Housing Wealth Shocks, Home Equity Withdrawal, and the Claiming of Social Security Retirement Benefits*

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Abstract

This paper examines the impact of changes in house prices on when eligible individuals start receiving Social Security benefits. If house prices increase, financially constrained households may draw upon the additional home equity to finance expenses and delay receipt of Social Security in order to have increased lifetime monthly benefits. To address concerns that house price changes are correlated with unobserved local demand shocks, we use a control function approach and employ two different instrumental variables. We find that individuals delay Social Security claiming when house prices increase during the housing boom. The probability of claiming within two years after becoming eligible decreases by 8.67-8.81 percent for every 10 percent increase in house prices. We also find that the total home loan amount increases in response to the price appreciation, indicating households are drawing upon their home equity to finance consumption and delay receiving Social Security.

Key Words: Social Security; home equity; housing wealth shock; land supply elasticity

JEL classifications: D12, D14, J14, J26, R20

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1. Introduction

Individuals in many countries face an important decision regarding when to claim retirement benefits. The trade-off resides in the design of the system that individuals who claim later receive increased monthly benefits, even though they receive the benefits for a shorter period of time.[1] In the United Kingdom, working an additional year past the state pension age increases benefits by 10.4 percent, which in 2019 translated into an additional 142.64 pounds a year. The pension system in France and the Social Security scheme in the United States (U.S.) also increase monthly benefits if an individual delays receipt past the initial eligibility age. Despite its prevalence, the early literature modelling life cycle financial decisions failed to fully incorporate the complicated financial option involving the specifics of this trade-off.[2] However, as emphasized in more recent studies, when to exercise the option to claim is one of the most crucial life cycle financial decisions (Coile et al., 2002; Gustman and Steinmeier, 2005; Shoven and Slavov, 2014; Hubener et al., 2016).

This paper examines the impact of a housing wealth shock on when individuals claim Social Security benefits. In the U. S., among various financial assets, Social Security benefits and home equity are typically the two largest components of an elderly individual's balance sheet (Poterba, 2014).[3] As shown in Figure 1, home equity comprises about 38–45 percent of the total net worth for households in the top two age groups. In the meantime, Figure 2 illustrates that an eligible individual in the cohort born between 1943 and 1954 experiences an increase in monthly Social Security benefits of 76 percent if the individual claims Social Security at age 70 versus age 62. Given the large increase in benefits, individuals may draw upon their home equity to finance consumption and delay claiming Social Security. This is especially true for a financially constrained household that experiences an unexpected positive housing wealth shock. The tendency to rely on home equity to finance consumption

[1] See https://www.ssa.gov/policy/docs/progdesc/ssptw/index.html for a cross-country comparison of retirement programs.

[2] See, for example, Merton (1969), Bodie et al. (1992), Campbell and Viceira (2001), Cocco (2005), Farhi and Panageas (2007), Gomes and Viceira (2008), Horneff et al. (2008), Love (2010), Chai et al. (2011), Inkmann and Michaelides (2011), and Hubener and Rogalla (2014).

[3] Housing is also the dominant component of wealth for a typical household in the United Kingdom (Banks et al., 2004).

has been established in the literature (Campbell and Cocco, 2007; Bostic et al., 2009; Mian and Sufi, 2011; Cooper, 2013; Aladangady, 2017; French et al., 2018). Studying the effect of an unanticipated change in housing wealth and the timing of when to claim Social Security allows us to better understand the substitutability of these two assets as a source of income for the aged population.

We argue for the existence of substitution between the two assets by first highlighting the large gains from a delay in receiving Social Security as documented in Coile et al. (2002) and Shoven and Slavov (2014). Then, following the framework of Mariger (1987), Feldstein (1990), and Mirer (1998), we show in a conceptual model that the desire to delay claiming Social Security in order to receive higher benefits may be compromised by the lack of initial wealth and the presence of financial constraints. Therefore, an unexpected positive housing wealth shock (either permanent or transitory) could ease the constraint by financing consumption directly (Case and Shiller, 2005; Bostic et al., 2009; Gan, 2010) or by allowing households to finance expenditures through home equity-based borrowing (Mian and Sufi, 2011; Cooper, 2013; Aladangady, 2017).[4]

The main identification challenge is the likely presence of unobserved local demand shocks that are correlated with both changes in house prices and the decision to receive Social Security benefits. The failure to directly control for unobserved local demand shocks leads to an omitted variables problem that could bias our estimates (Chaney et al., 2012; Zhao and Burge, 2017; Charles et al., 2018). We exploit two sets of instrumental variables to address this endogeneity concern. For the first instrument, we interact the change in the national house price index with the MSA-level supply elasticity measure, developed by Saiz (2010). The identifying assumption is that the deviation in local house price appreciation from the national house price index is driven by the underlying exogenous differences in local land supply elasticities, which are not correlated with time-varying local economic activity.[5]

[4]To finance consumption directly, a household may sell their home and buy a smaller, less expensive property or become renters upon retirement or in preparation for retirement. A household has a stronger incentive to do so when their house value appreciates and there is more equity to receive from selling the house. To rely on the collateral channel, a household could draw upon the increased home equity by cash-out refinancing, taking out a second mortgage, or obtaining a Home Equity Line of Credit (HELOC) in the U.S. Similar instruments also exist in European countries (Hull, 2017).

[5]Either the supply elasticity instrument or its interaction has been used extensively in in the previous literature, including Mian and Sufi (2011), Mian and Sufi (2014), Chaney et al. (2012), Mian et al. (2013),

For the second instrument, we interact the change in the regional house price index with a house price sensitivity measure, developed by Guren et al. (2020), that captures systematic differences in CBSA-level exposure to regional house prices. The identifying assumption of this instrument is that there are no unobserved factors that are correlated with regional house price changes and that differentially affect cities that are more historically sensitive to housing market cyclicality.

Our empirical analysis relies on four data sources. The primary dataset is the restricted Health and Retirement Study (HRS), which is a biannual longitudinal survey of more than 26,000 Americans over the age of 50. We use the restricted version of the HRS with county-level geographic identifiers, as it allows us to link the respondents to their corresponding MSAs and CBSAs and then match to our MSA-level and CBSA-level instruments. The three additional datasets are the housing price index constructed by the Federal Housing Finance Agency (FHFA), the MSA-specific housing supply elasticities for 269 MSAs provided by Saiz (2010), and CBSA-specific housing price sensitivity measures provided by Guren et al. (2020). These datasets provide the necessary information to form our two instrumental variables.

We find that increases in house prices result in individuals delaying claiming Social Security benefits past age 62 during the boom period from 2002–2006. Results are similar using both instrumental variables. Specifically, if house prices increased by 10 percent in the previous two years, the probability of claiming Social Security benefits within two years of becoming eligible decreases by 5.47-5.56 percentage points. This translates to an 8.67%-8.81% decrease in the probability of claiming within two years of becoming eligible. During the bust period from 2008–2010, we do not find a statistically significant effect on Social Security claiming. This null result is consistent with the argument that home equity-based borrowing is only viable when house prices appreciate. Furthermore, we find that the effects are concentrated among individuals who had an outstanding balance on their mortgage and households that do not have any stock accounts. The evidence is consistent with the argument that the households that are more likely to be financially constrained are more likely to respond to the increase in home prices to delay receiving Social Security.

Cvijanović (2014), Dettling and Kearney (2014), Aladangady (2017), Chetty et al. (2017), and Stroebel et al. (2019).

To show direct evidence of home equity-based borrowing, we examine if there is an increase in the total home loan amount, which includes the amount owed on a first mortgage, the amount owed on any additional mortgages, and any home equity line of credit (HELOC). We find that among individuals who have not moved in the past two years, there is an increase in the total amount of home loans when house prices appreciate. This effect is concentrated among individuals who are more likely to be financially constrained, specifically those who have not paid off their mortgage. This result is consistent with our hypothesis that the home equity-based borrowing channel helps to alleviate a binding financial constraint. We do not find an effect of an increase in home value on mobility, suggesting that households are not selling their house to either downsize or become renters.

Our paper contributes to the research on Social Security claiming decisions. There is an extensive literature documenting large gains in lifetime wealth from delaying receipt of Social Security.[6] Yet, despite the gains from delaying, many people still claim shortly after becoming eligible (Shoven and Wise, 2017). There are many potential explanations for this behaviour, such as liquidity constraints, life expectancy, self-assessed health status, and labour market shocks (Crawford and Lilien, 1981; Hurd et al., 2004; Munnell and Soto, 2005; Rutledge et al., 2012; Card et al., 2014). Other studies have shown behavioural factors affect the timing of Social Security claiming, including framing effects (Brown et al., 2016) and reference dependence with loss aversion (Behaghel and Blau, 2012). Our paper highlights another important factor – appreciated housing value – that may alleviate financial constraints and allow individuals to delay claiming Social Security. To our knowledge, our paper is the first to examine the link between a change in home equity and when an individual starts receiving Social Security.[7]

We also contribute to the literature on the impact of home equity on consumption and saving behaviour. There is an extensive literature on the extent to which consumption and

[6]See, for example, Coile et al. (2002), Munnell and Soto (2005), Mahaney and Carlson (2007), Meyer and Reichenstein (2010), Sass et al. (2013), and Shoven and Slavov (2014).

[7]Campbell and Cocco (2007) document the large effect of house prices on consumption for elderly homeowners but they did not link this to their Social Security claiming decision. Dotsey et al. (2015) show that Social Security reforms has important implications for labour supply and consumption decisions, but the authors eliminate owner-occupied housing and treat all housing in the economy as rental units.

savings respond to a change in home equity.[8] Early literature focused more on the housing wealth effect. Recent literature highlights the home equity-based borrowing channel (Mian and Sufi, 2011; Mian et al., 2013; Cooper, 2013; Aladangady, 2017). Campbell and Cocco (2007) and French et al. (2018) examine UK data and find evidence that older homeowners are more likely to draw upon home equity to finance consumption. We contribute to this literature by highlighting the decision households in the U.S. make when choosing whether to use their housing wealth to finance consumption in order to delay receipt of Social Security. To our knowledge, our paper is the first to reveal the home equity-based borrowing mechanism in conjunction with the receipt of Social Security benefits.

The rest of the paper will proceed as follows. Section 2 provides background information on the Social Security Retirement Program and discusses the rationale behind examining the relationship between changes in house prices and Social Security claiming. We discuss our empirical strategy in Section 3. Data and summary statistics are provided in Section 4 and results are presented in Section 5. The mechanisms driving the results are analysed in Section 6. Section 7 concludes and discusses the policy implications of this research.

2. House Price and Social Security Claiming

2.1. The Social Security Retirement Program in the United States

Social Security has become an essential facet of life in the U.S, covering more than 90 percent of all workers. The benefits represent a substantial component of total assets for an elderly household. For example, Social Security benefits comprise about 40% of the net wealth of the baby boomer generation and provides the largest share of aggregate income for the aged population (Gustman and Steinmeier, 2005).[9]

[8]This literature is too extensive to provide an exhaustive review. Some examples include Attanasio and Weber (1994), Engelhardt (1996), Muellbauer and Murphy (1997), Lehnert (2004), Case and Shiller (2005), Case et al. (2012), Haurin et al. (2018), Greenspan and Kennedy (2008), Gan (2010), Carroll et al. (2011), Jiang et al. (2011), Browning et al. (2013), Ong et al. (2013), Adam and Tzamourani (2016), Cloyne and Kleven (2017), and Mccully et al. (2018).

[9]Social Security benefits take up a larger share of income for middle or low income aged households. For individuals aged 65 or older in 2014, these benefits comprise 80.7% of income for the lowest quintile but only 15.4% of income for the highest quintile. More information can be found by following the URL: https://www.ssa.gov/policy/docs/chartbooks/income_aged/2014/iac14.pdf.

