher property taxes raise mobility among elderly homeowners. The point estimates from instrumental variable estimation using relief programs to generate instruments suggest that a $100 increase in annual property taxes is associated with a 0.73 percentage point increase in the two-year mobility rate for homeowners over the age of 50. This is an eight percent increase from the baseline two-year mobility rate of nine percent. These results are robust to alternative specifications.

Keywords: Property tax, Elderly mobility, Property tax relief program
JEL classification: H31, H71, R21

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1 Introduction

During the late 1990s and early 2000s, the housing market in the United States experienced a remarkable boom. As housing prices increased, property taxes rose significantly in many parts of the country. Increases in property taxes have drawn attention from both the general public and policy makers. For example, in February 2006, the Wall Street Journal reported "Across U.S., Rising Property Taxes Spark Revolts," and the New York Times wrote "As Property Values Rise, Homeowners Feel Pinch." The New York state government considered a $6 billion property tax cut over three years, and Texas issued a $14.2 billion property tax cut for the biennium. The public and politicians were particularly concerned that elderly homeowners living on fixed incomes would be driven out of their homes because they could no longer afford increasing property taxes. One of the heatedly debated issues during the 2006 midterm election across the country was how to provide property tax relief to elderly homeowners.

Property taxes may affect elderly homeowners' moving decisions through liquidity constraints. Elderly homeowners typically rely on fixed incomes such as Social Security benefits and pension benefits, and many of them do not have sufficient liquid assets. As a result, rising property taxes may cause elderly homeowners to be liquidity constrained. Anecdotal evidence suggests that many elderly homeowner have great psychological attachment to their houses and would prefer not to move as long as they can afford it. Significant increases in property taxes, however, may cause elderly homeowners to liquidate their housing wealth, even if they value their homes more than the marginal buyer in the local housing market. In this case, providing property tax relief to these liquidity-constrained elderly homeowners and preventing unwanted moves may be welfare-enhancing. News articles and political debates often refer to liquidity constraints as the base for policy interventions that protect elderly homeowners from rising property taxes.

Alternatively, increasing property taxes may raise mobility rates among elderly homeowners through demand adjustments. Elderly homeowners usually do not have school-aged children living in the house and do not consume school services. Given that half of property tax revenues are used to finance public schools, elderly homeowners may find that the local public services that they receive are not worth the costs. In response, they may decide to adjust their housing consumption bundles and relocate to areas with both fewer public services and lower property taxes. This demand adjustment channel has important implications to state and local fiscal policies. Precisely because elderly homeowners consume fewer public services but expand state and local tax base, they are attractive to state and local governments except when they reach the end of their lives and demand expensive medical care services through Medicaid. For example, Longino and Crown (1989) call the elderly "pure gold," and Mackey and Carter (1994) discuss wide varieties of tax preferences provided by state and local governments to entice elderly homeowners. Estimates of the elasticity of elderly mobility with respect to property taxes will help state and local government design fiscal policies that retain and attract elderly homeowners in their jurisdictions.

Apart from its policy significance, studying property taxes' effect on elderly mobility is also of great economic importance. First, it will provide insights to the incidence question of property taxation. As summarized by Zodrow (2001), the traditional view suggests that property taxes are distortionary and the burden is borne entirely by homeowners. The benefit view, in contrast, argues that property taxes are non-distortionary because they simply pay for the local public services demanded by residents. If we find empirical evidence suggesting that rising property taxes have a large effect on elderly homeowners' moving decisions, then it is unlikely that increases in property taxes are driven by elderly homeowners' demand for more and better local public services.

Second, studying the property tax effect on elderly mobility will enhance our under-

standing of the life-cycle housing consumption model. The simplest version of the life-cycle model, which assumes away capital market imperfection, transaction costs, bequest motives, and uncertainty, predicts that utility-maximizing agents accumulate wealth while working and deplete wealth after retirement. If elderly homeowners view their housing wealth as a part of retirement savings to be used for general consumption, then we would expect elderly homeowners to trade down and consume their housing wealth after retirement. However, studies including Feinstein and McFadden (1989) and Venti and Wise (1989, 1990, 2001) find little evidence of downsizing behavior among elderly homeowners in the absence of precipitating shocks such as health decline and loss of spouse. Because residential mobility is directly linked to housing consumption adjustment and downsizing decisions, studying how factors such as property taxes affect elderly mobility may help us build richer models to describe household life-cycle saving and consumption patterns.

Although policy makers have assumed that rising property taxes cause elderly homeowners to move, researchers have provided little empirical evidence of such a link. The empirical question whether property taxes cause elderly homeowners to move is difficult to address for two reasons. First, reliable household-level measures of property tax payments and mobility outcomes are scarce. Hence, many earlier studies use aggregated measures such as property tax per capita and state to state or county to county migration flows. These studies include Cebula (1974), Clark and Hunter (1992), Dresher (1994), Conway and Houtenville(2001), and Duncombe et al. (2000). Second, property taxes are likely to be endogenous to individuals' moving decisions. For example, many local public services are financed through property taxes. Hence, homeowners who pay high property taxes also tend to live in areas with good local public services (e.g. nice parks, low crime rates, and new senior centers). Because the quality and quantity of local public services may be correlated with mobility outcomes and because econometricians cannot measure all aspects of these local public services, studies that fail to instrument for property taxes often suffer from

omitted variable bias.

In this paper, I use the 1992 to 2004 waves of the Health and Retirement Survey (HRS) panel data. This data set has household-level measures of property tax payments and mobility outcomes in addition to extensive information on demographics and socio-economic characteristics. To address the endogeneity problem associated with property taxes, I exploit the variation in state-provided property tax relief programs and use simulated relief benefits to instrument for property tax payments. By construction, these simulated relief benefits contain only the variation in program rules and depend exclusively on state of residence, year, and age of homeowners. More generous relief programs reduce property tax payments of eligible homeowners, and these state-provided programs are arguably exogenous to individual homeowners' unobserved tendency to move. Therefore, property tax relief benefits can be used as a valid instrument for property taxes in studying elderly mobility.

I find that higher property taxes have a significant impact on elderly homeowners' moving decisions. My central instrumental variable estimates suggest that a $100 increase in annual property taxes causes the two-year mobility rate to increase by 0.73 percentage points, which represents an eight percent increase from a baseline two-year mobility rate of nine percent. The results are robust to alternative model specifications. In addition, I find that elderly homeowners respond to rising property taxes by moving to houses with lower property taxes, less expensive houses, and houses with lower effective tax rates. Because of the specific instruments used in this paper, these estimates provide an upper bound of the property tax effect on elderly mobility. They may not be generalized to the average elderly homeowner. Nevertheless, this paper's findings offer indispensable evidence for normative welfare analysis of the impact of property taxes and property tax relief programs on elderly homeowners.

This paper proceeds as follows: the next section outlines the background and reviews

previous research on property taxes and elderly mobility. Section 3 then describes the data used in this paper. In section 4, I explain the empirical strategy that I use to identify the effect of property taxes on elderly mobility. I also show estimation results with robustness checks. The last section concludes and provides directions for future research.

2 Background and Previous Research

Property taxes vary considerably across geographic areas. Much of this variation is due to the variation in local public goods financed through property taxes. The Tiebout hypothesis argues that if moving is costless and if there are a large number of neighborhoods with different tax-service combinations, then every household would always live in their desired neighborhood. Elderly homeowners living in high property tax areas simply enjoy more and better local public services that they value. In reality, however, moving is costly and households do not constantly adjust their housing consumption bundles. Elderly homeowners who moved in a high property tax area twenty years ago no longer benefit from the good public schools as their children have grown up and moved out of the house. Therefore, they may relocate to low-tax and low-service areas in response to higher property taxes.

Economists have long recognized that after one controls for all local characteristics such as public services and local amenities, property taxes should be capitalized into house prices. Studies including Palmon and Smith (1998) and de Bartolomé and Stuart Rosenthal (1999) find compelling empirical evidence of substantial property tax capitalization. However, even full capitalization cannot ensure that property taxes have no impact on elderly homeowners' moving decisions. For example, if elderly homeowners facing higher property tax are more likely to become liquidity constrained, then they would have to move to smaller houses with lower property taxes.

