Lecture 3: Pensions and capital markets

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Master PPD
Paris – February 2025

Outline of the lecture

I. **Funded vs unfunded**
   1. Chocolate economy (Samuelson, 1958)
   2. An economy with capital stock (Diamond, 1965)

II. **Adequacy of savings**
   1. Retirement savings in a life-cycle model
   2. Is there a retirement savings puzzle ?

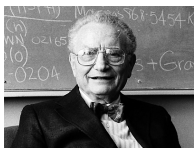
III. **Impact of pensions on savings**
   1. Old literature
   2. Natural experiments

IV. **Retirement savings policies**
   1. Tax incentives
   2. Behavioural effects (match rates, default)
   3. Mandated savings contribution

I. Funded vs unfunded

Chocolate economy

- **Paul A. Samuelson (1915–2009)**



American economist,
Prof. MIT, Nobel prize in 1970.

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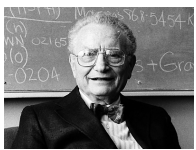

American economist,
Prof. MIT, Nobel prize in 1970.

- **Samuelson (JPE, 1958)**
  - "*An Exact Consumption-Loan Model of Interest with or without the Social Contrivance of Money*"
  - Invention of the overlapping generation model (OLG) – first developed by Maurice Allais (1947)
  - Illuminating model on basic economics of unfunded pension system

I. Funded vs unfunded

Chocolate economy

- **Chocolate economy**
  - No capital stock, no durable goods
  - "*no intertemporal trade with Mother Nature is possible*"
  - "*If Crusoe were alone, he would die at the beginning of his retirement years*"

I. Funded vs unfunded

Chocolate economy

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- **OLG model**
  - Each generation lives two periods : work and retirement
  - Cohort t represents L_t workers earning w_t
  - Demographic growth, n : $L_{t+1} = (1+n)L_t$
  - Productivity growth, g : $w_{t+1} = (1+g)w_t$

I. Funded vs unfunded

Chocolate economy

- **Introducing an unfunded pension scheme**
  - Workers give fraction τ of their earnings to retirees
  - Tax revenues $T_t = \tau w_t L_t$
  - Benefits expected $B_{t+1} = T_{t+1} = \tau w_{t+1} L_{t+1}$

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- **Rate of return of unfunded scheme**

$$\frac{B_{t+1}}{T_t} = \frac{T_{t+1}}{T_t} = \frac{\tau w_{t+1} L_{t+1}}{\tau w_t L_t} = (1+g)(1+n)$$

  - $(1+n)$ is the "*biological rate of interest*"
  - Unfunded pension system offers implicit rate of returns equal to the growth of the tax base, approximately $n+g$

I. Funded vs unfunded

Chocolate economy

- **Pareto improvement**
  - In a chocolate economy, an unfunded pension system increases welfare of all cohorts
  - Windfall to the first cohort, and positive rate of return to all successive cohorts
  - It allows trade across generations

I. Funded vs unfunded

Chocolate economy

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  - Windfall to the first cohort, and positive rate of return to all successive cohorts
  - It allows trade across generations
- **Social compact in Samuelson's words**
  - "*The reluctance of the young to give to the old what the old can never repay is overcome. Yet the young never suffer, since their successors come under the same requirement. Everybody is better off. It is as simple as that.*"

I. Funded vs unfunded

Chocolate economy

- **Same result with fiat money**
  - Retirees could buy products from workers using fiat money
    - "*printing oblongs of paper or stamping circles of shell*"
    - shell money used in Ancient China, Africa, Oceania
  - With fixed stock of money, price levels decline at rate $(1+g)(1+n)$ implying the same real return

I. Funded vs unfunded

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  - With fixed stock of money, price levels decline at rate $(1+g)(1+n)$ implying the same real return
- **What is a funded scheme ?**
  - Not fiat money ! not Treasury bonds
  - Investment in real assets, in capital stock

I. Funded vs unfunded

An economy with capital stock

- **Peter A. Diamond**

American economist, Prof. MIT,
Nobel prize winner 2010.

I. Funded vs unfunded

An economy with capital stock

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- **Diamond (AER, 1965)**
  - "*National Debt in a Neoclassical Growth Model*"
  - OLG model with capital stock
  - Individuals get an interest rate r on their savings
  - Unfunded system offers a return of $\gamma = (1+g)(1+n) - 1$

An economy with capital stock

- Initial retirees receive windfall of $T_0 = \tau w_0 L_0$

An economy with capital stock

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- **Returns from funded/unfunded pensions**
  - Each cohort pays in taxes $\tau w_t L_t$
  - And receives a return of $\gamma \tau w_t L_t$
  - Investment in the capital stock would offer $r \tau w_t L_t$

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- **Pareto-improving nature of unfunded pensions**
  - Loss/gain from unfunded pension is $(r - \gamma)\tau w_t L_t$
  - Pareto improvement iff $r < \gamma$ i.e. economy dynamically inefficient (too much capital)
  - Loss to all working generations if $r > \gamma$, i.e., dynamically efficient economy (Cass, 1965)

  $\Rightarrow$ With capital stock unfunded pensions are not anymore Pareto-improving

An economy with capital stock

- **Loss from unfunded pensions**
  - Loss from unfunded pension is $(r-\gamma)\tau w_t L_t$
  - Present value PV_t of period t is $\frac{1}{(1+r)}(r-\gamma)\tau w_t L_t$
  - With wage and demographic growth $w_t L_t = w_0 L_0 (1+\gamma)^t$

An economy with capital stock

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  - With wage and demographic growth $w_t L_t = w_0 L_0 (1+\gamma)^t$
- **Present value consumption loss of unfunded pensions**
  - Present value of all losses of all working cohorts

$$\sum_{t=0}^{t=\infty} \frac{1}{(1+r)^t} PV_t = \tau w_0 L_0 = T_0$$

  - Losses of working cohorts = windfall to initial cohort

An economy with capital stock

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$$\sum_{t=0}^{t=\infty} \frac{1}{(1+r)^t} PV_t = \tau w_0 L_0 = T_0$$

  - Losses of working cohorts = windfall to initial cohort
- **Unfunded pension as transfer to initial cohort**
  - No present value loss of unfunded pensions
  - Unfunded pensions redistribute from future cohorts to the first retirees

An economy with capital stock

- **Assumptions behind previous result**
  1. Marginal product of capital r is appropriate intergenerational discount rate δ
  2. No capital income taxes $r_n = r$
  3. Labour supply is fixed

An economy with capital stock

- **Assumptions behind previous result**
  1. Marginal product of capital r is appropriate intergenerational discount rate δ
  2. No capital income taxes $r_n = r$
  3. Labour supply is fixed
- **Discounting and capital income taxes**
  - If $r > \delta$, then there is a PV loss of unfunded pensions
  - If $r_n = \delta$ and $r_n < r$, then there is a PV loss of unfunded pensions
  - See Feldstein (1995, 1998), Feldstein and Liebman (2002)

I. Funded vs unfunded

Labour supply responses

- **Labour supply responses**
  - (i) During pre-retirement years (behavioural responses w.r.t social security contributions)
  - (ii) At retirement (behavioural responses w.r.t benefit schedule)
- **Pension social security contributions (SSCs)**
  - "compulsory payments paid to general government that confer entitlement to receive a future social benefit" (OECD definition)
  - Called Payroll tax (U.S.), National Insurance contributions (U.K.) or *cotisations sociales* (France)

I. Funded vs unfunded

Labour supply responses

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American economist,
Prof. Harvard University
NBER president

I. Funded vs unfunded

Labour supply responses

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- **Feldstein (RESTAT, 1999)**
  - Elasticity of taxable income (ETI) : ε
  - Deadweight loss (DWL) of a tax :

$$DWL = \frac{1}{2}\varepsilon\frac{t^2}{1-t}TI$$

I. Funded vs unfunded

Labour supply responses

- **Computing the effective marginal tax rate**
  - Set the statutory rate of pensions SSCs : θ
  - Assume individuals correctly perceive the link between SSCs and pension benefits
  - Gap between returns in capital market and unfunded pensions : $\frac{r-\gamma}{1+r}$

I. Funded vs unfunded

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- **Effective marginal tax rate** t_1

$$t_1 = \frac{r-\gamma}{1+r}\theta$$

I. Funded vs unfunded

Labour supply responses

- **Not a tax ?**
  - If individuals correctly perceive the link between SSCs and pension benefits
  - If $\gamma = r$ (same return)
  - Then no marginal tax rate from SSCs : $t_1 = 0$
  - Then no deadweight loss from unfunded pensions

I. Funded vs unfunded

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  - If individuals correctly perceive the link between SSCs and pension benefits
  - If $\gamma = r$ (same return)
  - Then no marginal tax rate from SSCs : $t_1 = 0$
  - Then no deadweight loss from unfunded pensions
- **Or a tax ?**
  - If individuals correctly perceive the link between SSCs and pension benefits
  - If $\gamma < r$ (higher return from capital market)
  - Then there is a positive marginal tax rate $t_1 > 0$
  - There is deadweight loss from unfunded pensions

I. Funded vs unfunded

Labour supply responses

- **Salience effects**
  - If individuals don't perceive the link between SSCs and pension benefits
  - Then marginal tax rate from SSCs is the statutory rate θ
  - Deadweight loss can then be large

I. Funded vs unfunded

Labour supply responses

- **Salience effects**
  - If individuals don't perceive the link between SSCs and pension benefits
  - Then marginal tax rate from SSCs is the statutory rate θ
  - Deadweight loss can then be large
- **Non contributory benefits**
  - If no link between contributions and pensions
  - Then marginal tax rate from SSCs is the statutory rate θ
  - Deadweight loss can then be large

II. Adequacy of savings

- **What is adequacy ?**
  - Judgment whether people save adequately for retirement
  - What is “adequate” ? Rational choices vs myopia
  - Low savings because of poverty or myopia ?

