Redistribution, distortions, and the welfare effects of Social Security

Youngsoo Jang
University of Queensland

Svetlana Pashchenko
University of Georgia

Ponpoje Porapakkarm (Poe)
National Graduate Institute for Policy Studies (GRIPS)

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Motivating background

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- US social security program (old-age survival ins trust fund) will be exhausted by 2033 ...(CBO, 2024)
- Existing studies/debates focus on instrument for its long-run sustainability *given its current design*
  - increase payroll taxes
  - cut benefits
  - increase full retirement age (FRA)

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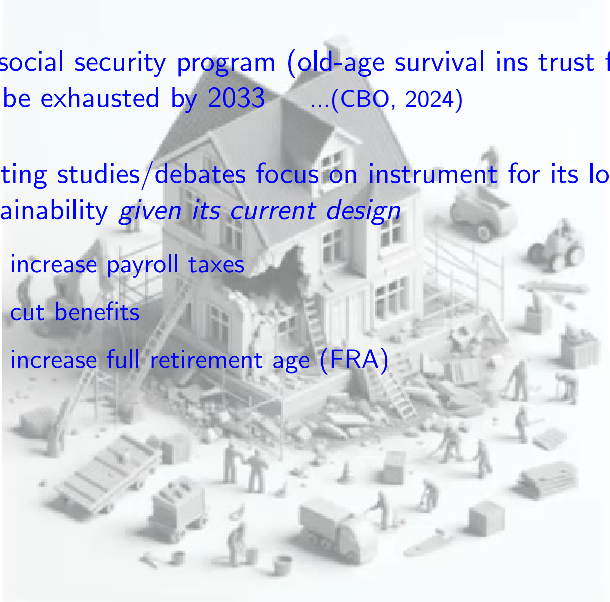

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- Pre-requisite questions:

  $\Rightarrow$ What is the optimal size of the program in the long-run?

  $\Rightarrow$ Should some features of the program also be redesigned?

Motivating background

- What is the optimal size of US Social Security in the long-run *given its current design*?

  Auerbach and Kotlikoff (AER1987); Hubbard, Judd (AER1987); Hong, Rios-Rull (JME2007); Imrohoroglu, Imrohoroglu, Joines (RED1999, QJE2003); Kumru, Thanopoulos (JEDC2008); Bagchi, Jeurgen (MD2023)

- Can the design of Social Security be improved *given its current size*?

  Yes: Golosov, Shourideh, Troshkin, Tsyvinski (AER2013); Jones and Li (RED2023); Huggett and Parra (JPE2010)

- We ask:

  How the optimal size of Social Security (long-run) depends on its design?

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- What is the optimal size of US Social Security in the long-run *given its current design*? ..... *Zero!*

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Social security : Insurance vs. distortions

1. Social Security pensions insure longevity risk
   - ⇒ mandated annuitization is undesirable if *annuity demand is low*
2. Social Security partially insures lifetime income risk
   - ⇒ redistribute through pensions
3. Social Security distorts intertemporal choice
   - ⇒ payroll taxes dictate *how much* and *when* to save for retirement

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   - limited due to income-mortality correlation : Coronado, Fullerton, Glass (2011); Goda, Shoven, Slavov (2011)
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3. Social Security distorts intertemporal choice
   - ⇒ payroll taxes dictate *how much* and *when* to save for retirement
     - adversely affect young people with borrowing-constrain Hubbard and Judd (1987); Hurst and Willen (2007); Pries (2007)

What we do?

- Focus on the three key features:

  1. Mandatory annuitization
  2. Redistribution through pension benefits
  3. Intertemporal distortions through payroll tax

- How changes in (1) – (3) affect the long-run welfare of Social Security program?

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What we do? .... 1^{st} Part: A tractable OLG model

- *Increase* the size of Social Security program affects welfare through 4 channels:
    1. Annuitization distortion ($+$ or $-$)
    2. Income redistribution ($+$)
    3. Intertemporal distortions ($-$)
    4. Dynamic (in)efficiency ($-$)

What we do? ... 2^{nd} Part: Quantitative LFC model

Key feature: People have *strong bequest motive*

$\Rightarrow$ low annuity demand (consistent with data)

1. When bequest motive is strong, removing social security has small effect on aggregate capital

2. Still, it is optimal to *remove* social security due to the large intertemporal distortion

3. Once removing the distortions and increasing redistribution, it is optimal to *expand the program (160%)*

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Related literature (subset)

1. Long-run welfare effects of removing Social Security:

   - optimal to remove

   Auerbach, Kotlikoff (1987); Hong, Rios-Rull (2007); Hubbard, Judd (1987); Imrohoroglu, Imrohoroglu, Joines (1999, 2003), Kumra, Thanopoulos (2008), Bagchi, Jeurgen (2023)

   - optimal to have

   Imrohoroglu, Imrohoroglu, Joines (1995); Harenberg, Ludwig (2019); Fuster, Imrohoroglu, Imrohoroglu (2003)

2. Optimal design of Social Security benefits: Golosov, Shourideh, Troshkin, Tsyvinski (2013); Jones, Li (2022); Huggett, Parra (2010)

3. *Intertemporal distortions* in social security: Hubbard, Judd (1987); Hurst, Willen (2007); Pries (2007)

Outline of the presentation

- Motivating facts
- Theoretical illustration
- Quantitative model
- Estimation
- Results

Motivating facts

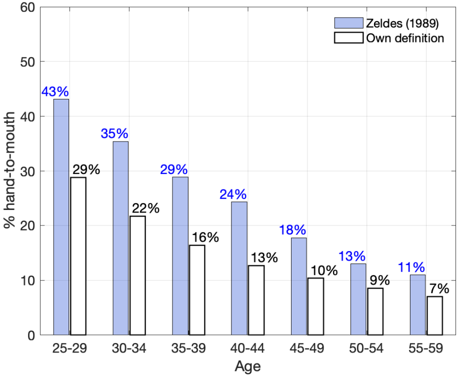
#1 Large fraction of borrowing-constraint people

$\Rightarrow$ *payroll tax is distortive*

#2 Low annuity demand

$\Rightarrow$ *mandatory annuitization is distortive*

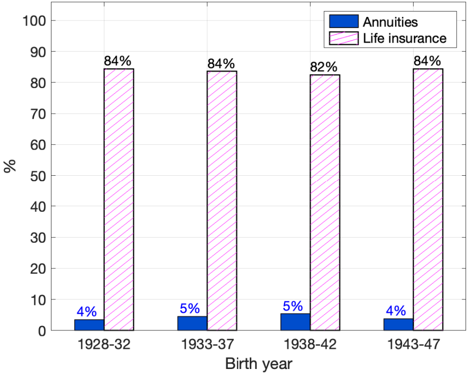
Fact 1: percentage of the hand-to-mouth (net worth, PSID)



- Median wealth = 0 ⇒ *yet, mandated to save for retirement*

non-housing wealth

Fact 2: low annuity demand (private annuities, HRS)



⇒ *Hardly, anyone buys private annuities*

☐ This might be due to market frictions.