The amount of Social Security benefits that an individual receives depends on a set of rules applied to the earnings history and when an individual starts receiving benefits. Specifically, the Average Indexed Monthly Earnings (AIME), which are based on the thirty-five years the individual earned the most, are calculated, and a formula is applied to arrive at the Primary Insurance Amount (PIA). The PIA is the benefit a person receives if Social Security is claimed at the Full Retirement Age (FRA). The actual amount received depends on both the PIA and when an individual starts receiving Social Security. The earliest age an individual can claim Social Security retirement income is 62. Monthly benefits are lower the earlier the beneficiary begins claiming because the claimant will receive benefits for a longer period of time.[10] The reduction in benefits for early claiming is birth-year-cohort specific. For example, the reduction in benefits for claiming Social Security at age 62 is 20% for people born in 1937 or earlier but is 20.8% for people born in 1938. The maximum reduction for claiming at age 62 is 30 percent for the cohort whose FRA is 67.[11] The credit for delaying claiming past the FRA is larger for people born in later cohorts.[12]

When to claim Social Security benefits is one of the most crucial and complex financial decisions facing U.S. workers (Shoven and Slavov, 2014). The Social Security Advisory Board summarizes the decision an individual has to make by stating that: "If you withdraw early, you may not have enough income to enjoy the years ahead of you. Likewise, if you withdraw late, you'll have a larger income, but fewer years to enjoy it. Everyone needs to find the right balance based on his or her own circumstances" (Social Security Advisory Board, 2009). The American Association of Retired Persons (AARP) website begins its advice about when to claim Social Security benefits with the statement: "If you're healthy and can afford it, you should consider waiting until you reach your full retirement age."[13] Despite various considerations, as a whole, there is a large spike in claiming at age 62 as seen in Figure 3. According to the Social Security's Annual Statistical Supplement, 56% of eligible individuals

[10]The government provides Delayed Retirement Credits (DRC) to increase the monthly benefit amount for people who delay claiming past the FRA, but this is capped at age 70. The DRC is not considered in our analysis.

[11]https://www.ssa.gov/planners/retire/ageincrease.html.

[12]The yearly rate of increase for delayed claiming is 3.0% for 1917-1924 birth cohort, 3.5% for 1925-1926 cohort, and 8.0% for people born in 1943 and later. For more details, please visit https://www.ssa.gov/planners/retire/delayret.html and https://www.ssa.gov/oact/quickcalc/early_late.html.

[13]http://www.aarp.org/work/social-security/info-12-2010/top-25-social-security-questions.5.html.

claimed Social Security at age 62 in 2002, and an additional 8% of eligible individuals claimed before turning 64.[14]

2.2. Financial Constraint and Housing Shock

In a life cycle model without financial constraints and bequest motives, the decision to claim should be determined by the expected utility after taking into consideration the Social Security rules, expected life expectancy, the opportunity costs of investment, and other idiosyncratic preference related factors. Given these considerations, it has been shown that a large share of individuals would benefit from delaying receipt of Social Security (Coile et al., 2002; Munnell and Soto, 2005; Mahaney and Carlson, 2007; Meyer and Reichenstein, 2010; Sass et al., 2013; Shoven and Slavov, 2014; Shoven and Wise, 2017). For example, Coile et al. (2002) conducts simulations of an expected utility maximization model and show that delays are optimal in a wide variety of cases and that gains are often significant.

However, despite the potential gains, in a world with financial constraints, individuals with insufficient wealth may not be able to claim at the time that maximizes their lifetime benefits or their expected utility. In this section, we present a conceptual framework that establishes the incentives for individuals to delay claiming Social Security when they experience a housing wealth shock. To do this, we consider how financial constraints may prohibit delayed claiming as well as the role that housing wealth can play to allow individuals to access additional funds. Following the framework of Mariger (1987), Feldstein (1990), and Mirer (1998), we focus our analysis on age 62 onward and consider a simple framework with the following assumptions:

1. Individuals have no labour income (they have already stopped working at age 62);[15]
2. Individuals do not have any financial wealth at age 62;
3. Individuals may experience an unexpected positive housing wealth shock at age 62, which could be permanent or transitory;

[14] This is similar to the "annuity puzzle." Many households are reluctant to voluntarily convert accumulated assets into a life annuity (Inkmann and Michaelides, 2011), although life annuities are highly beneficial for most households (Yaari, 1965; Davidoff et al., 2005). The decision to delay claiming could be equivalent to purchasing a deferred joint and survivor life annuity (Hubener et al., 2016).

[15] Similar to Mirer (1998), we take the time of retirement as given rather than as something to explain. The decision of when to exit the labour market requires the individual to determine the optimal age of claiming retirement benefit as well as the age of retirement. Such a model is complex and beyond the scope of this paper, though interesting. In our empirical analysis, we control for an individual's employment status.

4. There is no bequest motive.

Given these assumptions, we derive our main hypothesis to be tested in the empirical analysis as follows.

Hypothesis: If financial constraints exist and individuals experience an unexpected positive housing wealth shock at age 62, they will delay claiming Social Security past age 62. This applies regardless of whether the change in housing wealth is permanent or transitory.[16]

The intuition is straightforward.[17] We first claim that, given the large gains associated with delaying, individuals will choose to receive Social Security past age 62 if they do not face any financial constraints. In other words, if there exists a financial market that allows individuals to arrange a lifetime consumption profile that is independent of the time income is received without any additional cost, at the optimum, retired individuals will delay claiming until the actuarial value of the benefits is maximized.

Alternatively, if financial constraints exist and individuals do not experience a positive wealth shock at age 62, they will claim Social Security at age 62. This statement follows directly from the lack of initial wealth. If financial constraints prevent an individual from borrowing tomorrow's money to finance today's consumption, an individual will have to claim Social Security benefits at age 62 since they do not have any wealth or other assets to utilize. Consumption is smoothed throughout the remaining lifetime and is the same as the monthly Social Security benefit determined by claiming at age 62. As a result, consumption with financial constraints is lower than consumption in the absence of financial constraints.

With the presence of financial constraints, the timing of claiming Social Security will respond to an unexpected positive housing wealth shock. Expected capital gains are already smoothed into consumption and do not affect behaviour. If individuals experience an unexpected and positive housing wealth shock at age 62, the additional housing wealth will cause the optimal time to claim Social Security to no longer be at age 62. The specifics of the response depend on whether the shock is permanent or transitory.

If the housing capital gains are permanent, there are two channels that may affect the

[16] While unanticipated shocks to housing wealth are likely to be perceived as permanent (Zhao and Burge, 2017), it is possible that these shocks are perceived as transitory given the existence of previous housing cycles.

[17] Detailed derivations are provided in Appendix 2.

timing of claiming Social Security. First, if the increased housing wealth is marketable, such that individuals can sell their homes for a gain, then the additional wealth from the sale expands the budget constraint and allows individuals to delay receiving Social Security for higher lifetime monthly benefits. Alternatively, if an individual does not want to move, the increased housing wealth can be used as collateral. In this situation, individuals may borrow against housing wealth to finance consumption. In either case, a permanent positive housing wealth shock leads to a delay in claiming Social Security.

If the housing capital gains are transitory, the effect from the direct consumption channel is limited as there is no longer a lifetime wealth expansion. However, this transitory shock could still provide opportunities for individuals to smooth intertemporal consumption by consuming housing wealth initially and paying back the debt later. Individuals could also use the appreciated home equity at the early stage as collateral to finance early consumption even if the housing wealth shock is transitory.

3. Empirical Strategy

To determine the effect of changes in house prices on the decision to claim Social Security benefits at age 62 or 63, we exploit the recent housing market fluctuations in the U.S. and conduct our analysis separately for the boom (2002 to 2006) and bust (2008 to 2010) periods.[18] We separate our sample into these periods because households have more of an ability to borrow against home equity when house prices appreciate than when house prices decline (Mian and Sufi, 2011).

We consider the impact of a percentage change in house prices on the probability of claiming Social Security within one or two years after becoming eligible. To do so, we estimate the following probit regression:

$$claim_t^{i,c} = \Phi\left(\beta_1 \Delta\% H_t^{i,c} + \beta_2 X_t^{i,c} + \gamma_s + \delta_t + \varepsilon_t^{i,c}\right) \tag{3.1}$$

We focus on claiming Social Security one or two years after turning 62 in a probit setting

[18] Although house prices started to decrease before 2008, we focus on 2008 to 2010 because we use the house price change in the previous two years.

instead of the traditional hazard approach for two reasons. First, as illustrated in Figure 3, more than 50% of individuals claim Social Security within one year of becoming eligible, and more than 60% claim within two years. Hence, the main variation in the timing of claiming Social Security is whether or not an individual claims at age 62 or 63. Second, as we discuss in detail later, we use instrumental variables with a control function approach to address the endogeneity problem. Given the assumptions of this approach, a traditional hazard model is not feasible.[19] To strike a balance between the variation in the timing of the decision to claim and the assumptions imposed in the empirical setting, we use a probit model.

A probit model likely suffers from endogeneity issues that would bias our estimates. Specifically, there may be unobserved local demand shocks correlated with local house price appreciation, which simultaneously affect when an individual starts receiving Social Security. For example, unobserved positive local demand shocks may contribute to higher house prices and overall price inflation. Inflation may increase the likelihood of claiming Social Security benefits early in order to pay the higher prices to fund expenses.[20] Alternatively, if house prices increase, the local economy may experience a positive demand shock in the labour market, which would cause individuals to continue working to delay claiming Social Security benefits. Therefore, our estimation may suffer from the omitted variable bias and the sign of that bias is ambiguous.

To combat the endogeneity issue, we use a control function approach with two different instruments.[21] The first instrument is based on the Saiz (2010) elasticity measures and the first-stage regression using our first instrument is as follows:

$$\Delta\%H_t^{t,c} = \theta_1 \Delta\%P_t^{US} \times Elasticity^c + \theta_2 X_t^{i,c} + \gamma_s + \delta_t + \epsilon_t^{i,c} \tag{3.2}$$

[19] The same approach to estimate a hazard model that takes into consideration the full spectrum of the timing variation is subject to more stringent assumptions. Mackenzie (2014) shows that the instrumental variables estimator for the marginal hazard ratio assumes that the omitted covariate has an additive effect, which has to satisfy the mean-zero property to ensure the marginal distribution of the outcome variable satisfies a proportional hazard model with the specified hazard ratio.

[20] The Social Security Administration makes the Cost-of-Living adjustment for the benefit at the national level.

[21] In our non-linear setting, a traditional two-stage least squares approach will produce inconsistent estimates of the coefficients and partial effects (Blundell and Powell, 2003, 2004; Wooldridge, 2015). To obtain consistent estimates, we utilize the control function method to address the endogeneity concern (Petrin and Train, 2010; Wooldridge, 2015). Despite a different way to construct the "controls," Wooldridge (2015) states that the control function approach is inherently an instrumental variables method as it also relies on excluded instrumental variables.

where $\Delta\%H_t^{t,c}$ is the two-year percent change in the national house price index, $Elasticity^c$ is the Saiz (2010) estimate of the housing supply elasticity in MSA c (a city is represented by an MSA in this instance), and $\epsilon_t^{i,c}$ is the error term. We believe that the interaction of the supply elasticity and the percent change in the housing price index meets the exclusion restriction of a valid instrument. In response to a nation-wide positive demand shock, MSAs with more inelastic housing supply (i.e., New York City, NY or San Francisco, CA) will experience larger house price appreciation than MSAs with a more elastic housing supply (i.e., Houston, TX or Kansas City, MO). This variation is likely driven by location-specific topological features and land use stringency policies embedded in the elasticity measure.

To verify the correlation between elasticity measures and house price appreciation, Figure 4 shows the change in reported house value in our data for the ten most elastic MSAs and the ten most inelastic MSAs from 1994 to 2010. This figure shows that during the housing boom, inelastic MSAs experienced more house price appreciation than the elastic MSAs. The pattern is consistent with the housing price growth documented in Mian and Sufi (2011). Furthermore, Figure 5 shows the correlation between claiming Social Security benefits at age 62 or 63 and the MSA land supply elasticity. We see in this figure a clear divergence in the probability of claiming at age 62 or 63 for the ten most elastic MSAs versus the ten most inelastic MSAs during the housing boom. Consistent with our priors, individuals in more inelastic MSAs are less likely to claim early during the boom. Figures 4 and 5 motivate using the supply elasticity to explain the tendency to claim through its impact on housing prices.

The supply elasticity has been used as an instrument extensively in the literature (Mian and Sufi, 2011, 2014; Chaney et al., 2012; Mian et al., 2013; Cvijanović, 2014; Dettling and Kearney, 2014; Aladangady, 2017; Chetty et al., 2017; Stroebel et al., 2019). However, the validity of this instrument was questioned by Davidoff (2016). He argues that the attributes of housing supply that make areas more difficult to develop (such as lakes and mountains) are valued amenities which are correlated with housing demand. We believe that the Saiz instrument is appropriate in our context, despite this critique. This is because similar to how Mian and Sufi (2011, 2014), Aladangady (2017), Chetty et al. (2017), and Stroebel et al. (2019) show that changes in many fundamental local economic indicators, such as wage growth, are uncorrelated with the elasticity measures, we also find that in our sample the correlation between the housing supply elasticity and income growth is -0.0994 during the housing boom. Because there is not a strong correlation between the housing supply elasticity and local demand factors, we believe that the exclusion restriction is met.

