The Effect of Public Pensions on Women's Labor Market Participation over a Full Life-Cycle*

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Abstract

Spousal and survivor's pensions are two important provisions of the US Social Security pension system. In this paper we assess the impact of these benefits on the female employment rate in the context of a full life-cycle model in which households decide about female labor supply and savings. One important aspect of our model is that we allow for returns to labor market experience so that participation decisions affect not only current earnings and Social Security pension eligibility but also future earnings. We quantify the effect on female labor supply and on household income and consumption inequality of (i) removing the spousal benefit, (ii) removing both the spousal and survivor's pension benefits and (iii) extending from 35 to 40 the number of periods of the working career that are considered to calculate each worker's pension. We find that reforms (i) and (ii) have strong effects on female employment all over the life-cycle, whereas (iii) has a very mild effect. The effect of (ii) on household income inequality during old ages is large, but the effect on consumption inequality is negligible.

1 Introduction

The participation of married women in labor force increased dramatically in the US in the last century. As a result of it the US came to have the sixth highest female labor participation rate out of 22 OECD countries in 1990. However, as documented by Blau and Kahn (2013) by 2010 its rank had fallen to 17th. They argue that family-friendly policies that have emerged during the past two decades in other OECD countries may be responsible for this step backwards. In fact there are several empirical and quantitative papers that support that these policies are important in understanding the relative performance of women in the labor market across countries.[1] However, less attention has been paid to the impact that Social Security pension rules may have on the married female labor supply. As documented in OECD (2010) there is a lot of heterogeneity across countries in the size of the ratio of gross pension for one-earner couples relative to single households and in the ratio of survivor's pension benefit relative to a one-earner couple's pension benefit. Interestingly, they are both substantially higher in the US than in the Scandinavian countries, where, in contrast, female labor participation is higher.

French and Jones (2012) argue that Social Security may distort labor supply, although they find that the labor supply of young men is not very responsive to changes in the pension rules. Despite this result, we believe there are several reasons why it is interesting to analyze their effect on women's labor incentives. First, at individual level the system redistributes in favor of poor individuals since the pension formula is a concave function of average lifetime earnings. This may favor women more than men because of the well-documented earnings gender gap. Second, the pension system provides second earners with a spousal benefit equal to 50% of the first earner's pension benefit, if she is not eligible for a retired-workers pension or if her own pension is lower than that (spousal pension benefit). If the first earner passed away this is increased to 100% of the deceased spouse's pension (survivor's pension benefit). These provisions work as minimum pensions for second earners and as the literature has shown minimum pensions may have substantial impact of retirement patters, see for instance Jiménez-Martín and Sánchez-Martín (2007). The elimination of the spousal and survivor's benefits can increase female labor supply by reducing household Social Security wealth and by reducing the effective tax rate on the second earner's labor income. The evaluation of this reform is especially important at a time when

[1] See for instance Waldfogel (1998) or Ruhm (1998), among other empirical papers, and Erosa, Fuster and Restuccia (2010) and Low and Sánchez-Marcos (2015) using quantitative models.

developed countries are facing serious problems in achieving financial stability in their public pension systems. Finally, the pension formula establishes that benefits are a function of the 35 years of highest adjusted earnings over the whole working career, so the system redistributes from those individuals with a history of contributions longer than 35 years towards those with 35 years of contribution only. This may be interpreted as an insurance against spells out of the labor market that occur at child-bearing ages, typically on the part of mothers.

The aim of this paper is to further understanding of female labor market incentives under the Social Security pension rules in the US. We use a partial equilibrium life-cycle model in which forward-looking households make female labor market participation and saving decisions. In the model labor market participation decisions affect current earnings, future earnings (through a learning-by-doing technology) and Social Security pension benefits. Households face earnings and survival uncertainty. Our model features the US pension system and provides a satisfactory representation of the life-cycle employment behavior of women and of the distribution of public pensions for men and women that we observe in the data. We conduct several policy evaluation exercises: (i) removal of spousal benefit, (ii) removal of both spousal and survivor's pension benefits; and (iii) extension from 35 to 40 of the number of periods of the working career that are considered in calculating the retired worker pension. We find that removing spousal and the survivor's pension benefits has a substantial effect on women's employment decisions over the life-cycle, in particular after age 40. The average effect goes from an increase in the employment rate of 4 percentage points in the case in which the spousal pension benefit is removed to 9 percentage points in the case in which both the spousal and survivor's pension benefits are taken away. However, the extension of the number of years considered in calculating pension benefits has a negligible effect on participation.

Our paper is related to two strands of the literature. First strand is the one that analyzes the determinants of female labor market participation and its evolution over time. Greenwood, Sehadri and Yorukoglu (2005) explore the role played by the development and dissemination of household appliances in explaining the increase in the labor force participation of women. There are other papers that emphasize changes in medical/contraceptive technology, such as for instance Goldin and Katz (2002) or Albanesi and Olivetti (2009). In the context of a life-cycle model, Attanasio, Low and Sánchez-Marcos (2008) explore the employment behavior of different cohorts of women and find that decreases in the child-care costs together with changes in female wages relative to males are key elements in accounting for the higher attachment to the labor market of younger cohorts of women. More recently, Eckstein and Lifshitz (2011), Fernández and Wong (2014) and Guvenen and Rendall (2015) explore the effect of changes in education distribution, marital stability, wages and fertility on the female labor market behavior across several cohorts. Finally, Guner, Kaygusuz and Ventura (2012) focus on the impact on female labor supply of different tax policies and Domeij and Klein (2013) on the labor incentive effects of child care subsidies. Second strand of the literature to which our paper is related focuses on the effects of public pensions on labor incentives, in particular on male retirement decisions. In a partial equilibrium framework, Rust and Phelan (1997), French (2005) and French and Jones (2012) find that public pension plans have large effects on the labor supply of older male workers. In a general equilibrium framework, İmrohoroğlu and Kitao (2010) find that a 50% reduction in the payroll tax rate and in benefits raises the participation of men in their sixties from 50% to 62%. Wallenius (2013) and Erosa, Fuster and Kambourov (2012) find that a substantial fraction of the differences in men's aggregate hours worked between the US and continental European countries is accounted for differences in Social Security programs and taxation. However, there are few papers that consider two-adult households in analyzing the labor incentives of public pensions. Noteworthy exceptions are the papers by van der Klaauw and Wolpin (2008) and Casanova (2010) who estimate structural dynamic models of saving and participation decisions of couples, but consider only old couples. In contrast, we assess the effect of several Social Security reforms over the complete life-cycle. Finally, recent papers by Nishiyama (2010) and Kaygusuz (2015) use general equilibrium models of two-adult households to assess changes in the US Social Security pension rules. In contrast to Kaygusuz (2015) who uses a seven period model, we consider a-one-year period model and introduce earnings and wages uncertainty. Two distinctive features of our model with respect to both the aforesaid papers is that wages are endogenous through a learning-by-doing technology and that we explicitly model the retirement decision. The endogeneity of wages is an important aspect that may enhance the response of the labor supply at early ages to changes in the incentives to work. Although the importance of human capital is emphasized in Wallenius (2013) her analysis focuses on males only. The decision of the age of retirement is an important margin of adjustment of labor supply in response to changes in the pension rules, as emphasised by the previous literature in the case of men.