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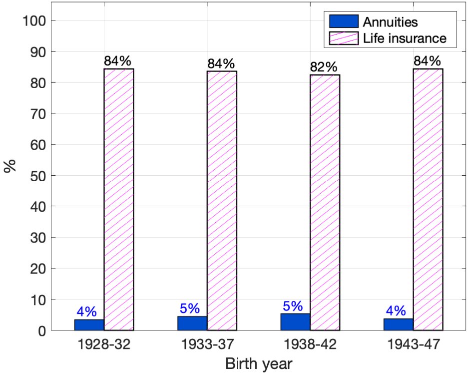

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Fact 2: low annuity demand (public annuities, HRS)

Claiming age	62	63	64	65 (FRA)	66	67	68	69	70
% full benefits	80%	86.7%	93.3%	100%	106.5%	113%	119.5%	126%	132.5%

Social security benefits by claiming age (upto 1937 cohort)

- Delay SS benefits claiming = buy public annuities

back

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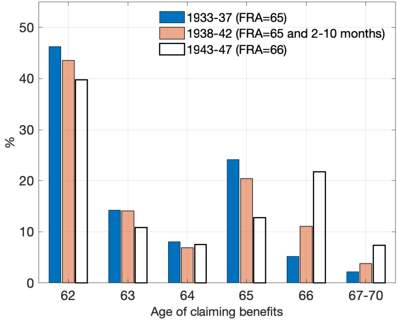

- 2/3 in each cohort claim before FRA
- More than 40% claim as early as possible
  - ⇒ *Low demand for public annuities*

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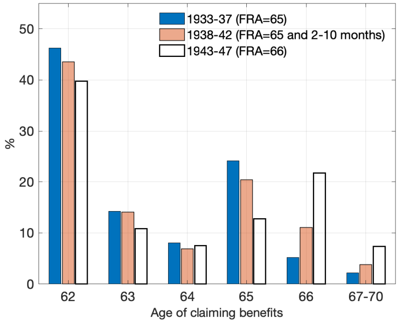

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- 1^{st} Part : Theoretical illustration
- 2^{nd} Part : Quantitative model
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Environment

- OLG structure (population growth $= n$)
- Two stages of the life-cycle:
  - Working period: $t <= R$
  - Retirement period: $R + 1 \leq t \leq T$

Ex-ante heterogeneity:

- Labor income: $y_{it} = \epsilon_i \lambda_t, \ \ \epsilon_i \sim F(\epsilon_i)$ for $t \leq R$
- Survival probability : $\theta_i \sim G(\theta_i)$ for $t > R + 1$
- ϵ_i and θ_i can be correlated: $\Rightarrow \ H(\epsilon, \theta)$

- Saving: liquid asset $(a_{it} \geq 0)$ and illiquid retirement account

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Setup (cont.)

$$V_i(\epsilon,\theta) = \max_{a_{it+1}\geq 0, c_{it}>0, \gamma_{it}, \alpha_i \in [0,1]} \overbrace{\sum_{t=1}^{R} \beta^{t-1} u(c_{it})}^{\text{working stage}} +$$

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$$c_{it} = \begin{cases} y_{it}(1-\gamma_{it}) + a_{it}(1+r) - a_{it+1} & ;\ \text{if } t \leq R \\ (1-\alpha_i)PW_i + d_i + a_{it}(1+r) - a_{it+1} & ;\ \text{if } t = R+1 \\ d_i + a_{it}(1+r) - a_{it+1} & ;\ \text{if } t > R+1 \end{cases}$$

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- $a_{it+1} \Rightarrow$ Saving wedge at age $t \leq R$:

$$wedge^{s}_{it} = u'_{it} - \beta(1+r)u'_{it+1}$$

(+ if borrowing constraint is binding)

- $\alpha_i \Rightarrow$ Annuitization wedge at age $R+1$:

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Introduce pay-as-you-go pension system ...

- Fixed contribution rate : $\gamma_{it} = \tau \quad$ for $t \leq R$

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Pay-as-you-go pensions and welfare

- Ex-ante welfare: $W = \int V_i \, dH(\epsilon, \theta)$
- Lifetime wealth at $R+1$:

$$LW_i(\widehat{r}) = \sum_{t=1}^{R} y_{it} (1+\widehat{r})^{R+1-t}$$

- How does welfare change with the pension size?

$$\frac{\partial W}{\partial \tau} = \underbrace{-\beta^R \int u'_{iR+1} \Big(LW_i(r) - LW_i(n) \Big) \, dH(\theta_i, \epsilon_i)}_{\text{dynamic (in)efficiency } (-)}$$

wedge def.

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$$\underbrace{-\int \sum_{t=1}^{R} (\beta(1+r))^{t-1} \; wedge^s_{it} \; \widetilde{PE}_{it} \, dH(\theta_i, \epsilon_i)}_{\text{intertemporal distortions } (-)}$$

$$\underbrace{-\frac{\beta^R}{q^{ss}} \int LW_i(n) \; wedge^a_i \, dH(\theta_i, \epsilon_i)}_{\text{annuitization distortions } (+,-)} \quad \underbrace{-\frac{\beta^R}{q^{ss}} (1-A) cov \Big(LW_i(n), MU^{Ret}_i \Big)}_{\text{redistribution } (+)}$$

wedge def.

Outline of the presentation

- Data facts
- Theoretical illustration
- Quantitative LFC model
- Estimation
- Results

Model: Individual's preference

- People derive utility from
  - consumption (c_t)
  - leisure ($\widetilde{l_t}$)
  - bequests (k_{t+1})
- *Epstein-Zin preferences* $\Rightarrow$ Risk aversion $\neq \frac{1}{IES}$

Life-cycle model

- Three life-cycle stages
  - 25-61$\rightarrow$ work
  - 62-69$\rightarrow$ can work/retire, and decide when to claim (FRA=65)
  - 70-99$\rightarrow$ retired
- People face uncertainty in:
  - Health $\{G, B\}$ and survival
  - Labor productivity
  - Out-of-pocket medical and nursing home expenses
- Income-mortality correlation
  - Two fixed productivity $\{\xi_{low}, \xi_{high}\} \Rightarrow$ health transitions

