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Abstract

More than half of all Social Security beneficiaries claim their benefits before reaching full retirement age, which has important implications for individual retirement income security and for the Social Security program itself. Whereas previous studies have analyzed the determinants of early claiming and/or delayed retirement, none have examined how household debt or liquidity constraints might impact the labor supply and benefit claiming behavior of older individuals. This paper uses data from the Health and Retirement Study to fill this gap in the literature. Preliminary results suggest that having household debt, particularly in the form of outstanding mortgages, positively impacts older adults' likelihood of delaying retirement and Social Security benefit receipt.

Introduction

According to data tracked by the Federal Reserve System's Board of Governors, Americans' indebtedness increased dramatically from the late 1980s until just before the Great Recession. In 2007, the typical family with debt owed $70,600, up from $25,300 in 1989 (Federal Reserve Board 2010). By 2010, the median value of debt for families with debt was $70,700, with debt payments accounting for about 18 percent of their disposable income (Bricker et al. 2012). Older families, in particular, experienced the largest increases in debt over the period. Between 1989 and 2010, the median value of their debt increased between 5 and 6 times. In contrast, the median value of debt among younger families only doubled.

Indebtedness could affect older adults in two ways. On one hand, debt might compel older individuals to keep working and delay Social Security benefit claiming into their mid-sixties and beyond so they can pay off their financial obligations. On the other hand, indebted adults who are cash-strapped and unable to service their debt because they are not working (as a result unemployment or poor health, for example) or because they are earning much less than their lifetime average might claim their benefits as soon as they are eligible to get the necessary cash to make their loan payments. Determining which of these two opposing effects dominates and how debt influences labor supply and claiming decisions is an empirical question whose answer has important implications for individuals' economic well-being in retirement and for the Social Security program itself. The source of the debt, such as whether it is tied to one's home or owed on credit cards, may also affect claiming decisions.

People can begin collecting benefits as early as age 62, but early claimants receive lower monthly benefits for the rest of their lives. Benefits are also reduced $1 for every $2 earned above a threshold ($15,120 in 2013) for beneficiaries who work before reaching the full retirement age (FRA). Thus, the decision to claim benefits early can negatively impact one's own retirement security, and potentially one's spouses'. Moreover, delayed claiming confers substantial financial gains to most older adults who continue working while waiting to collect Social Security. Butrica, Smith, and Steuerle (2007) estimate that people could increase their annual consumption at older ages more than half by delaying retirement for five years, and 9 percent by waiting only one year. The additional earnings from working longer can also generate income and payroll tax revenues, helping to finance Social Security and other government services. Butrica, Smith, and Steuerle (2007) estimate that delaying retirement one year would reduce the Social Security deficit in 2045 by 2 percent.

To our knowledge, this is the first paper to explore the link between older adults' indebtedness and their labor supply and Social Security benefit receipt. With the rising level of indebtedness among older households and scheduled increases in the Social Security full retirement age, thus larger penalties for early claiming, understanding this relationship is especially important.

Background

Although early claiming has declined over the last decade, it remains commonplace today (Johnson and Haaga 2012; Song and Manchester 2007). More than half of all Social Security beneficiaries claim their benefits before reaching the FRA (Social Security Administration 2012, table 6.A3). Previous literature has extensively examined the characteristics of early claimants. Burkhauser, Couch, and Phillips (1996) and Panis (2002) find that the majority of them are in

good health and receiving employer-sponsored pension benefits. Johnson and Haaga (2012) find that early claiming is more prevalent among women, adults with limited education, those with health problems, and varies significantly with macroeconomic conditions, such as high unemployment. Von Wachter (2009) also finds that trends in earnings inequality and the education distribution have significantly impacted on the age of claiming. Muldoon and Kopcke (2008) find that most households have sufficient financial wealth to delay claiming Social Security benefits, yet they claim early. Sass, Sun, and Webb (2007) find a positive association of later claiming and college education for married men, which they cautiously interpret to indicate greater financial awareness. Coile et al. (2002) estimate a hazard model of delayed retirement and find a U-shaped pattern with respect to wealth.

Studies that have examined the optimal claiming age usually conclude that most individuals claim too early. Munnell and Soto (2005), for example, show that the optimal combination of claiming ages for a household depends on the ratio of the wife's and husband's PIA as well as their age difference. They find that while it is often optimal for the wife to claim early, it is usually optimal for the husband to delay. Sass, Sun and Webb (2007) also find that most married men claim Social Security benefits earlier than the age that maximizes the household's expected present value of benefits (EPVB). Moreover, most of the loss is borne by the survivor beneficiary, which could severely jeopardize the economic situation of many elderly widows. Using a utility-equivalence scale Sun and Webb (2009) estimate how much households lose by claiming at age 62 rather than at optimal ages. They conclude that the factor by which the Social Security benefits of a non-liquidity constrained retired household claiming at sub-optimal ages must be increased so that it is as well-off in expected utility terms as at the optimal combination of ages can be as high as 19 percent.

None of the previous papers, however, have explored the link between Social Security claiming decisions and household indebtedness or liquidity constraints. With the rising level of indebtedness among older households, and scheduled increases in FRA, thus larger penalties for early claiming, understanding the direction of the effect of debt and liquidity constrains on benefit claiming will be important for policy makers to understand. The purpose of this study is to fill this gap in the literature.

The importance of liquidity constraints has received a lot of attention in the consumption theory literature, where they have been identified as one of the possible explanations for why individuals' consumption behavior deviates from the permanent income/lifecycle model (Caroll, 2001; Zeldes 1989). The majority of those studies, however, assume an exogenous, even if stochastic, labor supply/income. Recent literature has presented empirical evidence that households adjust not just consumption, but also their labor supply in the presence of borrowing constraints. Studies of the effects of credit market imperfections on households' labor supply decisions often find significant positive effects, particularly among women and homeowners (Fortin, 1995). Bottazzi (2004) finds significant effects of the mortgage qualification constraint on female labor market participation in Britain, while Del Boca and Lusardi (2002) find similarly strong effects of mortgages on women's labor market participation in Italy. A more recent study by Rossi and Trucchi (2012), which uses various definitions of liquidity constraints, also finds significant impacts of credit rationing on actual and desired labor supply in Italian households. Belkar, Cockerell, and Edwards (2007) use data from the Household, Income and Labour Dynamics in Australia survey and find the strongest effect of indebtedness on individual's likelihood of labor force participation when using a debt-servicing ratio variable. In addition, the effects are larger for women than for men, and larger for women with young children than for

those without. The authors suggest that this ordering reflects these groups relative attachment to the labor force.

This paper builds on the previous literature by examining the effect of liquidity constrains on labor supply and Social Security benefit receipt using data from the Health and Retirement Study and focusing on households who are of Social Security eligibility age. With a simple conceptual framework, we show that early Social Security claiming provides older adults who are liquidity constrained with an additional income source for achieving better consumption smoothing. A testable implication of our simple model is that an individual's decision to work more, claim benefits early, or both, is a function of the borrowing limit and how binding the constraint is, among other factors.

Conceptual Framework

For simplicity, we assume a two period framework in which people work in the first period and are retired in the second. They derive utility from consumption and leisure. In the first period they can choose their level of both consumption and leisure, while in the second period they can choose only their level of consumption (since they are retired and leisure is fixed). Individuals maximize their utility over the two periods by choosing optimal leisure and consumption subject to a budget constraint.

$$U = \sum_{t=1}^{2} \beta^{t-1} u(c_t, l_t) = u(c_1, l_1) + \beta u(c_2, 1)$$

Where $u' > 0, u'' < 0 \; and \; u_{c,l} > 0$

We further assume individuals have no initial assets or bequests, which suggests their budget constraints are:

$$w(1 - l_1) - A_1 = c_1$$

$$A_1(1 + r) + Y_r = c_2$$

or

$$w(1 - l_1)(1 + r) + Y_r = c_1(1 + r) + c_2$$

where *w* is the wage rate, A_1 is personal savings at end of the of the first period, *r* is the interest rate, and Y_r is retirement income from Social Security benefits or pensions, for example. Individuals choose their optimal consumption and leisure in the first period, and devote all their time to leisure in the second period while consuming whatever income is leftover from their choices in the first period.

$$\max_{c_1, l_1} u(c_1, l_1) + \beta u(w(1 - l_1)(1 + r) + Y_r - c_1(1 + r), 1)$$

Without market imperfections, optimal consumption and leisure satisfy the following first order conditions:

1) consumption: $u_c'(c_1^*, l_1^*) - \beta(1+r)u_c'(c_2^*, 1) = 0$ or $\frac{u_c'(c_1^*, l_1^*)}{u_c'(c_2^*, 1)} = \beta(1+r)$
2) leisure: $u_l'(c_1^*, l_1^*) - \beta(1+r)wu_c'(c_2^*, 1) = 0$ or $\frac{u_l'(c_1^*, l_1^*)}{u_c'(c_1^*, l_1^*)} = w\,\beta(1+r)$

These equations imply that the agent will try to equate the marginal utility of consumption across periods, as well as the marginal utility of consumption and leisure in the first period.