One limitation of our analysis is that we assume exogenous labor supply of husbands. This may be a reasonable assumption for middle aged men, but controvertible for men close to retirement. Therefore our results provide and upper bound of the female labor supply response to the different policy reforms, as their effect may be lessen in the case in which husbands are allowed to react as well. Nevertheless we believe that our paper makes a contribution to the literature by focusing on the response of women's labor supply, in contrast to most of the previous literature that instead focused on the response of men's labor supply. Finally we acknowledge that ignoring general equilibrium effects is a limitation of our research as holding wages and interest rates fixed may overstate the response of labor supply and savings to policy changes, however, we leave the analysis of those effects for future work.

2 Model Economy

In this section we lay out the model economy that we use for the analysis of several reforms of the US Social Security pension rules. We consider a partial equilibrium life-cycle model in which unitary households face earnings and lifespan uncertainty. Households make female labor market participation and saving decisions. We consider only the extensive margin decision of female labor supply and we assume all working women offer the same number of hours.[2] Men always work in this model and their earnings are exogenously given. Although we ignore any general equilibrium effects of the policy reforms that we implement, female wages are endogenous as we assume that they depend on labor market experience. This is an important feature in studying female labor supply decisions because it introduces an additional trade-off of labor market spells. Household size evolves exogenously over the life cycle. We assume that all households are initially made up of two adults who remain married and may have two children at a particular age. Household size changes deterministically with the arrival and emancipation of children, but it changes stochastically as individuals die. This is an essential feature of the model since we are interested, among other things, in exploring the effect on women labor supply over the life-cycle of survivor's pension benefit. However, all household members die at age T.[3]

[2]French and Jones (2012) find that, in the case of men, most changes in life cycle labor supply in response to changes in pension rules occur along the extensive margin.

[3]In the Appendix A we provide a detailed description of the solution method of the model that we lay out below.

2.1 Household's problem

Households derive utility of consumption and disutility of female labor supply. We assume that there is a fixed utility cost of work that may change with woman's age. In addition to that we assume there is a fixed monetary cost of working that exogenously evolve with household composition, in particular with the number and age of children living at home. Female labor supply decisions affect a woman's current earnings, but also her future wages and the public pension for which she is eligible. Thus, the number of years of labor market experience is a state variable of the household's problem, which enable us to capture important features of the data. First, there is empirical evidence that accumulated labor market experience is highly correlated with wages (see for instance Eckstein and Wolpin (1989)). In this circumstances labor market spells related to child-bearing have a trade-off in terms of future wages that may be important in understanding the labor supply decision. Second, according to current rules of the US Social Security pension system, individual pension benefit is a concave function of average lifetime earnings.

2.2 Married household problem before retirement

The recursive formulation of a married household problem before retirement is as follows

$$\begin{aligned}
&V_t^{M,p_t}(a_t,h_t,v_t) = \max_{a_{t+1}} u(c_t,p_t,e_t)+\\
&\beta[\pi^f_{t,t+1}\pi^m_{t,t+1}E_t\max(V^{M,0}_{t+1}(a_{t+1},h_{t+1},v_{t+1}),V^{M,1}_{t+1}(a_{t+1},h_{t+1},v_{t+1}))+\\
&\pi^f_{t,t+1}(1-\pi^m_{t,t+1}E_t\max(V^{Wf,0}_{t+1}(a_{t+1},h_{t+1},v_{t+1}),V^{Wf,1}_{t+1}(a_{t+1},h_{t+1},v_{t+1}))+\\
&\qquad\qquad\pi^m_{t,t+1}(1-\pi^f_{t,t+1})E_tV^{Wm}_{t+1}(a_{t+1},h_{t+1},v_{t+1})]
\end{aligned}\tag{1}$$

where p_t is a discrete female labor supply choice which takes on value 1 if woman participates and 0 otherwise, c_t is total household's consumption and e_t is the number of adult-equivalent members of the household. $V^{M,p_t}(.)$ is the value function of a married household, $V^{Wf,p_t}(.)$ is the value function of a widow household and $V^{Wm}(.)$ is the value function of a widower household. State variables are a_t, which denotes beginning of period household assets; h_t, which denotes beginning of period female human capital and $v_t = (v_t^m, v_t^f)$ that is the vector of permanent male and female productivity shocks. The probability of surviving from age t to age $t+1$ for an individual of gender g is given by $\pi_{t,t+1}^g$, $g = \{f, m\}$. Finally, β is the discount factor.

The household's intertemporal budget constrain can be written as followsd

$$a_{t+1} = (1+r)\left(a_t + \left(y_t^f - f_t - \tau_t^f\right) p_t + y_t^m - \tau_t^m - c_t\right) \tag{2}$$

where r is the interest rate and f_t is the fixed cost of work at age t. Female earnings are y_t^f, and the husband's earnings are y_t^m. Earnings are described in Section 2.5. Each household earner pays taxes, τ_t^g, that are a function of the Social Security payroll tax and individual's earnings, in particular $\tau_t^g = \tau \min(y_t^g, \bar{y})$, with $\bar{y}$ being the earnings ceiling for contributions. Households can save, but are not allowed to borrow.[4] We denote the child care units needed by a two-earner family at age t by k_t and the price of each unit of child care by q. Therefore, the total child care cost f_t paid by a two-earner household in period t is given by $f_t = qk_t$. The participation choice and the consumption choice at period t determine the endogenous state variables (assets and human capital) at the start of the next period.

Woman chooses to participate in period t if

$$V_t^{M,1}(a_t, h_t, v_t) \geq V_t^{M,0}(a_t, h_t, v_t) \tag{3}$$

The problem of a widow household can be defined similarly.

2.3 Married household problem during retirement

The recursive formulation of a married household problem in which the wife and the husband are retired from the labor market is as follows

[4] This is a common assumption in the literature that evaluates public pensions. See for instance İmrohoroğlu and Kitao (2010) or French and Jones (2012).

$$V_t^{M,R}(a_t, b) = \max_{a_{t+1}} u(c_t, e_t) + \beta[\pi^f_{t,t+1}\pi^m_{t,t+1}V^{M,R}_{t+1}(a_{t+1}, b)+$$
$$\pi^f_{t,t+1}(1 - \pi^m_{t,t+1})V^{Wf,R}_{t+1}(a_{t+1}, b) + \pi^m_{t,t+1}(1 - \pi^f_{t,t+1})V^{Wm,R}_{t+1}(a_{t+1}, b)] \quad (4)$$

where $b = (b^m, b^f)$ is the vector of husband and wife's pension benefits. $V^{M,R}(.)$ is the value function of a married household in which both husband and wife are retired, $V^{Wf,R}(.)$ is the value function of a retired widow household and $V^{Wm,R}(.)$ is the value function of a retired widower household.