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- **Contrasting views**
  - Common view : people don’t save enough
  - Some economists more sanguine : people save enough
  - Survey of evidence by Skinner (JEP, 2007)

II. Adequacy of savings

- **What is adequacy ?**
  - Judgment whether people save adequately for retirement
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- **Contrasting views**
  - Common view : people don't save enough
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  - Survey of evidence by Skinner (JEP, 2007)
- **Types of evidence**
  1. Old age poverty and mandatory pensions
  2. Fall in consumption at retirement
  3. Happiness usually higher when retired
  4. Micro models of savings with uncertainty

Life-Cycle Model as Benchmark

- **Retirement Saving in a Life-Cycle Model**
  - Compute the ratio of wealth to income necessary to smooth consumption (Skinner, 2007)
  - Leave out housing wealth, bequest motives

Life-Cycle Model as Benchmark

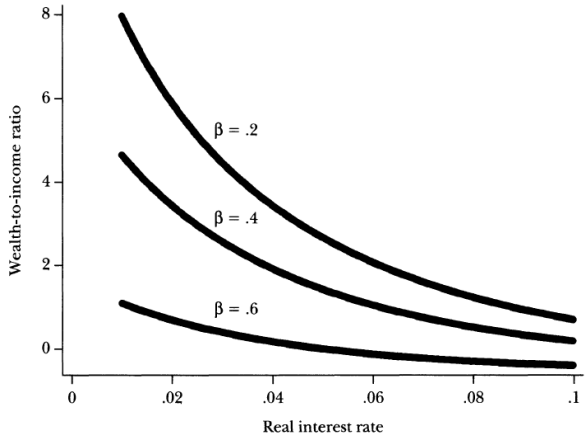
- **Retirement Saving in a Life-Cycle Model**
  - Compute the ratio of wealth to income necessary to smooth consumption (Skinner, 2007)
  - Leave out housing wealth, bequest motives
- **What information/assumptions are needed ?**
  - age
  - expected retirement age
  - marital status
  - expected real rate of return
  - saving rate
  - retirement replacement rate

Figure 1 – Target Nonhousing-Wealth-to-Income Ratios in a Life-Cycle Model

Row	*Model specification*	*Age 40*	*Age 45*	*Age 50*	*Age 55*	*Age 60*	*At retirement*
1	Simple life-cycle benchmark	1.8	2.3	2.9	3.6	4.3	5.1
2	Nonhomeowner	3.7	4.5	5.2	6.0	7.8	8.6
3	Higher saving rate (15%)	−0.5	0.3	1.1	1.9	2.8	3.8
4	Lower saving rate (2.5%)	3.1	3.6	4.1	4.6	5.2	5.8
5	Late retirement (age 70)	0.9	1.4	1.9	2.5	3.1	4.5
6	Early retirement (age 60)	2.7	3.3	4.0	4.7	5.5	5.5
7	Early death (age 85)	1.0	1.5	2.0	2.6	3.2	3.9
8	Replacement rate $\beta = 0.6$, retired at 62, 5% saving rate, nonhomeowner	1.8	2.3	2.7	3.3	3.9	4.2
9	Earnings and consumption growth of 2% until retirement	3.2	3.6	4.0	4.4	4.7	5.1
10	Consumption decline at retirement (by 20%)	0.6	1.1	1.6	2.1	2.7	3.4

SOURCE : Skinner (2007), Tab. 1, p. 63.

Figure 2 – The Impact of the Interest Rate on Required Life-Cycle Wealth Accumulation

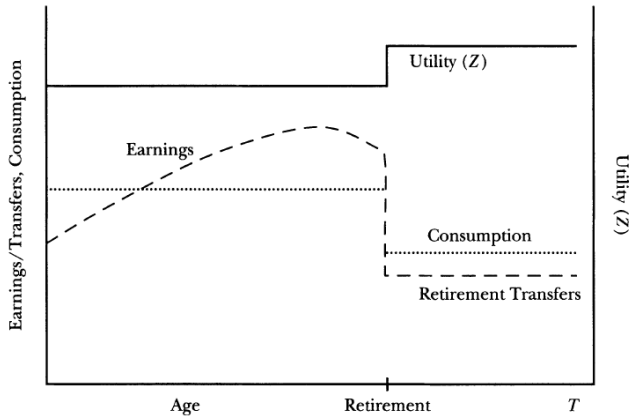


Source : Skinner (2007), Fig. 1, p. 64.
Note : This graph shows how changes in assumptions about future real interest rates affect target wealth values to ensure consumption smoothing, evaluated at age 50. The association between the interest rate and wealth-income ratios are shown for different replacement rates of retirement income relative to preretirement income : $\beta = 0.2$ (20 percent of pretax income), 0.4, and 0.6.

How Much Money Do You Really Need to Enjoy Retirement ?

- **Reasons for expecting lower consumption needs**
  - change in housing size or location
  - with children gone, lower expenses
  - substitution of market expenditures to home production
- **Reasons for expecting higher consumption needs**
  - enjoying leisurely activities
  - out-of pocket health care costs
  - long-term care at older ages

Figure 3 – Household Production Model : Leisure and Contemporaneous Utility Z Rises at Retirement, Consumption Declines



SOURCE : Skinner (2007), Fig. 3, p. 71.
NOTE : Utility Z is a function of consumption and leisure. Because leisure rises so much at retirement Z jumps up despite the decline in market expenditures or "consumption". Note that for other parameters of the household production function, consumption may actually rise optimally at retirement.

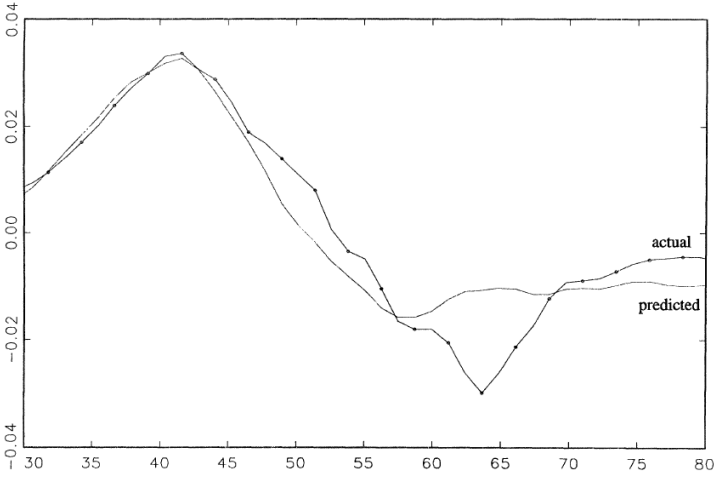
Drop in consumption at retirement

- **Banks, Blundell and Tanner (AER, 1998)**
  - U.K. data : Family Expenditure Survey (FES)
  - Estimate life-cycle model on consumption growth

Drop in consumption at retirement

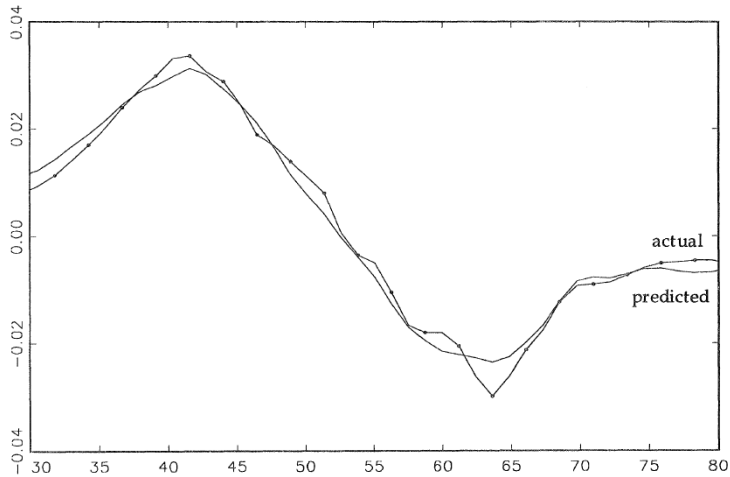
- **Banks, Blundell and Tanner (AER, 1998)**
  - U.K. data : Family Expenditure Survey (FES)
  - Estimate life-cycle model on consumption growth
- **The retirement-savings puzzle**
  - Fall in consumption at retirement unexplained by controlling for demographics (change family size, aging, mortality)
  - Partly explained by work-related expenditures : but not completely
  - Not explained by forward-looking consumption-smoothing model
- **Explaining the puzzle ?**
  - Only unexpected information could reconcile data with the life-cycle model

Figure 4 – Consumption growth by age, controlling for demographics



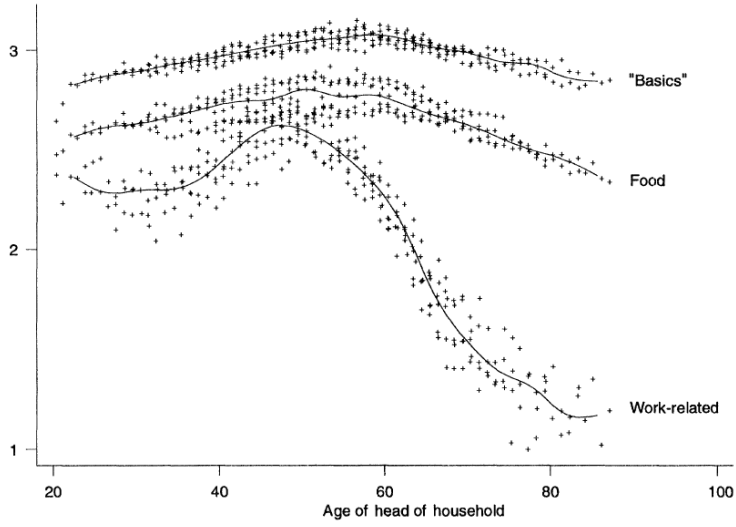
Source : Banks, Blundell and Tanner (1998), Fig. 3.

