How Social Security and Medicare Affect Retirement Behavior In a World of Incomplete Markets

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Econometrica 1997

Sargent Reading Group

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Introduction

Puzzles

1. early retirement puzzle
2. age 65 retirement puzzle
3. Medicare puzzle

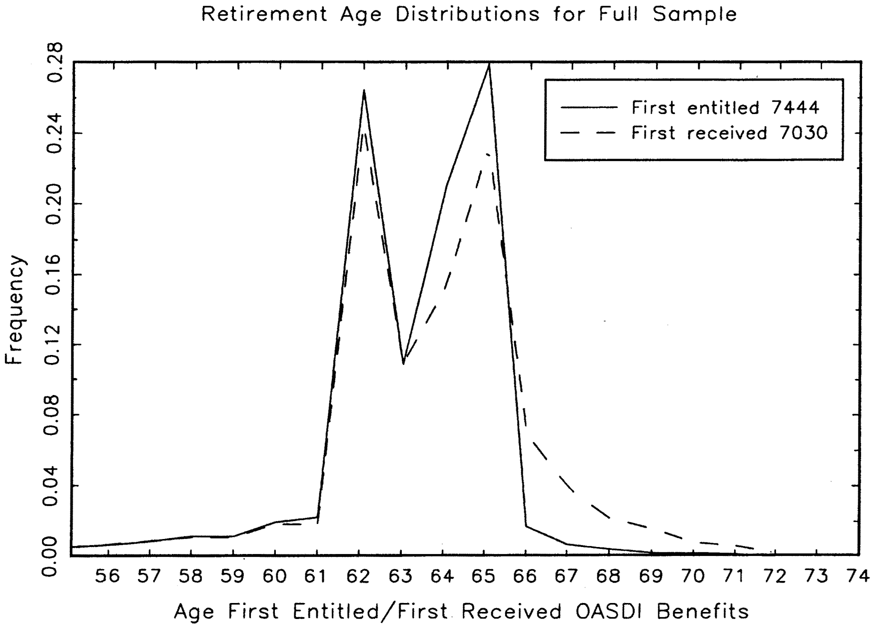

FIGURE 2.1.—Distributions of ages of application and first receipt of Social Security benefits.

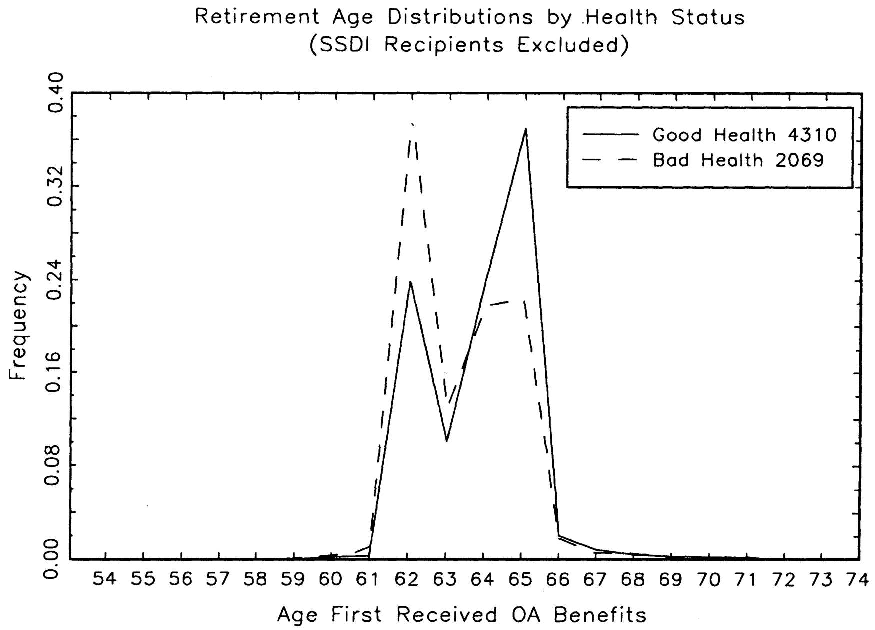

FIGURE 2.2.—Impact of health status on the age of application for Social Security benefits.

