How Well Does the U.S. Social Insurance System Provide Social Insurance?

Mark Huggett and Juan Carlos Parra (2010)

presented by Nawid Siassi

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Motivation

- Rationale for government-provided insurance: there are risks that are not easily insured in private markets.
- Labor income risk: important source of risk for most individuals.
- Not easily insurable because of (i) unobserved effort or labor hours, and (ii) permanent component realized at young age.
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- not easily insurable because of (i) unobserved effort or labor hours, and (ii) permanent component realized at young age

- it is often claimed that progressive income taxation and progressive social security system may provide important source of insurance

- how well does US social insurance provide social insurance?
Cornerstones of the paper

- answer by quantifying maximum possible gain to superior insurance
- benchmark OLG model with cohort of workers facing idiosyncratic wage risk and stylized structure of US social insurance system
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- answer by quantifying maximum possible gain to superior insurance
- benchmark OLG model with cohort of workers facing idiosyncratic wage risk and stylized structure of US social insurance system
- contrast expected utility for newborn with ex-ante utility that a planner could deliver \( \Rightarrow \) constrained by available resources of US system and incentive compatibility (hours worked unobservable)
- maximum welfare gain: 4.1%; evaluate 2 reforms: (a) optimal Social Security benefit function; (b) optimal tax on present value of earnings
agents maximize

$$E \sum_{j=1}^{J} \beta^{j-1} u(c_j, l_j) = \sum_{j=1}^{J} \sum_{s^j \in S^j} \beta^{j-1} u(c_j(s^j), l_j(s^j)) P(s^j)$$

where $S^j = \{s^j = (s_1, \ldots, s_j) : s_i \in S, i = 1, \ldots, j\}$ denotes the set of possible $j$-period histories, $S$ is a finite set of shocks, and $P(s^j)$ is the prob. of history $s^j$
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- labor productivity \( \omega(s_j, j) \) only observed by agent
- principal only observes earnings, i.e. product of wage rate, labor productivity and hours worked
Incentive Compatibility

- revelation principle: only look at incentive compatible allocations
- consider report function \( \sigma \equiv (\sigma_1, \ldots, \sigma_J) \) where \( \sigma_j \) maps shock histories \( s^j \in S^j \) into \( S \)
- truthful report function \( \sigma^* \) has property that \( \sigma^*_j(s^j) = s_j \) for any \( s^j \)
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- truthful report function $\sigma^*$ has property that $\sigma^*_j(s^j) = s_j$ for any $s^j$
- allocation is incentive compatible (IC) if $\sigma^*$ always gives at least as much expected utility as any other feasible report function:

$$W(c, l; \sigma^*, s_1) > W(c, l; \sigma, s_1) \quad \forall s_1 \forall \sigma$$

where $W(c, l; \sigma, s_1)$ denotes exp. utility of allocation $(c, l)$ and report function $\sigma$
U.S. Social Insurance vs. Planning Problem

\[ V^{US} \equiv \max_{(c,l) \in \Gamma^{US}} \mathbb{E} \sum_{j=1}^{J} \beta^{j-1} u(c_j, l_j) \]

\[ V^{PP} \equiv \max_{(c,l) \in \Gamma^{PP}} \mathbb{E} \sum_{j=1}^{J} \beta^{j-1} u(c_j, l_j) \]
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\[ \Gamma^{US} = \left\{ (c, l) : \sum_{j=1}^{J} \frac{c_j}{(1 + r)^{j-1}} \leq \sum_{j=1}^{J} \frac{w \omega(s_j, j) l_j - T_j(x_j, w \omega(s_j, j) l_j)}{(1 + r)^{j-1}} \right\} \]

and \( x_{j+1} = F_j(x_j, w \omega(s_j, j) l_j, c_j), x_1 \equiv 1 \}

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where \( \text{Cost} \equiv E \left[ \sum_{j=1}^{J} - \frac{T_j(x_j, w \omega(s_j, j) l_j^{US})}{(1 + r)^{j-1}} \right] \)
Tax-Transfer System

- tax function and law of motion \((T_j, F_j)\) to capture features of U.S. social security and federal income taxation: 
  \[ T_j = T_{j}^{ss} + T_{j}^{inc} \]

- social security: proportional tax on agent’s labor income before retirement, then pays out benefits based on average earnings
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- Tax function and law of motion \((T_j, F_j)\) to capture features of U.S. social security and federal income taxation: \(T_j = T_j^{ss} + T_j^{inc}\)

- Social security: proportional tax on agent’s labor income before retirement, then pays out benefits based on average earnings.

- Piecewise-linear concave function; bend points match U.S. values.

- Estimate effective average taxes paid as non-linear function of income (here: separately for working age and retirement).
FIG. 1.—U.S. social security benefit formula (source: Social Security Handbook 2003). Average earnings and benefit payments are both expressed as a multiple of average economywide earnings.
Fig. 2.—Average federal income tax rates (source: Congressional Budget Office 2004)
Calibration

- deterministic retirement age: 65 years

- labor productivity process

\[ \omega(s_j, j) = \mu_j \exp(s_j^1 + s_j^2 + s_j^3) \]

  - \( \mu_j \): deterministic component (age profile)
  - \( s_j^1 = s^1 \): permanent component drawn from \( N(-\sigma_1^2/2, \sigma_1^2) \)
  - \( s_j^2 \): persistent component, AR(1)
  - \( s_j^3 \): transitory component, iid

- consider two models: only permanent shocks and full model

- partial equilibrium: exogenous wage rate \( w \) and interest rate \( r \)
### Maximum Welfare Gains

- permanent shock model: **4.1% in CEU** (6.1% without private info)
Hours: Planner (A) vs U.S. (B)

A

B

Work hours

Age

Shock s_1  Shock s_2  Shock s_3  Shock s_4  Shock s_5
Intratemporal Wedge: Planner (below) vs U.S. (above)
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Policy Reforms

1. piecemeal reform: optimal social security benefit function
2. radical reform: replace income taxation and social security by tax on present value of earnings

<table>
<thead>
<tr>
<th>Type of Reform</th>
<th>Permanent-Shock Model</th>
<th>Full Model</th>
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<tbody>
<tr>
<td>Reform 1: change the benefit function</td>
<td>.18</td>
<td>1.15</td>
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<tr>
<td>Reform 2: tax the present value of earnings</td>
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<td>-.07</td>
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<tr>
<td>Reform 3: eliminate capital income taxation</td>
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<td>-.22</td>
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<td>Maximum possible gain</td>
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<td>Unknown</td>
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