Three Essays on Retirement: The Patterns and Consequences of Job Insecurity and Employer Risk-Shifting

by

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For Moraa and my parents

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABSTRACT

Chapter I: Household Responses to a Late-Career Job Loss

This paper demonstrates that spousal earnings affect an individual's decision to retire. I find that husbands with higher-earning spouses are more likely to retire following an involuntary job loss. Earlier studies show that job loss reduces subsequent employment, earnings, and wealth, but they do not explain why some workers return to work and others do not. I add an important dimension to these studies by considering how spousal earnings and household assets affect a worker's post-displacement labor supply. To explore the household's problem, I develop a stylized two-period model to illustrate how labor supply responds to spousal earnings and household assets in an uncertain environment. Using data from the Health and Retirement Study, I test my theoretical model's predictions using a reduced-form empirical specification. Relative to men with low-earning spouses, husbands with high-earning wives are more likely to exit the labor force following displacement. The same effect is not detectable in the population of older women. In both populations, a displaced worker with higher household assets is less likely to return to the labor force. For both sexes, job loss has a profound impact on retirement well-being. At a broader level, a reduction in the labor supply of older workers has negative fiscal consequences.

Chapter II: Trends in Retiree Health Insurance: New Evidence from Household Surveys

Over the past two decades, studies of individuals' trends in access to employer-sponsored, early-retiree health insurance (ESERHI) have relied almost entirely on data gathered in surveys of employers. Because of this, direct estimates of levels and trends in the fraction of the population (both working and non-working) with such access cannot be reliably obtained. Using data from seven waves of the Health and Retirement Study, I provide precise population estimates of levels and trends in the availability ESERHI for individuals aged 55-64 between 2002 and 2014. My results show (1) that declines in access measured at the individual level mirror offer rates at the employer level; (2) that the diminishing probability of early-retiring individuals having health insurance coverage is less affected by their own employers withdrawing this coverage, and more affected by declines in the number of employers ever offering such coverage; and, (3) that access to ESERHI declines more for some population groups, e.g., men, than others. I discuss the possible effects of declining access on individuals making the choice to opt for early retirement.

Chapter III: Retirement Savings Responses to Liquidity Change and Consumption Needs

Tax-advantaged savings plans are intended to encourage households to build nest eggs that provide income during retirement. Such plans include defined contribution 401(k) and 403(b) plans, traditional and Roth individual retirement accounts (IRA), and annuities. These plans also provide pre-retirement liquidity features, allowing retirement savings to be used to finance current consumption. Households could be using these retirement accounts as another form of financial net worth accessible as a buffer stock to a range of cash flow and expenditure

outlays prior to retirement. We seek to determine the factors that lead households to contribute to their retirement savings or withdraw money from these plans prior to age 65. The overall economic climate, household-level events, such as large unexpected out-of-pocket medical expenses, and household cash flow changes are expected to play a role in the decision to add or withdraw funds from defined contribution (DC) pensions. The ability to take pre-retirement withdrawals from these plans and reduce contributions raises the important question of how plan liquidity and discretionary participation affects retirement security.

Chapter I

Household Responses to a Late-Career Job Loss

1.1 Introduction

A late-life job loss is potentially devastating for retirement security. Displaced older workers typically have high pre-displacement job tenure, more difficulty finding a new job, and few years in which to make up for lost earnings and savings. As a result, a household that experiences a late-life employment shock will be unable to smooth consumption as it transitions into retirement. It will respond to a displacement by reducing consumption and/or increasing labor supply later in life, and as a result, its welfare will suffer. Rates of job loss for older workers are surprisingly high and have converged with the job loss rates of younger workers over the past 35 years. For the cohort born between 1942 and 1947, twenty-one and a half percent lost at least one job between 1998 and 2014.

The impact that a job loss has on retirement security depends on household characteristics. For displaced workers with high earning spouses, intra-household insurance mitigates the cost of an unexpected earnings shock. In addition, wealthy households are better equipped to moderate the effect of such a shock. In a family labor supply model, a household can adjust consumption and the leisure of each spouse in response to reduced earnings potential.

The contribution of this paper is establishing why some workers retire following a job loss and others do not. I argue that spousal earnings and household assets account for the differential response. This assertion is supported by the predictions of a theoretical model and reduced-form regression estimates. This study lies at the confluence of a long literature on the theory of retirement and a literature on individual and household responses to job loss.

Two demographic trends make the study of older workers' labor supply and its interaction with spousal earnings particularly timely. The United States will transition to an older population in the coming decades. The ratio of people over 64 to people 20–64 will increase by 80 percent by 2050. The macroeconomic and fiscal consequences of this shift will depend on how long people stay in the labor force. People are living longer, and if workers continue to exit the labor force in their early 60's, the fraction of the population that is retired will increase. During retirement, households typically draw down their assets and reduce consumption. The shift toward an older population may affect the aggregate savings rate, and in turn, the productive capacity of the economy and the rate of return on capital assets. In addition, the solvency of government programs such as Social Security, Medicare, and Medicaid will depend on older workers' labor supply. Working longer provides more resources to pay for Social Security and the health care costs associated with an aging population. The second major demographic shift relevant to this paper is married women's increased labor force participation over the last six decades. As a result of this change, more individuals from dual-career households have reached the typical retirement age in recent decades. Characterizing the effect of spousal earnings on the retirement decision contributes to our understanding of older worker's labor force participation (see Figure 1.1 and Figure 1.2 for historical trends).

This study explores the link between spousal earnings and labor supply. It fits within the broader literature in labor economics on job displacement and retirement. The existing literature in this field documents the patterns of job loss and the effects of job loss on earnings, employment, wealth, health, and spousal labor supply.

1.2 Literature Review

Older workers typically have longer job tenure than younger workers, and therefore should face less employment risk. While survey data confirm this pattern—the job loss rate is relatively lower for workers ages 50–64—their absolute employment risk is surprisingly high. Using the Displaced Worker Survey, Farber (2011) estimates that the three year job loss rate for workers ages 50–64 exceeded 14 percent during the 2007–2009 recession. Further, over the past three decades the job loss rates of older workers have converged with that of younger workers (ages 20–39). Finally, older workers' job security is equally sensitive to the business cycle. The variation in job loss rates over time is approximately the same for all age groups. Farber's study documents that involuntary job loss is a significant threat to employees later in life.

The consequences of job loss vary by age. These consequences include persistent and substantial earnings declines, reduced wealth, higher mortality, and a decline in health insurance coverage. Earnings declines are particularly large for high tenure workers, who tend to be older and have occupation- or industry-specific human capital. The average earnings loss for displaced workers with 15 or more years of tenure is 27 points larger than that of workers with less than one year of tenure (Farber 2011). In addition to experiencing a larger earnings declines following displacement, late-life job losers have fewer years during which they can replace lost earnings or savings. Indeed, Stevens and Moulton (2013) show household wealth falls substantially in the years following a job loss. Relative to workers who are not displaced,

household wealth is 8 percent lower for those who lose a job after 50. A further difference between older and younger workers is that job loss has a smaller effect on mortality in a population of older workers. Compared to older workers, displaced workers younger than age 55 suffer significantly higher percentage increases in mortality (Sullivan and von Wachter 2009). Finally, older workers are more likely to be displaced from a job with health insurance. If they reenter the labor force, older single workers are no more likely than young single workers to enter a job with coverage. Older married workers are only slightly more likely than young married workers to find coverage through an employer (Olson 1992). The expected value of health insurance is greater later in life because older individuals' have greater expected health expenditures. For these reasons, the loss of health insurance accompanying a job loss is more costly for older workers. Earnings potential, household wealth, health, and access to health insurance will influence an individual's post-displacement labor supply. In addition, individuals with higher earning spouses may be more likely to have access to health insurance through their spouses. My empirical analysis assumes that this correlation is not significant. Since the effects of job loss on these variables differ by age, the population of older households warrants separate study.

The ability to replace labor income and the cost of finding new employment differ by age as well. Older workers are either at or near an age when (1) they have fully accrued their benefits in a defined benefit pension plan; (2) they can receive defined contribution distributions without incurring a penalty; (3) they are eligible to receive Social Security retirement benefits; and (4) they become eligible for Medicare at 65. Not only is the option value of exiting the labor force greater for older individuals, but the cost of staying in the labor force is greater at older ages as well. Despite its illegality, Neumark (2009) shows that older workers continue to face

age discrimination in hiring. As a consequence of this practice, unemployed older workers need to search longer for a new job and are more likely to become discouraged and exit the labor force. In order to avoid separating the effects of displacement from normal retirement behavior, several job loss studies exclude older workers.[1]

In all years between 1984 and 2010, older workers (ages 50–64) were more likely than younger workers to exit the labor force following a displacement. However, older workers' likelihood of retiring post-displacement declined steadily between 1984 and 2010, whereas displaced younger workers' likelihood of exiting the labor force remained flat over this period (Farber 2011). That is, a displaced older worker was less likely to retire in 2010 than he was in 1984. Despite this convergence, retirement is still an appealing option after a late-life job loss. Chan and Stevens (2001) find large and lasting effects of job loss later in life. Four years after a job loss, the difference in employment rates between displaced and non-displaced workers is approximately 20 percent. Both the rates of return to employment and the higher rates of exit from post-displacement jobs explain this long term effect.

In married households, the interaction between household labor supply and displacement varies by age. Stephens (2002) finds a significant "added worker effect" following a husband's job loss in families where both members are between the ages 25 and 65. In the "average" married household, a wife increases her work effort by an average of 11 percent during the years following displacement. This estimate incorporates changes on both the intensive and extensive margin. In a sample of workers over 50, there is no significant added worker effect (Toohey 2015).[2] The reason for this difference may be that older worker's hours are less flexible, a

[1] Examples include Jacobson, LaLonde, and Sullivan (1993) and Couch and Placzek (2010).
[2] Cao (2018) finds that the added worker effect is strongest for younger cohorts and weakest for older cohorts. Younger cohorts commit a higher share of income to inflexible consumption, and older cohorts are more likely to have accumulated buffer stock savings and have better access to short-term financing.

spouse with a limited work history will have difficulty finding employment, or the household has preferences for joint retirement. In an empirical study of older workers, Lee (2017) finds that displaced workers and their spouses are less likely to retire at the same time. Wives delay retirement when their husbands retire following a job loss. Lee infers that intra-household insurance mitigates the impact of an earnings shock. These studies inform my decision about which variables belong in a theoretical model. I develop a two-period model of family labor supply to better understand how husbands' and wives' demands for leisure are affected by job loss.

1.3 Theoretical Model

The objective of my theory is to describe the effect of spousal earnings and household assets on labor supply following a job loss. I write a two-period model of the retirement decision with uncertain earnings. A job loss is modeled as a shock to potential earnings in the second period. I assume unitary decision-making in married households, and I assume households cannot divorce. Each household maximizes expected utility over consumption and the leisure of each spouse subject to a lifetime budget constraint. The leisure choice is binary in each period, during which each agent is either working full-time or out of the labor force. There are no labor market frictions—a worker can always find employment that pays his potential earnings. An individual is retired if he chooses not to work in the second period, and so retirement is implicitly an absorbing state. My model abstracts from uncertain longevity, liquidity constraints, bequest motives, pension plan incentives, and social security retirement benefits. Despite its simplicity, the model offers analytical insights into how an earnings shock affects the labor supply of each worker in a married household. My theoretical approach is nested within the class of dynamic

life-cycle models of the retirement decision with uncertainty.[3] Instead of structurally estimating the model's parameters, I calibrate them and analyze the comparative statics to develop hypotheses about the relationships between spousal earnings, household assets, and labor supply. I then test these predictions in a reduced-form regression.

Modeling leisure as a binary choice is better-suited to the retirement problem. A different class of dynamic life-cycle models of household labor supply treat leisure as a continuous variable. These theoretical frameworks, such as MaCurdy (1981), are not particularly well-suited to the retirement problem because most career jobs have minimum hours constraints. These constraints are reflected in the HRS data—very few workers gradually draw down their hours at career jobs.[4] Those workers who do reduce their annual hours typically transition to a lower wage bridge job (Rust and Phelan 1997). Thus, there is a significant cost to reducing one's hours. Since the continuous leisure model is less applicable to the labor supply decisions of an older population, I treat leisure as a discontinuous variable. As a result, I must calibrate and simulate my model to make theoretical predictions.

1.3.1 The Household's Problem

A household consists of two potential workers and no children. I use the terms "husband" and "wife" and describe the effects of displacement from the husband's perspective for expositional clarity. The model is symmetric, and so the same conclusions apply to a wife's labor supply. The service flow to the household in each period is Cobb-Douglas (Equation 1.1). It is "produced" from joint household consumption expenditures (c_t), the leisure of the husband

[3] For example, Rust and Phelan (1997), Rust (1989), Gustman and Steinmeier (2000), and Gustman and Steinmeier (2005).
[4] There are coordination economies with team production and high costs of health care benefits for older workers (Hurd 1996).

(h_t), and the leisure of the wife (f_t) using Cobb-Douglas technology with constant returns to scale.

$$g\left(c_t, h_t, f_t\right) = c_t^{\alpha} h_t^{\beta} f_t^{(1-\alpha-\beta)} \tag{1.1}$$

The marginal products are:

$$\begin{aligned} \frac{\partial g}{\partial c_t} &= \alpha c_t^{\alpha-1} h_t^{\beta} f_t^{(1-\alpha-\beta)} \\ \frac{\partial g}{\partial h_t} &= \beta c_t^{\alpha} h_t^{\beta-1} f_t^{(1-\alpha-\beta)} \\ \frac{\partial g}{\partial f_t} &= (1-\alpha-\beta)\, c_t^{\alpha} h_t^{\beta-1} f_t^{(-\alpha-\beta)} \end{aligned} \tag{1.2}$$

In most life-cycle models of family labor supply, consumption and the leisure of each spouse are additively separable. The advantage of the Cobb-Douglas functional form is that it allows for changes in consumption at retirement *and* for joint retirement preferences. In the flow of services function (Equation 1.1), there are diminishing marginal returns to consumption expenditures and the leisure of each spouse such that α, β, and $\alpha + \beta \in (0,1)$. Leisure is binary, h_t and $f_t \in \{0.5,1\}$, corresponding to full-time work and out of the labor force, respectively. The parameter for full-time employment is chosen as 0.5 to approximate the discretionary leisure of a full-time worker relative to an individual not out of the labor force.[5] The marginal product of consumption increases discontinuously as the household's labor supply moves from both spouses working, to one spouse working, to both spouses retired. The productivity of each spouse's leisure increases continuously in consumption and discontinuously in the leisure of their partner. Therefore, the husband's leisure, the wife's leisure, and consumption are complementary in the production of service flows to the household. This

[5] I assume 13 hours of discretionary leisure each day, which allows for 8 hours of sleep and 3 hours for personal care and eating. Of the 91 discretionary hours per week, I assume 45 hours devoted to work and commuting each week.

feature of the model accommodates findings from earlier studies. Gustman and Steinmeier (2000) and Casanova (2011) present empirical evidence of the complementarity of leisure in older households.

The flow of services function is nested within an isoelastic utility function (Equation 1.3). These functional forms (Cobb-Douglas and isoelastic) allow for positive or negative changes in consumption at retirement and increases or decreases in leisure when one's spouse retires. These utility maximizing choices depend on the curvature of the utility function (γ) and the enhanced productivity of consumption expenditures and leisure when at least one spouse retires (a function of α and β). The next sub-section discusses these effects in more detail.

$$u(c_t, h_t, f_t) = \begin{cases} \frac{g^\gamma}{\gamma} & \text{for } \gamma < 1 \\ ln(g) & \text{for } \gamma = 0 \end{cases} \tag{1.3}$$

In each period's budget constraint, the household's labor income (y_t) depends on the leisure choice of each spouse and their earnings potential (Equation 1.4). Each worker's time endowment is normalized to one. The earnings potential (e_t^i) of each spouse is multiplied by two, so that labor income equals earnings potential when an individual is working full-time. The second period budget constraint shows that earnings potential declines in the second period if a spouse does not work in the first period. Labor productivity falls by a factor of ρ, which enters the earnings equation as an interaction with the indicator function **1**( ). This function takes a value of one if an individual choose not to work in the first period. This restriction is consistent with a theory of human capital depreciation in which work during one's early career maintains skills valued by employers.

$$
\begin{aligned}
y_1 &= 2e_1^H\left(1-h_1\right)+2e_1^F\left(1-f_1\right) \\
y_2 &= 2e_2^H\left(1-h_2\right)\left(1-\rho\cdot\mathbf{1}\left(h_1=1\right)\right)+2e_2^F\left(1-f_2\right)\left(1-\rho\cdot\mathbf{1}\left(f_1=1\right)\right)
\end{aligned}
\tag{1.4}
$$

I combine Equations 1.1, 1.3, and 1.4 to to express the household's two-period optimization problem.

$$
\begin{aligned}
&\max_{c_1,h_1,f_1,c_2,h_2,f_2} \quad \frac{\left[c_1^{\alpha}h_1^{\beta}f_1^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma}+\delta\mathbb{E}\left\{\frac{\left[c_2^{\alpha}h_2^{\beta}f_2^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma}\right\} \\
&\text{subject to} \quad c_1+\frac{c_2}{1+r}=y_1+\frac{y_2}{1+r}+A_0
\end{aligned}
\tag{1.5}
$$

Households have the subjective discount factor δ and can save and borrow at interest rate *r*. A household begins the first period with assets A_0. The second period earnings potential of each spouse is stochastic. In the context of this paper, I interpret any earnings shock to be the result of a displacement.[6] That is, e_2^i declines when a worker is displaced. The timing of the model is as follows. In the first period, the household chooses its consumption and the labor supply of each spouse. After making these decisions, it learns each member's potential earnings in the second period. Then, the household chooses consumption and labor supply for the second period. Earnings are not formally insurable. However, income diversification in a dual-earner household provides informal insurance against displacement. Within this model, each spouse is incentivized to work in the first period to reduce the variance of expected lifetime income.

A two-period model is sufficient to identify the essential elements of the relationship between job loss and the household's retirement decision. An alternative to the two-period model is a multi-period model in which each period corresponds to one year. I expect such a model would yield one additional prediction: If a household is further is from its terminal period

[6] An uncertain health shock could also be interpreted as a decline in potential earnings. However, the physical inability to work implies zero potential earnings in the second period.

(i.e. younger), then it is less likely to retire. I allow for age effects in the reduced-form regression, so this theoretical simplification will not affect my hypothesis tests.

1.3.2 Intra-period Complementarities and Inter-period Substitutability

A displaced workers' labor supply depends on the within-period complementarities between household consumption and the husband's leisure, household consumption and the wife's leisure, and the husband's leisure and the wife's leisure. These complementarities are determined by α and β. A displaced worker's labor supply will also depend on the household's first-period savings, which is determined by the substitutability of the flow of services across periods. The substitutability of service flows declines as γ declines. To illustrate how these parameters affect the household's decisions, I elaborate on the consumption-leisure tradeoff and the leisure-leisure tradeoff.

Earlier studies have found that consumption typically declines at retirement (Haider and Stephens Jr 2007).[7] The flexible function form of utility in this model allows for increases or decreases in consumption at retirement. The interaction between consumption and the labor supply of either spouse depends on two counteracting forces in the model: (1) the productivity of expenditures in the flow of household services (a function of α and β), and (2) the curvature of the utility function (determined by γ).[8]

The productivity of expenditures, that is, the marginal product of consumption, increases when one or both spouses are not working. In the model, when both spouses are employed, the $MPC = \alpha c^{\alpha-1}(0.5)^{1-\alpha}$. When only one spouse is working, either $MPC = \alpha c^{\alpha-1}(0.5)^{\beta}$ or

[7] However, recent empirical work shows no decline in consumption at retirement (Aguila, Attanasio, and Meghir 2011).

[8] Laitner and Silverman (2012) present a dynamic life-cycle model of retirement without uncertainty. They prove consumption after retirement is a function these two factors—the productivity of consumption expenditures and the concavity of the utility function.

$MPC = \alpha c^{\alpha-1}(0.5)^{1-\alpha-\beta}$. And, when neither is employed, the $MPC = \alpha c^{\alpha-1}$. The increasing productivity of consumption property holds if $(1-\alpha) > \beta > 0$. The model simulations impose equal returns to the husband's leisure and the wife's leisure, that is $\beta = \frac{1-\alpha}{2}$, which satisfies this condition. If $\gamma = 1$, then the household flow of services becomes the objective function. In this case, the household unambiguously wants to take advantage of the increased productivity of consumption when one or both members retire. It saves a lot when household members work in the first period, and it consumes a lot when they retire. In a model with uncertainty, the household has an additional incentive to save—first-period savings serve as insurance against a displacement. If a household does not receive a negative potential earnings shock, the additional savings will be spent on consumption during retirement. The curvature of the utility function counteracts this effect.

With concave utility ($\gamma < 1$), a household wants to smooth its service flow over time. This creates an incentive to decrease consumption after retirement—the household wants to offset increases in the service flow (Equation 1.1) that would otherwise occur from increased leisure. As γ decreases, it becomes less willing to substitute these flows across time. In a three factor flow of services function, γ, α and β determine whether the complementarity of consumption and leisure or the desire to smooth over time dominates.

Similarly, the counteracting forces between intra-period complementarities and inter-period substitutability affect a couple's decision to coordinate the timing of retirement. Earlier studies have found that couples typically coordinate the timing of retirement (Gustman and Steinmeier 2000). This model allows for either joint or separate retirement. A husband's marginal product of leisure increases as his wife transitions from work to leisure and vice versa (Equation 1.2). In other words, the complementarities in the flow of services function

incentivize joint retirement. With concave utility, however, the desire to smooth encourages spouses to work in opposite periods to offset increases in the service flow that would otherwise occur from both spouses taking leisure. With earnings uncertainty and human capital depreciation, both spouses are more likely to work in the first period to insure against income risk. Relative to the case with no uncertainty, they will save more in the first period. If no earnings shock is realized, the household has higher than expected second-period consumption and at least one spouse will be more likely to retire to take advantage of the complementarity between consumption and leisure in the second period. If one household member is displaced, the effect on the labor supply of the other spouse is unclear. The threshold at which joint retirement dominates cannot be solved analytically in my model. Simulations of my model will show how spousal earnings and household assets affect joint retirement.

1.3.3 Solution

Due to the non-differentiability of the household's objective function, I solve the problem computationally using backward induction.[9] I find the household's maximum lifetime expected utility by searching over a grid of choice variables.

$$\underset{A_1,h_1,f_1,h_2,f_2}{\arg\max} \quad \frac{\left[c_1^{\alpha} h_1^{\beta} f_1^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma} + \delta \mathbb{E}\left\{\frac{\left[c_2^{\alpha} h_2^{\beta} f_2^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma}\right\} \tag{1.6}$$

$$\text{subject to} \quad c_1 + \frac{c_2}{1+r} = y_1 + \frac{y_2}{1+r} + A_0$$

[9] I specify a joint probability density function over the husband and wife's second period potential earnings. For a given amount of savings it carries into the second period ($(1+r)A_1$), and after the realization of both spouses' earnings, the household chooses each spouse's labor supply to maximize second-period utility. This decision yields a vector of utility across all joint potential earnings outcomes. I multiply this vector with the joint probability density to find expected utility in period 2. The specific value of A_1 that the household saves in period one corresponds to first-period utility maximizing choices of c_1, h_1, and f_1. I add first-period utility to second-period expected utility. Finally, I choose the A_1 that maximizes lifetime expected utility to determine the household's behavior in both periods.

First- and second-period labor income (y_1 and y_2) are defined in Equation 1.4. To gain additional insights into household utility-maximizing behavior, I derive demand functions for two simpler models (Appendix A). These include a one period, continuous-leisure model and a two-period model, discrete-leisure model without uncertainty. For the single period model, the husband's demand for leisure is a function of two ratios—household assets divided by his earnings and his wife's earnings divided by his earnings. The problem is symmetric, and so the same holds for his wife. I test whether this result carries through to the more complex model and whether it is consistent with the data.

1.4 Simulated Results

1.4.1 Baseline Parameterization

The model's parameters are calibrated from descriptive statistics and previous research (Table 1.1). I assume the returns to leisure are the same for each spouse $\left(\beta = \frac{1-\alpha}{2} = 0.25\right)$. I am not interested in the effects of household discounting and the interest rate. Therefore, I impose that the gross interest rate is one $(\delta(1 + r) = 1)$ and $\delta = 0.95$. I assume human capital depreciates by 50 percent if an individual does not work in the first period. While seemingly large, this choice is sensible. Farber (2011) estimates that the earnings of a worker displaced from a long-tenure job decline by a least 25 percent. The potential earnings of an individual not employed in the first period should be smaller than those of a displaced worker. In addition, and perhaps more intuitively, an individual who enters the labor force in his late 50's after not working when middle-aged will have a significantly lower earnings potential than a similarly trained and educated worker who is employed throughout his life. The continuously employed worker will possess greater occupational-specific and firm-specific human capital. The

comparative statics of the model are sensitive to the parameter values of γ, α and β but less sensitive to the other parameter values.

1.4.2 No Employment Risk and No Human Capital Depreciation

Presenting the case in which a household does not face a potential job loss nor human capital depreciation allows me to examine the comparative statics and dynamics of the model before introducing complicating factors. The outcomes of the simulation refer to whether the husband and the wife are working. They are presented in a contour plot over the parameter space (A_0, e^F)—Figure 1.3. The interpretation of "F=work" is that the wife is working full-time, and "F=oolf" means the wife is out of the labor force. The vertical axis represents the wife's earnings potential, and the horizontal axis represents the household's assets when it enters the first period. The model is homothetic, and the husband's earnings potential is normalized to one. So, each axis can be interpreted as a ratio with the husband's earnings in the denominator, that is $\left(\frac{e_t^F}{e_t^H}\right)$ and $\left(\frac{A_0}{e_t^H}\right)$. Since both the wife's earnings and the husband's earnings are flow variables, the numeric values on vertical axis can be interpreted as the ratio of spouses' annual earnings. The magnitudes on the horizontal axis have no definitive interpretation. Since the numerator is a stock variable and the denominator a flow, the magnitude depends on the length of each period. In my application of the model, I imagine the two periods covering the ages between 50 and 64. Within this context each period is approximately 7.5 years, and $A_0 = 4$ is interpreted as initial assets equaling 30 times annual earnings. This choice is somewhat arbitrary, and therefore, these numerical values are not particularly meaningful.

The top panel depicts the household's labor supply in the first period. For household assets less than approximately 2.75, we can see how the household labor supply changes as the wife's potential earnings increase. For low levels of earnings, only the husband works in the

initial period. As her earnings increase, both members choose to work. As they increase further, only the wife chooses to work. These results are intuitive. When the wife has low potential earnings, her returns to leisure are greater than the returns to the additional consumption that her income could provide. As a result, she chooses not to work. As her potential earnings increase, she passes a threshold at which she decides to enter the labor force. For mid-range assets ($2.75 < A_0 < 4.7$), only the spouse with higher potential earnings is employed in the first period. When initial assets are above 4.7 and the wife's earnings are less than her husband, neither spouse works. The frontier between both spouses enjoying leisure (i.e. both retired) and the wife working but not the husband is upward sloping. This result can be easily understood. As assets increase, the wife needs to be compensated with more potential earnings to sacrifice leisure in favor of work. The household's response to an increase in assets is a bit more straightforward. For a given level of the wife's earnings, household labor supply (either 2, 1, or 0 members employed) decreases as its assets increase.

The behavior of second period labor supply is more complex. Bands surround the frontiers that divided the household's first period labor supply (Panel 2, Figure 1.3). These represent a non-monotonic relationship between the wife's potential earnings, initial household assets, and the household's second-period labor supply. This non-monotonic relationship is a consequence of the counteracting forces derived from the household's smoothing preference and its flow of services function. The bands surround the first-period labor supply frontiers because it is only for these parameters of e^F and A_0 that the household adjusts its savings to take advantage of the complementarities between consumption and leisure in the second period. That is, away from these regions a change in savings will affect neither its first or second period labor supply. When the flow of services is highly substitutable over time, the household prefers to

sacrifice in the first period and enjoy its reward in the second, or vice versa. Intertemporal substitutability is determined by γ. For larger values of γ the service flows are more substitutable, and for lower values the household prefers to smooth over time. Indeed, these bands are wider in the simulation where $\gamma = 0.6$ and narrower where $\gamma = -1$ (see Figure 1.4 and Figure 1.5).

Consider a concrete example. The frontier where $A_0 \approx 4.7$ and $e^F < 1$ divides the household labor supply in the first period. To the left of this line, the household sacrifices its first-period service flow. The husband works, the household consumes less (not visible in this graph), and its savings are large.[10] With these additional savings, the household "lives large" in the second period—it consumes more, and both spouses are retired. Conversely, to the right of this frontier, the household has a high service flow in the first period and low service flow in the second. When I introduce earnings uncertainty and human capital depreciation into the model, the non-monotonic relationship between the wife's potential earnings, initial household assets, and the household's second-period labor supply persists. However, this relationship only appears in a limited portion of the parameter space.

My model with no earnings uncertainty does not predict joint retirement. That is, this simulation does not show a transition where both spouses work in the first period to both retire in the second. This result is determined by two features of the model. First, intertemporal substitutability dominates the complementarity between spouses' leisure in the flow of services function. Second, within the Cobb-Douglas flow of services function, the complementarity between consumption and the leisure of each spouse is larger than the complementarity between their leisure. This behavior does not fit with observed household retirement patterns (Gustman

[10] Savings increase linearly as initial assets increase and are constant for a given level of initial assets except around these frontiers. First-period savings exhibit a discontinuous peak and then a trough around these boundaries.

and Steinmeier 2000). However, Lee (2017) shows that households in which one worker is displaced are less likely to coordinate the timing of their retirement. In Figure 1.6, I present a simulation that accommodates joint retirement. The parameter values now reflect a strong desire to smooth service flows and the complementarity between spouses' leisure is greater than the consumption-leisure complementarity ($\alpha = 0.3, \beta = 0.35, \gamma = -3$). In this simulation, the household does choose to jointly retire.

In order to distinguish between the effects of human capital depreciation and earnings uncertainty on second-period labor supply, I introduce these effects individually. In a model with human capital depreciation no employment risk, the second period labor supply outcomes change slightly. The opportunity cost of staying out of the labor force in the first period mitigates the household's preference to consume and take leisure in the first period and sacrifice in the second. However, on the opposite side of these frontiers the same incentives exist. That is, a household will sacrifice in the first period in order to enjoy more consumption and leisure in the second.

1.4.3 One Spouse Faces Employment Risk

Consider an older individual who faces a relatively high probability of job loss, and if displaced, his earnings potential sharply declines. Relative to a worker who faces less uncertainty, his household should save more to insure against employment risk. If his wife earns less than average or does not work at all, the incentive to save is even greater. In addition to household savings, the presence of a working spouse will influence his decision to return to work after a job loss. My model characterizes how both household assets and spousal earnings affect a displaced worker's labor supply. I begin by limiting my attention to scenarios in which only the

husband faces employment risk. This allows the results to be displayed clearly, and the comparative statics do not change when both spouses face uncertainty.

This section focuses solely on the displaced worker's labor supply. My simulations use the baseline parameterization specified in Table 1.1. The husband's earnings potential is normalized to one, the vertical axis represents his wife's earnings potential, and the horizontal axis represents the household's initial assets in period one. The probability of displacement is 15 percent, and the decline in potential earnings associated with a displacement is 25 percent. The "marginal effect" of an increase in spousal earnings or an increase in assets on a husband's labor supply is relatively insensitive to these parameter choices (in quotes here because the effect is discontinuous). Compared to the scenario in which the household faced no employment risk, it will save more to insure against an income shock.

Figure 1.7 depicts a contour plot of his first period labor supply over the $(A_0,\ e^F)$ parameter space. For lower values of assets and spousal earnings (to the "south west" of the frontier), the husband is employed in the first period. If his wife earns less than he does, the threshold at which he decides not to work depends only on assets. You can see this by looking across a "row" of the parameter space where $e^F < 1$. Once he reaches a value of $A_0 \approx 5.1$, the husband decides to take leisure in the first period. As mentioned above, I caution against interpreting the numeric value of initial assets. It depends on the length of the first period, which can be arbitrarily defined. When a wife earns more than her husband, the frontier dividing his labor supply depends on both her earnings and household wealth. This relationship is linear. As her earnings increase, it takes fewer assets to induce the husband to take leisure in the first period. These observations can be summarized as follows. If a wife is the primary bread winner, then her husband's labor supply will depend on the interaction between her earnings and

household assets. If a husband is the primary bread winner, then his initial labor supply depends only on assets.