Figure 5 – Consumption growth by age, controlling for demographics and changes in labour-market participation



Source : Banks, Blundell and Tanner (1998), Fig. 8.

Figure 6 – Spending on food, basic and work-related items



Source : Banks, Blundell and Tanner (1998), Fig. 7.

Drop in consumption at retirement

- **Bernheim, Skinner and Weinberg (AER, 2001)**
  - U.S. household surveys
  - Panel Study of Income Dynamics (PSID)
  - Consumer Expenditure Survey (CEX)
  - Focus on change in consumption around retirement

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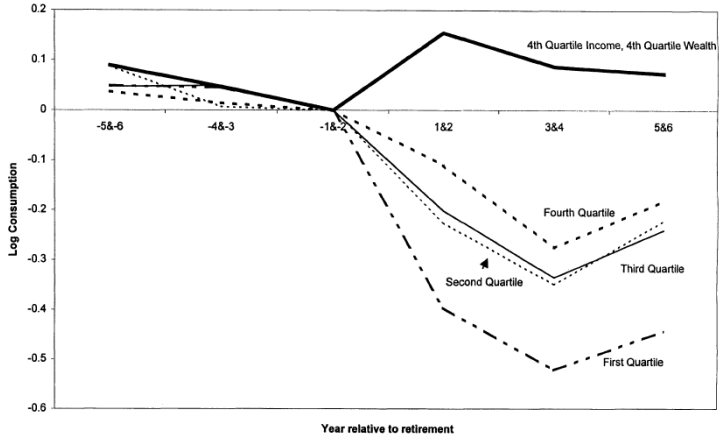
  - U.S. household surveys
  - Panel Study of Income Dynamics (PSID)
  - Consumer Expenditure Survey (CEX)
  - Focus on change in consumption around retirement
- **Results**
  - Fall in consumption at retirement
  - Strong correlation between drop in C and wealth (richest households do not experience any drop)
  - Inconsistent with life-cycle explanations
  - Evidence for myopia, or rule of thumb, or dynamically inconsistent individuals

Figure 7 – Change in consumption at retirement, by wealth quartile



SOURCE : Bernheim, Skinner and Weinberg (2001), Fig. 4, p. 847.

Drop in consumption at retirement

- **Aguiar and Hurst (JPE, 2005)**
  - U.S. household data on food consumption, and time use for food production : Continuing Survey of Food Intake of Individuals (CSFII)

Drop in consumption at retirement

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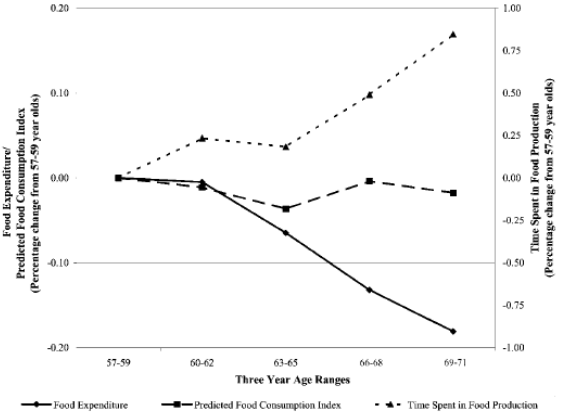
- **Key messages**
  - Reminder : Consumption is not expenditure
  - Complementarity of consumption and leisure after retirement

Drop in consumption at retirement

- **Aguiar and Hurst (JPE, 2005)**
  - U.S. household data on food consumption, and time use for food production : Continuing Survey of Food Intake of Individuals (CSFII)
- **Key messages**
  - Reminder : Consumption is not expenditure
  - Complementarity of consumption and leisure after retirement
- **Results**
  - Food expenditures fall by 17% at retirement
  - Time spent on home production rises by 60%
  - Caloric intake, vitamin intake or meat quality do not drop at retirement

Figure 8 – Change in food expenditure, food consumption and time spent on food production



NOTES : Data are taken from the pooled 1989-91 and 1994-96 cross sections of the CSFII, excluding the oversample of low-income households. The sample is restricted to male household heads (1,510 households). All series were normalized by the average levels for household heads aged 57-59. All subsequent years are the percentage deviations from the age 57-59 levels.
SOURCE : Aguiar and Hurst (2005), Fig. 1, p. 925.

III. Impact of pensions on savings

1. **Old literature : Following Feldstein (1974)**
   - times-series
   - cross-section
   - cross-country

2. **Natural experiments**
   - Italy (Attanasio and Brugiavinni, 2003)
   - U.K. (Attanasio and Rohwedder, 2003)

Old literature

Following Feldstein (1974)

- **Feldstein (JPE, 1974)**
  - U.S. data from national accounts (1929-1971)

$$C = \alpha + \beta_1 YD + \beta_2 YD_{t-1} + \beta_3 W + \beta_4 SSW$$

  - With Consumption (C), disposable income (YD), household wealth (W), Social Security wealth (SSW)
  - Results : $\beta_1 + \beta_2 = 0.65$; $\beta_4 = 0.021$

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  - Results : $\beta_1 + \beta_2 = 0.65$; $\beta_4 = 0.021$

- **Impact on aggregate savings**
  - In 1971, SS taxes = 51 bn \$; SSW = 2029 bn \$; savings = 61 bn \$
  - SS taxes reduce savings by (1-0.65)*51=18
  - Wealth effect of SS = 0.021*2029 = 43
  - SS reduces savings by 50 %

Old literature

Replicating Feldstein (1974)

- **Leimer and Lesnoy (JPE, 1982)**
  - Replication of Feldstein results on 1930-1974 data
  - Programming error in computing *SSW*
  - SSW grows more slowly in revised version

Old literature

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- **Replication results**
  - Much smaller effects of SSW (non significatively different from 0)
  - Different specifications
  - "*Most of our results provide no statistically significant support for the hypothesis that social security has had an impact on savings, either positive or negative*"

Old literature
Replicating Feldstein (1974)

Figure 9 – Results from replication study

ESTIMATED COEFFICIENTS OF SOCIAL SECURITY WEALTH VARIABLE IN CONSUMER-EXPENDITURE FUNCTIONS USING ORIGINAL AND REPLICA FELDSTEIN SERIES

	1930–74		1947–74	
SSW CONCEPT	Original	Replica	Original	Replica
Gross	.026	.011	.004	−.060
	(2.82)	(1.06)	(.10)	(−2.96)
Net	.037	.009	.059	−.095
	(2.78)	(.50)	(1.32)	(−3.13)

NOTE.—Figures in parentheses are *t*-statistics. The 1930–74 regressions exclude the war years 1941–46.

SOURCE : Leimer and Lesnoy (1982), Tab. 2, p. 611.

Old literature : overview

- **Times-series after Feldstein (1974)**
  - Feldstein (JPE, 1980), Feldstein (NTJ, 1996)
  - Times series identification very weak
- **Cross-section**
  - Feldstein and Pellochio (RESTAT, 1979) : large substitution (0.70) ; Novos (1989) : replication shows results depends on few obs.
  - King and Dicks-Mireaux (1982), Diamond and Hausman (1984)
- **Cross-country**
  - Barro and McDonald (JPubE, 1979), Feldstein (1980), Horioka (1980)

$\Rightarrow$ Overall very weak evidence, see survey by Page (1998), or in French Caussat (1992)

Natural experiments

Italian reform

- **Attanasio and Brugiavinni (QJE, 2003)**
  - Pension reform in Italy in 1992
  - Use variation across cohorts (young affected, not older workers)
  - Slow phase-in, no sharp discontinuity

Natural experiments

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  - Pension reform in Italy in 1992
  - Use variation across cohorts (young affected, not older workers)
  - Slow phase-in, no sharp discontinuity
- **Methods and results**
  - Compare savings rate of old/new cohorts
  - 30-40% pension cuts offset by private savings

Figure 10 – Changes in Median Saving Rate against Changes in Median Pension Wealth

Source : Attanasio and Brugiavinni (2003), Fig. 1, p. 1099.

