Old, Sick, Alone and Poor: A Welfare Analysis of Old-Age Social Insurance Programs

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CIGS End of Year Macro Conference
December 26 2014
Motivation

- All societies must deal with the fact that some individuals will end up *old, sick, alone and poor*.

- Why?
  - Some individuals enter retirement with low wealth.
  - Significant risks after retirement.
    - Longevity
    - Medical expenses
    - Long-term care expenses
    - Spousal death
  - These risks are correlated.

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Motivation

- Poverty among retirees is a challenge for society.
- Poor retirees often cannot self-insure by re-entering the labor force.

Questions:
- Is there a role for social insurance (SI) for the aged?
- What is a good program?
U.S. Social Security Program (SS)

- Biggest SI program for retirees in U.S.
- SS outlays were 4.8% of GDP in 2011 and are growing.
- A large macroeconomics literature finds that a U.S.-style, pay-as-you-go, public pension program is bad public policy:
  - **Bad in dynamically efficient OLG models** (Auerbach and Kotlikoff, 1987).
  - **Bad in dynastic models** (Fuster, Imrohoroglu and Imrohoroglu, 2007).
  - **Bad when individuals face life-time earnings risk** (Conesa and Krueger, 1999).
  - **Bad when the economy is open** (Hong and Rios, 2007).
- **Strongest argument in favor of SS:**
  - **It is even more costly to remove** (Nishiyama and Smetters, 2007).
Is there a role for social insurance?

It would be a mistake to conclude from these results that there is no role for society to provide insurance to retirees.
Means-tested Social Insurance (MTSI) for Retirees

- U.S. also offers means-tested social insurance (MTSI) to retirees.

- Some MTSI programs for U.S retirees are:
  - Medicaid
  - Supplemental Social Security Income
  - Food Stamps
  - Housing and energy assistance programs

- We assess these programs using a quantitative model of the U.S. economy and find that they are highly valued.
Means-tested Social Insurance (MTSI) for Retirees

MTSI is valuable:

- It provides good insurance against longevity risk.
- It is particularly effective in insuring against: medical expenses, nursing home expenses, spousal death and low lifetime earnings.

Why?

- The transfers induced by the means-test line up well with states where demand for the insurance is highest.
- It is cheap
  - Largest program is Medicaid: expenditures for the aged are 0.6% of GDP.
  - Second largest program is SSI: outlays for the aged are 0.3% of GDP.
Quantitative Model of U.S. Economy: Overview

- Full-lifecycle, OLG, GE model
- Households
  - become active at age 21 (period = 2 years)
- While working:
  - are married couples
  - differ by education status of members
  - face uncertainty over male and female’s labor productivity
  - choose consumption, savings, female labor supply

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Households
- retire exogenously at age 65

While retired:
- married, widows, widowers
- have uncertain
  - health status
  - medical expenses
  - nursing home expenses
  - death (foreseen 1 period in advance)

- choose consumption, savings
- die with certainty at age 100
Assuming retirees foresee their death 1 period in advance allows us to:

- Capture high OOP expenses of HRS retirees in last year of life. *(3.4 times larger than other years.)*
- Eliminate accidental bequests. *(They muddle welfare effects of policy changes.)*
- Reproduce finding of Porterba et al. (2012). *(Many HRS individuals die with very low levels of assets.)*
  - 46% have less than $10,000 in financial assets
  - 50% have zero home equity
Exogenous risks faced by retirees:

- **Survival and health status**
  - Stochastic functions of age, sex, marital status, and previous health status

- **Medical expenses**
  - Do not affect household utility
  - Stochastic function of age, sex, marital status, current health status and death
  - Stochastic component consists of both
    - acute shocks
    - a small probability but large expense “nursing home” shock

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Social insurance (SI) includes
- means-tested social insurance program (Medicaid/other old-age SI)
- progressive PAYG social security program (includes spousal and survivor benefits)
- Medicare (expenses are net of Medicare benefits, include Medicare earnings tax)

SI financed (along with government expenditures) by
- progressive income taxes
- payroll tax
- proportional capital income tax