I ignore the parameter space outside of the frontier delineating first period labor supply because, by definition, a husband must be employed to be at risk of displacement. Figure 1.8 and Figure 1.9 describe his second-period labor supply. The frontier dividing his first period labor choice is depicted in each graph for reference. After learning he is not displaced, the husband retires given sufficiently high wealth or spousal earnings. As you can see in Figure 1.8, the parameter space in which the husband works is reduced relative to the first period. This response is intuitive. The household no longer needs to save to insure against uncertainty nor is the husband penalized for not working (in the form of human capital depreciation), and so he enjoys leisure. The shape of the response can be best understood by dividing households into high earning wives and lower earning wives. When his spouse is the primary bread winner $e^F > 1$, his decision to retire is a function of both her relative earnings and household wealth (the area between the downward-sloping diagonals). When the husband has higher earnings potential, his reduction in labor supply is only dependent on assets with one exception. When both spouses earnings potential are approximately equal $e^H \approx e^F$ and $A_0 \in (3.2, 4)$, the husband chooses to retire despite having higher earnings potential. Recall the case in which the household faces no employment risk (Section 1.3.2). Its first period savings are non-linear around these labor supply frontiers in order to take advantage of the intertemporal substitutability of its "flow of services". The savings non-linearities are present when the household faces uncertainty as well. In this specific region of Figure 1.8, the household sacrifices in period one in order to enjoy joint leisure in the second period.

Figure 1.9 delineates the husband's labor supply following a job loss. Relative to Figure 1.8, the domain in which he works is smaller. That is, he is less likely to work following a displacement. This result is consistent with the literature that shows late-life job loss has large and lasting effects on employment. The contribution of my model is that it demonstrates how the displaced worker's labor supply depends on spousal earnings and household assets. Similar to the scenario in which the husband is not displaced, his second period labor supply depends on the interaction between wealth and spousal earnings if his wife earns more. And, if he is the bread winner ($e^F < 1$), it depends only on assets (with an exception). As was the case above, the household builds up savings around the frontiers that divide first period labor supply in order to take advantage of intertemporal substitutability. In the approximate region $A_0 \in (1.3, 3.2)$ and $e^F \in (0.75, 1)$, these savings encourage the husband to retire after losing a job. The buildup of savings at the boundary $\{h_1 = 0.5,\ f_1 = 0.5\}$ (both spouses work) and $\{h_1 = 0.5,\ f_1 = 1\}$ (only the husband works) causes the non-convexity in this graph.

The objective of this paper is to characterize how spousal earnings and household assets affect labor supply following a job loss. The shaded area in Figure 1.10 illustrates the region in which second period employment differs for displaced and non-displaced workers. The marginal effects are linear and easily interpreted for certain parameter values but not others. All of the effects discussed in the subsequent paragraphs should be interpreted as comparing a displaced worker to a control who is not displaced. Simply demonstrating that a displaced worker would retire for specific parameter values is not sufficient. It could be that a non-displaced worker in the same situation would have retired as well. Therefore, I am describing the regions in which their behavior differs.

Consider a household where $e^F = 0.5$ and $A_0 = 4$. If this husband were not displaced, he would continue to work. Following a job loss, however, he chooses to retire. For $e^F < 0.75$, the model predicts that given sufficient assets a displaced husband would retire, while a member of the control group (a non-displaced husband with identical assets and spousal earnings) would continue to work. You can see this effect by looking across rows of the parameter space where spousal earnings is less than 0.75. In order to test this prediction empirically in a reduced-form model, I would determine whether below a specific threshold of the spousal earnings ratio $\left(\frac{e_1^F}{e_1^H}\right)$ there exists a threshold of the asset ratio $\left(\frac{A_0}{e_1^H}\right)$ where displaced worker retire, but the control group does not. I discuss the suitability of ratios instead of levels later in this section.

When $e^F > 1$, the marginal effect of assets on a displaced worker's response to a job loss depends on the value of spousal earnings. That is, the interaction between spousal earnings and wealth determine whether our displaced husband returns to work. For example in a household with $A_0 = 1$, a displaced husband whose wife earns $e^F = 1.25$ would retire, while one whose wife earns $e^F = 1$ would not. Investigating whether this result is reflected in the data would involve testing whether above a certain spousal earnings threshold, the husband's labor supply following a job loss depends on the interaction between spousal earnings and household wealth.

Finally, within a middle range of spousal earnings, the effect of initial household wealth on labor supply following displacement will be nonlinear. This prediction is evident by looking across a row in Figure 1.10 in the range of $0 < e^F < 1$. A husband who loses a job would respond in the following ways. If household wealth is low, he is employed in the second period. As assets increases, he retires in the second period (where a member of the control group would not). As they increase further, he supplies labor, and if they increase even more, he withdraws from the labor force. The source of this non-linearity arises from household building up savings

along the first-period labor supply boundary discussed above. It had originally planned to adjust its second period service flow by increasing consumption. Following a decline in the husbands earnings potential, however, it equilibrates its flow of services by increasing his leisure. This non-linear effect of the interaction between assets and spousal earnings cannot be captured in a reduced form empirical test of this model.

Another way to express these results is to hold assets fixed (looking at columns in the parameter space). Below a certain threshold of assets (in this parameterization $A_0 < 3.4$), the response to job loss depends on the interaction between spousal earnings and assets, and this relationship could be nonlinear. Above this threshold, the second-period labor supply of a "treated" (i.e. displaced) worker would differ from that of a "non-treated" worker. And, as assets increase further $(A_0 > 4.1)$ there would be no difference in their labor supply.

When both spouses face employment risk, the generalizable predictions of my model do not change. The primary difference in behavior is that households save more to insure against greater uncertainty. I present an example to support this claim. Due to the difficulties representing multiple outcomes for multiple workers, I present results for specific values of the parameter space in Appendix B.

Testable Predictions of the Model

I test my theoretical predictions in a reduced form empirical model. One limitation of this approach is that it cannot capture the non-monotonic relationship described above. However, it appears that these nonlinearities are limited to a relative small domain of the (A_0, e^F) parameter space. The second limitation is that my sample does not yield enough statistical power to test both the marginal effects of e^F and A_0 and the effect of their interaction. Nevertheless, certain predictions should translate to the reduced form approach. First, relative to

the control group, a husband's labor supply following a job loss are negatively related to the ratio of spousal earnings potential $\left(\frac{e_t^F}{e_t^H}\right)$ and the ratio of household wealth to the husband's earnings potential $\left(\frac{A_0}{e_t^H}\right)$. This prediction is a consequence of the homotheticity of the utility function. Figure 1.11 shows a simulation where the husband's potential first-period earnings are all doubled. The parameter space in which the a displaced husband's second-period labor supply differs from the control group is identical to Figure 1.10. Second, the model predicts the labor supply of "treated" husbands will differ from the control group at specific thresholds. The thresholds depend on my model's parameters. In particular, the earnings ratio that divides the parameter space is particularly sensitive to each spouse's return to leisure in the flow of services function. Figure 1.12 illustrates my theoretical results when $\beta = 0.3$. Next, I test the theoretical predictions of my model.

1.5 Estimation Strategy

My definition of displacement is consistent with earlier studies, and I make no distinction between retirement and being out of the labor force in a population of older workers. When a worker leaves a job because the "business closed" or she was "laid off or let go", I classify her as displaced. This event is a plausibly exogenous shock to her earnings potential that does not limit her ability to work.[11] In comparison, a worker who leaves a job because of poor health also experiences a decline in her potential earnings, but this event is more likely to limit her physical ability to work. Throughout this paper "retirement" and "labor supply" are used interchangeably. In an older population, I regard the decision to retire and the decision to exit the labor force as the same. Most individuals do not permanently exit the labor force after

[11] In comparison, a worker who leaves a job because of poor health also experiences a decline in her potential earnings, but this event is more likely to limit her physical ability to work.

leaving their career job, and so I do no treat retirement as an absorbing state. While workers who leave long-tenure, full-time jobs may describe themselves as retired, the majority (60 percent) move to a bridge job.[12] Bridge jobs are attractive because they allow older workers to gradually reduce their hours, but the cost is typically a large decline one's wage rate. A sizable portion (15 percent) reverse course and reenter employment following at least two years out of the labor force (Cahill, Giandrea, and Quinn 2013). Because data on self-reported retirement are subjective and do a poor job explaining the employment patterns of older individuals, my empirical estimations use data on labor force participation. This measure is consistent with my theory, which models labor supply.

My primary goal is to measure the effect of spousal earnings and household assets on a worker's post-displacement labor supply. I include a control group of non-displaced workers because spousal earnings and household assets may affect labor supply, independent of displacement. I modify the approach used in previous studies of displacement.

$$h_{it} = \sum_{k=1}^{4} \eta_k D_{it}^k + \beta \mathbb{I}_i + \sum_{k=1}^{4} \delta_k \mathbb{I}_i \cdot D_{it}^k + \gamma ar_i + \sum_{k=1}^{4} \theta_k ar_i \cdot D_{it}^k + \varphi X_{it} + \alpha_i + \mu_t + \epsilon_{it} \quad (1.7)$$

Where h_{it} is a binary outcome variable indicating whether individual i is in the labor force at time period *t*. D_{it}^1 is assigned a value of one if individual *i* in time period *t* was displaced 0–2 years ago and zero otherwise. Similarly, $D_{it}^2 = 1$ if individual *i* in time period *t* was displaced 2–4 years ago. D_{it}^3 corresponds to 4–6 years ago, and D_{it}^4 corresponds to more than 6 years ago. I_i takes the value of one if the spousal earnings ratio is greater than 0.8 in the period when a respondent enters the survey $\left(\frac{e_i^F}{e_i^H} > 0.8 \text{ or } \frac{e_i^H}{e_i^F} > 0.8\right)$. The spousal earnings ratio enters

[12] Bridge jobs are attractive because they allow older workers to gradually reduce their hours, but the cost is typically a large decline one's wage rate.

the regression as a binary variable because the labor supply response to this variable is strongly non-linear. I chose the threshold of 0.8 because it divides the sample evenly, which allows for sufficient power to estimate both the male and female regressions. For male respondents, one-third of spouses earn more than 80 percent of their labor income and two-thirds earn less. For women, the converse is true. Two-thirds of their husbands earn more than 80 percent of their labor income and one-third earn less. ar_i is a continuous measure of the household assets to respondent earnings ratio in the initial period $\left(\frac{A_1}{e_1^I}\right)$, henceforth referred to as the "household asset ratio". The each respondent's spousal earnings ratio and asset ratio is time-invariant. X_{it} is a linear age effect, allowing for intercept differences between 50–61, 62–62, and 65 and older. I choose these ages because work incentives change when individuals become eligible for Social Security and Medicare. α_i is an individual random effect, which accounts for time-invariant characteristics of individuals. μ_t is a year fixed effect that captures the effect of the business cycle on labor supply.

While previous studies of displacement model the individual effect α_i as a fixed effect, a random effects model is more appropriate for my question and for my data. First, the random effects approach yields consistent estimates when there is a short time series for each respondent. Fixed effects models do not. The median length a respondent is in the sample is four waves. Second, the results from a random effects model allow one to make out-of-sample predictions for an "average" respondent. Third, random effects models allow the disturbance covariance matrix to be unrestricted. That is, they account for the within household error variance over time. Finally, random effects estimations do not drop respondents whose dependent variable is constant across the entire sample period. As a result, individuals who are employed in every

wave are not excluded from the estimation.[13] Since I am not interpreting the magnitude of the random effect, this limitation will not affect my interpretation of the results. Jakubson (1988) estimates female labor supply using both fixed and random effects models and find that both "give almost numerically identical estimates of the key parameters."

1.6 Data

1.6.1 Survey and Sample Description

My analysis uses the first 12 waves (1992–2014) of the Health and Retirement Study (HRS). In 1992 the HRS originally interviewed individuals ages 50–61 and their spouses regardless of age, yielding 12,652 respondents from 7,704 households. New cohorts in the same age range were added in 1998, 2004, and 2010.[14] When respondents initially enter the study, they are asked questions about their current job and previous job (prior to entering the study). Re-interviewed respondents are asked about their current labor force status and recent employment history. Their responses to these questions allow me to identify workers who recently left a job and the reason for the change. The HRS also provides detailed information on income and wealth. Missing data on income and wealth are imputed by the RAND Center for the Study of Aging across all waves. Their contribution makes these data more accessible, and my data set incorporates these imputations. I test the predictions of my model using two longitudinal samples from the HRS—one of female respondents and the other of male respondents.

My sample selection criteria follow from the assumptions of my model and are consistent with other studies of displacement. First, I divide the data into male respondents and female

[13] The disadvantage of random effects models is the requirement that the individual effect is normally distributed and independent of the regressors and the error term.
[14] 1998: Added 2529 respondents from the War Baby cohort (WB) born 1942–1947. 2004: Added 3330 respondents (2154 households) from the Early Baby Boomer cohort (EBB) born 1948–1953. 2010: Added Mid Baby Boomer cohort (MBB) born 1954–1959.

respondents to create separate samples. I perform separate analysis on each population because the previous literature shows that responses to job loss differ by gender. Second, all cohorts born after 1931 are included in my analysis, so that prime working-age respondents are measured across the entire 1992–2014 time period. Third, I require respondents to be married to the same individual throughout their participation in survey. I am interested in measuring the effect of spousal earnings on post-displacement labor supply. Next, both the respondent and his or her spouse must be between the ages of 40 and 80 when interviewed. Next, I restrict my sample to individuals who are employed when they first enter the HRS but not self-employed. This criterion ensures that both the control (non-displaced) and treated (displaced) groups are similar insofar as they are both at risk of job loss. Sixth, individuals who were displaced in the two years prior to entering the survey are dropped. Were they not, the sample would be biased towards people who are most likely to seek a new job following displacement. In other words, they had already been subjected to the "experiment" and were found to rebound from a job loss quickly. Finally, the respondent must appear in at least two survey waves. For male respondents, the resulting unbalanced panel has 32,826 person-wave observations, comprised of 5,140 individuals. The sample for women consists of 30,435 person-wave observations and 4,884 respondents (see Table 1.2).

1.6.2 Measurement

To identify a recent job loss for new HRS respondents, I use information from the job history section of the survey. For reinterviewed respondents, I rely on the employment section. Individuals who left a job are asked, "Why did you stop working at that job?" If their response is either the "business closed" or they were "laid off/let go", I classify them as displaced. Combining layoffs and firings ("let go") is inconsequential for testing the theoretical predictions

of my model. In both cases an individual's potential earnings decline and his ability to work is unaffected.[15]

I rely on RAND contributions to the HRS to accurately measure each spouse's earnings (labor income). Earnings are reported for the calendar year prior to respondent's interview. RAND interpolates missing earnings data. Constructing the spousal earnings ratio from only the respondent's initial observation yields a noisy measure. To more accurately measure each spouse's contribution to household earnings, I use earnings data from when the respondent initially enters the survey until the household labor supply changes. This span is comprised of consecutive periods when both the respondent and his spouse have the same labor force status as their first wave. The spousal earnings ratio equals the sum of spousal earnings divided by the sum of respondent earnings over this span. This measure is constructed in this manner for both displaced and non-displaced workers.

The measure of total household assets is constructed from RAND and researcher contributions to the HRS. Respondent assets include financial wealth, housing wealth (primary residence only), and pension wealth. Financial and housing wealth are interpolated by RAND where missing. I include housing wealth because most of the reduction in wealth following a displacement comes from individuals' reported values of their homes, with little change in the amount of mortgage debt. The explanation of this decline is twofold. Job losses are associated with declining local economies, and so the displacement shock may be correlated with negative shocks to home values. Second, displaced workers are more likely to move. Moving to a less expensive home provides access home equity when a loan is unavailable (Stevens and Moulton

[15] Firings comprise a small proportion of this category. Boisjoly, Duncan, and Smeeding (1998) disaggregate the "laid off/fired" response for an identical question in the Panel Study of Income Dynamics and find that only 16% of workers in this category are fired.

2013). Aggregated measures of pension wealth are imported from Gustman, Steinmeier, and Tabatabai's data contribution to the publicly available HRS data. In an effort to more accurately measure the household asset ratio, it is constructed using the same method as the spousal earnings ratio.[16] The household asset ratio is bottom-coded and top-coded at the 1st and 99th percentiles.

1.6.3 Descriptive Statistics

A comparison of the sample of men and women reveals how older workers' employment outcomes differ by gender (Table 1.2). Twenty-one percent of men and 18.5 percent of women experience a job loss at some point during their participation in the study. These statistics are somewhat surprising as we typically consider women to be employed in industries that have not had mass layoffs over the previous 30 years. On average, men experience their first displacement at a slightly older age (58.8 vs. 56.3). Men are on average two years older than their wives when they lose a job, and women are on average three years younger than their husbands at displacement (not reported in table). When respondents are first observed, men's median salaries are significantly higher than women's, and they are less likely to have a working spouse. In addition, men's spouses earn significant less, conditional on employment.

Differences between workers who are “never displaced” and those who are displaced at some point in the panel are consistent with one's presuppositions. The averages in Table 1.3 correspond to the year in which respondents first appear in the survey. Never-displaced respondents and their spouses earn significantly more than their displaced counterparts. Both groups are equally likely to have working spouses. In other words, never-displaced respondents

[16] Stevens and Moulton (2013) do not find significant pre-displacement effects household assets.

are no more likely to be in dual-earner households. On average, workers who are never displaced earn more income and are better educated.

1.7 Estimation Results

The dependent variable in my regression is labor force participation, and the omitted category is low spousal earnings ratio and non-displaced. I present estimates from a random effects linear probability model estimated using maximum likelihood estimation. The marginal effects of the linear probability model and the logit model are comparable (see Appendix C). My analysis is limited to a worker's first job loss. For workers who experience multiple displacements, the decline in their earnings is largest at their first displacement (Stevens 1997). My focus on the most severe job loss is consistent with testing my theoretical model, which assumes a significant decline in potential earnings.

The effects of the spousal earnings ratio and household asset ratio on men's post-displacement labor supply are consistent with my theoretical predictions. Men who have relatively high earning spouses are more likely to exit the labor force following a job loss (Table 1.4). Relative to a non-displaced worker in a low spousal ratio household, displaced men in low spousal ratio households at the median asset ratio are 6.5 percent more likely to be out of the labor force 0–2 after a job loss.[17] This effect persists in the years following a displacement, but diminishes slightly after four years (Column 1). A non-displaced husband with a high spousal ratio is 1.2 percent less likely to be in the labor force in any period following his first observation (Column 2). While this effect is not statistically significant, it indicates that non-displaced men with high-earning spouses retire earlier. Relative to displaced men with a low spousal earnings ratio, displaced husbands with a high spousal earnings ratio are less likely to be in the labor force

[17] Calculated as -0.0653 = -0.0551 + 6*(-0.0017)

in every subsequent period (Column 2). For example, these men are 4.25 percent less likely to be in the labor force 0–2 years after a displacement, relative to their counterparts with a low spousal earnings ratio. Compared to non-displaced men in low spousal ratio households, they are 12 percent less likely to be in the labor force.[18] This effect is only statistically significant for men who were displaced 2–4 years ago, but these parameters are jointly significant (p-value = 0.027). These results are consistent with my theoretical prediction that husbands with a high spousal earnings ratio are less likely to return to work after a displacement.

The household asset ratio has a minor impact on men's labor supply following a job loss. For workers who were displaced 0–2 years ago, an increase in total assets equivalent to their annual earnings would reduce the probability of returning to the labor force by 0.17 percent. This effect is persistent in the years following a job loss, indicating that displaced men with higher household asset ratios are less likely to return to work. The coefficients of the interactions between the household asset ratio and the displacement dummies are jointly significant (p-value = 0.051). The effect of the household asset ratio is similar for displaced women, but the effect of spousal earnings is not.

The relationship between women's spousal earnings ratio and post-displacement labor supply is not consistent with my theoretical predictions. In the years following a job loss, displaced women are less likely to be in the labor force than non-displaced women (Table 1.5). For example, a displaced worker with a low spousal earnings ratio at the median asset ratio is 12.9 percent less like to be in the labor force, relative to a similar non-displaced worker.[19] This effect persists in the years following displacement (Column 1). Compared to men in the same type of household, women from a low spousal ratio household are less likely to return to work

[18] -0.1198 = -0.012 - 0.0551 - 0.0425 + 6*(-0.0017)
[19] -0.129 = = -0.118 + 8*(-0.00139)

after a job loss. A non-displaced woman with a high spousal ratio is 4.2 percent less likely to be in the labor force in any period after her first observation (Column 2). This suggests that non-displaced women with high-earning husbands retire earlier than non-displaced women with low-earning husbands. Compared to displaced women with a low spousal earnings ratio, displaced women with a high spousal earnings ratio are only slightly less likely (0.94 percent) to be in the labor force 0–2 years after a displacement (Column 2). This effect is insignificant and is not consistent over time. Further, the post-displacement effects are jointly insignificant. In contrast to men, women's post-displacement labor supply is unaffected by their spouse's earnings.

The effect of the household asset ratio on displaced women's labor supply is similar to the effect on displaced men. For workers who lost a job 0–2 years ago, an increase in total assets equivalent to their annual earnings would reduce the probability of returning to the labor force by 0.14 percent. This effect is persistent in the years following a job loss, indicating that displaced women with higher household asset ratios are slightly less likely to return to work. The coefficients of the interactions between the household asset ratio and the displacement dummies are jointly significant.

My empirical results are consistent with previous studies of older workers' labor supply. These studies find that displacement has large and lasting effects on older workers' labor supply. They also show that the response to displacement differs by gender. If men and women have different returns to leisure, my theoretical model predicts that the relationship between their post-displacement labor supply and spousal earnings ratio will differ. Because the cohorts of men in my sample are more likely to be in physically demanding occupations and because women are more likely to have older spouses, men might plausibly have higher returns to leisure within the average household.

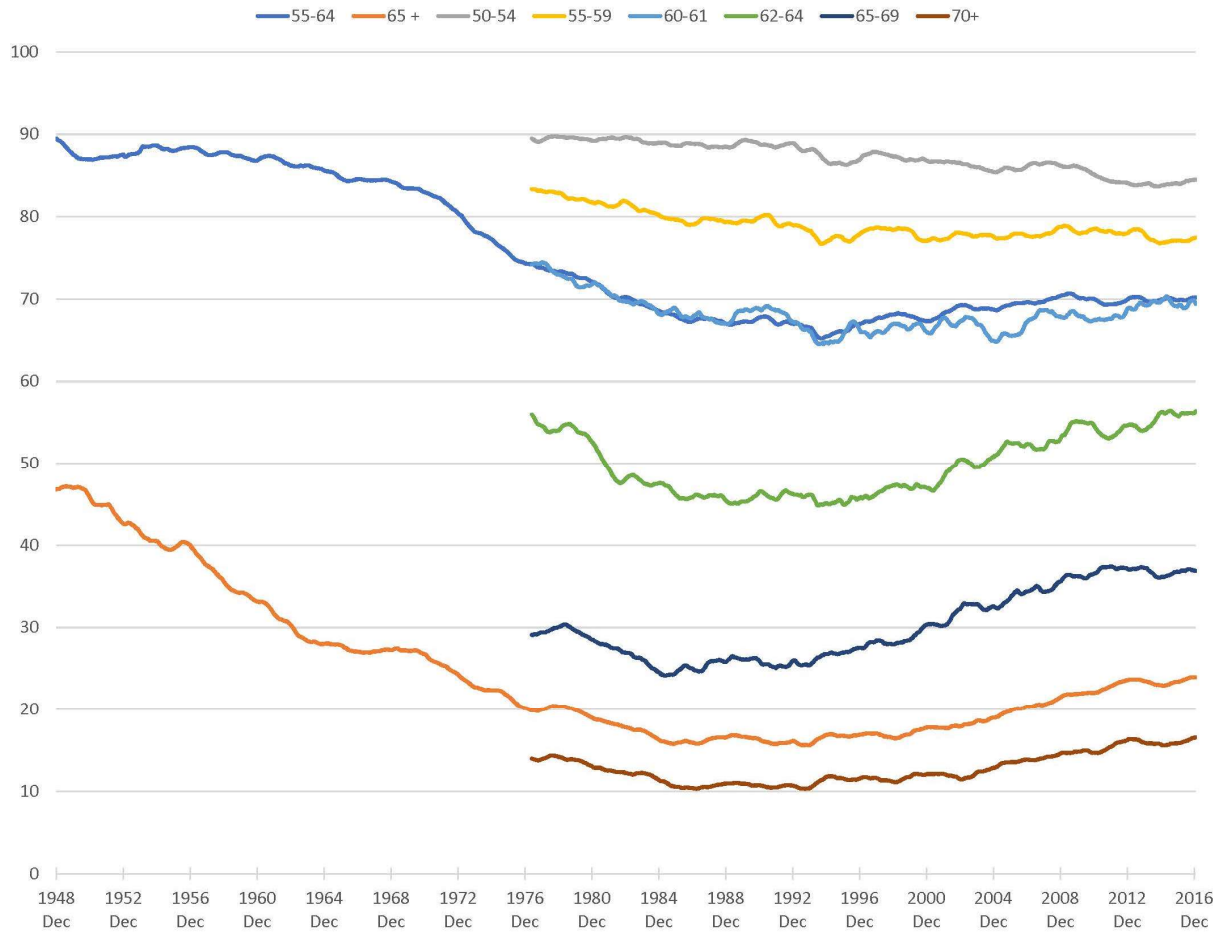
1.8 Conclusion

This paper examines the effects of spousal earnings and household assets on a worker's labor supply following a job loss. Theoretical predictions for the response are generated from a stylized two-period model of family labor supply. In this model, a husband's labor supply depends on the ratio of his wife's earnings to his own earnings and the ratio of household assets to his earnings. The model is symmetric, and so the converse is true for a wife's labor supply. The model predicts that individuals with higher spousal earnings ratios and higher household asset ratios are more likely to exit the labor force after a displacement. The response is not monotonic. Therefore, a reduced form empirical model does fully test the predictions of my theory.

Displaced men with wives who make a significant contribution to household earnings are less likely to return to the labor force following a job loss. In addition, displaced men with higher household asset ratios are less likely to return to work. These patterns are consistent with the theoretical predictions of the two-period family labor supply model. Spousal earnings to do not have a significant effect on women's post-displacement labor supply. Within the context of my model, this result implies that older women's return to leisure is lower than their husbands. While this paper cannot definitively confirm that conclusion, it is consistent with two patterns in the data. On average, men may have more physically demand jobs, which makes work more costly at older ages. On average, men are older than their wives and returns to leisure may be correlated with age. Earlier studies have not investigated returns to leisure within the household, and it warrants further study.

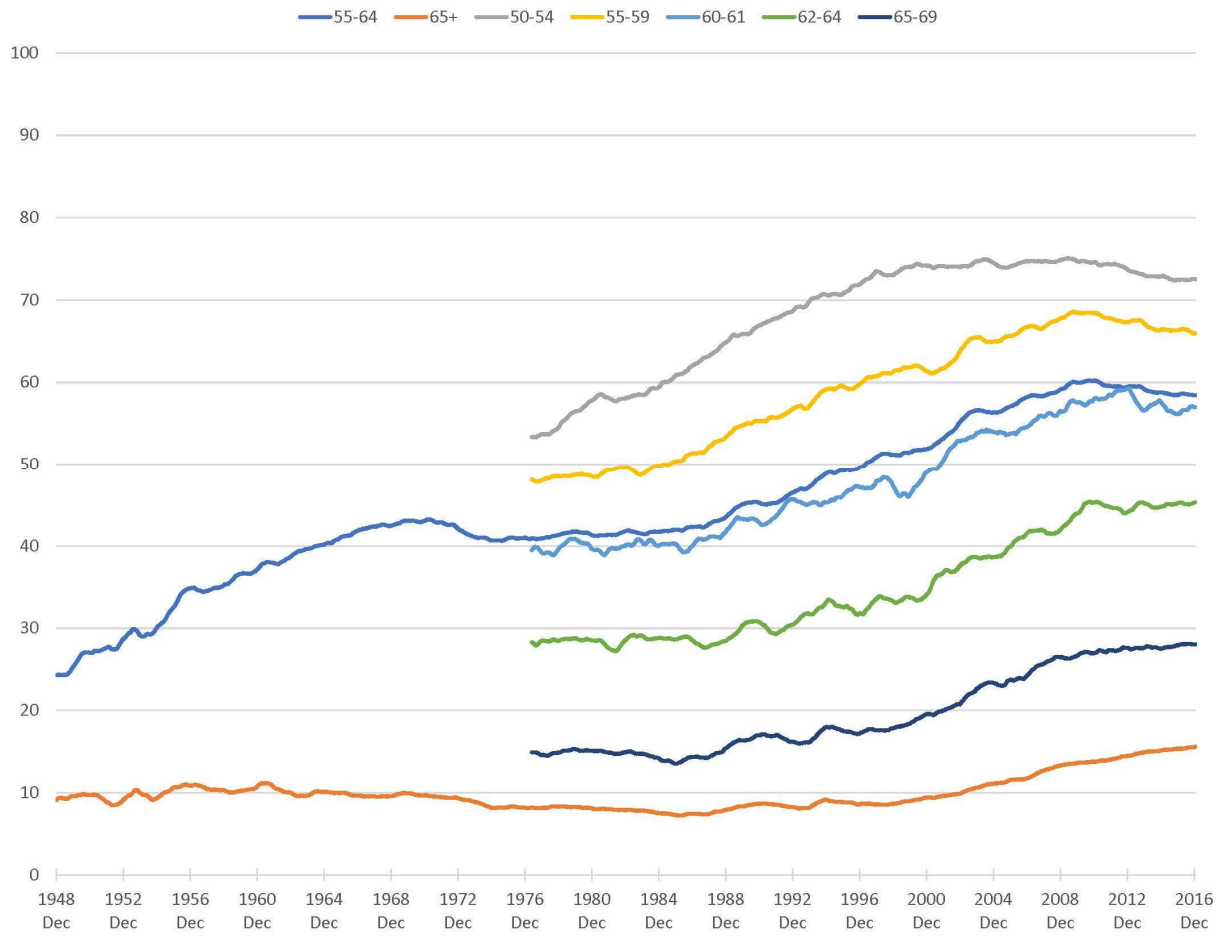
1.9 Figures and Tables

Figure 1.1: Labor Force Participation of Men over 55



Source: Displaced Worker Survey Supplement to the Current Population Survey

Figure 1.2: Labor Force Participation over Women over 55



Source: Displaced Worker Survey Supplement to the Current Population Survey

Table 1.1: Model Calibration

Parameter	Value	Comments
α	0.5	Inferred from Altig et al. (2001)
γ	-0.1	From Laitner and Silverman (2012)
e_1^H	1	The husband's earnings potential is normalized to one. The model is homothetic. Therefore, the ratios of earnings $\left(\frac{e_t^F}{e_t^H}\right)$ and assets to earnings $\left(\frac{A_0}{e_t^H}\right)$ determine the household labor supply in each period.
$e_2^i \mid disp$	0.75	Earnings potential declines by 25 percent if a worker loses a job (Farber 2011)
$pr(disp)$	0.15	The probability of displacement is 15 percent (from HRS descriptive statistics).

