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

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In 1972, Friedman argued:

- There is no need for a universal social security (SS) program in the US.
- Means-tested social insurance (SI) programs are sufficient in insuring against old-age risks.

Feldstein (1987) showed:

- SS can be better than means-tested SI when individuals are heterogeneous because means-tested SI has large negative incentive effects on the savings behavior of the poor.
Objective: Assess the welfare and incentive effects of SS and means-tested SI programs in the US.

In particular, we ask

- Is there a role for any SI for retirees?
- If yes, what combination of programs is preferred?
We answer these questions using a model in which retirees are subject to

- health
- medical expense and
- spousal death risk

in addition to

- lifetime earnings and
- survival risk.
Is there a role for any SI for retirees?

- Yes, individuals prefer an economy with SI programs of the size currently offered in the US to one without.

- Medical expenses and their associated risks play an important role in this result.
What combination of programs is preferred?

- Despite that
  - Means-tested SI has the negative incentive effects on poorer households emphasized by Feldstein
  - and SS dampens these effects

We find results consistent with Friedman’s claim:

**All newborn prefer means-tested SI of the scale in the US to either SS alone or both programs.**

- Why? Insurance benefits of means-tested SI are large even for rich.
We model old-age health, medical expense, and spousal death risk because:

- **Fact:** Poor health, hospital stays, nursing home stays and widowhood are all associated with higher probabilities and persistence of impoverishment.

- We measure impoverishment as movement into the 1st quintile of the wealth distribution.
Motivation: Risks

- Nursing home stays are associated with higher probabilities and persistence of impoverishment.

### Percentage of Retirees Moving from Each Quintile to Quintile 1

<table>
<thead>
<tr>
<th>Quintile</th>
<th>65–74 Year-olds</th>
<th>75–84 Year-olds</th>
<th>85+ Year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>NH Stay</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>75.7</td>
<td>87.9</td>
<td>74.6</td>
</tr>
<tr>
<td>2</td>
<td>18.0</td>
<td>25.6</td>
<td>17.4</td>
</tr>
<tr>
<td>3</td>
<td>3.8</td>
<td>9.6</td>
<td>4.5</td>
</tr>
<tr>
<td>4</td>
<td>1.0</td>
<td>5.3</td>
<td>1.8</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
<td>3.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using 1992–2010 HRS data on retirees 65+.
Motivation: Risks

We model old-age health, medical expense, and spousal death risk because:

- **Fact:** Poor health, hospital stays, nursing home stays and widowhood are all associated with higher probabilities and persistence of impoverishment.

- We measure impoverishment as movement into the 1st quintile of the wealth distribution.

- And SS and means-tested SI partially insure individuals against these risks.
Model: Key Features

- 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
Model: Key Features

- **Households**
  - retire exogenously at age 65

- **While retired:**
  - married, widows, widowers
  - have uncertain
    - death (foreseen 1 period in advance)
    - health status
    - medical expenses
  - choose consumption, savings
  - die with certainty at age 100
Model: Key Features

- **Survival and health status**
  - are exogenous shocks
  - determined by age, sex, marital status, and previous health status

- **Medical expenses**
  - are exogenous expense shocks
  - do not affect household utility
  - depend on age, sex, marital status, current health status and death
  - include a small prob. but large expense “nursing home” shock
Model: Key Features

- **Social insurance (SI) includes**
  - progressive PAYG social security program (includes spousal and survivor benefits)
  - means-tested social insurance program (Medicaid/other old-age SI)
  - Medicare (all expenses are net of Medicare, 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 borrowing**
Retired Household’s Problem

Retired household solves

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

subject to ...

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

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

\[ c + M + a' = a + y^R - T_y^R + Tr^R. \]

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

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

\[ T_y^R \equiv \tau_y^R ((1 - \tau_c) ar, S(\bar{e}, d), d, M) \quad \text{income taxes} \]

\[ Tr^R \quad \text{means-tested SI transfer} \]
Means-tested SI transfers to retirees are given by

\[
Tr^R \equiv \begin{cases} 
\max \{y^d + \phi M - I^R, c^d + M - I^R, 0\}, & \text{if } y^d > I^R - M, \\
0, & \text{otherwise,} 
\end{cases}
\]

where \( I^R \equiv a + y^R - T_y^R \) is cash-in-hand.