The budget constrain in period t is given by

$$a_{t+1} = (1 + r)\left(a_t + b^f + b^m - c_t\right) \quad (5)$$

2.4 Claiming age decision

Woman chooses what age to claim the public pension benefit, if she is eligible. We make the assumption that after claiming she definitively retires from the labor market. She can choose to retire at any time between t_{min} and t_{max}, however retirement is compulsory at $t = t_{max} + 1$. A woman chooses to retire at $t^f_{cl} = t$ if

$$V_t^{M,R}(a_t, b) \geq V_t^{M,1}(a_t, h_t, v_t) \quad (6)$$

2.5 Income

In this section we describe the process for labor income of both husband and wife. We also provide a detailed description of the pension formula by which Social Security income is determined after retirement of the labor market.

2.5.1 Earnings

The income process features two important aspects of the data: earnings uncertainty and earnings growth over the life-cycle. First we assume that both female and male earnings, y_t^f and y_t^m, are subject to permanent shocks, v_t^f and v_t^m, which are positively correlated. In particular we assume

$$\begin{aligned} v_t^f &= v_{t-1}^f + \xi_t^f \\ v_t^m &= v_{t-1}^m + \xi_t^m \text{ where } \xi_t = (\xi_t^f, \xi_t^m) \sim N\left(\mu_\xi, \sigma_\xi^2\right) \quad (7) \\ \mu_\xi &= (-\frac{\sigma_{\xi^f}^2}{2}, -\frac{\sigma_{\xi^m}^2}{2}) \quad \text{and} \quad \sigma_\xi^2 = \begin{pmatrix} \sigma_{\xi^f}^2 & \rho_{\xi^f,\xi^m} \\ \rho_{\xi^f,\xi^m} & \sigma_{\xi^m}^2 \end{pmatrix} \quad (8) \end{aligned}$$

The assumption of permanent shocks implies that the variance of earnings increases over the life-cycle, consistent with what it is observed in the data (see for instance Huggett, Ventura and Yaron (2011)). Under this assumption the slope of the variance of the earnings life-cycle profile gives the variance of the permanent shock.

Second in order to capture the increasing male earnings' profile over the life-cycle we feed into the model exogenous growth as a function of age. Therefore husband's earnings are calculated as follows

$$\ln y_t^m = \ln y_0^m + \alpha_1^m t + \alpha_2^m t^2 + v_t^m \quad (9)$$

In contrast, woman's earnings growth is endogenous and it is a function of her human capital at the beginning of the period. We assume a learning-by-doing technology such that human capital is the total number of years of labor market experience. Therefore human capital at the beginning of period $t+1$ is given by $h_{t+1} = h_t + p_t$. Female earnings are a two parameter function of human capital

$$\ln y_t^f = \ln y_0^f + \alpha_1^f h_t + \alpha_2^f h_t^2 + v_t^f \quad (10)$$

2.5.2 Pensions

During retirement public pensions b^m and b^f are the only source of household income, apart from the return to assets. According to the US Social Security rules individual pension benefit is calculated as a concave function of the individual's average lifetime earnings. More specifically, it is a function of the N years of highest adjusted earnings over the whole working career, including years with zero earnings if needed to total N years. This is known as the Average Indexed Monthly Earnings (AIME). Furthermore, a minimum number of years of contribution N_{min} is required for individuals to be eligible for a public pension. We consider a married household is entitled to a husband's retired worker pension benefit. In addition to that the wife is eligible for a pension benefit in the amount of her corresponding retired worker pension benefit or a fraction of her husband's pension benefit (spousal benefit), whichever is higher.[5] Survivors get their own worker-pension benefit or their spouse's pension benefit (survivor's pension benefit), whichever is higher. As a consequence, women may be dually entitled as workers and as spouses or survivors.

Therefore the complete labor market history of each individual is needed in order to calculate each individual AIME and thus the corresponding pension benefit. However, keeping track of the complete labor market history of each spouse is computationally very costly and unfeasible in this model that allows for saving decisions and that features the degree of earnings uncertainty at the individual level observed in the data. Our approach is therefore to build up an approximation of each individual's AIME[6] based on the last working period earnings and the number of years of contribution to the pension system. In the Appendix B we provide a detailed description of this approximation and we test its degree of accuracy.

3 Calibration

In this section we start describing the different data sources that we use for the quantitative analysis (section 3.1). Then we provide a detailed description of the process we follow to take our model to the data (section 3.2) and we assess its ability to account for different facts (section 3.3). We specify the

[5] We assume here that the first earner is the husband.

[6] Other papers proceed in a similar way. For instance Erosa, Fuster and Kambourov (2012) assume that each ability type gains a pension that depends on the average lifetime earnings of its ability type and ignore the stochastic individual component of earnings in the determination of the pension.

functional forms for the utility function and the child care cost function and we explain our calibration strategy. In this respect there is a first set of parameter values that we borrow directly from existing studies in the related literature. There is a second set of parameter values that we select so that our model economy resembles the data in a number of specific dimensions.

3.1 Data

For the quantitative analysis we select the cohort of women born between 1944 and 1948 in US, for which we observe the retirement decision. We use three different data sources. Our main data source is the Integrated Public Use Microdata Series - Current Population Survey (IPUMS-CPS) that it is based on a large representative sample of the US population. It is an integrated set of microdata spanning from 1962 to 2014 of the Current Population Survey (CPS). The IPUMS-CPS combines the labor information provided by the CPS with the data from US decennial censuses that are part of the Integrated Public Use Microdata Series - USA (IPUMS-USA). Thus, IPUMS-CPS takes advantage of the relatively large sample size of IPUMS-USA at ten-year intervals and fills in information for the intervening years with CPS data. We select married women aged 60-64 in 2008 and we follow them backwards and forward to obtain relevant statistics for our quantitative analysis. More precisely, we obtain their complete life-cycle employment, their earnings distribution as well as their husbands' and the the distribution of their pension benefits and their husbands'. However, IPUMS-CPS does not provide data on wealth so we use the Survey of Income and Program Participation (SIPP) 2008 wave 4 core and topical module data to calculate several statistics that we need for the quantitative analysis. SIPP is a longitudinal survey of the resident population of the United States that excludes people living in institutions and military barracks. Data in the core module file contain basic demographic characteristics of each member of the household. These include, among others, age, sex, marital status and types and amounts of income. Data in the topical module file includes assets and liabilities; real estate, dependent care, vehicles; interest accounts, stocks, mortgages, value of business and rental. We then merge the core and topical modules and calculate the wealth distribution for our sample of married households. Finally, we rely on the RAND HRS Data (version N) to calculate statistics of the distribution of the number of years of labor market experience. The RAND HRS Data file is a cleaned and streamlined version of 13 different waves (from 1992 to 2012) of the Health and Retirement Study (HRS) that contains variables covering a broad range of measures consistently across waves. In turn, the HRS is a longitudinal data set representative of noninstitutionalized individuals aged 51 and above and their spouses. It provides extensive information on demographics, income, labor status, health status and and retirement. In particular our interest is on a variable that reports the number of years of labor market experience for each women at their claiming age.