Figure 1.3: No Displacement, No Human Capital Depreciation

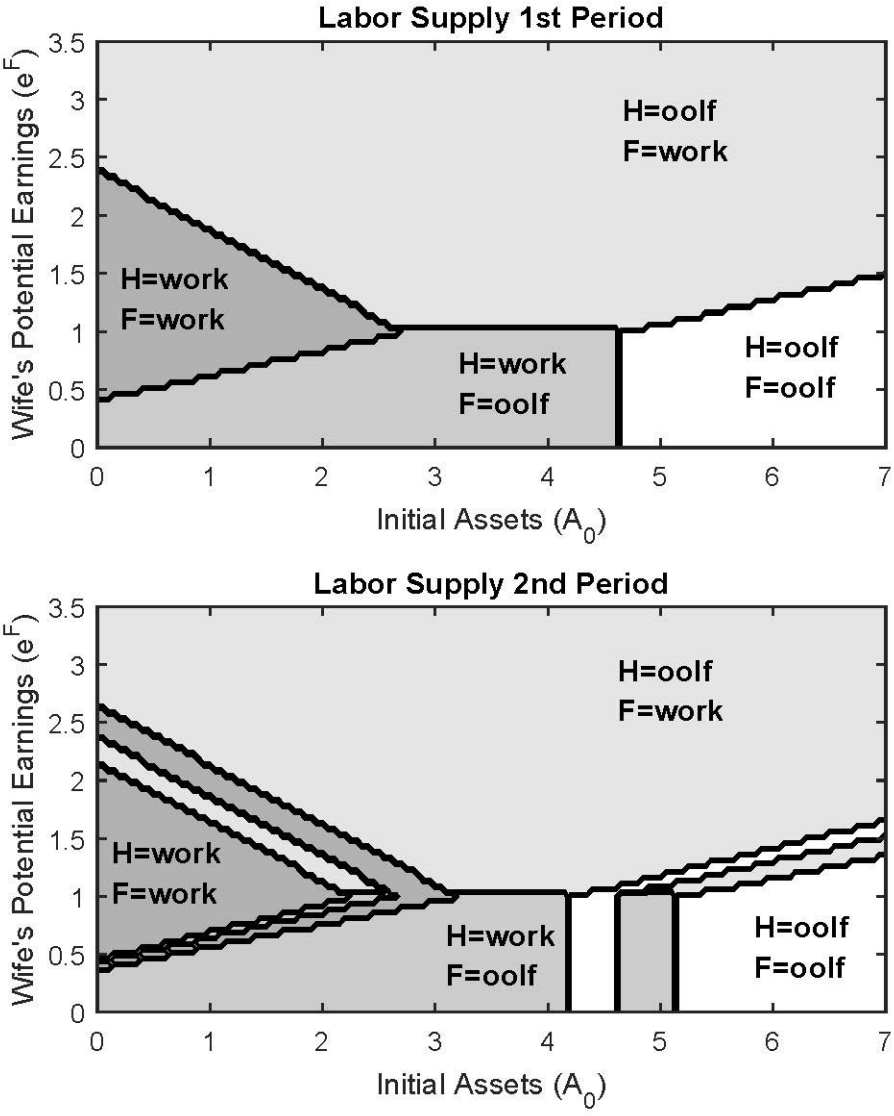


Figure 1.4: No Displacement, No Human Capital Depreciation, $\gamma = 0.6$

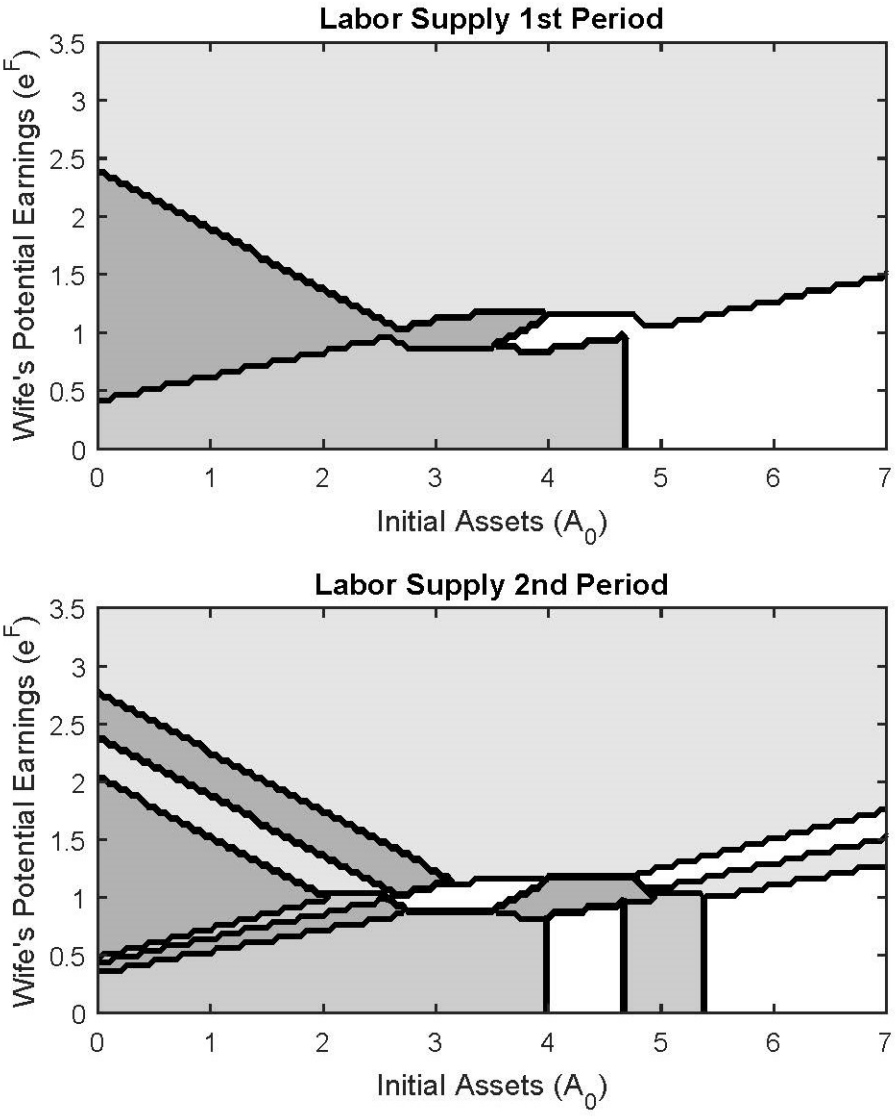


Figure 1.5: No Displacement, No Human Capital Depreciation, $\gamma = -1$

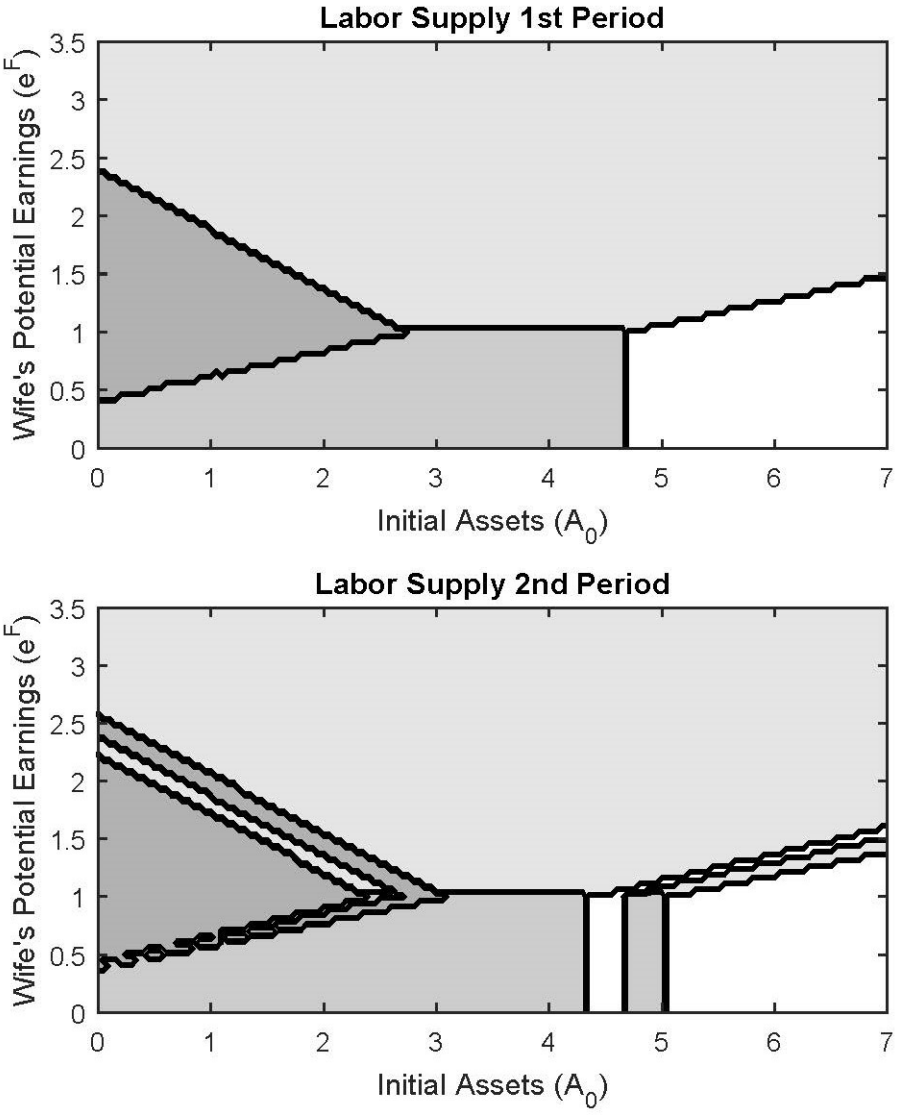


Figure 1.6: No Displacement, $\rho = 0.5, \alpha = 0.3, \beta = 0.35, \gamma = -3$

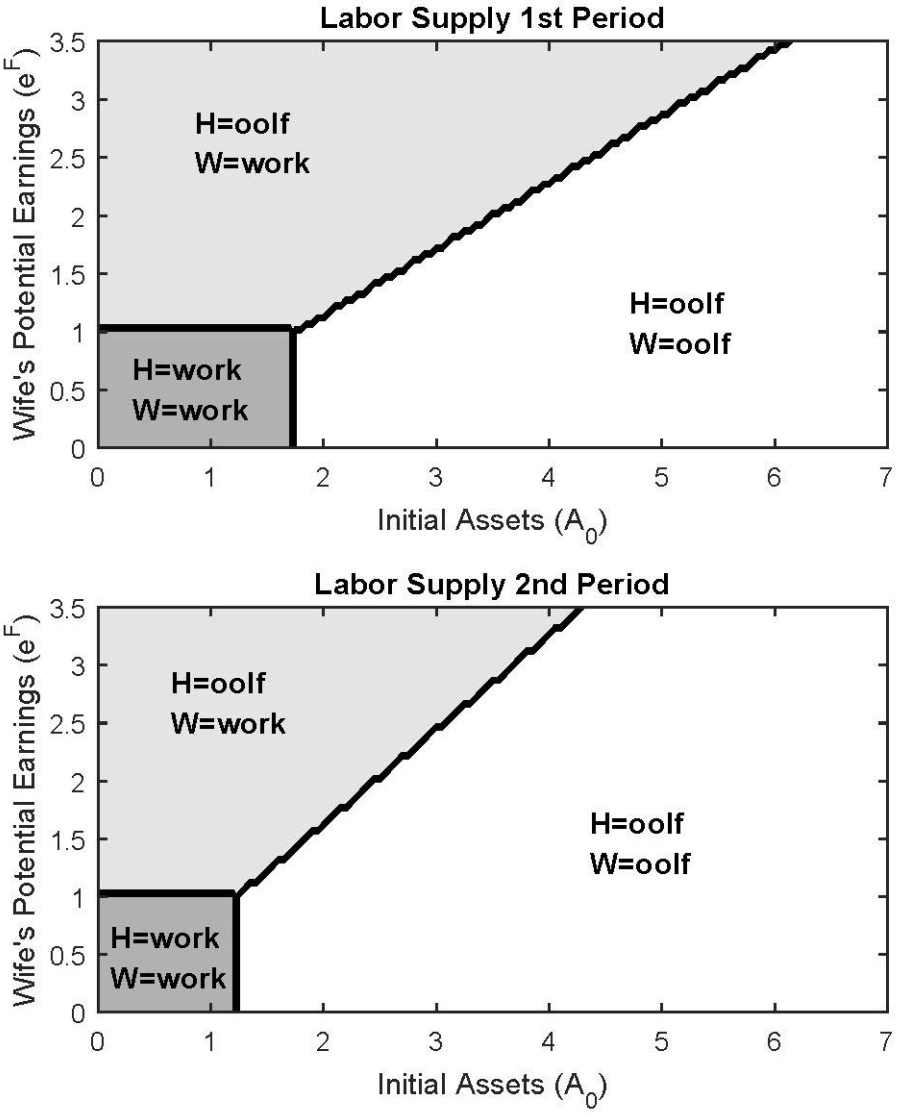


Figure 1.7: Husband's Labor Supply 1st Period

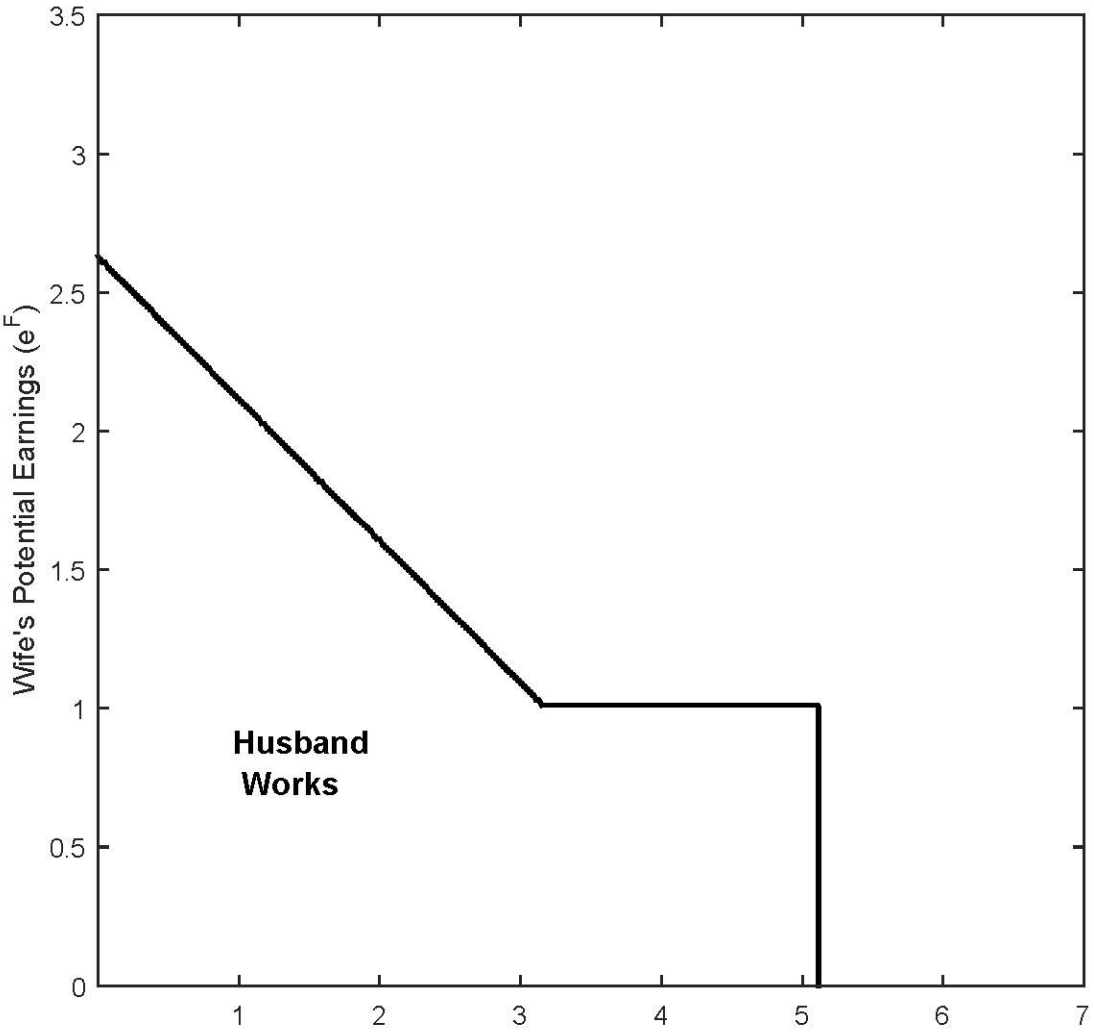


Figure 1.8: Husband's Labor Supply 2nd Period (Not Displaced)

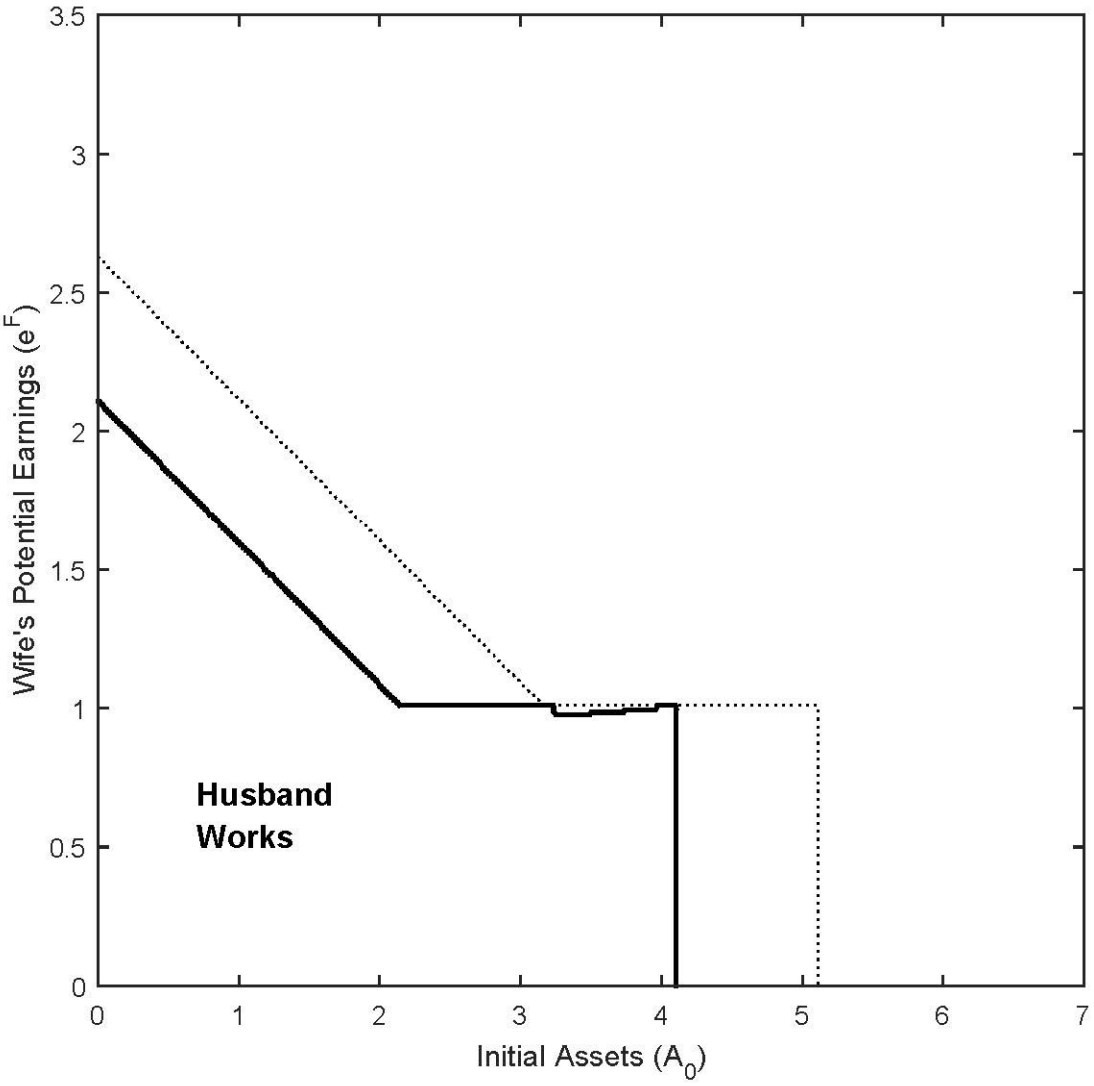


Figure 1.9: Husband's Labor Supply 2nd Period (Displaced)

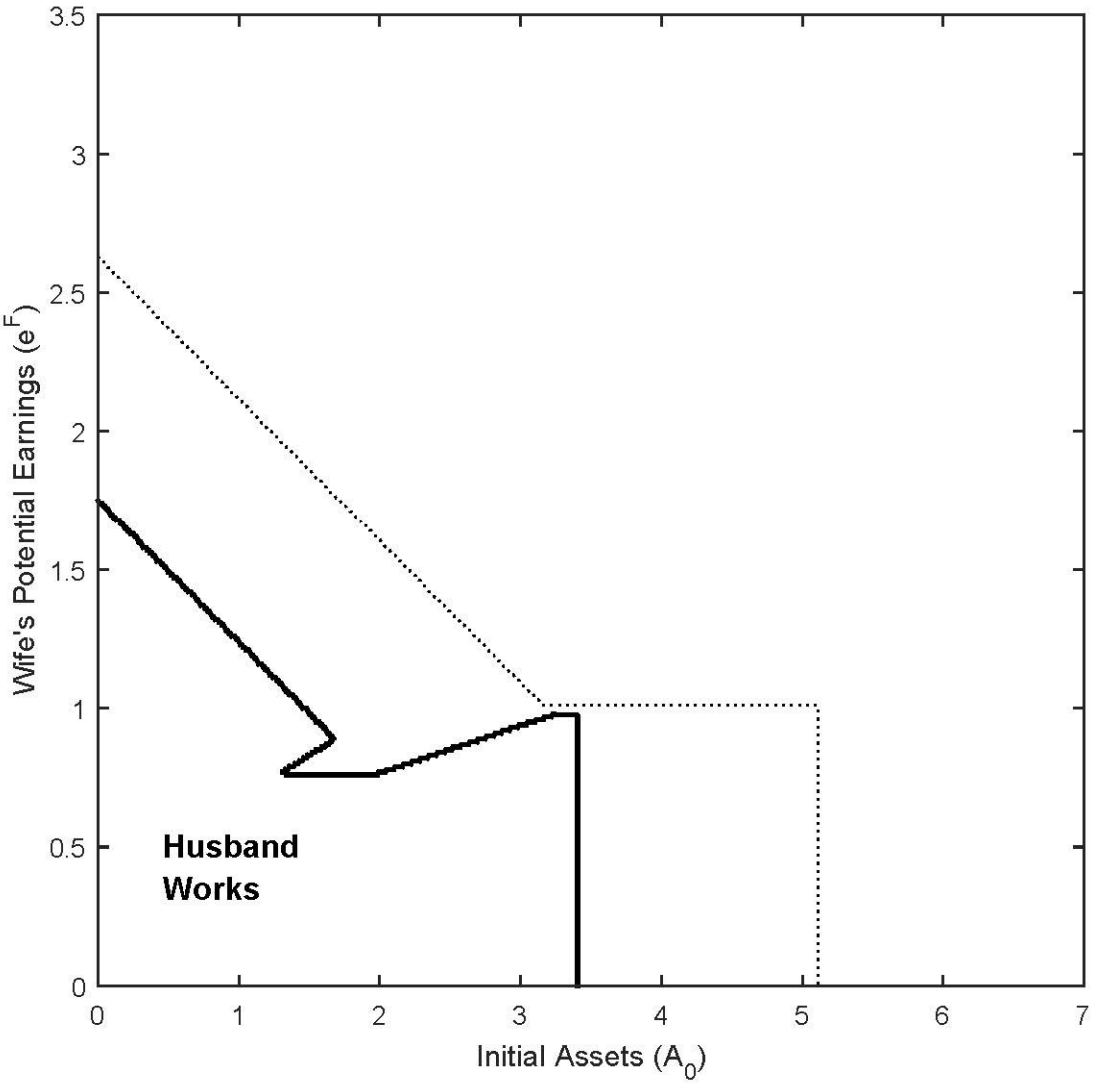


Figure 1.10: Marginal Effects

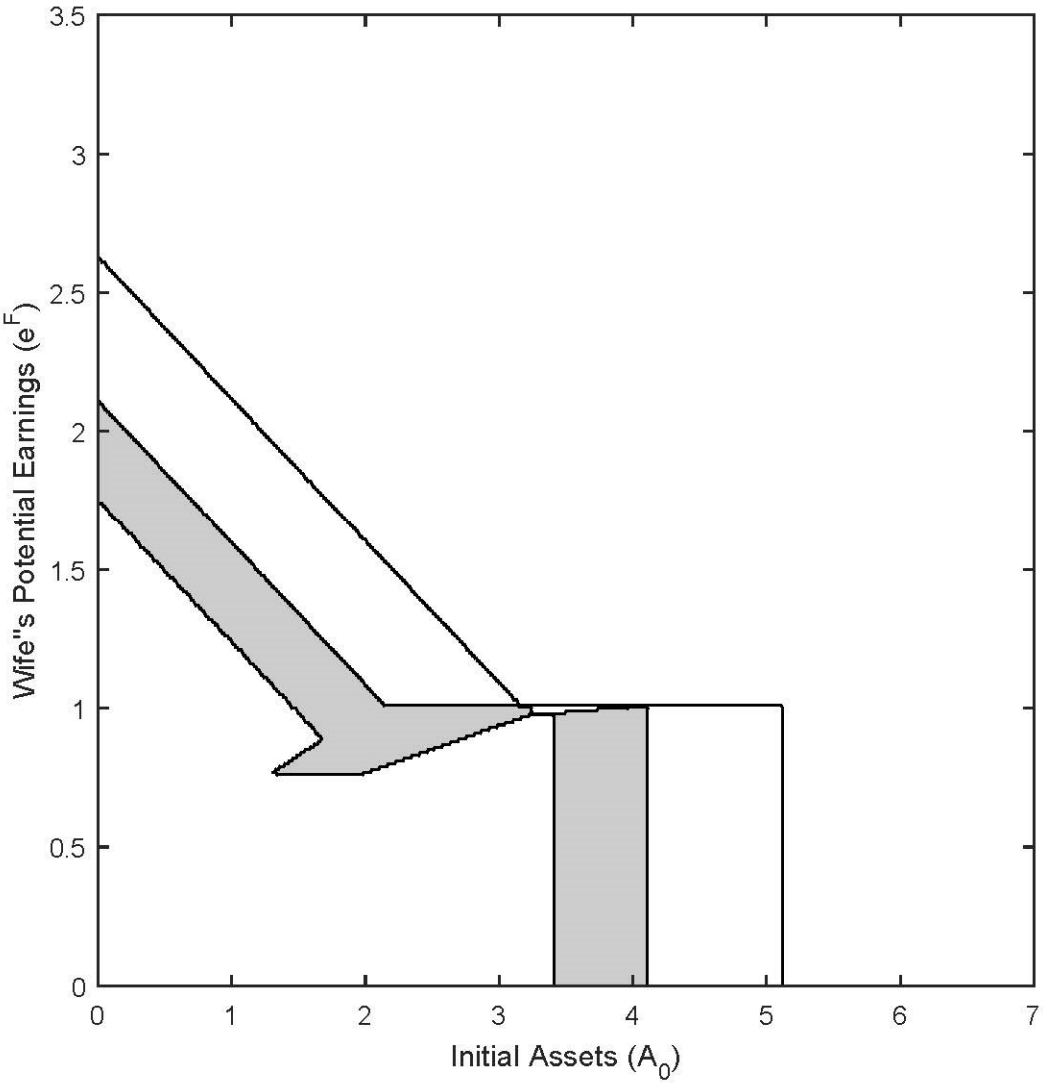


Figure 1.11: Homotheticity ($e_1^H = 2$)

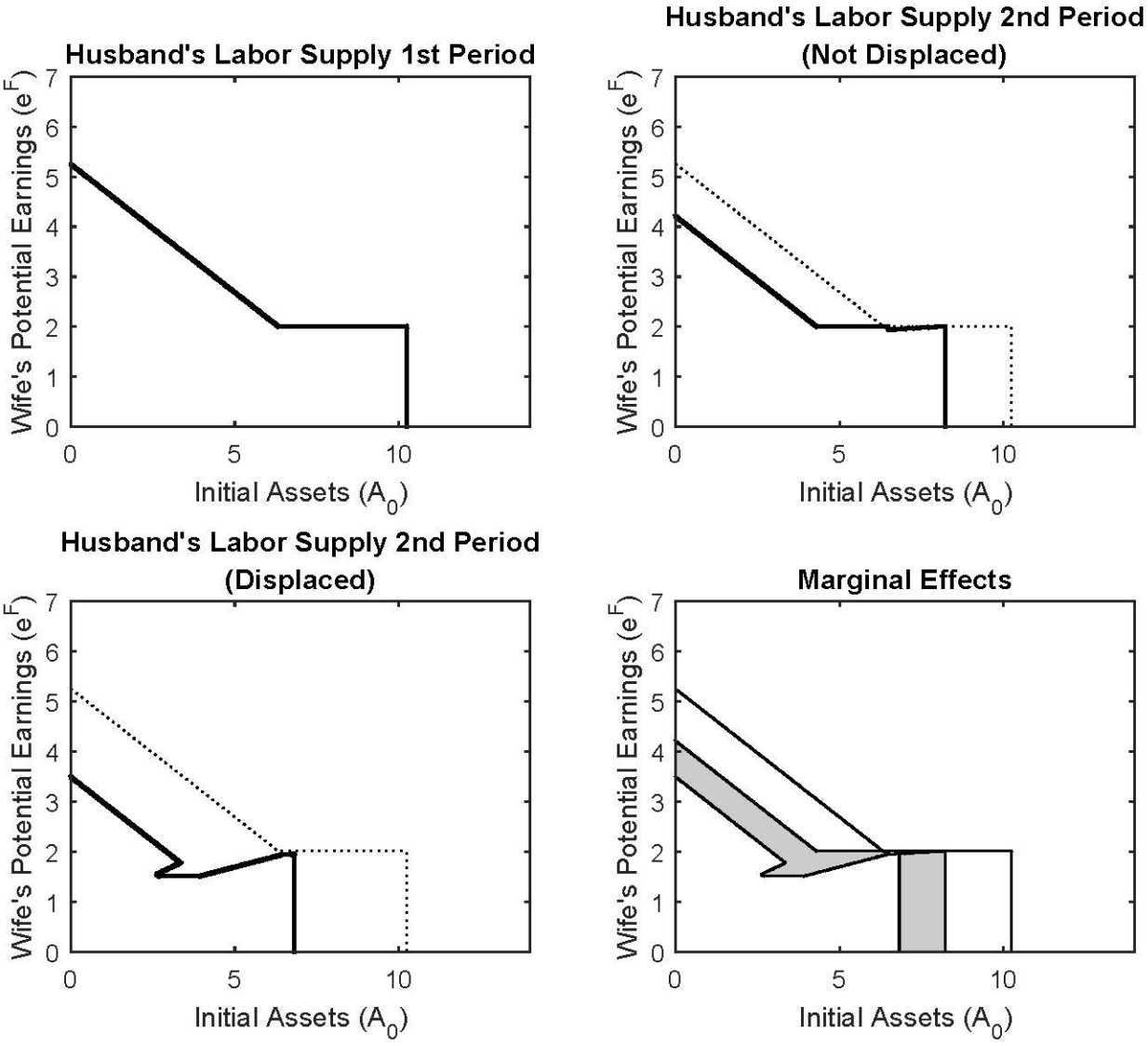


Figure 1.12: Husband has Greater Return to Leisure

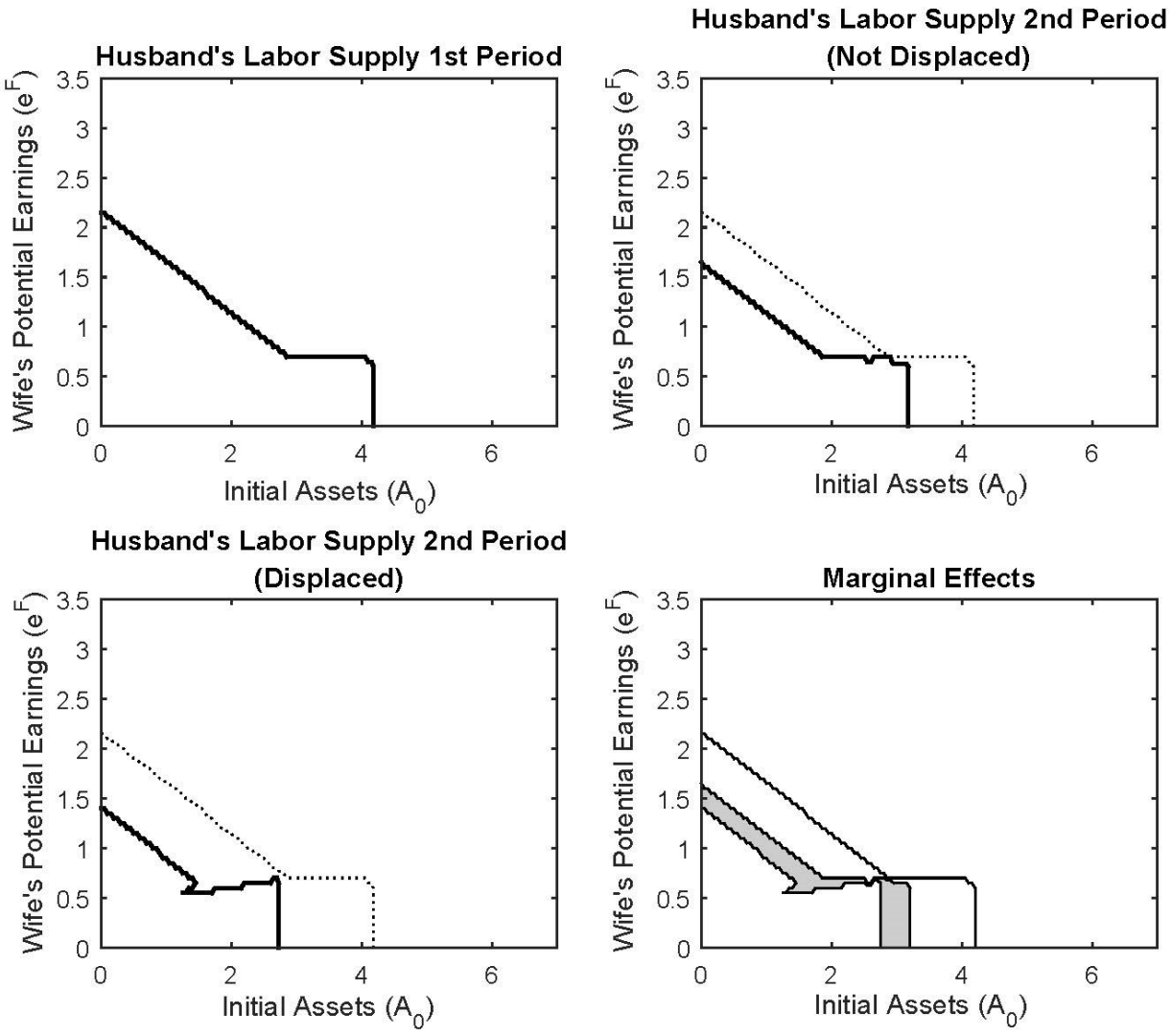


Table 1.2: Sample Comparison of Men and Women

	Men	Women
Person-year observations	32,826	30,435
Respondents	5,140	4,884
Respondents with at least one displacement	1,082	907
Respondents with multiple displacements	226	182
Median age at first displacement	58.8	56.3
Respondent's First Observation:		
Median Earnings	$54,254	$31,507
% with positive earning spouses	68.5%	78.7%
Spouse's Median Earnings (conditional)	$30,833	$53,990

Note: Unweighted tabulations using the 1992-2014 HRS survey. Dollar figures are in 2014 dollars using the CPI-U.