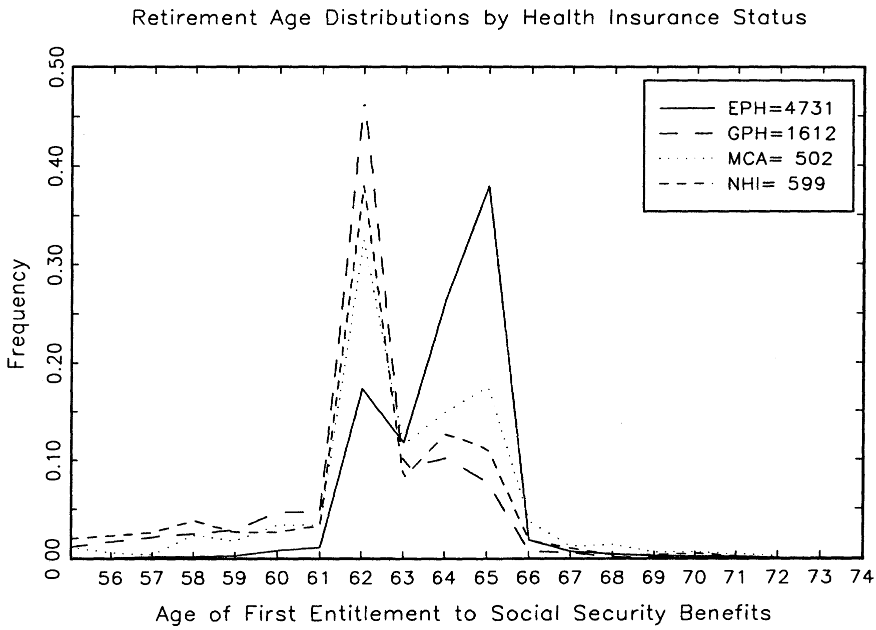

FIGURE 2.3.—Impact of health insurance coverage on the age of application of Social Security benefits.

Introduction

Policies and "incentive schemes"

- social security benefit rules
- social security benefit adjustment for early and late retirement
- Medicare eligibility

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- borrowing constraint

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$\Rightarrow$ Goal:

construct a dynamic programming (DP) model that "explains" the puzzles

DP model

DP model: setup

$$V_t(s) = \max_{\delta} E_{\delta} \left\{ \sum_{j=t}^{T} \beta^{j-t} u_j(s_j, d_j, \theta_u) | s_t = s \right\}$$

- s_t: state variables
- d_t: control variables, $\delta = (d_0, ..., d_T)$
- $\theta = (\beta, \theta_u, \theta_p)$: parameters characterizing preferences and beliefs about uncertain events
- α: social security system

$\Rightarrow$ Estimate θ by MLE given the observed δ

DP model: setup

- state variables $s_t = (x, \epsilon)$
  - x: observable
  - ϵ: unobserved
- integrate out ϵ to obtain a conditional choice probability $P_t(d|x, \theta, \alpha)$
- assume ϵ follows a multivariate extreme value distribution and rewrite *expected value function* without ϵ (Rust 1987, 1988)

DP model: setup

- assume ϵ follows a multivariate extreme value distribution
- can express $P_t(d|x, \theta, \alpha)$ with a multinomial logit representation

$$P_t(d|x,\theta,\alpha) = \frac{exp\{\nu_t(x,d,\theta,\alpha)\}}{\sum_{d' \in D(x)} exp\{\nu_t(x,d,\theta,\alpha)\}}$$

$$\nu_t(x,d,\theta,\alpha) = u_t(x_t,d_t,\theta_u) +$$
$$\beta \int \log[\sum_{d_{t+1} \in D(x_{t+1})} exp\{\nu_{t+1}(x_{t+1},d_{t+1},\theta,\alpha)\}] p_t(dx_{t+1}|x_t,d_t,\theta_p,\alpha)$$

$$V_t(x,\epsilon) = \max_{d \in D(x)} [\nu_t(x,d,\theta,\alpha) + \epsilon(d)]$$

DP model: estimation

Estimation

$$
\begin{aligned}
L(\theta) &= L(\beta, \theta_u, \theta_p) \\
&= \prod_{i=1}^{I} \prod_{t=1}^{T_i} P_t(d_t^i | x_t^i, \theta, \alpha) p_t(x_t^i | x_{t-1}^i, d_{t-1}^i, \theta_p, \alpha)
\end{aligned}
$$

Strategy

- estimate θ_p using p_t terms
- using the estimates θ_p, solve the DP and estimate (β, θ_u)

Data

Retirement History Survey (RHS)

- biennial panel between 1969-1979 of samples of age 58-73
- choose male heads
- exclude samples who expect to receive private pension benefits (44% of the samples)
- exclude samples who qualify for DI benefits (10%)

States and controls

- $x_t = (y_t, ss_t, e_t, m_t, h_t, hi_t, aw_t)$
  - total income:
    $y = w + w^{sp} + ss + ss^{sp} + oi - hc$ *(net of health costs)*
  - social security state: not eligible, early retiree or normal retiree
  - employment state: NE, PT and FT
  - marital status
  - health status: $good$, bad or $dead$
  - health insurance status: eph, gph, mca or nhi
  - social security average monthly earnings
- $d_t = (ed_t, ssd_t)$
  - employment decision
  - social security application
- no savings and consumption decision $c = y$

Estimation: states transition

$$
\begin{aligned}
p_t(x'|x,d) \;&=\; p_t^1(y'|y,ed,ss,ssd,m,h,aw) \times p_t^2(aw'|ed,y,aw) \\
&\quad \times p_t^3(m'|m,h) \times p_t^4(h'|h,aw) \times p_t^5(h' = dead|h,m)
\end{aligned}
$$

- assume independence of p_t^j
- health costs (that depends on health insurance) enter y'. estimated with the Pareto distribution.