While we believe our estimates using the Saiz instrument are valid, to further corroborate our findings, we employ a second instrument proposed by Guren et al. (2020). The control function using the second instrument is specified as follows:

$$\Delta\%H_t^{i,c} = \mu_1 \Delta\%P_t^r \times \varphi^c + \mu_2 X_t^{i,c} + \gamma_s + \delta_t + \epsilon_t^{i,c} \tag{3.3}$$

where $\Delta\%H_t^{i,c}$ is the percent change in regional house prices. φ^c is estimated by Guren et al. (2020) and is a proxy for the housing price sensitivity in CBSA c. When creating φ^c, the authors include various controls, such as local and regional changes in retail employment. This removes concerns about reverse causation in the estimation of φ^c.

This second instrument exploits the fact that house prices in some cities are systematically more sensitive to regional house price cycles than other cities. To create the instrument, the authors estimate the systematic historical sensitivity of local house prices to regional house price cycles. This historical sensitivity estimate was then interacted with a contemporaneous shock to regional house prices, giving it a structure similar to a Bartik instrument. For this instrument to be valid, the identifying assumption is that, conditional on the control variables included, there are no other unobserved factors that are correlated with regional house prices and that differentially affect the cities that are more historically sensitive to regional housing cycles.

4. Data and Summary Statistics

Our analysis relies on four data sources. The primary dataset is the restricted HRS that allows for detailed georeferencing. The HRS is a longitudinal household survey of more than 26,000 Americans over the age of 50 and is collected every two years. The core dataset provides detailed information for each survey respondent, such as demographic attributes, financial and housing wealth, health, labour market status, and information on Social Security claiming.

The geocoded HRS provides detailed information on the county in which the respondent lives. After a preliminary screening, our sample includes 19,027 individuals.[22]

The remaining three datasets are used to create our instruments. We obtain information on the national, regional, and MSA-level house price indexes constructed by the Federal Housing Finance Agency (FHFA).[23] The FHFA index is widely used to capture national and local house price trends (Himmelberg et al., 2005). To form our first instrument, we interact the national FHFA index appreciation rates with the land supply elasticities for 269 MSAs, calculated by Saiz (2010). He estimates land supply elasticities by processing satellite-generated data on elevation, the presence of bodies of water, and the Wharton Regulation Index (WRI), which is a measure of the stringency of land use regulation. The second instrumental variable is an interaction of the regional FHFA index appreciation rate with a measure of how sensitive a CBSA is to house price cycles, created by Guren et al. (2020).[24]

We match MSAs and counties using the Geographic Correspondence Engine.[25] Given our instrumental variable strategy, we limit our sample to counties located within the MSAs covered by the Saiz elasticity measure or the CBSAs covered by the Guren et al. sensitivity measure. We further restrict our sample to homeowners at the time they turn 62.[26] We also exclude individuals who moved in the two years prior to turning 62 to ensure that the change in home equity is due to price appreciation or depreciation of the same unit. Finally, we exclude households that experienced a percent change in house prices in the previous two years either above the 99$^{\text{th}}$ percentile or below the 1$^{\text{st}}$ percentile.

Table 1 presents summary statistics for our variables. We present the mean and standard deviation of each variable for three periods: the full sample (2002 to 2010), the boom period

[22] Initially, the sample included 37,319 elderly individuals. We exclude the 5,729 individuals who report receiving Social Security benefits before becoming age eligible. We also exclude the 706 respondents who report ever receiving disability retirement benefits. Further, we include only individuals whom we observe before they turn 60 (two years before the eligibility age), which causes us to lose 11,857 respondents.

[23] http://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx#qat.

[24] This instrument is available online at the authors' websites.

[25] http://mcdc2.missouri.edu/websas/geocorr2k.html.

[26] We limit our sample to homeowners due to the fact that we are examining how a change in house value affects Social Security claiming behaviour. Renters do not own their home and therefore cannot withdraw home equity. While renters have been used as a control group in other research (Zhao and Burge, 2017), for our identification strategy using renters would require us to perform an imputation of home values. Such imputations would bias estimates towards zero, which is the expected coefficient. Therefore, using renters as a placebo test is not feasible in our setting.

(2002 to 2006), and the bust period (2008 to 2010). In the full sample, approximately 52% of individuals claim Social Security within one year of becoming eligible, which is similar to the number reported by the U.S. Social Security Administration. The percent who claim within one year of becoming eligible is higher during the boom period but decreases during the bust. The lower probability of claiming early on average during the bust period may be due to changes in the Social Security program. Specifically, there were changes in the generosity of benefits that made claiming at age 62 or 63 less beneficial for the cohorts who happened to become eligible during the bust period.

Although the HRS is conducted every two years, the respondents report the year and month they started receiving Social Security. This information allows us to expand the biannual survey to an annual panel. However, because respondents only report house values during the survey years, we still use the two-year change in house prices. For survey years, we take the difference in reported house prices between the two surveys. In non-survey years, we use the reported house prices in the adjacent two years and the MSA house price index to extrapolate the house value. For example, for 2005 we use the reported house values in 2004 and 2006, as well as the MSA house price index in 2004, 2005, and 2006, to estimate the reported house value in 2005.

We show in Table 1 that the two-year average percentage change in house values in our sample is 12% from 2002 to 2010. The national and MSA house price appreciation rate, however, are both approximately 10%. From 2002-2006, this number increased to approximately 19% in our sample and to 17.5% at both the national and the MSA level. However, during the bust period from 2008-2010, house prices declined by about 4% in our data, and 8.3-8.5% based on the national housing price index and the MSA-specific housing price index.[27] The average housing supply elasticity is 1.73 and the average sensitivity of

[27] One explanation that the reported house values are above the national and MSA house price index values is that we are only considering a sample of the population, those close to age 62, while the indices are based on the entire population. It is plausible that the average house value of this group is different from the national average. Alternatively, individuals may overestimate the value of their home. The evidence on what determines the possible reporting errors is mixed. Haurin et al. (2018), who examined just the elderly population, found that the size of the error changes with income, credit score, and ethnicity. Goodman and Ittner (1992), however, found that this reporting error is uncorrelated with characteristics of the home, the local economy, and the homeowner. We include a variety of controls to minimize any bias in the error term, similar to Corradin and Popov (2015) and Harding and Rosenthal (2017). We are not concerned about the remaining measurement errors as the instrumental variables approach we adopt in our empirical analysis will

house prices in different cities to regional house price movements is 1.07. Approximately 57% of respondents are female, 86% are white, and 82% are married. Older workers with more than ten years of service in their last job are 35% of our sample. Approximately 56% of the sample has completed high school and 28% have a college degree. Average non-housing wealth is about $428,063. The average self-assessed health status is 2.48, which suggests that individuals assess their health as "good" on average.[28] Given the important role of retirement decisions in Social Security claiming, we also control for retirement status. Approximately 38% of the respondents are no longer working. These averages are similar for both the boom and bust periods.

5. Results

5.1. Baseline

We begin our analysis by estimating Equation (3.1) using a probit model. Results are presented in Table 2. Column (1) examines whether an individual claims Social Security within one year of becoming eligible during the housing boom (2002 to 2006). Column (2) examines whether an individual claims Social Security within two years of becoming eligible. Columns (3) and (4) follow the same structure as columns (1) and (2) but cover the bust period (2008 to 2010). All specifications include controls for gender, race, marital status, tenure at last job, education, non-housing wealth, self-assessed health, and employment status. We report the coefficients from the probit model in the upper panel and the corresponding marginal effects in the lower panel. Standard errors are clustered at the city level and are reported in parentheses.

As shown in Table 2, we do not find a statistically significant effect of a change in house value on claiming Social Security benefits at age 62 or 63 during the boom or bust period. However, a probit model likely suffers from endogeneity issues due to omitted variable bias or potential attenuation bias caused by measurement errors. We address these concerns by

help to correct for any potential attenuation bias.

[28]The variable "self-reported general health status" includes five values, with 1 for "excellent," 2 for "very good," 3 for "good," 4 for "fair," and 5 for "poor."

using a control function approach with the two instrumental variables described earlier.

Table 3a reports results using the Saiz (2010) instrument and Table 3b reports results using the Guren et al. (2020) instrument. Both tables follow the same structure as Table 2. The first-stage results at the bottom of both tables indicate that our instrument has significant explanatory power for our endogenous regressor as the F-statistics are consistently above the standard threshold of 10. The estimated coefficient is consistent with our priors that areas with a lower supply elasticity or a higher house price sensitivity are associated with a higher rate of house price appreciation.

The second-stage results reported in Tables 3a and 3b indicate a negative and statistically significant effect of a change in house prices on the likelihood of claiming Social Security benefits at age 62 or 63 during the boom period. This coefficient suggests that when house prices increase, individuals delay receiving Social Security. Using the Saiz (2010) instrument, the coefficients indicate that when housing values increase by 10%, the probability of claiming Social Security within one year of becoming eligible is reduced by 4.26 percentage points and the probability of claiming within two years of becoming eligible is reduced by 5.47 percentage points. This translates into a 7.81% decrease in the probability of claiming within one year of becoming eligible and an 8.67% decrease in the probability of claiming within two years of becoming eligible. The results using the Guren et al. (2020) instrument are of a similar magnitude. Specifically, when housing values appreciate by 10%, the probability of claiming Social Security within one year of becoming eligible is reduced by 4.06 percentage points and the probability of claiming within two years of becoming eligible is reduced by 5.56 percentage points. This translates into a 7.44% decrease in the probability of claiming within one year of becoming eligible and an 8.81% decrease in the probability of claiming within two years of becoming eligible. Overall, the results suggest that when house prices increase, individuals delay receiving Social Security past age 62.

Comparing our probit and control function estimates, we are able to draw insight on the bias present in the probit model. First, the null finding of the probit model could result from attenuation bias due to measurement error of the reported housing value that we use to form our key independent variable. Second, the probit estimates could also result from a stronger upward bias. We are concerned with two main sources of endogeneity: unobserved local inflation and unobserved local labour market performance. The former leads to an upward bias while the latter leads to a downward bias. Given that we control for labour force participation, we are less concerned with the second source of bias. If the magnitude of the upward bias roughly matches the true coefficient, we may end up having a probit estimate that is close to zero and statistically insignificant.

During the bust period, however, we do not find a statistically significant effect using either instrument. This result is consistent with the argument that when house prices depreciate, borrowing against home equity is no longer a viable option. The patterns are also largely consistent with Harding and Rosenthal (2017) who find that housing capital gains encourage entry into self-employment, but housing capital losses have no discernible effect on entry into or exit from self-employment. However, we also recognize that, as argued in Bhutta and Keys (2016), housing is a durable good and there is less likely to be a supply response during a bust, which affects the identifying variation of the instruments.

5.2. Heterogeneity by Financial Constraints

Next, we consider if the impact of changes in house values on claiming behaviour differ based on if an individual is more likely to be financially constrained. As explained in Section 2, financially constraint individuals are more likely to respond to a positive housing wealth shock to delay receiving Social Security benefits. We explore this empirically by looking at two indicators of an individual's assets: stock account balance and if there is an outstanding mortgage two years before becoming eligible to claim Social Security.

We report our estimates in Tables 4 and 5. Results using the Saiz (2010) instrument are presented in columns (1) and (2) and results using the Guren et al. (2020) instrument are reported columns (3) and (4). We focus on the decision to claim within two years of becoming eligible during the boom period. Results regarding the decision to claim within one year are similar and are reported in Appendix Table A1. We also focus on the boom period given the results from Tables 3a and 3b show that the effect of house price changes on Social Security claiming is only present when house prices appreciate.[29]

Results in Table 4 suggest that when individuals with a zero stock account balance experience a positive shock to housing wealth, they delay claiming Social Security. However, there is no statistically significant relationship for individuals with a positive stock account balance. This result is consistent for both instruments. Note that the first-stage F-statistics are not over the standard threshold of 10 for households with a positive stock balance, so these results may suffer from a weak instrument problem.[30] However, the findings in columns (1) and (3) are in line with our priors that those who are financially constrained are more likely to need to draw upon housing assets to finance current consumption and delay claiming Social Security.

Similarly, in Table 5, we find that those individuals with a positive outstanding mortgage balance two years before becoming eligible to claim Social Security are more likely to delay claiming if house prices appreciate.[31] This is true when we both instruments. Note that individuals with an outstanding mortgage balance are identified based on the lagged status, as we think the current mortgage status could be simultaneously determined by home equity-based borrowing. For those individuals who do not have a mortgage, the results are statistically insignificant. Overall, the findings in Tables 4 and 5 support our argument that the households who are more likely to be financially constrained are driving the baseline results.

6. Mechanism

Our results thus far indicate that individuals delay claiming Social Security when house prices appreciate, especially those that are more likely to be financially constrained. There are two main channels that could drive this result. First, homeowners could stay in their current home but borrow against the appreciated home equity. Second, homeowners could

[29]We do not find any statistically significant effects during the bust period. These results are available from the authors upon request.