Table 1.3: Comparison of Never-Displaced and Displaced Respondents

	Never Displaced	Displaced
Median Earnings	$42,751	$37,684
% with working spouse	73.3%	74.1%
Spouse's Median Earnings (conditional)	$42,479	$37,206
% HS graduate	80.5%	76.1%
% College graduate	26.8%	21.4%

Note: Based on respondent's first observation. Unweighted tabulations using the 1992-2014 HRS survey. Dollar figures are in 2014 dollars using the CPI-U.

Table 1.4: Estimates of Men's Labor Force Participation

	No Interaction	High Spousal Ratio Indicator	Asset Ratio
Non-Interacted Terms		-0.0120	0.000592***
		(0.0107)	(0.000222)
Displaced		$\mathbf{I}\cdot D^{k****}$	$ar\cdot D^{k****}$
0–2 years ago	-0.0551***	-0.0425	-0.00170***
	(0.0149)	(0.0303)	(0.000597)
2–4 years ago	-0.0618***	-0.103***	-0.000239
	(0.0160)	(0.0324)	(0.000634)
4–6 years ago	-0.0394**	-0.0553	-0.00113
	(0.0174)	(0.0366)	(0.000701)
6+ years ago	-0.0268**	-0.0312	-0.00175***
	(0.0136)	(0.0270)	(0.000507)
N_{OBS} = 27,247	N_{GROUPS} = 5019		Median $ar \approx 6$

Note: All regressions include year fixed effects and age effects allowing for discontinuites at 62 and 65.
*p < .10. **p < .05. ***p < .01

Table 1.5: Estimates of Women's Labor Force Participation

	No Interaction	High Spousal Ratio Indicator	Asset Ratio
Non-Interacted Terms		-0.0420***	-0.000125
		(0.00953)	(0.000155)
Displaced		$\mathbf{I}\cdot D^{k}$	$ar\cdot D^{k****}$
0–2 years ago	-0.118***	-0.00935	-0.00139***
	(0.0228)	(0.0276)	(0.000429)
2–4 years ago	-0.116***	-0.0101	-0.000726
	(0.0247)	(0.0297)	(0.000442)
4–6 years ago	-0.107***	0.0332	-0.00135***
	(0.0284)	(0.0330)	(0.000464)
6+ years ago	-0.0488**	-0.0103	0.0000641
	(0.0222)	(0.0252)	(0.000328)
N_{OBS} = 24,906	N_{GROUPS} = 4734		Median $ar \approx 8$

Note: All regressions include year fixed effects and age effects allowing for discontinuites at 62 and 65.
*p < .10. **p < .05. ***p < .01

CHAPTER II

Trends in Retiree Health Insurance: New Evidence from Household Surveys

2.1 Introduction

Recent studies show that over the past two decades, employer-sponsored early-retiree health insurance (ESERHI) coverage has eroded. This research relies almost entirely on surveys of employers. These studies reveal several interesting trends: the costs of ESERHI have increased considerably to both employers and retirees, employers have shifted costs to retirees and restricted access to their plans, the share of employers offering coverage has declined steadily for the past two decades, and the majority of employers that still offer ESERHI plan to shift costs to retirees or eliminate coverage over the long-term. [20] What these surveys cannot reveal is whether the number uninsured older workers and early retirees will substantially increase as a result of these trends, and if so, whether the effects are uniform or impact some groups more than others. In addition, employer surveys cannot produce population estimates of ESERHI coverage. The Health and Retirement Study (HRS), a survey of households, is better

[20] See McArdle, Neuman, and Huang (2014); Fronstin and Adams (2012); Buchmueller, Johnson, and Lo Sasso (2006); Kaiser Family Foundation (2017); Towers Watson (2015); Aon Hewitt (2012). Employer survey data sources: the Kaiser Family Foundation and Health Research & Educational Trust (Kaiser/HRAT) Employer Health Benefits Survey, the Insurance Component of the Medical Expenditure Panel Survey (MEPS-IC), and surveys from the benefits consulting firms Towers Watson and Aon Hewitt.

suited to address the consequences of declining ESERHI. Household-level data yield estimates that (1) measure how the reduction in employer offer rates impacts ESERHI coverage for the population aged 55–64, (2) reveal whether individuals substitute different sources of health insurance for ESERHI, or possibly, become uninsured, and (3) document how different populations are affected by declines in ESERHI. This paper is complementary to recent studies that use employer surveys. Taken together, they describe the impact of declining ESERHI on older workers and early retirees, and how this population is likely to be impacted in the future.

Most Americans retire before the age of 65, the age of near-universal eligibility for Medicare (Gustman and Steinmeier 2009). With fewer firms offering early-retiree health insurance, older workers and early retirees face the risk of becoming uninsured. Losing health insurance in the years approaching Medicare eligibility can be particularly costly. Older households are more likely to incur high medical expenses because the risk of serious health problems increases with age. Although this population is more likely to have significant assets (Boshara, Emmons, and Noeth 2015), if these are not protected, high medical expenses could threaten retirement security. In addition, older workers have less time to adjust their savings in response to a cut in retiree health insurance benefits. If they are forced into early retirement, perhaps due to declining health, older worker may be less prepared to buy private insurance.

However, becoming uninsured is not an inevitable consequence of losing retiree health insurance benefits. Workers who lose retiree coverage may still retire early without losing health insurance by substituting spousal insurance, private insurance, or government-provided insurance for ESERHI. Alternatively, they could remain insured by continuing to work or by returning to work. If there are adequate formal or informal safety nets to protect against the loss

of early-retiree health insurance, the costs of declining offer rates of ESERHI are potentially insignificant.

I examine how declining early-retiree health insurance has affected the population aged 55–64. To preview my results: Workers are more likely to substitute a different source of health insurance for a loss in ESERHI than to become uninsured. Early-retiree health insurance coverage for the population aged 55–64 is greater than what employer surveys suggest. At the same time, between 2002 and 2014, the overall percentage point decline in ESERHI is similar for population estimates and estimates from employer surveys. The largest declines in ESERHI occurred in periods when labor markets were weak. All population subgroups (identified by race, gender, education) experienced declines in retiree health insurance coverage.

2.2 Background

2.2.1 Employer-sponsored Early-retiree Health Insurance

Employer-sponsored early-retiree health insurance covers retirees between leaving their employer and becoming eligible for Medicare at age 65. ESERHI plans differ considerably from employer to employer. Most employers either offer subsidized coverage, which includes an employer contribution, or "access only" coverage, which does not include an employer contribution but provides access to the employer's group plan at the community rate. McArdle, Neuman, and Huang (2014) summarize estimates related to these types of plans from a 2012 survey of firms with 500 or more employees. "Access only" coverage was offered at 39 percent of firms with ESERHI. At 49 percent of firms with ESERHI, early retirees shared premium costs with employers. And, at 12 percent of firms, employers paid the full premium. For retiree health insurance plans in which firms and retirees share costs, the average retiree contribution was 37 percent. For point of reference, the average annual cost of ESERHI per retiree was

$11,961 in 2012. Finally, they report that firms with subsidized or "access only" plans typically offer retirees the same health plan options that are available to active employees.

Retiree health insurance is an insecure benefit. Employers who offer ESERHI have no legal obligation to provide future retiree health benefits, meaning workers or current retirees can lose benefits at any time (unless current retirees were promised this specific benefit in their Summary Plan Description). Further, employers are not required to pre-fund retiree health insurance obligations. As retiree health insurance costs increase, the trend has been for firms to shift more of these costs to current and future retirees. In surveys conducted by Kaiser Family Foundation and others, employers reported capping their contribution to retiree health benefits, tightening eligibility requirements (e.g. raising minimum age and service requirements), raising retirees' premiums and cost sharing, and eliminating coverage for future retirees—typically first for new hires, less frequently for current employees, and rarely for current retirees (McArdle, Neuman, and Huang 2014).[21] An alternative strategy to contain costs involves employers transitioning from a defined benefit to a defined contribution retiree health insurance plan.

Under defined contribution retiree health insurance plans, workers and employers contribute to a health reimbursement account (HRA). Workers can then use this account to purchase private insurance when they retire. This type of arrangement shifts the risks of rising healthcare costs from employers to retirees. In a 2013 survey of employers, 34 percent of ESERHI sponsors favored transitioning to a defined contribution plan in the long-term (McArdle, Neuman, and Huang 2014).[22] Defined contribution retiree health insurance does not

[21] Retiree health insurance is not a protected benefit. That is, employers can terminate retiree health insurance benefits for their current employees *and* their current retirees—unless they made a specific promise to maintain the benefit. The manner in which employers contain retiree health insurance costs (e.g. eliminating the benefit for new hires first) likely reflects concerns about their reputation. Concern for reputation leads to behavior which appears as if implicit contracts were enforced (Holmstrom 1981).

[22] Over the long-term, 33 percent of sponsors did not plan to change their retiree health insurance plans significantly, and 30 percent of sponsors planned to eliminate retiree health insurance altogether.

comport with the idea of "retiree health insurance" from an earlier era. As such, survey respondents covered by this type of plan are unlikely to report retiree health insurance coverage. Since employers' interest in defined contribution plans is growing, employer surveys fill an important gap in our understanding of early-retiree health insurance.

2.2.2 Employer Surveys: Trends and Firm Characteristics

Employers' offer rates of early-retiree health insurance have been declining for decades. Here, I limit my attention to the period between 2002 to 2014, the years for which there is comparable HRS data. Kaiser Family Foundation (2017) reports that the percentage of employers with 200 or more worker offering ESERHI declined from 34 percent in 2002 to 23 percent in 2014 (Figure 2.1). These estimates are based on data collected from both private-sector and public-sector employers. Estimates from the Insurance Component of the Medical Expenditure Panel Survey (MEPS-IC) are reported separately for private and public-sector employers.[23] Between 2002 and 2010, the percent of private firms (of any size) offering ESERHI was essentially unchanged, falling from 7 percent to 6 percent. The share of firms with more than 1000 employees offering coverage fell from 43 percent in 2002 to 34 percent in 2010. State and local governments are much more likely to offer early-retiree health insurance, however their offer rates declined significantly between 2002 and 2010. The share of state government employers offering ESERHI fell from 92 percent to 70 percent over this period, and the share of local governments with 10,000 or more employees offering coverage fell from 93 to 78 percent. Comparisons of these estimates reveal how early-retiree health insurance differs by employer characteristics.

[23] All subsequent estimates in this paragraph are taken from Fronstin and Adams (2012).

Regarding data for employers offering *any* type of retiree health insurance (either for early retirees or Medicare-age retirees), employer offer rates of retiree health insurance vary by employer size, sector, and other employer characteristics.[24] Larger firms are more likely to offer retiree health benefits to active workers. In 2013, the share of employers with 3–199 workers offering retiree health insurance was 5 percent. The shares for employers with 200–999 workers, 1000–4999 workers, and 5000 or more workers were 26 percent, 34 percent, and 48 percent, respectively (McArdle, Neuman, and Huang 2014). Since 40.4 percent of workers were employed at firms with less than 200 employees in 2013, employer offer rates are not an appropriate proxy for population coverage rates.[25] While MEPS-IC data can be weighted by employer size to approximate population estimates, weighting can only be done for private-sector firms.[26] State and local government are much more likely to offer retiree health insurance (Figure 2.1). In 2013, 16 percent of workers were employed in the public sector.[27] Therefore, population estimates from MEPS-IC will underestimate the share of employees covered by ESERHI. Retiree health insurance offer rates are higher at employers with: (1) a relatively large share of high-earning workers, (2) some union workers, and (3) a relatively large share of workers age 50 or older (Kaiser Family Foundation 2017). In addition, private establishments with relatively high shares of older employees experienced less erosion in access to retiree health benefits between 1997 and 2003 (Buchmueller, Johnson, and Lo Sasso 2006). Due to this firm

Of employers offering retiree health insurance in 2013, 90 percent offered early retiree benefits. In 2014, 92 percent offered early retiree benefits.

[25] Author's calculation using U.S. Census Bureau, Statistics of U.S. Businesses.

[26] There is no information on whether the "size" effect applies in the public sector. For example, if (small) local governments are less likely to offer ESERHI than (large) state governments, then we cannot weight the public sector as a homogenous stratum. The number of workers at public-sector employers are not available in the MEPS-IC data.

[27] Author's calculation using Bureau of Labor Statistics Data.

heterogeneity, population estimates derived from employer surveys are not comparable to population estimates derived from household surveys (Figure 2.2).[28]

2.2.3 Findings from the Survey of Income and Program Participation (SIPP)[29]

The SIPP can produce population estimates of early-retiree health insurance coverage. Workers who have never retired are asked whether they expect to have retiree health benefits, however the survey does not distinguish between benefits for early retirees and supplemental coverage for Medicare-eligible retirees. Since approximately 90–95 percent of employers offering retiree health benefits provide early-retiree benefits (Kaiser Family Foundation 2017), the SIPP estimates are nevertheless informative. Between 2002 and 2010, the percentage of workers aged 45–64 expecting retiree health benefits fell from 43 percent to 32 percent. These estimates are consistent with my estimates from the HRS (Figure 2.2). Relative to the SIPP, the HRS provides larger sample sizes for older workers and more detailed information about retiree health insurance plans. Among major surveys, the Health and Retirement Study is best-suited to estimate ESERHI coverage for an older population.[30]

2.3 Data

This study uses data from seven waves of the Health and Retirement Study spanning 2002–2014. The HRS is a longitudinal, biennial survey of individuals and, if coupled, their partners. The HRS is the only nationally-representative household survey capable of producing precise population estimates of employer-sponsored early-retiree health insurance (ESERHI) for individuals aged 55–64. The survey collects data on access to ESERHI through a current or

[28] The methodology for HRS estimates is discussed in a later section.
[29] SIPP figures taken from Fronstin and Adams (2012).
[30] The Household Component of the Medical Expenditure Panel Survey (MEPS-HC) has detailed data on health insurance but a much smaller sample of individuals aged 55–64. Neither the Current Population Survey (CPS) nor American Community Survey (ACS) asks about the availability of ESERHI for workers with current employer-sponsored health insurance.

former employer up to the age of 65. In 1992 the HRS originally interviewed individuals ages 50–61 and their partners regardless of age, yielding 12,652 respondents from 7,704 households. New cohorts were added in 1998, 2004, and 2010.[31] In each wave, I limit the sample to respondents aged 55–64.[32] The HRS sample ranges between 17,200 and 22,000 respondents between 2002 and 2014, with approximately 30 percent of the sample between the ages of 55 and 64.

In each wave of the HRS, respondents answer a sequence of questions about their source of health insurance coverage (for a list of relevant questions see Table 2.1). Respondents can report a government-sponsored plan (Medicare/Medicaid/VA) and up to three private health insurance plans. The sources of private insurance plans include the respondent's current employer, the respondent's former employer, their spouse's current employer, their spouse's former employer, a nongroup plan, or other. If a respondent reports multiple private plans, I assign them to the first-reported plan. Since only 4.5 percent of respondents report more than one private plan, this decision does not significantly alter estimates of ESRHI. If a respondent reports both a government and private plan, I assign them to the private plan. Approximately 7 percent of respondents report both a private plan and a government-sponsored plan. Figure 2.3 describes the logical criteria for assigning respondents to each insurance source. The sample size numbers refer to person-year observations.

If a respondent receives health insurance through their current or former employer, they are asked whether it includes retiree health insurance. Since 2002, respondents covered by a

[31] **1998:** Added 2529 respondents from the War Baby cohort (WB) born 1942–1947. **2004:** Added 3330 respondents (2154 households) from the Early Baby Boomer cohort (EBB) born 1948–1953. **2010:** Added 3283 respondents from Mid Baby Boomer cohort (MBB) born 1954–1959.

[32] The HRS provides consistent estimates of retiree health insurance in a nationally representative sample of Americans ages 55 and older.

current employer have been asked, "If you left your current employer now, could you continue this insurance coverage for yourself up to the age of 65?" Respondents covered by a former employer have been asked, "Can you continue this insurance coverage for yourself up to the age of 65?" Respondents covered by their spouse's current or former employer have *not* been asked if they can continue this coverage up to the age of 65. As a consequence, my main results underestimate the share of the population that has access to early-retiree health insurance.

2.4 Results

2.4.1 Trends in Retire Health Insurance

Early-retiree health insurance benefits declined between 2002 and 2014, with the largest drop offs occurring in the two year periods ending in 2010 and 2012. The share of the population aged 55–64 covered by ESERHI benefits fell from 29.7 percent in 2002 to 19.9 percent in 2014 (Table 2.2). The erosion of coverage was more pronounced for individuals who accessed retiree health insurance from a former employer. The share of respondents with ESERHI from their former employers fell from 13.3 percent in 2002 to 7.2 percent in 2014. The share of respondents whose current employer offers a retiree insurance option fell from 16.3 percent in 2002 to 12.8 percent in 2014. Since access to retiree health insurance potentially affects one's decision to retire early, the headline numbers (Row A) better reflect older workers' and early retirees' exposure to risk resulting from the erosion of ESERHI.

The differences in population estimates derived from the HRS and employer surveys are consistent with the differences in these surveys. Fronstin and Adams (2012) weight each firm by its number of employees to estimate the share of current employees with ESERHI in the private sector. Relative to the HRS, their estimates are lower in every period (Figure 2.2).[33] This

[33] The HRS estimates of the share of current employees with ESERHI is calculated as B/(B+E) from Table 2.2.

discrepancy is as expected. First, firms in the MEPS-IC survey employ workers of all ages. Since firms with relatively larger shares of workers 50 and older are more likely to offer ESERHI, we would expect that the HRS population estimates for workers aged 55–64 are higher than the population estimates derived from employer surveys. Second, the MEPS-IC estimates are restricted to private sector employment. The offer rates of ESERHI are considerably higher in the public sector. Therefore, the HRS estimates that include public sector employment should be significantly higher. The fact the estimates from employer surveys and household surveys differ as expected partially validates both results. As mentioned above, however, the share of current employees with retiree health insurance is not the best measure of how older workers and early retirees are affected by changes to ESERHI.

The HRS population estimates of ESERHI only include respondents who have access to retiree health insurance through their current or former employer and not respondents who may have access to retiree health insurance through their spouse's current or former employer. To get a better sense of the total share of the population affected by changes to retiree health insurance, I compute rough estimates of ESERHI that account for individuals who receive health benefits from their spouse's employer. Retiree health insurance is nearly identical for coupled and non-coupled respondents across the sample period. Therefore, I proportionally assign the shares of individuals who receive coverage through their spouse to the ESERHI category (Table 2.3). For example, 35 percent of respondents who received health insurance through their current employer in 2014 had ESERHI. The share of individuals who accessed health insurance through their spouse's current employer was 14.2 percent. Multiplying these two numbers, I infer that 4.9 percent of spouses had access to ESERHI through their spouses' current employer. When spouses' employers are considered as a source of retiree health insurance, roughly 41 percent of

the population aged 55–64 has access to ESERHI in 2002. This figure falls to 28 percent in 2014. Not all employer-sponsored health insurance plans cover spouses, and so, these inferences are upper bounds on the percentage of the population that has access to ESERHI. I also assume that an individual who accesses insurance through their spouse's current employer will also be eligible for their spouse's retiree health insurance (if they have it). Most early-retiree health insurance plans are continuations of plans offered to current employees, and so I think this assumption is reasonable. Since these estimates are not based directly on survey questions, I will not draw inferences from them in my subsequent analysis.

There were other significant trends in the source of health insurance coverage for individuals aged 55–64 between 2002 and 2014 (Figure 2.4). Overall, individuals receiving health insurance from private employers fell from 72 percent to 62 percent across the period. Health insurance from private employers includes coverage provided by individuals' current and former employers (with and without retiree benefits) and spouses' current and former employers. The sharpest decline occurred between 2008 and 2010 when full-time employment dropped. Employer-sponsored health insurance did not recover in 2012 when full-time employment rebounded, indicating that re-employed workers did not take new jobs that offered health insurance. The share of individuals receiving government-provided health insurance stable between 2002 and 2008, and then increased significantly in 2010 and again in 2014. Expansion in state Medicaid coverage is the likely explanation for the 2014 increase. The share of uninsured adults aged 55–64 increased between 2002 and 2012, and then decreased between 2012 and 2014 when the Affordable Care Act (ACA) was implemented. One explanation of this pattern could be that the erosion of ESERHI contributed to increasing uninsurance rates in the

population aged 55–64, and that the ACA mitigated the loss of ESERHI. I will explore this possibility by examining the transitions of workers who have early-retiree health insurance.

2.4.2 The Consequences of Declining Retiree Health Insurance

One advantage of the HRS over employer surveys is that it allow us to explore the consequences of declining retiree health insurance. Workers who have had early-retiree health insurance at their current employer but then lose it are no more likely to become uninsured before age 65 than workers who do not lose coverage. However, workers who have employer-sponsored health insurance but have never had retiree health insurance are significantly more likely to become uninsured. I document this conclusion in the following way. First, I limit the HRS sample to individuals born before 1949 so the entire sample reaches age 65 by 2014. I then create three categories of workers. Type I has ESERHI through their current employer and does not lose this coverage from their current employer. Type II loses early-retiree health insurance. That is, they have ESERHI through their current employer and subsequently have health insurance from their current employer without retiree coverage. Type III has health insurance from their current employer without ever having had retiree coverage. The probabilities of Type I and Type II workers to become uninsured before age 65 are 5 percent and 4.3 percent respectively (Table 2.4). These estimates do not differ significantly. Workers who have employer-sponsor health insurance, but never retiree coverage, are significantly more likely to become uninsured. Their probability of losing health coverage before age 65 is 11 percent. With the fewer and fewer employers offering early-retiree health insurance, the share of workers who never have retiree health insurance will grow in two ways: (1) New workers in companies that once had ESERHI (Type III workers) will be at higher risk of becoming uninsured, and (2) as new companies that do not offer ESERHI emerge and replace companies that do offer it, the

proportion of Type III workers will also grow. As a consequence, uninsurance rates in the population aged 55–64 will likely increase. I will address how ACA may mitigate this effect in the discussion section.

2.4.3 Factors Associated with Declining Retiree Health Insurance

The erosion of early-retiree health insurance is primarily the consequence of declining offer rates. In surveys, employers report eliminating early-retiree health insurance, first, for new hires, less frequently for current employees, and rarely for current retirees. I examine whether the population estimates concur with employer surveys. Specifically, I look at whether younger cohorts are less likely to have ESERHI and whether individuals who have retiree health insurance from a former employer are less likely to lose coverage. I also consider whether job displacements are contributing to declining ESERHI.

Cohort Effect

Younger cohorts are indeed less likely to have retiree health insurance benefits (Figure 2.5). As younger cohorts with less access to retiree health benefits age into the sample between 2004 and 2014, older cohorts age out. The Early Baby Boomer (EBB) cohort, born between 1948 and 1953, and the Mid Baby Boomer (MBB) cohort, born between 1954 and 1959, enter the Health and Retirement Study in 2004 and 2010, respectively. The EBB cohort has lower rates of retiree health insurance coverage than the previous two cohorts born between 1931 and 1947. In addition, the MBB cohort has lower rates of coverage than all previous cohorts. This pattern is consistent with employers' reports over the past two decades—these younger cohorts more likely entered the new jobs after the erosion of ESERHI began. As the composition of the sample of respondents aged 55–64 gradually shifts to these younger cohorts, retiree health

insurance benefits will continue to decline. The relatively large decline between in 2010 could be attributed, in part, to the entry of the MBB into the sample.

The Probability of Losing ESERHI Coverage

To investigate how likely individuals are to lose retiree health insurance from a current or former employer, I look at the transitions of individuals who have ESERHI. I examine these groups separately First, I discuss the transitions of individuals who receive ESERHI from their current employer (ESERHI-CE).

It has become more common for workers to lose retiree health benefits. Table 2.5 displays the transition probabilities for individuals who received ESERHI-CE in the previous wave. The sample selection criteria for each wave between 2004 and 2014 are (1) the respondent reported ESERHI from their current employer in the previous wave, (2) they did not age out of the sample, and (3) the source of their health insurance is not missing in the current wave. Conditional on ESERHI-CE eligibility in the previous wave, the persistence of ESERHI declines between 2004 and 2014. The percent of individuals who maintained ESERHI fell from 67.3 in 2004 to 59.2 percent in 2014. The increased probability of losing retiree health insurance is reflected in two types of transitions. First, between 2004 and 2014, the share of workers who transition from ESERHI-CE to retiree insurance from a former employer (ESERHI-FE) falls from 15.2 percent to 10.8 percent. The interpretation of this change is unclear. It could be attributed to fewer retirements, employers rescinding ESERHI-FE, or a combination of the two. Second, fewer workers continue to receive ESERHI from their current employer, which falls from 52.1 percent in 2004 to 48.5 percent in 2014. These workers' retiree health benefits were either rescinded by their employer, or they changed jobs and were not offered retiree health benefits by their new employer.

The vast majority of workers lose retiree health insurance from their current employer as a result of their employers eliminating coverage, and not as a consequence of switching jobs. For workers who remain with the same firm, the probability of having one's retiree health insurance benefits rescinded is sizeable in every wave of the study (Table 2.6). In 2004, 26.9 percent of workers had this benefit cut by their employers. The largest share of workers lost ESERHI from their employer between 2008 and 2012, approximately 36 percent in each two-year wave. Employers may have been more likely to eliminate this benefit during the recession and the sluggish recovery in an effort to cut costs.

Retirees are relatively unlikely to lose ESERHI, and in the event that they do, they rarely become uninsured. In every wave between 2004 and 2014, approximately 80 percent of individuals who had ESERHI-FE in the previous wave kept their coverage (Table 2.7). Of the approximately 20 percent of individuals who lost ESERHI-FE, it is not possible to tell how many had this benefit cut by their former employers and how many transitioned out of this status by choice. Some of these early retirees may have returned to work due to economic circumstances unrelated to health insurance, while others may have found it less expensive to get health insurance through their spouse or a government-provided plan. These data, coupled with the data in Table 2.6, support employers' claims that they are more likely to eliminate retiree health insurance for current employees than current retirees.

Job Displacement

The erosion of early-retiree insurance between 2002 and 2014 may not be wholly attributable to declining employer offer rates. During the Great Recession, many workers lost jobs because their employer "closed" or they were "laid off". The rates of job loss for the population aged 55–64 in the two year periods ending in 2010 and 2012 were 11.1 percent and

7.2 percent, respectively (Table 2.8). The largest declines in early-retiree health insurance occurred during these periods as well. If workers lose retiree health insurance as a result of losing their jobs, then we should observe a smaller share or workers retaining retiree health insurance from their current employer in periods when the job displacements increase. We should also observe a larger share of workers retaining retiree health insurance in periods when the job displacements decrease. The evidence of this pattern is mixed. The persistence of ESERHI-CE reached its nadir of 42.1 percent in 2010 (Table 2.5). It recovered to 47.9 percent in 2012 when job displacements decreased, but it remained relatively flat at 48.5 percent in 2014 when job displacements fell even further. Due to the limited sample size of job losers, I cannot estimate the effect of job loss on early-retiree health insurance coverage.

2.4.4 Trends in Retiree Health Insurance by Subpopulations

Examining how early-retiree health insurance differs across demographic groups and worker characteristics provides a clearer picture of who is most likely to be affected by declining coverage and informs discussions about health insurance policy. Employer surveys cannot identify which populations are most affected. No demographic groups were completely insulated from the erosion of retiree health insurance. However, some groups may have different rates of decline over time. For example, who is more likely to be exposed to declines in coverage, those with more schooling or those with less? I now consider how groups defined by wealth, education, race/ethnicity, gender, health status, and job tenure might differ.

Wealth

Among late-career workers, wealth serves as a proxy for lifetime income and as a proxy for individuals' preparedness for retirement. In 2002, individuals in the top three wealth quartiles had similar rates of ESERHI (Figure 2.6). The largest decline in coverage was

concentrated in the second quartile in which coverage fell from 34 percent to 16.6 percent. The proportional decline was similar for the first and second quartiles in which approximately 50 percent of people lost ESERHI. Individuals in the top half of the wealth distribution experienced significant declines in coverage as well, but smaller proportional declines (30 percent). The share of people with retiree health insurance fell from 35 percent to 23.3 percent in the third quartile and from 30.7 percent to 24.5 percent in the top quartile. These findings corroborate employer surveys. Employers whose work force is comprised of 35 percent or more of workers who earn less than $23,000 per year (2016 $) are 10 percent less likely to offer retiree benefits(Kaiser Family Foundation 2016). Wealthier households, who are better equipped for an environment without retiree health insurance, have been less exposed to recent declines.

Education

Better educated workers have greater access to retiree health insurance, and their coverage eroded less between 2002 and 2014 (Figure 2.7). The proportional decline for workers with less than a high school education was 57 percent. Retiree health insurance fell by 43 percent for high-school-educated workers. And, coverage decreased by approximately 30 percent for workers with some college and college-educated workers. Insofar as education is correlated with occupation, employers of low-skill labor appear to be more likely to eliminate early-retiree health insurance.

Race/Ethnicity

The share of whites and African-Americans with retiree health insurance is nearly identical across the sample period (Figure 2.8). This observation contrasts with racial differences by any type of employer-sponsored health insurance over the same period (Figure 2.9). African-Americans were less likely to have access to health insurance from a current or

former employer in every year, and they experienced a larger decline in coverage between 2002 and 2014. In other words, African-Americans are equally likely to work for employers who offer retiree health insurance but less likely to work for employers who offer any type of health insurance. The former might be explained by the fact that African Americans are proportionally more likely to be in a union and be employed by in the public-sector.[34] Both of these characteristics are associated with high employer offer rates of retiree health insurance. The latter could reflect that African Americans who are not employed in the public sector are concentrated in occupations that have less access to health insurance. People who identify themselves as non-black, Hispanic are the least likely to have retiree health insurance in every year except 2014. This result may be attributed to Hispanics' lower rates of any employer-sponsored health insurance coverage, owing to their tendency to hold low-wage jobs that do not offer health benefits (Rutledge and McLaughlin 2008).

Declines in retiree health insurance benefits do not differ significantly by race or ethnicity (Figure 2.8). The proportional declines for whites, African Americans, and Hispanics was approximately 30 percent across the sample period. The largest decline in ESERHI appears to affect individuals who categorize themselves as an 'Other' race or ethnicity, but due to the limited size of this sample, this result is not statistically significant.

Gender

Retiree health insurance coverage fell considerably more for men than women between 2002 and 2014 (Figure 2.10). Thirty-five percent of men had retiree health insurance in 2002, while only 20.8 percent had coverage in 2014. Over this period, the share of women with retiree health insurance fell from 22.2 percent to 19.1 percent. These represent proportional declines of

[34] Authors calculations from BLS data.

45 percent and 14 percent, respectively. One explanation of this difference is that this benefit was more likely to be eliminated in the industries where men are overrepresented.

Health

Less healthy individuals have lower rates of retiree health insurance in every period (Figure 2.11). In 2002, the share of individuals who self-reported ESERHI among those in good, fair, or poor health was 19.9 percent. In the same year, it was 32.5 percent among those individuals in very good or excellent health. In 2014, these figures were respectively 10.8 percent and 22.7 percent. Poor health often restricts work and forces individuals into early retirement. In addition, pre-retirement morbidity is higher for later birth cohorts (Choi and Schoeni 2017). As we consider the policy implications of eroding early-retiree health insurance, it is important to consider that individuals who are more likely to have difficulty working at older ages and are the least likely to be covered by retiree health insurance. Further, this problem will be exacerbated as less healthy younger cohorts reach retirement ages in the future.