    $\Rightarrow$ health $\Rightarrow$ labor productivity, survival

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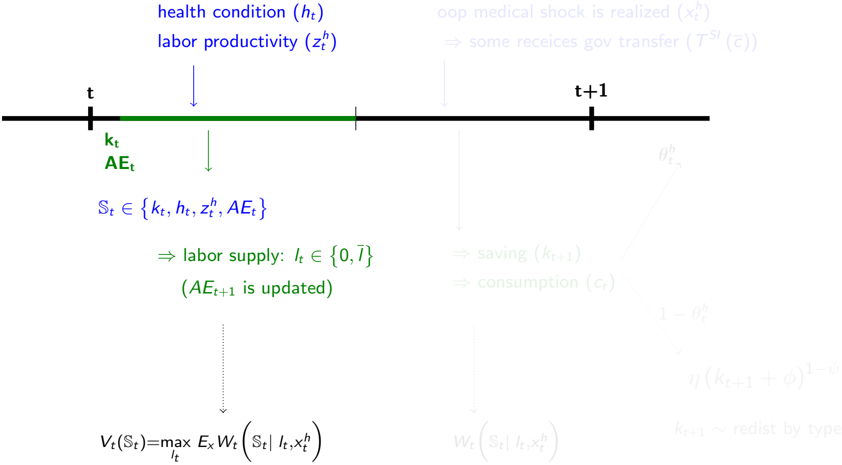
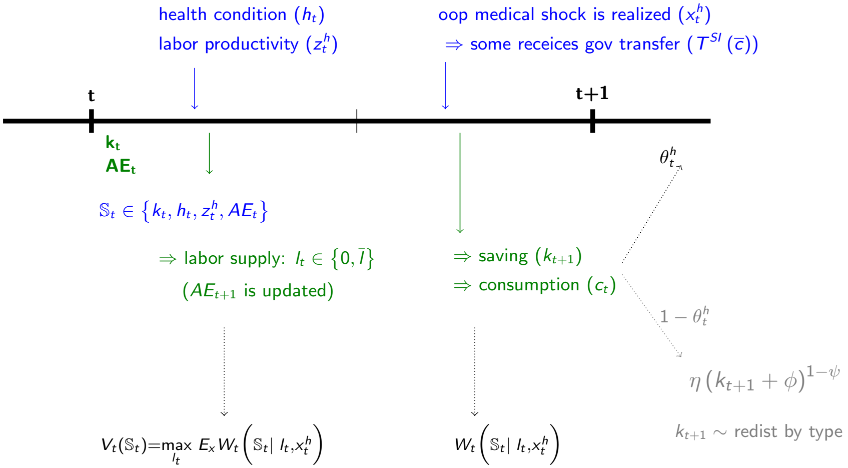
Model: individuals younger than earliest claiming age (25-61)



Model: individuals younger than earliest claiming age (25-61)



Model: individuals younger than earliest claiming age (25-61)

Consumption-saving problem

$$W_t(\mathbb{S}_t|l_t, x_t^h) = \max_{c_t, k_{t+1}} \left\{ \begin{array}{c} \left(c_t^{\chi} \widetilde{l_t}^{1-\chi}\right)^{1-\gamma} + \\ \beta \left[\theta_t^h E_t \left(V_{t+1}(\mathbb{S}_{t+1})\right)^{1-\psi} + (1-\theta_t^h)\eta \left(k_{t+1}+\phi\right)^{1-\psi}\right]^{\frac{1-\gamma}{1-\psi}} \end{array} \right\}^{\frac{1}{1-\gamma}}$$

subject to

$$\widetilde{l_t} = 1 - l_t - \phi_w^B \mathbf{1}_{\{l_t>0 \ \cap \ h_t=B\}}$$

$$k_t\,(1+r) + z_t^h \cdot l_t + T^{SI} + Beq(\xi) - x_t^h - Tax = k_{t+1} + c_t$$

Model: individuals (62-69) who still didn't claim benefits

health condition (h_t)
labor productivity (z_t^h)

oop medical shock is realized (x_t^h)
$\Rightarrow$ some receices gov transfer ($T^{SI}(\bar{c})$)

SS benefit: $SS(AE_t, j)$

t **t+1**

$\mathbf{k_t}$
$\mathbf{AE_t}$

$\mathbb{S}_t \in \{k_t, h_t, z_t^h, AE_t\}$

$\Rightarrow$ labor supply: $l_t \in \{0, \bar{l}\}$
$\Rightarrow$ claiming decision: $i_t^C \in \{0, 1\}$
$\Rightarrow$ pay Tax^{ET} if $t < 65 \cap z_t^h l_t > \bar{y}^{ET}$
(AE_{t+1} is updated)

$\Rightarrow$ saving (k_{t+1})
$\Rightarrow$ consumption (c_t)

θ_t^h

$1 - \theta_t^h$

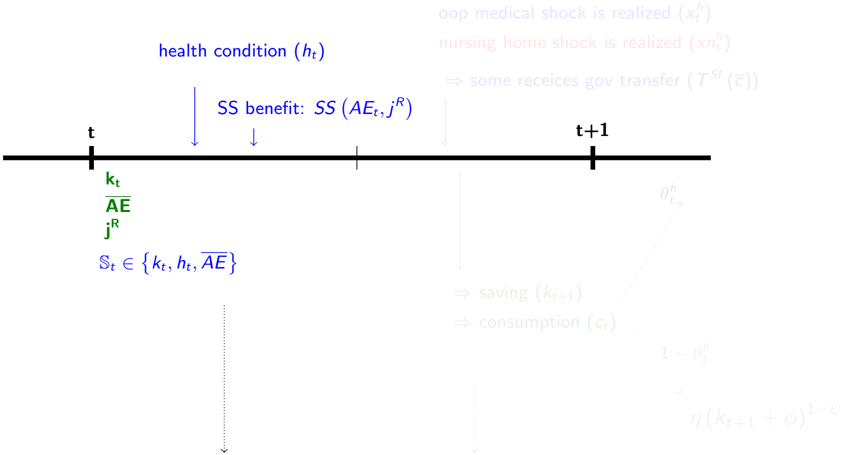
$\eta\left(k_{t+1} + \phi\right)^{1-\psi}$

$$V_t(\mathbb{S}_t) = \max_{l_t, i_t^C} E_x W_t\left(\mathbb{S}_t | \, l_t, i_t^C, x_t^h\right)$$

$$W_t^E\left(\mathbb{S}_t | \, l_t, i_t^C, x_t^h\right)$$

benefit schedule recursive prob (62-69) 63-69 (already claimed)

Model: individuals (70up)



$V_t^R\left(\mathbb{S}_t, J^R\right) = E_{x,xn} W_t^R\left(\mathbb{S}_t, J^R | x_t^h, xn_t^h\right)$ $\quad W_t^R\left(\mathbb{S}_t, J^R |, x_t^h, xn_t^h\right)$

Model: individuals (70up)

oop medical shock is realized (x_t^h)

nursing home shock is realized (xn_t^h)

health condition (h_t)

$\Rightarrow$ some receices gov transfer ($T^{SI}(\bar{c})$)