In 2004, property tax collections in the U.S. exceeded $300 billion. Property taxes are responsible for approximately 72% of all local tax revenues, representing the most important tax revenue source for local governments.[1] The housing market boom of the late 1990s and early 2000s led to significant increases in residential property taxes. Figure 1 shows that from 2000 to 2005, median house values rose by nearly 50% in real terms and median property tax payments by homeowners increased by 30%.[2]

Rising property taxes may be particularly burdensome to elderly homeowners. Elderly homeowners tend to be housing-rich but income-poor, which may make them vulnerable to increases in property taxes. For example, according to the 2004 Survey of Consumer Finances (SCF) data, 15% of elderly homeowners have a house-value-to-income ratio of at least 10, while only 4% of non-elderly homeowners have such high house-value-to-income ratios. 13% of elderly homeowners pay more than 10% of household income for property taxes, while only 6% of non-elderly homeowners do so. In addition, for 21% of elderly homeowners, annual property tax payments represent at least 10% of their total financial wealth.

A few papers investigate property taxes and elderly mobility using household-level panel data. The studies closest to this paper are Farnham and Sevak (2006) and Seslen (2005). The former study is a test of a life-cycle Tiebout model using the 1992-2000 HRS data and local fiscal data. It finds that cross-state, empty-nest movers experience reduced exposure to local school spending and property taxes. Although their study examines both property taxes and elderly mobility, Farnham and Sevak (2006) address the question from a different angle than the current study. Their study focuses on testing whether property tax payments decline after an elderly homeowner makes a move, whereas my study asks whether

[1] See Bradley (2005) and NCSL (2005).

[2] A number of factors could have contributed to the increase in residential property tax payments, including unfunded federal mandates, reduction in state aid to local governments, changes in the cost of providing local public services, and relative appreciation rates of residential versus non-residential properties. Although interesting in its own right, it is beyond the scope of this paper to determine which factors explain the property tax increases the most.

rising property taxes induce elderly homeowners to move.

Seslen (2005) examines the effect of property taxes on elderly homeowners' downsizing decisions in a competing risk framework. Using the Retirement History Survey from 1969 to 1979, she finds little evidence that property taxes affect elderly homeowners' decisions to move or to liquidate their housing wealth. Thus, she concludes that property tax relief programs are likely to solely transfer resources to the wealthy without achieving the goal of protecting the needy. Although Seslen (2005) employs sophisticated econometric tools, the data she studies were collected about 30 years ago, and they may not bear relevance on the current situation. Moreover, both Seslen (2005) and Farnham and Sevak (2006) ignore the potential endogeneity problem where some unobserved factor may drive both property tax payments and mobility decisions.

This paper advances the prior literature in several ways. First, the panel structure of the HRS data allows me to look at the dynamic relationship between the last period's property tax payments and the next period's mobility outcomes, which is impossible to do with cross-sectional data. Second, during my sample period, the United States experienced significant increases in property taxes. This trend of rising property taxes provides useful variations to study the effect of property taxes on elderly homeowners' moving decisions. Third, I obtained access to the HRS restricted geographic identifiers and collected data on state-provided property tax relief programs for the sample period. With these data, I am able to address the potential endogeneity problem using instrumental variable approaches. To my knowledge, this is the first study to examine the causal effect of property taxes on elderly mobility at the national level. The innovations in both data and estimation methodology allow this paper to present more compelling evidence than currently exists.

3 Data

3.1 HRS Household Level Panel Data

The Health and Retirement Study (HRS) is biannual panel data of the elderly and near-elderly in the United States. This paper uses the seven waves of the survey from 1992 through 2004. The HRS includes households from four different cohorts.[3] The original HRS cohort consists of individuals born between 1931 and 1941. They appear in all seven waves of my sample. The AHEAD cohort (born before 1924) was interviewed in 1993 first and then in 1995. Since 1998, the AHEAD cohort has been biannually interviewed, concurrent with the HRS cohort. In 1998, two other cohorts were added to the sample: the "Children of the Depression" (CODA) cohort (born between 1924 and 1930), and the "War Baby" (WB) cohort (born between 1942 and 1947). Hence, these two cohorts appear only in the last four waves (1998-2004) in my sample.

In addition to the publicly available HRS data, I obtained restricted access to household level geographic identifiers. These identifiers allow me to identify the state of residence for each household at the time of each survey interview. The state identifier is crucial in my analysis because it links households with the state-provided property tax relief programs that they are eligible for. Because of the ambiguity associated with mobility for people living in mobile homes, I exclude them from my analysis. I also exclude people living on farms and ranches from my sample, as these properties may be treated as agricultural rather than residential for property tax purposes. Households residing in mobile homes or on farms and ranches combined constitute around 10 percent of the entire HRS sample. In addition, I drop individuals who are newly separated or divorced because mobility becomes complicated for

[3] In 2004, a fifth cohort, Early Boomers (born between 1948 and 1953), was added to the HRS. Because households in this cohort have only been interviewed once and I need at least two adjacent surveys to study whether the last period's property taxes affect mobility in the next period, I exclude them from my analysis.

these households. Newly separated and divorced homeowners represent less than 1 percent of the sample.

Except for the very first survey conducted on each household, every subsequent survey asks respondents whether they have moved since their last survey interview. I use respondents' answers as my mobility measure. I contacted HRS staff to confirm that this mobility measure is a valid and consistent measure across waves. Panel A of Table 1 displays the two-year mobility rates of the HRS cohort households from 1992 to 2004. In earlier years when those respondents were relatively young, their two-year moving probability was around 7%. Toward the end of the panel, the probability increases to 12%. In contrast, the average one-year mobility rate among homeowners of age below 65 is about 10% during the 1990s and early 2000s.[4] Panel B of Table 1 shows that homeownership rates of HRS cohort households stayed steady at around 80% during the 12-year sample period. Panel C of Table 1 presents a tenure transition matrix for all moves made by HRS cohort households between 1992 and 2004. Over 80% of homeowners remained homeowners after they relocated, and 70% of renters stayed renters after they moved. In summary, Table 1 shows evidence consistent with the conclusion drawn by Venti and Wise (2001) that mobility rates among elderly homeowners are low, and that elderly homeowners do not seem to trade down and consume their housing wealth in the absence of precipitating shocks.

In all seven waves, respondents were requested to report the amount of property taxes paid on their primary residence during the past year. I assume the self-reported property tax payments are the actual payments *after* all relevant exemptions, rebates or refunds provided by relief programs have been applied. Such an assumption is crucial for my IV strategy, as the first-stage relies on higher relief benefits correlating with lower property tax payments. For programs where participation is automatic and property tax bills are

[4]Author's estimate using the Panel Study of Income Dynamics (PSID) data.

mailed to homeowners after benefits have been netted out, this assumption seems justified. For programs where homeowners receive rebate checks soon after paying property taxes, it is unclear whether respondents would report their before-relief property tax payments or after-relief property tax payments.

For programs that are implemented by state personal income tax credits, however, respondents are likely to report their before-relief benefits for two reasons. First, relief benefits are usually received long after homeowners have paid their property taxes. Second, property tax relief benefits may appear less salient on state personal income tax returns. For example, filers may view property tax credits that they claim against income tax liabilities as *income tax* relief benefits rather than *property tax* relief benefits. Recent studies including Chetty, Looney and Kroft (2009) and Finkelstein (2009) suggest that tax salience could have a significant impact on behavior. Regression results shown in an earlier version of this paper suggest that the first-stage relationship does not hold for observations in states that implement their property tax relief programs using income tax credit. In other words, respondents in these states do not report lower property tax payments when they are eligible for more generous relief benefits. To ensure that I have a strong and precisely estimated first-stage, I exclude in my main regression analysis states where relief benefits are granted by tax credits on state personal income tax returns.[5] The dropped observations represent about 25% of the sample.[6]

Table 2 presents the summary statistics of demographic and socio-economic variables. Note that only about 17% of moves in the sample are cross-state moves, which

[5]These states are District of Columbia, Massachusetts, Michigan, Missouri, Montana, New Jersey, New Mexico, New York, Oklahoma, Rhode Island, Vermont, and Wisconsin. I do not exclude states that use rebate checks to implement relief programs because the sample size would drop significantly and asymptotic theory no longer applies when there are only a few states left in the sample and standard errors are clustered at the state level.

[6]The average two-year mobility rates in these dropped states are not economically or statistically different from those in the analysis sample.

implies a 3.8% five-year cross-state mobility rate (i.e. $9 \times 0.17 \times (5/2) = 3.8$). This rate is very similar to what other studies on elderly migration find.[7] Given that the majority of moves are within-state relocations, results produced by studies focusing on cross-state mobilities could be misleading.

3.2 Data on Property Tax Relief Programs

3.2.1 Background on Property Tax Relief Programs

As of 2005, all 50 states and District of Columbia have some form of property tax relief programs for homeowners, especially for low-income and elderly homeowners. Many of these programs were first established well before my sample period started.[8] Broadly speaking, there are four categories of relief programs. The first includes *Homestead Exemptions and Credits*. This is the most widely used form of property tax relief. Homestead exemption programs usually reduce assessed property value by a certain amount.[9] Homestead credit programs either refund a certain percentage of taxes due or provide a fixed credit to qualifying homeowners.[10] These homestead exemption and credit programs usually require homeowners to file an application with local property tax authorities.

