Social Security, benefit claiming and labor force participation: A quantitative general equilibrium approach

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Introduction

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  Obama’s stimulus package $800 billion, TARP $700 billion, ...

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- Worst financial crisis since the Great Depression –
  Obama's stimulus package $800 billion, TARP $700 billion, ...
- Unfunded liabilities of Social Security today: **$17.5 TRILLION**
- Trust fund is expected to run out soon.
- With the projected increase in the dependency ratio, eventually, the system becomes unsustainable, unless there is a reform of some type, a large reduction in benefits or an increase in the payroll tax rate.

Introduction

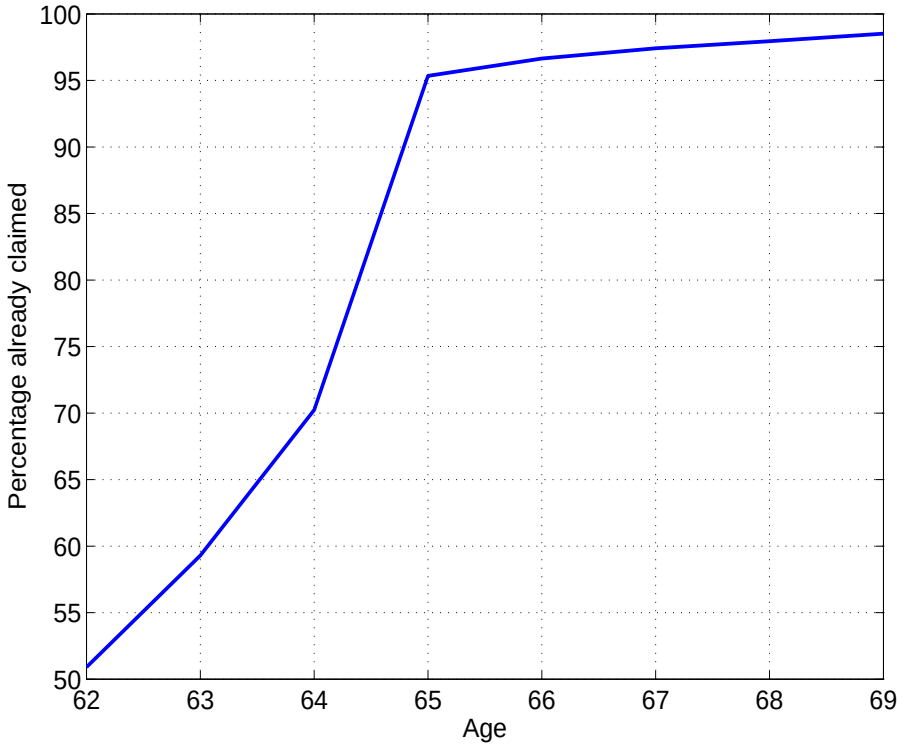
- Two trends related to Social Security and other economic, demographic and social factors:
  - The labor force participation rate for older workers has declined.
    - For example, for males between the ages of 55 and 64, from 83% in 1970 to about 70% in 2008.
  - Retirement age has declined.
    - In 2007 about 50% of retirees claimed benefits at age 62.

Two research questions

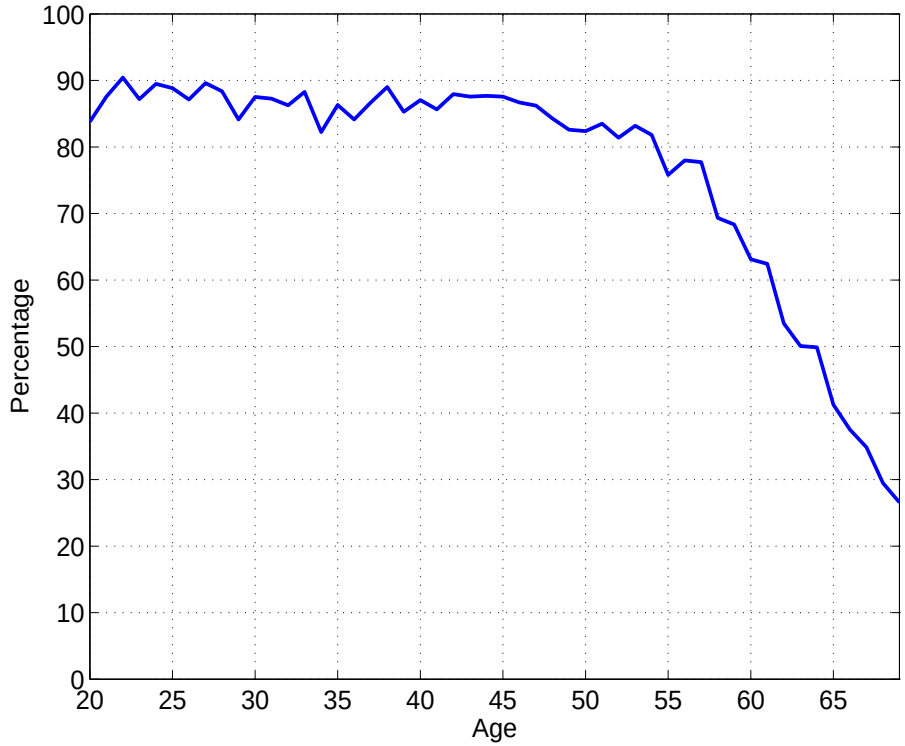
1. Can we build a quantitative general equilibrium model, calibrated to the U.S. microeconomic data and long run macro indicators, that generates two observations?

   - distribution of benefit claims at ages 62-70
   - labor force participation rate of individuals over the life cycle

Two research questions



(a) Benefit claim (SSA, 2007)



(b) Participation (MEPS, 2006)

Two research questions

2. Given a quantitative model that generates observed behavior in benefit taking and the labor force participation, what are the consequences of three reform experiments?

   - 50% reduction in benefits and taxes
   - increase in earliest retirement age from 62 to 64
   - increase in normal retirement age from 66 to 68

   Repeat the same computations in an environment in which individuals face projected conditional survival probabilities and dependency ratio in 2080

Literature

- Macroeconomics, general equilibrium, OLG
  - Auerbach and Kotlikoff (1987), Hubbard and Judd (1987)
  - Conesa and Krueger (1999), De Nardi, İmrohoroğlu and Sargent (1999), İmrohoroğlu, İmrohoroğlu, and Joines (1995), Rios-Rull (1996), Nishiyama and Smetters (2007)
    - Social Security offers partial insurance against various risks, but distorts saving and labor supply.
    - Overall a reform is welfare reducing due to transitional costs and political factors.
  - Attanasio, Kitao and Violante (2009), Jeske and Kitao (2009), De Nardi, French and Jones (2009)
    - Roles of health, expenditures and insurance.
- Benefit claim and labor participation exogenous

Literature

- Macro/GE exceptions with endogenous participation
  - Kulish, Smith, and Kent (2006): deterministic model on Australia.
  - Diaz-Gimenez and Diaz-Saavedra (2009): Social Security in Spain, no health shocks, delay 3 years and maintain solvency.
  - Rogerson and Wallenius (2009a), Prescott, Rogerson, and Wallenius (2009): non-linear transformation of work hours to efficiency. Study the effect of taxation.
  - Rogerson and Wallenius (2009b): introduce home production to explain the pattern of retirement and the role of nonconvexities.
  - Alonso-Ortiz (2010) studies the relation between social security rules and retirement behavior in OECD countries.