SS benefit: $SS\left(AE_t, j^R\right)$

t **t+1**

$\mathbf{k_t}$

$\overline{\mathbf{AE}}$

$\mathbf{j^R}$

$\mathbb{S}_t \in \left\{k_t, h_t, \overline{AE}\right\}$

$\Rightarrow$ saving (k_{t+1})

$\Rightarrow$ consumption (c_t)

θ_t^h

$1-\theta_t^h$

$\eta\left(k_{t+1}+\phi\right)^{1-\psi}$

$V_t^R\left(\mathbb{S}_t, J^R\right) = E_{x,xn} W_t^R\left(\mathbb{S}_t, J^R | x_t^h, xn_t^h\right)$

$W_t^R\left(\mathbb{S}_t, J^R |, x_t^h, xn_t^h\right)$

recursive prob (70+)

Production sector

Production function:

$$Y = AK^{\nu}L^{1-\nu}.$$

Factor prices:

$$r = \underbrace{\nu A \left(\frac{K}{L}\right)^{1-\nu}}_{MPK} - \delta$$

$$w = \underbrace{(1-\nu)\, A \left(\frac{K}{L}\right)^{\nu}}_{MPL}$$

Government budget constraint

⇒ Regular government budget balance:

$$\int \left(Tax_t - T_t^{SI} \right) \mathcal{M}(\boldsymbol{s}_t) = G$$

⇒ Social Security budget:

$$\int \left(\tau_{ss} \min\left(z_t^h l_t, \overline{y}_{ss}\right) + Tax^{ET} \right) \mathcal{M}\left(\boldsymbol{s}_t\right) = \int ss\, \mathcal{M}\left(\boldsymbol{s}_t\right)$$

Outline of the presentation

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Data

- We use three datasets

1. MEPS: *medical spending*
2. HRS: *claiming behavior, nursing home costs*
3. PSID: *wealth, labor income, employment*

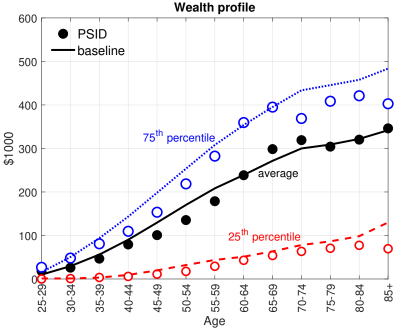
Exogenous shocks

parameters		sources
Health transition probability :	$\mathcal{H}\left(h_{t+1} \middle| h_t, \xi\right)$	PSID
Survival probability :	θ_t^h	HRS and SS life tables
Labor productivity :	z_t^h	PSID
OOP medical expenses:	x_t^h	MEPS
Nursing home costs:	xn_t^h	HRS

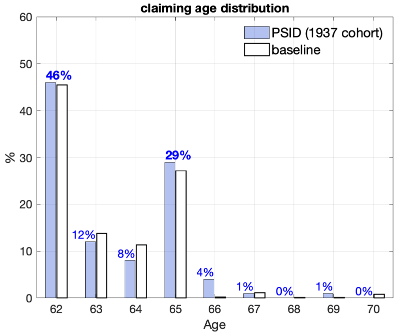
health-survival labor productivity
OOP med nursing home

Estimated parameters and model fit

1/IES	γ	1.403
Risk aversion	ψ	3.847
Bequest strength	$\{\phi, \eta\}$	
- Beq threshold		\$4,172
- Marginal propensity to Bequest		0.97
Discount factor	β	0.948
Disutility if working after claiming (< 65)	ϕ_{ss}	11% of endowed time



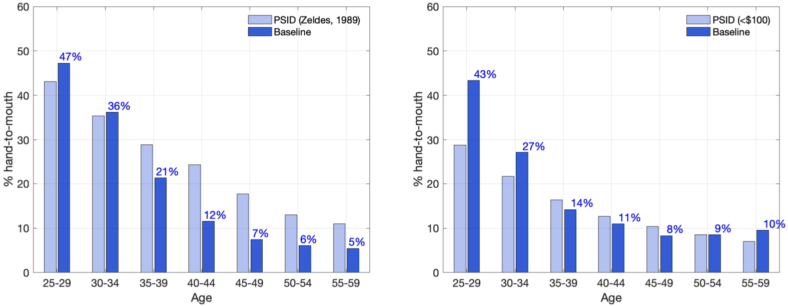
Wealth profiles



claiming age distribution

employment profile

Model fit: external validation



Def: Zeldes (1989) | Def: $100 net worth threshold

% hand-to-mouth

Outline of the presentation

- Data facts
- Theoretical illustration
- Quantitative model
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- **Results**

Results

Welfare measure: $transfer in each period ...

R1. Optimal size of social security program given its current design (baseline)

$$\int \left(\tau_{ss} \times \min\left(wz_t^h l_t, \bar{y}_{ss}\right) + Tax^{ET}\right)\mathcal{M}\left(\boldsymbol{s}_t\right) = b_{scale} \times \int ss\,\mathcal{M}\left(\boldsymbol{s}_t\right)$$

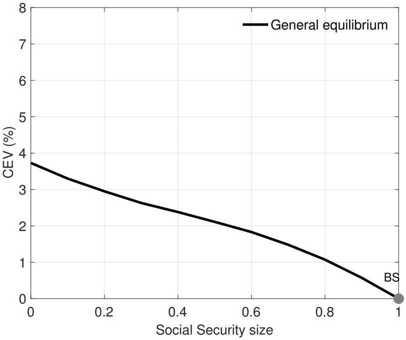
R2. Optimal size of social security program + changing SS feature

R2.1 No mandatory annuitization

R2.2 More redistributive pensions

R2.3 No intertemporal distortions

R1: Ex-ante welfare from eliminating Social Security



	K	N	r	w	Bequests		τ_y
					ξ_L	ξ_H	
Baseline	3.95	0.54	2%	1.178	0.033	0.166	0.13
No Social Security	4.10	0.56	2%	1.180	0.027	0.133	0.16

wealth profile PE

Results

R1. Ex-ante welfare when changing SS size (baseline)

$$\int \left(\tau_{ss} \min\left(wz_t^h l_t, \overline{y}_{ss}\right) + Tax^{ET}\right) \mathcal{M}\left(\boldsymbol{s}_t\right) = b_{scale} \times \int ss\, \mathcal{M}\left(\boldsymbol{s}_t\right)$$

R2. Ex-ante welfare when changing SS size + changing SS feature

R2.1 Mandated annuitization : $\alpha = 1 \rightarrow\rightarrow 0$

R2.2 More redistributive pensions : $ss(AE, j^R) \rightarrow\rightarrow$ uniform

R2.3 Less intertemporal distortions : $\tau_{ss} = 0$ (younger people)

Results

R1. Ex-ante welfare when changing SS size (baseline)

$$\int \left(\tau_{ss} \min\left(wz_t^h l_t, \overline{y}_{ss}\right) + Tax^{ET}\right) \mathcal{M}\left(\boldsymbol{s}_t\right) = b_{scale} \times \int ss\, \mathcal{M}\left(\boldsymbol{s}_t\right)$$