Natural experiments

U.K. reform

- **Attanasio and Rohwedder (AER, 2003)**
  - Exploit two pension reforms in the U.K.
    1. Indexation change of Basic state pension (BSP) in 1975 and 1981
    2. Introduction of SERPS (contributory supplementary pension) in 1978

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  - Exploit two pension reforms in the U.K.
    1. Indexation change of Basic state pension (BSP) in 1975 and 1981
    2. Introduction of SERPS (contributory supplementary pension) in 1978
- **Methods and results**
  - Compare savings rate of old/new cohorts
  - No response in savings from young workers
  - No response to BSP changes
  - Large response to SERPS reform

Table 1 – Changes in Median Saving Rate against Changes in Median Pension Wealth

Age group	SERPS	Basic State pension (BSP)
20–31	0.0135	-0.3061
	(0.334)	(0.133)
32–42	-0.5472	0.0060
	(0.277)	(0.139)
43–53	-0.6511	0.0432
	(0.269)	(0.087)
54–64	-0.7487	0.0351
	(0.243)	(0.040)

SOURCE : Attanasio and Rohwedder (2003), Tab. 5, p. 1514.

IV. Retirement savings policies

1. Policy question
2. Tax incentives
3. Match rates
4. Default effects
5. Save more tomorrow programme
6. Mandated savings contribution
7. Active vs passive savings

Policy question

- **Policy objectives**
  - People need to save enough for retirement
  - Assumption that people don't save enough
  - Providing incentives for retirement savings

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- **Policy options**
  - Mandatory savings
  - Tax incentives
  - Defaulting/framing

Tax incentives

- **Tax-favored individual retirement savings accounts**
  - U.S. : Individual Retirement Arrangements (IRA)
  - France : PERCO, PERP

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Tax incentives

- **Tax-favored individual retirement savings accounts**
  - U.S. : Individual Retirement Arrangements (IRA)
  - France : PERCO, PERP
- **Defined contribution pensions**
  - U.S. : 401(k)
- **Tax treatment**
  - No tax on contribution
  - Interest is accumulated tax free
  - Taxes are paid on withdrawal

Tax incentives : U.S. case

- **Individual Retirement Arrangements (IRA)**
  - Additional private contributions for workers with no employer pension or low incomes (income below $50K)
  - Back-end, postpaid tax : contributions deducted from taxable income
  - Very popular in the U.S in the early 1980s, until 1986
    - 1974 : for workers with no employer pension
    - 1981 : extended to all workers
    - TRA 1986 : restricted to those with no pension or less than 40K $

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  - Additional private contributions for workers with no employer pension or low incomes (income below $50K)
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  - Very popular in the U.S in the early 1980s, until 1986
    - 1974 : for workers with no employer pension
    - 1981 : extended to all workers
    - TRA 1986 : restricted to those with no pension or less than 40K $
- **Roth IRA**
  - Introduced in 1998
  - Front-end, prepaid tax : withdrawals are tax-free but contributions not deductible

Tax incentives : U.S. case

- **Employer-based 401(k) plans**
  - DC pensions as substitute for DB employer provided pensions
  - Creation in 1978
  - 401(k) organised around the workplace
  - Worker can contribute only if employers sponsor such plan
    e.g., 60% of U.S. workers eligible, 40-50% participate

- **Contribution design**
  - Default option set by employers
  - high contribution limit : \$19K/year in 2019
  - contribution deducted from paycheck automatically
  - employers offer often matches
    e.g., 50% match rate up to 6% of salary

Figure 11 – Optimal vs actual wealth at retirement

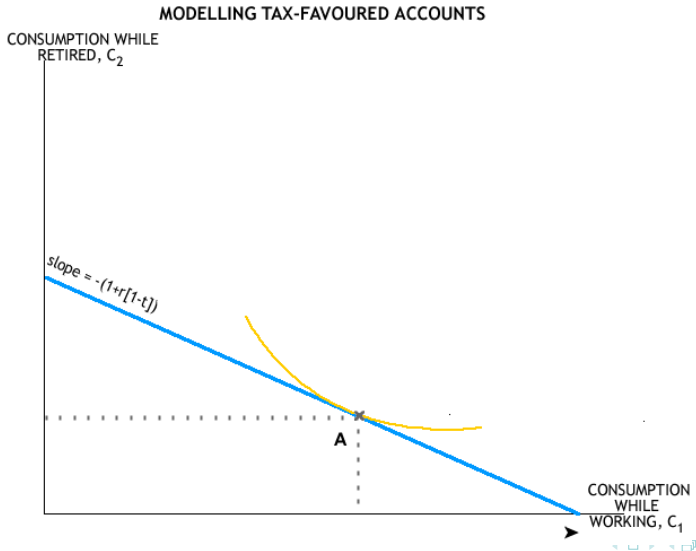


Figure 12 – Optimal vs actual wealth at retirement

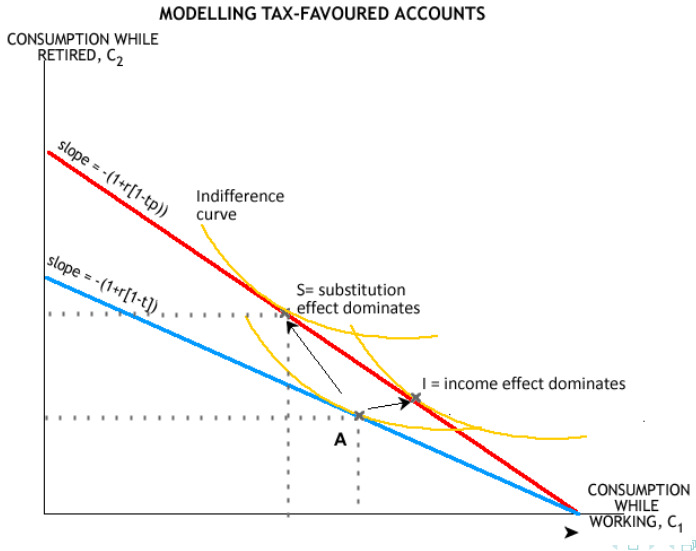


Figure 13 – Optimal vs actual wealth at retirement

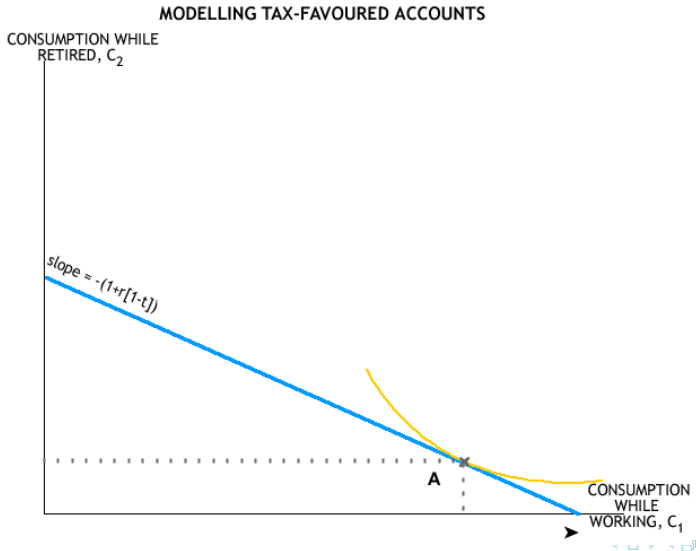
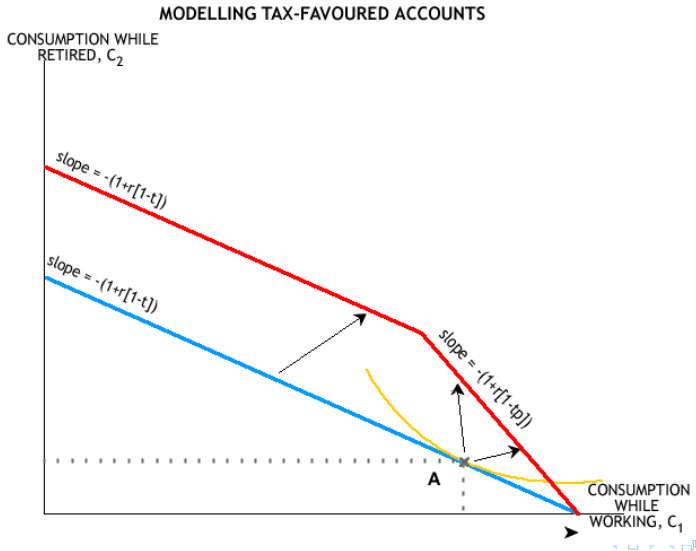


Figure 14 – Optimal vs actual wealth at retirement



Tax incentives

- Individuals with savings below the threshold
  - Income effect : lower savings
  - Substitution effect : higher savings
  - Ambiguous total effect

Tax incentives

- Individuals with savings below the threshold
  - Income effect : lower savings
  - Substitution effect : higher savings
  - Ambiguous total effect
- Individuals with savings above the threshold
  - Income effect only
  - Decrease of savings

Tax incentives

- **Empirical evaluations**
  - Use eligibility rules, threshold, etc.
  - Measure savings for those affected/not affected
  - Large debate in the literature : see survey by Berheim (2002)

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  - Significant increase in tax favoured vehicles
  - Limited substitutions with other savings

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- **Engen, Gale and Scholz (JEP, 1996)**
  - Significant increase in tax favoured vehicles
  - Large substitutions with other savings

Tax incentives

- **Gelber (AEJ-EP, 2011)**
  - Firms offer 401(K) after 1 year of tenure
  - DiD design : comparing year 1 vs year 2 of tenure
  - Data : 1996 Survey of Income and Program Participation (SIPP)