Job Tenure

Retiree health insurance rates are positively correlated with tenure at the respondent's longest tenured job (Figure 2.12). This is unsurprising as the as the vesting of retiree benefits is a function of tenure and age at most employers. Further, retiree health insurance declined the most for long-tenure workers. Between 2002 and 2014, coverage fell 32 percent for individuals with more than 20 years of service and their longest-tenured job. The declines were more modest for individuals with less tenure. This finding comports with employer surveys. Employers report tightening eligibility criteria for early-retiree insurance in response to rising costs.

2.4.5 Descriptive Regression

Many of the these demographic characteristics (wealth, education, race, gender, and tenure) are correlated, and so I consider them jointly in a regression to better identify which populations have access to early-retiree health insurance benefits. I estimate a linear probability model to see which individual characteristics are most strongly correlated with retiree health insurance coverage. Individual observations are pooled across waves, and the standard errors are adjusted for the HRS sample design and clustered by household. The specification of the model is:

$$Y_i = \beta_0 + \beta_{WLTH} \cdot WLTH + \beta_{ED} \cdot ED + \beta_{RAC} \cdot RACE + \beta_F \cdot FEM + \beta_T \cdot TEN + \beta_{YR} \cdot YR + u_i$$

where Y_i is equal to one if the respondent has early-retiree health insurance benefits through a current or former employer and zero otherwise. The vector *WLTH* includes dummies for wealth quartiles. The vector *ED* is comprised of dummies for educational attainment. The vector *RACE* includes dummies indicating the respondent's race and ethnicity. *FEM* is equal to one if the respondent is female. The vector *TEN* includes dummies indicating tenure at the respondent's longest job. The vector *YR* includes dummies indicating the survey year.

The results from the descriptive linear probability model are broadly consistent with the preceding figures (Table 2.9). Individuals in the second, third, and fourth wealth quartiles are more likely to have retiree health insurance than those in the first. However, the coefficients for the second and fourth quartiles are not significantly different. Retiree health coverage increases with education, but on average, individuals with a high school education and individuals with some college do not significantly differ. African Americans are more likely to be covered than whites, which is surprising given disparities between these groups along other employment characteristics. Controlling for other factors, women are 3 percent less likely to have ESERHI

coverage. Job tenure is strongly associated with retiree health insurance. Individuals with more than 20 years of tenure are 26.7 percent more likely to have ESERHI than individuals with less than 10 years. There are significant year-over-year declines in ESERHI in between survey waves ending in 2006, 2010, and 2012, with the sharpest decline occurring during the Great Recession. On average, individuals are 10.7 percent less likely to have ESERHI in 2014 than 2002.

I compare the estimates from the pooled regression to estimates from separate regressions for each wave. The coefficients are similar with the exception that the positive coefficients for men and individuals in the second wealth quartile on having retiree health benefits decline in each subsequent wave. In other words, retiree health insurance coverage decreased more for these groups. These patterns are visible in Figure 2.10 and Figure 2.6.

2.6 Discussion

2.6.1 The Affordable Care Act and the Erosion of Early-Retiree Health Insurance

The share of individuals covered by early-retiree health insurance was unaffected by the implementation of the Affordable Care Act. Coverage was essentially flat between 2012 and 2014 (Figure 2.4). Logically, we would have expected a decline, because the advent of ACA marketplaces, also known as exchanges, created an alternative to retiree health insurance for early retirees. With early retirees able to purchase insurance through ACA marketplaces, defined contribution Health Reimbursement Accounts (HRA) became an appealing option for employers interested in limiting their exposure to rising health care costs. In addition, it is puzzling that some early retirees with "access only" retiree health insurance did not find it cheaper to purchase coverage through the marketplaces or gain coverage under the Medicaid expansion.

The ACA established the Early Retiree Reinsurance Program (ERRP) as a temporary program intended to stabilize retiree health insurance in the years preceding the introduction of health insurance marketplaces. The program provided financial assistance to plan sponsors offering retiree health insurance by reimbursing 80 percent of claims for early retirees. Demand for assistance outpaced funding, and claims incurred after December 31, 2011 were not reimbursed. The $5 billion allocated to the ERRP in 2010 does not appear to have stabilized early-retiree health insurance coverage. ESERHI coverage fell between 2010 and 2012 when assistance was available, and it stabilized between 2012 and 2014 after program funding ran out.

The implementation of the ACA may mitigate the effects of declining retiree health insurance. First, Medicaid expansion may shield individuals at the lower end of the income and wealth distribution, who are less likely to have retiree health benefits, from declining retiree health insurance. Second, individuals with incomes between 100 and 400 percent of poverty qualify for premium tax credits to purchase coverage through the marketplaces. As a result, early retirees who have "access only" retiree health insurance may find that it is cheaper to buy insurance through ACA marketplaces. Third, older individuals who buy insurance in the marketplace are implicitly subsidized. Under the ACA, insurance rates in the marketplace are allowed to vary based on age within a ratio of 3:1 for adults, which means younger adults are subsidizing older adults. Further, premiums for marketplace plans cannot vary based on health status, which provides another implicit subsidy to older individuals who tend to have more health problems. Finally, individuals with pre-existing condition can no longer be denied coverage. As a result, workers who fall into this category that do not have retiree health insurance are able to retire early without losing coverage. This feature of the ACA could be particularly valuable to workers in poor health who are more likely to have a condition that limits work and are less

likely to have retiree health insurance. Recent changes to the ACA limit its ability to mitigate the effects of declining retiree health insurance.

The effective repeal of ACA's individual mandate in the Tax Cuts and Jobs Act of 2017 will likely raise premiums in the health insurance exchanges as the risk pool tilts toward older and less healthy individuals. This change could cause workers to delay retirement, and it could temper the decline in employer-sponsored retiree health insurance. If employers carry out their plans to transition workers to defined contribution plans in which retirees use a HRA to purchase health insurance ACA marketplaces, the repeal of the individual mandate would increase the costs of early retirement. The existing literature, which will be discussed in the next section predicts this change would cause workers to delay retirement. In addition, the repeal of the individual mandate may cause employers to reconsider defined contribution HRAs. Without ACA marketplaces as a viable alternative to early-retiree health insurance, employers may be pressed to keep their early-retiree health benefits. Were they to respond in such a manner, the effect may be a levelling out or a slowing in the decline of retiree health insurance.

The decision by the Justice Department to no longer defend crucial provisions of the ACA that protect individuals with pre-existing medical conditions will likely have the same effects as the repeal of the individual mandate. The elimination of these provisions effectively increases the costs of early retirement. As a result, more workers may delay retirement, and employers may be pressed to provide retiree health insurance. This change will be particularly costly to older workers in poor health. If they cannot access health insurance through Medicaid or a spouse, they are likely to delay retirement until they are eligible for Medicare. If their health condition prevents them from working, then they face a considerable risk of becoming uninsured.

2.6.2 The Effect of Eroding Retiree Health Insurance on Early Retirement

In general, early retirement is more costly for workers without access to retiree health insurance. If early retirees without ESERHI are not eligible for government-provide health insurance or cannot access health insurance through their spouses, then they must buy private insurance or go uninsured. Prior to the implementation of the ACA, the costs of early retirement were higher for workers without ESERHI—fewer individuals were eligible for Medicaid, premiums for private insurance were higher, and many individuals could not access private insurance due to pre-existing conditions. Economic theory predicts that the decline in early-retiree health insurance will cause workers to delay retirement (Blau and Gilleskie 2001). Previous empirical studies confirm this prediction.

Nyce et al. (2013) find that subsidized retiree health insurance increases older workers' probability of leaving their firm. Their administrative data prevent them from distinguishing between full retirements, partial retirements, and transitions to self-employment, but they show individuals' behavioral response to retiree health benefits are strong, especially among workers aged 62–64. Subsidized retiree health coverage raises the probability of leaving one's employer at age 62 by 6.3 percentage points, a 36.2 percent increase relative to the turnover rate for workers with no coverage. At age 63, it raises the turnover probability by 7.7 percentage points, a 48.8 percent relative increase. And at age 64, it raises the turnover probability by 5.5 percentage points, a 38 percent relative increase. They find no evidence that "access only" retiree health insurance increases older workers' probability of leaving their firm. Other studies that use different methodologies also find that workers with access to retiree health insurance retire earlier.

Reduced-form studies find that retiree health insurance substantially increases the probability of retirement before age 65. Using HRS data, Blau and Gilleskie (2001) estimate that subsidized retiree health insurance increases the rate of retirement (relative to workers without ESERHI) by 2 percentage points per year for men age 51-61. If firms pay the full cost of this benefit, the rate of retirement for men in this age group is 6 percentage points higher per year. The effect of subsidized ESERHI on retirement increases with age. At age 61, men with ESERHI are 7.5 percent more likely to retire. Using data from the National Medical Expenditure Survey and Survey of Income and Program Participation, Madrian (1994) finds that individuals with retiree health insurance retire approximately one year earlier than individuals without such coverage. She estimates that retiree health insurance increases the probability of retiring before age 65 between 7 and 15 percentage points. Reduced-form studies suffer from potential endogeneity arising from a correlation between retiree health insurance coverage and individual preferences for leisure. Structural models account for this endogeneity.

Structural models of retirement also show that the availability of ESERHI increases the probability retirement for older workers. The estimates presented in French and Jones (2011) lie within the bounds of the range established in reduced-form studies. In two simulations they compare workers who all have retiree health insurance to workers who have employer-sponsored health insurance but no retiree coverage. The workers retirement incentives and preferences for leisure are identical. If all workers had retiree health insurance, the job exit rate at age 62 would be 8.2 percentage points higher. Translated into years, these workers would retire 0.34 years earlier than workers without such coverage. (Blau and Gilleskie 2008) also find that retiree health insurance increases the probability of retirement. If retiree health insurance were provided to all male workers aged 50–64 that currently lack such coverage, it would increase their

retirement rate by 3.6 percentage points. If retiree health insurance were taken away from men who do have it, it would decrease their retirement rate by 4.7 percentage points. A model developed by Rust and Phelan (1997) accounts for social security incentives associated with retirement, risk aversion, and the entire distribution of medical expenditures. In a sample of men without a pension, they find that retiree health insurance reduces the probability of working full-time by 10 percentage points at ages 58–59, by 20 percentage points at ages 60–61, and by 16 percentage points at ages 62–63. Taken together, these studies and others provide overwhelming support for the argument that reductions in the share of workers covered by ESERHI will cause older workers to delay retirement.[35]

The Affordable Care Act may weaken this relationship between retiree health insurance and the probability of retirement. Workers who previously did not have access to early-retiree health insurance can now buy coverage that is implicitly and explicitly subsidized through the ACA marketplaces. In addition, the expansion of Medicaid provided an additional source of coverage for some older workers. The preliminary evidence indicates that the implementation of the ACA did not increase the probability of retirement or part-time work among older workers did not increase after 2014 (Levy, Buchmueller, and Nikpay 2016). The absence of a relationship between the implementation of the ACA retirement suggests that employer-sponsored retiree health insurance will continue to have a significant effect on the timing of retirement. Therefore, the erosion of early-retiree health insurance will most likely cause workers to delay retirement.

Does it matter if individuals work longer? Delaying retirement does not have an unambiguous effect on the welfare of the population aged 55–64. The effect of retirement on

[35] See also Kapur and Rogowski (2011), Robinson and Clark (2010), Strumpf (2010), Marton and Woodbury (2013), and Gruber and Madrian (2002).

health in unclear. Some studies find that retirement causes physical health to improve (Insler 2014, Bound and Waidmann 2007). This effect can be attributed, in part, to retirees adopting healthier behaviors such as quitting smoking and increasing physical activity. Alternatively, if retirees are unmarried or do not increase physical activity during retirement, then they are more likely to experience decreased mobility and declining mental health in retirement (Dave, Rashad, and Spasojevic 2008). These studies imply that it is not retirement itself that improves health, but rather what one does during retirement. Beyond physical health, we may consider whether individuals are happier during retirement. Charles (2002) finds that retirement has a positive effect on subjective well-being. On the other hand, on average, retirement causes a decrease in a person's cognitive ability relative to staying in the labor force (Rohwedder and Willis 2010). If workers respond to declining retiree health insurance by extending their careers, the net effect of this change is unclear.

2.6.3 Medicare Debate: Implications for Retiree Health Insurance

Raising the Medicare eligibility age to 67 has been a proposal consistently discussed over the years as a way of reducing federal spending. Increasing the Medicare age would directly increase the costs of employer-sponsored early-retiree health insurance. Employers would likely consider a variety of steps in response to such a change. They may shift more costs of retiree health insurance to retirees through higher retiree contributions or by providing "access only" plans. They may transition to defined contribution plans where retirees would be responsible for purchasing their own health insurance through ACA marketplaces. Or, employers may eliminate retiree health insurance altogether. Increasing the Medicare-eligibility age increase employers' costs of early-retiree health insurance, but it would also increase workers' demand for this benefit. The expected net effect of this proposed policy change is ambiguous.

2.7 Conclusion

In conclusion, the population estimates from the Health and Retirement study corroborate the findings from employer surveys. This paper offers additional insights into the causes and consequences of declining employer-sponsored early-retiree health insurance that cannot be extracted from employer surveys. It also identifies the characteristics of individuals who are most affected by this change. The erosion of retiree health insurance between 2002 and 2014 can be attributed to less prevalence among younger cohorts and employers rescinding retiree health benefits from their current employees. Job displacement likely contributed to this trend, but its effect cannot be precisely estimated. Decreased access to early-retiree health insurance causes workers to postpone retirement. If rates of early retirements decrease, the effect on the population of older individuals is not unambiguously adverse. However, workers in poor health are particularly vulnerable to declining coverage. They are both less likely to have access the retiree health insurance and less able to respond to declining coverage by lengthening their career. Workers who have employer-sponsored health insurance and never have access to retiree coverage are significantly more likely to become uninsured before age 65. As younger cohorts (who are less likely to ever have retiree health insurance) approach retirement in the coming years, the prevalence being uninsured in the population aged 55–64 will likely increase. Eliminating the ACA's individual mandate and weakening the provisions that protect individuals with pre-existing condition will exacerbate this problem.

2.8 Figures and Tables

Figure 2.1: Comparison of Employer Offer Rates of ESERHI by Data Source

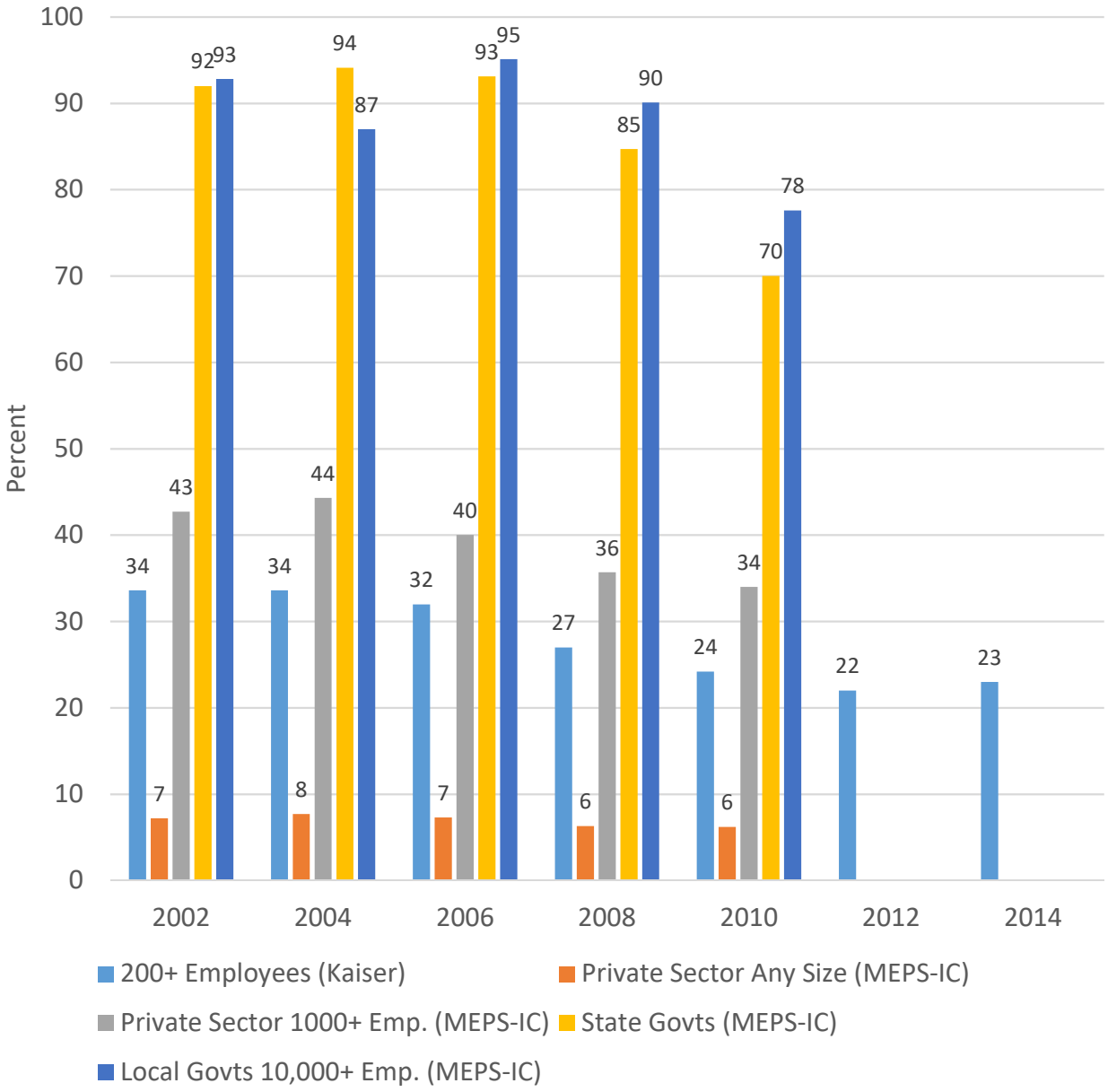
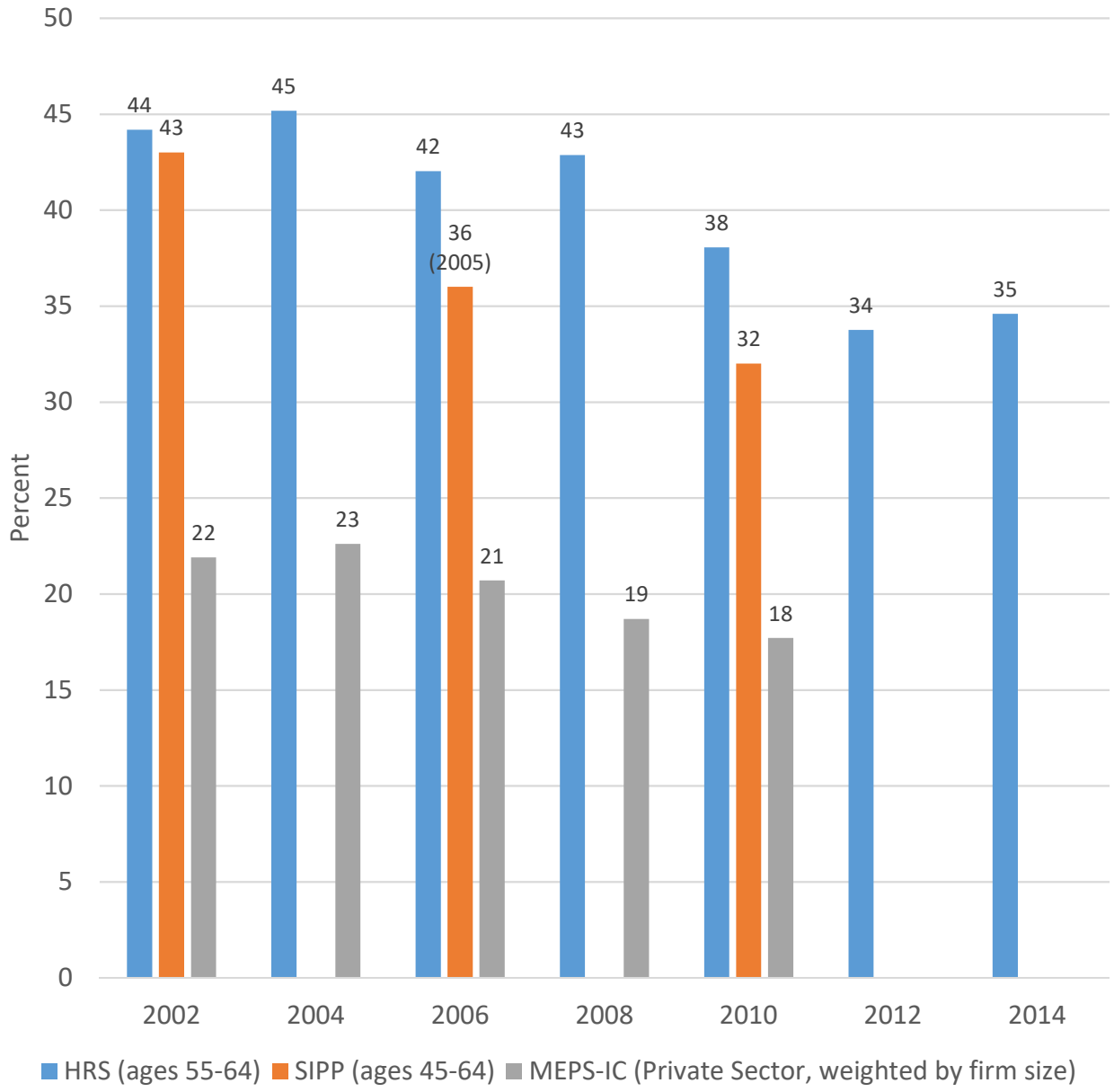


Figure 2.2: Comparison of Population Estimates of ESERHI for Current Employees by Data Source

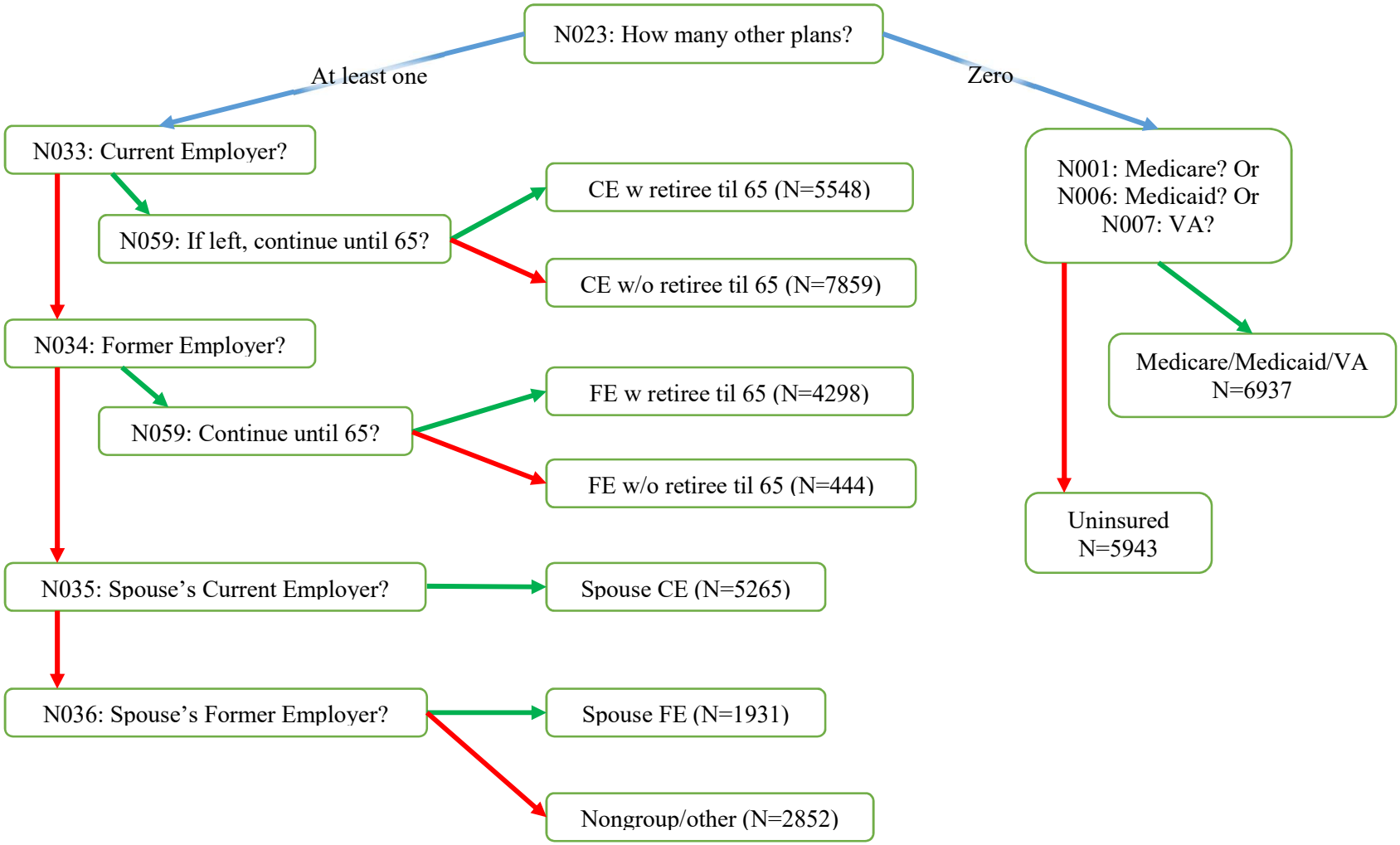


Note: SIPP figures from Fronstin and Adams (2012).

Table 2.1: Summary of Relevant HRS Questions about Health Insurance Coverage 2002–2014

Question Number	**Wording (condensed)**	**Notes**
N001	Are you currently covered by Medicare?	
N006	Are you currently covered by Medicaid?	
N007	Are you currently covered by Tri-Care, CHAMPUS, CHAMP-VA, or any other military health care?	
N023	Now, we'd like to ask about all the other types of health insurance plans you might have, such as insurance through an employer or a business, coverage for retirees, or health insurance you buy for yourself, including any [Medigap or] other supplemental coverage. How many other plans do you have?	
N033	*If R is self-employed:* Do you obtain this health insurance through your own business or professional organization? *If R is working for someone else:* Do you obtain this health insurance through your current employer?	Asked about each private plan
N034	Do you obtain this health insurance through a former employer of yours?	
N035	*If R is coupled or separated:* Do you obtain this health insurance through your (spouse's/partner's) current employer? *Otherwise, if R is divorced:* Do you obtain this health insurance through your former (spouse's/partner's) current employer?	
N036	*If R is coupled or separated:* Do you obtain this health insurance through your (spouse's/partner's) former employer? *Otherwise, if R is divorced:* Do you obtain this health insurance through your former (spouse's/partner's) former employer?	
N059	*If R is covered by former employer*: Can you continue this insurance coverage for yourself up to the age of 65? *Otherwise*: If you left your current employer now, could you continue this insurance coverage for yourself up to the age of 65?	

Figure 2.3: Assigning Respondents to Insurance Sources



Note: green arrow = "yes", red arrow = "no", N reflects person-year observations

Table 2.2: Health Insurance Coverage by Source for Respondents Aged 55–64 (Percent)

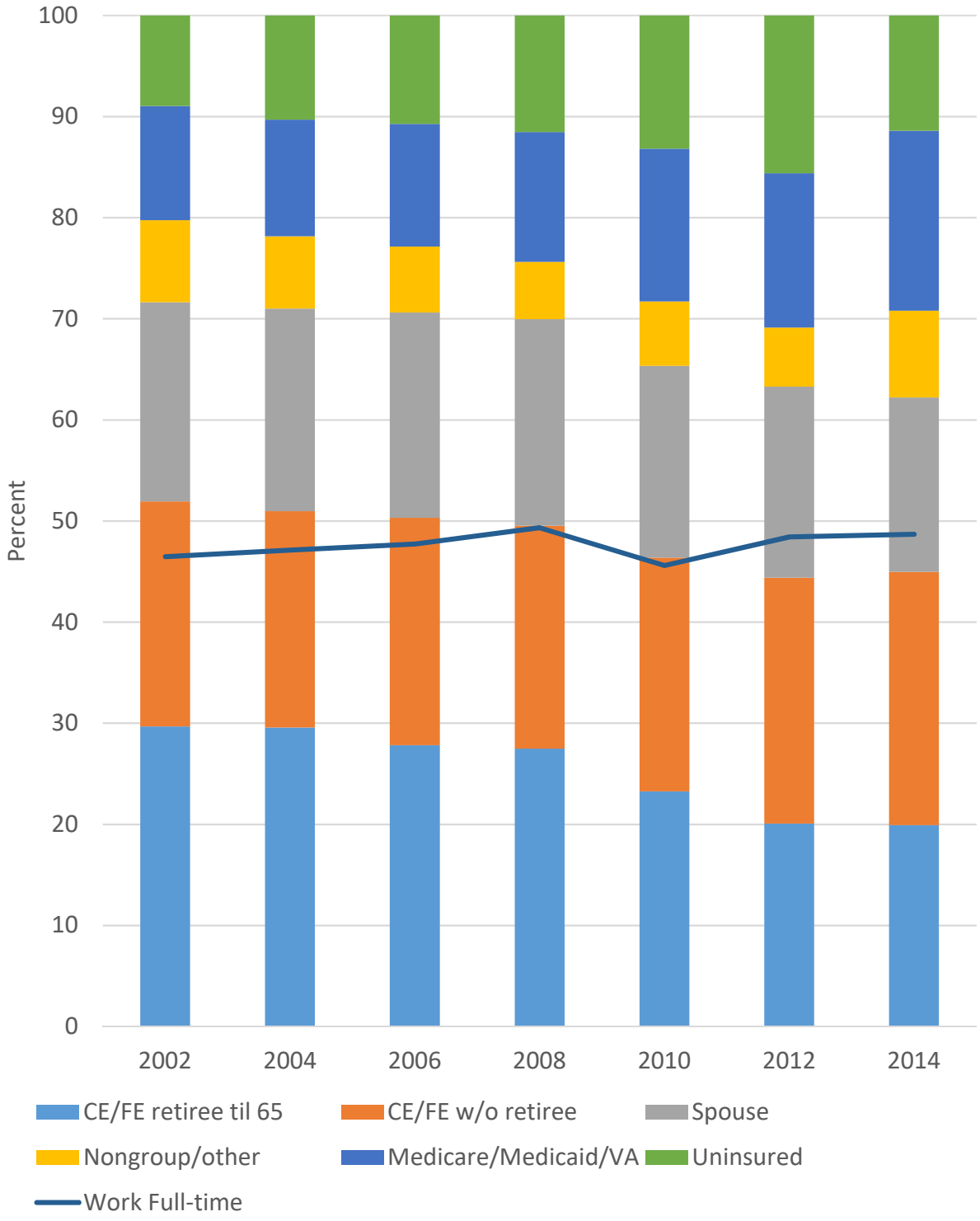
Source of Insurance	2002	2004	2006	2008	2010	2012	2014
(A) ESEHRI	29.67	29.56	27.82	27.49	23.25	20.06	19.91
(B) CE w retiree til 65	*16.32*	*16.59*	*15.37*	*15.97*	*13.30*	*11.93*	*12.75*
(C) FE w retiree til 65	*13.34*	*12.97*	*12.45*	*11.52*	*9.94*	*8.13*	*7.17*
(D) ESHI	22.27	21.40	22.50	22.05	23.12	24.32	25.04
(E) CE w/o retiree til 65	*20.62*	*20.14*	*21.20*	*21.28*	*21.65*	*23.41*	*24.11*
(F) FE w/o retiree til 65	*1.65*	*1.25*	*1.30*	*0.77*	*1.48*	*0.90*	*0.93*
(G) Spouse	19.70	20.05	20.29	20.43	18.97	18.91	17.25
(H) Spouse CE	*14.51*	*14.75*	*15.31*	*15.19*	*14.72*	*14.99*	*14.24*
(I) Spouse FE	*5.19*	*5.30*	*4.98*	*5.24*	*4.26*	*3.92*	*3.01*
(J) Nongroup/other	8.10	7.15	6.52	5.64	6.38	5.83	8.59
(K) Medicare/Medicaid/VA	11.29	11.52	12.13	12.86	15.10	15.27	17.81
(L) Uninsured	8.97	10.32	10.75	11.53	13.19	15.61	11.39

Notes: ESERHI = employer-sponsored early-retiree health insurance. ESHI = employer-sponsored health insurance (without pre-65 retiree coverage). Weighted by respondent-level analysis weight.

