Private Pensions, Retirement Wealth and Lifetime Earnings

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Question

- How do private pension plans impact the distribution of retirement wealth?

- Can incorporating private pension plans into the “standard” life cycle model improve ability of model to match large heterogeneity in retirement wealth of households with similar lifetime earnings observed in data?
Motivation

1. Employer pension plans offered to large fraction of U.S. population and significant component of retirement wealth: 
   *but*: Most life cycle models abstract from employer pensions


3. Hendricks (2007a,b), Venti and Wise (1998) argue that the bulk of the dispersion in retirement wealth is attributed to differences in saving propensities, possibly due to heterogeneity in household preferences
Mechanism: Why Private Pensions might Matter

- Private pensions should have direct and indirect effect on wealth distribution
  1. Direct effect: households with pensions should save less than households without pensions
  2. Indirect effect: private (defined benefit) pensions can increase risk over life-cycle
     Why: household coverage by private pensions is incomplete
        ⇒ risk of losing coverage (due to potential job loss)
        ⇒ creates additional precautionary saving motive for households with pensions

- Households with private pensions may have higher/lower non-pension wealth than household with same take-home pay but without pension – which leads to higher non-pension wealth inequality within earnings decile
What We Do

1. Use 1968-2005 waves of Panel Study of Income Dynamics (PSID) to compute earnings profile and wealth inequality by lifetime earnings decile

   Use 1999-2005 PSID Wealth Supplement which includes data on pension wealth (earlier PSID wealth surveys do not)

2. Compare data to predictions of stochastic life cycle model
   2.1 With stochastic employer (defined benefit) pension plans
   2.2 Without employer pension (‘‘standard’’ life-cycle model)
What We Find

1. Data: incorporating private pensions reduces retirement wealth inequality

2. Model: incorporating private pensions moves model predictions closer to data
   - Gini of non-pension retirement wealth ↑
   - Help to generate wealth poor households with high earnings

3. Problem: large gap between distribution of total retirement wealth including pensions in model and data

<table>
<thead>
<tr>
<th></th>
<th>PSID</th>
<th>Model without pensions</th>
<th>Model with pensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini of R.W. (no pension)</td>
<td>0.68</td>
<td>0.56</td>
<td>0.62</td>
</tr>
<tr>
<td>Mean Gini of R.W (no pension)</td>
<td>0.56</td>
<td>0.39</td>
<td>0.49</td>
</tr>
<tr>
<td>within lifetime earnings deciles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Gini of R.W (incl. pension)</td>
<td>0.52</td>
<td>—</td>
<td>0.37</td>
</tr>
</tbody>
</table>
Pension Wealth Significant in PSID

- Including pensions increases ratio of mean retirement wealth to lifetime earnings for all lifetime earnings deciles. Ratio increases roughly two percentage points on average within lifetime earnings deciles.
Private pensions reduces measured retirement wealth inequality among households with similar lifetime earnings: average Gini within lifetime earnings deciles drops from 0.56 to 0.52.
Wealth Inequality: Decile

![Graph showing wealth distribution for 2nd and 9th deciles.](image)

- **2nd Decile**
  - Net Worth
  - Net Worth + Pension

- **9th Decile**
  - Net Worth
  - Net Worth + Pension
Numerical Experiments

Do private pensions matter for retirement wealth distribution in “standard” stochastic life-cycle model?

1. Simulate model without private pensions
2. Simulate model with private pension

Key features

1. Private pension coverage: stochastic + correlated with earnings level
2. Stochastic earnings: persistent earnings shock
3. Age dependent probability of dying
4. Social security: based on average earnings
5. Stochastic inheritance
Model without Private Pensions: People

- Life begins at 20, work until 64, die by age 95.
- Stochastic mortality: zero probability of dying before age 52, average lifespan of household 82 years.
- Preferences represented by

$$
\sum_{j=1}^{J} \beta^{j-1} \prod_{t=0}^{j} P_{t} \frac{c_{j}^{1-\sigma}}{1-\sigma}
$$

- Household’s state summarized by $s = (j, k, e, \bar{y})$
  1. $j \in \{1, 2, ..., J\}$ is period
  2. $k \in \mathbb{R}$ is private wealth
  3. $e \in \{1, ..., n_e\}$ is earnings realization
  4. $\bar{y} \in \mathbb{R}_+$ is average earnings to present
Household Problem in Model without Private Pensions

- Household problem in period $j$ is given by

$$V[k, e, \bar{y}] = \max_c \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta P_{j+1} E[V(k', e', \bar{y}')] \right\}$$  \hspace{1cm} (2)$$

$$k' = (1 + r)k + y + l + \tau - c$$  \hspace{1cm} (3)$$

- where equation (3) is the flow budget constraint
- $l$ is a random inheritance governed by a probability distribution
- $\tau$ is social security benefits
- and earnings given by

$$y = l(e)h(j)$$  \hspace{1cm} (4)$$

$$e_{i,j+1} = \rho e_{i,j} + \epsilon_{i,j+1}$$  \hspace{1cm} (5)$$

$$\epsilon \sim N(0, \sigma^2)$$
Model with Private Pensions

- Add **two** more state variables: \( n_{db} \) and current pension status
- Private pension benefits given by

\[
db = \alpha(n_{db}) n_{db} \bar{y}_p
\]  