Borrowing Constraints

Next, assume that there are liquidity constraints, limiting agents to borrowing below a certain threshold $A_1 \geq B$. The Kuhn-Tucker theorem allows us to rewrite the maximization problem in the following way:

$$\max_{c_1, l_1} u(c_1, l_1) + \beta u(w(1-l_1)(1+r) + Y_r - c_1(1+r), 1) + \lambda(w(1-l_1) - c_1 - B)$$

And maximization needs to satisfy the following conditions:

$u_c'(c_1^*, l_1^*) - \beta(1+r)u_c'(c_2^*, 1) - \lambda^* = 0$

$u_l'(c_1^*, l_1^*) - \beta(1+r)wu_c'(c_2^*, 1) - \lambda^* w = 0$

$\lambda^*(w(1-l_1) - c_1 - B) = 0$

We know that the Lagrange multiplier must be non-negative: $\lambda^* \geq 0$. When the constraint is not binding or $(w(1-l_1) - c_1 - B) > 0)$, then $\lambda^* = 0$ and the problem reverts back to the unconstrained case we discussed above. If $\lambda^* > 0$ then the constraint must bind. From the first order condition we see that

$u_c'(c_1^C, l_1^C) - \beta(1+r)u_c'(c_2^C, 1) = \lambda^* > 0$

Hence $u_c'(c_1^C, l_1^C) > \beta(1+r)u_c'(c_2^C, 1)$, meaning that the agent's marginal utility of consumption in the first period will be higher than the discounted marginal utility of consumption in the second period. In other words it also suggests that optimal consumption in the second period will be higher, and consumption in the first period will be lower, compared with the unconstrained case.

Thus, the unconstrained level of leisure in first period which was optimal under the unconstrained case, will no longer be optimal when the constrain binds as marginal utility of leisure no longer equates that of consumption. Since consumption in period one is lower in this case, the marginal utility is higher. To set the intra-period marginal utilities of consumption and leisure equal to each other, the agent has only one option and that is to increase the marginal utility of leisure via increasing his labor supply in the first period.[1]

See figure 1 for graphical representation. In the presence of binding borrowing constraints, the agent's consumption bundle—consumption in the first and second period moves from point A to point C. Point B would have been the resulting bundle had labor supply not been adjusted. The agent is able to improve his well-being by moving from point B to point C by

[1] Since $u_c'(c_1^C, l_1^U) < u_c'(c_1^U, l_1^U)$, the only way to make sure $u_l'(c_1^C, l_1^C) = \beta(1+r)wu_c'(c_1^C, l_1^C)$ is to set $l_1^C < l_1^U$

adjusting his labor supply in the first period. Still, due to the borrowing constraints, he ends up on a lower indifference curve U_3 compared with U_1 which was feasible in the absence of borrowing constraints.

Borrowing Constraints and Early Claiming

Let's further introduce the option of early Social Security claiming, which in the context of this simplified model makes some of the retirement income available in period 1. Let's assume that if early claiming is chosen, half of the retirement income can be used in period 1 and the rest in period 2. In addition, since early claiming results in actuarially reduced benefits, assume that only a portion $(1-\propto)$, where $0 <\propto< 1$ of the full retirement income Y_r is available to the agent if he starts benefits early. Now the agent's utility maximization problem involves one more choice D=1 if he chooses early claiming, and D=0 otherwise.

$$max_{c_1,l_1,D} \sum_{t=1}^{2} \beta^{t-1} u(c_t, l_t) = u(c_1, l_1) + \beta u(c_2, 1)$$

subject to

$$w(1 - l_1) + D\,\frac{(1-\propto \mathrm{D})Y_r}{2} - A_1 = c_1$$

$$A_1(1 + r) + (1 - D)\,\frac{(1-\propto \mathrm{D})Y_r}{2} = c_2$$

Or the budget constraint can be expressed as:

$$w(1 - l_1)(1 + r) + (1-\propto D)Y_r = c_1(1 + r) + c_2$$

In the absence of borrowing constraints, the agent would never choose D=1 as that will bring his budget constrain down, and he could always improve on his position and move to a higher indifference curve by choosing D=0 (figure 1).

However, when borrowing constraints $A_1 \geq B$ are present and binding, as we saw in the example above, inter-period marginal utility of consumption is not equated. The option of early claiming provides the agent with one additional tool besides adjusting labor supply, which he can use to ease up the borrowing constraints and move to a higher indifference curve. As figure 1 shows, depending on the magnitude of the actuarial reduction $\propto$, the individual might be able to improve on his lifetime utility by choosing early claiming and consumption allocation at point D, which is on a higher indifference curve than point C – the optimal allocation under borrowing constraints and no availability of early claiming. Also importantly, when the constraint is binding both l_1^* and D^* are a function of the borrowing limit B.

There is one important caveat to our simple analysis. We implicitly assumed that receiving early Social Security benefits is a possibility, while maintaining the unconstrained level of leisure/labor. In practice, for individuals below the full retirement age, Social Security withholds benefits if annual earnings exceed a certain level.[2] This scenario is not shown on figure 1. The effect of it can be visualized as shifting the budget constraint under early claiming

[2] The level is called "retirement earnings test exempt amount" and in 2013 is equal to $15,120.

down, if the agent needs to reduce hours to keep the benefit. Alternatively, if the agent's labor supply is below the exempt amount, he will not be affected by the earnings test, and can even increase his labor supply and shift the budget constraint up. As a result, the best allocation under early claiming might be better or worse than allocation D, depending on how close the individual's earnings are to the earnings test threshold. Overall both increased labor supply and early benefit claiming, individually or in combination, are potential responses to the existence of borrowing constrains and present an interesting empirical question.

The simple conceptual framework presented here, provides us with the following testable implications: the more binding the liquidity constraints, the higher the agent's incentive to either increase work, claim Social Security early, or both. Which of these routes an individual will choose is a function of the following factors: employment availability, hours flexibility, the relative magnitudes of the borrowing constraint, versus wages, versus retirement income, the magnitude of the actuarial reduction, as well as the possibility of working and receiving benefits simultaneously, which in turn is a function of annual earnings and the worker's birth cohort and his full retirement age (as the annual earnings test was repealed in year 2000 for workers past their full retirement age).

In the conceptual framework presented so far, the individual optimizes over hours of work, consumption and benefit claiming, while instead, in the empirical specification we model the labor supply participation, that is, the effect of borrowing constrains on the extensive rather than intensive margin of labor supply. The reason is that the model is presented just for illustrative purposes, and an interior solution discussion makes it more easily tractable. Whereas the empirical estimation will not identify the effect of liquidity constraints on hours of work, we interpret a potential positive effect of borrowing constrains on the participation decision as evidence for the distorting effects of debt on labor supply.[3]

Empirical Strategy

Our goal is to estimate the influence of debt, in the form of borrowing/liquidity constraints, on labor supply and Social Security benefit receipt. To do this, we estimate several different model specifications. We begin with a set of latent variable models in the form of bivariate probits of labor supply and Social Security receipt. We then estimate nonparametric survival and hazard functions of the probability of retiring and the probability of claiming Social Security benefits. We estimate these separately for older adults with and without debt to better capture how the timing of full retirement and Social Security claiming might be related to having debt. Finally, we estimate discrete-time hazard models of the influence of debt on the timing of initial Social Security benefit claiming and the timing of full withdrawal from the labor force.

Bivariate Probit Models

We start by estimating latent variable models of labor force participation and Social Security receipt. The propensity to participate in the labor force or to collect Social Security benefits is modeled as a function of personal demographic and socio-economic characteristics X and liquidity constraints Lc.

(1) $$y_i^* = X_i\beta + Lc_i\gamma + \varepsilon_i$$

[3] See the Appendix for a graphical illustration of how borrowing constraints can impact both the intensive and extensive margins of labor supply.

$$y_i = 1[y_i^* > 0]$$

More specifically, to allow for potential correlation between the two decisions, we model the two equations jointly in a bivariate probit model, as follows:

(2) $y_{1i}^* = X_i\beta + Lc_i\gamma + \varepsilon_{1i}$ where $\varepsilon_{1i} \sim \mathcal{N}(0, {\sigma^2}_1)$

(3) $y_{2i}^* = X_i\beta + Lc_i\gamma + \varepsilon_{2i}$ where $\varepsilon_{2i} \sim \mathcal{N}(0, {\sigma^2}_2)$

Where y_{1i}^* and $y_{2i}^*$are two latent variables observed according to the following rule: $y_{1i} = 1[y_{1i}^* > 0]$ and $y_{2i} = 1[y_{2i}^* > 0]$. While the error terms are assumed to be independently and identically distributed as bivariate normal, and ρ is the correlation parameter.

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim \mathcal{N}\left[\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{bmatrix}\right] \quad \text{or} \quad \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim \mathcal{N}\left[\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right]$$

Survival Analyses

To capture the effect of debt and liquidity constraints on individuals' timing of labor force retirement and Social Security claiming, we estimate a set of duration models. In one model, we observe spells for each person beginning when he turns age 62 and ending when he fully retires, drops out of the survey, or reaches age 69 without retiring. In another model, we observe spells for each person beginning when he turns age 62 and ending when he starts collecting Social Security benefits, drops out of the survey, or reaches age 69 without claiming benefits.

We begin by plotting the cumulative probability of not yet retiring. The retirement hazard, $\lambda(t)$, is the probability of retiring at age *t*, conditional on not having already retired. The survival function at age *t*, $S(t)$, is defined as

$$S(t) = S(t-1) * [1 - \lambda(t)],$$

and shows the probability of not having retired by age *t*. We estimate S(t) using the nonparametric Kaplan-Meier estimator. Since, at this point, we are only interested in the shape of the raw (unconditional) survival data, we estimate S(t) without any regressors. Similarly, we estimate a survival curve that indicates the duration till initial benefit claiming. We compare survival curves for those with and without debt at age 62.

Next, we estimate discrete-time multivariate hazard models where the hazard rate is a function of personal demographic and socio-economic characteristics X, liquidity constraints Lc, and the elapsed time since the beginning of the spell.[4] We assume a logistic functional form[5] for the hazard function, $\lambda_{ik} = \frac{e^{X_{ik}\beta + Lc_i\gamma}}{1 + e^{X_{ik}\beta + Lc_i\gamma}}$ which allows us to estimate the model as a logit model via

[4] Given the biennial nature of our data, observations are in two-year periods. The MLE approach takes care of the potential problems with right censoring. Each censored spell contributes to the likelihood with the discrete survival function, so we are acquiring the maximum information from people who were censored by utilizing the fact that they survived till the time of the censoring. As for the completed spells, they contribute to the likelihood with the discrete time density function.