- Retirees on Medicaid must pay a Medicaid copayment of \((1 - \phi)M\).
- We cap the copayment such that the minimum level of consumption is \(c^d\).
We consider a steady-state competitive equilibrium of a small open economy.
We calibrate the model to reproduce this demographic structure:
Pre-Medicaid Medical Expense Process

- Stochastic component of expenses is calibrated to estimates from French and Jones (2004) and data on NH stays and expenses.

- We estimate the deterministic component using HRS data.

- Cohort and income effects are controlled for in the estimation.
Calibration: A few highlights

- Estimated effects of various factors on pre-Medicaid expenses:

![Graph showing the ratio of medical expenses across different factors such as age, marital status, gender, and health status.](image-url)
Assessment: A few highlights

- We set the consumption floors for retirees to target Medicaid take up rates by marital status.
- The model does a good job reproducing them by age groups.

<table>
<thead>
<tr>
<th>Medicaid Take-Up Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
</tr>
<tr>
<td>Married</td>
</tr>
<tr>
<td>data</td>
</tr>
<tr>
<td>model</td>
</tr>
<tr>
<td>Widows</td>
</tr>
<tr>
<td>data</td>
</tr>
<tr>
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</table>
The model also matches well

- Flows into Medicaid by age and marital status
- Average OOP medical expenses by age and marital status
- The conditional probabilities and persistence of impoverishment already discussed
What does the model say about the following questions:

- Is there any role for public SI programs for retirees?
- If yes, what combination of programs is preferred?
Experiments

To find out we:

- Consider 4 versions of the baseline model: ‘no SI’, ‘SS only’, ‘means-tested SI only’, and ‘both (U.S. economy)’
- Consider same economies but with no medical expenses to understand their role.

How we shut-down each program:

- **SS**: Remove benefits and reduce payroll taxes
- **Means-tested SI**: Set consumption floor very low (≈ $50 a year) and reduce income taxes
Experiments

Some details:

- All experiments are revenue-neutral: G/Y fixed
- Use proportional income tax/transfer to satisfy govt budget const.
- Welfare is measured as an equivalent % variation in lifetime consumption.
Role of Public SI in Our Model

- First, is there any role for public SI programs for retirees?
- To find out compare the ‘no SI’ economy to the economy with both programs...
When both programs are introduced into the ‘no SI’ economy:

- Output, consumption, wealth and female labor supply all fall

<table>
<thead>
<tr>
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<th>No SI</th>
<th>Both (U.S. Economy)</th>
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<tbody>
<tr>
<td>Output</td>
<td>1.00</td>
<td>0.74</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.71</td>
<td>0.50</td>
</tr>
<tr>
<td>Wealth</td>
<td>3.47</td>
<td>1.22</td>
</tr>
<tr>
<td>Working Females’ Hours</td>
<td>0.39</td>
<td>0.34</td>
</tr>
<tr>
<td>Female LFP</td>
<td>0.49</td>
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When both programs are introduced into the ‘no SI’ economy:

- Output, consumption, wealth and female labor supply all fall
- Despite this average newborn welfare increases

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<td>Welfare, %</td>
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BKK (2013)
Why does newborn welfare increase?

- Medical expenses and their associated risks increase the insurance value of SS and means-tested SI.

- When medical expenses are zero: average welfare decreases from the introduction of both programs by 10.0%.
Given that there is a role for old-age public SI:
  What combination of programs is preferred?

To find out compare the economy with both programs to economies with either means-tested SI or SS removed.

First consider removing means-tested SI...
Which combination is preferred? Both v. SS Only

When means-tested SI is removed:

- Output, consumption, wealth and female labor supply all increase.

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<td>0.56</td>
</tr>
<tr>
<td>Wealth</td>
<td>1.22</td>
<td>1.80</td>
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Which combination is preferred? Both v. SS Only

When means-tested SI is removed:

- Output, consumption, wealth and female labor supply all increase.
- But removing means-tested SI leads to a large welfare loss.

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<tr>
<td>Welfare, %</td>
<td>0.00</td>
<td>-7.33</td>
</tr>
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BKK (2013)
Why does newborn welfare fall so much?

- Retirees face more risk in our baseline model due to the presence of medical expenses.

- Means-tested SI is a very valuable form of insurance against medical-expense-related risks even when SS is available.

- When medical expenses are zero:
  
  average welfare falls from the removal of means-tested SI by 0.3%.
Now let’s consider what happens when SS is removed...
Which combination is preferred? Both v. Means-tested SI Only

When SS is removed:

- Take-up rates of means-tested SI by poorer households increase significantly.
- Both at later ages and the fraction who roll on at 65.

Percent increase in means-tested SI take-up rates when SS is removed

Q1–Q5 are male PE quintiles

BKK (2013)
Why do means-tested SI take-up rates increase?

Two reasons:

1. **Insurance effect:** Some of the insurance against survival and medical expense risk provided by SS is now provided by means-tested SI.
Why do means-tested SI take-up rates increase?

Two reasons:

2. Incentive effect:

- Means-tested SI induces some poorer households not to save for retirement.
- These households roll directly onto means-tested SI at age 65.
- SS forces these households to save increasing their expected return from private savings.
- As a result some households choose to save on their own that would not have otherwise.

Thus removing SS exacerbates the negative incentive effects that means-tested SI has on savings behavior.
Which combination is preferred? Both v. Means-tested SI Only

The impact of removing SS on take-up rates looks very different when there are no medical expenses.

Percent increase in means-tested SI take-up rates when SS is removed
Q1–Q5 are male PE quintiles

BKK (2013)
Which combination is preferred? Both v. Means-tested SI Only

When SS is removed from the ‘no medical expense’ economy:

- The increase in take-up rates increases monotonically with age.
- Why? Insurance against survival risk that was provided by SS is now provided by means-tested SI.

Percent increase in means-tested SI take-up rates when SS is removed

Q1–Q5 are male PE quintiles

BKK (2013)
When SS is removed from the ‘no medical expense’ economy:

- Now only about 10% of Q1 roll in at age 65
- Why? Without medical expenses the negative incentive effect is small.

Percent increase in means-tested SI take-up rates when SS is removed
Q1–Q5 are male PE quintiles

BKK (2013)
Which combination is preferred? Both v. Means-tested SI Only

Overall, removing SS results in:

- Means-tested SI take-up rates increasing from 13% to 34%.
- Government outlays on means-tested SI increase from 0.75% to 2.5% of GNP.
Overall, removing SS results in:

- Means-tested SI take-up rates increasing from 13% to 34%.
- Government outlays on means-tested SI increase from 0.75% to 2.5% of GNP.
- Despite this wealth increases and taxes fall.

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<tbody>
<tr>
<td>Output</td>
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<td>1.91</td>
</tr>
<tr>
<td>Prop. Tax</td>
<td>0.0</td>
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</tr>
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BKK (2013)
Overall, removing SS results in:

- Means-tested SI take-up rates increasing from 13% to 34%.
- Government outlays on means-tested SI increase from 0.75% to 2.5% of GNP.
- Despite this wealth increases and taxes fall.
- And newborns experience a large welfare gain.

<table>
<thead>
<tr>
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<th>Both (U.S. Economy)</th>
<th>Means-tested SI Only</th>
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<tr>
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</tr>
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<td>Welfare, %</td>
<td>0.0</td>
<td>11.8</td>
</tr>
</tbody>
</table>

BKK (2013)
Our results support Friedman’s claim:

- Average newborn welfare is highest in the economy with means-tested SI only.
- Moreover, all newborns prefer this economy.
- This is despite the fact that means-tested SI has large negative incentive effects on the behavior of poorer households and that SS dampens these effects.

<table>
<thead>
<tr>
<th></th>
<th>Both (U.S. Economy)</th>
<th>SS Only</th>
<th>Means-tested SI Only</th>
</tr>
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<tbody>
<tr>
<td>Welfare, %</td>
<td>0.00</td>
<td>-7.33</td>
<td>11.8</td>
</tr>
</tbody>
</table>
Robustness: Changes in the Scale of Means-tested SI

- We have found that households like means-tested SI but what if anything can we say about the optimal scale?
- To see, we consider changing the size of means-tested SI in our baseline economy where SS is of the scale in the U.S.
Robustness: Changes in the Scale of Means-tested SI

- Whether households want an increase or a decrease depends on how financed.

<table>
<thead>
<tr>
<th>Welfare</th>
<th>U.S. economy</th>
<th>Income 30% up</th>
<th>Income 30% down</th>
<th>Payroll 30% up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>-0.44</td>
<td>0.04</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>By household education type (female, male):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school, high school</td>
<td>-0.24</td>
<td>-0.13</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>high school, college</td>
<td>-0.91</td>
<td>0.45</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>college, high school</td>
<td>-0.69</td>
<td>0.28</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>college, college</td>
<td>-1.20</td>
<td>0.65</td>
<td>0.29</td>
<td></td>
</tr>
</tbody>
</table>

**Means-tested SI**

<table>
<thead>
<tr>
<th></th>
<th>take-up rates</th>
<th>govt. outlays, % GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.9</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>24.1</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>23.7</td>
<td>1.44</td>
</tr>
</tbody>
</table>

BKK (2013)
Robustness: Changes in the Scale of Means-tested SI

- Feldstein (1986) argues that if the scale of means-tested SI is small enough, individuals, especially the poor, will prefer SS.

- To evaluate this claim, we experiment with adding SS to economies with different consumption floors.

- We find:
  - The floors have to be extremely low, \( \approx \$5 \) a year, for individuals to obtain small welfare gains from SS.
  - If medical expenses are zero, there is no floor that will make SS preferred.
Robustness: To Modeling Assumptions

- Foreseeing death and open economy
  - Our results are robust to these two assumptions.

- We do not change the scale of Medicare

- exogenous medical expenses

- private insurance markets
Robustness: To Modeling Assumptions

- Foreseeing death and open economy
- **We do not change the scale of Medicare**
  - Since Medicare is a PAYG benefit program our conjecture is that, like SS, newborns would prefer an economy without it.
- Exogenous medical expenses
- Abstract from private insurance markets
Robustness: To Modeling Assumptions

- Foreseeing death and open economy
- We do not change the scale of Medicare

- **Exogenous medical expenses**
  - Modeling the market for medical care would be a significant extension of our model.

- Abstract from private insurance markets
Robustness: To Modeling Assumptions

- Foreseeing death and open economy
- We do not change the scale of Medicare
- Exogenous medical expenses

- Abstract from private insurance markets
  - There are significant supply-sides problems in some of these markets.
  - Moreover, every society has to deal with the fact that some people will end up old, sick, alone and poor.
Additional Impoverishment Transitions

- Poor health is associated with higher probabilities and persistence of impoverishment.

### Percentage of Retirees Moving from Each Quintile to Quintile 1

<table>
<thead>
<tr>
<th>Quintile</th>
<th>65–74 Year-olds</th>
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<tbody>
<tr>
<td></td>
<td>Healthy</td>
<td>Unhealthy</td>
<td>Healthy</td>
</tr>
<tr>
<td>1</td>
<td>69.7</td>
<td>80.9</td>
<td>70.8</td>
</tr>
<tr>
<td>2</td>
<td>15.6</td>
<td>22.6</td>
<td>15.1</td>
</tr>
<tr>
<td>3</td>
<td>3.4</td>
<td>5.5</td>
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Source: Authors’ calculations using 1992–2010 HRS data on retirees 65+.

BKK (2013)
Additional Impoverishment Transitions

- **Hospital stays** are associated with higher probabilities and persistence of impoverishment.

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<td>7.8 7.7</td>
</tr>
<tr>
<td>4</td>
<td>0.9 1.6</td>
<td>1.7 2.5</td>
<td>4.0 4.3</td>
</tr>
<tr>
<td>5</td>
<td>0.6 0.4</td>
<td>0.6 0.6</td>
<td>2.2 1.3</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using 1992–2010 HRS data on retirees 65+.
Additional Impoverishment Transitions

- **Widowhood** is associated with higher probabilities and persistence of impoverishment.