The second category is *Circuit-Breakers*. Some of these programs are for homeowners only, and others are for homeowners as well as renters. Since these programs are designed

[7] Woo (2005) states that the five-year cross-state mobility rate among elderly homeowners is 4.2% in the Census data and 4.0% in the Current Population Survey data.

[8] Homestead exemptions are believed to be a by-product of the Great Depression of the 1930s. Circuit-breakers were first legislated in the 1960s and 1970s. Limits were put in place in the late 1970s and early 1980s when high inflation rates caused nominal property tax bills to rise precipitously and eventually resulted in property tax revolts.

[9] For example, a homeowner of age 65 or above in Kentucky was allowed to exclude $29,400 from the assessed value of his main residence for property tax purposes in 2005.

[10] For example, Massachusetts state statue Clause 17D and 41C grant a $175 homestead credit and a $500 homestead credit respectively to homeowners of age 70 or above who satisfy certain income, assets, and residence requirements.

to help people who need assistance, benefits are typically a decreasing function of income. Circuit-breaker programs can work either on a sliding scale or through a threshold mechanism. For example, the District of Columbia has a circuit-breaker program where homeowners whose income is $20,000 or less can receive up to a $750 tax credit using a threshold mechanism. In 2007, Idaho's circuit-breaker program refunded up to $1320 for homeowners of age 65 or above with income below $28,000 using a sliding scale mechanism.[11]

The third category is *Property Tax Deferral Programs*. These programs allow qualified homeowners, typically low-income elderly homeowners, to defer property tax payments at a low interest rate. These deferred payments essentially become a lien against the taxpayer's house. When the homeowner sells the house or dies, deferred taxes must be paid when the estate is settled. Deferral programs are considered by academics the most targeted and cost-effective way of providing property tax relief. Nevertheless, very few qualified homeowners take up such programs in practice. Anecdotal evidence suggests that elderly homeowners are reluctant to put a lien on their houses. This is consistent with the observation that very few elderly homeowners purchase reverse mortgages in the United States.

The last broad category is *Property Tax Limits*. Property tax limits include rate limits, assessment limits, revenue rollbacks, expenditure limits, and property tax freezes. Depending on the state, any one or a combination of the above limits can be used. Proposition 13 in California and Proposition 2.5 in Massachusetts are among the most prominent examples of property tax limits. Although almost all states have property tax limits of one kind or another, many of these programs do not guarantee that individual homeowners' property tax bills will not go up significantly from year to year. Property taxes are the product of taxable values and tax rates. Therefore, the amount of property taxes homeown-

[11]The key difference between homestead credit programs and circuit-breakers is that although homestead credit programs may use income as a qualification criterion, their benefit levels do not vary with income. In contrast, benefits are explicitly a decreasing function of income for circuit-breakers. For this reason, circuit-breakers are considered better targeted at low and moderate-income individuals.

ers pay will be limited only when both assessment values and tax rates are limited. Rate limits or assessment limits alone are insufficient in curbing property tax growth. Moreover, states usually allow for override and bonded indebtedness so that local governments can still increase property taxes with voters' approval. For example, if non-elderly homeowners want to spend more on schools, they may approve an override, in which event the elderly will face rising property taxes. This paper considers two kinds of limits that apply to individual homeowners: "assessment value freezes" and "property tax freezes."[12]

Participation rates of property tax relief programs vary substantially across states and programs. In the mid-1990s, the American Association of Retired Persons (AARP) obtained program participation data from various state administering offices and estimated participation rates for these programs.[13] The median estimated participation rate among the eligible is the highest for homestead exemptions – around 90%. In contrast, the median estimated participation rate is only about 40% for homestead credits and circuit-breakers, and less than 1% for deferral programs. It is puzzling why participation rates for homestead credits and circuit-breakers are so low among elderly households. Some have suggested that social stigma and program complexity may play a role.[14]

Since state-provided property tax relief programs are extremely complicated and vary significantly across states, I choose to focus on three types of relief programs in this paper.[15] The first type includes homestead exemptions, homestead credits, and circuit-breakers. Relief benefits from these programs can be quantified for individual homeowners.

[12]For example, in Illinois, homeowners of age 65 and older with income less than $40,000 may receive a freeze on their equalized assessed real property value. In Texas, school property taxes do not increase once a homeowner reaches age 65. The former is an assessment value freeze and the latter is a property tax freeze.

[13]See Baer (1998).

[14]See ACIR (1975).

[15]I do not consider programs that provide exactly the same amount of benefits to everyone because of the lack of within-state variation. Deferral programs are ignored because participation rates are too low. Limits that affect a jurisdiction but not necessarily individual homeowners are not considered. I also exclude local option programs that vary across localities within a state due to data collection difficulties.

The second and the third types refer to assessment value freezes and property tax freezes, respectively. For these two types, it is difficult to quantify the benefits for individual homeowners. Such benefits depend upon when the homeowner applied for the freeze program and the assessment value or property tax payments at the time of application. Hence, I use dummy variables to indicate whether a homeowner is eligible for "assessment value freezes" or "property tax freezes." Note that all three types of relief programs need to be considered when evaluating how generous a state is in providing property tax reliefs since one state may have more than one type of relief programs.

3.2.2 Data Collection on Property Tax Relief Programs

First, I collected descriptive information from a range of publications by the U.S. Advisory Commission on Intergovernmental Relations (ACIR), the American Association of Retired Persons (AARP) and the National Conference of State Legislatures (NCSL) from 1990 to 2005. Then I compiled and organized such information by state and year. In my effort to confirm changes in these state programs over years and to resolve inconsistencies reported in various ACIR, AARP, and NCSL publications, I read state statutes that define these programs in legal terms. I searched for historical local news on property tax relief program changes. I studied program application forms, homeowners' brochures, and Q&As on state and local government websites. I contacted Connecticut, Delaware, Georgia, Florida, Hawaii, Illinois, Indiana, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Nevada, New Jersey, North Dakota, Texas, Utah, Virginia, and Wyoming state and local governments for further explanation and confirmation of program details.

After obtaining accurate program descriptions, I calculated eligible benefits as a function of state of residence, year, age, income, house value, Social Security income, marital status, household size, and wealth. This calculation generates three output variables:

the amount of benefits from homestead exemption, homestead credit, and circuit-breaker programs that a homeowner is eligible for (B1), whether a homeowner is eligible for an "assessment value freeze" program (B2), and whether a homeowner is eligible for a "property tax freeze" program (B3). These three output parameters can be calculated for any homeowner in the U.S. in any year between 1990 and 2004.

To illustrate how I calculate relief benefits, I show in Table 3 formulas for B1 in year 2000 – benefits from homestead exemption, homestead credit, and circuit-breaker programs – in the ten states with the most observations in my sample. The amount of benefits are calculated for a hypothetical married homeowner of age 65 with an annual total household income of $20,000, Social Security income of $10,000, and house value of $100,000. The calculated B1 for this hypothetical homeowner varies from zero in Pennsylvania to $1,000 in New Jersey. The formulas shown in Table 3 suggest that eligible benefits vary considerably across states, and they are sensitive to individual characteristics such as income and house value.

4 Empirical Strategy and Results

In this section, I present the empirical models and estimation results in studying the effect of property taxes on elderly mobility. Specifically, I first use property tax relief benefits as instruments to obtain IV estimates in a linear probability model. Then I test the robustness of the estimation results by using various sub-samples and alternative model specifications. I also examine whether rising property taxes induce elderly homeowners to move to houses with lower property taxes, less expensive houses, and houses with lower effective tax rates.

4.1 OLS and 2SLS

To investigate whether property taxes have an impact on elderly mobility, I start with the following linear probability model:[16]

$$Move_{ist} = \beta Tax_{ist} + \mathbf{X}_{ist}\mathbf{\Pi} + \zeta_s + \delta_t + \epsilon_{ist} \tag{1}$$

where $Move_{ist}$ is a binary indicator for whether household i in state s moved between time t and $t+1$, ζ_s denotes state fixed effects, δ_t denotes year fixed effects, and the covariate vector $\mathbf{X}_{ist}$ includes income quintile indicators, house value quintile indicators, gender, race, household size, number of living children, whether married, whether newly widowed, level of education (i.e. less than high school, high school graduates, some college, and college graduates), whether currently working, whether newly retired, whether spouse is currently working, whether spouse is newly retired, whether hospitalized between the last interview and the current interview,[17] and age dummies. The key variable of interest in equation (1) is Tax_{ist}, property tax payments by household i in state s at time t. If higher property taxes cause elderly homeowners to move, then we expect β to be positive.