Table 2.3: Rough Estimates of Population Aged 55–64 with Access to ESERHI (Percent)

	Source of Insurance	2002	2004	2006	2008	2010	2012	2014
(A)	CE w retiree til 65	16.3	16.6	15.4	16.0	13.3	11.9	12.8
(B)	CE w/o retiree til 65	20.6	20.1	21.2	21.3	21.7	23.4	24.1
(C)	CE proportion with retiree (A/A+B)	44%	45%	42%	43%	38%	34%	35%
(D)	FE w retiree til 65	13.3	13.0	12.5	11.5	9.9	8.1	7.2
(E)	FE w/o retiree til 65	1.7	1.3	1.3	0.8	1.5	0.9	0.9
(F)	FE proportion with retiree (D/D+E)	89%	91%	91%	94%	87%	90%	89%
(G)	Spouse CE	14.5	14.8	15.3	15.2	14.7	15.0	14.2
(H)	Spouse CE w retiree til 65 (C*G)	6.4	6.7	6.4	6.5	5.6	5.1	4.9
(I)	Spouse FE	5.2	5.3	5.0	5.2	4.3	3.9	3.0
(J)	Spouse FE w retiree til 65 (I*F)	4.6	4.8	4.5	4.9	3.7	3.5	2.7
	Rough Estimate of ESERHI including Spousal Coverage (A+D+H+J)	40.7	41.1	38.8	38.9	32.5	28.6	27.5

Figure 2.4: Health Insurance Coverage by Source (condensed categories)



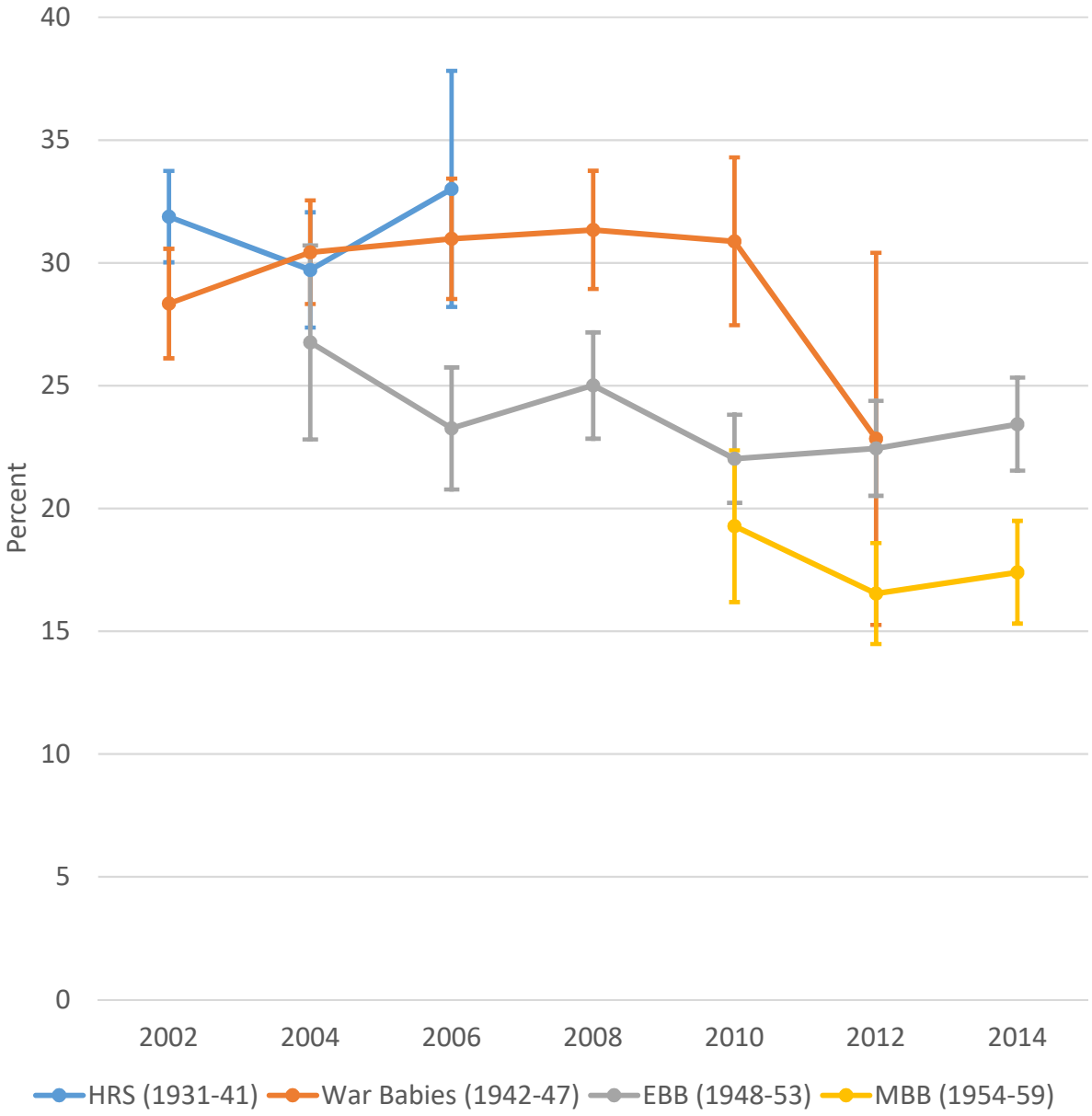
Note: Weighted by respondent-level analysis weight

Table 2.4: Probability of Becoming Uninsured before Age 65 (Percent)

Type of Worker	Estimate	95% Confidence Limits	
Type I	4.96	3.36	6.56
Type II	4.35	2.44	6.25
Type III	10.97	8.37	13.58

Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design.

Figure 2.5: Retiree Health Insurance Benefits by HRS Cohorts



Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Table 2.5: Transitions out of Current Employer ESERHI (%)

Source of Insurance in Current Wave *(respondent had CE w retiree til 65 in previous wave)*	2004	2006	2008	2010	2012	2014
ESERHI	67.3	63.9	64.9	56.7	56.9	59.2
CE w retiree til 65	*52.1*	*50.0*	*51.3*	*42.1*	*47.9*	*48.5*
FE w retiree til 65	*15.2*	*13.9*	*13.6*	*14.6*	*9.0*	*10.8*
ESHI	21.9	25.7	22.4	29.9	31.1	26.7
CE w/o retiree til 65	*21.4*	*24.0*	*22.0*	*28.1*	*29.3*	*26.3*
FE w/o retiree til 65	*0.5*	*1.7*	*0.4*	*1.8*	*1.8*	*0.4*
Spouse	4.0	4.3	3.5	3.2	2.8	3.7
Nongroup/other	1.6	0.9	2.8	3.6	1.8	5.8
Medicare/Medicaid/VA	0.8	1.3	1.7	0.4	1.2	0.5
Uninsured	4.4	4.0	4.7	6.4	6.2	4.1

Note: Weighted by respondent-level analysis weight

Table 2.6: Transitions out of ESERHI-CE for Job-Stayers (%)

Source of Insurance in Current Wave *(respondent had CE w retiree til 65 in previous wave and has same employer)*	2004	2006	2008	2010	2012	2014
CE with w retiree til 65	68.8	64.6	65.1	56.4	56.7	60.3
CE with w/o retiree til 65	26.9	29.6	26.6	36.0	36.1	31.6
Spouse	0.9	2.1	2.1	1.6	1.1	1.8
Nongroup/other	0.6	0.4	1.5	1.8	1.0	2.1
Medicare/Medicaid/VA	0.4	0.3	0.9	0.5	0.9	0.3
Uninsured	1.9	1.4	2.7	2.9	3.1	3.1

Note: Weighted by respondent-level analysis weight

Table 2.7: Transitions out of Former Employer Coverage with Retiree Health Insurance (%)

Source of Insurance in Current Wave *(respondent had CE w retiree til 65 in previous wave)*	2004	2006	2008	2010	2012	2014
ESHRI (pre-65)	82.4	83.3	82.5	81.8	80.3	80.2
CE w retiree til 65	*2.3*	*3.0*	*4.6*	*2.1*	*1.4*	*1.3*
FE w retiree til 65	*80.1*	*80.3*	*77.9*	*79.7*	*78.9*	*78.9*
ESHI	6.0	3.4	4.5	5.7	6.7	4.6
CE w/o retiree til 65	*2.5*	*1.2*	*3.2*	*3.3*	*5.0*	*2.6*
FE w/o retiree til 65	*3.5*	*2.2*	*1.3*	*2.4*	*1.7*	*2.1*
Spouse	3.6	2.6	2.6	2.4	2.2	4.4
Nongroup/other	2.6	5.3	3.3	4.3	2.9	5.8
Medicare/Medicaid/VA	3.8	5.2	5.4	5.7	5.4	4.2
Uninsured	1.6	0.3	1.8	0.3	2.6	0.8

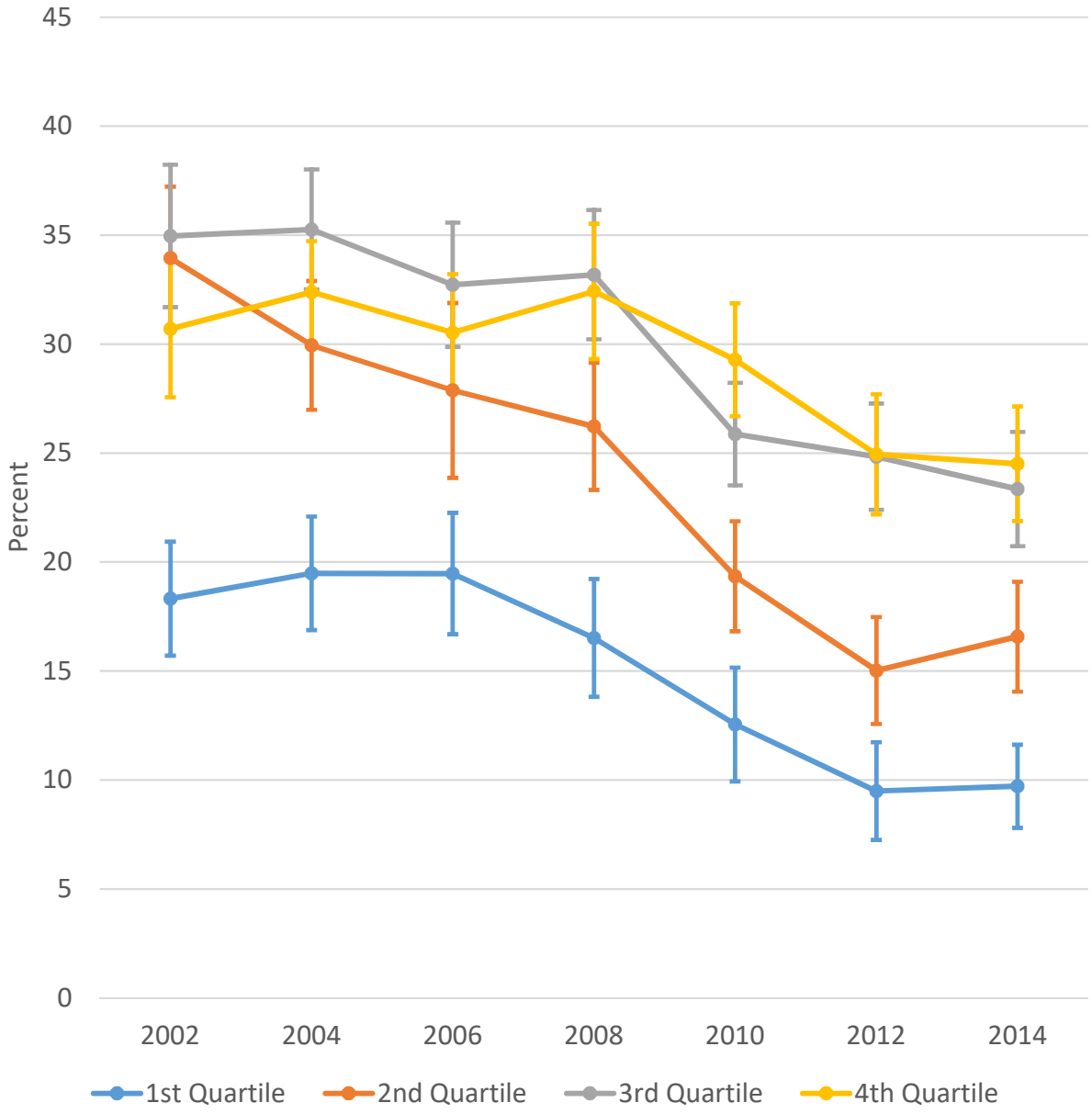
Note: Weighted by respondent-level analysis weight

Table 2.8: Probability of Job Loss (Percent)

Year	Estimate	95% Confidence Limits	
2002	8.35	7.00	9.70
2004	6.03	5.03	7.04
2006	5.24	4.39	6.10
2008	5.12	4.20	6.04
2010	11.07	9.72	12.41
2012	7.19	6.05	8.34
2014	4.28	3.61	4.95

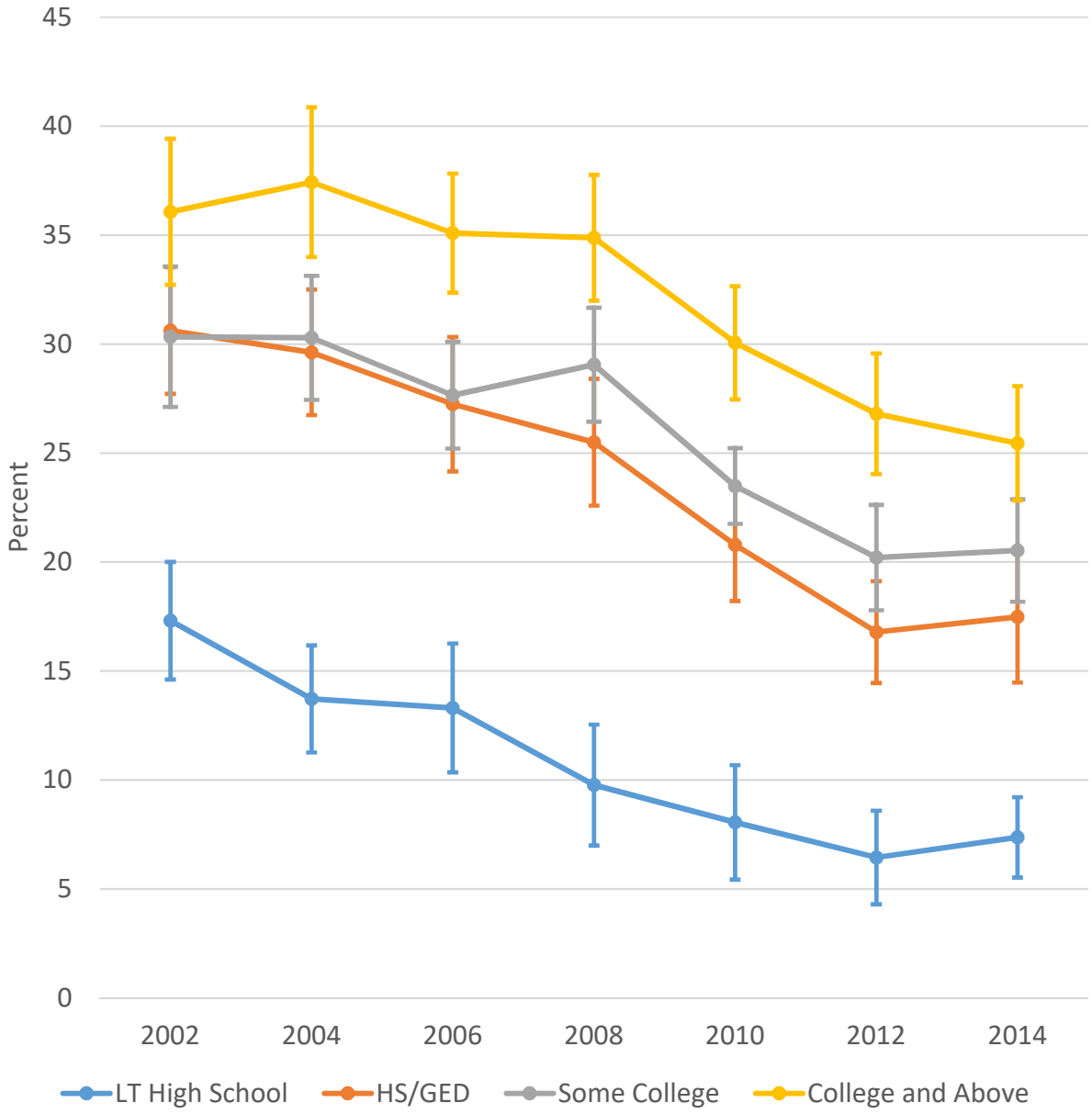
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design.

Figure 2.6: Retiree Health Insurance Benefits by Wealth



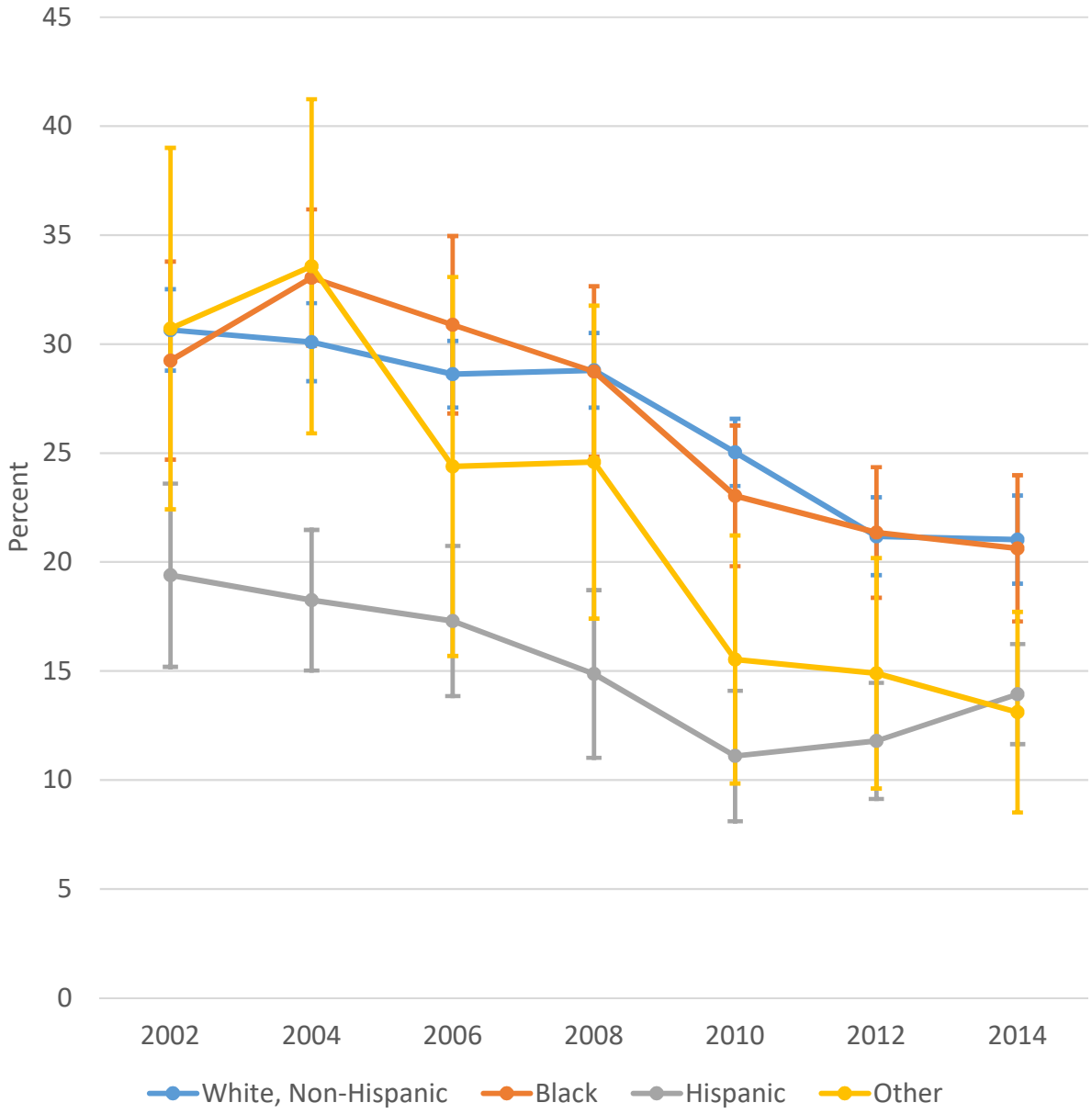
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.7: Retiree Health Insurance Benefits by Education



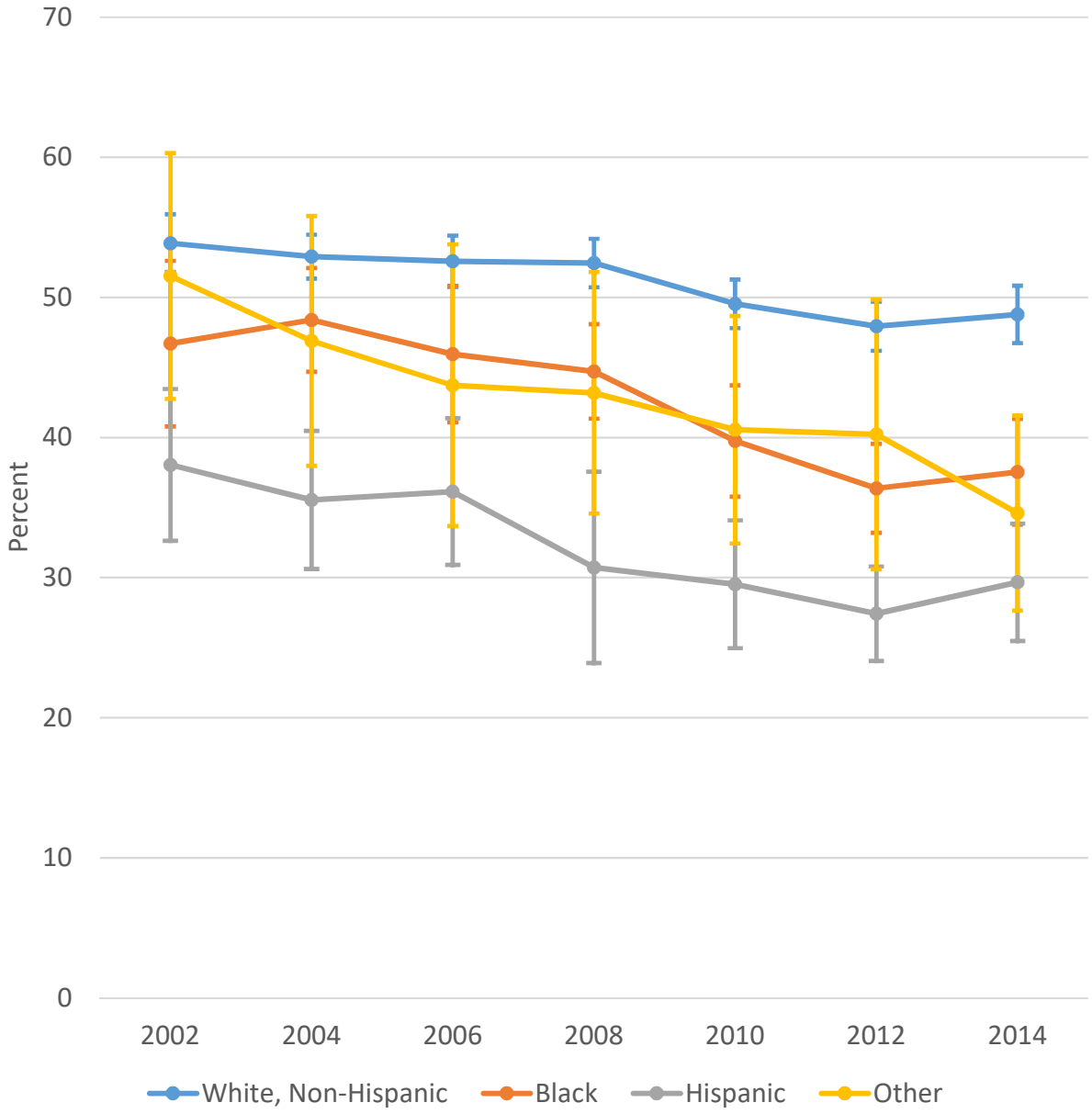
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.8: Retiree Health Insurance Benefits by Race and Ethnicity



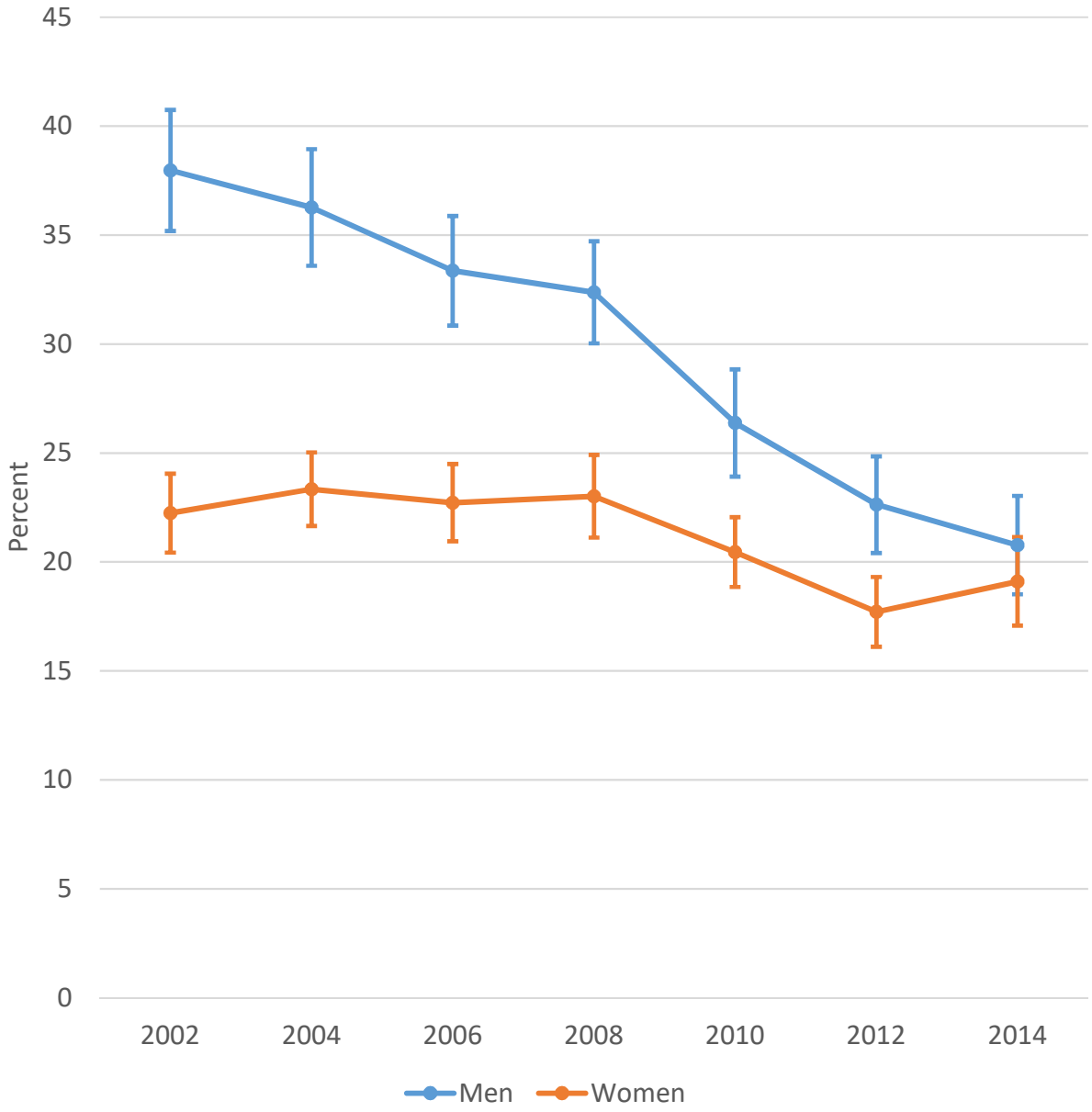
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.9: Any Employer-Sponsored Health Insurance Benefits by Race and Ethnicity



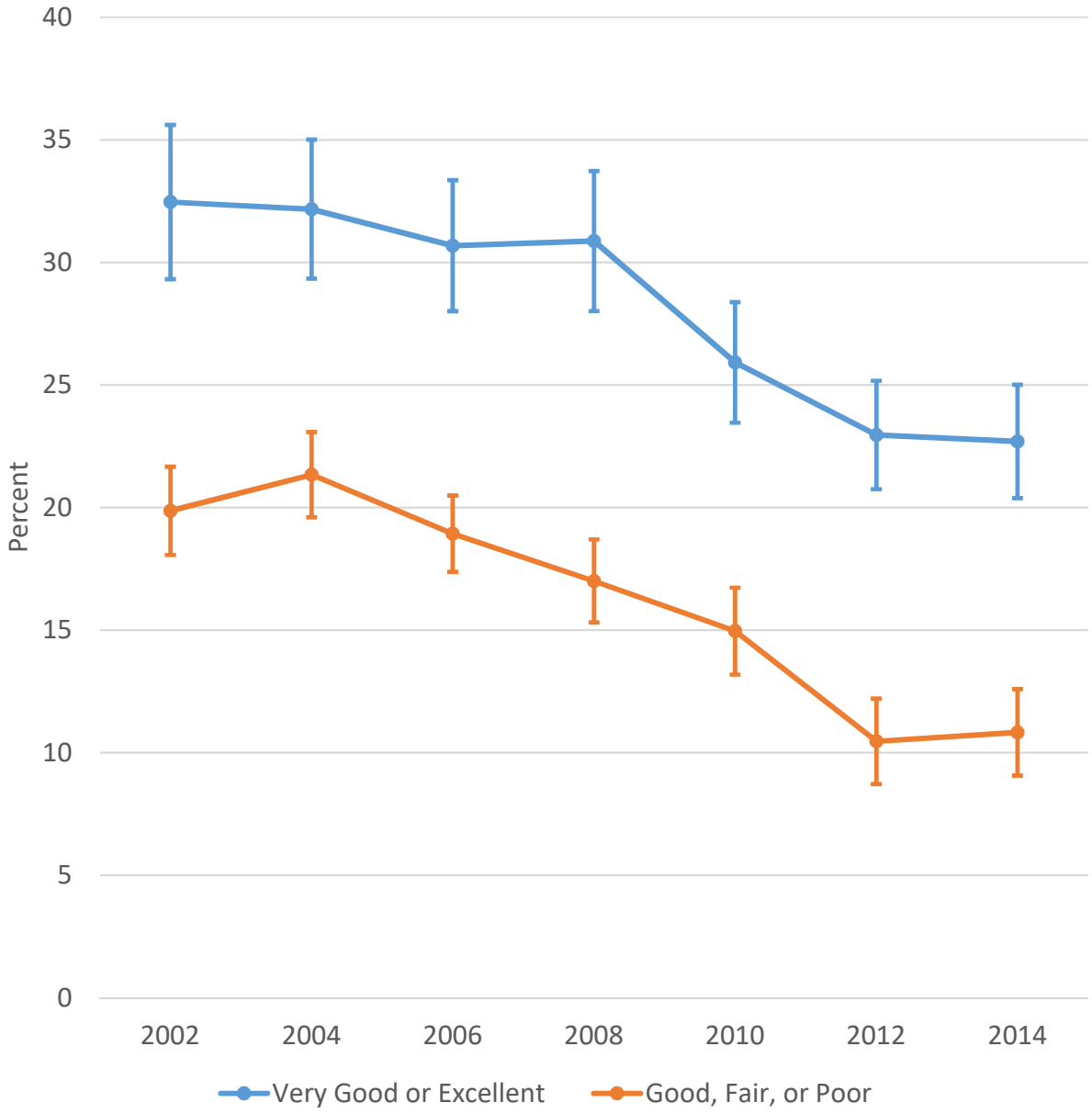
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.10: Retiree Health Insurance Benefits by Gender



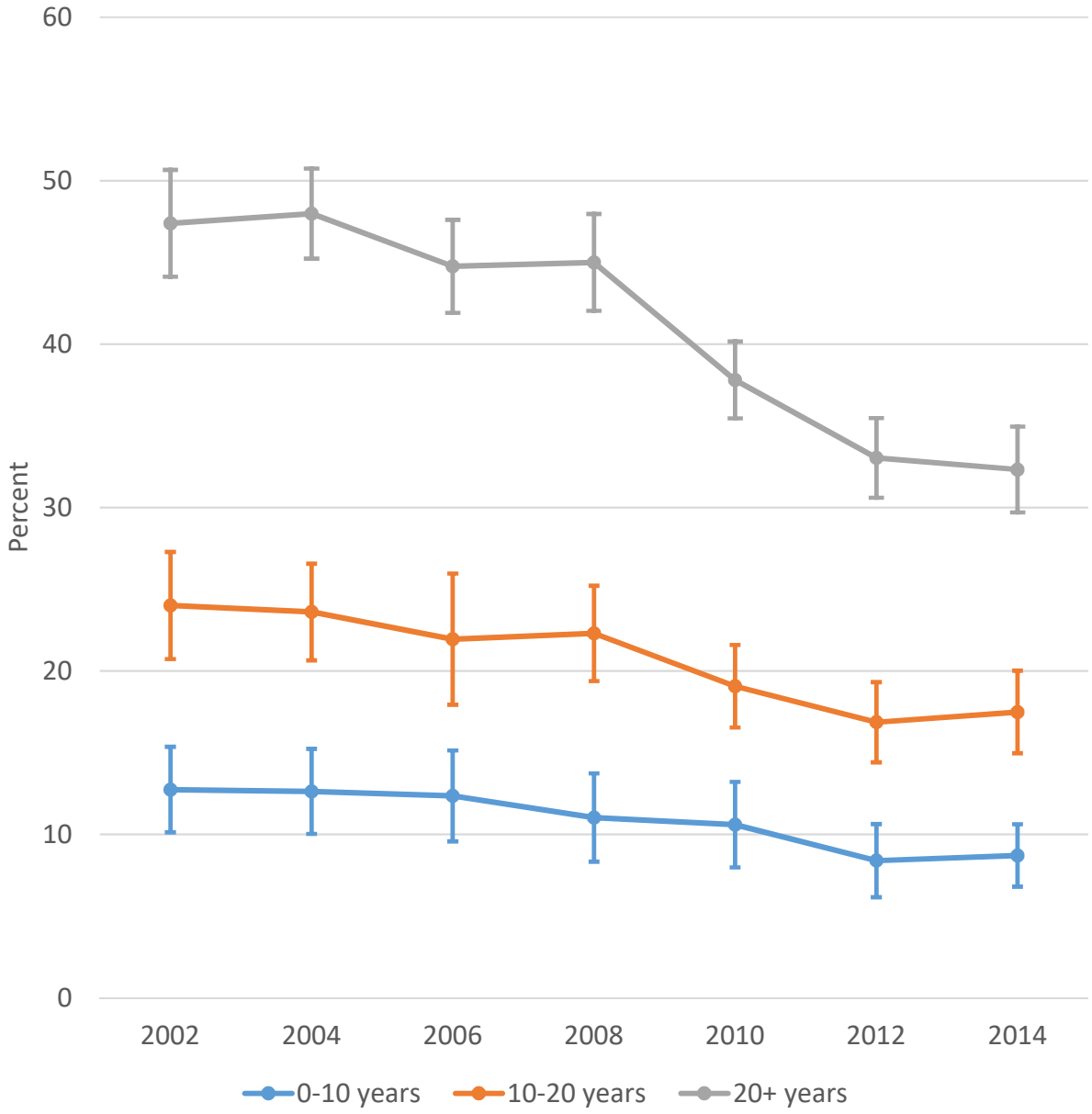
Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.11: Retiree Health Insurance Benefits by Self-Reported Health



Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Figure 2.12: Retiree Health Insurance Benefits by Tenure at Longest Job



Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design. Vertical lines represent 95 percent confidence intervals.