(\( \approx 80\% \) of present value of pensions for HH in PSID sample defined benefit)

- \( \bar{y}_p \): average income over last 35 years of working life
- \( n_{db} \): years of pension coverage
- \( \alpha(n_{db}) \): fraction of average income per year of coverage
- Transition matrix \( \Pi_p \): probability of retaining (losing) coverage for households with pension coverage and probability of gaining pension coverage for households without
- \( \Pi_p \) not symmetric: calibrate to generate ↑ fraction of population with coverage over life cycle
Paramaterization

- Follow Hendricks (2007b) so as to compare findings
- Households born at 20 and “work” until 64
- Households can live up to 95, no probability of death before age 52. Use female mortality rates from Period Life Table 1990
- Preferences: \( u(c) = \frac{c^{1-\sigma}}{1-\sigma} \)
  \( \sigma = 1.5 \)
  \( \beta = 0.958 \) chosen so that mean household wealth equals 6.9 times of mean household earnings net of taxes
- Risk free rate of return: 4%
- Approximate social security with step function \( \tau(\bar{y}) = 0.9 \min(\bar{y}, \bar{y}_1) + 0.32 \max(0, \min(\bar{y}, \bar{y}_2) - \bar{y}_1) + 0.15 \max(0, \bar{y} - \bar{y}_2) \)
- Approximate earnings process using 7 point Markov process
  \( \rho = 0.96, \sigma_\epsilon = 0.21, \sigma_{\epsilon 1} = 0.62 \)
  \( l(e) = (0.08, 0.19, 0.44, 1.00, 2.27, 5.18, 11.77) \)
Earnings profile (1968-2005 PSID)

1. Retirement wealth is observed
2. At least 15 years of nonzero earnings are observed for the head
3. The household’s core weight is positive
Private Pensions: Parameterization

- Transition matrix and initial fraction covered chosen to:
  1. Match initial pension coverage in 2004 SCF: 20%
  2. Match lifetime pension coverage in 1999-2005 PSID

- $\alpha(n_{db})$: Approximate this with step function
  1. Assume vesting of 7 years: $\alpha(n_{db} \leq 7) = 0$
     (Mitchell and Dykes (2003), Foster (1997))
  2. To capture backloading of benefits, we set
     $\alpha(n_{db} \in [8, 10]) = 1.25$
     $\alpha(n_{db} \in [11, 20]) = 1.62$
     $\alpha(n_{db} \in [21, 35]) = 2.5$
     $\alpha(n_{db} \in [36, 45]) = 2.5 \frac{35}{n_{db}}$

- Transition matrix:

<table>
<thead>
<tr>
<th></th>
<th>Pension</th>
<th>No pension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pension</td>
<td>0.91</td>
<td>0.09</td>
</tr>
<tr>
<td>No pension</td>
<td>0.03</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Private Pensions: Targets

- Lifetime pension coverage:
  PSID: 51%; Model: 53%

<table>
<thead>
<tr>
<th>Replacement Range</th>
<th>PSID Fraction</th>
<th>Mean Replacement</th>
<th>Model Fraction</th>
<th>Mean Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20%</td>
<td>38%</td>
<td>9.25%</td>
<td>35%</td>
<td>11.5%</td>
</tr>
<tr>
<td>[20%, 60%]</td>
<td>43%</td>
<td>38.11%</td>
<td>44%</td>
<td>33.5%</td>
</tr>
<tr>
<td>&gt; 60%</td>
<td>19%</td>
<td>75.21%</td>
<td>20%</td>
<td>75.6%</td>
</tr>
<tr>
<td>All</td>
<td>—</td>
<td>34%</td>
<td>—</td>
<td>34%</td>
</tr>
</tbody>
</table>
Numerical Experiments: Key Findings

- Pensions reduce discrepancy between model and data: non-pension wealth
  - Average Gini within lifetime earnings deciles increase from 0.39 to 0.49
Numerical Experiments: Key Findings

- Puzzle remains: total retirement wealth
Retirement wealth excluding pension (Net worth)

- Private pensions help to generate wealth poor households with high earnings
Total retirement wealth (including pensions): two discrepancies between data and model

1. Data: a number of low net worth households lack pensions
   Model: almost all low net worth households have pensions
2. Data: some high net worth households have very large pensions
   Model: not able to generate this pattern
High substitution between pension wealth and non-pension wealth in the model

Social security has much larger impact on retirement wealth distribution than private pensions
Conclusion: What Next

- Private pensions move predictions of model closer to data – but puzzles remain

Possible Extensions

- Improved calibration of pensions?
- Income heterogeneity?