[5] We also estimate a clog-log specification which has analogous proportional hazards assumption as continuous-time Cox model. The results are consistent with the logit specification and are available upon request.

maximum likelihood.[6] The dependent variable equals 1 in the period when the individual fully retires or starts collecting benefits; otherwise, it equals zero.

Robustness Checks

To address potential unobserved heterogeneity, we estimate random effects models utilizing the panel nature of our data. The equations we estimate belong to the class of discrete choice panel data models with individual-specific effects, and take the following form:

$$\Pr[y_{it} = 1|\mathrm{X}_{it}, Lc_{it}, \alpha_i] = \Phi(\alpha_i + X_{it}\beta + Lc_{it}\gamma) \tag{7}$$

where $\Phi(\cdot)$ is the standard normal cdf. The unobserved individual-specific permanent characteristics α_i could include unobserved risk preferences or attitudes towards work and leisure.[7] For the random effects model we use a probit specification, which assumes that the individual effects are normally distributed.

In the prior specifications, we assumed that Lc was exogenous; however, there are many reasons to think that liquidity constraints are not strictly exogenous. For example, causality might go in the opposite direction. That would be true if individuals who have higher preferences for leisure are also be more likely to be liquidity constrained, or if individuals who do not work are less likely to take out a mortgage. To address such endogeneity problems in relation to the mortgage variables, we estimate two sets of models that differ in whether the instrumented variable is dichotomous or continuous.

First, we estimate jointly the latent variable model of our outcome variable (work or benefit receipt) with a latent variable model that determines the presence of liquidity constraints (having a mortgage or not). Thus we estimate a two equation system, where y_i^* and Lc_i^* are latent variables:

$$y_i^* = X_i\beta + Lc_i\gamma + u_i \tag{8.1}$$

$$Lc_i^* = X_i\delta + Z_i\theta + \epsilon_i \tag{8.2}$$

This specification was first proposed by Heckman (1978) and was also applied in Del Boca and Lusardi (2003) to instrument the effect of the propensity to hold a mortgage on female labor supply in Italy. We assume a joint normal distribution for the two error terms.

To deal with a continuous endogenous Lc variable such as the dollar value of the debt, we apply a control function approach, where equation (8.2) is replaced by equation (8.3)

$$Lc_i = X_i\delta + Z_i\theta + \varepsilon_i \tag{8.3}$$

In general, control function estimator work by estimating a model of endogenous regressors as a function of instruments (equation 8.3) , much like the 'first stage' of a two-stage least squares estimation, and then using the estimates of the the errors from this model as additional "control

[6] Note that in the model that we specify we do not allow for unobserved heterogeneity

[7] One could potentially specify a fixed effects logit model, and estimate it via conditional maximum likelihood. However, that specification does not recover the coefficients on time-invariant variables. See Cameron and Trivedi (2002) for discussion.

variable" regressors in the binary choice model (8.2). Further the significance of the "control variables" provides a test for the endogeneity of the regressor Lc.[8]

In both specifications, to identify the direction of causality we need factors that shift the likelihood of facing a liquidity constraint but are not directly related to the propensity to work or claim benefits. Appropriate instruments Z would be such that capture the conditions of the housing market and are not directly related to the propensity to work or receive benefits.

Data and Sample

Our analysis is based on the Health and Retirement Study (HRS), a large nationally representative survey of Americans age 51 and older that has been interviewing respondents every other year since 1992. We restrict our sample to non-disabled individuals ages 62 to 69 because they are age-eligible to collect Social Security benefits.

In addition to detailed information on personal characteristics, employment, earnings, income, and program participation, the HRS provides valuable information on financial assets, housing wealth, mortgage debt, credit card balances, and other debt. We use several measures to gauge older adults' indebtedness, including whether or not they have debt, their level of debt, their debt-to-income ratio, and their debt-to-asset ratio. We use the debt-to-income ratio to capture short-term liquidity constraints and the debt-to-asset ratio to capture long-term liquidity constraints. We also consider various sources of debt—mortgage, credit card, or other—for each of these measures. Mortgage debt is the outstanding mortgage on the primary residence, credit card debt refers to credit card balances carried over from one month to the next, and other debt includes the outstanding mortgage on a secondary residence, medical debts, life insurance policy loans, and loans from relatives. For the first time in 2008, the HRS added a separate question on the credit card debt of respondents. Prior to 2008, credit card debt was not distinguishable from other debt.

The predictors in our multivariate models include the debt variables described above, as well as sex, age, race and ethnicity, education, cohabiting status, spouse's earnings and claiming status, self-reported health, and census region of residence. We also control for whether the respondent's age is above his Social Security FRA, since the retirement earnings test does not apply after the FRA—meaning that the respondent could claim his benefit and continue to work without any penalty. In addition, we control for other household income, which we define as total household income excluding the respondent's earnings and Social Security benefits. Finally, we control for financial assets (including checking and savings accounts, certificates of deposit, stocks, bonds, IRAs, and other financial assets) and non-financial or other assets (including real estate, vehicles, and businesses).

The dependent variables in our multivariate models relate to work and Social Security benefits. In the bivariate probit models, they capture whether the respondent is currently working for pay and whether the respondent currently receives Social Security benefits. In the duration models, they capture the age the respondent fully retires and the self-reported age that the respondent first claims benefits (or the age at the time of the interview when he first reports receiving positive benefits if the self-reported age is missing).

[8] See Wooldrigde (2002)

Descriptive Analyses

Americans are increasingly likely to have debt at older ages. Between 1998 and 2010, the share of adults ages 62 to 69 with any type of debt increased from 47.9 to 62.3 percent. Moreover, the median value of outstanding debt grew 68 percent over the same period—from $19,020 per person in 1998 to $32,130 per person in 2010 (figure 2).

Mortgages are the most significant source of debt—accounting for slightly more than half the debt of indebted individuals in this age group. Although that share has remained relatively constant since 1998, the proportion of adults with a mortgage has increased considerably over time (figure 3). Less than a third of adults ages 62 to 69 had a mortgage in 1998, compared with about two-fifths in 2010. Except for a slight dip due to the Great Recession, the median value of outstanding mortgages has also been on the rise—increasing 60 percent since the late 1990s. Among individuals with mortgages, the mortgage constitutes almost all their debt (roughly 90 percent)—a share that has remained constant over the period (figure 4). The speed with which individuals pay off their mortgages has slowed over time, with older homeowners in 2010 owning a smaller share of their homes than their counterparts in 1998.

While the trends in mortgage debt follow closely the trends in total debt, they are not the sole driver of the increasing proportion of indebtedness among older adults. Figure 5 shows that the share of adults age 62 to 69 with other debt has been also on the rise—from 31.5 percent in 1998 to 44.5 percent in 2010. The median value of other debt, however, does not exhibit the same marked rise over time as mortgage debt.

To get a better picture of older adults' overall financial position, we also tracked how their average debt-to-assets ratio has changed over time (figure 6). Although older adults became more leveraged during the Great Recession, an increasing trend in indebtedness was evident even before the financial downturn of 2008. On average, debt consumed 9.9 percent of older adults' assets in 1998, 13.9 percent in 2006, and 17.9 percent in 2010.

Moreover, the increased trend in indebtedness has impacted both individuals who have not reached full retirement age, as well as those who have. Figure 7 shows age differences in the share of older adults with any debt, and figure 8 shows age differences in the share of older adults with mortgages. Both total debt and mortgage debt has increased dramatically between 1998 and 2010 for all age groups, suggesting that the increased trend in indebtedness is not a phenomenon affecting only relatively younger households.

Our simple conceptual framework, presented above, suggested that older adults have two possible responses to debt; they either delay retirement or they tap into their Social Security wealth, perhaps prematurely. While it's expected that labor force participation declines and Social Security receipt increases with age, there are striking differences between those with and without debt. Older adults with debt are significantly more likely to work and significantly less likely to receive Social Security benefits than their counterparts without debt (table 1). Nearly half of adults ages 62 to 69 with any debt work, compared with only a third of older adults without debt. On the flip side, only 71 percent of older adults with debt receive Social Security benefits, compared with 78 percent of those without debt. The differences between those with and without debt are especially noticeable through age 65. Past age 65, there continues to be differences in labor force participation by indebtedness, but the differences in benefit receipt disappear. This finding suggests that older adults' behavior is influenced by the Social Security retirement earnings test—which does not apply after FRA. Finally, differences in labor force

participation and benefit receipt are similar, but larger, between those with and without mortgage debt, and similar, but smaller, between those with and without credit card debt.

Multivariate Analyses

Next we consider how debt influences older adults' labor supply and benefit receipt controlling for other factors. The bivariate probit coefficients have the expected signs and significance with respect to most variables in our model—age, education, health, and spouse's work and benefit receipt (see table A1 for the full set of results). Table 2 shows the marginal effects of the debt variables on labor force participation and benefit receipt.

Even controlling for other factors, we find that having debt, as well as the dollar value of debt, is positively and significantly correlated with individuals' propensity to work and negatively and significantly correlated with their likelihood of receiving Social Security benefits. Those with outstanding debt are also more likely to delay fully retiring from the labor force and to postpone claiming their benefits. In particular, those with debt are 8 percentage points more likely to work and 2 percentage points less likely to receive benefits compared with those without debts. In addition, the amount of debt also has a statistically significant impact on older adults' behavior; an increase of $10,000 in debt per person increases the likelihood of working by 0.6 percentage points and decreases the likelihood of receiving benefits by 0.3 percentage points.