Table 2.9: Correlates of Retiree Health Insurance Benefits (Linear Probability Model)

	Retiree Health Insurance through current or former employer	
	Coefficient	Standard Error
Wealth Quartile (1st quartile omitted)		
2nd	0.0454***	0.0096
3rd	0.0692***	0.0087
4th	0.0438***	0.0120
Education (LT high school omitted)		
HS/GED	0.0719***	0.0113
Some College	0.0896***	0.0104
College and above	0.1322***	0.0135
Race/Ethnicity (White omitted)		
Black	0.0558***	0.0111
Non-black, Hispanic	-0.0132	0.0100
Other	0.0027	0.0194
Gender (Male omitted)		
Female	-0.0296***	0.0097
Tenure (0–10 years omitted)		
10–20 years	0.0781***	0.0088
20+ years	0.2671***	0.0097
Year (2002 omitted)		
2004	-0.0034	0.0087
2006	-0.0251***	0.0085
2008	-0.0287***	0.0098
2010	-0.0761***	0.0094
2012	-0.1084***	0.0115
2014	-0.1066***	0.0116
Constant	0.0612***	0.0110
Observations	38,768	
R-squared	0.1033	

Notes: Weighted by respondent-level analysis weight. Standard errors adjusted for sample design and clustered by household. *** p<0.01, ** p<0.05, * p<0.1.

CHAPTER III

Retirement Saving Responses to Liquidity Change and Consumption Needs (with Frank Stafford)

3.1 Introduction

Tax-advantaged savings plans are designed to encourage households to build nest eggs that provide income during retirement. Such plans include defined contribution 401(k) and 403(b) plans, traditional and Roth individual retirement accounts (IRAs), and annuities.[36] These plans also provide pre-retirement liquidity features, allowing retirement savings to be used to finance current consumption.[37] The degree to which households treat these retirement accounts as buffer stock savings to insure against uncertain income and finance expenditures prior to retirement are open questions. We seek to determine the factors that lead households to contribute to their retirement savings or withdraw money from these plans prior to age 65. The overall economic climate, household-level events, such as large unexpected out-of-pocket

[36] 401(k) plans, 403(b) plans, and traditional IRAs allow pre-tax contributions, and the participant's earnings grow tax-deferred year after year. Roth IRA contributions are taxed, but withdrawals during retirement and capital gains are not taxed. Money invested in an annuity grows tax-deferred.

[37] Households commonly use these pre-retirement liquidity features. (1) Estimates of aggregate premature withdrawals from all tax-advantaged savings accounts amount to 30–45 percent of annual total retirement plan contributions (Argento, Bryant, and Sabelhaus 2015), and (2) The most common method for accessing 401(k) balances is borrowing from the account. At any given time, 20 percent of workers with access to a 401(k) have an outstanding loan. Over the course of five years, 40 percent of workers borrow at some point (Lu et al. 2017).

medical expenses, and household cash flow changes are expected to play a role in the decision to add or withdraw funds from these discretionary retirement plans.[38] The dual-purpose nature of these tax-advantaged savings plans—to provide income during old-age and to cover current consumption needs—may undermine the retirement security of plan participants.

There are reasons to believe that household contributions to discretionary retirement accounts reflect their expectations about withdrawing from these accounts for pre-retirement consumption. In other words, households may be contributing more than would be required to smooth consumption between their working years and retirement, and their retirement security may be unaffected by plan liquidity features. While they do not speak to savings adequacy, several studies find that making 401(k) loans available increases participation (U.S. Government Accountability Office 1997) and boosts savings on the intensive margin, in the form of higher contribution rates (Munnell, Sunden, and Taylor 2001, Holden and VanDerhei 2001, Mitchell, Utkus, and Yang 2007). Poterba, Venti, and Wise (1996) find the bulk of IRA and 401(k) contributions are net additions to saving.

Even if "cashing in" retirement savings is part of a long-term financial plan, withdrawing funds may nevertheless threaten retirement security. First, if participants are more likely to borrow against their 401(k) when asset prices are depressed, say during a recession, then such loans will reduce their lifetime returns to retirement savings. When the loan is disbursed, assets are sold. Households gradually repurchase these assets over the course of the loan as asset prices recover. Essentially, they are selling "low" and buying back "high". Second, most households who separate from their job end up defaulting on their 401(k) loans and incur a 10 percent penalty (Lu et al. 2017). Such defaults likely reduce long-term retirement savings. Third, if

[38] We use the terms "DC pensions" and "discretionary retirement plans" to refer to 401(k), 403(b), IRAs, and annuities. When referring to defined benefit (DB) pension plans, we will explicitly say so.

401(k) loans lead employees to reduce plan contribution rates, then borrowing could undermine retirement savings adequacy. We examine how life events and the business cycle affect both withdrawals and contributions the discretionary retirement savings.

The importance of plan liquidity is accentuated by the transition from defined benefit (DB) to defined contribution pensions over the past few decades. The percentage of pensioned full-time employees with a DC plan rose from 40 percent in 1983 to 79 percent in 1998. The percentage covered by DB plans declined from 87 percent in 1983 to 44 percent in 1998 (Friedberg and Webb 2005). This pattern has continued since 1999, as indicated by data from the Panel Study of Income Dynamics (PSID). The percentage of working, married men with access to a DB pension fell by 13 percentage points, while the percent with access to a DC plan increased by 10 percentage points. Working, married women are less likely to have *any* pension coverage, but their DB and DC pension coverage rates exhibited similar trends. Given this context of increasing DC coverage and declining DB coverage, the effect of pension liquidity on Americans' retirement security will continue to grow in importance.

The paper proceeds as follows. We first discuss our data and the broader context of the changing landscape of pensions. Next, we present a theoretical model to frame why households contribute to or withdraw from their retirement savings. We conclude with a discussion of our empirical results.

3.2 Data

We use data from the Panel Study of Income Dynamics (PSID)[39], a nationally representative longitudinal household survey conducted by the Survey Research Center at the

[39] The two other data used to study withdrawals from retirement accounts include proprietary Vanguard data, which is not nationally-representative, and the Survey of Consumer Finances, which is not a panel. The panel structure of the PSID allows us to examine how deviations from average income affect contributing to and withdrawing from retirement accounts.

University of Michigan. The PSID, which began in 1968 with about 5000 families, surveyed families and their descendants every year until 1997, and every other year since then. As a result, the sample has grown substantially over the past 50 years. The study collected detailed information on household assets every five years between 1984 and 1999 and every wave since then. In 1999, the PSID implemented a module to measure households' pension participation, and this module has been repeated in every survey wave. We restrict our sample to the nine survey waves that include both wealth and pension data between 1999 and 2015. For the section of this paper that describes the changing landscape of retirement savings, we further restrict our sample to married households in which the head is aged 25–64. In our analysis of "cashing in" and contributions, we follow households aged 25–64 that are married when they first enter the sample. However, they need not be married throughout. This decision allows us to examine the effect of divorce on saving and dissaving behavior. These restrictions result in an unbalanced panel because (1) of survey attrition and non-response; (2) split-off households (e.g., children of PSID participants) may enter the sample after 1999; and (3) older households may age out of the sample prior to 2015.

3.2.1 Retirement Saving Plan Participation and Active Contributions

The PSID pension and wealth modules include several questions that allow us to assess whether households can make discretionary contributions or withdrawals from their retirement savings plans. Information is collected for both spouses in married or cohabitating households. We use four pension measures (for each spouse) in our analysis: (1) whether the respondent has a pension at their current job, (2) whether they contribute to this pension, (3) how the pension benefit is figured—defined benefit, defined contribution, or both, and (4) whether the respondent

has a DB or DC pension, or both, from a previous employer (up to two plans reported). Table 3.1 presents the wording for selected survey questions.

We construct household-level variables from these underlying individual responses. If either the husband, wife, or both have a pension, then we code the household as having a pension. If both the husband and wife only have a defined benefit pension, or if one spouse has a DB pension and the other does not have a pension, then the household is "*DB only*". If both the husband and wife only have a defined contribution pension, or if one spouse has a DC contribution and the other does not have a pension, then the household is "*DC only*". If the household has a pension, it is categorized as having both types of pensions ("*Both*") when one of the following is true: (1) the husband has *DB only* and the wife has *DC only*, or vice versa, (2) either the husband or the wife report both types of pension plans at their current employer. We must also include information on financial assets to determine whether the household has access to liquid retirement savings. Households are asked whether they have an annuity or IRA and whether they contributed to an annuity or IRA since the last survey wave. A household is considered to have "discretionary retirement savings" if it has an annuity or IRA, or if the household pension type from their current or former employers is *DC only* or *Both*.

3.2.2 "Cashing In"

The PSID has collected information about whether a household "cashed in" any of its discretionary retirement savings since 1999. The specific question reads, "(Since January [of previous wave], did [you/you or anyone in your family living there/they]) cash in any part of a pension, private annuity, or IRA?" The manner in which households interpret this question is somewhat ambiguous. For example, if a household takes a non-qualified distribution from its IRA or DC pension and incurs a 10 percent penalty, we expect it would report cashing in.

However, if a household borrows money from its DC pension (which is advantageous relative to a non-qualified distribution), it is not clear that every household would consider this cashing in. For the purpose of our analysis, we assume that they would. If a pre-retirement household takes a qualified distribution (for example, as a first-time home buyer or due to financial hardship), we expect they would consider this cashing in. However, if a retiree takes a qualified distribution, it is not clear they would report cashing in. We assume that they would. Our assumptions are based on a literal interpretation of the question—if one converts retirement savings into money, then they are "cashing in." The ambiguity arises because households may have a normative interpretation of the question. That is, they may believe these retirement accounts are *supposed* to be used to finance their retirement, and some households might associate "cashing in" with something they are not supposed to do. Data from 1999 are not used in our regression analysis of cashing in and contributing to discretionary retirement savings, as the survey question in 1999 referenced the withdrawals and contributions over the previous five years.

The rules for cashing in differ by the type of retirement savings vehicle. If a household withdraws funds from a Roth IRA prior to age 59½, they incur a 10 percent penalty (with some exceptions)[40]. Funds withdrawn from a traditional IRA account incur the same penalty, and the household must pay income tax on the amount withdrawn. If a Roth IRA has been established for at least five years, the account holder can take a qualified distribution up to $10,000 prior to age 59½ if: (1) it is used towards purchasing their first home, (2) the distribution occurs after the holder becomes disabled, or (3) the withdrawal is made to a beneficiary after the account holder's death. If the account is less than five years old, then the account holder can take a qualified distribution under these circumstances (and a few additional ones), but they must pay

[40] Funds are deposited to a Roth IRA on an after-tax basis.

income taxes on the amount withdrawn. Qualified distributions from a traditional IRAs are exempt from the 10 percent penalty—but not income tax—prior to age 59½, if the account holder: (1) uses it for higher education expenses for themselves or their dependents (2) uses it towards purchasing their first home ($10,000 limit), (3) applies it to unreimbursed medical expenses that exceed 7.5 percent of adjusted gross income, (4) applies it to health insurance premiums when they are unemployed, (5) takes substantially equal payments that are spread equally over their life expectancy, or (6) dies or becomes permanently disabled. If a household faces a short-term cash flow crisis and holds a DC pension, borrowing against their DC pension is preferable to taking a distribution.

A 401(k) loan allows an active plan participant to gain access to their retirement savings without penalty prior to age 59½. If the account holder is employed at the firm that sponsors the 401(k) plan, then they can borrow up to half of the account balance to a maximum of $50,000. At the time of the loan, the participant agrees to replenish the withdrawn funds plus interest, typically over the course of 60 months. Not all employers allow participants to borrow against their 401(k), but as a practical matter, 90 percent of active DC pension participants have access to such loans (Lu et al. 2017). If the borrower leaves their job, the remaining loan balance is due within 60 days.[41] Failure to do so results in a 10 percent early withdrawal penalty, in addition to income tax. Historically, 10 percent of loans are not repaid, and such "defaults" erode retirement savings.

[41] New 401(k) rules make borrowing slightly less risky. The Tax Cuts and Jobs Act of 2017 gives borrowers more time to repay their loans. When they leave a job, they will have until October of the following year to replenish their 401(k) or IRA (if the plan is rolled over).

3.3 Context: Patterns of Pension Coverage and Annuity and IRA Participation

3.3.1 Pensions

The long-run cohort-based shift away from DB pensions is well-documented and recent movements (1992–2007) in coverage by pension type is parallel for men and women (Heiland and Li 2012). Estimates from the PSID concur with this trend and show DB coverage further eroded between 2007 and 2015. Conditional on working, the share of married men aged 25–64 with *DB only* coverage fell from 22.7 percent to 16.3 percent (Table 3.2, Panel A).[42] The share with access to *DC only* coverage increased from 16.8 percent to 33.5 percent over the same period.[43] There is a sizeable uptick in the share of men with DC only coverage between 2009 and 2011, and a decline in coverage for men with both types of plans. The PSID permanently adopted a slight variation of question related to the respondent's pension type in 2011 (Table 3.1). Prior to 2011, the question did not explicitly mention the phrase "defined contribution plan". Instead, it referred to plans that base "benefits on how much money has accumulated in a person's retirement account." In addition, in 2011 and the subsequent survey waves, the question included a notation to the interviewer specifically mentioning that defined contribution plans include 401(k), 403(b), and other less common types of DC plans. If we assume that there was not a dramatic increase in employers offering *DC only* plans and reduction in employers offering both types of plans, then it appears that this clarification caused respondents who previously categorized themselves as having both types of plans to recognize that they actually had a *DC only* plan. This change should not significantly affect our analysis, as we are interested in the share of individuals who have access to a liquid pension (the sum of *DC only* and *Both*). The

[42] Observations weighted by sample weights.
[43] These historical DB and DC trends are consistent with Form 5500 filings (Employee Benefits Security Administration 2018).

share of married men with a liquid pension rose from 28.4 percent in 1999 to 38.5 percent in 2015.

The PSID asks whether anyone in the household cashed in a pension, annuity, or IRA. Therefore, our unit of analysis is the household. In order to assess the factors that contribute to households withdrawing funds from their discretionary retirement savings, we must limit our sample to *households* that have access to these savings vehicles. Table 3.3 presents estimates of household employment and household pension coverage by the type of plan. If either spouse is currently working, then the household is employed. We are interested in employment because it is a necessary condition for borrowing against one's 401(k). Individuals need to be employed with their plan sponsor in order to take a loan. The share of households with at least one working spouse decreased slightly between 1999 and 2015, from 95.9 percent to 93.4 percent (Table 3.3). It appears that working women (Table 3.2, Panel B) dampened the effects of declining men's labor force participation (Table 3.2, Panel A). The share of working household with access to a DC pension increased from 36.7 percent in 1999 to 44.5 percent in 2015. These estimates are significantly larger than spouses' individual estimates of DC pension coverage. For example, in 2015, household DC pension access was 6 percentage points than access for married men alone. These differences underscore the importance of counting both spouses to construct our sample of households with access to liquid retirement savings.

3.3.2 Annuities, IRAs, and Total Discretionary Retirement Savings

Beyond defined contribution pensions, annuities and IRAs are another source of retirement savings that households can cash in prior to retirement. The share of families with IRAs or annuities rises modestly between 1999 and 2001 and then declines going forward to 2015 (Table 3.3). The largest declines occurred during the two-year periods ending in 2009,

2013, and 2015. A household has discretionary retirement savings if it has access to a DC pension through a current or former employer or has an annuity or IRA account. While households cannot borrow against their 401(k) plans from former employers, these plans are included because changing jobs or rolling over one's 401(k) creates a decision window when households may consider withdrawing some of these savings. The share of households with access to discretionary retirement savings dips in 2009 and does not recover in subsequent survey waves (Table 3.3). In principle, only households with some form of discretionary retirement savings (DC pension, annuity, or IRA) are able to withdraw from these accounts or adjust voluntary contributions. Therefore, we limit our analysis of cashing in and contributing to this sample. Prior to empirically evaluating the factors that affect cashing in or contributing to one's retirement savings, we lay out a conceptual framework to identify the circumstances that cause households to save or dissave.

3.4 Conceptual Framework: Saving/Dissaving with Consumption "Needs"

We develop a framework in which DC pensions, annuities, and IRAs have more general uses than solely providing retirement income. In this view, discretionary retirement savings funds have as their primary purpose the accumulation of wealth during one's working years to sustain consumption during retirement. However, once a balance has accumulated, these funds can serve a "buffer stock" role to cover both unanticipated declines in income and unanticipated expenses. In this way, discretionary retirement savings are similar to other financial accounts, such as saving accounts, brokerage accounts, or certificates of deposits. We choose a framework in which there are short-run shocks to income and consumption needs, but also allows for an inter-temporal perspective within a lifetime setting.

3.4.1 Model

A class of models which offers a framework for such behavior is a more generalized version of the Stone-Geary expenditure model. The original model of Klein and Rubin (1947) evolved to the generalized Linear Expenditure System (LES) of Stone (1970). Subsequently, Lluch (1973) and Howe (1975) developed a dynamic version of the model, known as the Extended Linear Expenditure System (ELES).[44] The attraction of this approach is that it articulates how shocks to income and/or consumption needs affect the dynamic value of a unit of additional assets over the planning horizon. Therefore, we can interpret how current income and expenditure shocks affect savings. We slightly modify Howe's articulation of the model to include two types of financial asset "goods", instead of one. By specifying savings as goods, Howe simplifies the dynamic problem as an atemporal maximization problem.

There are *n* consumption goods, and two assets goods—the stock of liquid savings and discretionary retirement savings. The model is equivalent to the LES, but with *n+2* goods instead of *n*.

$$u(q) = \sum_{k=1}^{n+2} \beta_k \, log(q_k - \gamma_k - \xi_k) \tag{3.1}$$

Where q_k is consumption of good *k*, γ_k is the consumption need of good *k*, and ξ_k represents a shock to the consumption need of good *k*. Liquid assets (exiting the period), defined as good *n+1*, and retirement assets (exiting the period), defined as good *n+2* are:

$$\begin{aligned} q_{n+1} &\equiv A_{n+1} + s_{n+1} \\ q_{n+2} &\equiv A_{n+2} + s_{n+2} \end{aligned} \tag{3.2}$$

[44] Other approaches to modeling consumption commitments include requiring the agent to pay an adjustment cost to change their consumption of the "commitment" good, such as housing (Chetty and Szeidl 2007), and an intertemporal approach in which the agent commits to consumption in the previous period (Dau-Schmidt 1992).

Where *A* represents assets (entering the period) and *s* represents savings (which can be positive or negative). The functional form of utility imposes a liquidity constraint where $q_{n+1} > 0$ and $q_{n+2} > 0$. The budget constraint is:

$$\sum_{k=1}^{n+2} p_k q_k = z \tag{3.3}$$

Where

$$z = (w_1 + \xi_{w1})L_1 + (w_2 + \xi_{w2})L_2 + A_{n+1} + \xi_{A1} + A_{n+2} + \xi_{A2} \tag{3.4}$$

The ξ_{Wi}'s represent shocks to wages, and ξ_{Ai}'s represent shocks to asset returns entering the period. There is no subsistence level for assets. That is, $\gamma_{n+1} = 0$ and $\gamma_{n+2} = 0$.

The *n+2* equilibrium conditions are:

$$\frac{\beta_k}{q_k - \gamma_k - \xi_k} = \lambda p_k \tag{3.5}$$

Where λ is the marginal utility of current income. The demand equations are:

$$q_k = \gamma_k + \xi_k + \frac{\beta_k}{\lambda p_k} \tag{3.6}$$

Assuming a constant returns to scale utility function ($\sum_{k=1}^{n+2} \beta_k = 1$), the marginal utility of (current) income is a function of:

$$\lambda_c = \frac{1}{(w_1 + \xi_{w1})L_1 + (w_2 + \xi_{w2})L_2 + A_{n+1} + \xi_{A1} + A_{n+2} + \xi_{A2} - \sum_k (\gamma_k + \xi_k)} \tag{3.7}$$

3.4.2 Households' Allocation between Liquid Assets and Discretionary Retirement Savings

Households' demand for liquid assets q_{n+1} and retirement savings q_{n+2} will depend on the prices p_{n+1} and p_{n+2}. Simplified expressions of these prices, where one buys an asset at price *p* today and receives \$1 *t* periods in the future, are:

$$p_{n+1} = \frac{1}{(1 + (1 - \tau)r)^{E(t)}} \tag{3.8}$$

$$p_{n+2} = \frac{1 - x}{(1 + k)(1 + r)^{E(t)}} \tag{3.9}$$

where Equation (3.8) is the price of a liquid asset, Equation (3.9) is the price of an asset in a discretionary retirement savings account, τ is the households' income tax rate (assumed to be constant over time), *r* is the rate of return to assets, *x* is the percentage penalty for a non-qualified distribution (10 percent for IRAs and DC pension loan defaults), *k* is the percentage at which employers match contributions to retirement savings plans, and *E(t)* represents the number of years in the future when a household a expects to withdraw funds from their savings.

We will discuss some examples to clarify how these prices apply to different types of retirement savings account. For an expected qualified distribution from a Roth IRA, $x = 0$ and $k = 0$. If a household is saving to buy its first home, saving in a Roth IRA strictly dominates saving in a liquid savings because $(1 + r)^{E(t)} > (1 + (1 - \tau)r)^{E(t)}$, so $p_{n+2} < p_{n+1}$. For 401(k)'s and traditional IRAs, I make the simplifying assumption that tax-exempt income that is contributed to the pension cancels out with the income tax paid on withdrawals. There will be a "revolving door" attraction to making 401(k) contributions. For households whose employers significantly match their retirement contributions ($k > 0$), all else equal and assuming continued employment with the same firm, saving in a 401(k) may strictly dominate buying

liquid assets whether they expect their distribution to be qualified or not. For qualified distributions, this will definitely be the case. If expenditures on such categories are anticipated, the family should certainly want to put in subsidized (and tax exempt dollars) up to the limit of such contributions by the employer or the tax code. For example, since educational expenses are a qualified distribution from 401(k)'s, households may save for college tuition in their DC pensions. This option may be particularly appealing because pension balances are not included as household assets on the Free Application for Federal Student Aid (FAFSA). One's employer match and their state's 529 college savings plan will determine whether this use of a 401(k) account is the most efficient.

Why do we observe households holding both liquid assets and discretionary retirement savings? First, Each household saves for different purposes, and consequently, has different expectations about when they might need to access savings. For example, if a household is saving for a car or home improvements (which are not qualified distributions if the account holder is younger than 59½) and the household does not have a generous employer match, then the price of liquid assets may be lower over the expected horizon. Second, a drawback of using retirement accounts to finance pre-retirement consumption is that it effectively reduces a household's maximum lifetime contributions. There are annual limits to how much an individual can contribute to their tax-advantaged retirement savings accounts. In 2018, the limit for 401(k)'s are $18,500, and combined limit for traditional and Roth IRAs is $5,500 (if younger than 50) and $6,500 for individuals age 50 and older. If, in order to smooth consumption over the lifecycle, a household is bumping up against these maximum contributions, then withdrawing funds prematurely will reduce their retirement income. Such households are likely to be high

income. Finally, if an individual changes employers, they can no longer borrow against their 401(k). For workers who expect to change jobs, DC pensions do not provide liquidity.

3.4.3 Incentives to Save and Dissave

The incentives to save or dissave are laid out in Table 3.5. The marginal utility of current income increases when there is a negative shock to earnings and assets and/or a net positive shock to consumption needs $(\sum_k \xi_k) > 0$. All else equal, when λ_c increases, the household will respond by reducing its consumption of goods and/or reducing its savings. However, savings behavior also depends on the marginal utility of future income. In the context of this model, β_{n+1} and β_{n+2} are the shares of net worth allocated to liquid assets and discretionary retirement savings, respectively. They are a function of the value of a dollar over the remaining horizon, represented here as λ_A. These shares increase when λ_A increases.

Dissaving included both reducing one's savings rate and drawing down assets. If a household experiences a net positive shock to consumption needs, then the marginal utility of current income (λ_c) is high relative to the value of a dollar over the remaining horizon (λ_A). In the case, the household will dissave. If it holds few liquid assets, it would be necessary to cash in its retirement savings. Similarly, if a husband or wife loses their job, and they do not anticipate that it will affect their lifetime income, then λ_c will be high relative to λ_A. In this case. they will also dissave and/or substitute to less expensive goods for a given expenditure domain—such as substituting home meals for meals eaten out and lowering transportation costs in various ways. Alternatively, if they expect that this job loss will permanently affect household income, then both λ_c and λ_A will increase. In this situation, it is unclear whether they will save or dissave. What incentives do households have to save? The value of a dollar over the remaining horizon will be higher than then the marginal utility of current income when: (1) a household receives an

inheritance; (2) the future is foreseen to have cash flow reductions—for example, a household expects its retirement income to be lower than its current income; or (3) its current consumption commitments decrease. Finally, it is unclear whether a household would save or dissave the marginal utility of current income and the value of a dollar over the remaining horizon both decrease. Such a situation could occur if an individual transitions to better-paying job with a higher earnings trajectory.

What else might affect β_{n+1} and β_{n+2}? Without formally modelling expectations and subjective discount factors, we nevertheless interpret how they might affect "consumption" shares of liquid assets and discretionary retirement savings, respectively β_{n+1} and β_{n+2}. If a household is anticipating a future expenditure on durable goods, then it should increase its savings. Whether they save in liquid assets or retirement accounts depends of the expected horizon and the prices of each type of asset (Equations 3.8 and 3.9). If a household expects asset prices to decrease, then it will increase savings—expected future income decreases, so the value of a dollar over the remaining horizon (λ_A) increases. Conversely, if they expect asset prices to increase, they will decrease savings. Recent research on financial market expectations finds that a change in observed returns will shape expected returns in a naïve fashion (Hurd and Rohwedder 2012, Dominitz and Manski 2011, Hudomiet, Kézdi, and Willis 2011). That is, market participants believe recent market performance predict future returns. According to these behavioral findings, we should expect the opposite of what our model predicts. These studies suggest that households will cash in their retirement savings when markets are falling or are at a trough, and they will contribute to retirement savings when the market is rising or at a peak.

How strongly families respond to future needs will also depend on its subjective discount rate. A high subjective discount rate will cause a strong response to short-run factors and would

lead to less financial reserves in general. The subjective discount rate will play a major role in the extent to which savings, including pensions, is shaped by longer term events. Data from the 2004 Survey of Consumer Finances indicate a very strong relationship between pension participation and a measure of subjective discounting (Gouskova, Chiteji, and Stafford 2010). And of those with a pension, having a high subjective discount would be a likely predictor of responding to shorter run financial conditions, including participation itself. In addition, pension contributions out of current cash flow can be shaped by expected returns on the investments in a DC plan. Optimistic expected returns on retirement savings may result in a wealth effect on prior allocations, thereby causing the household to reduce current savings. This effect seems to hold for non-pension wealth (Juster et al. 2006). Therefore, households who believe that past portfolio performance predicts future returns will be less likely to save when asset prices are increasing.

3.4.4 Predictions for Empirical Model

Due to data limitations, we rely on binary measures of saving and dissaving in households' discretionary retirement accounts. A household is saving if it is actively contributing to DC pension(s), an IRA, or an annuity. It is dissaving if it cashes in a pension, annuity, or IRA.

We focus on various life events, household finances, and the business cycle as predictors of cashing in or contributing to retirement savings. Life events, for which the timing is plausibly exogenous, include: (1) job loss due to being laid off, let go, or one's employer closing, (2) divorce, (3) high out-of-pocket medical expenditures, and (4) receiving a substantial inheritance. Job loss is associated with a decline in current income, which may cause the household consumption needs to bind, and potentially, a decline in expected future income. As a result, we

expect the marginal utility of current income (λ_c) increases, and the value of a dollar over the remaining horizon (λ_A) may increase as well. Our model does not predict whether this will cause the household to save or dissave, and so which effect dominates is an empirical question. Divorce may affect the household problem in three ways. If the non-head ex-spouse was employed, it reduces household income. Consumption needs may increase, specifically divorce attorneys' fees and the addition of an extra housing unit. And, partial retirement savings liquidation may be a condition of the divorce settlement. High out-of-pocket medical expenses increase consumption needs, and there is no other household consumption good that could be substituted for medical care. If the major medical expense is one that does not affect its expected future income, then the marginal utility of current income increases and λ_A is unchanged. Finally, receiving a substantial inheritance reduces the marginal utility of current income, and therefore, saving should increase.

Household finances affect its budget constraint, consumption needs, and ability to tap into liquid savings. If household income is below its long-term average, then the marginal utility of current consumption increases and the value of a dollar over the future horizon may be unchanged. In this scenario the household should dissave. Conversely, if income is above average, it should save. Mortgage distress, perhaps due to an unexpectedly high interest rate reset for an adjustable rate mortgage, increases a households consumption needs. Therefore, households in mortgage distress will be more likely to cash in their retirement savings. Non-housing, non-retirement wealth provides an alternative to retirement savings for households who want to dissave. If the marginal utility of current income increases for households without liquid savings, their only alternative is to tap into retirement savings.

The effect of business cycles on savings is ambiguous. If households have naïve expectations about financial market returns, they are more likely to dissave during recessions, when asset prices are typically depressed, and increase savings during recoveries. On the other hand, the classical prediction of a response to economic turmoil is that households should increase savings.[45] This suggests that those not adversely affected by short run events may, in anticipation of future uncertainties during a recession, increase their current savings, possibly in the form of increased contributions to retirement savings plans.