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R1. Ex-ante welfare when changing SS size (baseline)

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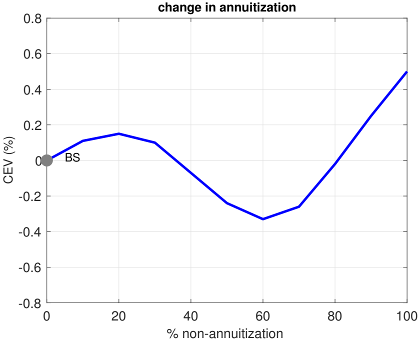
R2.3 Less intertemporal distortions : $\tau_{ss} = 0$ (younger people)

R2.1: Lower mandated annuitization

- $\alpha =$ fraction of annuitized benefits
- $(1-\alpha)$ of SS benefits is paid as one-time payment

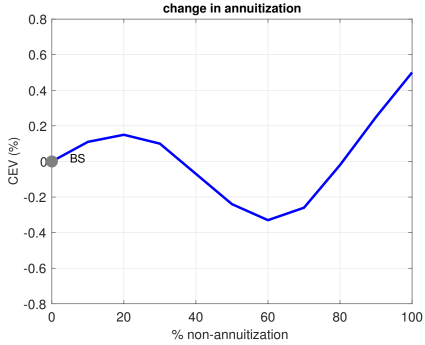
$$LS\left(AE, j^R\right) = (1-\alpha)\, ss\left(AE, j^R\right) \sum_{m=j^R}^{T} \frac{\overline{\theta}_{m|j^R}}{(1+r)^{m-j^R}}$$

R2.1: Lower mandated annuitization (cont.)

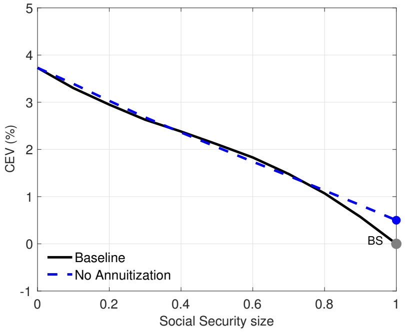


Fixed SS size (GE)

R2.1: Lower mandated annuitization (cont.)



Fixed SS size (GE)

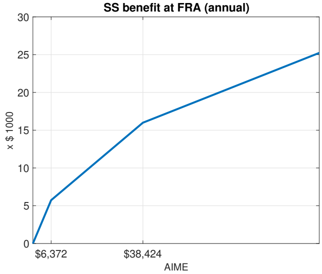


No annuitization (GE)

People are still better off without Social Security

R2.2: Increasing redistribution

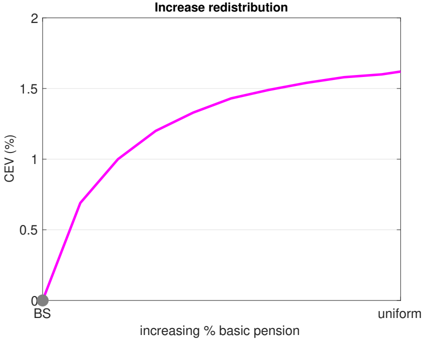
- $ss(AE, j^R = FRA)$: concave function of average earnings



- More redistributive pensions:

$$A * ss(AE, j^R = FRA) \; + \; (1 - A) * \overline{ss}$$

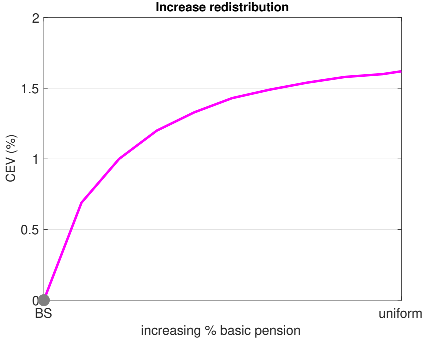
R2.2: Increasing redistribution (cont.)



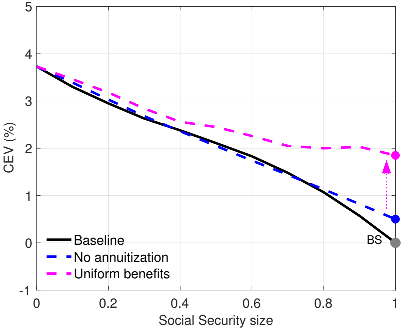
Fixed SS size (GE)

uniform + non-annuitization

R2.2: Increasing redistribution (cont.)



Fixed SS size (GE)



Uniform benefits (GE)

People are still better off without Social Security

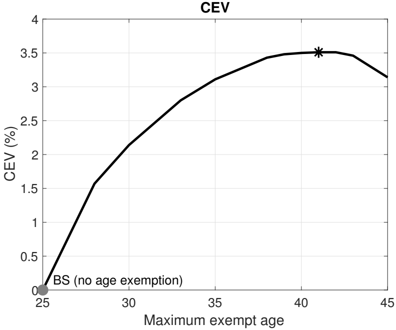
uniform + non-annuitization

R2.3: Less intertemporal distortions

- Many young workers
  - Have high expected income growth
  - Would prefer to delay saving for retirement
- Young people are exempt from payroll tax

$$\tau_{ss} = 0 \qquad \text{if} \qquad t \leq age_{exempt}$$

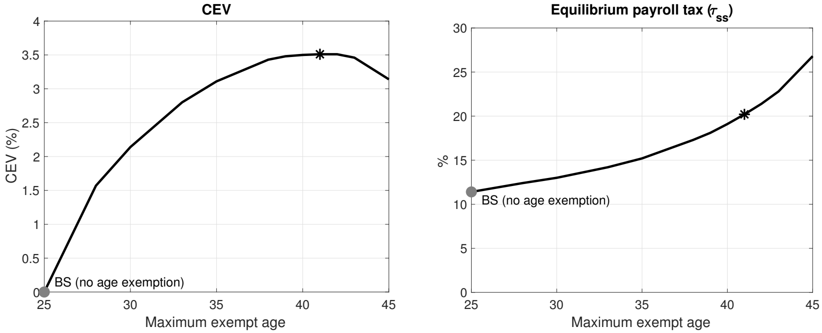
The effects of changing maximum exemption age



Fixed SS size (GE)

- Exemption age that maximizes welfare: 41 years old

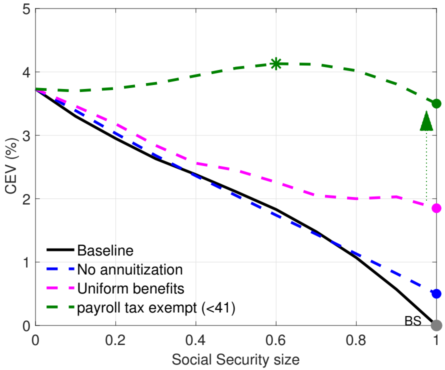
The effects of changing maximum exemption age