3.2 Parameters and Targets

Demographics. All women in our model begin their lives at the age of 25 with zero assets. We assume individuals face lifetime uncertainty from the full retirement age of 66 onwards but they all die after the age of 90. We target the death probabilities as reported by the Social Security Administration.[7] However, we calibrate the husband's probability of death at the age of 66 in order to target the fraction of widows in the data at that particular age (16%).[8] Public pension's claiming age is endogenous for eligible women that can start receiving their pension at the minimum age of 62. However we assume claiming is compulsory at the age of 66 for women who did not claim before that age.[9] Husbands' retirement age is exogenously given but we allow heterogeneity across households in this respect. In particular we consider five different types of households depending on what age the husband retires from the labor market: 62, 63, 64, 65 and 66. We target the distribution of married men's claiming age.[10]

Finally, in regards to fertility we introduce heterogeneity across households in the age of first child arrival. We choose to mimic the mean and standard deviation of the age of first child arrival that are respectively 22 and 4 for the cohort of women that we target here.[11] With this aim we assume that there are two type of households of equal measure in the total population: first type have two children, the first of whom arrives when their parents are 20 (so this households are made of 2 adults and 2 children at the first model period); second type have two children, with the first child arriving when their parents are 25. The second child arrives after 3 years of the first in both cases, again as observed on average in the data.

[7]See Social Security Administration Actuarial Life Table, 2007.

[8]As a result of this, the fraction of widows among women aged 66 or older that our model delivers is 39%. In the data this figure is 44% in 2008.

[9]The fraction of women born in the 1940s who remain in the labor force after age 66 is about 25%. As argued by Wallenius (2013) the adjustments for delayed claiming are somewhat less than actuarially fair which creates an incentive to retire at the full-retirement age.

[10]According to Haaga and Johnson (2012) and the RAND HRS the distribution of claiming age for the cohort of men born in the 1940s is as follows: 44% at 62, 14% at 63, 8% at 64, 21% at 65 and 13% at 66 or older.

[11]See Human Fertility Database for the US.

Earnings. The deterministic component of the male earnings process (α_1^m and α_2^m in equation 9) is set so that the model is consistent with earnings growth over the life-cycle as calculated in the IPUMS-CPS. We target earnings growth of 2.4% from age 25 to 35 and of 0.7% from 36 to 64. Innovations to male earnings are assumed to have a unit root. The standard deviation of the innovation for the husband's earnings is assumed to be 0.08, similar to estimates by Hugget, Ventura and Yaron (2011) and Low, Meghir and Pistaferri (2010). Furthermore, we assume the initial variance of log earnings to be 0.20, which is consistent with their estimates. There is not much evidence on the variability of female earnings so we assume same process than that for men's earnings. Finally, we assume that the correlation coefficient between the two shocks (for husband and wife) is 0.25 as estimated by Hyslop (2001). The parameters that characterize the effect of female human capital on earnings and the initial offered earnings gender gap have to be calibrated by solving the model. To identify the human capital function parameters we target the two coefficients of a regression of female log wages on the number years of experience and the squared number of years of experience as estimated by Eckstein and Wolpin (1989).[12] In particular, using simulated data we draw up an ordinary least square estimate of

$$\ln y_t^f = \beta_1 + \beta_2 h_t + \beta_3 h_t^2 + u_t \tag{11}$$

where u_t is the error term. We select α_1^f and α_2^f in equation 10 so that estimated β_2 and β_3 in the data and in the simulations are the same.

Finally, we select an initial offered earnings gender gap y_0^f/y_0^m which enable us to target the earnings gender gap of 0.52 as estimated in the IPUMS-CPS.

Childcare cost. We assume the shape of the function k_t that determines the number of child care units needed by a family at age t depends on the number of children and their age. We normalize to 1 the units that are required by a family with two infants (children aged 0 to 4). We assume units needed by a 5 year old child are 20% lower as estimated using data by State Child Care Resource and Referral Network offices for pre-school children.[13] Since data on child care cost is not available after that age we assume that the cost for a child older than 5 is 80% lower than the cost of an infant and that after age 15 chid care cost is equal zero.[14] Finally the price q of each unit of child care is calibrated by solving

[12] They use the cohort of women aged 30 to 44 in 1967 in the National Longitudinal Survey.

[13] See Child Care Aware of America (2012).

[14] One could possibly rely on survey data of child care cost expenditures. However, this may be an underestimation

the model. To identify it we target the employment rate of women aged 25 to 29.

Public pension rules. According to the US Pension rules, the Workers' Primary Insurance Amount (PIA) is computed using a piecewise linear function of the AIME with three bend points. The PIA formula is progressive. In 2008 the first USD 711 per month of relevant earnings attracts a 90% replacement rate. The band of earnings between USD 711 and USD 4,288 per month is replaced at 32%. These thresholds are 21% and 128% of the national average earnings respectively. A replacement rate of 15% applies between the latter threshold and the earnings ceiling. Finally, the payroll tax is 12.4%. The earnings ceiling for benefits and contributions is USD 102,000 a year, corresponding to 253% of the national average earnings.[15] Furthermore, a minimum of 10 years of contributions is required to be eligible for a public pension. The above PIA formula is used if an individual first applies for and receives benefit at the normal retirement age of 66. However, individuals are eligible to apply for Social Security once they reach the earliest retirement age of 62. Early receipt permanently reduces the benefit by the Actuarial Reduction Factor. In particular, those who retire at the age of 62 receive 75% of PIA, those who retire at 63 receive 80% of PIA, those who retire at 64 receive 87% of PIA and those who retire at 65 receive 93% of PIA. Individuals who initiate their claim after the official retirement age are rewarded with an additional 8% of PIA per year through the Delayed Retirement Credit. As we explained above, in addition to individual pensions for those who are eligible, the public pension system provides spousal and survivor's pension benefits. Spousal pension benefit is available for married women with a smaller own worker's pension. The benefit is equivalent to 50% of the husband's public pension if claiming is made at 66 with a 4% annual penalty for those who claim between 62 and 65. Survivors' pension benefit is available for widows and it is equivalent to 100% of the deceased spouse benefit amount if this is higher than the widow's own pension. Penalties also apply to survivor's pension benefit in case that it is claimed before normal retirement age. However, we assume individuals survive until age 66 with probability one and therefore survivor's pension benefit is effectively not claimed before that age.[16]

Preferences. We assume a constant relative risk aversion utility function for consumption with parameter σ and a utility cost of women's work ψ_t that depends on age. Therefore our utility function can be

of the true costs since the cost is not observed for those who remain out of the labor force because of the high child care cost they face.

[15] See OECD (2011).

[16] We also ignore the fact that survivor's pension benefit can indeed be claimed starting at the age of 60.

written as follows

$$u^M(c_t, p_t, e_t) = \frac{(\frac{c_t}{e_t})^{1-\sigma}}{1-\sigma} - \psi_t p_t \tag{12}$$

where $\frac{c_t}{e_t}$ is equivalised consumption and we use the McClements scale to determine e_t.[17] In regards to the utility cost of working we assume $\psi_t = \psi_1$ if $t < \bar{t}$ and $\psi_t = \psi_1(\frac{t}{\bar{t}})^{\psi_2}$ if $t \geq \bar{t}$, with $\psi_2 > 1$. This is intended to capture increasing cost of working after a certain age $\bar{t}$. In particular we think of the health status as important to account for the declining profile of labor market participation at old ages (see for instance van der Klaauw and Wolpin (2008)). This may also capture other incentives to exit the labor market that we ignore here[18] and it would help the model to mimic the participation rates at the end of the life-cycle that we observe in the data. We set $\bar{t}$ equal to 55 and we select employment rate of women aged 35 to 39 and employment rate of women aged 55 to 59 to calibrate ψ_1 and ψ_2. Finally, we assume discount factor β of 0.98 and a constant coefficient of relative risk aversion of 1.5 (that it is in the range of the estimates by Attanasio and Weber (1995)).

Other parameters. We set the rate of return to savings to equal the average real return on three monthly T-bills at 0.015.

To summarize we show in table 1 the list of calibrated parameters together with the targets used for their identification. Heterogeneity in the cost of working over the life-cycle helps us to be consistent with the decreasing path of employment after age 55. The price of child care that we calibrate implies that the child care cost for an infant is about 23% of an average worker's earnings in this economy. This is in line with the 20% reported by the OECD.[19] In regards to the human capital function we estimate wages to be a concave function of the number of years of labor market experience. It is important to note that the different human capital technology for men and women (as captured by α_1^g and α_2^g, $g = f, m$) may be an important source of earnings gender gap in the model economy. In fact, according to our estimates, female earnings would be 0.80 of male earnings by age 65 even if a woman worked in every period. In addition to this, an initial female-to-male earnings ratio of 0.57 is needed to target the

[17] According to the McClements scale, a childless couple is equivalent to 1.67 adults. A couple with one child is equivalent to 1.9 adults if the child is less than 3, to 2 adults if the child is between 3 and 7, 2.07 adults if the child is between 8 and 12 and 2.2 adults if the child is between 13 and 18.

[18] In particular defined benefit holders tend to retire at early ages, see for instance Casanova (2010).

[19] See OECD family database Chart PF3.4.A: Childcare fees per two-year old attending accredited early-years care and education services, 2008.

Table 1: Calibration

Targets	Model	Data
Women's Employment Rate 25-29	0.39	0.41
Women's Employment Rate 35-39	0.65	0.63
Women's Employment Rate 55-59	0.64	0.62
Earnings Gender Gap	0.52	0.52
β_2, Eckstein and Wolpin (1989)	0.02	0.02
β_3, Eckstein and Wolpin (1989)	-0.0003	-0.0002
Parameters		
ψ_1	0.002	
ψ_2	1.68	
q	23,300	
y_0^f/y_0^m	0.57	
α_1^f	0.010	
α_2^f	-0.00014	

average female-to-male earnings ratio over the life-cycle of 0.52. Note that in the presence of positive self-selection of women into the labor market, as our model implies,[20] the exogenous earnings gender gap that we feed in the model (both through the human capital function and the initial earnings gender gap) is higher than the observed earnings gender gap. Interestingly, positive self-selection is consistent with evidence found by Olivetti and Petrongolo (2008).

3.3 The benchmark economy

This section provides a description of several statistics of our benchmark economy that we compare with the data. Figure 1 shows the complete life-cycle employment profile of women both in the model and in the data. The profile in the data is smoother than in the simulations because the amount of heterogeneity in terms of fertility histories that we are able to capture is limited. However, we believe that the model provides a reasonable representation of women's participation behavior over the life-cycle. In addition to this in table 2 we report the distribution of the number of years of experience, the

[20] In the simulations average earnings of working women are higher than average offered earnings at all ages.

distribution of claiming age and the average number years of experience at claiming age. First, it is important that our model resembles the distribution of number of years of experience as it is a summary statistic of the behavior of women over their life-cycle and it is essential to determine their pension benefit. Second, in regards to the distribution of claiming age the model captures a fair amount of the early retirement at the age of 62. It is worth mentioning here that we are not targeting any dimension of this distribution and it is then not surprising that our model under-predicts early retirement since we omit several features of the data that the literature has shown to be relevant to account for the peaks at 62 and 65 (in particular defined benefit pensions and Medicare). Finally, both in the model and in the data the average number years of experience is higher the higher is the claiming age and this cannot be accounted only by the delay in the claiming decision. This reflects that women who are more attached to labor market over the life-cycle tend to retire later.

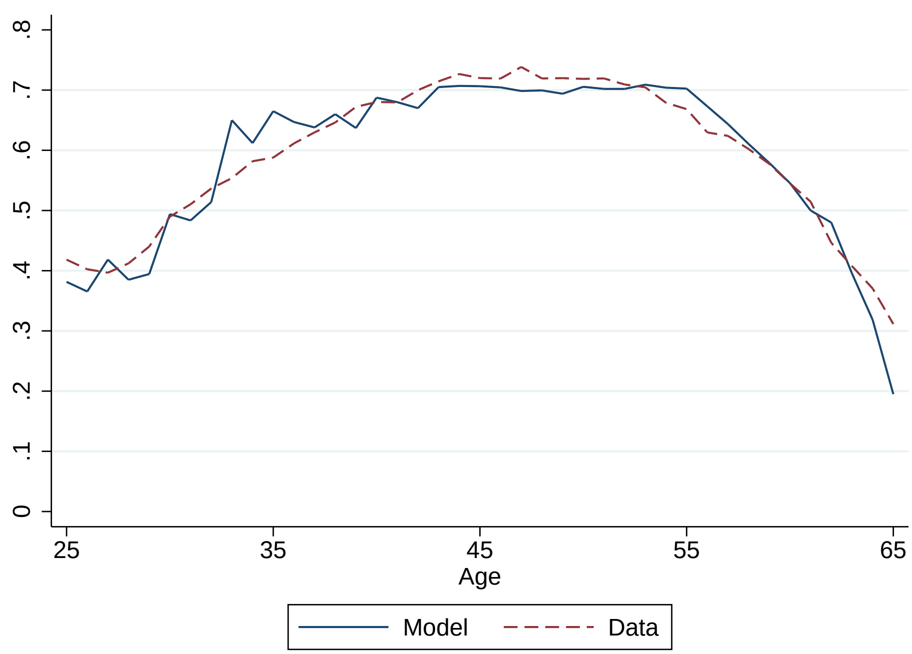

Figure 1: Female employment rate over the life-cycle

In regards to labor income in table 3 we show earnings distribution for men and women at middle ages (45 to 55). The different percentiles are fairly similar to what we observe in the data, however there are some discrepancies, in particular at the bottom of the distribution. It is important to note here that whereas male earnings distribution is exogenous, female earnings distribution is endogenous both because

Table 2: Labor market experience

	Model	Data
Number of years of experience percentiles:		
25%	22	23
50%	32	32
75%	38	37
Claiming age :		
62	0.36	0.49
63	0.11	0.12
64	0.10	0.05
65	0.16	0.17
≥ 66	0.26	0.17
Average number of years of experience by claiming age:		
62	25	29
63	31	29
64	33	31
65	34	32
≥ 66	38	35

Data source: RAND HRS Data Version N and Haaga and Johnson (2012).

Table 3: Earnings distribution

	Model	Data
Husband's earnings percentiles:		
25%	36,288	30,460
50%	46,382	49,636
75%	74,804	72,821
Wife's earnings percentiles:		
25%	17,440	15,084
50%	24,780	27,346
75%	38,600	43,516

Data source: IPUMS-CPS, 1962-2012 waves. 2008 US dollars. Workers aged 45 to 55.

of self-selection of women into the labor market and because of the returns to labor market experience that shape wages. Another important dimension in which our model has to be assessed is households' asset holdings relative to income. As reported in table 4 median assets across household's income percentiles for households aged 55 to 64 variate in similar fashion than in the data being increasing in household's income. However our model over-predicts the size of assets at that age with the remarkable exception of the households who belong to the first household income quintile. We believe that it is precisely for this group that is important that our model provides an accurate volume of assets since it is the group for which public pension income is a larger fraction of their total lifetime income.

Finally, we look at the distribution of pension benefits in table 5. It has to be taken into account that data values are calculated including disability pensions that tend to be smaller than pure retired worker pensions.[21] Therefore this is a source of discrepancy between the model and the data statistics. There are several things that are worth noting. First the distribution of male pension benefits is fairly similar to the data. Second the fraction of women who are entitled to a public pension as retired-workers only (these are married women whose pension is higher than 50% of their husband's pension) is equal to 0.62 in the model and then very similar to the 0.60 in the data. Other women receive either a spousal

[21]Unfortunately in the IPUMS-CPS survey those who receive a disability pension cannot be identified separately from other Social Security beneficiaries. According to the Social Security Administration in 2008 about 30% of Social Security beneficiaries aged 62 to 65 were receiving a disability pension. Average disable worker's pension is about 9% lower than *normal* worker's pension.

Table 4: Median Assets by Household Income (aged 55-64)

	Model	Data
Percentiles:		
20%	109,276	122,366
40%	175,315	132,506
60%	243,703	200,770
80%	343,467	245,019
100%	601,128	458,400

Data source: SIPP 2008, Core and Topical. 2008 US dollars.

pension benefit only or they are dually entitled as retired workers and spouses.[22] Therefore the fraction of women who benefit from the spousal benefit, either as their only source of income or as supplement to their retired worker pension, is very large. Finally, we report the distribution of pensions for women who are entitled as retired workers exclusively and the distribution of pensions for other women. Female pension benefits are larger in the model than in the data for two reasons. One reason is that the model is not able to account for the distribution of claiming age, in particular the early retirement. Another reason is that, as we said above, data values reflect the effect of disability pensions.

All in all we believe the model provides a satisfactory picture of what it is observed in the data in terms of female labor market participation, earnings, assets and public pension statistics and therefore it is an appropriate setup to carry on the policy evaluation exercise we present in section 4.

4 Policy Evaluation

In this section we explore the effect of three different reforms of the public pension system in the US: (i) removing the spousal benefit (reform 1), (ii) removing both the spousal and survivor's pension benefit (reform 2) and (iii) increasing the number of periods used to calculate the AIME from 35 to 40 (reform 3). The latter implies that for someone who worked only for 35 periods at a constant wage, the retired worker pension would be reduced by about 12% if her labor supply is kept constant.

The impact on the average life-cycle employment profile of reforms 1 and 2 is depicted in figure 2 where

[22] Unfortunately in the data we cannot distinguish those women who receive a spousal pension benefit only from those who receive it as a supplement to their retired worker pension.

Table 5: Distribution of pensions

	Model	Data
Men's percentiles:		
25%	12,631	11,676
50%	16,250	15,500
75%	20,340	18,537
Fraction of women entitled as workers	0.62	0.60
Women's percentiles (entitled as retired-workers only):		
25%	9,117	8,043
50%	12,426	10,234
75%	14,081	13,248
Women's percentiles (other):		
25%	6,515	4,470
50%	7,605	6,809
75%	10,060	8,124

Data source: IPUMS-CPS, 1962-2012 waves. 2008 US dollars.

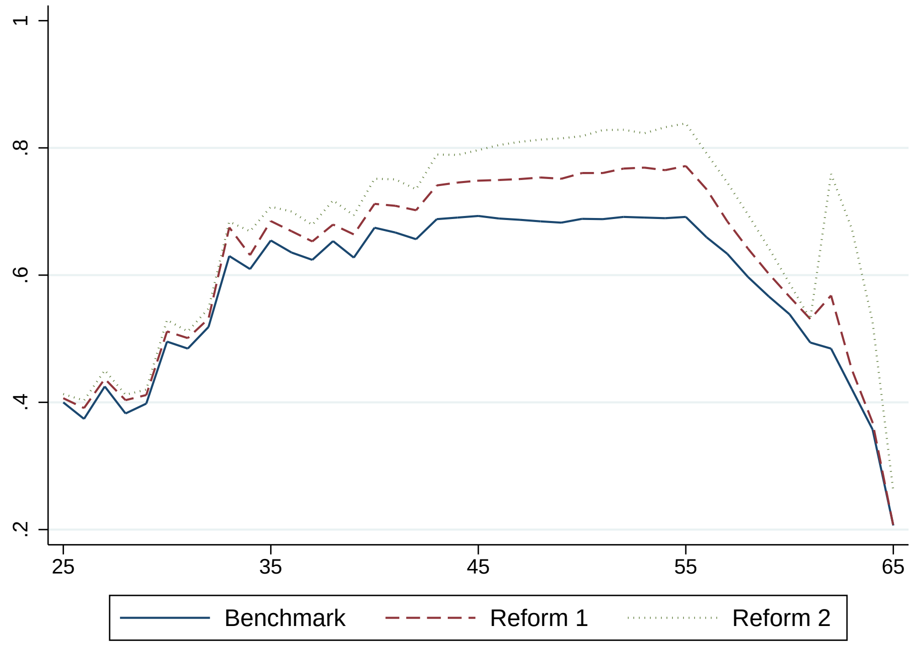

Figure 2: Life-cycle female employment rate

it can be seen that the effect is very substantial. In table 6 we report the variation of the employment rate for different age groups. The largest effect of reform 1 is found after middle ages (ages 45 to 60), with an average increase of 6 percentage points within each group. The effect is also strong within age groups 40 to 45 and 60 to 65, with about 3 additional points of participation with respect to the benchmark. Employment rate of women younger than 40 slightly increases as a result of the reform but the effect of about 2 percentage points is not negligible. Obviously the effect of reform 2 is of a larger magnitude as it removes altogether the spousal and survivor's pension benefit. After the age of 40 the variation in employment rate is equal or above 12 percentage points in all age groups. The largest effect is found after the age of 60 and it is mainly driven by the delay of the claiming age. Interestingly, the removal of the spousal benefit produces a peak in employment rate at the age of 62 (reaching a value of 0.54 in contrast to 0.48 before the reform) that it is exacerbated after the removal of the survivor's pension benefit (reaching a value of 0.77). The reason to observe this behavior may be related to the penalties that apply for early retirement. The penalties are designed to be actuarially fair for the average individual[23] in order to avoid distortions of the retirement decision. However, women live longer

[23]There have been several attempts in the literature to assess whether the penalty structure due to the early retirement is actuarially fair and the accepted result is that Social Securitys age-related reductions for early retirement

Table 6: Policy evaluation: variation of employment rate with respect to the benchmark (percentage points)

	Reform 1	Reform 2	Reform 3
25-29	1	2	1
30-34	2	4	0
35-39	3	6	0
40-44	4	8	0
45-49	6	12	0
50-54	7	14	0
55-59	6	12	0
60-65	3	17	2
All	4	9	0

Reform 1: removing the spousal benefit, Reform 2: removing both the spousal and the survivor's pension benefit and Reform 3: increasing the number of periods used to calculate the AIME from 35 to 40.

than the average individual and the penalties may be burdensome for them. As a consequence some women choose to work after age 61, in contrast to what they did before the reform. The reason is that before the reform the survivor pension benefit worked effectively as a minimum pension for women and therefore reduced their incentives to work. Noticeable the effect on employment is also very substantial before the age of 40 with a variation in the employment rate that goes from 2 percentage points in the age group 25 to 29 to 9 percentage points in the age group 35 to 39. Hence the consideration of a full life-cycle model is important to assess the elimination of spousal and survivor's pension benefits that are currently important provisions of the public pension system in the US. Finally, the extension from 35 to 40 of the number of periods to be considered in calculating the AIME has a mild effect of less than 1 percentage point on the employment rate of women (see figure 3) and last column in table 6. The effect is of course more visible at the beginning and at the end of the life-cycle.

All in all the effect on female employment rate of reforms 1 and 2 is sizeable, with an average increase of 4 percentage points in the case of reform 1 and 9 percentage points in the case of reform 2. The impact of reform 3 is below 1 percentage point increase in employment.

are approximately actuarially fair for individuals with average mortality, see for instance Crawford and Lilien (1981), Benítez-Silva and Heiland (2007), Sun and Webb (2011) and Gruber and Wise (2005).

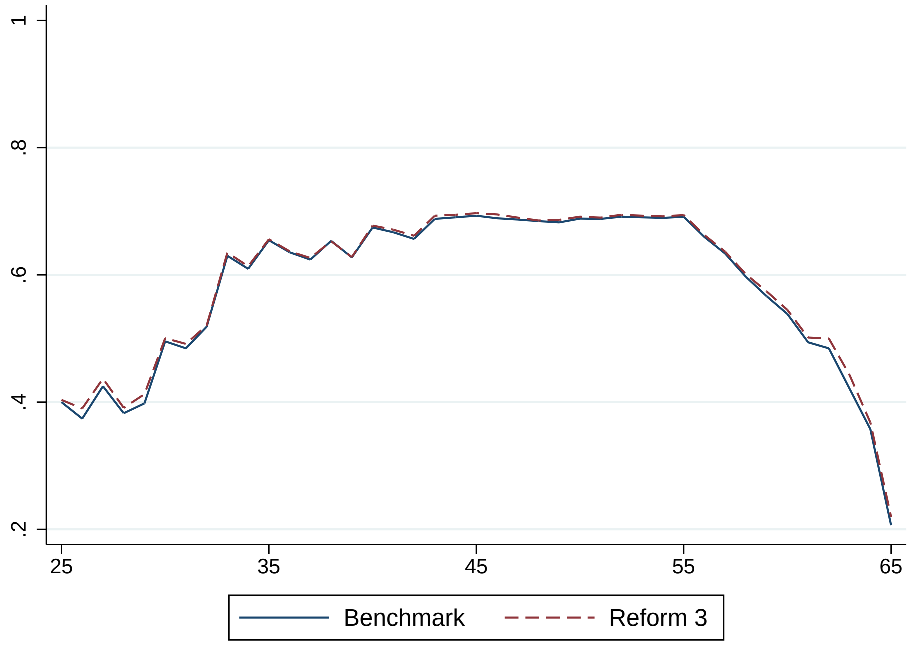

Figure 3: Life-cycle female employment rate

The implications of the reforms that are analyzed here go beyond its effect on female employment rate. In table 7 we look at the effect on the average pension of women and on the Gini index of households Social Security income and consumption. The average pension of women decreases from 12,324 in the benchmark economy to 10,682 in the economy without spousal benefit. This is obviously due to the fact that married women who are not eligible for their own worker pension are not receiving any benefit from the Social Security. Furthermore, as a result of the increase in employment rate there are more women who are eligible for a worker's pension (the fraction goes from 62% to 83%), but these are on average less productive women than women who were already eligible in the benchmark economy.[24] The further removal of the survivor's pension benefit reduces the average women's pension to 9,083. Note that the elimination of the survivor's pension benefit increases the fraction of women who are eligible to 87%, but still leaves some women without a public pension, not only during marriage, but also during widowhood. Of course the negative effect of this on the average pension dominates the positive effect of the slight increase in the average number years of experience that goes up from 28.8 in the benchmark to 29.2 under reform 1 and to 30.6 under reform 2.[25] Finally, as can be seen in the second row of

[24]This is because the positive self-selection into the labor market that the model implies.

[25]A larger number of years of experience positively affects the AIME (and therefore the pension benefit), directly

Table 7: Policy evaluation: other implications (households aged 66 or older)

	Benchmark	Reform 1	Reform 2	Reform 3
Women's average pension	12,324	10,682	9,083	12,066
Household Social Security Income's Gini Index	0.187	0.174	0.274	0.190
Household Consumption's Gini Index	0.252	0.249	0.253	0.253

the table, reform 2 has a dramatic effect on household's pension income inequality that goes up from 0.187 in the benchmark, as measured by the Gini index, to 0.274. However, its effect on household's consumption inequality is mild, the Gini index goes up from 0.252 to 0.253. The interpretation of this is that households use assets in order to smooth consumption over their life-cycle.

5 Conclusions

In this paper we use a partial equilibrium life-cycle model of household saving and female labor market participation decisions to assess several reforms of the US Social Security pension system. In our model individuals face earnings uncertainty as well as lifetime uncertainty. In addition a distinctive feature is that returns to labor market experience operate so participation decisions affect not only current earnings and Social Security pension eligibility, but also future earnings. In this setup we evaluate the effect of removing spousal benefit, removing altogether spousal and survivor's pension benefit and extending from 35 to 40 the number of periods of the whole working career that are considered in calculating the worker's Primary Insurance Amount. Our focus is on the effects of these reforms on the complete female life-cycle participation profile. We find that the effect is very substantial after the age of 40, but it is not negligible before that age. Average participation increases by 4 percentage points in the case in which the spousal benefit is eliminated and by 9 percentage points in the case in which both the spousal and survivor's pension benefits are taken away. Finally, extending from 35 to 40 the number of periods that are considered in calculating the worker's Primary Insurance Amount has a mild effect on female employment rate. Finally, although removing the spousal and survivor's pension benefits dramatically increases Social Security income inequality there is only a slight increase in consumption

through the number of periods that are considered for its computation and indirectly through higher wages.

inequality because in the absence of these pensions households use savings to smooth consumption over the life-cycle.

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Appendix A

In this Appendix we describe the solution method of the model economy we use for our analysis.