Column (1) of Table 4 displays the OLS estimation results of equation (1). The estimated coefficient on property taxes is positive but insignificant both statistically and economically. The magnitude suggests that a $100 increase in annual property tax payments is associated with a mere 0.0065 percentage points increase in two-year mobility rates. It is unsurprising that the OLS estimate of β is small and insignificant, since property taxes are likely to be endogenous to elderly homeowners' moving decisions. For instance, if higher property taxes means better local public services and if mobility rates are lower in areas

[16] I use a linear probability model here for the ease of estimation and interpretation. Results shown later in this paper suggest that nonlinear models such as probit and logit generate similar estimates.

[17] For the first wave in 1992, HRS asked whether the individual was hospitalized in the past year. From the second wave on, HRS asked whether the individual was hospitalized since the last interview.

with good local public services, then we may observe homeowners who pay higher property taxes are less likely to move than homeowners who pay lower property taxes. Thus, omitted variables such as the quality and quantity of local public services would bias the OLS estimates. An appropriate instrumental variable strategy has to be used to address such an endogeneity problem and to generate a consistent estimate of β.

Since eligibility for higher relief benefits means lower property tax payments, one potential candidate as an instrument for property taxes is eligible benefits for property tax relief programs. Recall that my property tax relief program benefit calculator imputes three variables for each household in each survey year: B1 (i.e. the amount of eligible benefits from homestead exemptions, homestead credits, and circuit-breakers), B2 (i.e. whether eligible for assessment value freeze programs), and B3 (i.e. whether eligible for tax freeze programs). As explained before, it is important to use all three variables to measure how generous a state's property tax relief programs are, because one state may have more than one type of relief programs. For example, some states provide most of property tax relief benefits through circuit-breakers, whereas others may rely heavily on freeze programs. Using only B1 as the measure of relief benefits would make the circuit-breaker states appear more generous than the freeze-program states. Therefore, using all three measures captures the overall variation in state-provided property tax relief programs and improves estimation efficiency.

Property tax relief benefits are nonlinear functions of state, age, year, household income, house value, marital status, Social Security benefits, pension benefits, household size, and total assets. To the extent that some of these factors influences elderly homeowners' moving decisions through channels other than property taxes, B1, B2, and B3 would correlate with both property taxes and unobserved moving tendencies, and hence, would violate the exclusion restriction. For example, homeowners who receive high Social Security benefits and pension benefits may have strong ties with local labor markets, which reduces their moving

probabilities. In other words, B1, B2, and B3 have two sources of variation: the variation caused by relief program rules and the variation stemming from individual characteristics. The latter source of variation may be endogenous and bias the estimate of β. To deal with such an endogeneity problem, I use a simulated IV approach.[18]

To simulate program generosity in state s in year t for homeowners of age a, I take the national sample of homeowners of age a who responded to HRS in year t and run them through state s's relief programs. The average eligible benefits for these homeowners becomes the simulated measure of program generosity for state s in year t for homeowners of age a. In essence, I measure state program generosity using a nationally representative sample that does not correlate with any individual homeowner's characteristics, but only with the exogenous policy variation in state, age, and year. Expressed in equations, the simulated benefits – $\hat{\text{B}}1$, $\hat{\text{B}}2$, and $\hat{\text{B}}3$ – are constructed as follows:

$$\hat{\text{B}}_{ist} = \frac{\sum_{k \neq i} \mathbf{F}_{st}(W_{kt}, Z_{kt}) \mathbf{1}(Z_{kt} = Z_{it})}{\sum_{k \neq i} \mathbf{1}(Z_{kt} = Z_{it})} \tag{2}$$

where Z_{kt} is the age of individual k at time t. W_{kt} consists of other relief program eligibility determinants, some of which may be endogenous. $\mathbf{F}_{st}(\cdot)$ is the benefit formula specific to state s at time t. $\mathbf{1}(\cdot)$ is a binary function that returns one if the statement in the parentheses is true and zero otherwise. The above equation takes everyone in the national sample who shares the same age as individual i at time t, calculates their eligible benefits assuming that they all live in state s where individual i lives, and averages the calculated benefits across all of these individuals. To improve small sample properties, I exclude individual i when

[18]The idea of simulated IV can be dated back to Hausman and Wise (1976), Rosen (1976), and Hausman (1981) in labor supply studies. Currie and Gruber (1996a, 1996b) and Cutler and Gruber (1996) build on this idea and name it the "simulated IV approach". Since then, this empirical strategy has become increasingly popular among empirical studies. Hoxby and Kuziemko (2004) and Engelhardt and Kumar (2007) are recent applications of the simulated IV approach.

calculating $\hat{B}_{ist}$.

To demonstrate that the simulated benefit measures, $\hat{B1}$, $\hat{B2}$, and $\hat{B3}$, are net of the variation due to individual homeowners' characteristics, I compare in Figure 2 the conditional averages of B1 (i.e. the eligible benefits calculated using individual characteristics) with $\hat{B1}$ (i.e. the simulated benefits) by income and house-value quintiles. Because homestead exemptions, homestead credits, and circuit-breakers tend to provide more relief to homeowners with low income and high property taxes, the conditional averages of B1 decrease monotonically with income and increase monotonically with house values. In contrast, the conditional averages of $\hat{B1}$ remain mostly unchanged across income and house-value quintiles, suggesting that the simulated benefit measures are rid of variations stemming from individual characteristics.

In addition to removing variations stemming from individual characteristics, the simulated benefits are also parsimonious measures of generosity for complex property tax relief programs. Even though specific programs and elderly homeowners may differ on multiple dimensions across states, $\hat{B1}$, $\hat{B2}$, and $\hat{B3}$ are calculated using a nationally representative sample. Thus, they become generosity indexes for property tax relief programs. Figure 3 shows the averages of $\hat{B1}$ by state. It summarizes how generous each state is in providing homestead exemptions, homestead credits, and circuit-breakers during the 1992-2004 sample period.

To identify the effect of property taxes on elderly mobility, the simulated benefits need to contain sufficient variation across state, age, and year. Figure 4 shows the variation in $\hat{B1}$ by state, age, and year. I divided the 36 states analyzed in the regression sample into three groups based on how generous their homestead exemption, homestead credit, and circuit-breaker programs are. Then I plotted the average $\hat{B1}$ by survey wave for these three state groups for individuals aged 50-59, 60-69, and over 70 respectively. The patterns

displayed in Figure 4 suggest that program generosity varies substantially across states, age, and year. These variations are essential in identifying the property tax effect on elderly mobility.

The identification assumption here is that relief programs affect elderly mobility rates only by reducing property taxes. By construction, the simulated benefits contain only the variation in program rules and depend exclusively on state, age, and year. To the extent that these relief programs are not correlated with elderly homeowners' moving decisions through channels other than property taxes, the exclusion restriction is satisfied and $\hat{\text{B}}1$, $\hat{\text{B}}2$, and $\hat{\text{B}}3$ are valid instruments. In implementing the IV strategy, I cluster the standard errors at the state level for all regressions in this paper, because state-provided property tax relief programs are the source of identifying variation.[19]

Column (2) of Table 4 shows the first-stage estimation results. As expected, the coefficients on the three instruments are all negative and statistically significant, meaning that more generous relief programs are correlated with lower property tax payments. For example, being eligible for assessment value freeze programs reduces annual property tax payments by \$172. Being eligible for tax freeze programs reduces annual property tax payments by \$456. The first-stage F-statastic is 64 and the concentration parameter is 189. Stock, Wright and Yogo (2002) suggest that the rule of thumb for detecting weak instruments is to check whether the first-stage F-statistic exceeds 10. Hansen, Hausman and Newey (2009) conclude that a concentration parameter of 30 or above suggests that there is no weak instruments problem. By either standard, $\hat{\text{B}}1$, $\hat{\text{B}}2$, and $\hat{\text{B}}3$ are strong instruments for Tax_{ist}.

[19]To be precise, there are two sources of correlation among observations in the data: the correlation among observations of the same household over time and the correlation among different households in the same state. Because some households move across state borders, the standard errors need to be clustered at both the household and the state level. In practice, the standard errors estimated using the two-way clustering method introduced by Colin, Gelbach and Miller (2007) turn out to be almost identical to the standard errors clustered only at the state level. For computational ease, I clustered the standard errors only at the state level.