Among the sources of debt, mortgage debt consistently has a stronger impact on labor supply and Social Security receipt than do credit card balances or other debts. Having a mortgage increases the likelihood of working by about 7 percentage points and reduces the probability of receiving Social Security benefits by 3 percentage points (model 2). Having other debt, outside of housing debt, also has a significant impact on older adults' labor force participation: raising their probability of working by 5.7 percentage points. However, the effect of other debt is likely driven by credit card debt. Separate from other debt, unpaid credit balances significantly raise the probability of working by 4 percentage points, while other debt is no longer statistically significant (model 3). Interestingly, the amount of debt impacts older adults differently depending on the type of debt. Whereas an additional $10,000 in housing debt increases the chances of working by 5 percentage points, the effect of credit card debt is more than double: 11 percentage points (model 6). Similarly, the impact of credit card debt is stronger on the propensity to receive benefits. An increase of $10,000 in credit card debt per person reduces the likelihood of benefit receipt by 12 percentage points, compared with only 0.2 percentage points for mortgage debt (model 6). However, whereas the existence of mortgage debt negatively impacts the likelihood of receiving benefits, having credit card or other debt does not (models 2 and 3).[9]

Focusing solely on the sample of homeowners reveals similar results, although somewhat larger in magnitude effects of mortgage debt.[10] Among homeowners, those with an outstanding mortgage are 8 percentage points more likely to work and 4 percentage points less likely to receive benefits. Table 3 also shows the effect of two additional measures of liquidity

[9] We performed several tests for differences in the effects of having a mortgage or other debt on labor supply and benefit receipt by sex, marital status, and wealth. We find that having a mortgage has a slightly stronger impact on labor force participation for women than for men. However, we find no statistically different effects by marital status or wealth.

[10] Close to 90 percent of individuals in our HRS sample are homeowners.

constraints: the ratio of the value of debt (mortgage or other debt) versus assets, and the ratio of debt versus other household income, where both are expressed in percentage terms. Whereas the short- and long- term version of the mortgage leverage ratio have the same impact on benefit receipt – reducing the likelihood by 0.04 percentage points, the effect of the long-term ratio is stronger on the probability of working, as compared with the short term one – 0.1 versus 0.04.

The next set of results show that those with outstanding debts are also more likely to delay fully retiring from the labor force and to postpone claiming Social Security benefits. We begin with a descriptive analysis of the duration (survival function) till full retirement and the duration till starting Social Security benefits, using a non-parametric Kaplan-Meier estimator. Of particular interest is the extent to which these durations differ by whether older adults have debt. [11]

As expected, the probability of not having fully retired (i.e. working) declines precipitously with age—from over 90 percent at age 62 to less than 30 percent at age 69 (figure 9). However, older adults with debt at age 62 (the beginning of their spell) are significantly more likely to delay retirement than their counterparts without debt. The difference between the two groups is even more striking when considering mortgage debt (figure 10). Close to 66 percent of homeowners with mortgages are still working at age 64, compared with only 54 percent of those without mortgages.

As is well known, the probability of not having claimed Social Security benefits also declines with age (figure 11). As previous literature has documented, the survival function declines rapidly between ages 62 and 65. Interestingly, individuals who have debt at age 62 (the beginning of their spell) are significantly more likely to postpone claiming benefits, particularly before age 65. Again, the difference between the two groups is even more striking when considering mortgage debt (figure 12). Whereas close to 50 percent of homeowners with mortgages have claimed benefits before reaching age 65, only 34 percent of those with mortgages have done so.

The Kaplan-Meier estimator, however, does not account for the other potential factors affecting the retirement and claiming. To control for those, we estimate the discrete-time hazard models described earlier and present odds ratios, which show relative probabilities, for the main debt variables (table 4).[12] We find that, controlling for other factors, having debt decreases the relative probability of fully retiring by approximately (1-0.7756) or 22 percent, and the relative probability of claiming Social Security benefits by 14 percent (model 1). Both mortgage debt and other debt have a negative and statistically significant impact on the labor force retirement and benefit claiming. Finally, the amount of mortgage debt also influences the probability of fully retiring, as well as the probability of claiming Social Security benefits.

Endogeneity

Up to this point in the estimation, we have assumed that the explanatory variables are strictly exogenous. It is possible, however, that the variables indicating liquidity constraints are endogenous. This could be due to reverse causality between taking on a mortgage or acquiring other debt and the decisions to work or claim benefit, such as labor force participation and

[11] For the Kaplan-Meier estimation, having debt is determined at the beginning of the spell.
[12] For conciseness, we do not present the full set of coefficient estimates, which are consistent in direction and significance with the bivariate probit results. They are, however, available from authors, upon request.

benefit receipt today affect having a mortgage or other debt in the future. We address this issue by estimating the set of instrumental variable models outlined earlier. As mentioned, viable instruments are those that capture household's access to credit and are not related to their work and benefit receipt decisions.

We focus on instrumenting the mortgage constraints for two reasons: First, the results so far have shown that this category of debt has consistently the strongest impact on individuals' work and claiming decisions. Second, although credit card debt seems to also have a strong impact, so far the HRS lacks the necessary panel length and information that would allow us to identify the individuals who have easier access to credit versus those who do not.[13]

We matched our HRS sample with data from the Federal Housing Finance Agency to capture variation over time and census regions in the state of the housing markets. In particular we used as instruments the average effective interest rates, term to maturity and loan-to-price ratio on conventional single-family mortgages, as well as the percent adjustable rate loans.[14]

Tables 5 and 6 present the results of the IV framework on work and benefit receipt respectively. Column 1 shows coefficient estimates from the models that instrument the binary variable of having a mortgage, while in column 2 the instrumented variable is the per person value of the mortgage. The estimated coefficients on the mortgage variables retain their expected direction from former specifications, but they lose their significance except for the effect of having a mortgage on work which continues to be strong and highly significant. Overall, the instruments seem to be strong determinants of the probability of having a mortgage and the dollar value of the mortgage, however the performed Wald text of exogeneity cannot reject the null hypothesis of no endogeneity in any of the models.

Individual Effects

Finally, as a robustness check we estimated a set of random effects probit models to allow for unobserved heterogeneity in the form of individual specific effects. Marginal effects of the debt variables on work and benefit receipt are presented in table 7. Results are consistent with earlier findings. Mortgages and other debt are both significant positive determinants of work. Having a mortgage has a negative statistically significant impact on benefit receipt, whereas that of other debt is not significantly different from zero.

Conclusion

This paper deepens our understanding of the determinants of labor force participation and Social Security benefit claiming among older Americans by examining the extent to which these decisions are related to household indebtedness. Our results show that the incidence as well as the absolute and relative value of debt among older households has been increasing. Further our empirical findings suggest that even when controlling for other factors, having debt is associated

[13] Potential variables related to credit card constraints would be for example the credit score or information on whether the individual has been declined credit cards before, or how often he applies for cards. Similarly with respect to having a mortgage, potential instruments could include again the credit score, the characteristics of the mortgage contract, and in the case of those who don't own a home or have a mortgage information on previous applications.

[14] While the Federal Housing Agency data is on a state level, the public version of the HRS data does not include state identifiers. Instead we aggregated the data on a census division-year basis, using the relative state population as weights.

with higher propensity to work and lower likelihood of receiving Social Security benefits. Older individuals with outstanding mortgages, as well as other debt are more likely to postpone the initial claim of their benefits and delay fully retiring from the labor force.

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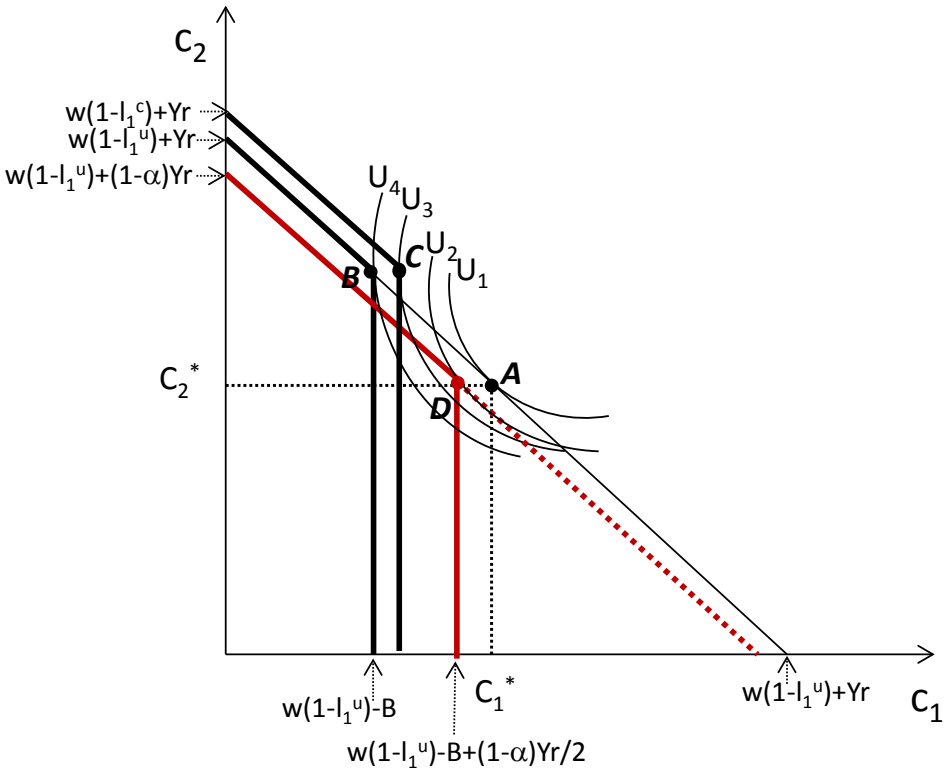
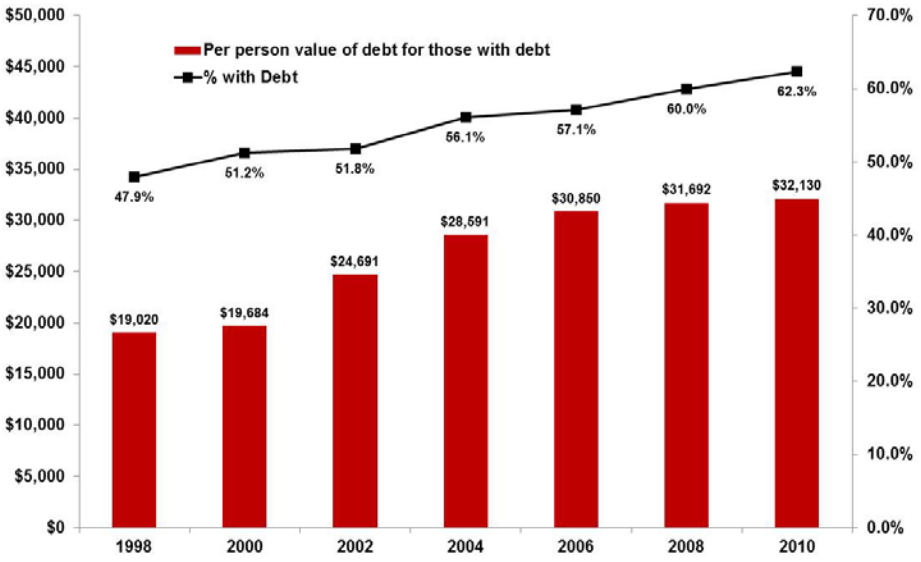
Figure 1:



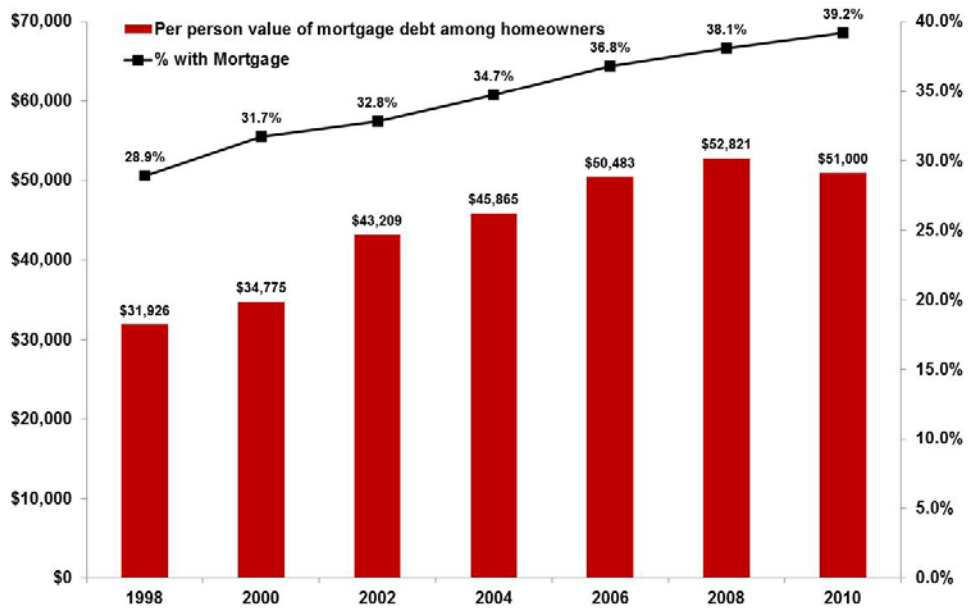
Note: For simplicity, assume further an interest rate of 0 and a discount factor of 1.

Figure 2: Share of Adults Ages 62 to 69 with Debt and the Median Value of Debt, 1998-2010



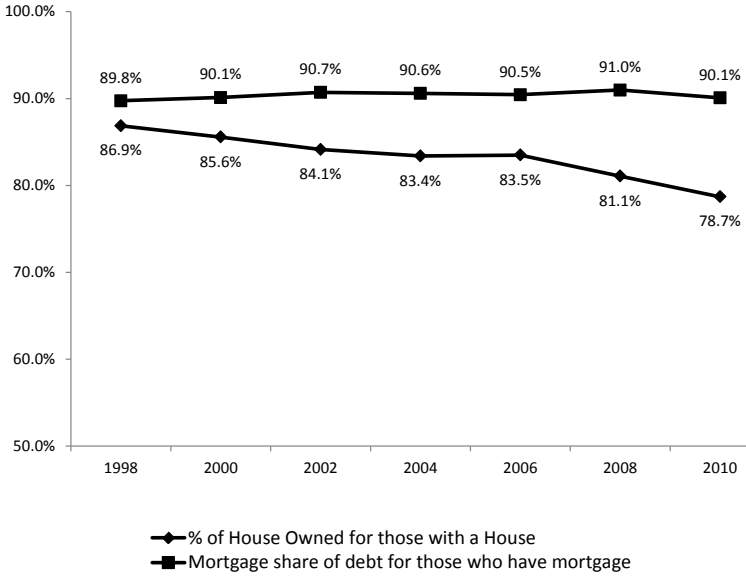
Source: Authors' calculations using 1998-2010 HRS.
Note: Dollar amounts are expressed in 2010 real dollars, adjusted by the change in the consumer price index.

Figure 3: Share of Adults Ages 62 to 69 with Mortgages and the Median Value of the Mortgage, 1998-2010



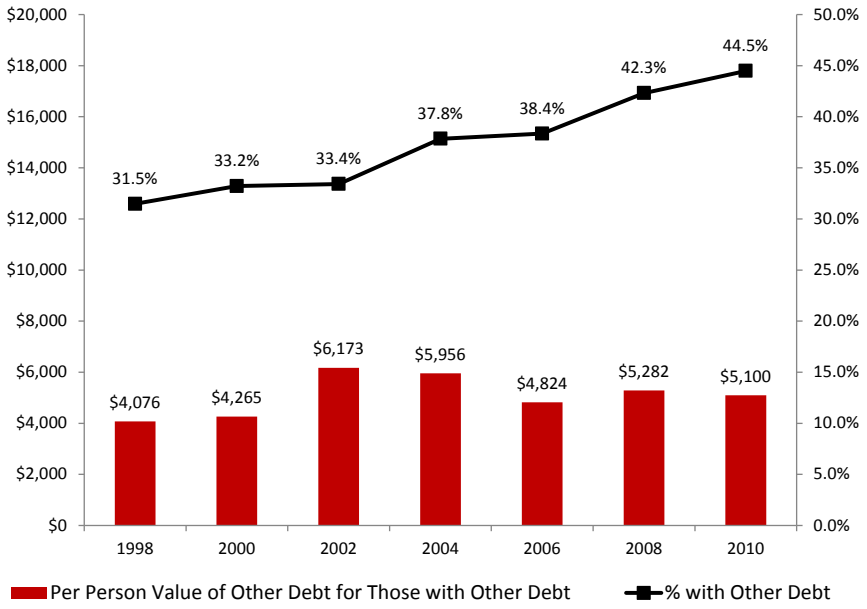
Source: Authors' calculations using 1998-2010 HRS.
Note: Dollar amounts are expressed in 2010 real dollars, adjusted by the change in the consumer price index.

Figure 4: Average Share of House Owned and the Mortgage Share of Debt Among Homeowners Ages 62 to 69, 1998-2010



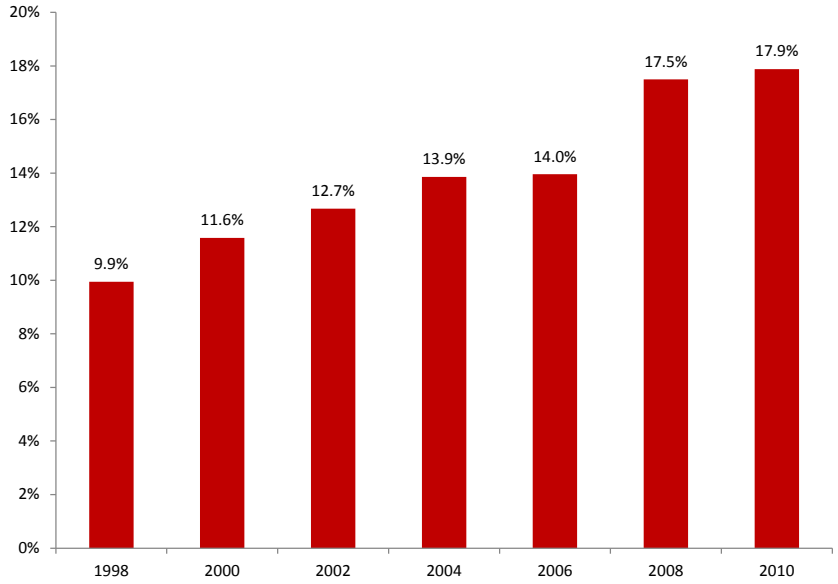
Source: Authors' calculations using 1998-2010 HRS.