Fixed SS size (GE)

- Exemption age that maximizes welfare: 41 years old

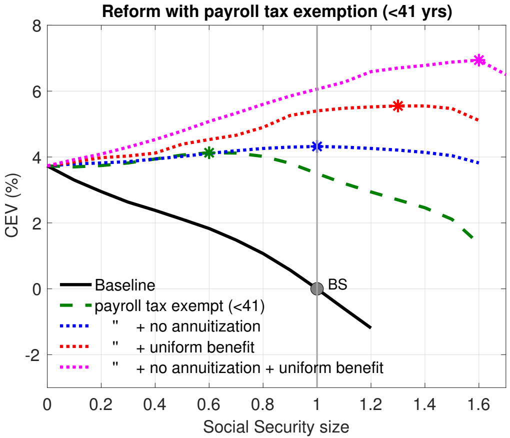
R2.3: Less intertemporal distortions (cont.)



- Payroll tax exemption upto 41 yrs old,
  - the optimal size is 60% of BS

by Type

R2: Combine all three policies



Optimal to **increase** the size of Social Security

τ^*_{ss}

Conclusions

- Study how optimal size of Social Security depends on its design features
- Focus on the three design features:
    - Mandatory annuitization
    - Insurance against lifetime income risk (redistributive benefits)
    - Intertemporal distortions through payroll tax
- Key findings (long-run)
    - ⇒ Social Security produces large ex-ante welfare losses *due to its design features*
    - ⇒ It is welfare improving only if addressing the intertemporal distortions from payroll taxes

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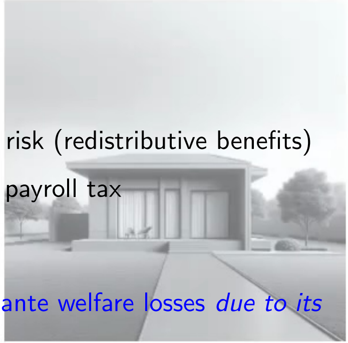
Conclusions



- Study how optimal size of Social Security depends on its design features
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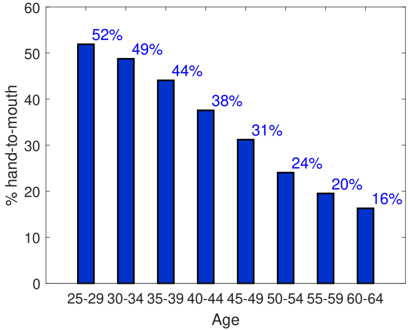
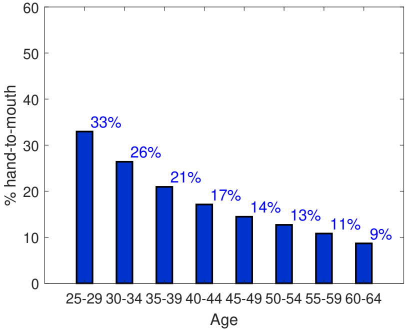
  - Intertemporal distortions through payroll tax
- Key findings (long-run)
  - ⇒ Social Security produces large ex-ante welfare losses *due to its design features*
  - ⇒ It is welfare improving only if addressing the intertemporal distortions from payroll taxes
  - ⇒ Correcting all the design flaws makes it optimal to **expand** the program (160% of current size)

THANK YOU !!

Fact 1: percentage of the hand-to-mouth (non-housing wealth)



Zeldes 1989



$100 threshold

back

Model: individuals (62-69) who still didn't claim benefits

Consumption-saving if he chooses to claim SS

$$W_t^E(\mathbb{S}_t|l_t, i_t^C = 1, x_t^h) = \max_{c_t, k_{t+1}} \left\{ \begin{array}{c} \left(c_t^{\chi}\widetilde{l}_t^{1-\chi}\right)^{1-\gamma} + \\ \beta\left[\theta_t^h E_t\left(V_{t+1}^C(\mathbb{S}_{t+1}, j^R)\right)^{1-\psi} + (1-\theta_t^h)\eta\left(k_{t+1}+\phi\right)^{1-\psi}\right]^{\frac{1-\gamma}{1-\psi}} \end{array} \right\}^{\frac{1}{1-\gamma}}$$

subject to

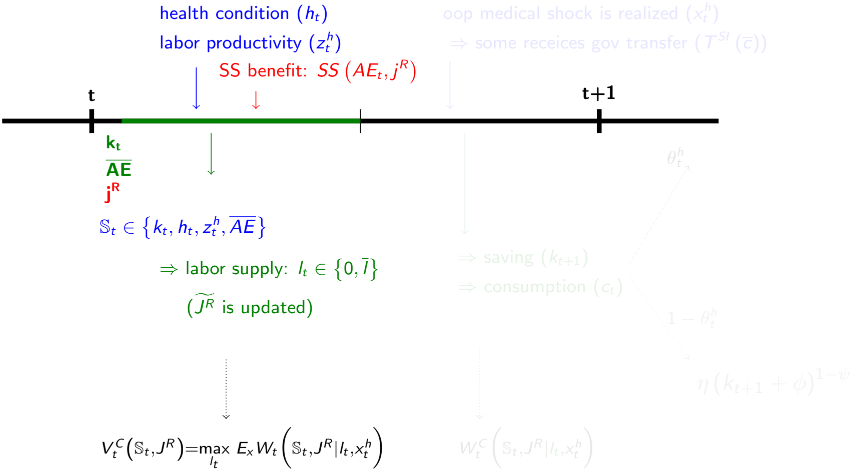
$$\widetilde{l}_t = 1 - l_t - \phi_w^B \mathbf{1}_{\{l_t>0 \,\cap\, h_t=B\}} - \phi_{ss}\mathbf{1}_{\{l_t>0 \,\cap\, i^C=1 \,\cap\, t<65\}}$$

$$k_t(1+r) + z_t^h l_t + \left(ss(AE_t, t) - Tax^{ET}_{\{t<65 \,\cap\, z_t^h l_t > \bar{y}^{ET}\}}\right) + T^{SI} + Beq(\xi) - x_t^h - Tax = k_{t+1} + c_t$$

$$j^R = \begin{cases} t+1 & ;\ \text{if } Tax^{ET} \geq 0.5\ ss(AE_t, t) \\ t & ;\ \text{otherwise} \end{cases}$$

▸ back

Model: individuals (63-69) who claimed benefits at age j^R



back

Model: individuals (63-69) who claimed benefits at age j^R

health condition (h_t)

labor productivity (z_t^h)

SS benefit: $SS\left(AE_t, j^R\right)$

oop medical shock is realized (x_t^h)