[30]The first-stage F-statistic could be lower than the full sample due to the fact that when we restrict our sample to different groups we exclude some geographic areas. These excluded areas could be in the MSAs with large variations in the supply elasticity. Losing these observations would hence reduce the variation of our instrument and the power of identification.

[31]We find similar results that individuals with a positive mortgage outstanding are more likely to delay claiming within one year of becoming eligible if house prices appreciate. Results are reported in Table A2 in the Appendix.

sell their home and move into either a cheaper unit or become renters.[32] We now consider both channels and examine which one is driving our baseline results.

6.1. Do Individuals Borrow Against Home Equity?

We provide direct evidence of cashing-out home equity, which takes into account loan balances in a first mortgage, a second mortgage, and a Home Equity Line of Credit (HELOC). In Table 6, we examine the effect of an increase in home value on whether or not the total home loan amount increased.[33] Due to this, the sample is restricted to individuals in the HRS who have valid data on the total home loan amount. In columns (1) to (5) we use the Saiz (2010) instrument and in columns (6) to (10) we use the Guren et al. (2020) instrument.

In columns (1) and (6), we examine if the total home loan amount increases after house prices appreciated for all individuals in our baseline regression with a slightly more restricted sample. We find a strong positive effect, which suggests that households draw upon their home equity in response to house price appreciation. This evidence is consistent with previous findings on the home equity-based borrowing channel as documented in Mian and Sufi (2011), Cooper (2013), Aladangady (2017), and others. In columns (2) and (7), we focus on the stayers. Again, we find a strong positive effect, suggesting that those staying in their same home are taking actions to increase the amount of their home loans.

In columns (3) and (8) we focus on stayers without a secondary home. This is an important check for three reasons. First, those individuals who have a secondary property could sell their second home to obtain the additional income needed for consumption. In this case, even though individuals do not move, they are still relying on the channel of selling their properties to obtain additional funds. Second, a secondary home could lead to measurement errors in capturing the appreciated housing value that the individual experiences, as we do not know the location of their secondary properties. Third, having a second property may be an indicator of being less financially constrained. For all these reasons, we look at individuals

[32] We considered the possibility that individuals rent out their residence(s) to obtain more rental income. Overall, we do not find any significant impact on the increased rental income. Results are available upon request.

[33] Reverse mortgage is another option available. Although in general few people take out a reverse mortgage, there was a slight increase in its popularity during the housing boom period (Shan, 2011; Davidoff, 2015; Cocco and Lopes, 2019). We cannot completely exclude this channel in our analysis.

without a secondary property to obtain results that do not have these possible confounding factors. In Table 6, we find a positive and statistically significant effect using the Saiz (2010) instrument, but do not find a statistically significant effect using the Guren et al. (2020) instrument.

Next, we focus on individuals with a zero stock account balance (columns (4) and (9)) and individuals who had an outstanding mortgage balance two years before becoming eligible to claim Social Security (columns (5) and (10)). Again, we believe that these individuals are more likely to be financially constrained and therefore are more likely to take out a home loan to finance expenditures and delay claiming Social Security. We find positive and statistically significant results for both groups when we use the Saiz (2010) instrument. When using the Guren et al. (2019) instrument, we find a positive but not statistically significant effect for stayers with zero stock account balance, but positive and statistically significant results for stayers who have an outstanding mortgage. The persistent effect for individuals who have an outstanding mortgage balance is consistent with our priors, as it suggests that those who still have a mortgage are more likely to take on additional loans to finance expenditures. Those that have paid off their mortgage, however, do not appear to be increasing the total amount of their home loans. Overall, these findings support the result that households, especially those that are more likely to be financially constrained, are drawing upon their home equity to delay claiming Social Security.[34]

6.2. Do Individuals Sell Their Current Home and Move?

An alternative explanation for our results is that when house prices appreciate, individuals nearing retirement downsize and move to a cheaper house or switch from owning to renting. By selling their house and moving, these individuals are able to withdraw their home equity. We examine these mechanisms in Table 7, which follows the same structure as Table 6. Table 7 reports the impact of house price appreciations on mobility and claiming Social Security within 2 years, while Table A3 in the Appendix presents similar evidence but for claiming within 1 year.

[34]This finding is also consistent with Nakajima and Telyukova (2017) and Cocco and Lopes (2019) who find that the demand for reverse mortgage loans increases for elderly homeowners with pre-existing mortgage.

In columns (1) and (6), we examine the likelihood that an individual stays in his or her current home when the value of the house increases. We find that households are more likely to stay in the same home over the next two years after their home value appreciates.[35] In columns (2) and (7), we restrict our sample to stayers. We find consistent negative effects, indicating that it is the behaviours of the stayers that are driving our baseline findings. Overall, these results do not support an argument that a mobility response is driving our results.

In columns (3) to (5) and (8) to (10), we consider the effects of claiming Social Security within two years of becoming eligible among different types of individuals: stayers without a secondary property, stayers with a zero stock account balance, and stayers who have not paid off their mortgage. All of these results are similar to our earlier findings, in that the stayers who are more likely to be financially constrained delay claiming Social Security when their home value increases. Overall, these findings suggest that it is not a mobility response that is driving our results.

7. Conclusion

Social Security and the timing of when an individual decides to claim Social Security benefits have become increasingly important due to the rapid increase in the aging population in the U.S. Besides Social Security payments, most elderly households carry a large fraction of their asset portfolio in their home equity. We use restricted HRS data and a control function approach with two different instrumental variables to investigate the effects of changes in housing wealth on the probability of claiming Social Security within one or two years of becoming eligible during the recent housing boom and bust periods. We find consistent evidence that when house prices increase during the boom, individuals delay receiving Social Security benefits.

We also consider the channels that drive these results. We do not find strong effects of increases in home value on mobility. In fact, we find that the claiming response is concentrated among stayers, not movers. This suggests that it is unlikely that homeowners sell their prop-

[35] In our sample of 1,124 individuals, only 65 moved after turning 62.

erty to cash out home equity. Furthermore, we find that among stayers, there is an increase in the total amount of home loans when house prices appreciate. The evidence suggests that individuals are borrowing against home equity, either by refinancing their current mortgage, taking out a HELOC, or taking out a secondary mortgage. We also find that this effect is concentrated among individuals who are more likely to be financially constrained.

While this research is an important first step to analyzing the substituibility between home equity and Social Security retirement income, future work should consider how these effects vary across gender and marital status. The Social Security program rules have differences regarding claiming of married couples that are an important and interesting dimension to consider (Cocco, 2005; Fehr and Kindermann, 2017). However, such analysis requires the researcher to separately consider married men, married women, single men, and single women. Given our sample size, we are unable to stratify the sample and retain enough observations to analyze these issues in our framework.

Our findings have important implications for policymakers. There is a widespread concern that the financial stability of the Social Security system in the U.S. is worsening. The program has paid more in benefits and expenses than it has collected in taxes and other non-interest income since 2010 and the Trustees Report projects this pattern will continue for the next 75 years.[36] In the meantime, it is widely recognized that the U.S., like many other countries, is moving into an aged society. The proportion of individuals over the age of 65 in the U.S. rose from 8 percent in 1950 to 13 percent in 2010 and is expected to rise to over 20 percent by 2030 as the Baby Boomer generation ages (Lee, 2014). The rapidly increasing aging population adds additional pressure on the funding of the Social Security program. The decision of when to claim Social Security benefits, and hence the lifetime benefits received, will greatly influence the expenses of the program over time. Hence, a more complete understanding of the impact of housing shocks on the claiming of Social Security is important for designing policy to ensure the solvency of the Social Security system.

[36]The deteriorating financial stability of the system is driven largely by the fact that the program was set up as a pay-as-you-go program, where payroll taxes collected today are used to pay current recipients. https://www.ssa.gov/OACT/TR/2018/tr2018.pdf.

References

Adam, K. and P. Tzamourani (2016). Distributional consequences of asset price inflation in the Euro Area. *European Economic Review 89*, 172–192.

Aladangady, A. (2017). How Do House Prices Affect Consumption? Evidence From Micro Data. *American Economic Review 107*(11), 3415–3446.

Attanasio, O. and G. Weber (1994). The UK consumption boom of the late 1980s: aggregate implications of microeconomic evidence. *The Economic Journal 104*(427), 1269–1302.

Banks, J., R. Blundell, and J. Smith (2004). Wealth Portfolios in the United Kingdom and the United States. *Perspectives on the Economics of Aging* (June), 205–246.

Behaghel, L. and D. Blau (2012). Framing social security reform: Behavioral responses to changes in the full retirement age. *American Economic Journal: Economic Policy 4*(4), 41–67.

Bhutta, N. and B. J. Keys (2016). Interest rates and equity extraction during the housing boom. *American Economic Review 106*(7), 1742–1774.

Blundell, R. and J. Powell (2003). Endogeneity in nonparametric and semiparametric regression models. *Econometric society monographs 36*, 312–357.

Blundell, R. and J. Powell (2004). Endogeneity in semiparametric binary response models. *The Review of Economic Studies 71*(3), 655–679.

Bodie, Z., R. C. Merton, and W. F. Samuelson (1992). Labor supply flexibility and portfolio choice in a life cycle model. *Journal of Economic Dynamics and Control 16*(3-4), 427–449.

Bostic, R., S. Gabriel, and G. Painter (2009). Housing wealth, financial wealth, and consumption: New evidence from micro data. *Regional Science and Urban Economics 39*(1), 79–89.

Brown, J. R., A. Kapteyn, and O. S. Mitchell (2016). Framing and Claiming: How Information-F raming Affects Expected Social Security Claiming Behavior. *Journal of Risk and Insurance 83*(1), 139–162.

Browning, M., M. Gørtz, and S. Leth-Petersen (2013). Housing Wealth and Consumption: A Micro Panel Study. *Economic Journal 123*(568), 401–428.

Campbell, J. and L. Viceira (2001). Who should buy long-term bonds? *American Economic Review 91*(1), 99–127.

Campbell, J. Y. and J. F. Cocco (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics 54*(3), 591–621.

Card, D., N. Maestas, and P. J. Purcell (2014). *Labor Market Shocks and Early Social Security Benefit Claiming.*

Carroll, C., M. Otsuka, and J. Slacalek (2011). How Large Are Housing And Stock Wealth Effects? A New Approach. *Journal of Money, Credit and Banking 43*(1).

Case, K. E., J. M. Quigley, and R. J. Shiller (2012). Wealth Effects Revisited 1975-2012. *Critical Finance Review 2*, 101–128.

Case, K.E., Q. J. and R. Shiller (2005). Comparing wealth effects: the stock market versus the housing market. *Advances in macroeconomics 5*(1).

Chai, J., W. Horneff, R. Maurer, and O. S. Mitchell (2011). Optimal portfolio choice over the life cycle with flexible work, endogenous retirement, and lifetime payouts. *Review of Finance 15*(4), 875–907.

Chaney, T., D. Sraer, and D. Thesmar (2012). The collateral channel: How real estate shocks affect corporate investment. *American Economic Review 102*(6), 2381–2409.

Charles, K. K., E. Hurst, and M. J. Notowidigdo (2018). Housing booms and busts, labor market opportunities, and college attendance. *American Economic Review*.

Chetty, R., L. SÁndor, and A. Szeidl (2017). The Effect of Housing on Portfolio Choice. *Journal of Finance 72*(3), 1171–1212.

Cloyne, J., H. K. I. E. and H. Kleven (2017). The effect of house prices on household borrowing: a new approach. *National Bureau of Economic Research*.

Cocco, J. F. (2005). Portfolio choice in the presence of housing. *Review of Financial Studies 18*(2), 535–567.

Cocco, J. F. and P. Lopes (2019). Aging in Place, Housing Maintenance, and Reverse Mortgages. *The Review of Economic Studies*.

Coile, C., P. Diamond, J. Gruber, and A. Jousten (2002). Delays in claiming social security benefits. *Journal of Public Economics 84*(3), 357–385.

Cooper, D. (2013). House price fluctuations: The role of housing wealth as borrowing collateral. *Review of Economics and Statistics 95*(4), 1183–1197.

Corradin, S. and A. Popov (2015). House Prices, Home Equity Borrowing, and Entrepreneurship. *Review of Financial Studies 28*(8), 2399–2428.

Crawford, V. and D. Lilien (1981). Social security and the retirement decision. *Quarterly Journal of Economics 96*(3), 505–529.

Cvijanović, D. (2014). Real estate prices and firm capital structure. *Review of Financial Studies 27*(9), 2690–2735.

Davidoff, T. (2015). Can "High Costs" Justify Weak Demand for the Home Equity Conversion Mortgage? *Review of Financial Studies 28*(8), 2364–2398.

Davidoff, T. (2016). Supply Constraints are Not Valid Instrumental Variables for Home Prices Because They Are Correlated with Many Demand Factors. *Critical Finance Review 5*(2), 177–206.