Literature

- Dynamic programming, structural model estimation, partial equilibrium
  - Rust and Phelan (1997): incomplete markets (no saving/borrowing). Role of health insurance and Medicare.
  - Gustman and Steinmeier (2005): preference heterogeneity explains retirement behavior.
  - French (2005): effects of Social Security rules (taxation and benefit adjustment) and private pensions on job exit rates at 62 and 65.
  - Benitez-Silva and Heiland (2007), Benitez-Silva, Dwyer, Heiland, and Sanderson (2007): early retirement penalty and earnings test, uncertainty about benefits.
  - van der Klaauw and Wolpin (2008): labor decision of married couples and singles.

Our Contribution

- In a quantitative general equilibrium model without any age-dependent preferences, generate two stylized facts:
  - age distribution of early taking
  - labor force participation rate
- Perform counterfactual experiments that suggest that
  - raising ERA by 2 years is nearly neutral
  - raising NRA by 2 years is better
  - downsizing the current SSA by half is even better
  - under the projected aging of population, reform becomes more urgent

MODEL

Demographics and health status

- Overlapping generations of individuals of age $j = 1, 2, ..., J$.
- Uncertain health status $h \in \{h^g, h^b\}$
  - $\pi_j^h(h, h')$: probability of health status h' in the next period conditional on today's health status h at age j.
  - Health status affects survival probabilities, work disutility and medical expenditures.
- Uncertain lifespan
  - $s_{j,h}$: probability that agents of age j in health status h survive until the next period.
  - The size of a new cohort grows at rate n.

Endowments and preferences

- No assets at birth (except for accidental bequests)
- One unit of time each period
- Earnings: $w\varepsilon_j\eta l$
  - w: market wage
  - ε_j: age-dependent deterministic productivity
  - η: idiosyncratic labor productivity
  - l: hours of work
- $u(c, l)$: period utility function
- $u^B(\cdot)$: warm-glow bequests
  - beq: bequests collected and distributed as a lump-sum transfer to the entire population

Health expenditures and insurance

- $\widetilde{m}$: gross medical expenditures from the distribution $\pi^m_{j,h}$
- m: out-of-pocket expenditures
  - depends on the employer health insurance status and eligibility for Medicare coverage.
- Employer-based health insurance
  - $i \in \{0, 1\}$: employer-sponsored health insurance status.
  - a draw at age $j = 1$ determines the insurance state i that is fixed throughout life.
  - tied to employment. no-participation means no coverage.
  - covers a fraction κ^{hi} of gross expenditures with a premium p^{hi} (included in the out-of-pocket expenditures m)

Social Security

- Pay-as-you-go Social Security system
  - τ^{ss} : tax on labor income up to the maximum of y^{ss}
  - ss : benefits received by a beneficiary, a concave function of an individual's average earnings e. Benefits are constant throughout the remaining life.
- Individuals can start collecting benefits at j^{ERA} (Earliest Retirement Age)
- Earnings test: if an individual below j^{NRA} (Normal Retirement Age) claims benefits and works, part of the benefit can be taxed away at τ^{ET}.
- Actuarial Reduction Factor (ARF) and Delayed Retirement Credit (DRC)
  - early taking of benefits comes with a permanent reduction.
  - late taking of benefits comes with a permanent increase.
  - if benefits are withheld by the earnings test, benefit entitlement is raised, which partially undoes the ARF.

Medicare

- Medicare coverage begins at age $j^{med} = 65$
- Abstract from supplemental private insurance
- Covers a fraction κ^{med} of gross expenditures
- Financed by the combination of the Medicare tax τ^{med} on earnings, Medicare premium p^{med} from each benefit recipient and the general government budget

Government transfer

- If an individual's assets fall below a consumption floor of $\underline{c}$ the government transfers tr.
- Medicaid, Supplemental Security Income

Market Structure

- No markets to insure against
  - longevity risk
  - idiosyncratic income risk

- Partial insurance
  - self-insurance by holding one-period riskless assets
  - imperfect health insurance

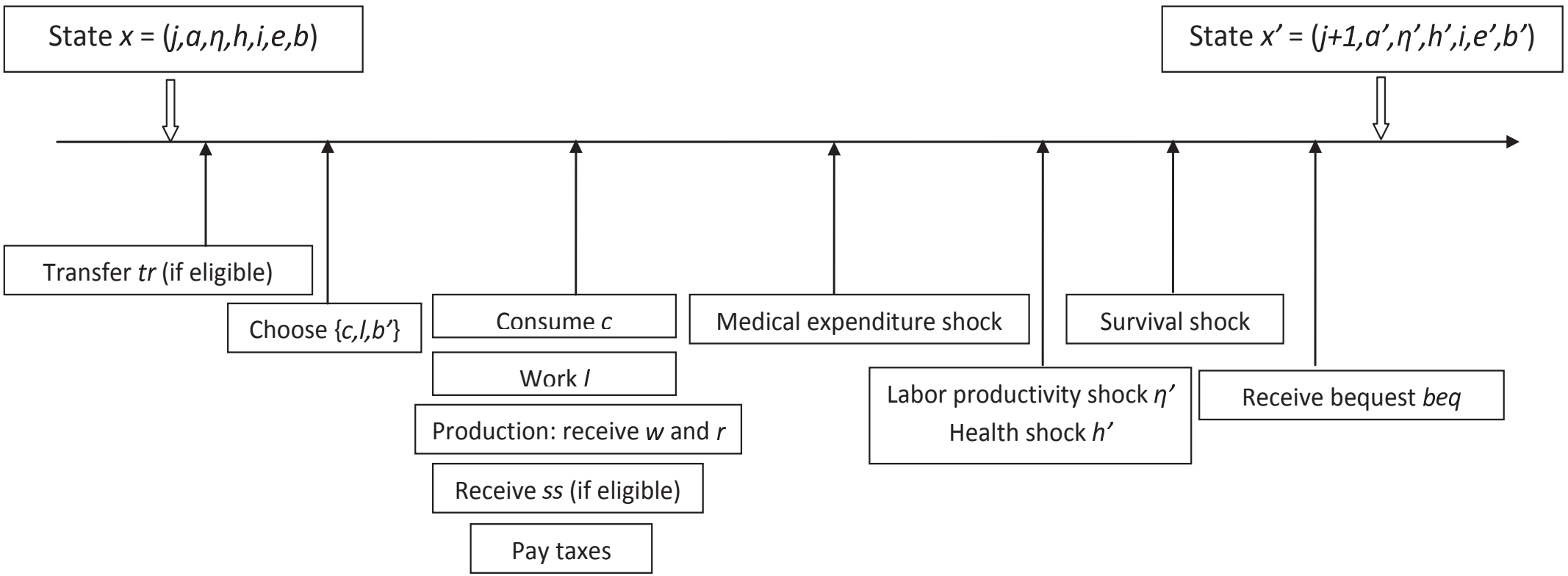
Technology

- Single good is produced according to neoclassical aggregate production function

$$Y = F(K, L) = AK^{\alpha}L^{1-\alpha}$$

- Capital depreciates at $\delta \in (0, 1)$

Household problem



Household problem

$x = \{j, a, \eta, h, i, e, b\}$: state vector faced by each individual

- j: age
- a: assets
- η: idiosyncratic labor productivity
- h: health status
- i: health insurance coverage (indicator)
- e: average labor earnings
- b: Social Security claim status (indicator)

