Life-Cycle Models: Lifetime Earnings and the Timing of Retirement

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Policy Issue

- Fertility and mortality patterns are leading to an aging population. This potentially affects the solvency problems of a number of important public programs.

- The effect will likely be greater if retirement ages trend downward.

- This paper examines the question: Do rising standards of living lead to a trend in retirement ages?

Idea of this Work

- We attempt to use cross–sectional lifetime earnings differences among households to study the connection between higher earnings and retirement age.

- The rich data resources of the Health and Retirement Study, with its linked lifetime earnings records, offer an opportunity to study the connection in detail.

Theoretical Framework

- Economists' often use the so–called "life–cycle model" to study households' lifetime behavior. In the model, each household's behavior reflects the solution of a dynamic utility maximization problem with lifetime budget constraints.

- This project's intent is to work in the context of the life–cycle model — with a general enough specification to encompass a variety of possible correlations between household earnings and retirement.

Life–Cycle Setup

$$\max_{c_t\,,\,R}\ \int_0^R e^{-\rho\cdot t}\cdot u(c_t\,,t\,,R)\,dt+\varphi(a_R\,,\,R)$$

$$\text{subject to:}\quad \dot{a}_t=r\cdot a_t+y_t-c_t\,,$$

$$a_0=0\,,$$

where

$$\varphi(A\,,\,R)\equiv\max_{c_t}\ \int_R^T e^{-\rho\cdot t}\cdot u(c_t\,,\,t\,,\,R)\,dt$$

$$\text{subject to:}\quad \dot{a}_t=r\cdot a_t-c_t\,,$$

$$a_T\geq 0\quad\text{and}\quad a_R=A\,.$$

Formulation (II): Additive Preferences

$$u(c\,,\,t\,,\,R) \equiv \begin{cases} \frac{1}{\gamma}\cdot[c]^{\gamma}\,, & \text{if } t < R\,, \\ \frac{1}{\gamma}\cdot[c]^{\gamma}+\Gamma\,, & \text{if } t \geq R\,. \end{cases}$$

"Free endpoint condition" for optimal retirement:

$$\frac{y_{R-}}{[c_{R-}]^{1-\gamma}} = \Gamma\,.$$

Modeling Strategy

- Focus on couples.

- HRS data:

•• Extensive

•• Censoring issues

•• Short earning histories for many wives

- Use MLE methods and random effects earnings dynamics model for men and for women. Summary index of earnings for each, μ_i^m and μ_i^f .

Modeling Strategy (cont.)

- Assumptions about behavior:

•• Wife retires either before or with husband; benefits of retirement accrue to household after both have retired

•• Households fall into 3 sets — N, S, and O – and the sample's distribution into these sets is independent of μ_i^m and μ_i^f

Modeling Strategy (cont.)

- Limited covariates at this point (more in future)

- Men who are disabled at retirement treated as if their actual retirement age is a lower bound for their desired retirement age

Estimation

- Free endpoint and other first–order conditions yield equation

$$\Psi(R_i \, , \, Z_i \, , \, \psi(R_i \, , \, \mu_i^m \, , \, \mu_i^f \,)) = 0$$

for household i

- We have

$$\psi \equiv \ln(\frac{y_R^m + y_R^f}{Y_R^m + Y_R^f}) + \gamma \cdot \ln(Y_R^m + Y_R^f) \, .$$

Estimation (cont.)

• Implicit function theorem and linearization yield

$$R_i = Z_i \cdot \xi + x_i \cdot \alpha_0 + \bar{x}_i \cdot \alpha_1 + \eta_i$$

•• We estimate the latter jointly with the earnings dynamics equations

•• x_i and $\bar{x}_i$ depend on μ_i^m and μ_i^f and on the given household's set N, S, or O

Analysis of Possible Outcomes

- Cases for Formulation II:

•• $\gamma > 0$ implies upward time trend in retirement age

•• $\gamma = 0$ implies no time trend in retirement age

•• $\gamma < 0$ implies downward time trend in retirement age

Analysis of Possible Outcomes (cont.)

- Sufficiency condition for free endpoint restriction requires

$$\alpha_0 > 0\,.$$

- We have

$$\alpha_1/\alpha_0 = \gamma\,.$$

- Thus, α_1 should have same sign as γ

Preliminary Outcomes

Retirement Equation:
Male 16-17 Yrs Education
Sample: 398 households

Coefficient	Estimate	Std Error
DUM26-28	0.747371	1.675168
DUM29-31	-0.076558	0.656037
DUM32-34	-0.058474	0.480915
DUM35-37	-0.052306	0.371783
DUM38-40	0.359175	0.414408
DUM41-43	-0.078523	1.003423
h_η	0.196031	0.011516
α_0	7.584181	4.092284
α_1	0.971501	0.999989

ADDENDUM:

γ	0.128096

Preliminary Outcomes

Retirement Equation:
Male 12 Yrs Education
Sample: 479 households

Coefficient	Estimate	Std Error
DUM26-28	-1.072518	1.451929
DUM29-31	0.819704	0.472764
DUM32-34	-0.559213	0.369712
DUM35-37	0.622135	0.304719
DUM38-40	-0.392488	0.364465
DUM41-43	2.893666	1.182520
h_η	0.224585	0.009617
α_0	-5.044323	3.971068
α_1	-1.947537	1.060381

ADDENDUM:

γ	0.386085