Davidoff, T., J. R. Brown, and P. A. Diamond (2005). Annuities and individual welfare. *American Economic Review 95*(5), 1573–1590.

Dettling, L. J. and M. S. Kearney (2014). House prices and birth rates: The impact of the real estate market on the decision to have a baby. *Journal of Public Economics 110*, 82–100.

Dotsey, M., W. Li, and F. Yang (2015). Home production and Social Security reform. *European Economic Review 73*, 131–150.

Engelhardt, G. V. (1996). House prices and home owner saving behavior. *Regional Science and Urban Economics 26*(3-4), 313–336.

Farhi, E. and S. Panageas (2007). Saving and investing for early retirement: A theoretical analysis. *Journal of Financial Economics 83*(1), 87–121.

Fehr, H., K. M. and F. Kindermann (2017). Families and social security. *European Economic Review 91*, 30–56.

Feldstein, M. (1990). Imperfect annuity markets, unintended bequests, and the optimal age structure of social security benefits. *Journal of Public Economics 41*(1), 31–43.

French, D., D. McKillop, and T. Sharma (2018). What determines UK housing equity withdrawal in later life? *Regional Science and Urban Economics 73*(February), 143–154.

Gan, J. (2010). Housing wealth and consumption growth: Evidence from a large panel of households. *Review of Financial Studies 23*(6), 2229–2267.

Gomes, F.J., K. L. and L. Viceira (2008). Optimal life-cycle investing with flexible labor supply: A welfare analysis of life-cycle funds. *American Economic Review 98*(2), 297–303.

Goodman, J. and J. Ittner (1992). The accuracy of home owners' estimates of house value. *Journal of Housing Economics 2*(4), 339–357.

Greenspan, A. and J. Kennedy (2008). Sources and uses of equity extracted from homes. *Oxford Review of Economic Policy 24*(1), 120–144.

Guren, A., A. McKay, E. Nakamura, and J. Steinsson (2020). Housing Wealth Effects: The Long View. *Working paper*.

Gustman, A. L. and T. L. Steinmeier (2005). The social security early entitlement age in a structural model of retirement and wealth. *Journal of Public Economics 89*(2-3), 441–463.

Harding, J. P. and S. S. Rosenthal (2017). Homeownership, housing capital gains and self-employment. *Journal of Urban Economics 99*, 120–135.

Haurin, D., S. Moulton, and W. Shi (2018). The Accuracy of Senior Households' Estimates of Home Values: Application to the Reverse Mortgage Decision. *Real Estate Economics 46*(3), 655–697.

Himmelberg, C., C. Mayer, and T. Sinai (2005). Assessing high house prices: Bubbles, fundamentals and misperceptions. *Journal of Economic Perspectives 19*(4), 67–92.

Horneff, W. J., R. H. Maurer, and M. Z. Stamos (2008). Life-cycle asset allocation with annuity markets. *Journal of Economic Dynamics and Control 32*(11), 3590–3612.

Hubener, A., R. Maurer, and O. S. Mitchell (2016). How Family Status and Social Security Claiming Options Shape Optimal Life Cycle Portfolios. *Review of Financial Studies 29*(4), 937–978.

Hubener, A., M. R. and R. Rogalla (2014). Optimal portfolio choice with annuities and life insurance for retired couples. *Review of Finance 18*(2), 147–188.

Hull, I. (2017). Amortization requirements and household indebtedness: An application to Swedish-style mortgages. *European Economic Review 91*, 72–88.

Hurd, M. D., J. P. Smith, and J. M. Zissimopoulos (2004). The effects of subjective survival on retirement and social security claiming. *Journal of Applied Econometrics 19*(6), 761–775.

Inkmann, J., L. P. and A. Michaelides (2011). How deep is the annuity market participation puzzle? *The Review of Financial Studies 24*(279-319).

Jiang, B. S., W. Sun, and A. Webb (2011). Did the Housing Boom Increase Household Spending ? *Working paper* (11), 1–7.

Lee, R. D. (2014). Macroeconomic consequences of population aging in the United States: Overview of a national academy report. *American Economic Review 104*(5), 234–239.

Lehnert, A. (2004). Housing, Consumption, and Credit Constraints. *SSRN Electronic Journal*.

Love, D. (2010). The effects of marital status and children on savings and portfolio choice. *The Review of Financial Studies 23*(1), 385–432.

Mackenzie, T. A. (2014). Hazards Regression Subject To Additive Confounding. *Health Services and Outcomes Research Methodology 14*(1-2), 54–68.

Mahaney, J. and P. Carlson (2007). *Rethinking Social Security claiming in a 401 (k) world.*

Mariger, R. P. . (1987). A Life-Cycle Consumption Model with Liquidity Constraints : Theory and Empirical Results. *Econometrica 55*(3), 533–557.

Mccully, B. A., K. M. Pence, and D. J. Vine (2018). How Much Are Car Purchases Driven by Home Equity Withdrawal? *Journal of Money, Credit and Banking* (8).

Merton, R. (1969). Lifetime portfolio selection under uncertainty: The continuous-time case. *The review of Economics and Statistics*, 247–257.

Meyer, W. and W. Reichenstein (2010). Social Security: When to Start Benefits and How to Minimize Longevity Risk. *Journal of Financial Planning 23*(3), 49–59.

Mian, A., K. Rao, and A. Sufi (2013, 11). Household Balance Sheets, Consumption, and the Economic Slump. *The Quarterly Journal of Economics 128*(4), 1687–1726.

Mian, A. and A. Sufi (2011). House Prices, Home Equity–Based Borrowing, and the US Household Leverage Crisis. *American Economic Review 101*(5), 2132–2156.

Mian, A. and A. Sufi (2014). What explains the 2007-2009 drop in employment? *Econometrica 82*(6), 2197–2223.

Mirer, T. W. (1998). The Optimal Time to File for Social Security Benefits. *Public Finance Review 26*(6), 611–636.

Muellbauer, J. and A. Murphy (1997). Booms and Busts in the UK Housing Market. *SSRN Electronic Journal*.

Munnell, A. and M. Soto (2005). Why Do Women Claim Social Security Benefits So Early?. *Center for Retirement Research at Boston College.*.

Nakajima, M. and I. A. Telyukova (2017). Reverse Mortgage Loans: A Quantitative Analysis. *Journal of Finance 72*(2), 911–950.

Ong, R., S. Parkinson, B. A. Searle, S. J. Smith, and G. A. Wood (2013). Channels from Housing Wealth to Consumption. *Housing Studies 28*(7), 1012–1036.

Petrin, A. and K. Train (2010). A control function approach to endogeneity in consumer choice models. *Journal of marketing research 47*(1), 3–13.

Rutledge, M. S., N. B. Coe, and C. R. R. Wp (2012). Great Recession-induced early claimers: Who are they? How much do they lose? (April).

Saiz (2010). The geographic determinants of housing supply. *Quarterly Journal of Economics 125*(3), 1253–1296.

Sass, S. A., W. Sun, and A. Webb (2013). Social Security claiming decision of married men and widow poverty. *Economics Letters 119*(1), 20–23.

Shan, H. (2011). Reversing the trend: The recent expansion of the reverse mortgage market. *Real Estate Economics 39*(4), 743–768.

Shoven, J. B. and S. N. Slavov (2014). Does it pay to delay social security? *Journal of Pension Economics and Finance 13*(2), 121–144.

Shoven, J.B., S. S. and D. Wise (2017). Social Security Claiming Decisions: Survey Evidence. *National Bureau of Economic Research*.

Stroebel, J., N. Y. U. Stern, and C. Booth (2019). House Prices , Local Demand , and Retail Prices. *Journal of Political Economy 127*(3), 1391–1436.

Wooldridge, J. M. (2015). Control Function Methods in Applied Econometrics. *Journal of Human Resources 50*(2), 420–445.

Yaari, M. (1965). Uncertain lifetime, life insurance, and the theory of the consumer. *The Review of Economic Studies 32*(2), 137–150.

Zhao, L. and G. Burge (2017). Housing Wealth, Property Taxes, and Labor Supply among the Elderly. *Journal of Labor Economics 35*(1), 227–263.

Table 1: Summary Statistics

	2002-2010		2002-2006		2008-2010	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Claim Social Security within 1 year	0.5149	0.4999	0.546	0.498	0.4438	0.4972
Claim Social Security within 2 years	0.6066	0.4886	0.6311	0.4826	0.5493	0.4979
Δ% in house value in previous 2 years	0.1186	0.3209	0.1888	0.3224	-0.0419	0.2528
Δ% in US HPI in previous 2 years	0.0965	0.1222	0.1746	0.0319	-0.0833	0.0253
Δ% in MSA HPI in previous 2 years	0.0969	0.1653	0.1754	0.1159	-0.0854	0.1095
Saiz housing supply elasticity	1.7326	1.0724	1.7252	1.0865	1.7500	1.0393
Guren et al. housing price sensitivity	1.0897	0.5817	1.0937	0.5783	1.0804	0.5901
Home loan increased in previous 2 years	0.2062	0.4047	0.2191	0.4137	0.1773	0.3822
Female	0.5677	0.4955	0.5553	0.4971	0.5960	0.4910
White	0.8633	0.3436	0.8619	0.3451	0.8663	0.3406
Married	0.8213	0.3832	0.8302	0.3756	0.8009	0.3996
Tenure at last job zero to five years	0.2302	0.4211	0.2257	0.4182	0.2404	0.4276
Tenure at last job five to ten years	0.1159	0.3203	0.1051	0.3068	0.1408	0.3481
Tenure at last job more than ten years	0.3492	0.4768	0.3576	0.4794	0.3300	0.4706
High school	0.5638	0.496	0.5653	0.4959	0.5605	0.4967
College	0.2774	0.4478	0.2568	0.4370	0.3243	0.4685
Non-housing wealth	428063	2201155	462014	2610368	350404	579714
Self-assessed health status	2.4773	0.9848	2.4565	0.9968	2.5248	0.9558
Retired	0.3847	0.4866	0.3837	0.4864	0.3869	0.4874

Table 2: Probit Regressions - Claiming Social Security within 1 or 2 years after Becoming Eligible

	2002-2006		2008-2010	
	(1)	(2)	(3)	(4)
Dependent Variable	Claim within 1 Year	Claim within 2 Years	Claim within 1 Year	Claim within 2 Years
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-0.0967	-0.1177	0.1468	0.1832
	(-0.1224)	(-0.0878)	(-0.2191)	(-0.2655)
	Marginal Effect			
Δ% in house value in previous 2 years	-0.0283	-0.0342	0.0423	0.0513
	(-0.0358)	(-0.0253)	(-0.0622)	(-0.0743)
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	1,600	1,578	677	669
Log Pseudolikelihood	-828.8786	-812.5042	-246.3202	-332.8628

Notes: This table reports the probit regression estimates for the probability of claiming Social Security within 1 or 2 years after becoming eligible. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Regressions are run separately for the boom and the bust periods. Standard errors are clustered at the city level and are reported in parentheses.

Table 3a: Control Function Regressions: Claiming Social Security - MSA Supply Elasticity as IV

	2002-2006		2008-2010	
	(1)	(2)	(3)	(4)
Second Stage Dependent Variable	Claim within 1 Year	Claim within 2 Years	Claim within 1 Year	Claim within 2 Years
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-1.4673**	-1.5158**	-0.3451	-0.4111
	(-0.5893)	(-0.6396)	(-0.6391)	(-0.6229)
	Second Stage Marginal Effect			
Δ% in house value in previous 2 years	-0.4262**	-0.5469**	-0.1082	-0.1504
	(-0.1705)	(-0.2288)	(-0.2004)	(-0.2279)
First Stage Dependent Variable	Δ% in house value in the previous 2 years			
	First Stage Regression Coefficient			
Δ% in U.S. HPI in previous 2 years × MSA land supply elasticity	-0.5080***	-0.5174***	-0.4651***	-0.4663***
	(-0.1114)	(-0.1113)	(-0.1314)	(-0.1271)
First-stage F-Statistics	20.7936	21.6225	12.5316	13.4689
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	1,197	1,181	486	477
Log Pseudolikelihood	-834.4523	-796.5949	-73.0165	-72.4506

Notes: This table reports the control function regression estimates for the probability of claiming Social Security within 1 or 2 years after becoming eligible using the Saiz instrument. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Regressions are run separately for the boom and the bust periods. Standard errors are clustered at the city level and are reported in parentheses.

Table 3b: Control Function Regressions: Claiming Social Security - Guren et al. CBSA Measure as IV

	2002-2006		2008-2010	
	(1)	(2)	(3)	(4)
Second Stage Dependent Variable	Claim within 1 Year	Claim within 2 Years	Claim within 1 Year	Claim within 2 Years
	Second Stage Probit Regression Coefficient			
Δ% in house value in previous 2 years	-1.3911**	-1.5540***	0.1289	-0.0051
	(-0.5392)	(-0.5442)	(-0.6445)	(-0.5100)
	Second Stage Marginal Effect			
Δ% in house value in previous 2 years	-0.4063**	-0.5557***	0.0379	-0.0018
	(-0.1580)	(-0.1949)	(-0.1895)	(-0.1800)
First Stage Dependent Variable	Δ% in house value in the previous 2 years			
	First Stage Regression Coefficient			
Δ% in U.S. HPI in previous 2 years × Guren et al. CBSA Sensitivity	0.9169***	0.9012***	1.0769***	1.0588***
	(-0.2089)	(-0.2101)	(-0.2009)	(-0.1936)
First-stage F-Statistics	19.2721	18.4041	28.7296	29.9209
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	1,242	1,225	501	492
Log Pseudolikelihood	-866.9046	-826.0363	-61.181	-61.8102

Notes: This table reports the control function regression estimates for the probability of claiming Social Security within 1 or 2 years after becoming eligible using the Guren et al. instrument. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Regressions are run separately for the boom and the bust periods. Standard errors are clustered at the city level and are reported in parentheses.

Table 4: Control Function Regressions: Claiming Social Security within 2 Years by Stock Account Two Years Ago

	2002-2006			
	(1)	(2)	(3)	(4)
Dependent Variable	Saiz Instrument		Guren et al. Instrument	
Sample	Stock Account = 0	Stock Account > 0	Stock Account = 0	Stock Account > 0
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-1.6694**	-1.3364	-1.6202***	-1.7735
	(-0.6870)	(-1.7819)	(-0.6208)	(-1.7053)
	Marginal Effect			
Δ% in house value in previous 2 years	-0.5576**	-0.5262	-0.4817***	-0.6596
	(-0.2285)	(-0.7016)	(-0.1845)	(-0.6342)
First-stage F-Statistics	19.7136	5.8564	16.9744	4.4944
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	667	507	691	527
Log Pseudolikelihood	-489.3326	-213.2091	-505.8252	-213.2091

Notes: This table reports the second stage of control function regression estimates for the probability of claiming Social Security within 2 years after becoming eligible stratified by the stock account balance two years ago. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Standard errors are clustered at the city level and are reported in parentheses.

Table 5: Control Function Regressions: Claiming Social Security within 2 Years by Outstanding Mortgage Two Years Ago

	2002-2006			
	(1)	(2)	(3)	(4)
Dependent Variable	Saiz Instrument		Guren et al. Instrument	
Sample	Mortgage = 0	Mortgage > 0	Mortgage = 0	Mortgage > 0
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-0.7708	-1.9685***	-1.0643	-1.9886***
	(-1.1011)	(-0.6907)	(-0.9947)	(-0.7258)
	Marginal Effect			
Δ% in house value in previous 2 years	-0.2835	-0.6118***	-0.3915	-0.7285***
	(-0.4050)	(-0.2147)	(-0.3658)	(-0.2658)
First-stage F-Statistics	8.4681	19.2721	7.6729	14.7456
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	442	727	458	755
Log Pseudolikelihood	-328.1099	-213.2091	-337.432	-405.3036

Notes: This table reports the second stage of control function regression estimates for the probability of claiming Social Security within 1 or 2 years after becoming eligible stratified by outstanding mortgage two years ago. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Standard errors are clustered at the city level and are reported in parentheses.

Table 6: Control Function Regressions - Total Housing Loan Amount in Previous Two Years Increased or not

	2002-2006									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Saiz Instrument					Guren et al. Instrument				
Sample	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage
	Probit Regression Coefficient									
Δ% in house value in previous 2 years	1.8820***	1.6723***	1.5262**	1.3979**	1.4313**	1.5288***	1.4310***	1.1141	1.1406	1.8788***
	(-0.4717)	(-0.5767)	(-0.7373)	(-0.6990)	(-0.7303)	(-0.4675	(-0.4802)	(-0.6835)	(-0.7759)	(-0.5746)
	Marginal Effect									
Δ% in house value in previous 2 years	0.5183***	0.5093***	0.6050**	0.5545**	0.5702**	0.5781***	0.5359***	0.4418	0.4536	0.7463***
	(-0.1299)	(-0.1756)	(-0.2923)	(-0.2759)	(-0.2909)	(-0.1767)	(-0.1792)	(-0.2710)	(-0.3085)	(-0.2289)
First-stage F-Stat	27.3529	21.2521	21.6225	19.5364	17.8084	21.0681	24.01	17.1396	14.5161	30.1401
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1161	1052	852	576	650	1,203	1,086	879	595	672
Log Pseudolikelihood	-720.78	-789.05	-625.36	-478.64	-429.66	-910.12	-806.81	-637.94	-491.03	-441.18

Notes: This table reports the second stage of control function regression estimates for the probability of whether the total housing loan amount in the previous two years increased or not. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Stayers with an outstanding mortgage are identified based on the lagged status. Standard errors are clustered at the city level and are reported in parentheses.

Table 7: Control Function Regressions - Mobility and Claiming Social Security within 2 Years

	2002-2006									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Saiz Instrument					Guren et al. Instrument				
Sample	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage
Dependent Variable	Stay	Claim SS within 2 years				Stay	Claim SS within 2 years			
	Probit Regression Coefficient									
Δ% in house value in previous 2 years	2.3355***	-1.6081**	-1.4587**	-1.7480**	-2.1332***	2.5325***	-1.7777***	-1.9322***	-1.9685***	-2.1712***
	(-0.4865)	(-0.6957)	(-0.6999)	(-0.7383)	(-0.6632)	(-0.5014)	(-0.4878)	(-0.4722)	(-0.5795)	(-0.6518)
	Marginal Effect									
Δ% in house value in previous 2 years	0.3265***	-0.5516**	-0.4258**	-0.6029**	-0.8344***	0.3814***	-0.6001***	-0.6664***	-0.6759***	-0.8347***
	(-0.0680)	(-0.2386)	(-0.2043)	(-0.2546)	(-0.2594)	(-0.0755)	(-0.1646)	(-0.1628)	(-0.1989)	(-0.2505)
First-stage F-Stat	12.8881	18.6624	21.2521	16.3216	18.3184	10.1124	20.1601	16.8921	13.1044	22.09
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1124	1,055	882	588	640	1,166	1,089	911	607	662
Log Pseudolikelihood	-534.62	-686.87	-584.31	-422.93	-327.03	-551.99	-704.74	-599.64	-433.34	-340.69

Notes: This table reports the second stage of control function regression estimates for the probability of staying [columns (1) and (6)] and the probability of claiming Social Security within two years after becoming eligible [Columns (2)–(5) and (7)-(10)]. Results obtained using the Saiz instrument are reported in columns (1) - (5). Results obtained using the Guren et al. instrument are reported in columns (6) – (10). Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Stayers with an outstanding mortgage are identified based on the lagged status. Standard errors are clustered at the city level and are reported in parentheses.

