Progressing into efficiency:
the role for labor tax progression in privatizing social security

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Motivation
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Social security is essentially about insurance:

- mortality (annuitized)
  Benartzi et al. 2011, Bruce & Turnovsky 2013, Reichling & Smetters 2015, Caliendo et al. 2017

- low income (redistribution)
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- redistribution is costly (distorts incentives)
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Our approach: replace redistribution in social security with tax progression
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Bottom line: Shift insurance from retirement to working period → improve efficiency of social security → raise welfare.
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Theoretical model
(Stylized) theoretical model: partial equilibrium OLG model

Incomes:

- wage $w_t$ grows at the constant rate $\gamma$, $z_t = (1 + \gamma)^t$, interest rate $r$ is constant
- two types $\theta \in \{\theta_H, \theta_L\}$, with productivities $\omega_{\theta} \in \{\omega_L, \omega_H\}$, and $\omega_H > \omega_L$
  - denote $y(\theta) = (1 - \tau)w_t\omega_{\theta}l_t(\theta)$ (and $\bar{y}(\theta) = (1 - \tau)\bar{w}\omega_{\theta}l_t(\theta)$, $\bar{w} = w_t/z_t$)
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Households:

- Live for 2 periods, population is constant,
- choose labor, consumption and assets

  first period: $c_{1,t}(\theta) + a_{1,t+1}(\theta) = (1 - \tau)w_t\omega_\theta \ell_t(\theta) - z_t T(\tilde{y}(\theta))$
  second period: $c_{2,t+1}(\theta) = (1 + r)a_{1,t+1}(\theta) + b_{2,t+1}(\theta)$

$T(y(\theta))$ is the progressive income tax and $\tau$ is social security contribution
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- GHH preferences: Frisch elasticity + risk aversion

  $$U(\theta) = \frac{1}{1 - \sigma}(c_{1,t}(\theta) - \frac{\phi}{1 + \eta} z_t \ell_{1,t}(\theta)^{1 + \eta} + \beta c_{2,t+1}(\theta))^{1 - \sigma}$$
Government:

- needs to collect exogenously given level of revenue $\tilde{R} = \frac{R_t}{z_t} = constant$,
- with progressive income taxation:

$$T(\tilde{y}) = \tau_\ell \cdot \tilde{y} - \tilde{\mu}$$
Government:

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- with progressive income taxation:

\[
T(\tilde{y}) = \tau_\ell \cdot \tilde{y} - \tilde{\mu}
\]

The implied government budget constraint is then

\[
\tilde{R} = \sum_{\theta \in \{\theta_L, \theta_H\}} T(\tilde{y}_t(\theta)),
\]

whatever funds are left are spent on lump-sum grants \( \mu_t \).
(Stylized) theoretical model: partial equilibrium OLG model

Social security

Beveridge (full redistribution)

\[ b_{2,t+1}^{BEV}(\theta) = \tau w_{t+1} \left(\frac{1}{2} \sum_{\theta \in \{L,H\}} \omega_{\theta} \ell_{1,t+1}(\theta) \right). \]
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Social security

**Beveridge (full redistribution)**

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b^\text{BEV}_{2,t+1}(\theta) = \tau w_{t+1} \frac{1}{2} \sum_{\theta \in \{L,H\}} \omega_\theta \ell_{1,t+1}(\theta).
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**Bismarck (no redistribution)**

\[
b^\text{BIS}_{2,t+1}(\theta) = \tau w_t (1 + \gamma) \omega_\theta \ell_{1,t}(\theta).
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Social security

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**Bismarck (no redistribution)**

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b^{BIS}_{2,t+1}(\theta) = \tau w_t (1 + \gamma) \omega_\theta \ell_{1,t}(\theta)
\]

In stationary equilibrium:

\[
\ell^{BIS}_{1}(\theta) > \ell^{BEV}_{1}(\theta)
\]

→ both types have efficiency gain, what about redistribution?
In BEV social security transfers from \(\theta_H\) to \(\theta_L\) are strictly positive. They are zero in BIS.
With $\beta = \frac{1}{1+r}$, discounted lifetime consumption becomes

$$c_t^{BIS}(\theta) - c_t^{BEV}(\theta) =$$
Basic intuitions

With $\beta = \frac{1}{1+r}$, discounted lifetime consumption becomes

$$c_t^{BIS}(\theta) - c_t^{BEV}(\theta) = (1 - \tau \ell (1 - \tau))\omega \theta w_t(\ell_1^{BIS}(\theta) - \ell_1^{BEV}(\theta))$$

efficiency gain
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$W(\theta_H) \uparrow \& W(\theta_L) \uparrow$
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With $\beta = \frac{1}{1+r}$, discounted lifetime consumption becomes

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efficiency gain

$$- \frac{1}{2}\tau\ell_1^{BEV}(\theta) - \omega_\theta \ell_1^{BEV}(\theta))$$

pension system redistribution

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efficiency gain

$$- \frac{1}{2} \tau w_t(\omega \theta \ell_{1,t}^{\text{BEV}}(\theta) - \omega_{-\theta} \ell_{1,t}^{\text{BEV}}(-\theta))$$

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$$+ (\mu_t^{BIS} - \mu_t^{BEV}(\theta))$$

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With $\beta = \frac{1}{1+r}$, discounted lifetime consumption becomes

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redistribution $\iff$ NEW
Effect on labor supply and government revenue

1. $\theta_H$ workers work more in both BIS and BEV than $\theta_L$, 

$$\frac{\ell_{BIS}(\theta_H)}{\ell_{BIS}(\theta_L)} = \frac{\ell_{BEV}(\theta_H)}{\ell_{BEV}(\theta_L)} = \omega_H \omega_L \equiv \varpi_{1/\eta} > 1$$

2. % ∆ in labor supply depends on $\eta$ (the smaller $\eta$, the larger ∆ ) 

$$\frac{\ell_{BIS}(\theta) - \ell_{BEV}(\theta)}{\ell_{BEV}(\theta)} = \left(1 - \tau \ell(1 - \tau)\right) \left(1 - \tau - \tau \ell(1 - \tau)\right)$$

$$\frac{1}{\eta} - 1 \equiv \xi_{1/\eta} - 1$$

3. % ∆ in gov’nt revenue depends on $\eta$ (Frisch elasticity) 

$$\frac{R_{BIS} - R_{BEV}}{R_{BEV}} \equiv \xi_{1/\eta} - 1$$
Effect on labor supply and government revenue

1. \( \theta_H \) workers work more in both BIS and BEV than \( \theta_L \),

\[
\frac{\ell_{BIS}(\theta_H)}{\ell_{BIS}(\theta_L)} = \frac{\ell_{BEV}(\theta_H)}{\ell_{BEV}(\theta_L)} = \frac{\omega_H}{\omega_L} \equiv \frac{\omega}{1} > 1
\]

2. \( \% \Delta \) in labor supply depends on \( \eta \) (the smaller \( \eta \), the larger \( \Delta \))

\[
\frac{\ell_{BIS}(\theta) - \ell_{BEV}(\theta)}{\ell_{BEV}(\theta)} = \left(1 - \tau \right) \left(1 - \tau - \tau\right) \frac{1}{\eta - 1} \equiv \xi
\]

3. \( \% \Delta \) in gov't revenue depends on \( \eta \) (Frisch elasticity)

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\frac{R_{BIS} - R_{BEV}}{R_{BEV}} \equiv \xi
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Effect on labor supply and government revenue

1. $\theta_H$ workers work more in both BIS and BEV than $\theta_L$, and ratio is constant

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   (the smaller $\eta$, the larger $\Delta$)

$$\frac{\ell^{BIS}(\theta) - \ell^{BEV}(\theta)}{\ell^{BEV}(\theta)} = \left( \frac{(1 - \tau \ell(1 - \tau))}{(1 - \tau - \tau \ell(1 - \tau))} \right)^{1/\eta} - 1 \equiv \xi^{1/\eta} - 1$$
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Key results

1. $\theta_H$ have strictly higher benefits under BIS than under BEV (efficiency $\uparrow$ & redistribution $\uparrow$)
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$\implies$ reform social security and distribute extra government revenue as lump-sum grants $\mu$