$\Rightarrow$ some receices gov transfer $\left(T^{SI}\left(\bar{c}\right)\right)$

t

t+1

$\mathbf{k_t}$

$\mathbf{\overline{AE}}$

$\mathbf{j^R}$

$\mathbb{S}_t \in \left\{k_t, h_t, z_t^h, \overline{AE}\right\}$

$\Rightarrow$ labor supply: $l_t \in \left\{0, \bar{l}\right\}$

$\left(\widetilde{J^R}\right.$ is updated)

$\Rightarrow$ saving (k_{t+1})

$\Rightarrow$ consumption (c_t)

θ_t^h

$1-\theta_t^h$

$\eta\left(k_{t+1}+\phi\right)^{1-\psi}$

$V_t^C\left(\mathbb{S}_t, J^R\right) = \max_{l_t} E_x W_t\left(\mathbb{S}_t, J^R | l_t, x_t^h\right)$

$W_t^C\left(\mathbb{S}_t, J^R | l_t, x_t^h\right)$

back

Model: individuals (63-69) who *already claimed* at age j^R

Consumption-savings problem

$$W_t^C(\mathbb{S}_t, j^R | l_t, x_t^h) = \max_{c_t, k_{t+1}} \left\{ \begin{array}{c} \left(c_t^{\chi} \widetilde{l}_t^{1-\chi}\right)^{1-\gamma} + \\ \beta \left[\theta_t^h E_t \left(V_{t+1}^C(\mathbb{S}_{t+1}, \widetilde{j}^R)\right)^{1-\psi} + (1-\theta_t^h)\eta \left(k_{t+1} + \phi\right)^{1-\psi}\right]^{\frac{1-\gamma}{1-\psi}} \end{array} \right\}^{\frac{1}{1-\gamma}}$$

subject to

$$\widetilde{l}_t = 1 - l_t - \phi_w^B \mathbf{1}_{\{l_t > 0 \,\cap\, h_t = B\}} - \phi_{ss} \mathbf{1}_{\left\{l_t > 0 \,\cap\, i_t^C = 1 \,\cap\, t < 65\right\}}$$

$$k_t (1+r) + z_t^h l_t + \left(ss(\overline{AE}, j^R) - Tax^{ET}_{\{t<65 \,\cap\, z_t^h l_t > \overline{y}^{ET}\}}\right) + T^{SI} + Beq(\xi) = k_{t+1} + c_t + x_t^h + Tax$$

$$\widetilde{j}^R = \begin{cases} j^R & ; \text{ if } Tax^{ET} < 0.5 \times ss(\overline{AE}, j_R) \\ j^R + 1 & ; \text{ otherwise} \end{cases}$$

back

Model: individuals (70up)

Consumption-savings problem

$$W_t^R(\mathbb{S}_t^R; x_t^h, xn_t^h) = \max_{c_t, k_{t+1}} \left\{ \begin{array}{c} c_t^{\chi(1-\gamma)} + \\ \beta \left[\theta_t^h E_t \left(V_{t+1}^R(\mathbb{S}_{t+1}^R) \right)^{1-\psi} + (1-\theta_t^h)\eta \left(k_{t+1} + \phi \right)^{1-\psi} \right]^{\frac{1-\gamma}{1-\psi}} \end{array} \right\}^{\frac{1}{1-\gamma}}$$

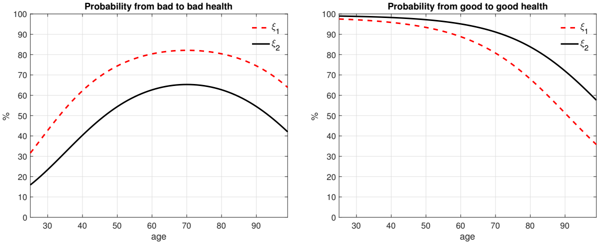
subject to

$$k_t\,(1+r) + ss(\overline{AE}, j^R) + T^{SI} = k_{t+1} + c_t + Tax + x_t^h + xn_t^h$$

back

Health transition and survival probability

Health transition probability by ξ

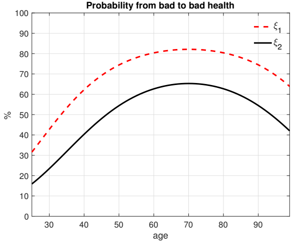


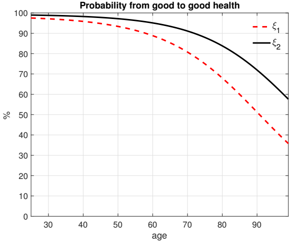
Survival probability by health

back

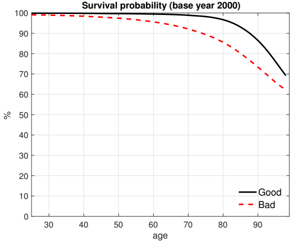
Health transition and survival probability

Health transition probability by ξ





Survival probability by health



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Stochastic processes estimated outside the model

- Health-dependent labor income process $\left(z_t^h\right)$

$$z_{it}^{h} = \lambda_t^{h} \exp(\nu_t) \exp(\xi)$$
$$\nu_t = \rho \nu_{t-1} + \varepsilon_t; \quad \varepsilon_{it} \sim iid \; N\left(0, \sigma_\varepsilon^2\right)$$

- Estimate $\hat{y}_{it}$:

$$\hat{y}_{it} = \hat{d}^{y}_{age} D^{age}_{it} \times D^{h}_{it} + \hat{d}^{y}_{j^c}(D^{c}_{i} = 1937) + \hat{\epsilon}^{y}_{it},$$

- $\hat{y}_{it}$ is used to compute λ_t^h

- $\rho = 0.984, \; \sigma_\varepsilon^2 = 0.02, \; \sigma_\xi^2 = 0.242$

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Age-dependent labor productivty : λ_t^h

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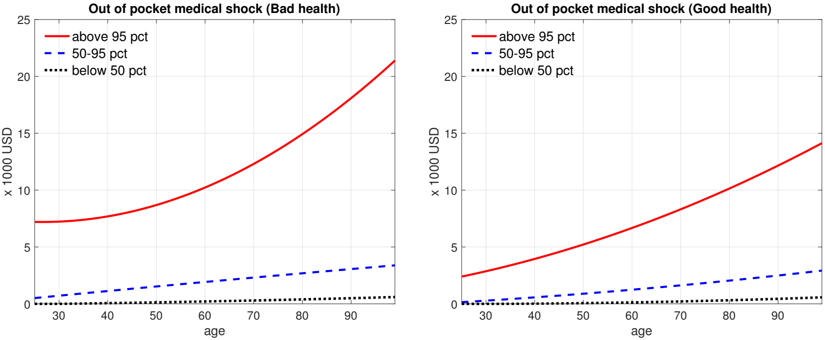
Health-dependent total medical expenses (x_t^h)