Household problem

$$V(x) = \max_{c,l,b'} \left\{ u(c,l) + \beta s_{j,h} E[V(x')] + \beta(1 - s_{j,h}) E[u^B(\tilde{a}')] \right\}$$

subject to

$$a' = (1+r)k + w\varepsilon_j \eta l + ss(x) - m(x) - T(x) + beq,$$

where

$$\begin{aligned}
k &= a - (1+\tau^c)c + tr \geq 0, \\
tr &= \max\{0, (1+\tau^c)\underline{c} - a\}, \\
e' &= f_j(e, w\varepsilon_j \eta l, b'), \\
T(x) &= \tau^k rk + (\tau^l + \tau^{med}) w\varepsilon_j \eta l + \tau^{ss} \min\{w\varepsilon_j \eta l, y^{ss}\} + \tau^{ET}, \\
\tilde{a}' &= a' - beq.
\end{aligned}$$

Government budget

$$
\begin{aligned}
G \quad + \quad & (1+r)D + \sum_x ss(x)\mu(x) + \sum_x tr(x)\mu(x) + \sum_{x|j \geq j^{med}} \kappa^{med}\widetilde{m}(x)\mu(x) \\
= \quad & \sum_x \Big[(\tau^l + \tau^{med}) w \varepsilon_j \eta l(x) + \tau^{ss} \min\{w\varepsilon_j \eta l(x), y^{ss}\} \\
& + \tau^k r k + \tau^c c(x) + p^{med} \cdot I_{\{j \geq j^{med}\}} \Big] \mu(x) + D'
\end{aligned}
$$

where $\mu(x)$ denotes the measure of individuals in state x

Stationary equilibrium

Given $\{s_j\}_{j=1}^{J}$, $\{n\}$ and $\{G, D', ss, \tau^{ss}, y^{ss}, \tau^{ET}, \tau^{med}, p^{med}, \tau^{k}, \tau^{c}\}$, a stationary competitive equilibrium consists of individuals' decision rules $\{c, \ell, b', a'\}$ for each state x, factor prices $\{w, r\}$, private health insurance premium $\{p^{hi}\}$, labor income tax rate $\{\tau^{l}\}$, a lump-sum transfer of accidental bequests $\{beq\}$ and the measure of individuals $\{\mu(x)\}$ that satisfy the following conditions:

1. Individuals solve their dynamic program.
2. Firms maximize profits: $w = F_L(A, K, L)$ and $r = F_K(A, K, L) - \delta$.
3. Bequests are given to all survivors as a lump-sum:

$$beq = \sum_{x} \tilde{a}(x)(1 - s_{j-1,h})\mu(x).$$

Stationary equilibrium – continued

4. Private health insurance premium p^{hi} is determined so that the insurance provider will break even.

$$p^{hi} \sum_{x|i=1,l(x)>0} \mu(x) = \kappa^{hi} \sum_{x|i=1,l(x)>0} \widetilde{m}(x)\mu(x).$$

5. The labor and capital markets clear.

$$\begin{aligned} L &= \sum_x \varepsilon_j \eta \ell(x)\mu(x), \\ K &= \sum_x k(x)\mu(x) - D, \end{aligned}$$

Stationary equilibrium – continued

6. The labor income tax satisfies the government budget constraint.

7. The goods market clears.

$$C + K' + M + G = Y + (1 - \delta)K,$$

where $C = \sum_x c(x)\mu(x)$ and $M = \sum_x \widetilde{m}(x)\mu(x)$

CALIBRATION

Calibration

- Use Medical Expenditure Panel Survey (MEPS) to calibrate:
  - health status transition
  - medical expenditures
  - employer provided insurance (eligibility and coverage)
  - Medicare coverage

Calibration

- Health expenditures (in 2006 $)

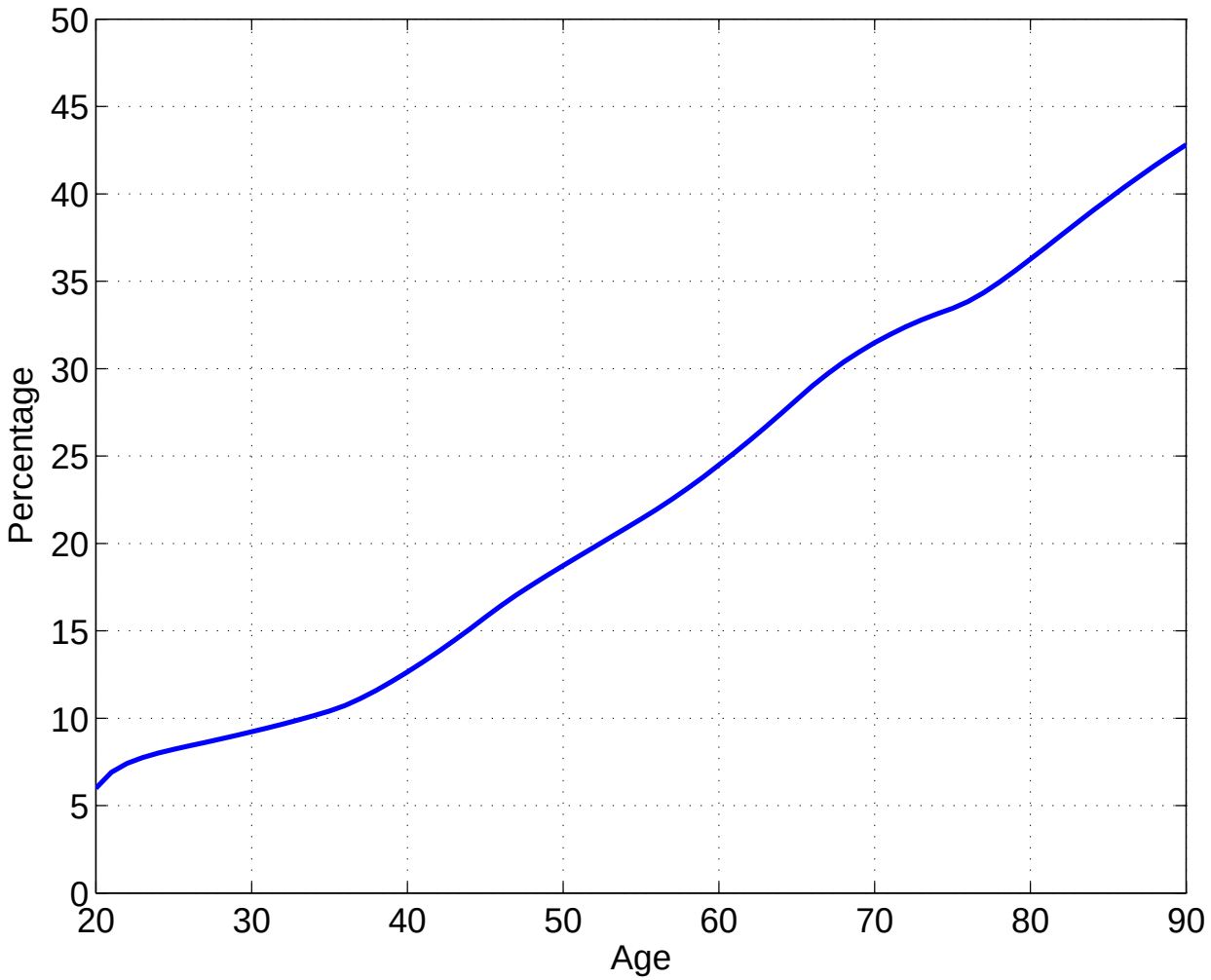
Percentile	60%	35%	5%
Age 20-29			
Good health	111	2,137	13,875
Bad health	616	6,769	30,100
Age 40-49			
Good health	291	2,808	16,126
Bad health	1,235	11,238	62,543
Age 65-			
Good health	1,814	8,394	34,780
Bad health	4,177	21,777	76,235