Column (3) of Table 4 presents the 2SLS estimation results. The estimated effect of property taxes is both statistically and economically significant. The point estimate suggests that a $100 increase in annual property tax payments induces the two-year mobility rate to increase by 0.73 percentage points. Given that the baseline two-year mobility rate among elderly homeowners is 9%, the 2SLS estimate implies that a $100 increase in annual property taxes induces mobility to rise by 8 percent. Since I have one endogenous variable and three instruments, I was able to perform an overidentification test and obtained a p-value of 0.88. This test outcome suggests that the null hypothesis that the instruments are valid cannot be rejected.

Note that I use all three simulated benefits measures – $\hat{B}1$, $\hat{B}2$, and $\hat{B}3$ – to instrument for property taxes. In theory, any subset of these instruments would suffice in identifying the effect of property taxes on elderly mobility so long as they all correlate with property tax payments and they all satisfy the exclusion restriction. Results not shown here confirm that the estimates of β using any one or two of the three instruments are quantitatively similar and statistically indistinguishable from each other. Since including all three simulated benefits as instruments improves precision while producing asymptotically the same estimates, it is preferrable to do so.

The estimated effects of other covariates shown in column (3) are mostly consistent with our expectation and the previous literature's findings. For instance, homeowners who are currently working are less likely to move. Homeowners who are recently widowed have higher moving probabilities. Large families are less prone to move, supposedly due to high moving costs. Number of living children is associated with higher mobility rates, which echoes the finding by Silverstein and Angelelli (1998) that older parents engage in return migration in order to live closer to children from whom they receive care.

4.2 Robustness Checks

In this section, I use alternative sub-samples and model specifications to check whether my findings are driven by some peculiar sub-population and whether the estimated results are robust to other regression models. In Panel A of Table 5, I first exclude observations of the AHEAD cohort. The AHEAD cohort were born before 1924 and are the oldest cohort in the sample. Even though I have included in the main specification a full set of age dummies and year dummies, which effectively control for cohort fixed effects, it is useful to see whether the oldest elderly homeowners respond to property taxes and relief programs differently from other cohorts. The IV estimate is similar to the one obtained when the AHEAD cohort is included, although it is less precisely estimated because of the smaller sample size.

Next, I drop households living in California because Proposition 13 creates a very unusual institutional setting. Proposition 13 in California was adopted in 1978. It limits property tax rate at 1% and requires assessment values grow no more than 2% per year unless the house is sold and re-assessment is carried out. Wasi and White (2005) find that Proposition 13 has a lock-in effect on homeowners in California. In the late 1980s, two amendments to Proposition 13 were passed. They allow any homeowner of age 55 or above who move to another house of equal or less market value within the same county to pay property taxes on the previous house' assessment value. Ferreira (2007) uses a regression discontinuity strategy to show that mobility rates of 55-year-old homeowners are 25% higher than those of 54-year-old homeowners in California after those amendments were enacted. Proposition 13 may cause elderly homeowners in California to respond differently to property taxes and relief programs than elderly homeowners in other states. The regression results without California observations are Panel A of Table 5 appear to be very similar to the results obtained for the entire sample.

I then investigate whether the results I find are driven by a small fraction of house-

holds who made multiple moves during the sample period. Specifically, I drop households who moved three or more times between 1992 and 2004.[20] This restriction reduces the sample size by less than 4%. The last column in Panel A of Table 5 presents 2SLS estimate on this restricted sample. The estimate remains unchanged, suggesting that the estimated effect of property taxes on elderly mobility is not driven by frequent movers.

Panel B of Table 5 shows the results using alternative regression models. The average two-year mobility rate is only 9 percent in my sample, and the linear probability model may be biased when the dependent variable is close to zero. To address such concerns, I estimate an IV probit model using the control-function approach where standard errors are block-bootstrapped at the state level. The IV probit estimate is very close to the linear probability estimate. Recent research including Engelhardt (2003) and Ferreira et al. (2008) finds that housing equity constraints and house price changes are important determinants of household mobility. In the last two columns of Panel B, I control for household-level loan-to-value ratios and MSA-level house price appreciation rates.[21] The estimates are little changed.

As mentioned before, the variation in the simulated benefits comes from state, age, and year. To ascertain that the results I have found in my main specification do not originate from uncontrolled two-way interactions between state, age and year, I add two-way interaction fixed effects in the property tax regression. Panel C of Table 5 displays the estimation results. Adding state∗year or year∗age fixed effects do not appear to change the estimates by much. In the case of adding state∗age fixed effects, around 1,500 additional fixed effects are controlled for in the regression model. Not surprisingly, estimated standard error becomes

[20] I am aware that this procedure selects the sample based on the dependent variable. The sole purpose of this exercise is to check whether the estimated marginal effect of property taxes on elderly mobility changes significantly once we exclude frequent movers.

[21] For households living outside of metropolitan areas, I use state-level house price appreciation rates instead. The house price index data are obtained from the Federal Housing Finance Agency.

considerably larger and the estimate is no longer statistically significant. Nevertheless, the estimated coefficient on property tax payments remains positive and of roughly the same magnitude. Overall, the results are robust to adding two-way interaction terms.

The identification assumption in my IV strategy is that state-provided property tax relief programs only affect elderly mobility through the property tax channel. For example, the exclusion restriction would be violated if there is some uncontrolled factor that drives both elderly homeowners' mobility rates and states' decision to change their property tax relief programs. Conversations with tax practitioners suggest that changes in property tax relief programs are generally determined by the state budget, the political party in office, and what other states do at that time. These determinants vary only at the state$*$year level and should be absorbed by state$*$year fixed effects. I have shown in Table 5 that the estimation results are robust to the specification with state$*$year fixed effects. This finding lends support to the validity of the instrumental variable strategy employed in this paper.

The linear probability model used in this paper focuses on whether last year's property tax payments affect the mobility outcome in the next two years. Since moving is often a life-cycle decision, one may suspect that the static approach used here generates a biased estimate of the property tax effect on an inherently dynamic process. To address such concerns, I estimate two dynamic models in Table 6. First, I add the lag of property tax payments in the linear probability model. The point estimates are positive, and the coefficient on last year's property taxes is of similar magnitude to those in the main specification. As we would expect, last year's property taxes seem to affect moving decisions more than the lag of property taxes. Unfortunately, because of the smaller sample size as well as the large correlation between the two property tax measures, the standard errors increased substantially and the estimates are statistically insignificant.

Second, I estimate the effect of property taxes on elderly mobility using hazard

models. I choose the flexible parametric proportional hazard model introduced by Han and Hausman (1990) instead of the more standard Cox proportional hazard model, because the IV estimates can be obtained using the control-function approach in the Han-Hausman model. Since moving is not an absorbing state, there are two ways of constructing the analysis sample. Column (3) in Table 6 shows the IV estimate using all moves made by each households, whereas column (4) shows the IV estimate using only the first observed move made by each household. In both cases, the estimated property tax effect is similar to the linear probability estimate. In summary, I find little evidence that the linear probability model produces different estimates of the property tax effect on elderly moving probabilities from dynamic models.

4.3 Further Discussions

The central IV estimate of this paper suggests that a $100 increase in property taxes induces the two-year mobility rate to rise by 0.73 percentage points, representing a 8% increase from the baseline average two-year mobility rate of 9 percent. Such a large estimated impact of property taxes may be a manifestation of the local average treatment effects (LATE) formulated by Imbens and Angrist (1994). The instruments used to identify the causal effect of property taxes, state-provided property tax relief programs, affect property taxes only of homeowners who both are eligible for and actually take up property tax relief. Because property tax relief programs are designed to assist low-income and elderly homeowners, and because people who actually take up these programs tend to be more sensitive to property taxes, it is not surprising that the IV estimates are large in magnitude. Therefore, the estimates shown here measure the mobility response to property taxes among the compliers (i.e. eligible homeowners who actually receive benefits from property tax relief programs), and one must be cautious when generalizing these results to the overall population.

If rising property taxes increase elderly mobility rates, we would expect that movers relocate to areas with lower property taxes. As discussed before, property taxes may affect elderly mobility through two channels: liquidity constraints and demand adjustments. If liquidity constraints are the reason why elderly homeowners respond to rising property taxes by moving, then we would expect them to move to less expensive houses. Similarly, If demand adjustments play a role in the elderly mobility response to property taxes, then we would expect them to move to areas with lower effective tax rates and presumably fewer local public services. To test these hypothesis, I exploit the panel feature of the HRS data and examine whether property taxes cause elderly homeowners move to houses with lower property taxes, less expensive houses, and houses with lower effective tax rates.

Panel A of Table 7 shows the 2SLS estimates. These estimates suggest that elderly homeowners indeed respond to higher property taxes by moving to houses with lower property taxes, less expensive houses, and houses with lower effective tax rates. The estimated effects are large and statistically significant. The magnitudes suggest that a 100$ increase in annual property tax payments raises the probability of moving to houses with lower property taxes, less expensive houses, and houses with lower effective rates by 0.4-0.6 percentage points. Panel B of Table 7 shows the IV estimates in multinomial logit models, and the results are almost identical to the 2SLS estimates.

The finding that homeowners move to reduce their property tax payments is reassuring. If we find in the data that elderly homeowners actually pay more property taxes after their moves than before, we would suspect that the main finding of this paper – higher property taxes cause elderly homeowners to move – are driven by some spurious factor. Additionally, the finding that homeowners move to less expensive homes is consistent with the liquidity constraint story where elderly homeowners simply cannot afford the rising property taxes. The finding that homeowners move to houses with lower effective tax rates is consis-

tent with the demand adjustment story where elderly homeowners do not want to pay for the local services of little value to them. Taken together, the evidence shown in Table 7 suggests that both liquidity constraints and demand adjustments may be at work in explaining the effect of property taxes on elderly mobility.

5 Conclusions

Property taxes are the most important tax revenue source for local governments. The 2000-05 housing market boom led to significant increases in homeowners' property tax liabilities. Both policy-makers and the general public are concerned by the prospect that house-rich but income-poor elderly homeowners are overburdened by rising property taxes. The goal of this paper is to provide empirical evidence on whether property taxes play an important role in elderly homeowners' moving decisions.

Using instrumental variable approaches, this paper finds that property taxes are important in elderly homeowners' moving decisions. The central point estimates suggest that a $100 increase in annual property taxes leads to a 0.73 percentage point increase on average in two-year mobility rates. The results are robust to varieties of robustness checks. Similar to many studies using IV strategies, the effect found in this paper may be specific to the particular instruments used and may not be generalized to the average homeowner in the elderly population.

According to the 2004 data, property tax relief programs cost about $10 billion a year in the United States.[22] In some states, these relief programs are provided at a great expense of lost revenues. For example, circuit-breakers in Vermont cost about 10% of total property tax revenues every year. Is the money well spent? Does the benefit of having these

[22] Author's estimate using 2004 circuit-breaker cost data reported in Lyons et al. (2007).

programs justify their cost? On one hand, if the effect of property taxes on mobility is driven by demand adjustment, property tax relief programs would keep elderly homeowners from relocating to places where the marginal price of local services matches the marginal benefit. In this case, we essentially spend valuable resources locking homeowners in their houses and preventing them from following an optimal housing consumption path. On the other hand, if the effect is due to liquidity constraints, providing generous property tax relief programs may alleviate such constraints and allow people who value the house the most to stay in it. This paper advances the literature by providing a careful analysis on the causal effect of property taxes on elderly mobility.

Many other intriguing and important questions remain unexplored with regard to the impact of property taxes on elderly homeowners. At present, little empirical analysis has been conducted to address the question of why effective tax rates did not decline in proportion to the increases in housing prices. Dye and Reschovsky (2008) suggest that cuts in state school aid caused by state fiscal crisis may be partially responsible for rising property taxes in the early 2000s. Furthermore, virtually no evidence has been presented to rationalize the prevalence of property tax relief programs and the political popularity associated with expanding these programs. Do elderly homeowners enjoy more political power by voting more often than non-elderly homeowners? Do state and local governments use property tax relief programs to entice retiree migrants? Do population aging and baby-boomers' entering retirement age imply diminishing support for public-school spending? Poterba (1998) discusses issues related to demographic change and the political economy of public education. More research is called for to address such questions.

Another set of research questions includes investigating the best way of providing property tax relief. Economists believe that reverse mortgages are a relatively efficient mechanism for elderly homeowners to tap into their housing wealth and to achieve consumption

smoothing toward the end of their life-cycle. The fact that very few eligible elderly homeowners take up property tax deferral programs is consistent with the observation that the reverse mortgage market in the U.S. is much smaller than expected. Studying why property tax deferral programs are unpopular among elderly homeowners could help us better understand whether elderly homeowners perceive their housing wealth in the same way they perceive their financial wealth, and whether the absence of a thriving reverse mortgage market is due to a lack of demand.

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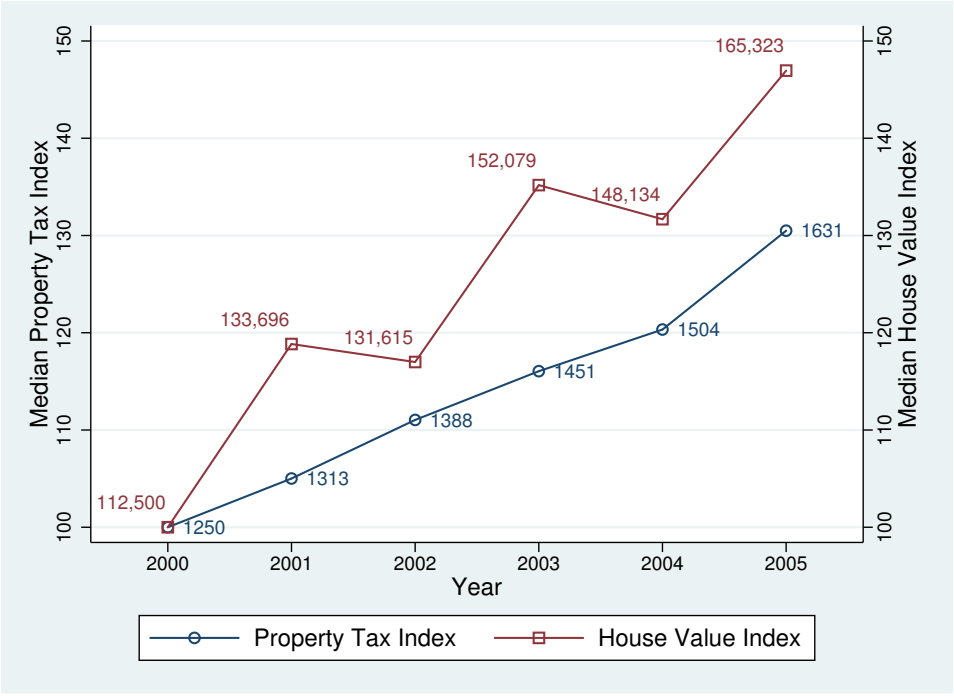
Figure 1: Median Property Taxes and House Values in the United States, 2000-2005



Note: The 2000 data are from the Decennial Census. The 2001-2005 data are from the American Community Survey (ACS). All dollar amounts are in 2000 dollars.

Figure 2: Comparing Benefits Based on Individual Characteristics with Simulated Benefits