Tax incentives

- **Gelber (AEJ-EP, 2011)**
  - Firms offer 401(K) after 1 year of tenure
  - DiD design : comparing year 1 vs year 2 of tenure
  - Data : 1996 Survey of Income and Program Participation (SIPP)
- **Results**
  - Significant increase in 401(K)
  - Rise in IRA saving (i.e., no substitution with other assets)
  - No other evidence of other change in financial assets
  - But large confidence interval, hence no precisely estimated impact on net worth

Figure 15 – Impact of becoming eligible to 401K on financial assets

	401(k) assets (1)	IRA assets (2)	Other financial assets (3)	Secured debt (4)	Unsecured debt (5)	Car value (6)
Panel A. No controls						
Become eligible	0.95	0.56	−0.05	0.10	−0.09	−0.50
	(0.29)***	(0.26)**	(0.29)	(0.35)	(0.40)	(0.29)*
R^2	0.01	0.01	0.00	0.00	0.00	0.00
Dollar equiv.	$2,759.80	$3,319.3	$−927.2	$5,543.8	$−626.8	$−7,650.0
Panel B. With controls						
Become eligible	0.93	0.53	− 0.08	0.14	− 0.15	− 0.58
	(0.29)***	(0.25)**	(0.29)	(0.36)	(0.39)	(0.29)**
R^2	0.04	0.05	0.05	0.04	0.05	0.06
Panel C. With controls and initial balance						
Become eligible	1.02	0.49	− 0.01	0.15	− 0.08	− 0.47
	(0.29)***	(0.25)*	(0.28)	(0.35)	(0.37)	(0.28)*
R^2	0.07	0.08	0.11	0.08	0.13	0.12

SOURCE : Gelber (2011), Table 2, p. 111.

Match rates

- **Match rates policy**
  1. Firm contribute to employee pension funds
  2. Firm match rates of contribution by employees
     e.g., \$1 employer contribution for every \$2 employee contributions

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  1. Firm contribute to employee pension funds
  2. Firm match rates of contribution by employees
     e.g., \$1 employer contribution for every \$2 employee contributions
- **Strong incentives**
  - Much bigger incentives than tax break
  - Why do firms do that ?

Match rates

- **Duflo, Gale, Liebman, Orszag and Saez (QJE, 2006)**
  - Randomized experiment on matching rates for IRA for low- and middle-income families
  - RCT took place in 2005 in St. Louis (Missouri, U.S.)
  - Customers of H&R Block (U.S. tax filing company) received match rates of 0%, 20% and 50% of IRA contributions (Express-IRA, X-IRA)

- **Main results**
  1. Significant effect of matches on probability of contributing and contribution levels
  2. But take-up rates were far below 100%
  3. People do not game the system (by contributing and withdrawing)
  4. Much larger effects than tax incentives

Table 2 – Effect of the experiment on X-IRA Behaviour

	Pre-experiment	No match	20% match	50% match
Opened an X-IRA	2.52	2.90	7.72	13.98
	(0.38)	(0.24)	(0.40)	(0.50)
Amount contributed	\$16.3	\$22.2	\$85.1	\$154.9
(unconditional)	(4.5)	(3.1)	(6.1)	(7.4)
Amount contributed	\$644.3	\$765.1	\$1102.3	\$1108.2
(positive amount only)	(50.4)	(84.0)	(54.9)	(34.4)
Fraction withdrawing		0.11	0.14	0.14
(after 3 months)		(0.03)	(0.02)	(0.01)

SOURCE : Duflo, Gale, Liebman, Orszag and Saez (2006), Tab. 2 and 5.

Match rates

- **Saver's Credit**
  - U.S. tax credit on the first \$2000 contributed to IRA or 401(k)
  - Non refundable credit (i.e., tax reduction)
  - Tax credit at rate t is equivalent to match rate of $\frac{t}{1-t}$

    e.g., a tax filer facing the 50 percent credit rate and contributing \$1000 would receive a \$500 tax credit, so that her out-of-pocket cost for a \$1000 contribution is only \$500, which is effectively a 100% match rate

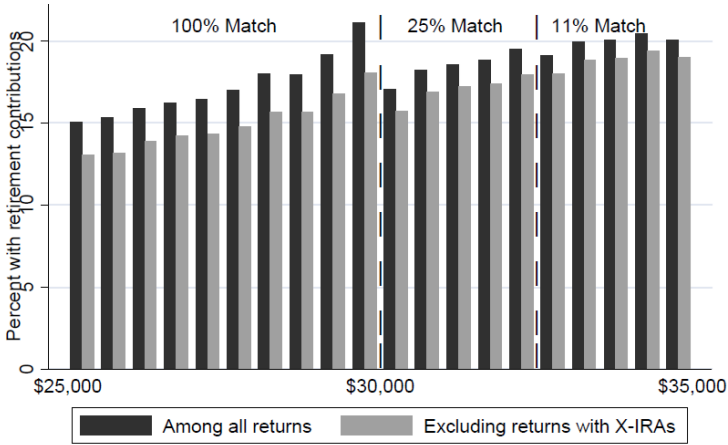
- **Comparison with experiment**
  - Saver's Credit incentives much larger
  - But smaller impact on participation

Figure 16 – Saver's Credit parameters

Credit Rate	Equivalent match rate	AGI Range		
		Married filing jointly	Head of household	Single and others
t	$t/(1 - t)$			
(1)	(2)	(3)	(4)	(5)
50%	100%	$0–$30,000	$0–$22,500	$0–$15,000
20%	25%	$30,001–$32,500	$22,501–$24,375	$15,001–$16,250
10%	11%	$32,501–$50,000	$24,376–$37,500	$16,251–$25,000
0%	0%	$50,001+	$37,501+	$25,001+

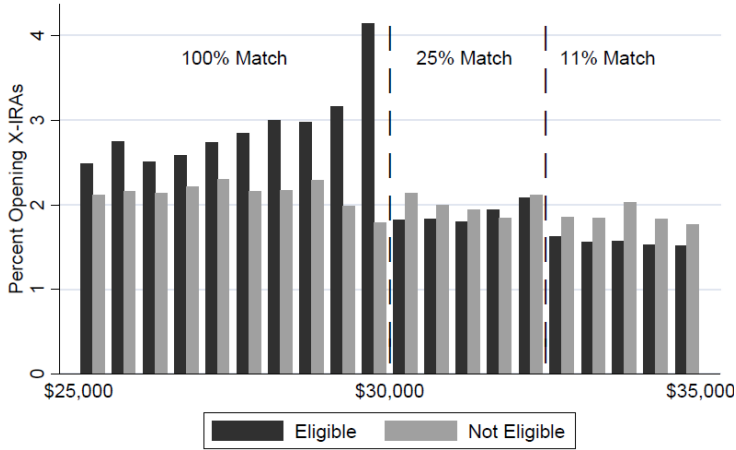
NOTE : AGI is gross income minus retirement contributions.
SOURCE : Duflo, Gale, Liebman, Orszag and Saez (2006), Tab. 6.

Figure 17 – Percent of Saver's Credit Eligible Returns with Positive Retirement Contributions



NOTE : The figure displays the percentage of tax returns receiving a positive Saver's Credit by $500 bands of normalized AGI among all eligible returns and among all eligible returns excluding returns with X-IRAs.
SOURCE : Duflo, Gale, Liebman, Orszag and Saez (2006), Fig. II, p. 1336.

Figure 18 – X-IRA Take-up by Saver's Credit Eligibility Status



NOTE : The figure displays the percentage of tax returns contributing to an X-IRA (for tax year 2004) by $500 bands of normalized AGI and Saver's Credit eligibility status.
SOURCE : Duflo, Gale, Liebman, Orszag and Saez (2006), Fig. III, p. 1338.

Madrian and Shea (2001) : Default effects

- **Madrian and Shea (QJE, 2001)**
  - Assess change in retirement in one U.S. firm
  - Change from voluntary enrollment to auto-enrollment
  - Default rate of contribution 3%

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  - Assess change in retirement in one U.S. firm
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- **Results**
  - Enormous impact on participation in the short-term (+60 ppt)
  - Very large impact on participation in the long-term (+30 ppt)
  - Employees stick to default contribution rate

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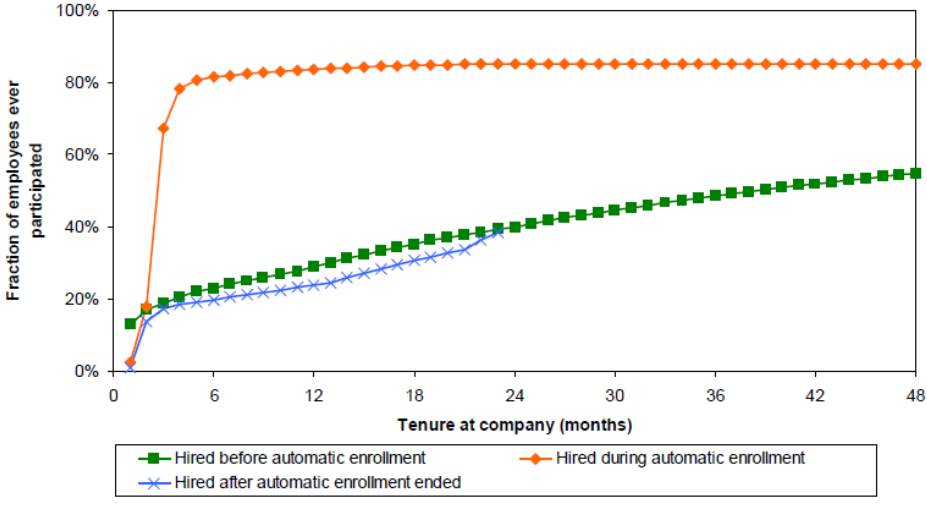
- **Results**
  - Enormous impact on participation in the short-term (+60 ppt)
  - Very large impact on participation in the long-term (+30 ppt)
  - Employees stick to default contribution rate
- **Very influential paper**
  - Power of inertia or default options