Figure 5: Share of Adults Ages 62 to 69 with Other Debt and Median Value of Other Debt, 1998-2010



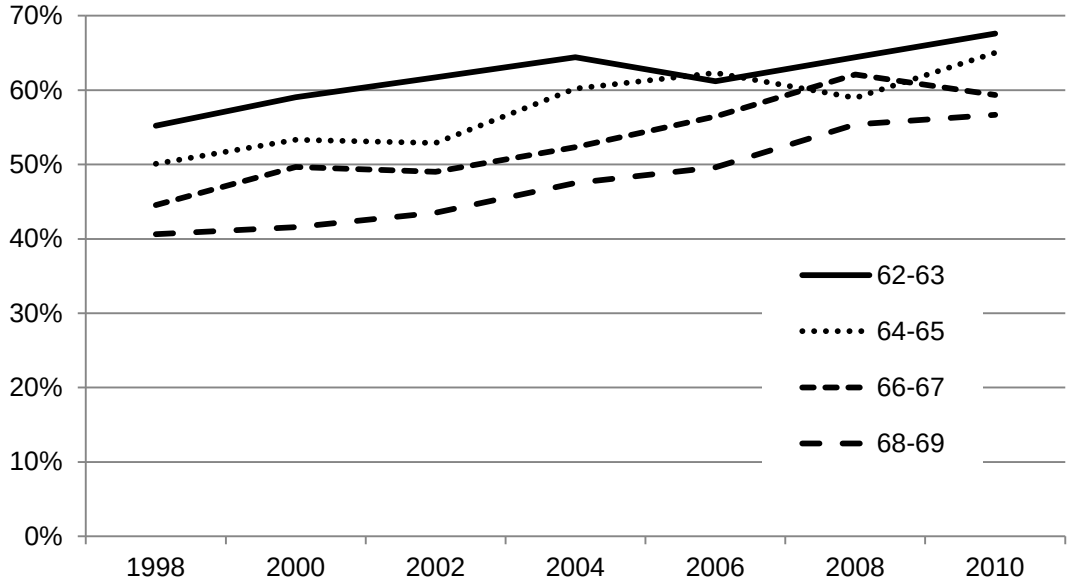
Source: Authors' calculations using 1998-2010 HRS.
Note: Dollar amounts are expressed in 2010 real dollars, adjusted by the change in the consumer price index.

Figure 6: Average Leverage Ratio Among Adults Ages 62 to 69, 1998-2010



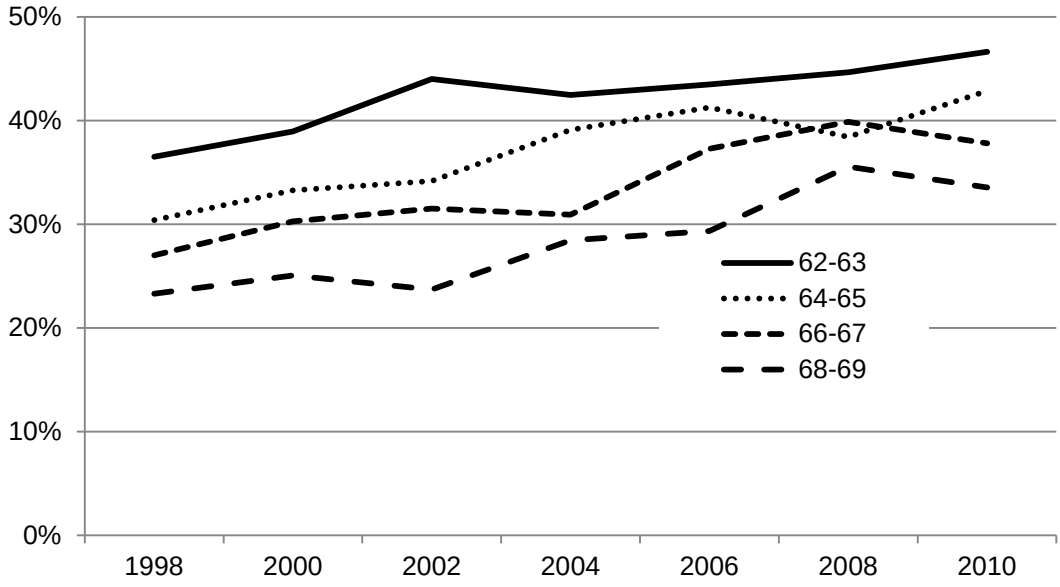
Source: Authors' calculations using 1998-2010 HRS.
Note: The top 0.5 percent of the sample with the highest leverage ratios was excluded from the calculation.

Figure 7: Share of Adults with Debt, by Age Group, 1998-2010.



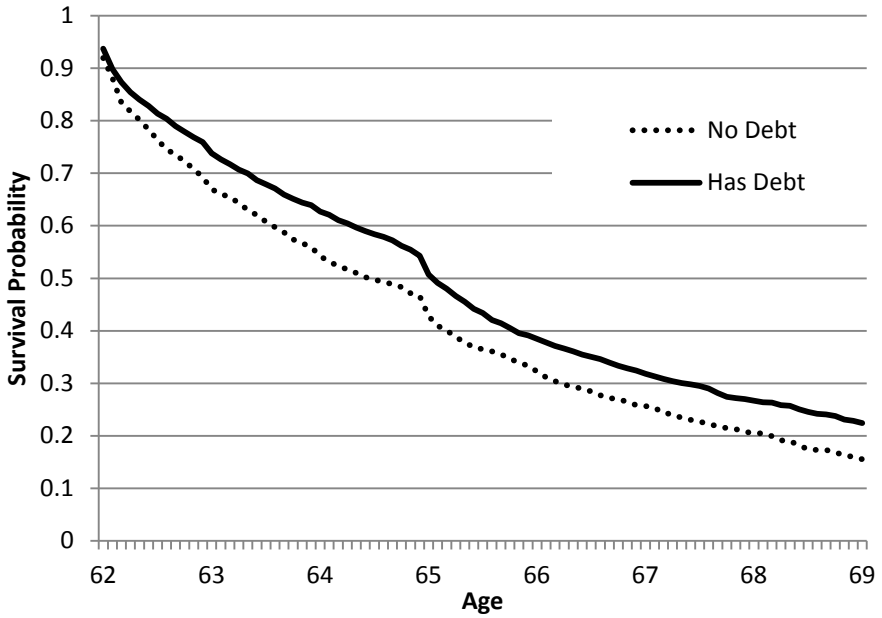
Source: Authors' calculations using 1998-2010 HRS.

Figure 8: Share of Adults with Mortgage Debt, by Age Group, 1998-2010



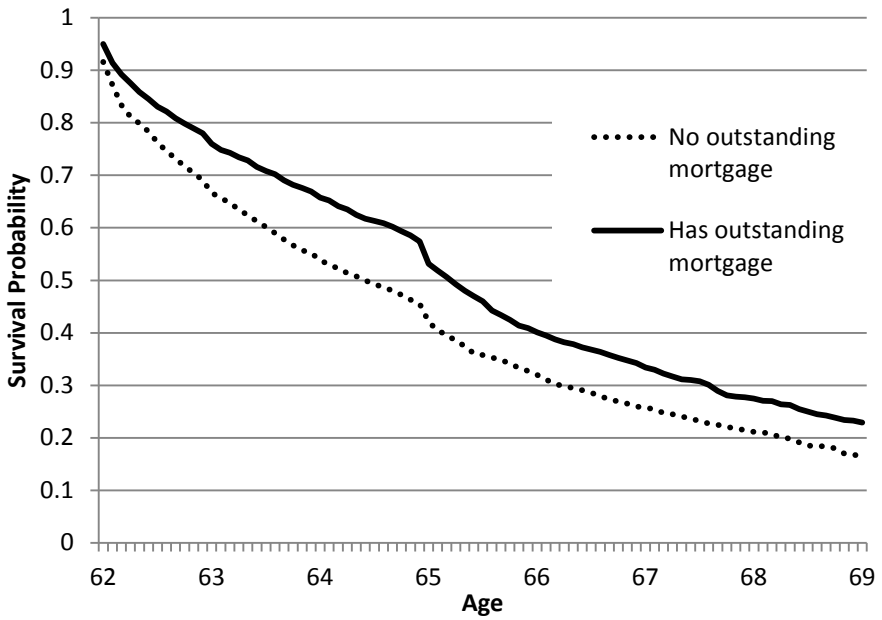
Source: Authors' calculations using 1998-2010 HRS.

Figure 9: Probability of Not Having Fully Retired: Adults Ages 62 to 69, by Debt.



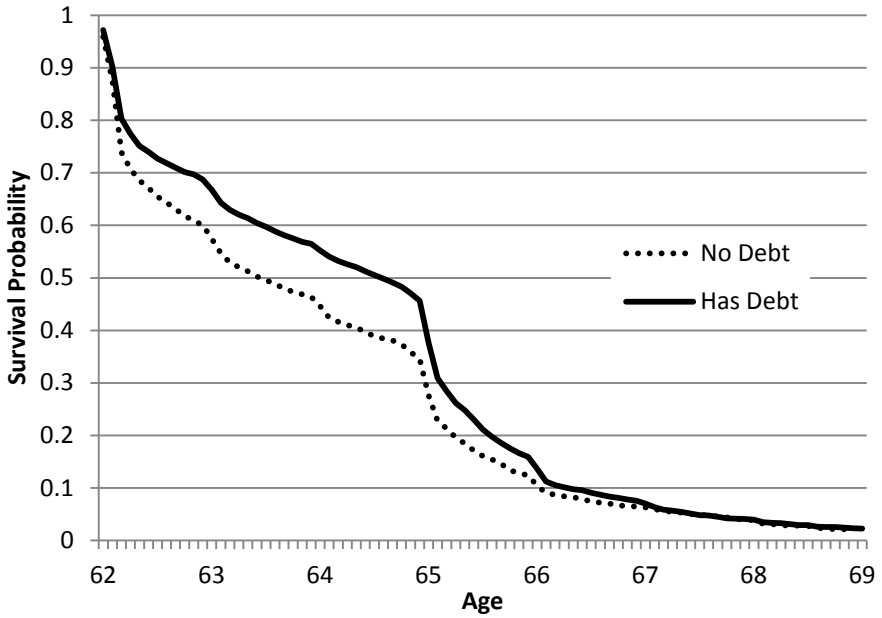
Source: Authors' calculations, using 1992-2010 HRS and Kaplan-Meier estimation method.

Figure 10: Probability of Not Having Fully Retired: Adults Ages 62 to 69, by Mortgage Debt.