3. $\exists \eta > 1$ such that reform is a Pareto-improvement.
Key results

1. $\theta_H$ have strictly higher benefits under BIS than under BEV
   (efficiency ↑ & redistribution ↑)

2. $\theta_L$ may have lower benefits under BIS than under BEV
   (efficiency ↑ but redistribution ↓)

   $\rightarrow$ reform social security and distribute extra government revenue as lump-sum grants $\mu$

3. $\exists \quad \eta > 1$ such that reform is a Pareto-improvement.
Key results

1. $\theta_H$ have strictly higher benefits under BIS than under BEV (efficiency $\uparrow$ & redistribution $\uparrow$)

2. $\theta_L$ may have lower benefits under BIS than under BEV (efficiency $\uparrow$ but redistribution $\downarrow$)

$\rightarrow$ reform social security and distribute extra government revenue as lump-sum grants $\mu$

3. $\exists \eta > 1$ such that reform is a Pareto-improvement.

4. $\exists \tilde{\eta} > \eta$ such that $\forall 1 < \eta < \tilde{\eta}$ reform raises social welfare function

$$W = \sum_{\theta \in \{\theta_L, \theta_H\}} U(\theta)$$
Quantitative model
Consumers

- **uncertain lifetimes**: live for 16 periods, with survival $\pi_j < 1$
- **uninsurable productivity risk** + endogenous labor supply
- CRRA utility function
- pay taxes (progressive on labor, linear on consumption and capital gains)
- contribute to social security, face natural borrowing constraint

Firms and markets

- Cobb-Douglas production function, capital depreciates at rate $d$
- no annuity, financial markets with (risk free) interest rate $10$
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Firms and markets

- Cobb-Douglas production function, capital depreciates at rate \( d \)
- no annuity, financial markets with (risk free) interest rate
Government

- Finances government spending $G_t$, constant as a share of GDP,
- Balances pension system: $\text{subsidy}_t$
- Services debt: $r_tD_t$,
- Collects taxes on capital, consumption, labor
  (progressive given by Benabou form)

$$G_t + \text{subsidy}_t + r_tD_t = \tau_{k,t}r_tA_t + \tau_{c,t}C_t + Tax_{\ell,t} + \Delta D_t$$

where $\Delta D_t = D_t - D_{t-1}$
Policy experiment

Status quo: current US social security

- redistribution through AIME
Policy experiment

**Status quo: current US social security**
- redistribution through AIME
- high distortion (no link between LS and future pension benefits)

\[ a_{j+1, t+1} + \tilde{c}_{j, t} + \gamma_t = (1 - \tau)w_t \omega_j, t \cdot l_j, t - \mathcal{T}((1 - \tau)w_t \omega_j, t \cdot l_j, t) + (1 + \tilde{r}_t)a_{j, t} + \Gamma_j, t \]
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Alternative: fully individualized social security and lump-sum grants
- no redistribution through social security
Policy experiment

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**Alternative: fully individualized social security and lump-sum grants**

- no redistribution through social security
- no distortion

\[ a_{j+1,t+1} + \bar{c}_{j,t} + \gamma_t = (1 - \tau)w_t \omega_j,t l_j,t - \mathcal{T}((1 - \tau)w_t \omega_j,t l_j,t) + (1 + \tilde{r}_t)a_j,t + \Gamma_j,t + \xi_{j,t} \cdot \tau w_t \omega_j,t l_j,t \]

implicit tax: PV of $\Delta b$ due to contribution
Results
Distortion for $\eta = 0.8$
Labor supply reaction for $\eta = 0.8$
Distribution of welfare effects for $\eta = 0.8$
Welfare effect across $\eta$
Fiscal adjustment across $\eta$
Macroeconomic adjustment across $\eta$
Longevity makes the reform beneficial for even less responsive labor markets
Half-internalizing the reform is sufficient to deliver welfare gains ($\eta = 0.8$)
Conclusions
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2. ... generating welfare gains [potentially: Pareto improvement]
Conclusions

1. Progression in tax system can effectively substitute for progression in social security ...
2. ... generating welfare gains [potentially: Pareto improvement]
3. Important role for response of labor to the features of the pension system
Questions or suggestions?
Thank you!

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