Figure 19 – Impact of auto-enrollment on participation

	Automatic enrollment		Immediate eligibility	
	Participation rate of Window cohort on 6/30/98	Participation rate of New cohort on 6/30/99	Participation rate of Old cohort on 6/30/98	Participation rate of Window cohort on 6/30/99
Overall	37.4%	85.9%	48.7%	49.4%
Gender				
Male	42.3	85.7	56.1	55.9
Female	35.9	86.0	46.3	47.4
Race/ethnicity				
White	42.7	88.2	53.4	54.4
Black	21.7	81.3	30.7	32.6
Hispanic	19.0	75.1	27.8	34.5
Other	46.2	85.2	55.0	62.9
Age				
Age <20	—	73.6	25.0	33.3
Age 20–29	25.3	82.7	36.7	36.9
Age 30–39	37.2	86.3	47.9	50.3
Age 40–49	47.3	90.1	54.9	58.0
Age 50–59	51.8	90.0	64.3	64.3
Age 60–64	60.0	86.0	60.6	70.0
Compensation				
<$20K	12.5	79.5	20.0	21.2
$20–$29K	24.5	82.8	31.7	35.3
$30–$39K	42.2	88.9	50.1	55.4
$40–$49K	51.0	91.8	61.6	64.5
$50–$59K	61.6	92.8	70.2	75.2
$60–$69K	59.7	94.7	79.2	75.1
$70–$79K	57.9	91.5	76.3	71.6
$80K+	68.3	94.2	76.3	82.6
Sample size	N = 4249	N = 5801	N = 3275	N = 4247

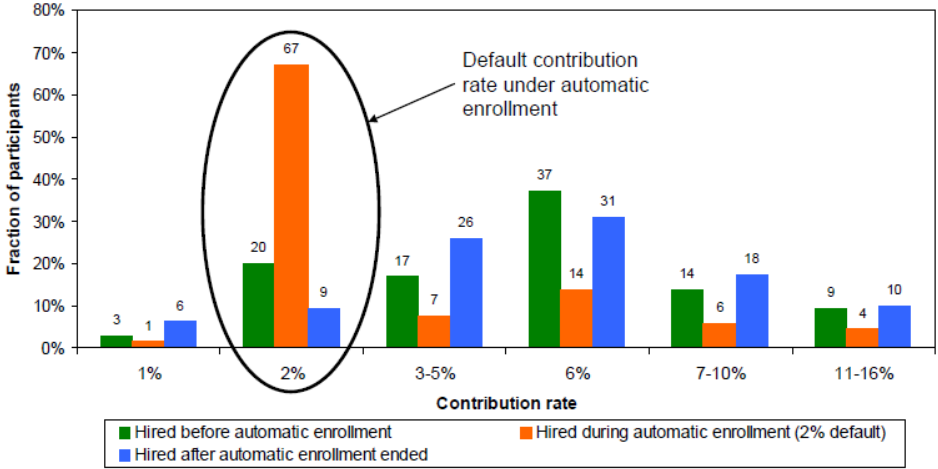
SOURCE : Madrian and Shea (2001)

Figure 20 – 401(k) participation by tenure at firm



Source : Madrian and Shea (2001)

Figure 21 – Distribution of contribution rates



SOURCE : Madrian and Shea (2001)

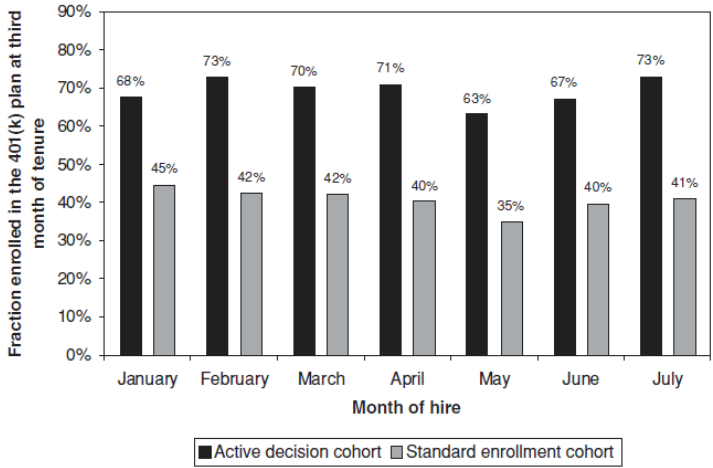
Default effects

- **Carroll, Choi, Laibson, Madrian and Metrick (QJE, 2009)**
  - Assess "active decision" in 401(k) savings
  - Standard enrollment : no enrollment by default
  - Automatic enrollment : enrollment by default
  - Active decision : no default, employees must declare explicitly their preference

Default effects

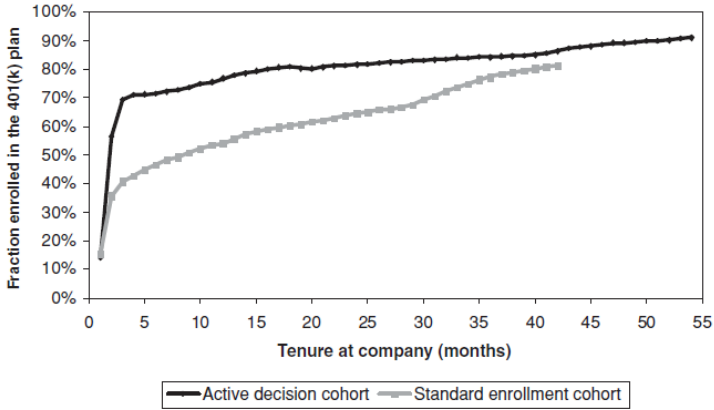
- **Carroll, Choi, Laibson, Madrian and Metrick (QJE, 2009)**
  - Assess "active decision" in 401(k) savings
  - Standard enrollment : no enrollment by default
  - Automatic enrollment : enrollment by default
  - Active decision : no default, employees must declare explicitly their preference
- **Natural experiment**
  - Large firm in the U.S. in finance
  - Until 1997, form mandatory to fill for expliciting preference in 401(k) arrangements (active decision)
  - From Nov. 1997, switch to a telephone-based system : employees can phone to enroll (standard enrollment)

Figure 22 – Fraction of Employees Enrolled in the 401(k) by Hire Month



SOURCE : Carroll et al. (2009), Fig. 1, p. 1649.

Figure 23 – Fraction of Employees Enrolled in the 401(k) by Tenure at Company



Source : Carroll et al. (2009), Fig. 2, p. 1650.

Default effects

- **Results**
  - Fraction of employees enroll + 28 ppts with active decision (compared to standard enrollment)
  - Acceleration of the decision making
  - Active decisions from individuals with lower propensity to save (lower contribution rates)

- **Model of optimal enrollment design**
  - Active decisions are optimal when consumers have a strong propensity to procrastinate and savings preferences are highly heterogeneous
  - Financial illiteracy, however, favors default enrollment over active decision enrollment

Mandated contributions

- **Card and Ransom (REStat, 2011)**
  - Employers can mandate contribution rates
  - Analyse change in mandated contribution rates on voluntary contributions
- **DC Pension funds for U.S. colleges and universities**
  - Rules vary across institutions (employee mandated to contribute or not, matched rates, variations by age
  - Options offered to professors to save additionally through a Supplemental Retirement Annuity (SRA)
- **Methodology**
  - Data from TIAA-CREF pension fund
  - Tobit estimation of impact of mandated contribution rates on SRA savings rate

Figure 24 – Tobit Models for Supplemental Pension Contribution Rate

	Person-Specific Contribution Rates	Averaged Contribution Rates	Subsample of Schools with Constant Contribution Rates
	(1)	(2)	(3)
Restricted model:			
Total contribution rate	−0.48	−0.58	−0.57
	(0.16)	(0.16)	(0.16)
Unrestricted model			
Individual contribution rate	−0.53	−0.61	−0.71
	(0.18)	(0.17)	(0.15)
Institutional contribution rate	−0.18	−0.23	−0.23
	(0.16)	(0.18)	(0.17)
Difference: Institutional minus individual effects	0.34	0.37	0.39
	(0.13)	(0.15)	(0.12)
T-test for equality	2.61	2.45	3.29
Controls for age and presence of alternative pension carrier(s)	Yes	Yes	Yes
Number individual observations	114,211	114,211	79,044
Number of institutions	77	77	53

SOURCE : Card and Ransom (2011), Tab. 3, p. 236.

Mandated contributions

- **Findings**
  1. \$1 extra of employee mandatory contribution reduces voluntary contribution by 60-80 cents
  2. \$1 extra of employer mandatory contribution reduces voluntary contribution by 20-40 cents

- **Take-away message**
  - Crowding-out not 100%
  - Lower for employer contributions, presumably less salient to employees

Save more tomorrow

- **Thaler and Benartzi (JPE, 2001)**
  - Using behavioural economics to increase employee saving
  - Individuals use self-control device like gov. pension schemes, home equity and DB pensions
  - Move to DC pension offer a risk of too low pension saving rates

- **Save more tomorrow (SMarT) programme**
  1. Employees asked about increasing pension contribution in the future (cf. hyperbolic discounting)
  2. Contribution increases at their next pay raise (cf. loss aversion)
  3. Contribution rates continue to increase at each pay raise until preset maximum (cf. inertia)
  4. Employees can opt out at any time

Save more tomorrow

- **Experimentation with SMarT**
  - Application in three companies, not RCTs
- **Results**
  1. A high proportion joined the plan (78%)
  2. Vast majority stayed in the plan until 4th pay raise (80%)
  3. Average saving rates increased from 3.5% to 13.6%
- **Behavioural economics for savings behaviour**
  - Hyperbolic discounting, self-control, procrastination, loss aversion explain inability to save (Benartzi and Thaler, 2007)
  - In 2006, SMarT was enshrined into law as part of the U.S. Pension Protection Act of 2006

Chetty et al. (2014) : Active vs passive savers

- **Chetty, Friedman, Leth-Petersen, Nielsen and Olsen (QJE, 2014)**
  - Danish administrative data (earnings, savings, etc.)
    - panel data set with 41 million observations on savings in retirement and non retirement accounts
  - Three policies analysed :
    1. Mandated savings by government
    2. Automatic contributions by firms
    3. Tax subsidies for retirement savings

- **Results**
  - Automatic contributions raise total savings much more than price subsidies because 85% of people are passive
  - Only 15% exploit tax incentives and they do so with crowding out of previous savings

Chetty et al. (2014) : Active vs passive savers

Mandated savings

- **Mandatory Savings Plan (MSP)**
  - Danish reform in 1998
  - Firms mandated to contribute to workers's retirement savings account of 1% of earnings if earnings above threshold (34.5 K DKr $\simeq$ 5K euros)

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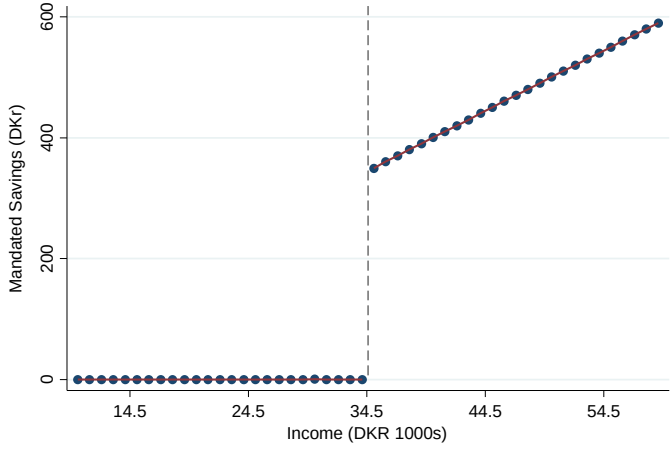
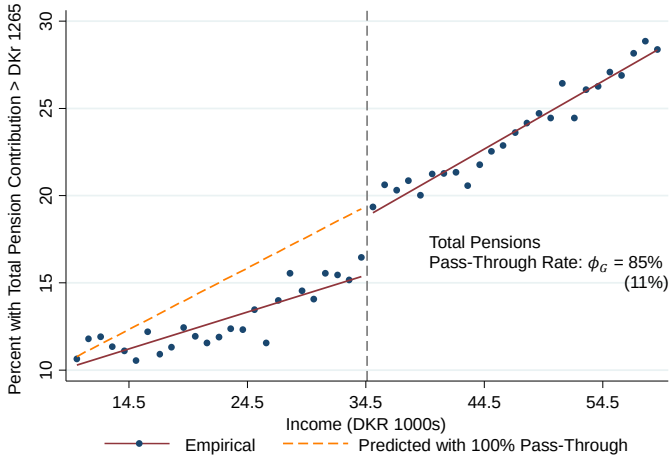
- **Mandatory Savings Plan (MSP)**
  - Danish reform in 1998
  - Firms mandated to contribute to workers's retirement savings account of 1% of earnings if earnings above threshold (34.5 K DKr $\simeq$ 5K euros)
- **Method and results**
  - Regression discontinuity design (RDD)
  - DKr 1 mandated pension savings leads to DKr 1 increase in total savings
  - No offset of mandatory savings with reduced savings
  - But evidence for very low level of earnings

Figure 25 – Contribution mandated by the programme



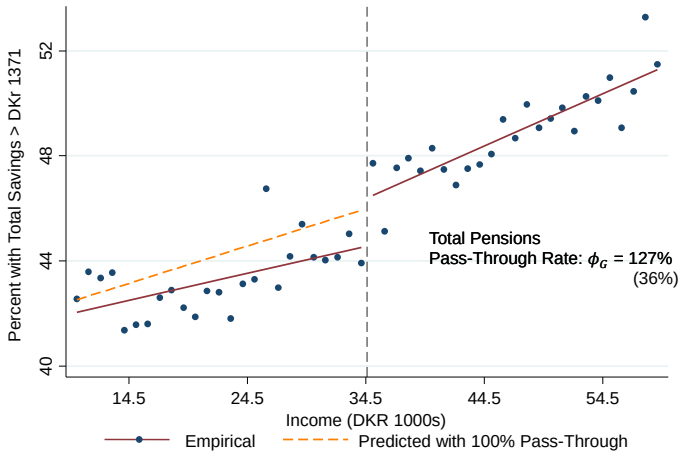
Source : Chetty et al. (2014), Fig. IV.a, p. 1179.

Figure 26 – Impact on total pension contributions



Source : Chetty et al. (2014), Fig. IV.c, p. 1180.

Figure 27 – Impact on total savings



SOURCE : Chetty et al. (2014), Fig. IV.d, p. 1180.

Table 3 – Government-Mandated Savings Plan : Pass-Through Estimates

Dep. Var. :	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δ Total pension contributions			Total pension threshold	Total saving threshold	Total ind. saving threshold	Net saving threshold
Pass-through	0.883	1.052	0.801	0.845	1.268	1.336	2.188
	(0.204)	(0.200)	(0.310)	(0.113)	(0.363)	(0.349)	(0.587)
Income control	Linear	Linear	Quadratic	Linear	Linear	Linear	Linear
Controls		X					
Observations	35,578	35,578	35,578	158,229	148,380	148,380	12,988

NOTES : (1) estimates the specification with no controls. (2) replicates (1) controlling for age, marital status, gender, college attendance, and two-digit occupation indicators. Column (3) replicates (1) using a quadratic rather than a linear control function for income. Sample is restricted to individuals who are making positive total pension contributions in 1997 in (1)–(3). (4)–(7) use the full sample.
SOURCE : Chetty et al. (2014), Tab. IV, p. 1183.

Chetty et al. (2014) : Active vs passive savers

Automatic contributions

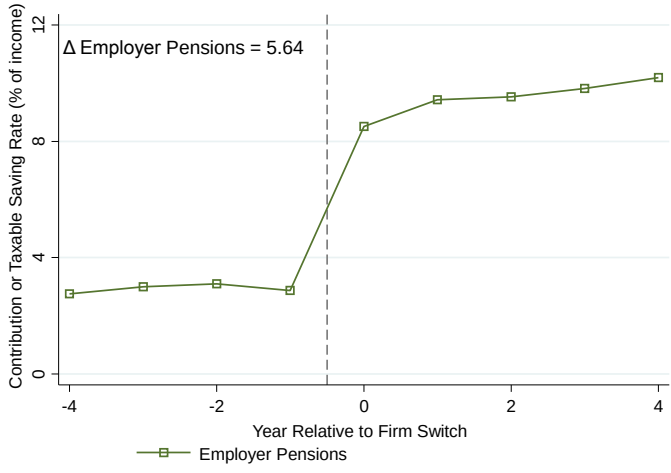
- **Event study around job changes**
  - Compare impacts of sharp increases/decreases in employer contributions at time of job change
  - Issues :
    - job switches may be endogenous
    - total compensation is changing as well
  - 4.1 million job switches in the data

Chetty et al. (2014) : Active vs passive savers

Automatic contributions

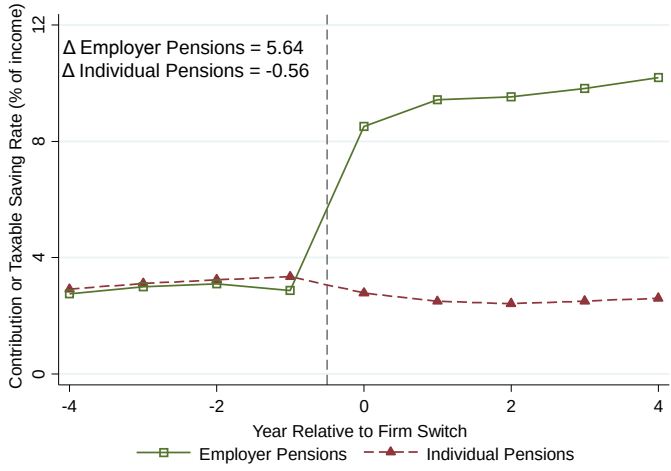
- **Event study around job changes**
  - Compare impacts of sharp increases/decreases in employer contributions at time of job change
  - Issues :
    - job switches may be endogenous
    - total compensation is changing as well
  - 4.1 million job switches in the data
- **Focus on large changes**
  - switchers to firms with at least 3 ppt increase in pension contributions
    $\Rightarrow$ by construction 5.57% increase in employer at the switch
  - switchers with positive individual pension contributions prior to switch

Figure 28 – Effects of Employer Pensions on Savings Rates



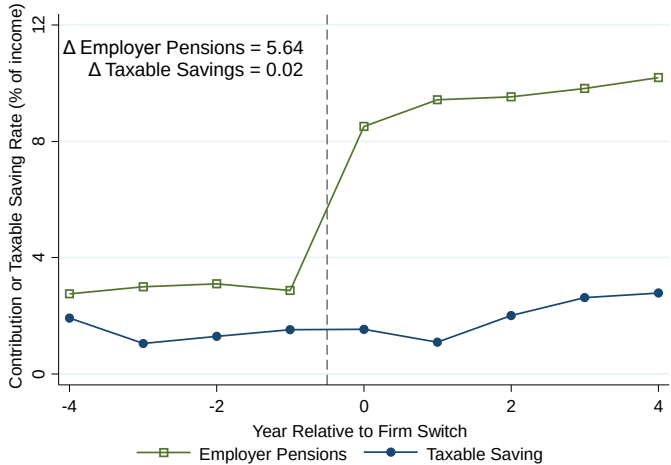
SOURCE : Chetty et al. (2014), Fig. 1.b, p. 1162.