Calibration

- Health status transition

Age		Good	Bad
20-29	Good	0.96	0.04
	Bad	0.42	0.58
50-59	Good	0.94	0.06
	Bad	0.20	0.80
80-	Good	0.85	0.15
	Bad	0.18	0.82

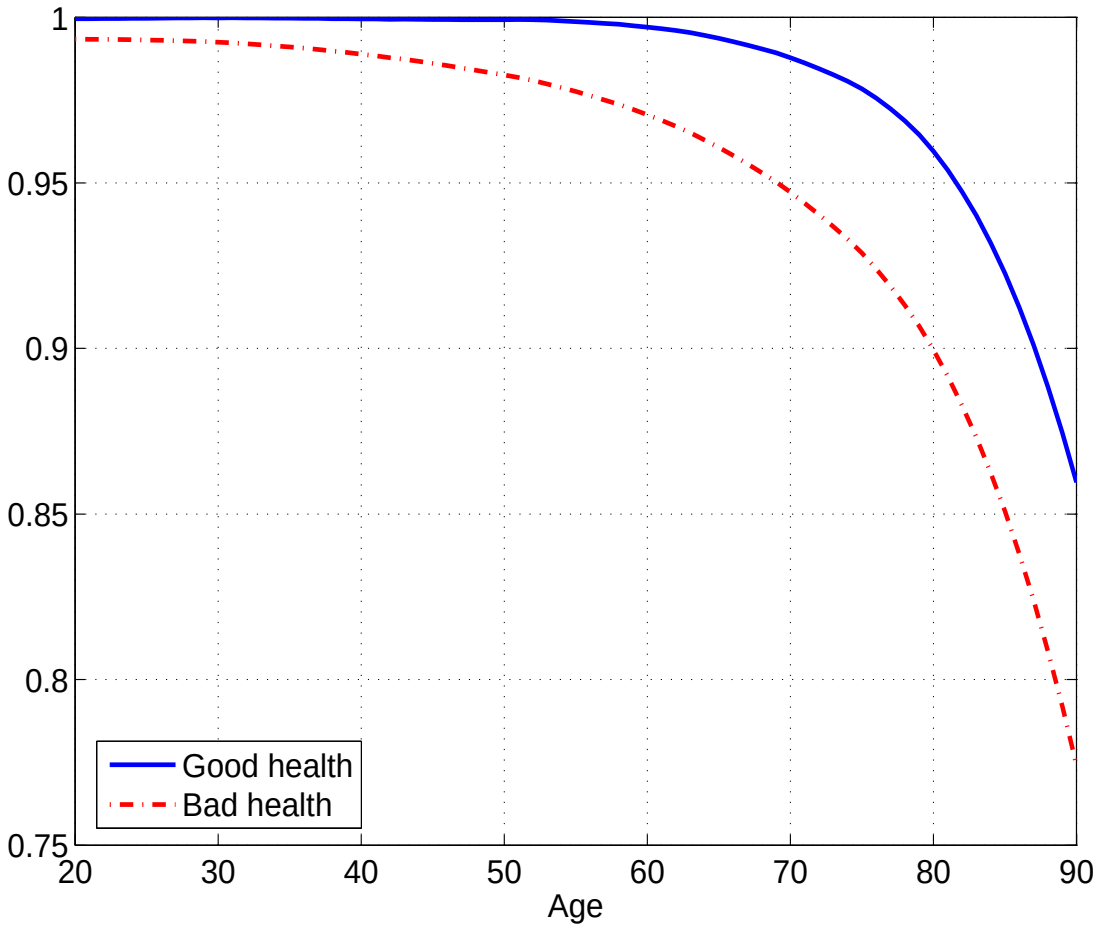
Calibration



Probability of being in bad health by age

Calibration: survival rates

- Bell and Miller (2005): survival rates in 2010
- HRS, Attanasio, Kitao and Violante (2009): good-health premium



Calibration

- Preference

$$
\begin{aligned}
u(c,l) &= \log c - \chi \frac{l^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} - \phi(h) \cdot I_{\{l>0\}} \\
u^B(a') &= \psi_1 \log(\psi_2 + a')
\end{aligned}
$$

  - $\gamma = 0.5$
  - χ, $\phi(h)$ and $\psi_1 \Rightarrow$ next page
  - $\psi_2 = \$500,000$

- Consumption floor $\underline{c} = \$3,000$

Calibration

Parameter		Value	Target
β	subjective discount factor	0.964	capital-output ratio=2.5
χ	preference weight on leisure	31.0	avg work hours=0.33
ψ_1	weight on bequest utility	27.0	wealth of age$\geq$75 1.75 of the avg
$\phi(h)$	cost of participation	{0.5,0.9}	participation of 60-69 and ratio of good and bad health

Calibration: Social Security

- Benefit based on the average past earnings e

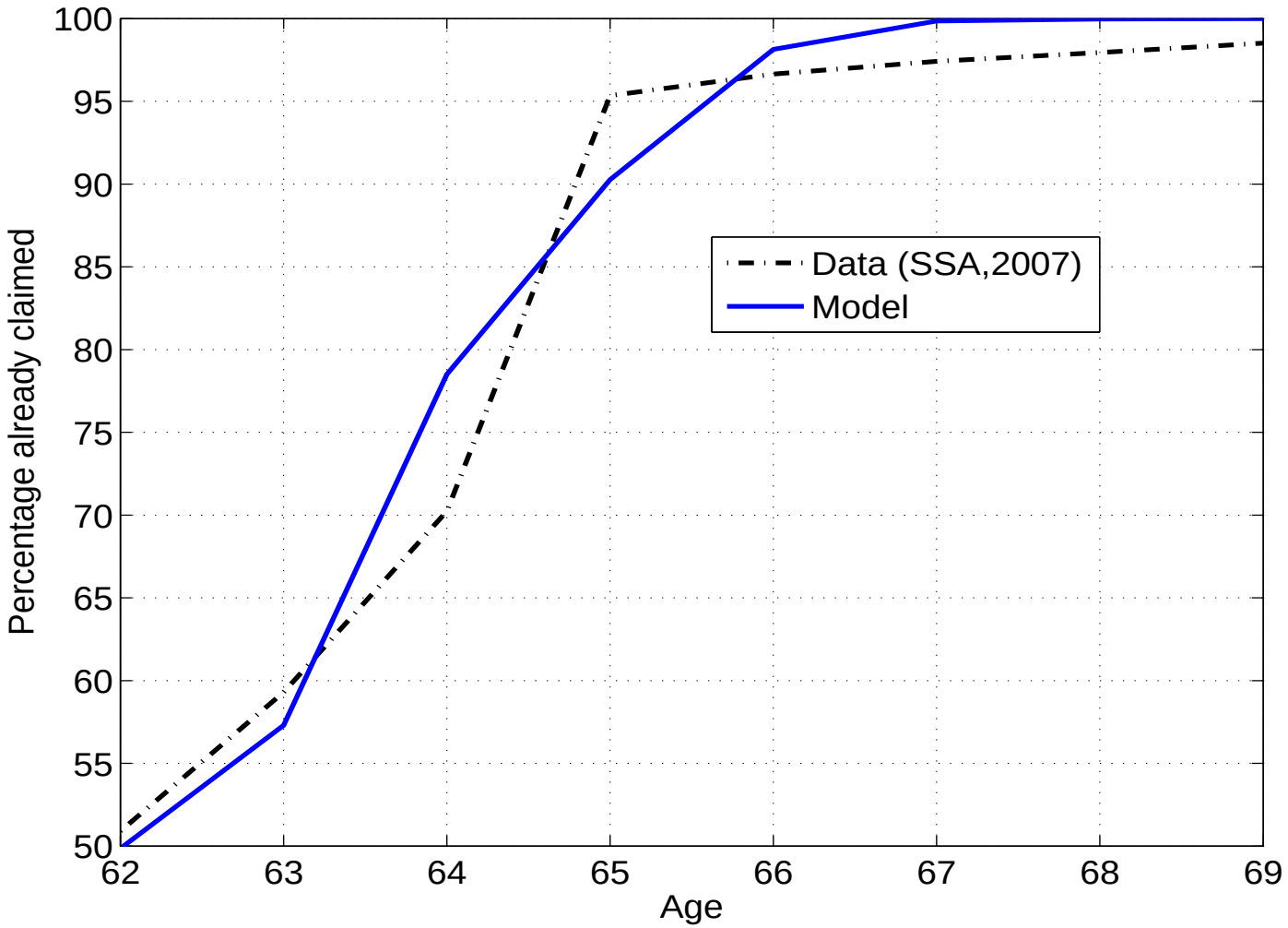
$$PIA = \begin{cases} 0.9 \times e & \text{if } e < \$8,532 \\ \$7,679 + 0.32 \times (e - \$8,532) & \text{if } \$8,532 \leq e < \$51,456 \\ \$21,414 + 0.15 \times (e - \$51,456) & \text{if } e \geq \$51,456 \end{cases}$$

- Normal retirement age 66
  - early retirement and Actuarial Reduction Factor (**ARF**): benefit reduced by 25%, 20%, 13.3% and 6.7% if retiring at 62 to 65
  - delayed retirement and Delayed Retirement Credit (**DRC**): benefit raised by 8% every year up to age 70

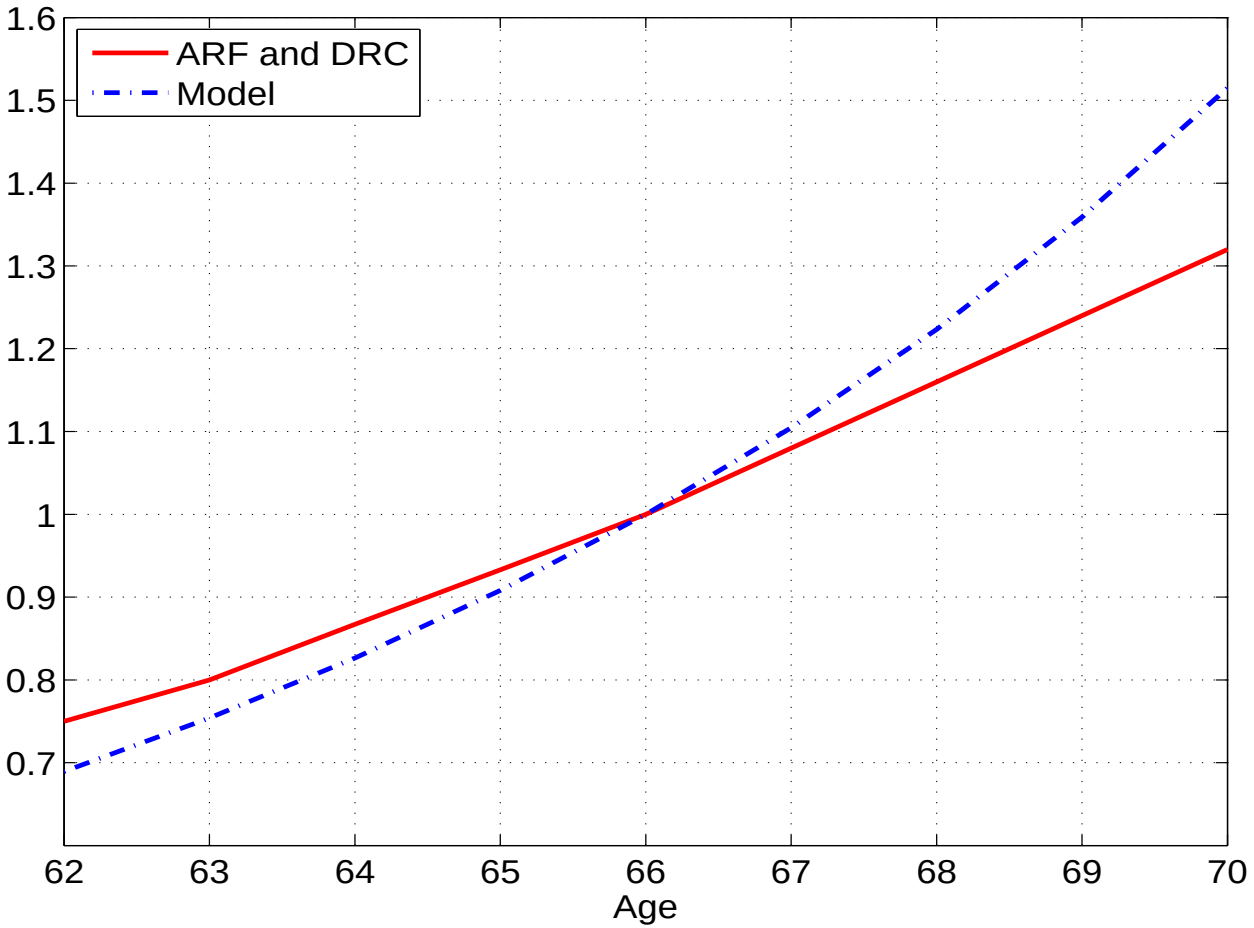
- Earnings test
  - benefits withheld at rate 50% for every dollar of earnings exceeding $13,560 until all benefits are exhausted
  - ARF is "undone" according to the benefits withheld