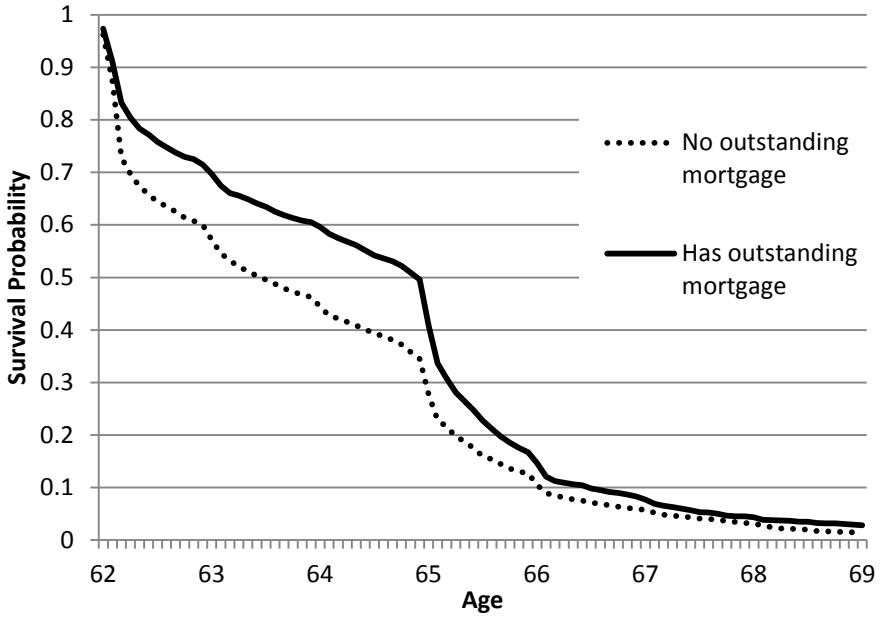
Source: Authors' calculations, using 1992-2010 HRS and Kaplan-Meier estimation method.

Figure 11: Probability of Not Having Claimed Social Security Benefits: Adults Ages 62 to 69, by Debt.



Source: Authors' calculations, using 1992-2010 HRS and Kaplan-Meier estimation method.

Figure 12: Probability of Not Having Claimed Social Security Benefits: Adults Ages 62 to 69, by Mortgage Debt.



Source: Authors' calculations, using 1992-2010 HRS and Kaplan-Meier estimation method.

Table 1: Share of Adults Ages 62 to 69 between 1998 and 2010 Who Work or Receive Social Security Benefits, by Debt

	No Debt	Debt		No Mortgage	Mortgage		No Credit Card Debt	Credit Card Debt	
% Working									
All	33.3%	46.3%	***	35.6%	49.6%	***	40.1%	47.0%	***
Age									
62-63	45.4%	57.9%	***	48.0%	60.3%	***	52.7%	59.3%	**
64-65	37.5%	48.5%	***	39.6%	51.1%	***	44.4%	49.7%	*
66-67	29.5%	40.8%	***	31.3%	44.1%	***	37.3%	43.4%	**
68-69	24.9%	36.0%	***	26.6%	39.4%	***	31.6%	38.8%	***
% Receiving Social Security benefits									
All	77.9%	70.8%	***	77.3%	67.8%	***	75.2%	74.0%	
Age									
62-63	43.9%	37.5%	***	43.4%	35.0%	***	35.3%	36.2%	
64-65	72.2%	66.0%	***	72.2%	62.5%	***	63.0%	61.9%	
66-67	91.3%	91.0%		91.7%	90.0%	**	90.6%	91.5%	
68-69	94.4%	94.2%		94.6%	93.5%	*	95.4%	96.4%	

Source: Authors' calculations using the 1998-2010 HRS. Note: Credit card debt information is available only in the 2008 and 2010 waves of the HRS. Sample excludes disabled individuals. Significance levels reported for t-tests of difference in means: *** p<0.01; ** p<0.05; * p<0.1

Table 2: Marginal Effects from Bivariate Probit Results of Labor Force Participation and Social Security Receipt among Adults Ages 62 to 69.

	Pr (work=1)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Had debt	0.0811***					
	(0.0083)					
Has other debt		0.0568***	0.0006			
		(0.0080)	(0.0192)			
Has outstanding mortgage		0.0707***	0.0741***			
		(0.0092)	(0.0168)			
Has credit card debt			0.0432**			
			(0.0219)			
Per person value of total debt				0.0066***		
				(0.0009)		
Per person value of other debt					0.0071***	0.0004
					(0.0018)	(0.0026)
Per person value of outstanding mortgage					0.0064***	0.0049***
					(0.0010)	(0.0016)
Per person value of credit card debt						0.1063**
						(.0525)
	Pr (receive SS=1)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Had debt	-0.0175**					
	(0.0071)					
Has other debt		0.0026	-0.0018			
		(0.0068)	(0.0160)			
Has outstanding mortgage		-0.0293***	-0.0287**			
		(0.0078)	(0.0137)			
Has credit card debt			0.0179			
			(0.0173)			
Per person value of total debt				-0.0026***		
				(0.0006)		
Per person value of other debt					-0.0011	-0.0021
					(0.0013)	(0.0019)
Per person value of outstanding mortgage					-0.0034***	-0.0023**
					(0.0008)	(0.0011)
Per person value of credit card debt						-0.1172***
						(0.0433)
Observations	27585	27585	5331	27585	27585	5331

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Table 3: Marginal Effects from Bivariate Probit Results of Labor Force Participation and Social Security Receipt among Adults Ages 62 to 69 Among Homeowners.

	Pr (Work=1)			
Variable	(1)	(2)	(3)	(4)
Has other debt	0.0521***			
	(0.0084)			
Has outstanding mortgage	0.0778***			
	(0.0095)			
Per person value of other debt		0.0073***		
		(0.0019)		
Per person value of outstanding mortgage		0.0067***		
		(0.0011)		
Ratio of Other debt/Assets			0.0006**	
			(0.0002)	
Ratio of Mortgage/Assets			0.0010***	
			(0.0002)	
Ratio of Other debt/Other income				0.0005
				(0.0004)
Ratio of Mortgage/Other income				0.0004**
				(0.0002)
	Pr (receive SS=1)			
Variable	(1)	(2)	(3)	(4)
Has other debt	0.0003			
	(0.0072)			
Has outstanding mortgage	-0.0390***			
	(0.0080)			
Per person value of other debt		-0.0008		
		(0.0013)		
Per person value of outstanding mortgage		-0.0039***		
		(0.0008)		
Ratio of Other debt/Assets			0.0001	
			(0.0001)	
Ratio of Mortgage/Assets			-0.0004***	
			(0.0001)	
Ratio of Other debt/Other income				-0.0005*
				(0.0003)
Ratio of Mortgage/Other income				-0.0004***
				(0.0001)
Observations	24624	24624	24624	24624

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Table 4: Hazard Model of Full Retirement and Social Security Benefit Claiming Among Adults Ages 62 to 69.

Exit from Labor Force (i.e. full retirement)				
Variable	Odds Ratios			
	(1)	(2)	(3)	(4)
Has debt	0.7756***			
	(0.0356)			
Has other debt		0.7934***		
		(0.0367)		
Has outstanding mortgage		0.8461***		
		(0.0398)		
Per person value of total debt			0.9692***	
			(0.0052)	
Per person value of other debt				0.9422***
				(0.0154)
Per person value of outstanding mortgage				0.9753***
				(0.0058)
Exit to Social Security Receipt				
Variable	Odds Ratios			
	(1)	(2)	(3)	(4)
Has debt	0.8600***			
	(0.0349)			
Has other debt		0.9334*		
		(0.0371)		
Has outstanding mortgage		0.8499***		
		(0.0349)		
Per person value of total debt			0.9832***	
			(0.0039)	
Per person value of other debt				0.9937
				(0.0091)
Per person value of outstanding mortgage				0.9793***
				(0.0040)

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Table 5: Labor Force participation with Endogenous Mortgage Constraint, Among Homeowners Between the Ages 62 to 69

	Y= work	Y= has a mortgage	Y= work	Y= Per person value of mortgage
High school grad	0.0499	-0.0014	0.0504	0.0017
Some college	0.0655	0.2312***	0.0872*	0.7125***
College grad	0.2152***	0.2883***	0.2377***	1.0402***
Couple	0.0416	0.0815	0.075	-1.0204***
Female*couple	-0.4262***	-0.0844	-0.4354***	-0.206
Spouse is working	0.4678***	0.2799***	0.4993***	0.5603***
Spouse receives SS	-0.0475	-0.1812***	-0.0657**	-0.4116***
Over FRA	-0.2213***	-0.1016*	-0.2398***	-0.2169
Over FRA *Year 2000 and later	0.1050***	0.0495	0.1134***	0.1318
log(other household income)	-0.0448***	0.0223**	-0.0472***	0.2872***
Per person financila ssets (in $10,000)	-0.0003	-0.0015**	-0.0004	-0.0011
Per person other assets (in $ 10,000)	0.0008**	-0.0001	0.0005	0.0129***
Has a mortgage	**0.4135****			
Per person value of mortgage			**0.0215**	
Average effective interest rate by division and year		-3.6236**		-23.3311***
Average adjustable-rate loans by year and division		0.1307*		0.5779*
Average term to maturity by year and division		0.1279***		0.3982***
Average loan-to-price ratio by year and division		-3.3025***		-18.3321***
Other controls include: sex, age dummies, race, health				
Observations	24624		24624	
Rho	-.118 (.128)		-0.008 (0.07)	
Wald test of exogeneity	Prob > chi2 = 0.3622		Prob > chi2 = 0.907	

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Table 6: Social Security Receipt with Endogenous Mortgage Constraint, Among Homeowners Between the Ages 62 to 69