3.5 Results and Discussion: Pension Contributions and Withdrawals

The nature and extent of household responses to life events, changes in resources, and expectations is unknown. We specify two sets of linear probability models to investigate these responses. The samples are restricted to households (1) in which the head is age 25 or older, (2) are married when they first appear in the PSID, and (3) who have a DC pension, annuity, or IRA. Households are pooled across survey waves, standard errors are clustered on households, and household-level sampling weights are included. All nominal amounts are converted into 2015 dollars.

3.5.1 Cashing In and Contributing, 2001–2015

The first set of regressions includes the 2001–2015 waves of the PSID. The dependent variables in our two regressions are (1) a binary indicating whether the household cashed in any part of its pension, annuity, or IRA since the previous survey wave, and (2) a binary indicating whether the household contributed to a pension, annuity or IRA since the previous survey wave. The covariates include: (1) a dummy variable indicating whether the "head of household"

[45] PSID data for 2009-2011 indicate a bifurcation in the changes in the family holdings of liquid assets. As of 2009, 18.5% of families had no liquid assets, and by 2011 this had grown to 23.4% of families. At the same time, the overall percentage of families in the highest category of $50,000 or more in liquid assets increased from 11.8% to 14.6% (Stafford, Chen, and Schoeni 2012).

divorced since the previous wave; (2) a dummy variable indicating whether either spouse lost a job since the previous wave; (3) a dummy indicating whether out-of-pocket medical expenditures are zero; (4) the natural log of positive medical expenditures; (5) an expenditure index which is the sum of two dummy variables—one indicating whether the household purchased a new vehicle in the previous two years, and the other indicating whether it made home improvements in excess of $10,000; (6) a dummy variable indicating whether the household inherited more than $10,000; (7) the ratio of current household income to its average across the sample period; (8) a dummy variable indicating whether the household has negative wealth (excluding home equity and DC pension balance); (9) the natural log of wealth, if positive; (10) categorical variables for age groups; and (11) year fixed effects.

Results are presented in Table 3.6. Life events affect the probability of cashing in retirement savings in a manner that is consistent with our conceptual framework. Getting divorced increases the probability of cashing in retirement savings by 9.5 percent. This result is consistent with estimates from the IRS Statistics of Income data which show that a negative marital event (divorce, widowhood, or separation) increases the probability of withdrawing from a retirement account (Argento, Bryant, and Sabelhaus 2015). Losing a job increases the probability of cashing in by 3.5 percent. This positive result indicates that job loss increases the marginal utility of current income more than it increases the value of a dollar over the future horizon. Beyond the effect on λ_c and λ_A, job transitions present opportunities for decisions on the transfer and disposition of pension balances, particularly for DC plans. Based on analysis of Health and Retirement Study (HRS) data, job change significantly increases the probability of cashing in DC pensions (Hurd, Lillard, and Panis 1998). Finally, a 10 percent increase in out-of-

pocket medical expenditures increases the probability of withdrawing from one's retirement savings by 0.6 percent. This result is consistent with the theoretical predictions.

The empirical support for the theoretical predictions of how household finances and the business cycle affects cashing in is mixed. Income has the predicted effect on dissaving. If household income falls by ten percentage points relative to the long-term average, the probability of cashing in increases by 0.17 percent. The wealth variable serves as a proxy for households' access to liquid savings. The measure is imputed by the PSID and excludes home equity and DC pension balances, but it include IRA and annuity wealth. Liquidity constrained households (as measured by negative wealth) are no more likely to cash in their retirement savings. This result is inconsistent with our conceptual framework and contradicts evidence from the Vanguard survey showing that liquidity constrained households are more likely to borrow against their 401(k) (Lu et al. 2017). Households in which the head is age 59–61 are significantly more likely to cash in than households age 44–58, and households age 62–64 are significantly more likely to cash in than households age 59–61. This result supports our literal interpretation of the PSID question on cashing in—older households who take qualified distributions from their retirement savings (most likely to provide retirement income) consider these distributions "cashing in". Finally, there are not strong business cycle effect on withdrawing retirement savings, with the exception that households were significantly less likely to draw down retirement assets in 2011 than they were in 2009.

As predicted, the life events that increased the probability of dissaving (divorce, job loss, and medical expenditures) reduced the probability of contributing to DC pensions, annuities, and IRAs. Planned expenditures did not decrease the probability of contributing to retirement savings. This suggests that households may be more likely to use liquid savings to buy a new car

or make home improvement, rather than tapping into their retirement savings. Inheriting more than ($10,000) increases the probability of contributing by 4 percent. This result is consistent with our theoretical predictions—households save when the marginal utility of current income decreases and the value of a dollar over the remaining horizon is unchanged.

The effect of the business cycle on retirement contributions is inconclusive. Relative to the 1999-2001 period, households were significantly less likely to contribute to retirement savings in the period covering 2001–2003, following the trough of the 2001 recession (November 2001). However, relative to the previous period, households were significantly more likely to save over 2009-2011, following the trough of the Great Recession (June 2009). Therefore, we cannot draw any conclusions about our competing hypotheses, namely that households have naïve expectations about asset returns and the classical prediction that households increase savings during periods of economic turmoil. A speculative interpretation of these results is that 2001 recession and the Great Recession were fundamentally different. The 2001 recession was precipitated by the dot com bubble bursting and accounting scandals at firms like Enron. It was exacerbated by the fall in the stock market following September 11, 2001. During this recession, households, confidence in the stock market eroded, but they did not anticipate protracted economic turmoil. As a result, the naïvely responded to falling asset prices by reducing contributions to their retirement savings. During the Great Recession, households feared that the U.S. economy was entering a protracted depression. Perhaps the increase in savings during this period demonstrates that the classical prediction of savings during recessions overrode households naïvely selling off assets.

3.5.2 Mortgage Distress, 2009–2015

The second set of linear probability models are identical to the first with the exception that we now include an index measuring mortgage distress. The index is the sum of four binary variables: being behind on current mortgage payments, expecting to be behind on mortgage payments, having worked with a lender to modify or renegotiate one's primary mortgage, and mortgage foreclosure. These measures are only available in the 2009–2015 PSID survey wave, so the sample is considerably smaller (Table 3.7).

Changes in the U.S. housing market between 2001 and 2015 impacted retirement savings. The U.S. economy experienced a dramatic rise in the price of owner occupied housing between 2001 and 2007. This run up was followed by a precipitous decline between 2007 and 2012.[46] Mortgage distress as of 2009 was induced by holding a risky position in housing as of 2007. Specifically, mortgage payment difficulties were concentrated in selected real estate markets where homeowners allocated a substantial share of their income to debt service and other home-related outlays such as taxes, utilities, and insurance. This pattern of taking large commitments related to housing expenditures contributed to mortgage defaults and foreclosures. In addition, the year in which the mortgage originated, the rate of decrease in the Case-Shiller home price index, and household wealth were also are substantial predictors of mortgage payment distress in 2009 (Stafford, Hurst, and Chen 2012). This over commitment to housing contributed to subsequent withdrawals from retirement savings accounts. Increasing our mortgage distress index by a factor of one, increases the probability of cashing in by 2.8 percent (Table 3.7) but has no significant negative effect on retirement account contributions.

[46] As measured by the S&P/Case-Shiller U.S. National Home Price Index.

3.6 Conclusion

The transition from defined benefit to defined contribution pensions continued between 2001 and 2015. This shift resulted in a greater share of households with access to liquid retirement savings, as well as a greater share of households whose retirement security depends on voluntary contributions. Previous research finds that plan liquidity induces households increase contributions to their retirement savings. This evidence suggests that households are using these tax-advantaged accounts, not only to save for retirement, but also to stabilize household finances prior to retirement. Our empirical results reflect this use of DC pensions, annuities, and IRAs. In response to adverse life events (such as divorce, job loss, or high medical expenses), households are more likely to cash in retirement savings and less likely to contribute. In addition, adverse shocks to household finances affect savings behavior. Households are more likely to make withdrawals and less likely to contribute when their income is below average or if they are in mortgage distress. The effect of these retirement account liquidity features on retirement savings adequacy warrants further study.

3.7 Tables

Table 3.1: Summary of PSID Survey Questions about Retirement Savings

Pensions (Asked of both husband and wife)
How Pension Benefit is Figured (1999–2009 survey waves) Some pension plans have a definite formula based on years of service or salary, often called defined benefit plan. Some plans base benefits on how much money has accumulated in a person's retirement account. Other plans use both ways of setting benefits. How are the benefits for your pension determined -- by a defined benefit formula based on years of service or salary, by the amount of money in your account, or in both ways?
How Pension Benefit is Figured (2011–2015 survey waves) Some pension and retirement plans base benefits on a formula involving age, years of service and salary, often called a defined benefit plan. Some plans base benefits on how much money has accumulated in a person's pension or retirement account, often called a defined contribution plan. Other plans use both ways of setting benefits. What type of plan (do you/does HEAD) have? *[Note to interviewer]: Defined Contribution plans include 401-K 403-B, ESOP, SRA, thrift/savings, stock/profit sharing, and money purchase plans, and target date funds (TDF).*
Cashing In
Since January [of previous wave], did [you/you or anyone in your family living there/they] cash in any part of a pension, private annuity, or IRA?

Table 3.2: Employment and Pension Coverage (Percent)

Panel A: Married Men

	1999	2001	2003	2005	2007	2009	2011	2013	2015
Currently Working	91.0	89.8	87.4	88.3	88.4	84.7	83.9	85.1	84.0
Conditional on Working									
DB only	22.7	21.4	20.7	20.8	20.7	19.5	19.3	15.9	16.3
DC only	16.8	19.9	17.4	17.2	20.4	18.1	27.7	31.9	33.5
Both	11.6	12.0	11.0	9.8	10.5	12.3	5.7	5.9	5.0
Neither	48.9	46.6	50.9	52.1	48.4	50.1	47.3	46.3	45.1
Conditional on Pension									
DB only	44.5	40.2	42.1	43.5	40.1	39.1	36.6	29.6	29.8
DC only	32.8	37.3	35.4	36.0	39.6	36.2	52.5	59.4	61.1
Both	22.8	22.5	22.5	20.5	20.3	24.7	10.9	11.0	9.1

Note: Weighted by sample weights

Panel B: Married Women

	1999	2001	2003	2005	2007	2009	2011	2013	2015
Currently Working	72.1	72.3	69.6	71.3	72.6	72.5	68.5	70.5	69.6
Conditional on Working									
DB only	19.6	20.7	20.2	21.7	21.2	21.5	24.1	18.9	17.3
DC only	14.7	16.2	15.3	14.8	18.4	15.0	21.9	29.1	30.3
Both	9.8	9.3	9.9	7.6	7.5	10.1	5.5	3.4	3.0
Neither	55.8	53.8	54.6	55.9	52.8	53.5	48.5	48.6	49.4
Conditional on Pension									
DB only	44.4	44.8	44.5	49.2	45.0	46.2	46.7	36.8	34.2
DC only	33.3	35.1	33.8	33.5	39.0	32.2	42.5	56.5	59.8
Both	22.3	20.1	21.7	17.3	15.9	21.6	10.6	6.7	6.0

Note: Weighted by sample weights

Table 3.3: Household Employment, Pensions, and Discretionary Retirement Savings

	1999	2001	2003	2005	2007	2009	2011	2013	2015
Currently Working (Percent)	95.9	95.9	94.5	95.0	95.3	94.0	93.2	93.8	93.4
Pensions (Percents)									
Conditional on Working									
DB only	26.1	25.6	24.8	25.9	24.8	23.9	22.3	19.5	18.4
DC only	18.6	20.9	18.8	18.9	22.4	18.8	28.2	34.6	36.4
Both	19.7	20.2	19.7	17.6	17.9	20.3	14.3	12.8	11.2
Neither	35.6	33.3	36.7	37.6	34.9	37.0	35.3	33.1	34.0
Conditional on Pension									
DB only	40.6	38.4	39.2	41.5	38.1	37.9	34.4	29.1	27.8
DC only	28.9	31.3	29.7	30.2	34.5	29.9	43.5	51.7	55.2
Both	30.5	30.2	31.1	28.3	27.4	32.2	22.0	19.2	16.9
Annuity or IRA									
Coverage (Percent)	39.9	42.5	41.9	41.4	41.3	37.5	37.5	34.5	31.4
Balance† (Conditional on Annty/IRA)	$115	$119	$102	$128	$160	$124	$193	$191	$239
Discretionary Retirement Savings									
Coverage (percent)	65.6	70.3	65.8	64.9	67.7	63.2	61.8	62.2	62.3
Sample Size with Discret. Retirement Savings	1920	2116	1977	1935	2078	1896	1818	1815	1737

† Thousands of 2015 dollars. Weighted by sample weights

Table 3.4: Household Contributions and Cashing In, Conditional on Discretionary Retirement Savings (Percent)

	2001	2003	2005	2007	2009	2011	2013	2015
Percent Contributing	77.3	73.4	71.2	75.2	73.0	80.4	83.2	84.3
Percent Cashing In	5.2	5.0	6.0	6.4	7.4	6.4	6.3	6.2
Amount Cashed In† (Conditional on cashing in)								
25th Percentile	$3,345	$3,755	$3,691	$3,244	$2,958	$5,277	$7,099	$7,556
50th Percentile	$10,564	$12,899	$12,354	$11,584	$10,601	$10,219	$15,128	$17,693
75th Percentile	$23,956	$35,167	$50,708	$27,328	$27,794	$25,457	$38,514	$32,002

† 2015 dollars. Weighted by sample weights

Table 3.5: Savings Response to Balance Current and Future Spending Needs

	Value of a dollar of the remaining horizon (λ_A)	
	Low	High
λ_c Low	?	Save
λ_c High	Dissave	?

Table 3.6: Factors Associated with the Probability of Cashing In or Contributing to Discretionary Retirement Savings, 2001–2015 (Linear Probability Model)

	Cashed In		Contributed	
	Coefficient	Std. Error	Coefficient	Std. Error
Divorced	0.0946***	0.0289	-0.1176***	0.0380
Job Loss	0.0350**	0.0168	-0.1472***	0.0260
medexp=0	0.0287*	0.0165	-0.1289***	0.0332
ln(medexp)	0.0068***	0.0020	-0.0096**	0.0038
Expenditure Index	0.0012	0.0037	0.0093	0.0068
Inherit > $10K	0.0018	0.0091	0.0397***	0.0145
Income Ratio	-0.0166**	0.0076	0.0832***	0.0131
wealth ≤ 0	0.0084	0.0163	0.0494	0.0371
ln(wealth)	-0.0018	0.0013	0.0063**	0.0032
Age (25–34 omitted)				
35–44	-0.0020	0.0067	-0.0216*	0.0121
44–58	0.0034	0.0063	-0.0392***	0.0130
59–61	0.0382***	0.0114	-0.1011***	0.0198
62–64	0.0839***	0.0141	-0.2044***	0.0227
Year (2001 omitted)				
2003	-0.0053	0.0077	-0.0364***	0.0137
2005	0.0031	0.0083	-0.0588***	0.0141
2007	0.0068	0.0083	-0.0144	0.0143
2009	0.0124	0.0090	-0.0240	0.0150
2011	-0.0026	0.0085	0.0427***	0.0145
2013	0.0032	0.0088	0.0665***	0.0142
2015	0.0000	0.0087	0.0733***	0.0145
Constant	0.0313	0.0224	0.7235***	0.0456
Observations	15,732		15,758	
R-squared	0.0159		0.0362	

Notes: Weighted by household-level sampling weight. Standard errors clustered by household.
*** p<0.01, ** p<0.05, * p<0.1.

Table 3.7: Factors Associated with the Probability of Cashing In or Contributing to Discretionary Retirement Savings, 2009–2015 (Linear Probability Model)

	Cashed In		Contributed	
	Coefficient	Std. Error	Coefficient	Std. Error
Mtge Distress Index	0.0280***	0.0089	-0.0076	0.0137
Divorced	0.0623*	0.0331	-0.1077**	0.0542
Job Loss	0.0155	0.0216	-0.1529***	0.0358
medexp=0	0.0171	0.0231	-0.1271***	0.0452
ln(medexp)	0.0051*	0.0029	-0.0057	0.0051
Expenditure Index	0.0078	0.0055	0.0215**	0.0093
Inherit > $10K	0.0065	0.0130	0.0343*	0.0197
Income Ratio	-0.0315**	0.0153	0.1491***	0.0252
wealth ≤ 0	0.0119	0.0225	-0.0340	0.0465
ln(wealth)	-0.0010	0.0019	-0.0008	0.0040
Age (25–34 omitted)				
35–44	0.0035	0.0101	-0.0272*	0.0162
44–58	0.0035	0.0087	-0.0464***	0.0163
59–61	0.0218*	0.0132	-0.0757***	0.0234
62–64	0.1080***	0.0190	-0.1717***	0.0272
Year (2009 omitted)				
2011	-0.0161*	0.0090	0.0676***	0.0137
2013	-0.0103	0.0096	0.0904***	0.0143
2015	-0.0116	0.0096	0.0936***	0.0152
Constant	0.0533	0.0328	0.6825***	0.0617
Observations	7,546		7,559	
R-squared	0.0251		0.0493	

Notes: Weighted by household-level sampling weight. Standard errors clustered by household.
*** p<0.01, ** p<0.05, * p<0.1.

APPENDICES

Appendix A: Derivation of Demand Functions

A.1 One-period model with continuous leisure

Flow of services to the household are Cobb-Douglas:

$$g(c,h,f) = c^{\alpha}h^{\beta}f^{(1-\alpha-\beta)}$$

Utility is isoelastic:

$$v(g) = \begin{cases} \frac{g^{\gamma}}{\gamma} & \text{for } \gamma < 1, \gamma \neq 1 \\ ln(g) & \text{for } \gamma = 0 \end{cases}$$

Maximization problem:

$$\max \frac{\left[c^{\alpha}h^{\beta}f^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma}$$

$$\text{subject to } c = (1-h)\,e^{H} + (1-f)\,e^{F} + A$$

$$h \leq 1$$

$$f \leq 1$$

Kuhn-Tucker Lagrangian (excluding non-negativity constraints):

$$\mathcal{L} = \frac{\left[c^{\alpha}h^{\beta}f^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma} - \lambda\left(c + he^{H} + fe^{F} - A - e^{H} - e^{F}\right) - \mu_1(h-1) - \mu_2(f-1)$$

The marginal utility of income to the family is λ. First order conditions are:

$$\begin{aligned}
\frac{\alpha}{c}g^{\gamma} &= \lambda \\
\frac{\beta}{h}g^{\gamma} &= \lambda \\
\frac{(1-\alpha-\beta)}{f}g^{\gamma} &= \lambda \\
c + he^{H} + fe^{F} &= A + e^{H} + e^{F} \\
\mu_1 (h-1) &= 0 \\
\mu_2 (f-1) &= 0
\end{aligned}$$

For a corner solution where either $h = 1$ or $f = 1$ the marginal utility of leisure is greater than the marginal utility of income:

$$\begin{aligned}
\frac{\beta}{h}g^{\gamma} &> \lambda \\
\frac{(1-\alpha-\beta)}{f}g^{\gamma} &> \lambda
\end{aligned}$$

Demand Equations for an interior solution:

$$\begin{aligned}
c &= \alpha \left(A + e^{H} + e^{F}\right) \\
h &= \beta \left(1 + \frac{e^{F}}{e^{H}} + \frac{A}{e^{H}}\right) \\
f &= (1-\alpha-\beta) \left(1 + \frac{e^{H}}{e^{F}} + \frac{A}{e^{F}}\right)
\end{aligned}$$

A.2 Two-period model without earnings uncertainty

Find demand equations for $(c_1,\ c_2)$. Leisure is discrete, h_t and $f_t \in \{0.5, 1\}$. The flow of services to the household are Cobb-Douglas:

$$g(c_t, h_t, f_t) = c_t^{\alpha} h_t^{\beta} f_t^{(1-\alpha-\beta)}$$

There is no human capital depreciation:

$$y_t = (1-h_t)\, e_t^{H} + (1-f_t)\, e_t^{F}$$

The maximization problem is:

$$\max_{c_1,c_2} \frac{\left[c_1^{\alpha} h_1^{\beta} f_1^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma} + \delta \cdot \frac{\left[c_2^{\alpha} h_2^{\beta} f_2^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma}$$
$$\text{subject to } c_1 + \frac{c_2}{1+r} = y_1 + \frac{y_2}{1+r} + A_0$$

Lagrangian:

$$\mathcal{L} = \frac{\left[c_1^{\alpha} h_1^{\beta} f_1^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma} + \delta \cdot \frac{\left[c_2^{\alpha} h_2^{\beta} f_2^{(1-\alpha-\beta)}\right]^{\gamma}}{\gamma} + \lambda \left(y_1 + \frac{y_2}{1+r} + A_0 - c_1 - \frac{c_2}{1+r} \right)$$

First Order Conditions for an interior solution:

$$\begin{aligned} \frac{\partial \mathcal{L}}{\partial c_1} &= g_1^{\gamma-1} \cdot \frac{\alpha}{c_1} \cdot g_1 - \lambda = 0 \quad &\Leftrightarrow \quad \frac{\alpha}{c_1} \cdot g_1^{\gamma} = \lambda \\ \frac{\partial \mathcal{L}}{\partial c_2} &= \delta \cdot g_2^{\gamma-1} \cdot \frac{\alpha}{c_2} \cdot g_2 - \frac{\lambda}{1+r} = 0 \quad &\Leftrightarrow \quad \frac{\delta\alpha}{c_2} \cdot g_2^{\gamma} = \frac{\lambda}{1+r} \end{aligned}$$

Euler Equation:

$$\frac{c_1}{c_2} \cdot \left(\frac{g_2}{g_1}\right)^{\gamma} = \frac{1}{\delta\,(1+r)}$$

Solve for c_2:

$$\begin{aligned} \frac{c_1}{c_2} \cdot \frac{c_2^{\gamma\alpha} h_2^{\gamma\beta} f_2^{\gamma(1-\alpha-\beta)}}{c_1^{\gamma\alpha} h_1^{\gamma\beta} f_1^{\gamma(1-\alpha-\beta)}} &= \frac{1}{\delta\,(1+r)} \\ \frac{c_1^{1-\gamma\alpha}}{c_2^{1-\gamma\alpha}} \cdot \frac{h_2^{\gamma\beta} f_2^{\gamma(1-\alpha-\beta)}}{h_1^{\gamma\beta} f_1^{\gamma(1-\alpha-\beta)}} &= \frac{1}{\delta\,(1+r)} \\ c_2^{1-\gamma\alpha} &= \delta\,(1+r) \cdot c_1^{1-\gamma\alpha} \cdot \frac{h_2^{\gamma\beta} f_2^{\gamma(1-\alpha-\beta)}}{h_1^{\gamma\beta} f_1^{\gamma(1-\alpha-\beta)}} \\ c_2 &= c_1 \cdot [\delta\,(1+r)]^{\frac{1}{1-\gamma\alpha}} \cdot \left[\frac{h_2^{\beta} f_2^{(1-\alpha-\beta)}}{h_1^{\beta} f_1^{(1-\alpha-\beta)}}\right]^{\frac{\gamma}{1-\gamma\alpha}} \end{aligned}$$

Plug into budget constraint and solve for demand function for c_1:

$$c_1 + c_1 \cdot \delta^{\frac{1}{1-\gamma\alpha}} \cdot (1+r)^{\frac{\gamma\alpha}{1-\gamma\alpha}} \cdot \left[\frac{h_2^{\beta} f_2^{(1-\alpha-\beta)}}{h_1^{\beta} f_1^{(1-\alpha-\beta)}}\right]^{\frac{\gamma}{1-\gamma\alpha}} = y_1 + \frac{y_2}{1+r} + A_0$$

$$c_1 = \left(1 + \delta^{\frac{1}{1-\gamma\alpha}} \cdot (1+r)^{\frac{\gamma\alpha}{1-\gamma\alpha}} \cdot \left[\frac{h_2^{\beta} f_2^{(1-\alpha-\beta)}}{h_1^{\beta} f_1^{(1-\alpha-\beta)}}\right]^{\frac{\gamma}{1-\gamma\alpha}}\right)^{-1} \cdot$$

$$\left((1-h_1)\, e_1^H + (1-f_1)\, e_1^f + \frac{1}{1+r} \cdot \left[(1-h_2)\, e_2^H + (1-f_2)\, e_2^F\right] + A_0\right)$$

Appendix B: Comparison of Logit and Linear Probability Models

Table B.1: Estimates of Men's Labor Force Participation

	Men		
Indepedependent Variable	Linear Probability Model	Logit	Marginal Effects†
High spousal ratio	-0.0120	-0.211	-0.0149
	(0.0107)	(0.140)	
Effects of displacement for low spousal ratio households			
0 - 2 years ago	-0.0551***	-1.020***	-0.0736
	(0.0149)	(0.174)	
2 - 4 years ago	-0.0618***	-0.866***	-0.0623
	(0.0160)	(0.181)	
4 - 6 years ago	-0.0394**	-0.685***	-0.0491
	(0.0174)	(0.192)	
6+ years ago	-0.0268**	-0.498***	-0.0355
	(0.0136)	(0.171)	
Differences between the effects of displacement for low and high ratio households			
0 - 2 years ago	-0.0425	-0.499	-0.0531
	(0.0303)	(0.348)	
2 - 4 years ago	-0.103***	-0.999***	-0.0908
	(0.0324)	(0.361)	
4 - 6 years ago	-0.0553	-0.538	-0.0554
	(0.0366)	(0.404)	
6+ years ago	-0.0312	-0.373	-0.0428
	(0.0270)	(0.345)	
Asset ratio	0.000592***	0.00586**	0.0050
	(0.000222)	(0.00276)	
Interaction of displacement with asset ratios			
0 - 2 years ago	-0.00170***	-0.0159**	-0.0139
	(0.000597)	(0.00685)	
2 - 4 years ago	-0.000239	-0.00385	-0.0034
	(0.000634)	(0.00682)	
4 - 6 years ago	-0.00113	-0.00751	-0.0065
	(0.000701)	(0.00754)	
6+ years ago	-0.00175***	-0.0165**	-0.0144
	(0.000507)	(0.00720)	

Note: All regressions include year fixed effects and age effects allowing for discontinuites at 62 and 65.

†Marginal effects corresponding to logit coefficients are defined as the difference in predicted probabilities of being out of the labor force when comparing households with high spousal contributions to households with low spousal contributions.

Table B.2: Estimates of Women's Labor Force Participation

	Women		
Indepedependent Variable	Linear Probability Model	Logit	Marginal Effects†
High spousal ratio	-0.0420***	-0.636***	-0.0400
	(0.00953)	(0.134)	
Effects of displacement for low spousal ratio households			
0 - 2 years ago	-0.118***	-1.831***	-0.1206
	(0.0228)	(0.282)	
2 - 4 years ago	-0.116***	-1.651***	-0.1080
	(0.0247)	(0.299)	
4 - 6 years ago	-0.107***	-1.464***	-0.0951
	(0.0284)	(0.337)	
6+ years ago	-0.0488**	-0.802***	-0.0507
	(0.0222)	(0.294)	
Differences between the effects of displacement for low and high ratio households			
0 - 2 years ago	-0.00935	-0.0482	-0.0491
	(0.0276)	(0.337)	
2 - 4 years ago	-0.0101	0.0610	-0.0407
	(0.0297)	(0.357)	
4 - 6 years ago	0.0332	0.571	-0.0045
	(0.0330)	(0.391)	
6+ years ago	-0.0103	0.156	-0.0320
	(0.0252)	(0.338)	
Asset ratio	-0.000125	-0.00285	-0.0036
	(0.000155)	(0.00211)	
Interaction of displacement with asset ratios			
0 - 2 years ago	-0.00139***	-0.0129**	-0.0177
	(0.000429)	(0.00522)	
2 - 4 years ago	-0.000726	-0.00522	-0.0071
	(0.000442)	(0.00533)	
4 - 6 years ago	-0.00135***	-0.0120**	-0.0164
	(0.000464)	(0.00561)	
6+ years ago	0.0000641	0.00331	0.0043
	(0.000328)	(0.00446)	

Note: All regressions include year fixed effects and age effects allowing for discontinuites at 62 and 65.

†Marginal effects corresponding to logit coefficients are defined as the difference in predicted probabilities of being out of the labor force when comparing households with high spousal contributions to households with low spousal contributions.

Appendix C: Both Spouses Face Employment Risk

When both spouses are at risk of displacement and there is a probability distribution across the costs associated with a job loss, the general predictions of my model do not change. I present an example to support this claim. The primary difference from the previous section is that households save more in the first period to insure against greater uncertainty. Due to the difficulties representing multiple outcomes for multiple workers, I discuss results for specific values of the parameter space.

In my baseline simulation the second-period effective labor of each spouse is discretely distributed across (0.8, 0.9, 1) multiplied by their first period effective labor. The probability of each outcome is (5%, 7%, 88%) respectively. Human capital depreciation is 11 percent $(\rho = 0.89)$. All other parameters are the same as those listed in Table 1.1. I discuss how changes to wealth affect each spouse's decision in each possible outcome of second-period earnings. You can imagine this discussion as being analogous to looking across the rows in Figure 1.7 through Figure 1.10. That is, what happens to labor supply as we increase initial assets for a given $\left(\frac{e_t^F}{e_t^H}\right)$. I set the spousal earnings ratio to one and examine how initial household assets affect labor supply.

The first column in Table C.1 lists a household's initial assets when it enters the first period. In the second column, the letter listed before the comma denotes the wife's labor supply and the husband's choice comes after the comma. 'w' stands for 'working', and 'o' abbreviates for 'out of the labor force'. The 3x3 matrix in the third column describes the household's choices conditional upon carrying the expected-utility-maximizing level of assets into the second period. The first, second, and third rows of this 3x3 matrix correspond to a 'bad',

Table C.1: Wealth Thresholds at which Household Changes Labor Supply

A0	Labor Supply t=1	Labor Supply t=2	A1	Lifetime Expected Utility
A0 ≤ 0.8	w,w	w,w w,w w,w w,w w,w w,w w,w w,w w,w	0.3985	-24.724
A0 = 0.9	w,w	w,w w,w o,w w,w w,w w,w w,o w,w w,w	0.4722	-24.688
A0 = 1	w,w	w,w o,w o,w w,o w,w w,w w,o w,w w,w	0.5225	-24.653
1.1 ≤ A0 ≤ 1.4	w,w	o,w o,w o,w w,o o,w o,w w,o w,o o,w	0.7713 (lower bound)	-24.617 (lower bound)
1.5 ≤ A0 ≤ 1.6	w,w	o,o o,w o,w w,o o,w o,w w,o w,o o,w	0.9656 (lower bound)	-24.475 (lower bound)
1.7 ≤ A0 ≤ 1.8	w,w	o,o o,o o,o o,o o,o o,o o,o o,o o,o	1.2974 (lower bound)	-24.407 (lower bound)
1.9 ≤ A0 ≤ 2.0	o,w	o,o o,w o,w o,o o,w o,w w,o o,w o,w	0.9307 (lower bound)	-24.337 (lower bound)
A0 = 2.1	o,w	o,o o,o o,o o,o o,o o,o o,o o,o o,o	1.2580	-24.269

'moderate', and 'no' shock for the wife, respectively. The first, second, and third columns correspond to a 'bad', 'moderate', and 'no' shock for the husband, respectively. A1 denotes the amount of savings carried into the second period.

Differences in wealth on the order of magnitude of 10 percent induce changes to household labor supply in the second period. When A0 ≤ 0.8 (initial household wealth), both spouses work in both period regardless of the shock to their earnings potential. When A0 = 0.9, both spouses work in the first period, and the spouse receiving the 'bad' shock does not work in the second period. This finding is consistent with the story of a husband remaining out of the

labor force when he is laid off from a long-tenure job or from a disappearing industry. For $1.1 \leq A0 \leq 1.4$, both spouses work in the first period and only one spouse works in the second period for all possible states. As expected, the person receiving the negative shock does not work in the second period. Along the diagonal of the 3x3 matrix, where both spouse receive the same shock, the household is indifferent between either spouse working. For simplicity, the wife is listed as 'out of the labor force' in these cases.

For $A0 \in (1.5, 1.6)$, both members withdraw from the labor force when they experience the worst productivity shock, and in all other states of the world, only one spouse supplies labor in the second period. When $A0 \in (1.7, 1.8)$, both spouses work in the first period and jointly retire in the second. As initial wealth increases further, the first period labor supply decision changes. When $A0 \in (1.9,\ 2.0)$, only the husband works in the first period. If he experiences the worst possible productivity shock, then he withdraws from the labor force. In this scenario, we see an "added worker effect". His wife picks up works in the second period following his job loss. In all other scenarios, the husband works in both the first and second period.

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