No private insurance and no uncollateralized borrowing
Utility function of a working-age household is

\[ U^W(c, l_f, s) = 2 \left( \frac{c/(1 + \chi)}{1 - \sigma} \right)^{1-\sigma} + \psi(s) \frac{l_f^{1-\gamma}}{1-\gamma} - \phi(s)I(l_f < 1) \]

- \( l_f \) is non-market time of the female member
- preferences vary across education types \( s \equiv (s^m, s^f) \)
- \( 1 - \chi \in [0, 1] \) is the degree of joint consumption
- \( \phi(s)I(l_f < 1) \) is the utility cost of female labor force participation
Utility function of a retired household is

\[ U^R(c, d) = 2^{N(d)-1} \left( \frac{c}{1 + \chi} \right)^{N(d)-1} \frac{1 - \sigma}{1 - \gamma} + \psi^R(d) \frac{1 - \gamma}{1 - \gamma} \]

- \( 1 - \chi \in [0, 1] \) is the degree of joint consumption
- \( N(d) \) is the number of household members given the marital status \( d \in \{ \text{married, widow, widower} \} \).
Retired Household’s Problem

Retired household solves

$$V(j, a, \bar{e}, h, \varepsilon_M, d, d') = \max_{c, a'} \left\{ U^R(c, d) \right\}$$

$$+ \beta \mathbb{E} \left[ \sum_{d''=0}^{2} \pi_j (d''|h', d') V(j + 1, a', \bar{e}, h', \varepsilon'_M, d', d'')|h, \varepsilon_M) \right\}$$

subject to ...

age $j$
assets $a$
average earnings $\bar{e} \equiv \{\bar{e}^m, \bar{e}^f\}$
health status $h \equiv \{h^m, h^f\}$
household medical expense shocks $\varepsilon_M \equiv \{\varepsilon_M,1, \varepsilon_M,2\}$
marital status $d \in \{0, 1, 2\}$

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Retired Household’s Problem

Retired household solves

\[ V(j, a, \bar{e}, h, \varepsilon_M, d, d') = \max_{c, a'} \left\{ U^R(c, d) \right\} \]

\[
+ \beta \mathbb{E} \left[ \sum_{d''=0}^2 \pi_j(d''|h', d') V(j + 1, a', \bar{e}, h', \varepsilon'_M, d', d'')|h, \varepsilon_M \right] \}
\]

subject to

\[
c \geq 0, \quad a' \geq 0,
\]

\[
c + M + a' = a + y^R - T^R_y + T^R_r.
\]

\[
M \equiv \Phi(j, h, \varepsilon_M, d, d') \quad \text{medical expenses}
\]

\[
y^R \equiv S(\bar{e}, d) + (1 - \tau_c)ra \quad \text{income}
\]

\[
T^R_y \equiv \tau^R_y ((1 - \tau_c)ar, S(\bar{e}, d), d, M) \quad \text{income taxes}
\]

\[
T^R_r \quad \text{means-tested SI transfer}
\]
Retired Household’s Problem

- The means-tested SI transfer function represents both Medicaid and other means-tested SI transfers.

- It also captures the following features of Medicaid:
  - Medicaid requires copays.
  - Copays are capped.

- Copays \(\Rightarrow\) even retirees on means-tested SI face some medical expense risk.
Means-tested SI transfers to retirees are given by

\[ T_R^R \equiv \max \left\{ y^d + \varphi M - I_R, c^d + M - I_R, 0 \right\} \]

where \( I_R^R \equiv a + y^R - T_y^R \) is cash-in-hand.
We consider a *steady-state competitive equilibrium* of a small open economy.
A Few Comments About the Calibration

- Stochastic components of the earnings and medical expense processes are not Gaussian.
- The earnings process includes an additional low earnings state which helps us
  - reproduce SS income distribution
  - improve model’s matching of bottom tail of earnings distribution
- The medical expense process includes a large NH shock which helps us
  - capture the risk of a large and persistent NH shock
  - improves model’s matching of upper tail of the medical expense distribution
A Few Comments About the Calibration

- We calibrate the model to reproduce this demographic structure:
A Few Comments About the Calibration

- Age 65 marital distribution attained with a spousal death event at age 65.