### Percentage of Retired Women Moving from Each Quintile to Quintile 1

<table>
<thead>
<tr>
<th>Quintile</th>
<th>65–74 Year-olds</th>
<th>75–84 Year-olds</th>
<th>85+ Year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Married</td>
<td>Widowed</td>
<td>Married</td>
</tr>
<tr>
<td>1</td>
<td>72.5</td>
<td>80.0</td>
<td>69.6</td>
</tr>
<tr>
<td>2</td>
<td>17.3</td>
<td>22.9</td>
<td>17.2</td>
</tr>
<tr>
<td>3</td>
<td>3.4</td>
<td>6.5</td>
<td>4.4</td>
</tr>
<tr>
<td>4</td>
<td>1.0</td>
<td>1.6</td>
<td>1.1</td>
</tr>
<tr>
<td>5</td>
<td>0.4</td>
<td>1.1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using 1992–2010 HRS data on retirees 65+.

- Men look very similar.

BKK (2013)
Additional Impoverishment Transitions

- Widowhood is associated with higher probabilities and persistence of impoverishment.

<table>
<thead>
<tr>
<th>Quintile</th>
<th>65–74 Year-olds</th>
<th>75–84 Year-olds</th>
<th>85+ Year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Married</td>
<td>Widowwed</td>
<td>Married</td>
</tr>
<tr>
<td>1</td>
<td>74.5</td>
<td>75.7</td>
<td>73.9</td>
</tr>
<tr>
<td>2</td>
<td>18.3</td>
<td>24.1</td>
<td>17.4</td>
</tr>
<tr>
<td>3</td>
<td>3.9</td>
<td>12.2</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>1.3</td>
<td>3.5</td>
<td>2.0</td>
</tr>
<tr>
<td>5</td>
<td>0.7</td>
<td>1.7</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using 1992–2010 HRS data on retirees 65+.

BKK (2013)
Working Household’s Problem

Working-age household solves

$$\begin{align*}
V(j, a, \bar{e}, \varepsilon_e, s) &= \max_{c, l_f, a'} \left\{ U^W(c, l_f, s) + \beta E[V(j+1, a', \bar{e}', \varepsilon'_e, s) | \varepsilon_e] \right\}
\end{align*}$$

subject to ...

age $j$
assets $a$
average earnings $\bar{e} \equiv \{\bar{e}^m, \bar{e}^f\}$
productivity shocks $\varepsilon_e \equiv \{\varepsilon_e^m, \varepsilon_e^f\}$
education types $s \equiv \{s^m, s^f\}$
Working Household’s Problem

Working-age household solves

\[ V(j, a, \bar{e}, e, s) = \max_{c, l_f, a'} \left\{ U(c, l_f, s) + \beta E[V(j+1, a', \bar{e}', e', s) | e_e] \right\} \]

subject to

\[ c \geq 0, \quad 0 \leq l_f \leq 1, \quad a' \geq 0, \]
\[ \bar{e}^{i'} = (e^i + j\bar{e}^i)/(j + 1), \quad i \in \{m, f\}, \]
\[ c + a' = a + y^W - T^W_y + Tr^W, \]
\[ y^W \equiv e^m + e^f + (1 - \tau_c)ra, \]
\[ e^i \equiv \omega \Omega^i(j, e_e, s_i)(1 - l_f I_{i=f}), \quad i \in \{m, f\}, \]
\[ T^W_y \equiv \tau_y (y^W - \tau_e (e^m)e^m - \tau_e (e^f)e^f) + \tau_e (e^m)e^m + \tau_e (e^f)e^f, \]
\[ Tr^W \equiv \max \left\{ 0, c - [a + y^W - T^W_y] \right\}. \]
Utility Functions

- Utility of a working-age household is

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

where \( 1 - \chi \in [0, 1] \) is the degree of joint consumption.

- Utility of a retired household is

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

where the number of household members \( N \) depends on \( d \).
We consider a steady-state competitive equilibrium of a small open economy.

Given a fiscal policy and a real interest rate $r$ in equilibrium

1. Individuals optimize
2. Firms maximize profits
3. Markets for goods and labor clear
4. Consistency conditions hold
5. Transfers to newborns equal accidental bequests
6. SS Benefits = SS Payroll Tax Revenue
7. GovtExp is such that:
   \[\text{IncomeTaxes} + \text{MedicareTaxes} + \text{CorporateTaxes} = \text{Transfers} + \text{GovtExp}\]