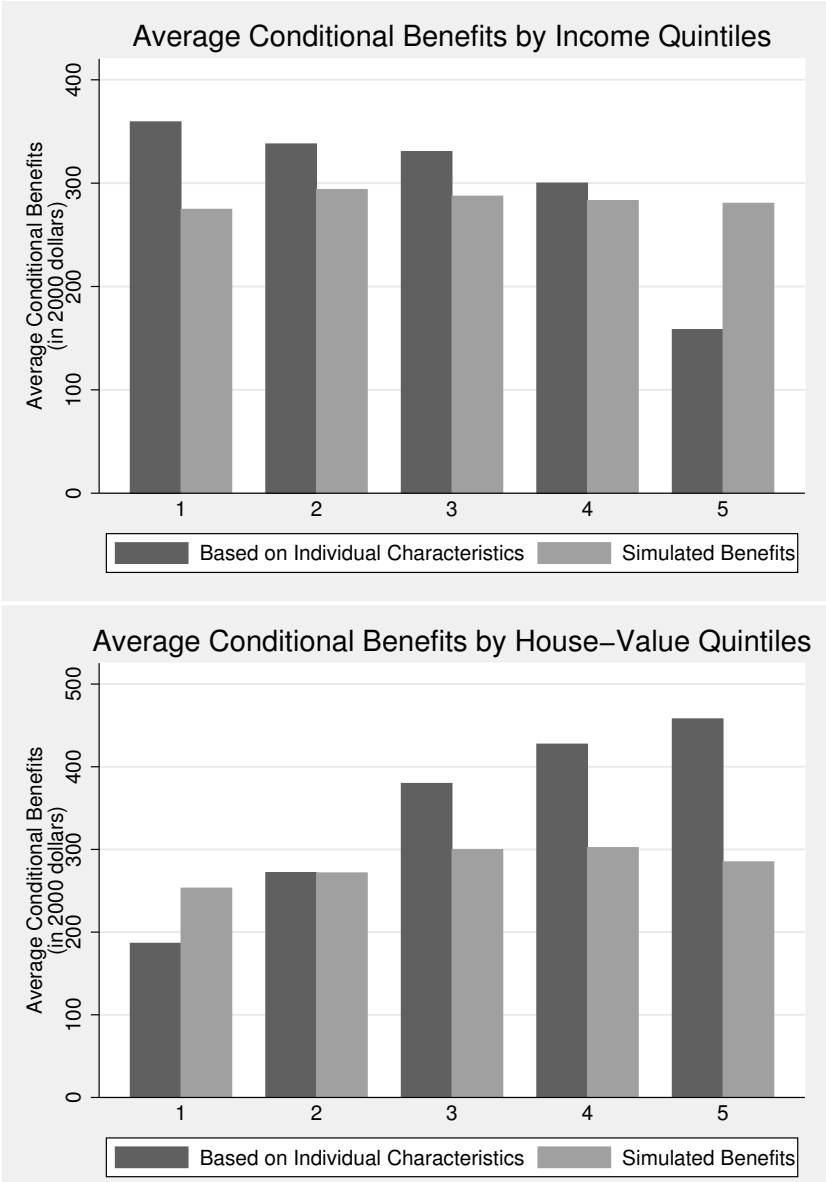
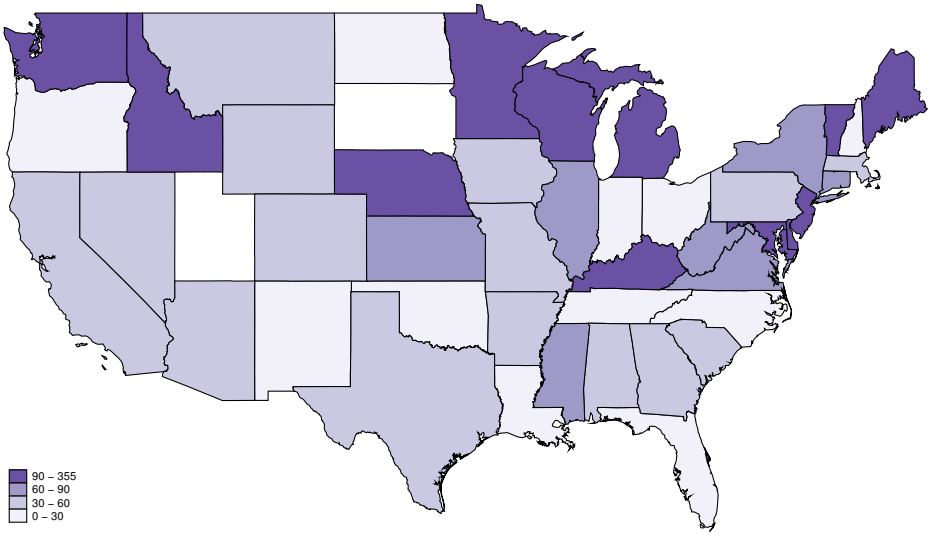
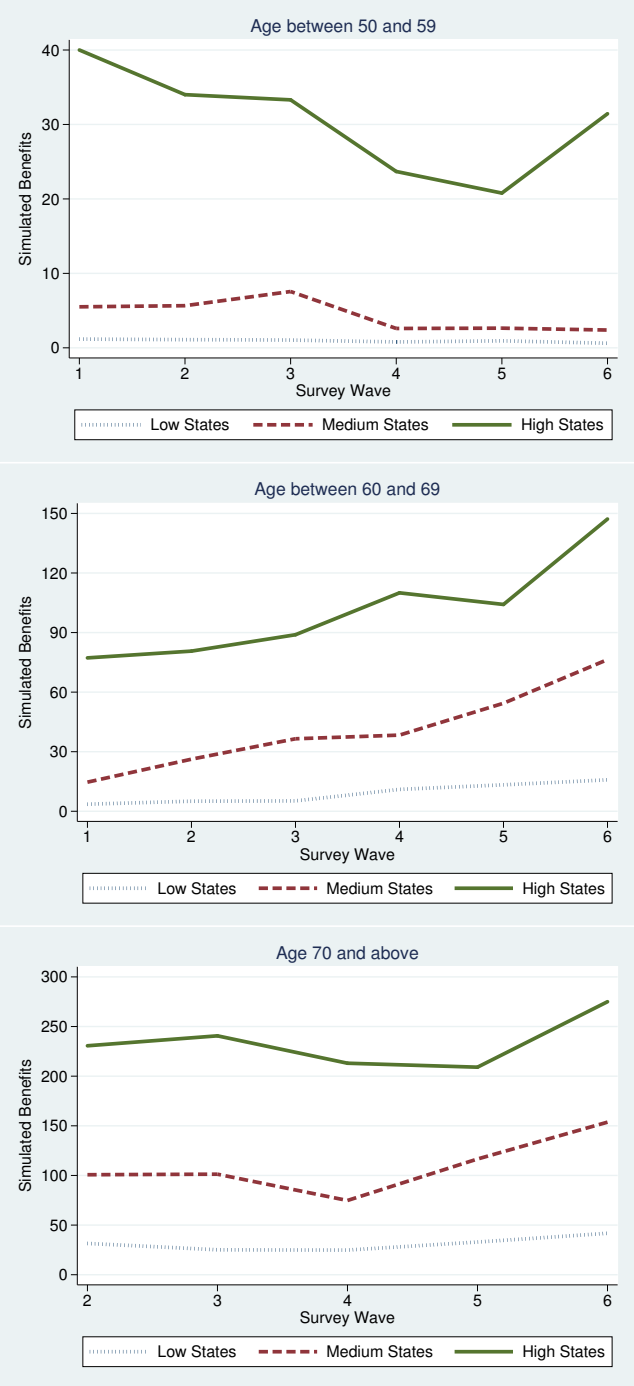


Figure 3: Average Simulated Benefits by State



Note: Simulated benefits refer to benefits from state-provided homestead exemptions, homestead credits, and circuit-breakers. Dollar amounts are in 2000 dollars. Simulated benefits for South Dakota and Utah are not shown because nobody in the sample lives in these two states.

Figure 4: Variation in Simulated Benefits by State, Age, and Year



Note: Simulated benefits refer to benefits from state-provided homestead exemptions, homestead credits, and circuit-breakers. Dollar amounts are in 2000 dollars. Low states refer to OR, LA, IN, FL, NH, TN, ND, NC, OH, PA, AR, and WY. Medium states refer to CA, SC, CO, GA, NV, TX, AL, AZ, IA, CT, KS, and WV. High states refer to MS, VA, IL, KY, WA, NE, MD, ME, ID, MN, DE, and HI. The graph for "age 70 and above" does not show the first survey wave because everyone in the 1992 sample was younger than 70.

Table 1: Mobility and Homeownership of HRS Households

A. Fraction of Homeowners Moving between Adjacent Waves			
	Mean	SE	N
1992-1994	0.065	0.004	4472
1994-1996	0.083	0.005	3630
1996-1998	0.079	0.004	4130
1998-2000	0.091	0.005	3939
2000-2002	0.129	0.005	3730
2002-2004	0.124	0.005	3591

B. Tenure Distribution			
	Own	Rent	N
1992	0.771	0.194	6726
1994	0.788	0.180	5999
1996	0.800	0.177	5712
1998	0.804	0.164	5432
2000	0.809	0.157	5071
2002	0.817	0.148	4826
2004	0.807	0.147	4645

C. Tenure Transition Matrix			
	To Own(%)	To Rent(%)	To Other(%)
From Own	80.66	14.37	4.97
From Rent	21.98	70.68	7.34
From Other	22.87	44.58	32.54

Note: This table refers to the HRS cohort (born between 1931 and 1941) households only. Household weights are used.

Table 2: Summary Statistics of Key Variables

	Mean	Median	SD
Moved between Waves	0.09		0.29
Fraction of Cross-State Moves	0.17		0.38
Property Tax	1,756	1,200	2,694
House Value	149,781	110,463	179,178
Income	63,786	41,925	102,164
Financial Wealth	126,520	26,000	529,017
Having Mortgage or Home Loan	0.46		0.50
Age	64.5		9.7
Male	0.52		0.50
White	0.91		0.29
Household Size	2.25		1.15
Number of Children	3.06		1.93
Less than High School	0.22		0.41
High School Graduates	0.32		0.47
Some College	0.22		0.42
College Graduates	0.24		0.43
Currently Working	0.43		0.49
Currently Retired	0.48		0.50
Currently Disabled	0.02		0.13
Newly Retired	0.08		0.28
Married	0.66		0.47
Separated or Divorced	0.12		0.32
Widowed	0.20		0.40
Newly Widowed	0.02		0.14
Recently Hospitalized	0.30		0.46

Note: $N = 29183$. The sample is restricted to households who were homeowners in the current wave and who have valid data for all variables. Property tax, income, house value, and financial wealth are in 2000 dollars. Household weights are used.