- The likelihood of the death event is decreasing with male average earnings.

- Targets the marital distribution by permanent income in the data.
A Few Comments About the Calibration

- **Consumption Floors:**
  - **Workers:** $c$ is 15% of average male earnings or $7,100 in year 2000 dollars.
  - **Retirees:** $c^d$ is very similar across marital groups and is approximately 16% of average male earnings or $7,600 in year 2000 dollars.

- **Means-test income thresholds:** $y^d \approx 2c^d$ chosen so model reproduces take-up rates.

- **Medicaid copay rate:** $1 - \varphi$ is 20%.

  **Target:** average OOP expenses of Medicaid recipients/average OOP expenses of all retirees = 0.46.
Assessment: Medicaid Take-Up Rates

- **Consumption floor** calibration
- **Target:** Take-up rates by marital status.
- **Assessment:** Take-up rates by age groups.

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Age</th>
<th>65–74</th>
<th>75–84</th>
<th>85+</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Married</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data</td>
<td></td>
<td>0.07</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>model</td>
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<td>0.05</td>
<td>0.07</td>
<td>0.12</td>
</tr>
<tr>
<td><em>Widows</em></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data</td>
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<td>0.22</td>
<td>0.19</td>
<td>0.24</td>
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<tr>
<td>model</td>
<td></td>
<td>0.21</td>
<td>0.23</td>
<td>0.25</td>
</tr>
<tr>
<td><em>Widowers</em></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data</td>
<td></td>
<td>0.19</td>
<td>0.15</td>
<td>0.19</td>
</tr>
<tr>
<td>model</td>
<td></td>
<td>0.17</td>
<td>0.16</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Findings

- What are the welfare effects of removing MTSI?
- Welfare is measured as an equivalent % variation in lifetime consumption.

**Assumption:**
- Absent MTSI society provides a *Townsendian consumption floor*
- Largest consumption floor that all households, indexed by education, agree on.
Welfare effects of removing MTSI

When MTSI is removed from our baseline economy

- **Ex-ante newborn welfare falls**

<table>
<thead>
<tr>
<th>Economy</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare, %</td>
<td></td>
</tr>
<tr>
<td>Ex-ante</td>
<td>-4.87</td>
</tr>
</tbody>
</table>
When MTSI is removed from our baseline economy

- High school educated HH dislike MTSI removal the most

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<td></td>
</tr>
<tr>
<td>Ex-ante</td>
<td>-4.87</td>
</tr>
<tr>
<td>By HH education type (female, male):</td>
<td></td>
</tr>
<tr>
<td>high school, high school</td>
<td>-6.04</td>
</tr>
<tr>
<td>high school, college</td>
<td>-2.87</td>
</tr>
<tr>
<td>college, high school</td>
<td>-1.53</td>
</tr>
<tr>
<td>college, college</td>
<td>0</td>
</tr>
</tbody>
</table>
Welfare effects of removing MTSI

When MTSI is removed from our baseline economy

- Welfare of all types indexed by male permanent earnings quintile falls

<table>
<thead>
<tr>
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<td>Welfare, %</td>
<td></td>
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<tr>
<td>Ex-ante</td>
<td>-4.87</td>
</tr>
<tr>
<td>By male permanent earnings:</td>
<td></td>
</tr>
<tr>
<td>quintile 1</td>
<td>-7.55</td>
</tr>
<tr>
<td>quintile 2</td>
<td>-5.43</td>
</tr>
<tr>
<td>quintile 3</td>
<td>-4.42</td>
</tr>
<tr>
<td>quintile 4</td>
<td>-3.65</td>
</tr>
<tr>
<td>quintile 5</td>
<td>-1.82</td>
</tr>
</tbody>
</table>
Why are welfare gains so large and so broadly based?