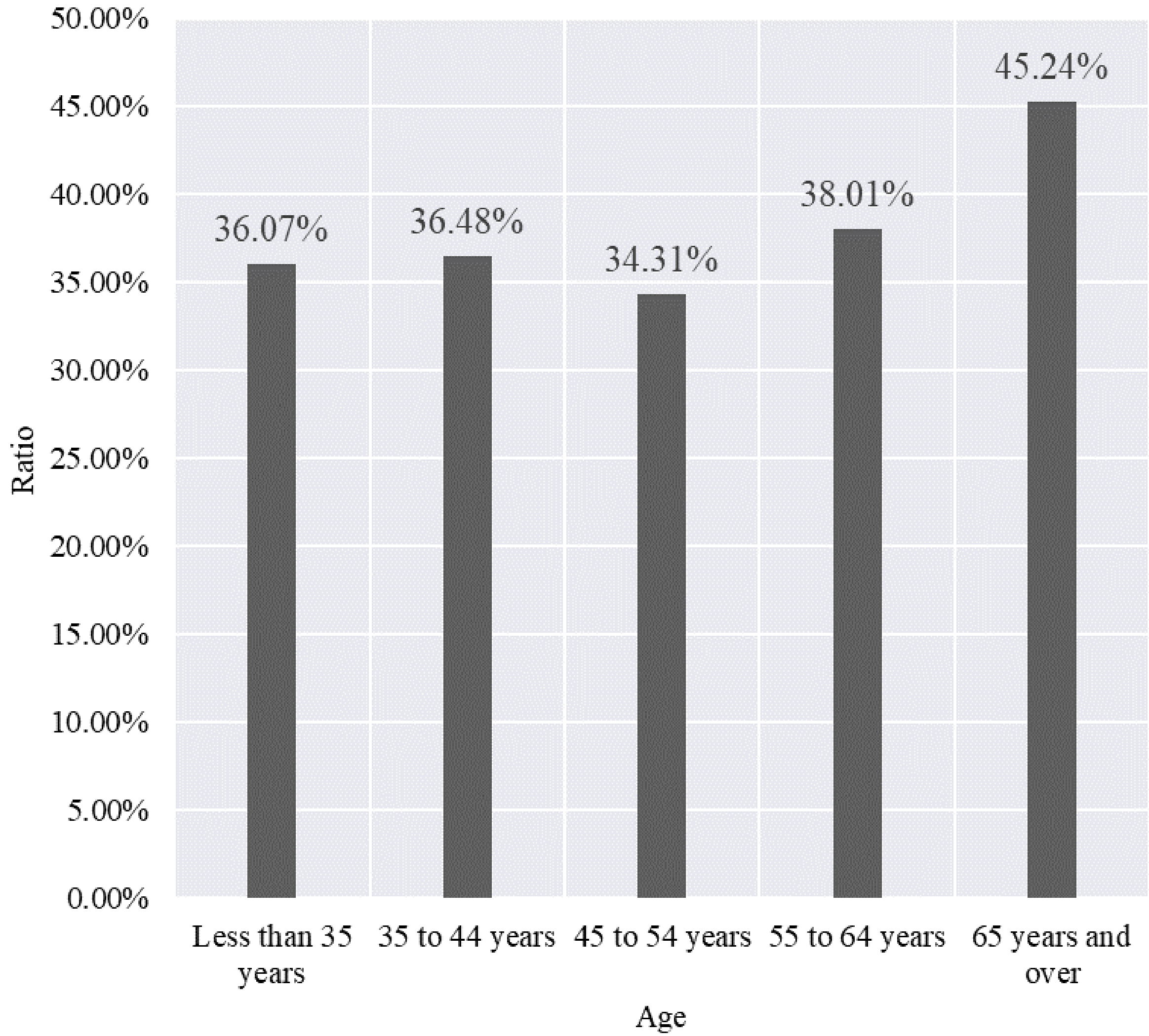

Figure 1: Ratio of Home Equity to Household Net Worth

Source: Survey of Income and Program Participation, 2005

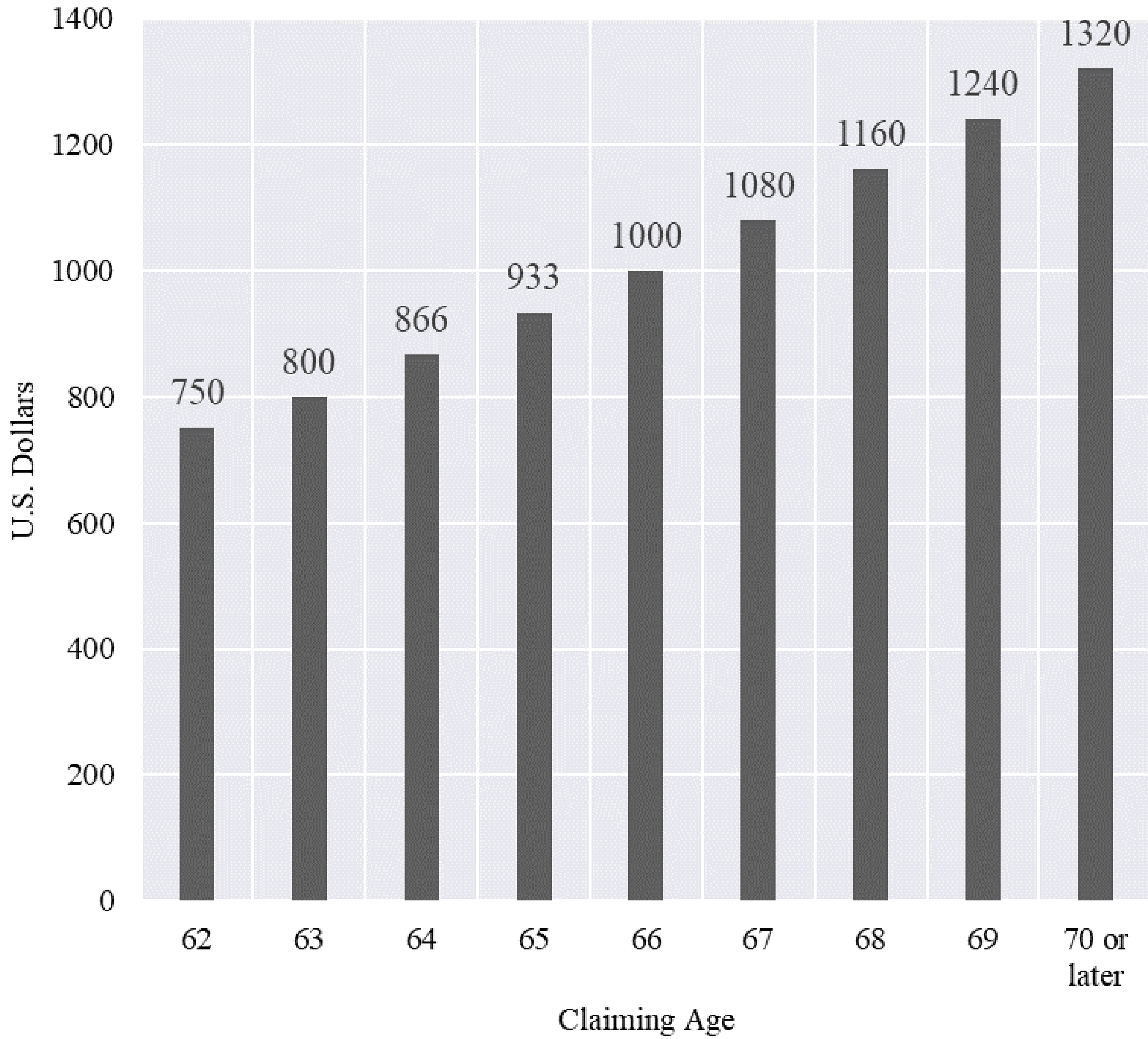

Figure 2: Monthly Social Security Benefit Amount for Cohort from 1943 to 1954
Source: `https://www.ssa.gov`.

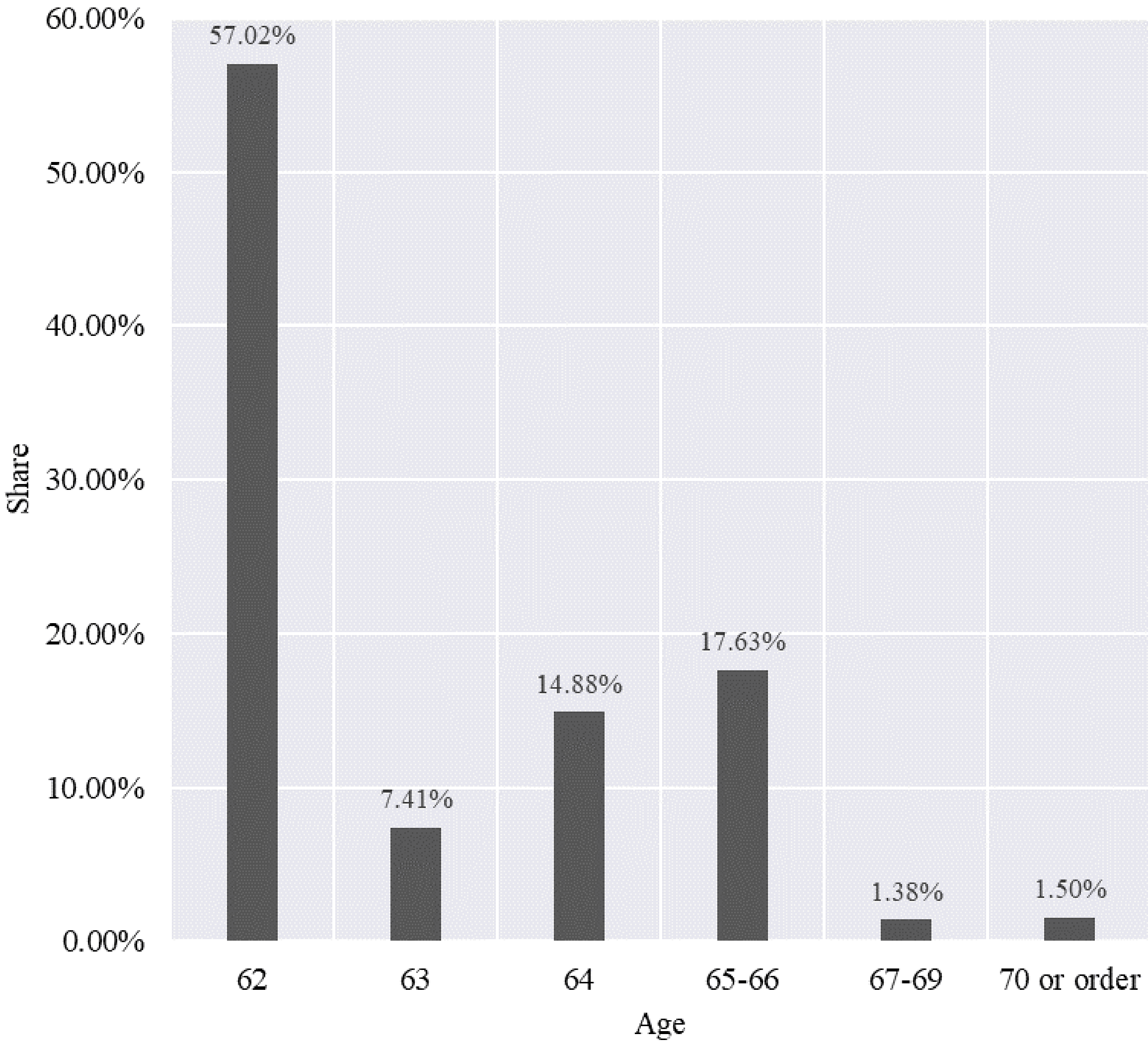

Figure 3: Age Distribution of Individuals Claiming Social Security Retirement Benefits

Notes: We exclude disabled workers whose benefit automatically converts to a retired worker benefit in the month the worker attains FRA. The data source is the Annual Statistical Supplement to the Social Security Bulletin in 2018. We report statistics in 2002, the beginning of our sample period.

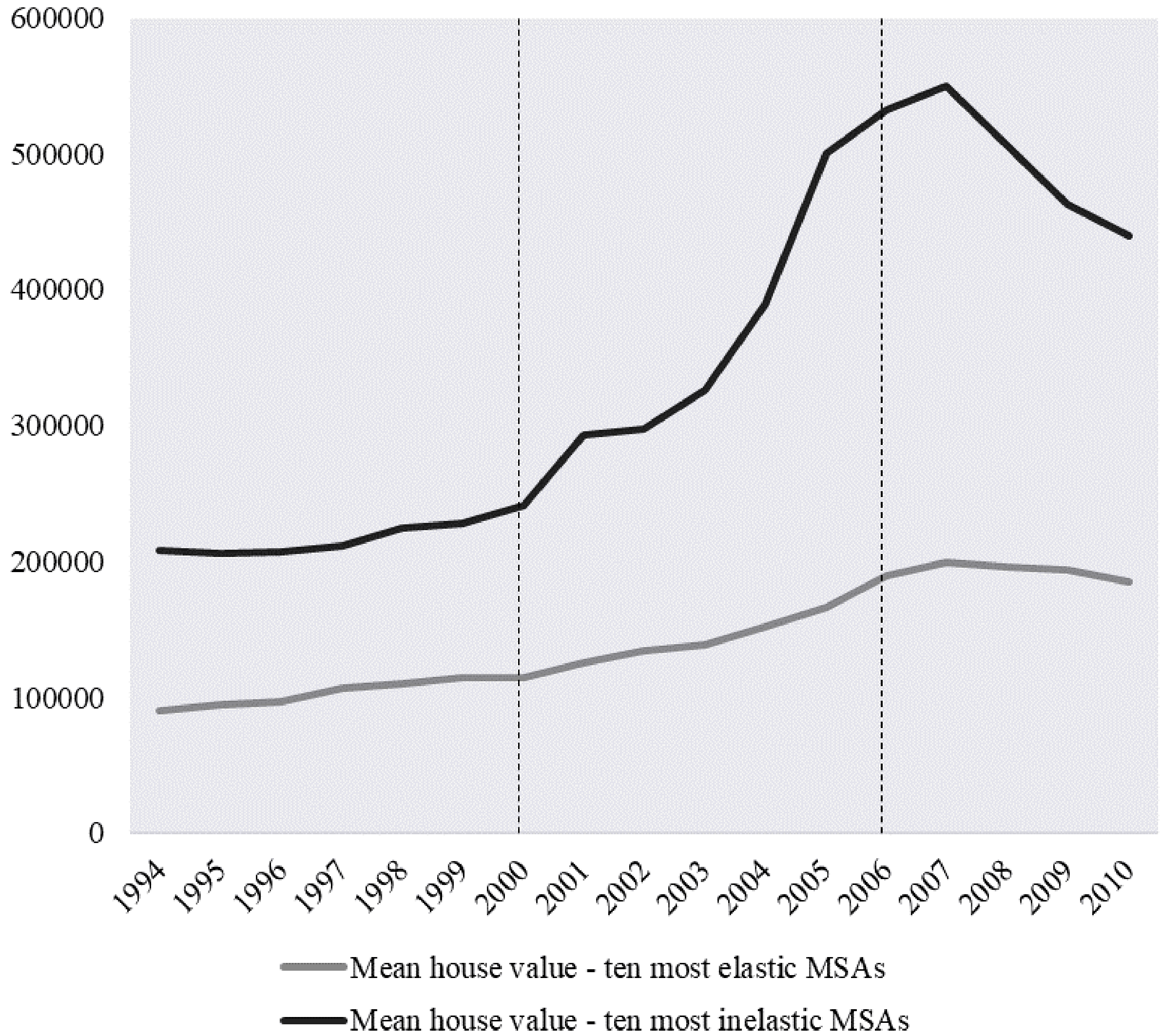

Figure 4: Homeowner Assessed House Value by MSA Land Supply Elasticity

Notes: The figure shows that the house value appreciation is associated with the MSA-specific land supply elasticity. Houses in inelastic MSAs fetch higher values and experience more dramatic house price appreciations during the boom period.

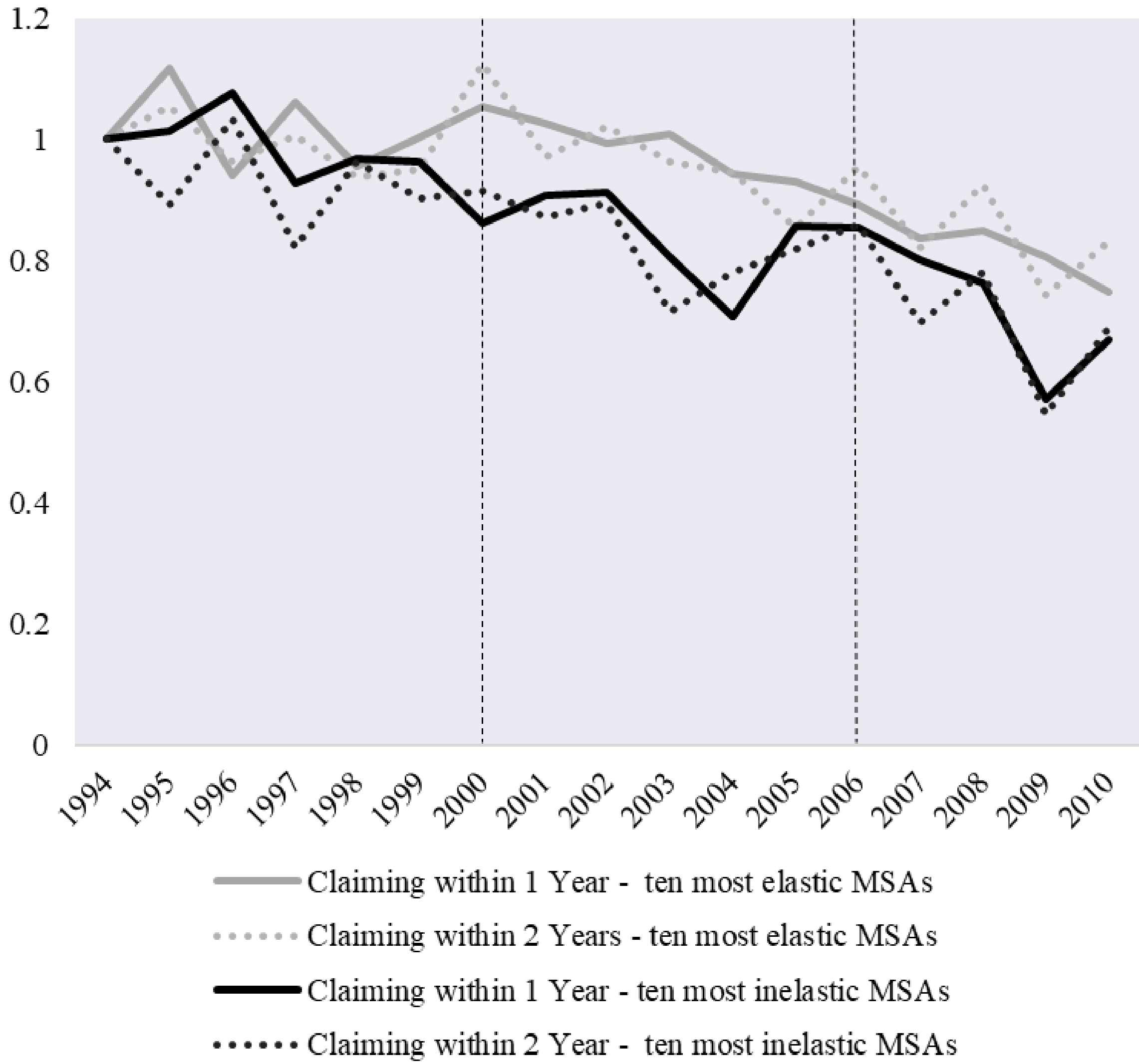

Figure 5: Early Claiming of Social Security Benefits by MSA Land Supply Elasticity

Notes: The figure shows that taking the probability of claiming Social Security either within 1 year or 2 years in 1994 as the benchmark, the claiming probability in the subsequent years steadily declines. During the housing boom in the early 2000s, there seems to be a divergence in the rate of early claiming depending on whether the individual resides in an MSA with elastic or inelastic land supply.