	(1)		(2)	
	Y=receive SS	Y= has a mortgage	Y= receive SS	Y= Per person value of mortgage
High school grad	-0.1591***	-0.0004	-0.1577***	0.0036
Some college	-0.2244***	0.2332***	-0.2227***	0.7151***
College grad	-0.6090***	0.2904***	-0.6055***	1.0445***
Couple	-0.1312**	0.0798	-0.1463**	-1.0191***
Female*couple	-0.3621***	-0.0819	-0.3614***	-0.2048
Spouse is working	-0.1533***	0.2793***	-0.1575***	0.5593***
Spouse receives SS	0.5980***	-0.1810***	0.5990***	-0.4126***
Over FRA	0.1946***	-0.1078**	0.1902***	-0.2246
Over FRA *Year 2000 and later	0.1911***	0.0519	0.1955***	0.1321
log(other household income)	0.0085	0.0223**	0.0112	0.2864***
Per person financila ssets (in $10,000)	0.0001	-0.0014**	0.0001	-0.0012
Per person other assets (in $ 10,000)	-0.0006**	-0.0001	-0.0005	0.0129***
Has a mortgage	**-0.0887**			
Per person value of mortgage			**-0.0102**	
Average effective interest rate by division and year		-3.2972**		-23.2830***
Average adjustable-rate loans by year and division		0.1411*		0.5794*
Average term to maturity by year and division		0.1272***		0.3975***
Average loan-to-price ratio by year and division		-3.3750***		-18.3441***
Other controls include: sex, age dummies, race, health				
Observations	24624		24624	
Rho	-.021 (.099)		-.011 (.067)	
Wald test of exogeneity	Prob > chi2 = 0.8351		Prob > chi2 = 0.8709	

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Table 7: Marginal Effects from Random Effects Probit Results of Labor Force Participation and Social Security Receipt among Adults Ages 62 to 69

	Pr (work=1)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Had debt	0.0966***					
	(0.0117)					
Has other debt		0.0715***	0.0033			
		(0.0114)	(0.0384)			
Has outstanding mortgage		0.1044***	0.1532***			
		(0.0138)	(0.0361)			
Has credit card debt			0.0714			
			(0.0451)			
Per person value of total debt				0.0080***		
				(0.0013)		
Per person value of other debt					0.0082***	0.0011
					(0.0025)	(0.0059)
Per person value of outstanding mortgage					0.0080***	0.0102***
					(0.0015)	(0.0033)
Per person value of credit card debt						0.1902*
						(0.1112)
	Pr (receive SS=1)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Had debt	-0.0112**					
	(0.0056)					
Has other debt		-0.0029	-0.0035			
		(0.0054)	(0.0045)			
Has outstanding mortgage		-0.0223***	-0.0059			
		(0.0066)	(0.0045)			
Has credit card debt			0.0053			
			(0.0043)			
Per person value of total debt				-0.0015***		
				(0.0005)		
Per person value of other debt					-0.0002	-0.0007
					(0.0009)	(0.0006)
Per person value of outstanding mortgage					-0.0023***	-0.0005
					(0.0007)	(0.0004)
Per person value of credit card debt						-0.0333*
						(0.0185)
Observations	27600	27600	5332	27600	27600	5332

Source: Authors' calculations, using 1992-2010 HRS.
Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Appendix

Table A1: Bivariate Probit Results of Labor Force Participation and Social Security Receipt among Adults Ages 62 to 69.

	(1)		(2)	
Variable	Y= work	Y= receive SS	Y= work	Y= receive SS
Female	-0.0812	0.2168***	-0.0711	0.2143***
	(0.0563)	(0.0606)	(0.0564)	(0.0604)
Age =63	-0.0770***	0.8458***	-0.0777***	0.8470***
	(0.0275)	(0.0292)	(0.0275)	(0.0292)
Age =64	-0.1910***	1.0848***	-0.1930***	1.0851***
	(0.0226)	(0.0276)	(0.0226)	(0.0276)
Age =65	-0.2597***	1.1320***	-0.2543***	1.1305***
	(0.0474)	(0.0486)	(0.0475)	(0.0486)
Age =66	-0.3341***	1.6182***	-0.3243***	1.6131***
	(0.0577)	(0.0634)	(0.0578)	(0.0634)
Age =67	-0.3900***	1.8184***	-0.3848***	1.8162***
	(0.0588)	(0.0662)	(0.0589)	(0.0662)
Age =68	-0.4434***	1.8773***	-0.4378***	1.8740***
	(0.0607)	(0.0707)	(0.0608)	(0.0708)
Age =69	-0.5086***	1.9772***	-0.5037***	1.9740***
	(0.0623)	(0.0726)	(0.0624)	(0.0726)
White	0.0183	0.1839**	0.0237	0.1750*
	(0.0899)	(0.0901)	(0.0897)	(0.0906)
Black	0.0369	-0.002	0.062	-0.0152
	(0.0952)	(0.0970)	(0.0950)	(0.0974)
Hispanic	-0.0622	-0.1236	-0.0528	-0.1316
	(0.0996)	(0.1017)	(0.0994)	(0.1021)
High school grad	0.0607*	-0.0907**	0.0666*	-0.0917**
	(0.0363)	(0.0364)	(0.0362)	(0.0363)
Some college	0.1030**	-0.1530***	0.1087***	-0.1505***
	(0.0405)	(0.0407)	(0.0405)	(0.0407)
College grad	0.2542***	-0.5443***	0.2521***	-0.5385***
	(0.0423)	(0.0433)	(0.0423)	(0.0434)
Couple	0.0234	-0.0717	0.0617	-0.0858
	(0.0551)	(0.0581)	(0.0552)	(0.0576)
Female*couple	-0.3331***	-0.3421***	-0.3440***	-0.3410***
	(0.0634)	(0.0680)	(0.0635)	(0.0678)
Spouse is working	0.4890***	-0.1561***	0.4979***	-0.1573***
	(0.0265)	(0.0274)	(0.0264)	(0.0273)
Spouse receives SS	-0.0892***	0.5743***	-0.0943***	0.5738***
	(0.0272)	(0.0308)	(0.0273)	(0.0308)
Over FRA	-0.086	0.1599***	-0.0958*	0.1629***
	(0.0573)	(0.0582)	(0.0574)	(0.0582)
Over FRA *Year 2000 and later	0.0162	0.1870***	0.017	0.1876***
	-0.0369	-0.043	-0.0369	-0.043
Fair health	0.5791***	0.0771	0.5821***	0.0763
	(0.0582)	(0.0589)	(0.0583)	(0.0589)
Good health	0.8346***	0.0568	0.8347***	0.0569
	(0.0584)	(0.0578)	(0.0585)	(0.0578)
Very good health	0.9467***	0.0317	0.9419***	0.0337
	(0.0594)	(0.0583)	(0.0594)	(0.0584)
Excellent health	1.0402***	-0.0027	1.0310***	0.002
	(0.0630)	(0.0622)	(0.0630)	(0.0623)
log(other household income)	-0.0451***	-0.002	-0.0501***	0.0017
	(0.0097)	(0.0104)	(0.0097)	(0.0104)
Per person financial assets (in $10,000)	-0.0004	0.0001	-0.0004	0.0002
	(0.0003)	(0.0002)	(0.0003)	(0.0002)
Per person other assets (in $ 10,000)	0.0007**	-0.0006**	0.0003	-0.0004*
	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Has debt	0.2108***	-0.0562**		
	(0.0218)	(0.0228)		
Per person value debt			0.0169***	-0.0084***
			(0.0023)	(0.0020)
Observations	27585	27585	27585	27585
Year dummies	yes	yes	yes	yes
rho	-0.4235		-0.4215	
	(0.0128)		(0.0128)	

Source: Authors' calculations, using 1992-2010 HRS

Notes: Standard errors in brackets; Significance *** p<0.01; ** p<0.05; * p<0.1.

Conceptual Framework (continued)

Graphical Illustration of the Effect of Borrowing Constraints on the Extensive and Intensive Margins of Labor Supply

Figure A2 illustrates a situation where the existence of a binding borrowing constraint impacts the intensive margin of labor supply – compare initial bundle A with bundle B under borrowing constraint but no adjustment in labor supply, then point C at which the individual has adjusted labor supply and finally allocation D if in addition early claiming is allowed. In contrast, figure A3 illustrates a situation when binding borrowing constraints can induce an individual at a corner solution (not working, at initial allocation A) to enter the labor force. If borrowing constraints bind, allocation A is no longer feasible, forcing the individual to move down to point B. Instead, however, he can re-optimize by increasing labor and reducing leisure, thus providing positive labor supply and achieve allocation C.

Figure A2:

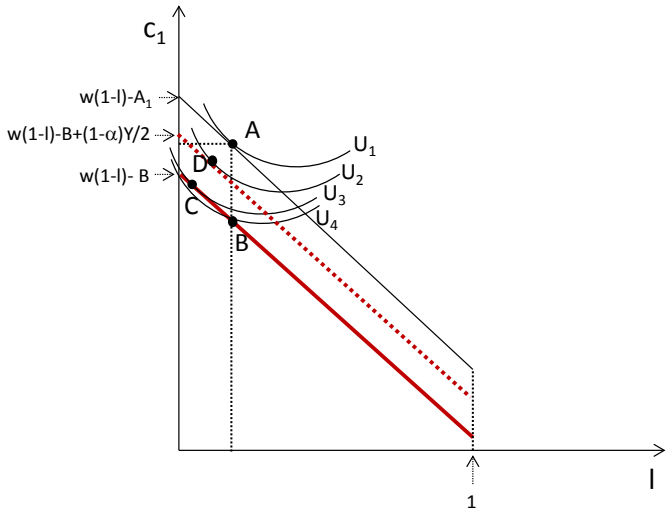


Figure A3: