Tax Reform Encouraging Longer Careers: An Analysis Using Microeconomic Data*

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John Laitner & Dan Silverman, "Consumption, Retirement and Social Security: Evaluating the Efficiency of Reform that Encourages Longer Careers," *Journal of Public Economics* 96, no. 7-8 (August 2012): 615-634.

Idea

- In an environment with declining mortality & fertility rates, encouraging longer careers may be an attractive policy goal

- We want to examine the possibility of removing some tax & other distortions that discourage later retirement

Proposal

- We consider the possibility of age-specific payroll tax rate adjustments that could counterbalance biases toward early retirement

- We seek efficiency gains

- Our proposal would utilize a reformed version of US Social Security System. However, it would be revenue neutral for that System

- The benefits of the proposed reform would accrue to individual households and to society as a whole (through enhanced income-tax collections)

Outline

- Present a model of life-cycle saving and labor supply for individual households
- Estimate the parameters of the model with two large data sets, the Consumer Expenditure Survey (CEX) and the Health and Retirement Study (HRS)
- Outline a hypothetical change in the Social Security System that might encourage later retirement
- Simulate outcomes from the change, using the model and our estimated parameters

Background References

- Modigliani [1986], Feldstein [1974], Auerbach & Kotlikoff [1987]

- Laitner & Silverman [2005, 2008, 2010]

- Goda et al [2009], Burtless & Quinn [2002]

- Kremer [2002], Erosa & Gervais [2002], Lozachmeur [2006], Weinzierl [2010]. Banks & Diamond [2010]

- Gustman & Steinmeier [1986], Rust & Phelan [1997], French [2005], van der Klaauw & Wolpin [2005]

Model

$$\max_{c_s \geq 0} \int_0^S e^{-\rho \cdot s} \cdot u(c_s\,,\, s)\, ds \qquad (1)$$

subject to: $\dfrac{da_s}{ds} =$

$$\begin{cases} r \cdot a_s + w \cdot E \cdot e_s \cdot (1-\tau) + b_s - c_s\,, & \text{if } s < R, \\ r \cdot a_s + b_s - c_s\,, & \text{if } s \geq R, \end{cases}$$

$$a_0 = 0\,, \quad a_S \geq 0\,,$$

where S is age of death and R is age of retirement

Utility Function

- $$u_s = u(c_s\,,\ s) \equiv \begin{cases} v(c_s)\,, & \text{if } s < R, \\ v(\lambda \cdot c_s)\,, & \text{if } s \geq R \end{cases}$$

- $$\lambda > 1\ :$$

  with λ registering the complementarity of the extra leisure after retirement and consumption expenditure

- $$v(f) = \begin{cases} [f]^{\gamma}/\gamma\,, & \gamma < 1\,,\ \gamma \neq 0\,, \\ \\ \ln(f)\,, & \text{the ``}\gamma = 0\text{'' case} \end{cases}$$

Household Budget

- $\frac{da_s}{ds} = r \cdot a_s + w \cdot E \cdot e_s \cdot (1 - \tau) + b_s - c_s$ if $s < R$,

- $\frac{da_s}{ds} = r \cdot a_s + b_s - c_s$ if $s \geq R$,

- $a_0 = 0\,, \quad a_S \geq 0$

with a_s = household assets
E = earning ability
e_s = age-dependent earning ability
r = aftertax real interest rate
τ = Social Security payroll tax
w = wage (net of all other taxes)
b_s = Social Security benefit flow
c_s = consumption expenditure on goods

Treatment of Labor/Leisure Choice

Work is full-time or not at all

- Justification: Costs of going back & forth to work, needs to coordinate schedule with colleagues & customers, needs to arrange schedule at home, etc.
- E.g., Rust & Phelan [1997], Hurd [1996]

Alternative: time endowment=1, leisure=ℓ_s

- Make $\ell_s \in [0\,,\,1]$ a control variable
- E.g., Auerbach-Kotlikoff [1987])

Social Security Benefits

- Social Security benefit flow is

  $$b_s = b(R\,,\,E\,,\,s)$$

  with $\partial b/\partial R \geq 0\,, \quad \partial b/\partial E \geq 0\,,$

  and $b_s = 0$ until $s \geq \max\{62\,,\,R\}$

- $B(R\,,\,E) = \int_R^S e^{-r\cdot(s-R)} \cdot b(R\,,\,E\,,\,s)\,ds =$ present value Social Security benefits

- Idea: in practice, line between Social Security benefits & a later retirement age is often weak — i.e., $\partial b/\partial R$ may be modest

Solution Procedure

- Assume unique $R \in (0\,, S)$
- Conditional on any R, solve for $c_s = c_s^*$ all adult ages $s \in [0\,,\,S]$
- Call maximized lifetime utility $U = U(R)$
- Set $R^* = \arg\max_{R_0} \{U(R_0)\}$

Optimal Age-Path of Consumption, given R

- $c_s^* = c_0^* \cdot e^{\frac{r-\rho}{1-\gamma} \cdot s}\,, \quad s \in [0\,,\,R)$

