1 Lecture 1. Social Security and Savings

Several interesting and related issues related to this topic:

Do people save sufficiently for their retirement? In particular low income people.

Does Social Security increase welfare for the elderly?

Several issues related to the life-cycle model:

Why do people on average consume less after retirement? The retirement-consumption puzzle.

Do young people save enough for their retirement? Do old people dissave sufficiently?

Should there be subsidies for retirement savings?

Do social security PAYG plans crowd out savings?

Feldstein (1974). Very influential study, which - among other things - predicted that social security decreased the capital stock by 38 percent, which, in turn, would decrease wages by 15 percent.

Distinguishes between two effects of social security on savings.

1. It reduces savings because it is a substitute for assets.
2. Increases savings because it makes workers retire earlier (induced retirement). This, in turn, may increase savings since prolongs the period of when accumulated assets are consumed.

Graphical illustration.

Empirical question which effect that dominates.

Aggregate consumption function:

$$C_t = \alpha + \beta_1 Y_t + \beta_2 RE_t + \gamma_1 W_{t-1} + \gamma_2 SSW_t$$

Y_t- aggregate permanent income.
$W_{t-1}-$ aggregate household wealth.
RE_t- "retained earnings".
SSW_t- aggregate social security wealth.

Discussion on net or gross social security wealth. Concludes that gross is probably the best measure, since social security taxes are already deducted from observed incomes.

Calculation of aggregate social security wealth.

Assumes that the social security benefits will correspond to about 41 percent of average earnings. Anticipated benefits will therefore be:

$$b_{a,t} = 0.41 Y_t (1+g)^{65-a}.$$

Same growth rate also after retirement, i.e., $b_{a,t} = 0.41 Y_t (1+g)^{n-65}$ for ages n larger than 65.

$g-$ is growth rate.

Present value of the future benefits:

$$A_{a,t} = S_{a,65} (1+d)^{-(65-a)} \sum_{n \geq 65} S_{65,n} b_{a,t} (1+g)^{n-65} (1+d)^{-(n-65)}$$

$d-$ discount factor.

Possible to substitute for all $b_{a,t}$ and thus obtain expressions from aggregate data.

Similar calculation for all tax payments:

$$TAX_{a,t} = \sum_{m=a}^{64} S_{a,m} \theta_{t+m-a} Y_t \left[(1+g) / (1+d) \right]^{m-a}$$

Data for calculating all these measures are obtained from the National accounts. However, the values of d and g must be set. The ratio $(1+d)/(1+g)$ is what matters. Different values of this ratio are evaluated as a sensitivity analysis.

Results:

Different specifications using primarily different ways to calculate SSW. Uses IV to correct for simultaneity bias.

In general positive and significant estimates. Higher point estimates than for household financial wealth. Attributes this difference to the fact that social security is more evenly distributed.

Implications of the results:

Uses the 0.650 coefficient for disposable income and the 0.021 coefficient for SSW. Implies a reduction of aggregate savings of 18 billion $US\$$ from the tax payments on 51 billion $US\$$ and a 43 billion reduction from the 2,029 billion SSWG. Together a 61 billion reduction of personal savings from the social security.

Reduced total private savings by 38 percent and therefore in the long run the capital stock by 38 percent. By assuming a Cobb-Douglas production function and a coefficient on capital on 0.3, he concludes that wage rates would increase with 15 % and interest rates would decrease by 28 % if Social Security was abolished.

- Income redistribution from workers to capital owners.
- Induced retirement may lead to lower income for the elderly.

Weaknesses:

All that can be said about the effect of trends in macro data econometrics applies here. Aggregation problems.

Stories about programing errors.

King and Dicks-Mireaux (1982). First famous study using individual data. Investigates the life-cycle hypothesis of savings and consumption. Effect of social security on savings just a by-product.

Descriptive statistics of net worth. Cross-section data from Canada. Net worth includes information on cash, deposits, bonds, stocks, and shares, registered savings plans, vehicles, owns occupied houses and other real estate, less debt of various kinds.

Two facts from the previous literature that suggest that the life-cycle model do not apply:

1. Some save too much by the end of their life (bequest motive?)
2. Some save too little. Restricted by low earnings?

Wealth-age profile:

$$\ln(W/Y) = f(A, \mathbf{X}) + u,$$

$W/Y-$ is the ratio between wealth and permanent earnings.

Piece-wise linear specification in age. Dummy variables:

$$\begin{aligned} d_{1i} &= 1 \text{ if } A_i < 30, \text{ zero otherwise} \\ d_{2i} &= 1 \text{ if } 30 \leq A_i < 40, \text{ zero otherwise} \\ & \quad . \\ & \quad . \\ d_{5i} &= 1 \text{ if } 60 \leq A_i < 75, \text{ zero otherwise} \\ d_{6i} &= 1 \text{ if } 75 < A_i, \text{ zero otherwise} \end{aligned}$$

$$
\begin{aligned}
V_{1i} &= d_{1i}(A_i - 15) + 15\sum_{j=2}^{6} d_{ji}, \\
V_{2i} &= d_{2i}(A_i - 15) + 10\sum_{j=3}^{6} d_{ji}, \\
&. \\
&. \\
V_{5i} &= d_{5i}(A_i - 60) + 15 d_{6i}, \\
V_{2i} &= d_{5i}(A_i - 60)^2 + 225 d_{6i}, \\
V_{7i} &= d_{6i}.
\end{aligned}
$$

Estimate as

$$\ln(W/Y) = a_0 + \sum a_j V_{ji} + u_i,$$

The idea with this specification is that it allows for linear segments up to age 60. Between age 60 and 75 it allows for a maximum.

The maximum is at age $60 - a_5/2a_6$.

Estimating permanent income

Estimates an earnings equation

$$\ln Y_i = \mathbf{Z}_i \boldsymbol{\gamma} + s_i - c(A_i),$$

where $\mathbf{Z}_i$ is a set of observable characteristics and s_i is an individual fixed effect.

Current earnings and permanent earnings differ from two reasons: life-cycle differences and transitory disturbances.

$$\ln E_{it} = \mathbf{Z}_i \boldsymbol{\gamma} + g(A_{it}) + s_i + u_{it},$$

Minimum variance estimator of s_i given information on $s_i + u_{it}$ (witch is what he gets from his cross-section data is

$$\widehat{s_i} = \alpha(s_i + u_{it}),$$

where

$$\alpha = \frac{\sigma_s^2}{\sigma_s^2 + \sigma_u^2}.$$

Problem is that they could not estimate σ_s^2 and σ_u^2 in the sample, since they only have access to cross-section data. They obtain estimates of those from secondary sources (paper by Lillard and Wiess, 1979).

Lots of discussion on problems with sample selection - skip over that (influence from Heckman typical for that era)

Results:

All results shows apparent evidence for the humped shaped relation wealth-income ratio. Two sets of results: wealth measures including and excluding equity in own home, respectively.

Test for homotheticity, i.e., that the wealth income ratio is independent of level of income. This is rejected. Possible explanation is that private pension programs are more prevalent among high income earners. Homotheticity is not rejected when these are excluded.

Effect of Social Security

Social security and pension wealth are calculated from the age-earnings profiles.

$$\ln TW = \ln W + \eta \ln SW + \delta D_1 \ln PW$$

where $D_1 = 1$ if the household is eligible for a private pension plan. $\eta = 1$ is SSW and household wealth are perfect substitutes.

$$\ln (W_i/Y_i) = f(A_i) - \eta \ln (SW_i/Y_i) + \delta D_1 \ln (PW/Y_i) + \rho \ln Y_i.$$

Results indicate that there are fairly low substitutability between household wealth and social security. For one extra dollar of social security wealth is decreased by 0.24.

Weaknesses??

Attanasio and Brugiavini (2003). Analyzes the effect of the famous 1992 Amato reform of the Italian public pension system on savings.

Amato reform:

1. Increase in the normal retirement age from 55 to 60 for women and from 60 to 65 for men.
2. Increase in the minimum number of years of contribution from 15 to 20.
3. 35 years of contribution for early retirement option applied to all funds.
4. Average of five last years of earnings replaced by average over the entire career.

Gradual implementation. Fully phased in 2032. Younger cohorts affected to a larger extent.

Quite similar to the Swedish pension reform.
Different empirical approaches

First try: RD design. Split the sample in two groups: thos with more than 15 years of contribution in 1992 in one group and those with less than 15 years of contributions.

$$[\overline{sr}_y (16, 93) - \overline{sr}_o (16, 93)] - [\overline{sr}_y (14, 91) - \overline{sr}_o (14, 91)]$$

They do this for different groups and conclude larger effects for more affected groups. Low precision in the estimates.

Different groups were differently affected by the Amato reform. Relate group averages in change in pension wealth to the change in savings rate. Figure I shows a negative relation.

More structural approach:
They depart from a four period model and derive a function for the savings rate. From that they derive the econometric model:

$$SR_{i,t} = X_{i,t}\beta + \phi\left(a_{i,t}\right) FE_{i,t} + \theta\left(a_{i,t}\right) PW_{i,t} + x_t + f_c + \epsilon_{i,t}$$

$FE-$ the ratio of future to current earnings.
$PW-$ pension wealth.
x_t- time dummies.
f_c- fixed group effects.

$\phi\left(a_{i,t}\right)$ and $\theta\left(a_{i,t}\right)$ are time and age dependent parameter vectors.

Sources of bias:

1. Measurement errors.
2. Unobserved heterogeneity.

Instrumental Variables. Interactions with cohort and group dummies. Try different groups.

Data

1989, 1991, 1993 and 1995 Survey on Household Income and wealth provided by the Bank of Italy.

Identifying assumption: There are no group/time-specific effects on savings other than the effect through the reform. In the extended analysis this assumption is somewhat relaxed by including interactions between years and cohorts only. Identification through year and occupation interaction.

Attanasio and Rohwedder (2003). Most influential recent study in this field.

Uses repeated cross-sections from the UK and pension reforms as "exogenous variation" in social security coverage and levels.

British pension system consists of two parts Basic pension (BSP) and SERPS which is related to previous earnings:

Basic pension (BSP).

Flat rate benefit (not related to previous earnings). Pension age 60 for females and 65 for males.

Indexation. Three eras:

1. Until early 1970ties: ad hoc upgrading of the pension levels (like the ceiling in Swedish UI).
2. From 1975 roughly indexed by the growth rate in gross earnings.
3. From 1980-1981: the government decides to link it to prices only.

20 percent of average earnings in early 1970ties, 15 percent now and predicted to be about 7 percent in 2050.

SERPS

Introduced in 1978 and implied a great increase in the pension wealth for those who became eligible. Up to 1987 those who did not have an occupational pension were eligible.

Critical assumption: workers did not systematically select themselves to jobs with private pensions.

From 1988 and onwards: workers could choose to opt out even if they were not in an occupational pension plan. Could choose to join any approved pension plan. SERPs no longer exogenous. Limits the study to data before 1987.

Indexation changes decreased and introduction of SERPS increased pensions. Affected also different groups. Magnitude of the change differ by age of birth of head of household. Differ also by household composition and age-pairs.

SERPS affected men born after 1913 and women born after 1918.

Not affected:

1. Older cohorts.
2. Those who already have an occupational pension.
3. Those with very low earnings.

Higher for later cohorts due to maturing of the system.

Data

FES (Family Expenditure Survey)

About 7,000 households each year.
1974-1987 surveys used. Individuals born between 1909 and 1968.

Final sample of about 4,000 individuals. Savings measured as the residual between income and spending.

1. Assumptions for the computation of pension wealth:
2. Entitlement they would have when they retire assuming current legislation.
3. Perfect foresight about the macro economy.
4. Current family characteristics given.
5. Uncertainty about longevity according to projections.
6. Lifetime earnings profiles.
7. People retire at normal retirement ages at age 60 for females and 65 for males.

$$E_t\left(PW_{it}\right) = \sum_{k=R_i}^{T} \frac{b_{itk} \cdot s_{tk}}{\left(1+r\right)^{k-t}} - \sum_{j=t}^{R_i-1} \frac{w_j \cdot c_j \cdot s_{tj}}{\left(1+r\right)^{j}}.$$

EPW increases by age for three reasons:

1. Older individuals need to discount for fewer periods.
2. Lower mortality risk.
3. Fewer remaining contributions.

Attanasio and Rohwedder develops a four period theoretical model.

The individual maximizes lifetime utility

$$\max_{c_t, t=1,\ldots,4} \sum_{t=1}^{4} \beta^{t-1} \log\left(c_t\right)$$

$$s.t. \sum_{t=1}^{4} \frac{c_t}{\left(1+r\right)^{t-1}} \leq \sum_{t=1}^{3} \left(\frac{w_t}{\left(1+r\right)^{t-1}}\right) + \frac{b}{(1+r)^3}$$

Intertemporal budget constraint: $A_t = A_{t-1}\left(1+r\right) + w_t - c_t, \quad t = 1, 2, 3;$
$A_0 = A_4 = 0$

Gives the optimal consumption levels for each period:
$c_1 = \frac{1}{1+\beta+\beta^2+\beta^3} \times \left[w_1 + \frac{w_2}{1+r} + \frac{w_3}{(1+r)^2} + \frac{b}{(1+r)^3}\right]$
$c_2 = \frac{\beta}{1+\beta+\beta^2+\beta^3} \times \left[w_1\left(1+r\right) + w_2 + \frac{w_3}{(1+r)} + \frac{b}{(1+r)^2}\right] =$
$= \frac{\beta}{1+\beta+\beta^2} \times \left[A_1\left(1+r\right) + w_2 + \frac{w_3}{(1+r)} + \frac{b}{(1+r)^2}\right]$
$c_3 = \frac{\beta^2}{1+\beta+\beta^2+\beta^3} \times \left[w_1\left(1+r\right)^2 + w_2\left(1+r\right) + w_3 + \frac{b}{(1+r)}\right] = \frac{\beta^2}{1+\beta+\beta^2} \times \left[A_1\left(1+r\right)^2 + w_2\left(1+r\right.\right.$

where $A_t = A_{t-1}\left(1+r\right) + w_t - c_t, \quad t = 1, 2, 3;$
$A_0 = A_4 = 0$

The idea here is to show that the optimal consumption level for e.g. period two can be rewritten as seen from the first period or as seen from the second period. This applies only if the rules in social security do not change. If they do change, the individual have to reoptimize. Thus, the response to the reform will depend on when during the life cycle the reform happens.

Empirical specification

Uses the theoretical model for the empirical specification of savings behavior. For example savings in period two can be written as

$$\frac{y_2 - c_2}{y_2} = 1 - \Psi \cdot \frac{b}{(1+r)^2 y_2} - \Psi \cdot \frac{1}{y_2} \left[w_1 (1+r) + w_2 + \frac{w_3}{1+r} \right],$$

where Ψ depends on β and when the household is observed. If an age 2 household is observed in a reform year, the second expression would be used. If it is observed after the reform, the first would be used.

This specification is generalized to a multiperiod framework. Finally, the SERPS and BSP reforms are allowed to have differential effects.

First set of result: OLS. However, both measurement errors and endogeneity problems are likely to be present. For the results presented: β set to 0.98 and r to 0.03.

Uses the fact that the reform did affect different cohort groups and also different groups on the labor market differently. Therefore possible to use the interaction of group dummies and year dummies as instruments for pension wealth.

Legitimate if:

1. Controling group and age dummies, the interaction has no separate affect in addition to the effect on pension wealth.
2. Pension wealth varies over these interactions.

Weaknesses??