Households have a finite horizon and so the model is solved numerically by backward recursion from the terminal period. At each age we solve the value function and optimal policy rule, given the current state variables and the solution to the value function in the next period. This approach is standard. The complication in our model arises from the combination of a discrete choice (to participate or not) and a continuous choice (over savings). This combination means that the value function will not necessarily be concave. We briefly describe in this appendix how we deal with this potential non-concavity. In addition to age, there are four state variables in this problem: the asset stock, the permanent component of earnings of the husband, ν_t^m, the permanent component of earnings of the wife, ν_t,and the experience level of the wife. We discretize both earnings variables and the experience level, leaving the asset stock as the only continuous state variable. Since both permanent components of earnings are non-stationary, we are able to approximate this by a stationary, discrete process only because of the finite horizon of the process. We select the nodes to match the paths of the mean shock and the unconditional variance over the life-cycle. In particular, the unconditional variance of the permanent component must increase linearly with age, with the slope given by the conditional variance of the permanent shock. Value functions are increasing in assets (a_t) but they are not necessarily concave, even if we condition on the labour market status in t. The non-concavity arises because of changes in labor market status in future periods: the slope of the value function is given by the marginal utility of consumption, but this is not monotonic in the asset stock because consumption can decline as assets increase and expected labour market status in future periods changes. By contrast, in Danforth (1979) employment is an absorbing state and so the conditional value function will be concave. Under certainty, the number of kinks in the conditional value function is given by the number of periods of life remaining. If there is enough uncertainty, then changes in work status in the future will be smoothed out leaving the expected value function concave: whether or not an individual will work in $t+1$ at a given a_t depends on the realization of shocks in $t+1$. Using uncertainty to avoid non-concavities is analogous to the use of lotteries elsewhere in the literature. The choice of participation status in t is determined by the maximum of the conditional value functions in t. In our solution, we impose and check restrictions on this participation choice. In particular, we use the restriction that the participation decision switches only once as assets increase, conditional on permanent earnings and experience. When this restriction holds, it allows us to interpolate behaviour across the asset grid without losing our ability to determine participation status. We therefore define a reservation asset stock, R_t to separate the value function and the choice of consumption made when participating from the value function and choice of consumption made when not participating. Solving for the reservation asset stock serves two purposes: one, it makes it easier to allow for the fixed cost in the budget constraint in the solution (rather than having an unconditional policy function with a discontinuity); two, it provides an additional check on our numerical solution: the reservation asset stock should be increasing in the wage rate. A sufficient condition for this to be unique is that the conditional value functions be concave. This is not true in general, as discussed above, but uniqueness can be achieved by having enough uncertainty to make the conditional expected value function concave. Even when the conditional value functions are not concave, however, we can have a unique reservation asset stock, particularly if individuals are impatient enough: impatience means that individuals prefer periods of non-participation to be earlier in the life-cycle and thereby, avoiding indifference about the timing of leisure which can generate non-uniqueness.[26] In solving the maximization problem at a given point in the state space, we use a simple golden search method. We solve the model and do the calibration assuming this process is appropriate and assuming there is a unique reservation asset stock for each point in the state space. We then check that the results in our benchmark case are unaffected when we

[26] In principle, we could test whether this unique reservation asset stock property held empirically. However, such a test would be difficult given the quality of asset data. Further, a rejection in the data may well be generated by unobserved heterogeneity which would not be a problem in our solution where the solution is carried out separately for each type of person.

use a global optimizing routine, simulated annealing, and we do not assume a unique reservation asset stock. It is worth stressing that there are parameter values for which the techniques we used do not work. In particular, the assumption of a unique reservation asset stock fails as the variance of shocks gets sufficiently low and if households have discount rates very close to the interest rate. There are no non-concavities due to borrowing constraints in our model because the only borrowing constraint is generated by the no-bankruptcy condition which is in effect enforced by having infinite marginal utility of consumption at zero consumption.

Appendix B

In this Appendix we provide a detailed description of the approximation we use for each individual AIME. As we said in section 2.5.2 we approximate the AIME as a function of the earnings in the last working period and the number of years of contribution to the pension system. More specifically for each period we calculate fictitious earnings based on the stochastic component of the earnings in the last working period (which is a state variable at claiming age) and on the age (in the case of men) or the level of human capital (in the case of women) in that particular period. However, there is an inconvenience of relying on the last working period stochastic component of the earnings because due to the nature of the stochastic process that we assume the variance of earnings is increasing over the life cycle (consistent with what it is found in the data). In order to deal with this we proceed in slightly different way to approximate the AIME for men and women. In the case of men we make the $\widehat{AIME}^m$ a function of the average of the fictitious earnings over the last N working periods

$$\ln \widehat{AIME}^m = \gamma_1^m + \gamma_2^m \ln \sum_{k=1}^{N} \frac{exp(\ln y_0^m + \alpha_1^m (t_{cl}^m - k) + \alpha_2^m (t_{cl}^m - k)^2 + v_{t_{cl}^m - 1}^m)}{N} \tag{13}$$

with $v_{t_{cl}^m-1}^m$ being the stochastic component of earnings in the last working period. The parameters γ_1^m and γ_2^m are the estimated coefficients of a linear regression of $\ln AIME^m$ (true AIME) on the average of the last N working periods fictitious earnings in the simulated data.

In the case of women, who may have a number of periods of contribution $h_{t_{cl}^f} < N$, we use a different formulae in order to avoid that the effect of periods with zero earnings on the approximated AIME is smoothed (as it would happen if we use the formulae above). In fact, it is very important for our analysis to capture the incentives to work through the AIME. Therefore we calculate $\widehat{AIME}^f$ as follows

$$\ln \widehat{AIME}^f = \frac{\sum_{k=1}^{min(N,h_{t^f_{cl}})} exp(\ln y^f_0 + \alpha^f_1(h_{t^f_{cl}} - k) + \alpha^f_2(h_{t^f_{cl}} - k)^2 + exp(\gamma^f_1 + \gamma^f_2 \ln v^f_{t^f_{cl}-1}))}{N} \quad (14)$$

where in this case γ^f_1 and γ^f_2 are the estimated coefficients of a linear regression of the log of the average of the stochastic component of earnings over the working career on the log of its value in the last working period $v^f_{t^f_{cl}-1}$ in the simulated data.

The parameter values that we estimate for the approximation are $\gamma^m_1 = 2.47$, $\gamma^m_2 = 0.78$, $\gamma^f_1 = 0.93$ and $\gamma^f_2 = 0.67$. Note that we need to solve the model and iterate in these parameters so that the individual decisions are based on the formulae that use parameter values that are consistent with the simulated data.

In order to assess the accuracy of our approximations in table 8 we compare the distribution of the true $AIME^g$ and the distribution of $\widehat{AIME}^g$ in the simulated data. We think the approximation is satisfactory.

Table 8: Accuracy of AIME approximation

	True	Approximation
Men		
Percentiles:		
1%	16,435	16,995
5%	20,496	20,614
10%	24,074 24,966	
25%	33,199	36,570
50%	48,980	44,964
75%	71,953	66,227
90%	99,084	95,073
95%	118,895	115,091
100%	150,093	141,133
Women		
Percentiles:		
1%	4,481	4,525
5%	6,861	7,051
10%	9,209	9,939
25%	14,335	15,486
50%	22,016	23,767
75%	33,501	33,955
90%	45,560	43,514
95%	54,739	52,486
100%	68,477	67,196