Appendix 1

Table A1: Control Function Regressions: Claiming Social Security within 1 Year by Stock Account Two Years Ago

	2002-2006			
	(1)	(2)	(3)	(4)
Dependent Variable	Saiz Instrument		Guren et al. Instrument	
Sample	Stock Account = 0	Stock Account > 0	Stock Account = 0	Stock Account > 0
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-1.6185***	-1.1659	-1.5485***	-1.4653
	(-0.5154)	(-1.6656)	(-0.5530)	(-1.2632)
	Marginal Effect			
Δ% in house value in previous 2 years	-0.5404***	-0.4593	-0.4515***	-0.5504
	(-0.1721)	(-0.6561)	(-0.1612)	(-0.4744)
First-stage F-Statistics	18.5761	6.76	17.7241	5.1529
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	677	513	701	534
Log Pseudolikelihood	-538.2275	-198.4536	-557.5734	-210.9641

Notes: This table reports the second stage of control function regression estimates for the probability of claiming Social Security within 1 after becoming eligible stratified by stock account balance two years ago. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Standard errors are clustered at the city level and are reported in parentheses.

Table A2: Control Function Regressions: Claiming Social Security within 1 Year by Outstanding Mortgage Two Years Ago

	2002-2006			
	(1)	(2)	(3)	(4)
Dependent Variable	Saiz Instrument		Guren et al. Instrument	
Sample	Mortgage =0	Mortgage > 0	Mortgage = 0	Mortgage > 0
	Probit Regression Coefficient			
Δ% in house value in previous 2 years	-0.4101	-2.1875***	-0.271	-2.1858***
	(-1.2062)	(-0.6836)	(-1.0037)	(-0.6467)
	Marginal Effect			
Δ% in house value in previous 2 years	-0.1287	-0.4744***	-0.1258	-0.5296***
	(-0.3785)	(-0.1483)	(-0.4659)	(-0.1571)
First-stage F-Statistics	9.61	18.8356	7.3984	16
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	456	734	472	763
Log Pseudolikelihood	-354.1458	-397.6699	-364.0559	-422.8467

Notes: This table reports the second stage of control function regression estimates for the probability of claiming Social Security within 1 year after becoming eligible stratified by outstanding mortgage two years ago. Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Standard errors are clustered at the city level and are reported in parentheses.

Table A3: Control Function Regressions - Mobility and Claiming Social Security within 1 Year

	2002-2006									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Saiz Instrument					Guren et al. Instrument				
Sample	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage	All	Stayers	Stayers without secondary properties	Stayers with zero stock account	Stayers with an outstanding mortgage
Dependent Variable	Stay	Claim SS within 1 year				Stay	Claim SS within 1 year			
	Probit Regression Coefficient									
Δ% in house value in previous 2 years	2.3355***	-1.8832***	-1.8476***	-1.9291***	-2.4177***	2.5325***	-1.7262***	-2.0646***	-1.8097***	-2.4232***
	(-0.4865	(-0.5395)	(-0.4862)	(-0.5037)	(-0.6552)	(-0.5015)	(-0.4653)	(-0.3963)	(-0.5534)	(-0.5482)
	Marginal Effect									
Δ% in house value in previous 2 years	0.3265***	-0.6460***	-0.5487***	-0.6047***	-0.9643***	0.3814***	-0.5810***	-0.6132***	-0.5653***	-0.8991***
	(-0.0680)	(-0.1856)	(-0.1444)	(-0.1579)	(-0.2613)	(-0.0755)	(-0.1566)	(-0.1176)	(-0.1728)	(-0.2038)
First-stage F-Stat	12.8881	17.0569	18.7489	17.3889	16.3216	10.1124	17.3889	13.5424	11.7649	22.3729
State Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,124	1,059	886	591	643	1,166	1,093	915	610	665
Log Pseudolikelihood	-534.6243	-702.177	-602.9671	-456.6941	-335.8122	-551.9909	-724.7599	-620.539	-471.0182	-351.4541

Notes: This table reports the second stage of control function regression estimates for the probability of staying [columns (1) and (6)] and the probability of claiming Social Security within one year after becoming eligible [Columns (2)–(5) and (7)-(10)]. Results obtained using the Saiz instrument are reported in columns (1) - (5). Results obtained using the Guren et al. instrument are reported in columns (6) – (10). Other control variables include gender, race, marital status, tenure at last job, education, total non-housing wealth, employment status, and self-assessed health status. Stayers with an outstanding mortgage are identified based on the lagged status. Standard errors are clustered at the city level and are reported in parentheses.

Appendix 2

Following the framework of Mariger (1987), Feldstein (1990), and Mirer (1998), we use a simple model to demonstrate the role of unexpected wealth shocks in Social Security claiming decisions, in the presence of financial constraints. The model assumptions are the same as in Section 2.2 (assumptions 1-4). The utility is assumed to be isoelastic and is given by

$$U(C) = \begin{cases} \frac{C^{1-\gamma}}{1-\gamma} & \gamma > 0 \text{ and } \gamma \neq 1 \\ \log(C) & \gamma = 1 \end{cases} \tag{A.1}$$

The expected lifetime utility for people reaching age 62 is given by

$$EU = \sum_{a=62}^{N} \frac{S_a}{(1+\rho)^{a-62}} \frac{C_a^{1-\gamma}}{1-\gamma} \tag{A.2}$$

where S_a is the probability of surviving to age a from age 62 conditional on that the person is alive at age 62, ρ is the rate of time preference, γ is the coefficient of relative risk aversion and C_a is consumption at age a. We suppress the cohort index for easy presentation.

Let W_a denote the wealth at age a. If W_a is either positive or negative, it could be carried forward with risk-free interest rate r. In any period a, the end-period wealth level W_{a+1} is determined by the start-period wealth W_a, annual Social Security benefits B_a, and the concurrent consumption C_a. We have

$$W_{a+1} = (1+r)W_a + B_a - C_a \tag{A.3}$$

We consider three scenarios separately. First, as a baseline scenario, we assume there is no housing wealth shock at age 62. Given the lack of initial wealth and in the presence of financial constraints, individuals have to claim Social Security benefits at age 62. At equilibrium, the optimal lifetime consumption is smoothed out intertemporally. The consumption level C_a^0 becomes:

$$C_a^0 = C_{62} = (1 - \delta_{62})\, B_{FRA} \quad \text{for } a = 62, \ldots, N \tag{A.4}$$

where δ_{62} is the penalty imposed on early claiming at age 62. B_{FRA} is the Social Security benefit at the Full Retirement Age (FRA).

Second, we assume, in a different scenario, there is an unexpected permanent increase in housing wealth when individuals reach age 62 ($W_{62} > 0$). Mirer (1998) shows that the optimal plan, in this case, consists of two sequential phases. In the first phase, individuals have marketable wealth to consume. The phase ends when the marketable wealth is exhausted, which we denote as age $\bar{a}$. $\bar{a}$ is not necessarily equal to the claiming age τ but cannot be less than τ. In the second phase, the only resource is the Social Security benefit. Age from $\bar{a}+1$ to N is the second phase. If the financial constraints are not binding in this case, the necessary condition for interior solutions leads to

$$\frac{C_a^{\bar{a}}}{C_{a-1}^{\bar{a}}} = \left[\frac{(1+r)(1-d_a)}{1+\rho}\right]^{1/\gamma} \tag{A.5}$$

where $d_a = 1 - \frac{s_a}{s_{a-1}}$.

Since the present value of all consumption expenditures in the first phase must be equal to the resources available through $\bar{a}$, the temporal consumption in the first phase from age 62 to $\bar{a}$ is

$$C_{1,a}^{\bar{a}} = \frac{W_{62} + \sum_{a=62}^{\bar{a}} B_a (1+r)^{-(a-62)}}{\sum_{a=62}^{\bar{a}} \left(\Pi_{j=62}^{a} F_j\right) (1+r)^{-(a-62)}} \quad \text{for } a = 62, \ldots, \bar{a} \tag{A.6}$$

where $F_j = \frac{C_{1,a}^{\bar{a}}}{C_{1,a-1}^{\bar{a}}}$, and $F_1 = 1$ for convenience.

Additional initial wealth allows individuals to delay the time of claiming social security benefit. However, whether there is an increase in consumption in the first phase is ambiguous. The consumption amount could be lower since more B_a before $\bar{a}$ become zero. The consumption amount could be higher with the positive initial wealth W_{62} or the increased value of B_a from delaying.

The consumption in the second phase will be

$$C_{2,a}^{\bar{a}} = B_a \text{ for } a = \bar{a}+1, \ldots, N \tag{A.7}$$

The consumption $C_{2,a}^{\bar{a}}$ in the second phase will be higher than C_a^0, as delaying claiming

Social Security allows B_a to increase.

Homeowners could utilize the positive housing wealth by moving to a smaller house or switching from owning to renting. Besides, individuals could use their house as collateral for additional bank loans. The appreciated value could relax the initial borrowing constraints for homeowners.

Third, we assume that there is an unexpected increase in housing wealth, but the wealth shock is transitory. Assume that the wealth drops to zero at age $\bar{a}'$. $\bar{a}'$ is greater than or equal to τ. In this case, although the present value of this additional wealth is zero, it has time value. Given that it is temporary, we assume that the borrower needs to pay back the money and borrowing cost after age $\ddot{a}$ with $\ddot{a} < \bar{a}'$. We also assume $\ddot{a} \geq \tau$.

The consumption between age 62 and age $\ddot{a}$ is

$$C^{\ddot{a}}_{1,a} = \frac{W_{62} + \sum_{a=62}^{\ddot{a}} B_a (1+r)^{-(a-62)}}{\sum_{a=62}^{\ddot{a}} \left(\prod_{j=62}^{a} F_j \right) (1+r)^{-(a-62)}} \qquad \text{for } a = 62, \ldots, \ddot{a} \tag{A.8}$$

The consumption between age $\ddot{a}+1$ and age $\bar{a}'$ is

$$C^{\ddot{a}}_{2,a} = \frac{-W_{62} - C + \sum_{\ddot{a}+1}^{\bar{a}'} B_a (1+r)^{-(a-62)}}{\sum_{a=\ddot{a}+1}^{\bar{a}'} \left(\prod_{j=\ddot{a}+1}^{a} F_j \right) (1+r)^{-(a-62)}} \qquad \text{for } a = \ddot{a}+1, \ldots, \bar{a} \tag{A.9}$$

where C is the present value of borrowing cost.

Whether consumption in the first two phases increase is ambiguous for similar reasons under Eq. A.6.

Similar to Eq. A.7, consumption between age $\bar{a}'$ and age N is

$$C^{\ddot{a}}_{3,a} = B_a \text{ for } a = \bar{a}' + 1, \ldots, N \tag{A.10}$$

The corresponding consumption between age $\bar{a}'+1$ and N is higher than C^0_a. It shows that, if the housing wealth shock is transitory, individuals may have incentives to delay claiming Social Security when financial constraints are binding.