- Compare baseline economy to
  - economy with no medical expenses
  - economy with no earnings risk
When medical expenses are absent

- Ex-ante welfare continues to fall when MTSI is removed but now disagreement among types

<table>
<thead>
<tr>
<th>Economy</th>
<th>Baseline</th>
<th>No Medical Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex-ante</td>
<td>-4.87</td>
<td>-0.26</td>
</tr>
<tr>
<td>By HH education type (female, male):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school, high school</td>
<td>-6.04</td>
<td>-0.34</td>
</tr>
<tr>
<td>high school, college</td>
<td>-2.87</td>
<td>-0.16</td>
</tr>
<tr>
<td>college, high school</td>
<td>-1.53</td>
<td>0.03</td>
</tr>
<tr>
<td>college, college</td>
<td>0</td>
<td>0.05</td>
</tr>
</tbody>
</table>

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Roles of medical expenses and life-time earnings risk

When earnings risk is absent

- Welfare of all types now rises when MTSI is removed

<table>
<thead>
<tr>
<th>Economy</th>
<th>Baseline</th>
<th>No Medical Expenses</th>
<th>No Earnings Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-ante</td>
<td>-4.87</td>
<td>-0.26</td>
<td>0.64</td>
</tr>
<tr>
<td>By HH education type (female, male):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school, high school</td>
<td>-6.04</td>
<td>-0.34</td>
<td>0.34</td>
</tr>
<tr>
<td>high school, college</td>
<td>-2.87</td>
<td>-0.16</td>
<td>1.33</td>
</tr>
<tr>
<td>college, high school</td>
<td>-1.53</td>
<td>0.03</td>
<td>1.15</td>
</tr>
<tr>
<td>college, college</td>
<td>0</td>
<td>0.05</td>
<td>1.92</td>
</tr>
</tbody>
</table>
Reforming MTSI for Retirees

- Given that MTSI is highly valued by HH’s in our economy would they like to increase its scale?
• **All** newborn like a 30% increase in MTSI if it is financed with a higher payroll tax.

<table>
<thead>
<tr>
<th></th>
<th>U.S. economy</th>
<th>30% up Payroll Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Welfare, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>0.54</td>
</tr>
<tr>
<td>By household education type (female, male):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school, high school</td>
<td></td>
<td>0.62</td>
</tr>
<tr>
<td>high school, college</td>
<td></td>
<td>0.35</td>
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<tr>
<td>college, high school</td>
<td></td>
<td>0.48</td>
</tr>
<tr>
<td>college, college</td>
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<td>0.29</td>
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<tr>
<td><strong>Means-tested SI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>take-up rates</td>
<td>12.9</td>
<td>23.7</td>
</tr>
<tr>
<td>govt. outlays, % GNP</td>
<td>0.75</td>
<td>1.44</td>
</tr>
</tbody>
</table>
Reforming MTSI for Retirees

- Newborn households dislike 30% increase financed by a higher income tax instead.
- Disagreement over a 30% decrease (lowering income tax).

<table>
<thead>
<tr>
<th>Welfare</th>
<th>U.S. economy</th>
<th>30% up Income Tax</th>
<th>30% down Income Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td></td>
<td>-0.44</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*By household education type (female, male):*

- high school, high school  
  | 30% up Income Tax | 30% down Income Tax |
  |                  |                    |
  | high school, college | -0.24 | -0.13 |
  | college, high school | -0.91 | 0.45  |
  | college, college    | -0.69 | 0.28  |
  |                      | -1.20 | 0.65  |

<table>
<thead>
<tr>
<th>Means-tested SI</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>take-up rates</td>
<td>12.9</td>
<td>24.1</td>
<td>6.0</td>
</tr>
<tr>
<td>govt. outlays, % GNP</td>
<td>0.75</td>
<td>1.50</td>
<td>0.30</td>
</tr>
</tbody>
</table>

BKK (2014)
Conclusion

- Removing MTSI in a quantitative model of the U.S. economy produces a large welfare loss.

- There are broad-based welfare gains if the scale of MTSI is increased by 30% financed by a payroll tax.

- If SS was removed, the fraction of retirees living off MTSI transfers would increase significantly but all ex-ante types would be better off.