- $c_s^* = c_R^* \cdot e^{\frac{r-\rho}{1-\gamma} \cdot (s-R)}\,, \quad s \in [R\,,\,S]$

- $c_R^* = [\lambda]^{\frac{\gamma}{1-\gamma}} \cdot c_{R-}^*\,,$

  where $c_{R-}^* \equiv \lim_{s \uparrow R} c_s^*\,,$

- c_0^* from lifetime budget

Intuitions

- Role of ρ : $(r - \rho)/(1 - \gamma)$ sets slope of lifetime consumption-expenditure profile

- Role of $\lambda > 1$: determines attractiveness of retirement; sets R

- Role of γ : $[\lambda]^{\frac{\gamma}{1-\gamma}}$ sets magnitude of upward or downward "jump" in consumption expenditure at retirement
  - Recall "retirement consumption puzzle" of Bernheim et al [2001], and others
  - Reflects the complementarity of consumption expenditure and leisure

Optimal Age of Retirement

- $\frac{\partial u(c_{R-}\,, R-)}{\partial c_{R-}} \cdot [y_{R-} + \frac{\partial B(R-\,, E)}{\partial R} - c_{R-} + c_R]$

$$= u(c_R\,, R) - u(c_{R-}\,, R-)$$

$$\text{where} \quad y_s \equiv w \cdot E \cdot e_s \cdot (1 - \tau)$$

- Can be rewritten here as

$$\frac{y_{R-} + \frac{\partial B(R-\,, E)}{\partial R}}{c_{R-}} = \text{a constant}$$

Reasons for Retirement in the Model

- "Positive" reasons:
  - If $r - \rho > 0$, optimal consumption expenditure rises with age, and consumption and leisure may be complementary
  - Even if $r - \rho = 0$, raising R raises a household's lifetime consumption profile, making the greater leisure that emerges during retirement more attractive

- "Negative" reasons:
  - e_s may decline at advanced ages due to failing health & stamina
  - Disabilities may arise that end the feasibility of work

Estimation — Data

- CEX (Consumer Expenditure Survey) 1984-2002
  - Annual cross section; large sample
  - $\bar{c}_{st}$ cell-by-cell; "pseudo panel": $\bar{c}_{s+1,t+1} - \bar{c}_{st}$
- HRS (Health and Retirement Study) 1992-2002
  - Complete panel data on households, including retirement age and earnings all ages
  - Also includes household wealth, which was not used here

Estimation Procedure

- Estimate ρ, λ, γ (as well as child & spousal consumption weights

- Method of moments

- Utilize:

  - CEX: Age-shape for c_s^*

  - CEX: Magnitude of "jump" in c_s^* at R

  - HRS: Household choice of R

Estimation Results: see Table 4

- Representative estimates:

$$\rho = 0.0144,\ \lambda = 3.0847,\ \gamma = -0.0797$$

- Implications:
  - Mild "consumption puzzle" behavior at retirement; consumption expenditure should drop 8-9%
  - Leisure quite important to households
  - $r = 0.0425$ implies $r - \rho > 0$

Table 4. Estimated Coefficients Equations (19)-(20): Estimated Parameter (Std. Error/T Stat.)				
Parameter or Observation Count	Specification of (19):[a, b]			
	No Time Dummies		Time Dummies in Eq. (19)[c]	
	Stringent Def. Male Disability	Broad Def. Male Disability	Stringent Def. Male Disability	Broad Def. Male Disability
Equation (19): Estimates of β^{CEX} from CEX Data				
$\beta_1^{CEX}=\frac{r-\rho}{1-\gamma}$	0.0264*** (0.0008/34.5720)		0.0279*** (0.0010/29.2975)	
$\beta_2^{CEX}=\beta_3=\xi^S$	0.3351*** (0.0523/6.4107)		0.3066*** (0.0505/6.0678)	
$\beta_3^{CEX}=\beta_4=\xi^K$	0.3372*** (0.0181/18.6686)		0.3363*** (0.0172/19.5193)	
$\beta_4^{CEX}=\frac{\gamma}{1-\gamma}\cdot\ln(\lambda)$	-0.0831** (0.0370/-2.2482)		-0.0750** (0.0352/-2.1299)	
Observations	765		765	
Equation (20): Estimates of β given β^{CEX}; HRS Data; ξ^S $(=\beta_3)$ and ξ^K $(=\beta_4)$ as above				
$\beta_1=\rho$	0.0143*** (0.0016/8.9820)	0.0141*** (0.0017/8.1098)	0.0131*** (0.0016/7.9322)	0.0129*** (0.0018/7.2238)
$\beta_2=\gamma$	-0.0797** (0.0370/-2.1537)	-0.0888** (0.0432/-2.0532)	-0.0693** (0.0343/-2.0211)	-0.0772* (0.0403/-1.9167)
$\beta_5=\lambda$	3.0847*** (0.5328/5.7893)	2.7716*** (0.5751/4.8193)	3.1772*** (0.6437/4.9362)	2.8473*** (0.6919/4.1150)
σ_ϵ^2	0.1783 (0.1912/0.9325)	0.1587 (0.1828/0.8681)	0.1879 (0.2347/0.8007)	0.1664 (0.2217/0.7505)
Observations	924	924	924	924

Source: see text. Significant at * 10%, ** 5%, and *** 1% level.

a. Unless otherwise noted, CEX adult (female) ages 25-69 and no time dummies.

b. Regressor 3, top panel: per household number kids ages 0-17, with weight 0.7, and 18-25 if in school or living with parents, with weight 1.0; up to maximum of 2 — see text.

c. Time–dummy coefficients omitted.