Table 3: Property Tax Relief Benefit Formula Examples

State	Formula Used For a Hypothetical Homeowner (year=2000, age=65, married, Income=$20,000, SSB=$10,000, HV=$100,000)	Benefits
FL	$0.5 \times ETR_{FL} \times \min(HV, 25000)$	$146
CA	$0.01 \times \min(34000, HV) \times 0.96 \times \frac{34877-\max(Income,8719)}{34877-8719}$	$186
MI	$\min(1200, \max(0, ETR_{MI} \times HV - 0.035 \times Income))$	$536
TX	$0.7 \times ETR_{TX} \times \min(HV - \min(HV, 15000), 10000)$	$119
NY	$0.5 \times ETR_{NY} \times \min(HV - \min(HV, 10000), 40000)$	$367
IL	$ETR_{IL} \times \min(HV, 6000)$ $+ \min\left(700 - 630 \times \frac{\min(Income,14000)}{14000}, \max(0, ETR_{IL} \times HV - 0.035 \times Income)\right)$	$166
PA	$\min\left(ETR_{PA} \times HV, 500 \times \left(1 - \frac{\max(Income-0.5\times SSB,5500)-5500}{15000-5500}\right)\right)$	$0
NJ	$250 \times (Income - SSB \leq 10000)$ $+ \max(150, \min(750, ETR_{NJ} \times HV - 0.05 \times Income))$	$1000
GA	$0.5 \times ETR_{GA} \times \min(HV, 10000) + 0.5 \times ETR_{GA} \times \min(HV, 25000)$	$150
MN	$\min\left(510, 0.5 \times \max\left(0, ETR_{MN} \times HV - \left(0.01 + 0.03 \times \frac{Income}{71700}\right) \times Income\right)\right)$	$510

Note: ETR is the state-year specific average effective property tax rate. HV is house value. SSB is Social Security benefit. Benefits shown here refer to eligible benefits from state-provided homestead exemptions, homestead credits, and circuit-breakers.

Table 4: Effect of Property Taxes on Mobility - Main Results

	(1) OLS	(2) First Stage	(3) 2SLS
Property Taxes (in 10,000)	0.0064		0.7328***
	(0.0093)		(0.2687)
Simulated Benefits $\hat{B}1$ (in 10,000)		-0.9807**	
		(0.4589)	
Simulated Benefits $\hat{B}2$		-0.0172***	
		(0.0050)	
Simulated Benefits $\hat{B}3$		-0.0456***	
		(0.0040)	
High School	-0.0044	0.0100	-0.0118
	(0.0070)	(0.0066)	(0.0094)
Some College	0.0060	0.0069*	0.0012
	(0.0087)	(0.0035)	(0.0076)
College	0.0128	0.0343***	-0.0123
	(0.0088)	(0.0064)	(0.0114)
Male	0.0061	0.0044	0.0031
	(0.0048)	(0.0039)	(0.0053)
White	0.0333***	0.0091	0.0265***
	(0.0083)	(0.0090)	(0.0085)
Household Size	-0.0075***	-0.0003	-0.0075***
	(0.0022)	(0.0015)	(0.0022)
Number of Children	0.0058***	-0.0009	0.0064***
	(0.0016)	(0.0006)	(0.0015)
Married	-0.0217***	0.0036	-0.0244***
	(0.0058)	(0.0061)	(0.0067)
Newly Widowed	0.0397*	-0.0097*	0.0470*
	(0.0221)	(0.0055)	(0.0235)
Currently Working	-0.0142**	0.0060	-0.0187***
	(0.0053)	(0.0049)	(0.0063)
Newly Retired	0.0229***	0.0112	0.0151
	(0.0073)	(0.0114)	(0.0097)
Recently Hospitalized	0.0079	-0.0004	0.0082
	(0.0066)	(0.0049)	(0.0076)
First Stage F-Stat		64.3	
Concentration Parameter		189	
Over-ID Test p-Value			0.8782
R^2	0.0331	0.1551	
N	22497	22497	22497

Note: Covariates not shown in this table include income quintile dummies, house value quintile dummies, age dummies, whether spouse currently working, whether spouse newly retired, states fixed effects, and year fixed effects. Simulated benefits $\hat{B}1$, $\hat{B}2$, and $\hat{B}3$ are the instruments for property taxes. Standard errors in the 2SLS model are clustered at the state level. Household weights are used. ***, **, * denote significance at the 1%, 5%, and 10% levels.

Table 5: Robustness Checks - Alternative Specifications, Various Sub-Samples, and Two-Way Interactions

A. Various Sub-Samples

	Orig. Specification	Drop AHEAD	Drop CA	Drop Freq. Movers
Property Taxes (in 10,000)	0.7328***	1.0068*	0.7233**	0.6464**
	(0.2687)	(0.5342)	(0.2654)	(0.2537)
N	22497	17090	19942	21668

B. Alternative Specifications

	Orig. Specification	Probit	Add LTV	Add HPA
Property Taxes (in 10,000)	0.7328***	0.7487**	0.8057***	0.7276***
	(0.2687)	(0.3321)	(0.2655)	(0.2605)
N	22497	22495	22497	22497

C. Two-Way Interactions

	Orig. Specification	Add State*Year	Add Year*Age	Add State*Age
Property Taxes (in 10,000)	0.7328***	0.5775*	0.8619***	1.1169
	(0.2687)	(0.3209)	(0.3153)	(0.9036)
N	22497	22497	22497	22497

Note: The probit model is estimated using the control function approach. The probit estimates are converted into marginal effects to be comparable to the 2SLS results. Standard errors in the probit model are bootstrapped with 500 random draws with replacement clustered at the state level. Simulated benefits $\hat{B}1$, $\hat{B}2$, and $\hat{B}3$ are the instruments for property taxes. Standard errors in the 2SLS model are clustered at the state level. Household weights are used. ***, **, * denote significance at the 1%, 5%, and 10% levels.

Table 6: Robustness Checks - Specifications Allowing for Dynamics

	(1) Orig. Specification	(2) Lag Model	(3) Hazard Model 1	(4) Hazard Model 2
Property Taxes (in 10,000)	0.7328***	0.5391	0.6911**	0.6657*
	(0.2687)	(0.6281)	(0.3371)	(0.3625)
Lag of Property Taxes (in 10,000)		0.1312		
		(0.7243)		
N	22497	14179	16081	13863

Note: Hazard model 1 uses all reported moves. Hazard model 2 uses only the first reported move of each households in the sample. Hazard models are estimated using the control function approach. The hazard estimates are converted into marginal effects to be comparable to the 2SLS results. Simulated benefits $\hat{B1}$, $\hat{B2}$, and $\hat{B3}$ are the instruments for property taxes. Standard errors in hazard models are bootstrapped with 500 random draws with replacement clustered at the state level. Standard errors in the 2SLS model are clustered at the state level. Household weights are used. ***, **, * denote significance at the 1%, 5%, and 10% levels.

Table 7: Effect of Property Taxes on Decisions to Move Up and Down

A. 2SLS Estimates

	Move to Lower Property Taxes	Move to Higher Property Taxes
Property Taxes (in 10,000)	0.4434**	0.2904
	(0.2031)	(0.1801)
	Move to Less Expensive Homes	Move to More Expensive Homes
Property Taxes (in 10,000)	0.5612***	0.2805
	(0.1640)	(0.2105)
	Move to Lower Effective Tax Rates	Move to Higher Effective Tax Rates
Property Taxes (in 10,000)	0.4875*	0.2387
	(0.2648)	(0.2128)

B. Multinomial Logit IV Estimates

	Move to Lower Property Taxes	Move to Higher Property Taxes
Property Taxes (in 10,000)	0.4654*	0.1964
	(0.2303)	(0.1287)
	Move to Less Expensive Homes	Move to More Expensive Homes
Property Taxes (in 10,000)	0.4837**	0.2842
	(0.1771)	(0.1851)
	Move to Lower Effective Tax Rates	Move to Higher Effective Tax Rates
Property Taxes (in 10,000)	0.5086**	0.1485
	(0.2418)	(0.1108)

Note: Multinomial logit models are estimated using the control function approach. The multinomial logit estimates are converted into marginal effects to be comparable to the 2SLS results. Simulated benefits $\hat{B}1$, $\hat{B}2$, and $\hat{B}3$ are the instruments for property taxes. Standard errors in multinomial logit models are bootstrapped with 500 random draws with replacement clustered at the state level. Standard errors in the 2SLS model are clustered at state level. Household weights are used. ***, **, * denote significance at the 1%, 5%, and 10% levels.