NUMERICAL RESULTS

Benefit claim



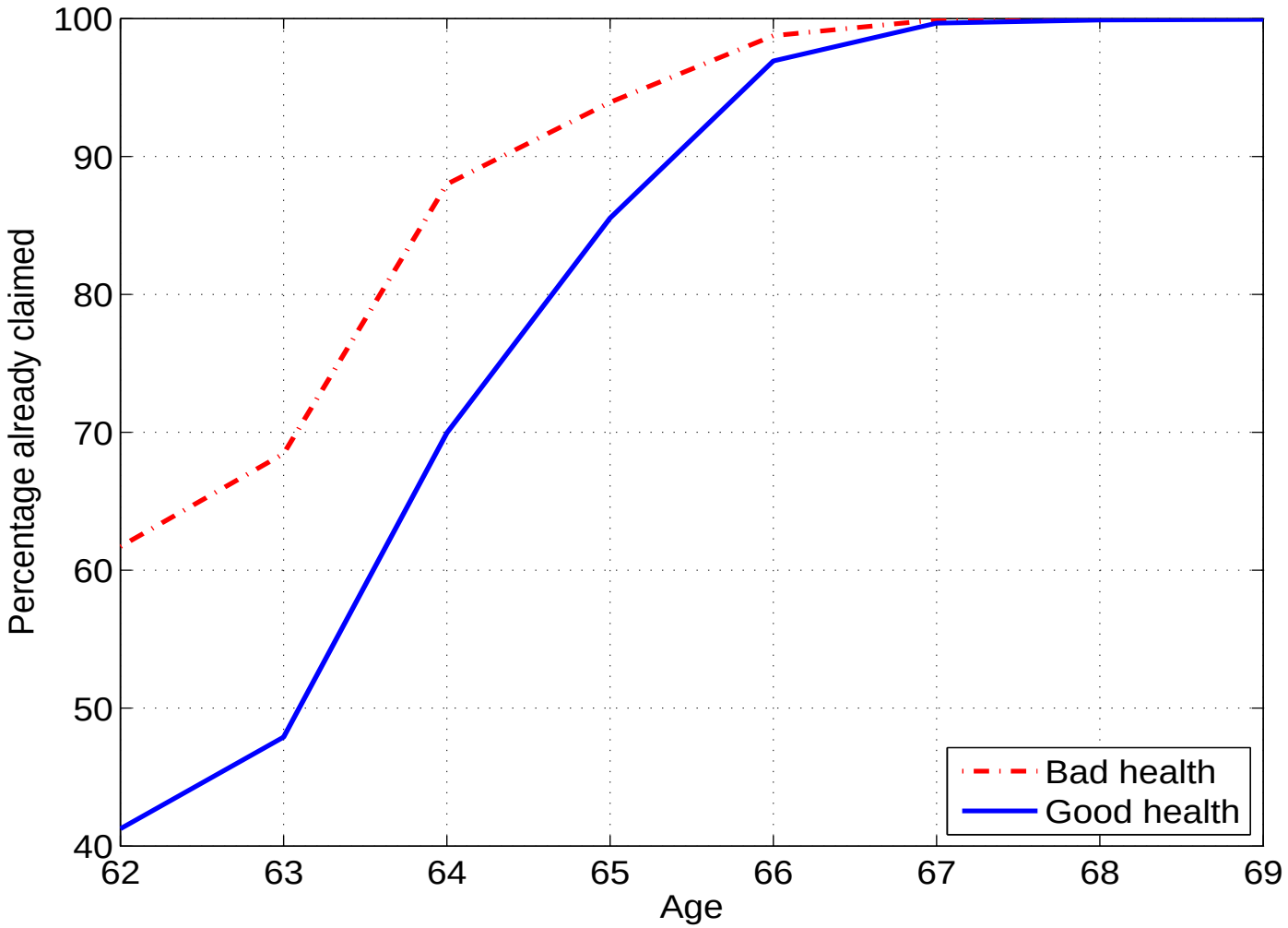
ARF/DRC and actuarially fair adjustment



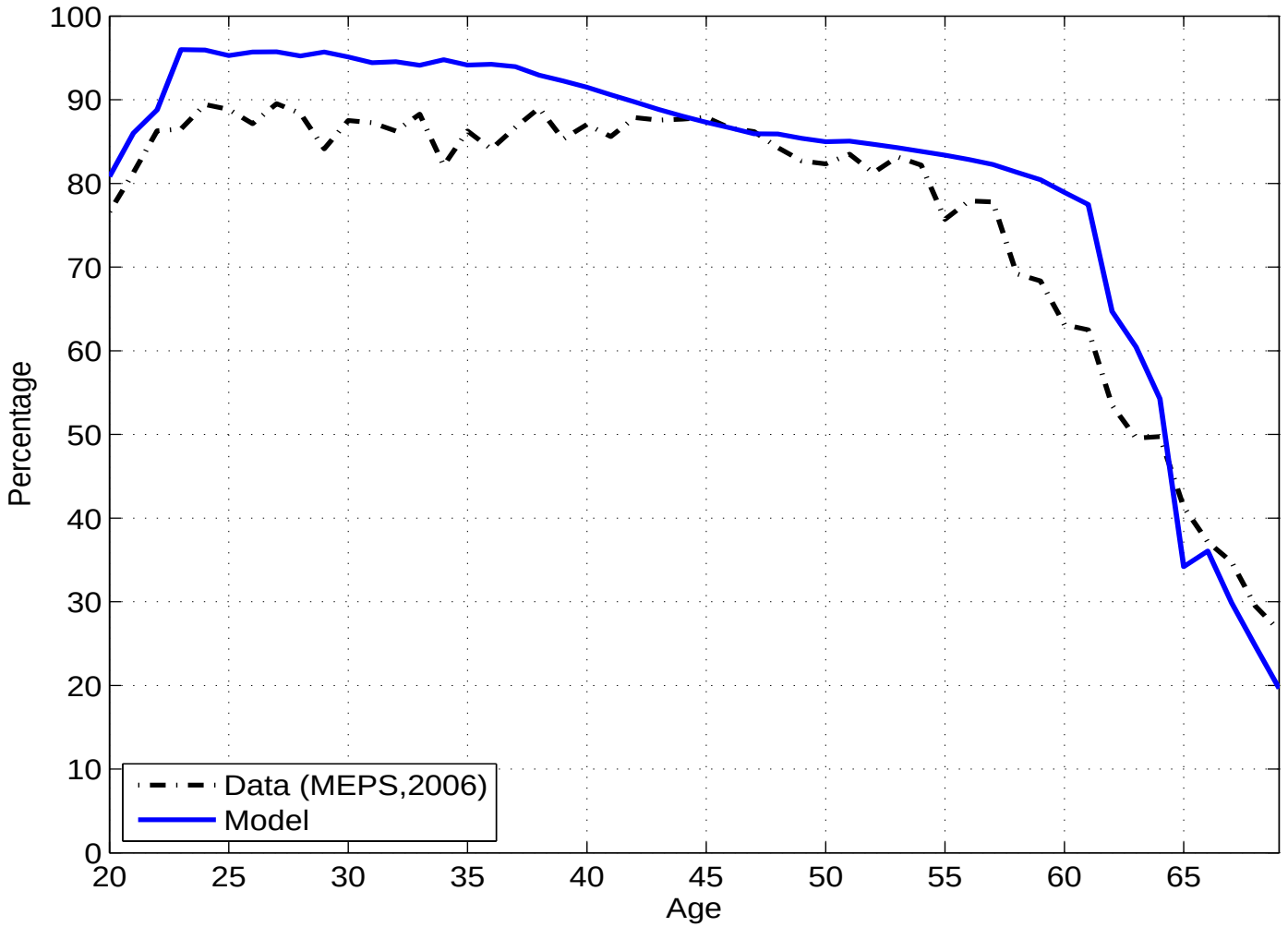
ARF/DRC and actuarially fair adjustment

- ARF more than actuarially fair, but the annuity value of Social Security may be not just the actuarially fair value.
  - heterogeneity in health
  - market incompleteness
    - buffer stock savings against uninsurable risks
    - longevity risks and medical expenditures later in life
  - earnings test