A Hypothetical Reform

- Set vesting age for Social Security, say, 54
- After vesting age, your benefits already established & your payroll tax ends
- Payroll tax higher before vesting (about 1 percent higher); budgetary neutrality for Social Security System; benefit formula unchanged
- Reform seems feasible — no legacy-cost issues provided we initiate the reform only for new laborforce entrants
- Goal: end payroll tax before most households come to margin for stopping work

Intuitions

At retirement age, we want you to face giving up

$$y_R = w \cdot E \cdot e_R$$

rather than

$$y_R = w \cdot E \cdot e_R \cdot (1 - \tau)$$

Intuitions (cont.)

- Income & substitution effects of payroll tax exactly offset in our model

- Social Security benefits tend to have strong income effect but weak substitution effect

- On balance, Social Security System encourages early retirement — which our hypothetical reform would seek to reverse

Simulation Outcomes: see Table 5

- Vesting age 54 implies 1.7 extra years work on average
- Equivalent variation per household: average = \$4100[1]
- Average extra income-tax revenues per household = \$15,700
- Vesting after career span of 34 years yields about the same outcomes

[1] All figures, 2005 dollars & present value age 50

Table 5. Policy Simulations using Estimated Parameters of Table 4, LHS: Mean/Median Value and [95% Confidence Interval][a]			
Vesting Age or Span of Years	Average Change Career Years	Average Equivalent Variation (PV Age 50; 2005 NIPA PCE Dollars)	Average Additional Income Tax Revenue Per Household (PV Age 50; 2005 NIPA PCE Dollars)
Age	Stringent Definition Disability (see Table 2); Vesting by Age		
54	1.69/1.71 [1.61 , 1.82]	4292.82/4197.75 [3886.82 , 4566.05]	15684.74/15652.77 [14447.37 , 16979.26]
59	1.08/1.08 [0.99 , 1.15]	2677.61/2503.94 [1947.75 , 3078.05]	9197.92/9012.78 [8388.53 , 9503.62]
64	-0.02/-0.03 [-0.09 , 0.06]	233.70/89.89 [-513.59 , 701.00]	1385.58/1317.73 [759.79 , 2090.91]
Span	Stringent Definition Disability (see Table 2); Vesting by Career Span		
34	1.63/1.67 [1.57 , 1.79]	4079.26/4066.01 [3753.12 , 4401.39]	14828.08/14933.84 [13910.95 , 16415.43]
39	1.24/1.27 [1.17 , 1.36]	3723.44/3616.23 [2976.30 , 4089.34]	10258.31/10397.80 [9517.31 , 11126.99]
44	0.31/0.32 [0.22 , 0.42]	1024.83/1033.39 [206.04 , 1607.89]	2870.73/2972.30 [2107.92 , 3581.56]
Age	Broad Definition Disability (see Table 2); Vesting by Age		
54	0.94/0.91 [0.75 , 0.99]	2269.83/2159.03 [1715.45 , 2495.10]	8188.89/7972.27 [6340.89 , 8675.11]
59	0.61/0.58 [0.45 , 0.67]	1476.43/1416.73 [1029.65 , 2033.86]	4623.10/4443.38 [3428.68 , 5301.52]
64	-0.11/-0.10 [-0.24 , -0.03]	-873.87/-765.09 [-1402.58 , -138.91]	-117.33/-69.85 [-883.42 , 553.96]
Span	Broad Definition Disability (see Table 2); Vesting by Career Span		
34	0.93/0.89 [0.74 , 0.97]	2192.09/2117.91 [1683.04 , 2379.93]	7786.25/7626.82 [6095.13 , 8161.78]
39	0.62/0.62 [0.49 , 0.74]	1586.06/1620.96 [1209.47 , 2531.16]	4682.04/4718.48 [3655.60 , 5816.34]
44	-0.05/-0.05 [-0.08 , -0.04]	-532.30/-549.03 [-703.61 , -301.08]	-3.90/-7.98 [-234.01 , 146.66]

Source: see text.

a. "Mean" based upon point estimates; median and confidence intervals based on 1000 random parameter vector draws — see text.

Intuition

- The reform that we propose gives households a new option: they can work longer than before, not paying payroll tax on their new earnings; we show the reform generates a positive average equivalent variation

- Longer careers imply more federal income-tax revenues; households would consume the services that the revenues support whether they pay the new income taxes or not

Conclusion

- This paper derives & analyzes a dynamic model of household behavior

- The model's setup allows estimation; the number of parameters is small; our estimation uses several large data sets

- We simulate the consequences of a possible policy change
  - The policy reform that we study is not designed to improve the solvency of the Social Security System
  - The largest gains accrue from increases in government income-tax revenues