- x_t^h is directly estimated from MEPS



$h_t =$ Bad health

$h_t =$ Good

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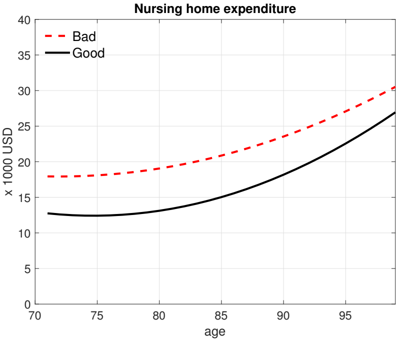
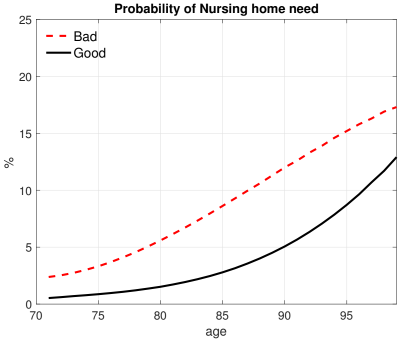
Nursing home expense shock $\left(xn_t^h\right)$



Nursing home expense shock



Probability of nursing home need

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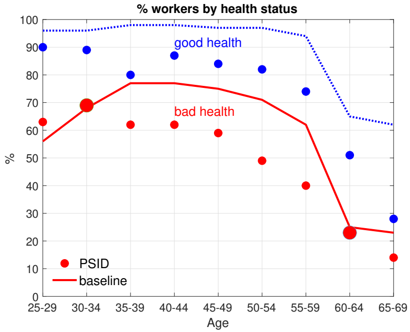
Estimated parameters and model fit (cont.)

Consumption floor	$\overline{c}$	\$2,401
Disutility from work (bad health)	ϕ_W^B	14.4% of endowed time



% working individuals

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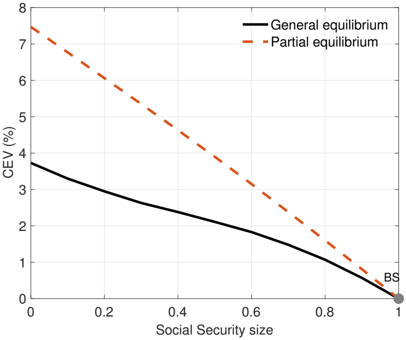
R1: Ex-ante welfare from eliminating Social Security



	K	N	r	w	Bequests ξ_L	Bequests ξ_H	τ_y
Baseline	3.95	0.54	2%	1.178	0.033	0.166	0.13
No Social Security	4.10	0.56	2%	1.180	0.027	0.133	0.16

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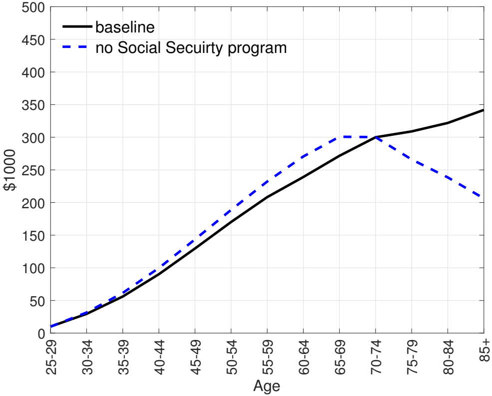
Wealth profiles: with and without Social Security



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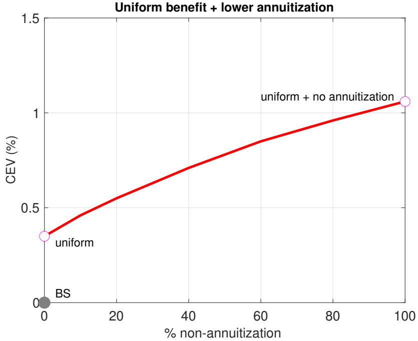
R2.2: uniform benefit + no annuitization (cont.)



Fixed SS size (PE)

People are still better off without Social Security

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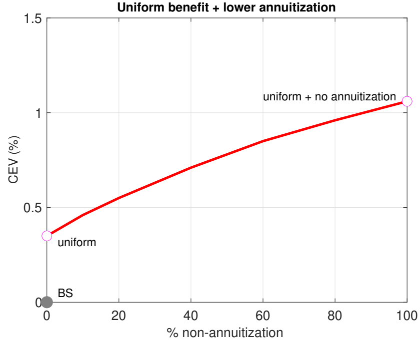
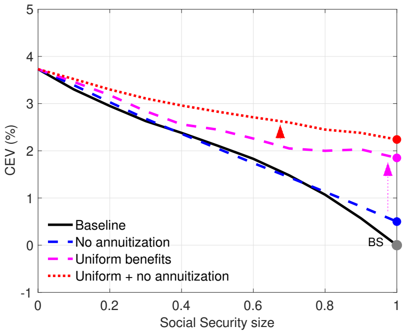
R2.2: uniform benefit + no annuitization (cont.)



Fixed SS size (PE)



Uniform benefit + no annuitization (GE)

People are still better off without Social Security

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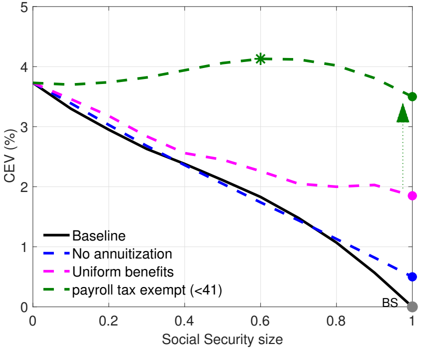
R2: Ex-ante welfare (fixed SS size)



CEV (fixed Social Security size as in baseline)

	All	ξ_{low}	ξ_{high}
No mandatory annuitization	0.50%	2.23%	-2.8%
Uniform benefits	1.85%	4.21%	-0.63%
$\tau_{ss} = 0$ upto 40yrs old	3.50%	5.09%	6.12%

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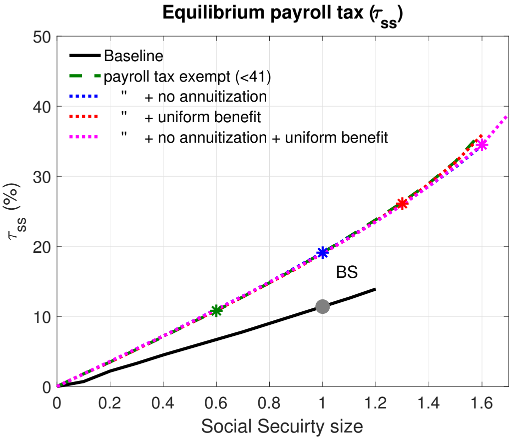
R3: Combining all three policies



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