Estimation: preferences

$$u_t(y,e,ed,h,m,\theta_u) = u_t^1(y,h,m,\theta_u^1) + \sum_{i=1}^{es}\sum_{j=1}^{es} u_t^2(i,j,\theta_u^2) I\{e=i, ed=j\}$$

- u_t^1: utility from consumption

$$u_t^1(y,h,m,\theta_u^1) = \left[\frac{y^{\theta_{11}}}{\theta_{11}}\right] \exp\{\theta_{12} + \theta_{13} I\{h=bad\} + \theta_{14} I\{m=married\} + \theta_{15} t/(1+t)\}$$

Estimation: preferences

$$u_t(y, e, ed, h, m, \theta_u) = u_t^1(y, h, m, \theta_u^1) + \sum_{i=1}^{es} \sum_{j=1}^{es} u_t^2(i, j, \theta_u^2) I\{e = i, ed = j\}$$

- u_t^2: utility of possible labor/leisure/search decisions (recall $e, ed \in \{NE, PT, FT\}$), for example
  - could, but not include age, health status and marriage status
  - $u_t^2(NE \rightarrow FT)$: potential disutility of search costs of unemployed returning to full-time job
  - $u_t^2(NE \rightarrow NE)$: utility of leisure by remaining unemployed

Estimation: preferences

$$
\begin{aligned}
u_t(y, e, ed, h, m, \theta_u) &= u_t^1(y, h, m, \theta_u^1) \\
&\quad + \sum_{i=1}^{es} \sum_{j=1}^{es} u_t^2(i, j, \theta_u^2) I\{e = i, ed = j\}
\end{aligned}
$$

- dummies for
  - disutility by negative income
  - disutility of working while receiving social security
  - utility of continuing to work among the high-income people

Estimation: preferences

parameter	estimate	t-stat
θ_{11} (risk aversion)	-0.072	-2.1
θ_{13} (bad health)	0.235	2.6
θ_{14} (married)	0.040	0.4
θ_{15} (age)	-1.637	-1.6
$u^2(FT \to FT)$	-54.72	-2.7
$u^2(FT \to PT)$	-51.80	-2.6
$u^2(FT \to NE)$	-47.24	-2.3
$u^2(PT \to FT)$	-60.77	-3.0
$u^2(PT \to PT)$	-56.00	-2.8
$u^2(PT \to NE)$	-51.99	-2.5
$u^2(NE \to FT)$	-65.44	-3.4
$u^2(NE \to PT)$	-60.61	-3.1
$u^2(NE \to NE)$	-53.39	-2.7

Retirement behavior

Retirement behavior

Recall...

Choice probabilities

- ed: employment decision $\{FT, PT, NE\}$
- ssd: social security application $\{DB, AB\}$

Retirement behavior: age 58-59

- FT=705, PT=58, NE=3

	FT	PT	NE
e=FT, N=705			
data	93.8	5.1	1.1
model	94.4	4.7	0.9
e=FT, hi=eph, N=563			
data	95.0	4.4	0.5
model	96.5	3.2	0.4
e=FT, hi=others, N=142			
data	88.7	7.8	3.5
model	86.2	10.6	3.2

Retirement behavior: age 60-61

	FT,DB	PT,DB	NE,DB	FT,AB	PT,AB	NE,AB
e=FT, N=1214						
data	72.3	3.5	0.3	16.0	5.4	2.5
model	70.0	3.7	0.8	16.3	6.0	3.2
e=FT, hi=eph, N=990						
data	77.7	2.8	0.3	13.8	4.8	0.6
model	73.8	2.9	0.4	16.2	4.7	2.0
e=FT, hi=others, N=224						
data	48.7	6.1	0.5	25.5	8.5	10.7
model	53.3	7.0	2.6	16.8	11.6	8.7
e=FT, h=bad, N=255						
data	63.5	2.6	0.4	21.6	7.1	4.7
model	63.5	3.9	1.4	18.4	7.1	5.7

Retirement behavior: age 62-63

Not already receiving social security

	FT,DB	PT,DB	NE,DB	FT,AB	PT,AB	NE,AB
e=FT, N=1221						
data	31.0	1.1	0.3	49.9	14.1	3.8
model	30.2	1.9	0.6	49.7	11.9	5.7
e=FT, hi=eph, N=1065						
data	31.5	0.9	0.1	51.0	14.1	2.4
model	31.1	1.7	0.4	50.8	11.0	5.0
e=FT, hi=others, N=156						
data	27.6	1.9	1.3	42.3	14.1	12.8
model	23.5	3.3	2.2	42.2	18.1	10.7

Work incentive

	FT	PT	NE
e=all, $t \geq 65$, *ss=applied*, *N=3345*			
data	19.3	20.0	60.7
model	19.8	20.2	60.0
e=all, $t \geq 65$,*ss=not applied*, *N=334*			
data	62.3	18.9	18.9
model	61.7	18.3	19.8

Remarks

"...it is a simple matter to perform counterfactual predictions of the impact of alternative Social Security policies"

- Limitation to conduct a policy analysis because:
  - sample selection
  - $y = c$
  - no GE effects
    - prices
    - fiscal consequences
    - effects on the behavior of young generations

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$\Rightarrow$ Work (to be) in progress...

- take it to a GE model with endogenous retirement decision
- private pensions?