Benefit claim by health : model

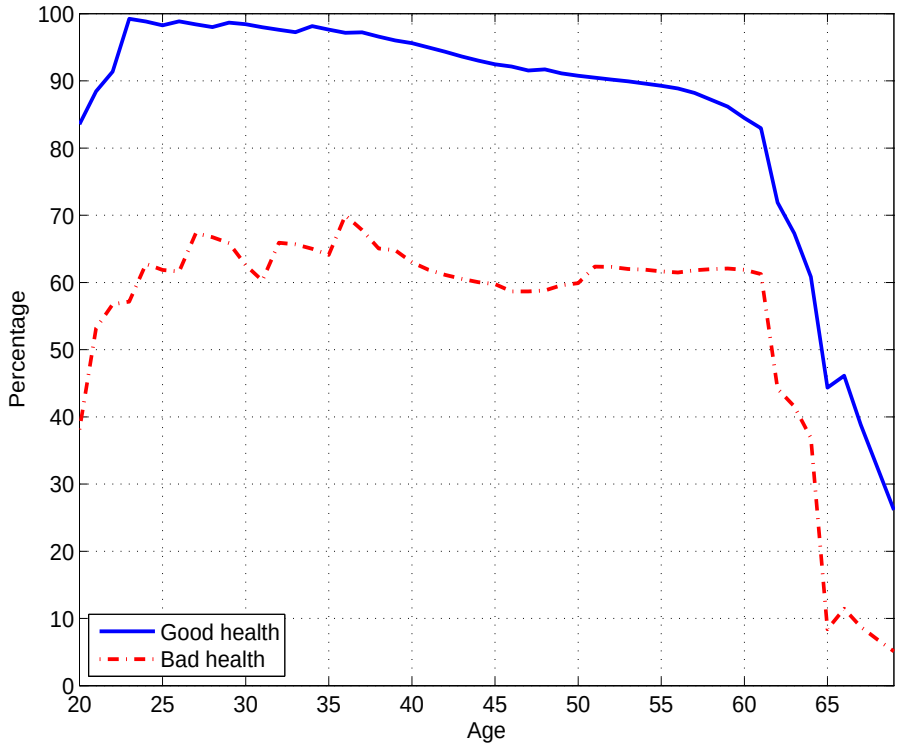


Labor participation : model vs data



Labor participation by health status

(c) Data



(d) Model

Social Security reforms

1. Benefit reduction by 50%

2. Increase in earliest retirement age (ERA): $62 \Rightarrow 64$

3. Increase in normal retirement age (NRA): $66 \Rightarrow 68$

Social Security reforms

	Benchmark	Benefit 50% $\Downarrow$	ERA 62 $\Rightarrow$ 64	NRA 66 $\Rightarrow$ 68
Capital	–	+9.9%	+0.11%	+2.4%
Labor	–	+3.1%	+0.18%	+0.7%
Average work hours	–	+0.2%	−0.04%	+0.1%
Wage	–	+2.4%	−0.10%	+0.6%
Interest rate (%)	5.54%	4.95%	5.56%	5.39%
Labor tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	28.1%	34.9%	33.2%
S.S. budget balance (% of GDP)	+0.48%	+0.30%	+0.54%	+1.32%
Social Security benefit already claimed				
at 62	49.9%	24.0%	–	39.3%
by 66	98.1%	89.4%	97.9%	87.4%
by 69	100.0%	99.8%	100.0%	100.0%
Labor force participation				
Age 60-69	49.8%	61.7%	52.4%	52.2%
Age 20-59	92.5%	91.7%	92.3%	92.9%

Demographic change

	Benchmark	Economy with aging
Capital (per capita)	$-$	-10.2%
Labor (per capita)	$-$	-10.1%
Average work hours	$-$	$+0.4\%$
Wage	$-$	-0.04%
Interest rate (%)	5.54%	5.55%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	43.6%
S.S. budget balance (% of GDP)	$+0.48\%$	-3.47%
Social Security benefit already claimed		
at 62	49.9%	37.4%
by 66	98.1%	94.8%
by 69	100.0%	100.0%
Labor force participation		
Participation: age 60-69	49.8%	50.2%
Participation: age 20-59	92.5%	91.0%

Social Security reforms with demographic change

	Benchmark with aging	Benefit 50% $\Downarrow$	ERA 62 $\Rightarrow$ 64	NRA 66 $\Rightarrow$ 68
Capital	–	+17.5%	−0.35%	+4.2%
Labor	–	+5.7%	+0.08%	+1.6%
Average work hours	–	+0.4%	−0.07%	+0.1%
Wage	–	+3.9%	−0.15%	+0.9%
Interest rate (%)	5.55%	4.60%	5.59%	5.31%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	43.6%	32.0%	43.7%	40.7%
S.S. budget balance (% of GDP)	−3.5%	−1.6%	−3.5%	−2.2%
Social Security benefit already claimed				
at 62	37.4%	17.1%	–	27.1%
by 66	94.8%	81.2%	94.4%	79.8%
by 69	100.0%	100.0%	100.0%	100.0%
Labor force participation				
Participation: age 60-69	50.2%	66.8%	52.0%	54.7%
Participation: age 20-59	91.0%	94.4%	90.7%	92.2%

GE vs PE: benefit 50% ⇓

	Benchmark	GE	PE
Capital	–	+9.9%	+40.3%
Labor	–	+3.1%	−0.4%
Average work hours	–	+0.2%	−0.3%
Wage	–	+2.4%	–
Interest rate (%)	5.54%	4.95%	5.54%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	28.1%	27.2%
Social Security benefit already claimed			
at 62	49.9%	29.6%	39.9%
by 66	98.1%	95.7%	97.4%
by 69	100.0%	100.0%	100.0%
Labor force participation			
Participation: age 60-69	49.8%	61.5%	52.4%
Participation: age 20-59	92.5%	93.9%	91.7%

GE vs PE: ERA 62 $\Rightarrow$ 64

	Benchmark	GE	PE
Capital	–	$+0.11\%$	-1.00%
Labor	–	$+0.18\%$	$+0.35\%$
Average work hours	–	-0.04%	-0.04%
Wage	–	-0.10%	–
Interest rate (%)	5.54%	5.56%	5.54%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	34.9%	34.9%
Social Security benefit already claimed			
at 62	49.9%	–	–
by 66	98.1%	97.9%	97.8%
by 69	100.0%	100.0%	100.0%
Labor force participation			
Participation: age 60-69	49.8%	52.4%	52.7%
Participation: age 20-59	92.5%	92.3%	92.4%

GE vs PE: NRA 66 $\Rightarrow$ 68

	Benchmark	GE	PE
Capital	–	+2.4%	+9.9%
Labor	–	+0.7%	−0.1%
Average work hours	–	+0.1%	−0.03%
Wage	–	+0.6%	–
Interest rate (%)	5.54%	5.39%	5.54%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	33.2%	33.0%
Social Security benefit already claimed			
at 62	49.9%	39.3%	41.9%
by 66	98.1%	87.4%	88.6%
by 69	100.0%	100.0%	100.0%
Labor force participation			
Participation: age 60-69	49.8%	52.2%	49.9%
Participation: age 20-59	92.5%	92.9%	92.3%

Sensitivity analysis

- Social Security rules and reform uncertainty
  - Earnings test ▷
  - Early retirement penalty : actuarial reduction factor (ARF) ▷
  - ARF and DRC at actuarially fair levels ▷
  - Uncertainty about future Social Security system ▷
- Medical expenditures, health insurance and Medicare
  - Health expenditure uncertainty ▷
  - Health expenditures ▷
  - Private health insurance ▷
  - Medicare ▷
  - Rise in medical expenditures ▷
- Other sensitivity analysis
  - Bequest motives ▷
  - Consumption floor $\underline{c}$ ▷

Concluding remarks

- A quantitative general equilibrium model to generate
  - distribution of Social Security benefit claims at different ages
  - labor force participation rate

- Evaluation of Social Security reforms
  - reducing benefits by 50% raises capital, wage rate and old-age participation and relieves pressure on SSA
  - raising ERA by 2 years has little macroeconomic effects
  - raising the NRA by 2 years has modest macroeconomic effects and improves Social Security budget
  - aging makes this reform even more urgent

Sensitivity: no earnings test ◁

Capital	–	$+0.60\%$
Labor	–	$+0.22\%$
Average work hours	–	-0.08%
Wage	–	$+0.14\%$
Interest rate (%)	5.5%	5.5%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	34.8%
Social Security benefit already claimed		
at 62	49.9%	**76.7%**
by 66	98.1%	**99.5%**
by 69	100.0%	**100.0%**
Participation: age 60-69	49.8%	51.2%
Participation : age 20-59	92.5%	92.5%

Sensitivity analysis : no ARF ◁

Capital	–	-6.7%
Labor	–	-3.2%
Average work hours	–	$+0.3\%$
Wage	–	-1.3%
Interest rate (%)	5.5%	5.9%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	**39.8%**
Social Security benefit already claimed		
at 62	49.9%	**96.0%**
by 66	98.1%	**99.9%**
by 69	100.0%	**100.0%**
Participation: age 60-69	49.8%	**30.0%**
Participation : age 20-59	92.5%	**92.0%**

Sensitivity analysis : actuarially fair adj. ◁

Capital	–	-0.9%
Labor	–	$+0.3\%$
Average work hours	–	-0.1%
Wage	–	-0.4%
Interest rate (%)	5.5%	5.6%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	35.2%
Social Security benefit already claimed		
at 62	49.9%	**5.8%**
by 66	98.1%	**33.9%**
by 69	100.0%	**53.5%**
Participation: age 60-69	49.8%	**56.6%**
Participation : age 20-59	92.5%	**92.0%**

Sensitivity: reform uncertainty ◁

- Benefit cut of 5% with 10% probability.

Capital	–	$+0.31\%$
Labor	–	-0.04%
Average work hours	–	-0.03%
Wage	–	$+0.12\%$
Interest rate (%)	5.5%	5.5%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	34.8%
Social Security benefit already claimed		
at 62	49.9%	**58.6%**
by 66	98.1%	**99.2%**
by 69	100.0%	**100.0%**
Participation: age 60-69	49.8%	49.4%
Participation : age 20-59	92.5%	92.5%

Sensitivity: health expenditures ◁

		No shock	No exp
Capital	–	-0.29%	**-6.5%**
Labor	–	-0.77%	-8.5%
Average work hours	–	$+0.40\%$	$+2.7\%$
Interest rate (%)	5.5%	5.5%	5.3%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	35.0%	38.0%
Social Security benefit already claimed			
at 62	49.9%	52.1%	**59.2%**
by 66	98.1%	98.2%	98.6%
by 69	100.0%	100.0%	100.0%
Participation: age 60-69	49.8%	**48.0%**	**37.9%**
good health	57.9%	59.1%	**48.4%**
bad health	28.5%	**18.9%**	**10.6%**
Participation : age 20-59	92.5%	91.7%	87.3%
good health	96.2%	96.9%	94.0%
bad health	67.5%	**56.6%**	**41.8%**

Sensitivity: medical insurance ◁

		No private HI	No Medicare
Capital	–	-0.6%	**+3.6%**
Labor	–	-1.4%	$+1.3\%$
Average work hours	–	$+0.3\%$	$+0.2\%$
Interest rate (%)	5.5%	5.5%	5.3%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	35.8%	32.3%
Social Security benefit already claimed			
at 62	49.9%	51.1%	43.8%
by 66	98.1%	97.9%	97.6%
by 69	100.0%	100.0%	100.0%
Participation: age 60-69	49.8%	**47.3%**	**52.8%**
good health	57.9%	57.7%	61.6%
bad health	28.5%	**20.2%**	29.8%
Participation : age 20-59	92.5%	**90.7%**	**93.2%**
good health	96.2%	96.3%	96.7%
bad health	67.5%	**52.7%**	69.6%

Sensitivity analysis : medical expenditures 50% ⇑ ◁

Capital	–	-0.4%
Labor	–	$+2.0\%$
Average work hours	–	$+1.6\%$
Wage	–	-0.9%
Interest rate (%)	5.5%	5.8%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	36.1%
Social Security benefit already claimed		
at 62	49.9%	45.1%
by 66	98.1%	97.7%
by 69	100.0%	100.0%
Participation: age 60-69	49.8%	**53.0%**
Participation : age 20-59	92.5%	**92.3%**

Sensitivity: no bequest motives ◁

Capital	–	-22.1%
Labor	–	-5.2%
Average work hours	–	$+2.2\%$
Wage	–	-6.8%
Interest rate (%)	5.5%	7.5%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	39.8%
Social Security benefit already claimed		
at 62	49.9%	**53.8%**
by 66	98.1%	**96.8%**
by 69	100.0%	**100.0%**
Participation: age 60-69	49.8%	**38.5%**
Participation : age 20-59	92.5%	**86.7%**

Sensitivity: consumption floor $1,500 ◁

Capital	–	**+0.9%**
Labor	–	+0.4%
Average work hours	–	+0.1%
Wage	–	+0.2%
Interest rate (%)	5.5%	5.3%
Labor income tax: $\tau^{\ell} + \tau^{ss} + \tau^{med}$ (%)	35.0%	34.6%
Social Security benefit already claimed		
at 62	49.9%	49.5%
by 66	98.1%	98.2%
by 69	100.0%	100.0%
Participation: age 60-69	49.8%	50.2%
Participation : age 20-59	92.5%	**93.3%**