Figure 29 – Effects of Employer Pensions on Savings Rates



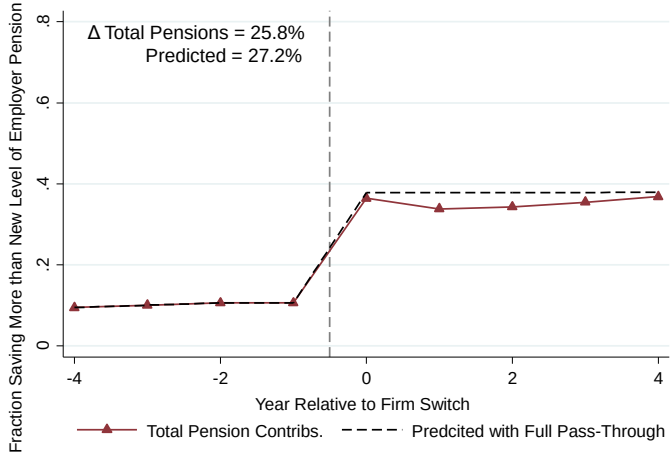
SOURCE : Chetty et al. (2014), Fig. 1.b, p. 1162.

Figure 30 – Effects of Employer Pensions on Savings Rates



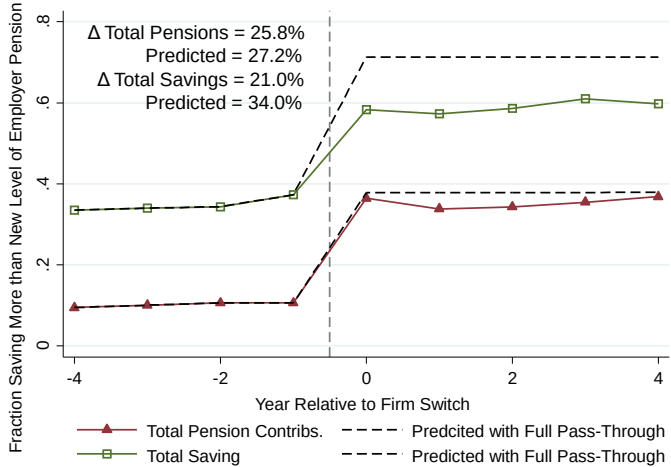
SOURCE : Chetty et al. (2014), Fig. 1.b, p. 1162.

Figure 31 – Effects of Employer Pensions on Savings Rates



Source : Chetty et al. (2014), Fig. 1.c, p. 1163.

Figure 32 – Effects of Employer Pensions on Savings Rates



SOURCE : Chetty et al. (2014), Fig. 1.c, p. 1163.

Chetty et al. (2014) : Active vs passive savers

Automatic contributions

- **Pass-Through Estimations**

$$\Delta z_i = \beta_0 + \phi_E \Delta p_i^E + \beta_1 \Delta w_i + \beta_X \Delta X_i + \varepsilon_i^E$$

  - where Δz_i is change in total savings/pension cont.
  - Δp_i^E change in employer contribution
  - Δw_i change in total compensation

Chetty et al. (2014) : Active vs passive savers

Automatic contributions

- **Pass-Through Estimations**

$$\Delta z_i = \beta_0 + \phi_E \Delta p_i^E + \beta_1 \Delta w_i + \beta_X \Delta X_i + \varepsilon_i^E$$

  - where Δz_i is change in total savings/pension cont.
  - Δp_i^E change in employer contribution
  - Δw_i change in total compensation

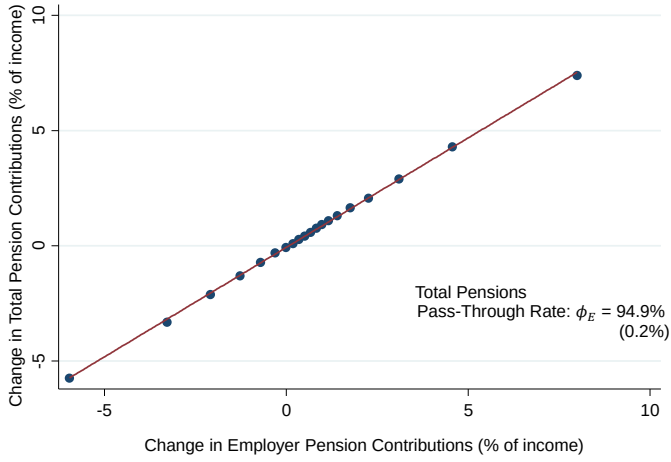
- **Interpreting the pass-through rate**
  - ϕ_E represents the impact of a DKr 1 increase in employer pensions holding total compensation fixed
  - ϕ_E identifies the fraction of passive savers

Table 4 – Employer Pensions : Pass-Through Estimates

Sample :	(1) All firm switches	(2) All firm switches	(3) Mass layoffs	(4) Top tax sample	(5) All firm switches	(6) First switches	(7) Switches age 46–54
Dep. Var. :	Δ Total pension rate	Δ Total savings rate	Δ Total savings rate	Δ Total savings rate	Δ Net savings rate	Δ Total savings rate	Δ Accrued wealth
Panel A : lagged saving > 0							
Δ Emp. Pens. Contrib. Rate	0.949 (0.002)	0.777 (0.022)	0.828 (0.187)	0.750 (0.038)	0.745 (0.037)	0.784 (0.040)	4.541 (0.426)
Δ Total compensation	0.007 (0.0002)	0.118 (0.0033)	0.178 (0.0250)	0.133 (0.0069)	0.059 (0.0048)	0.078 (0.0053)	0.089 (0.0042)
No. of Obs.	867,075	1,890,220	37,432	876,922	1,890,642	727,372	54,147

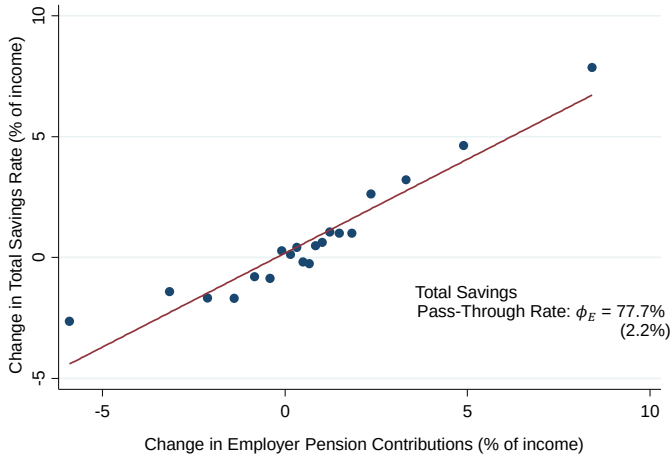
SOURCE : Chetty et al. (2014), Table III, panel A, p. 1169.

Figure 33 – Changes in Total Pension Contribution Rates vs. Changes in Employer Pensions



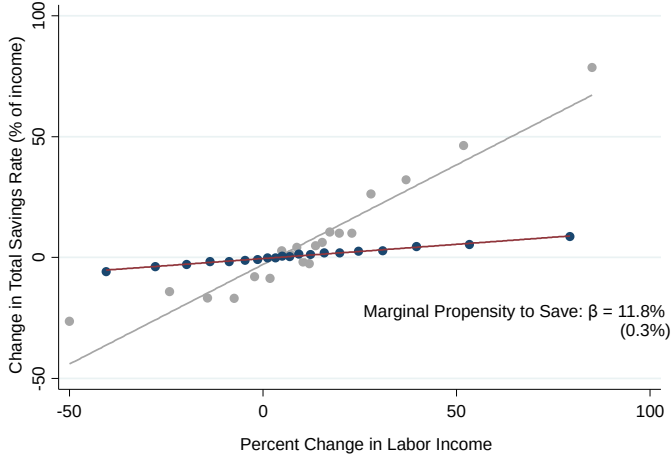
Source : Chetty et al. (2014), Fig. II.a, p. 1171.

Figure 34 – Changes in Total Savings Rates vs. Changes in Employer Pensions



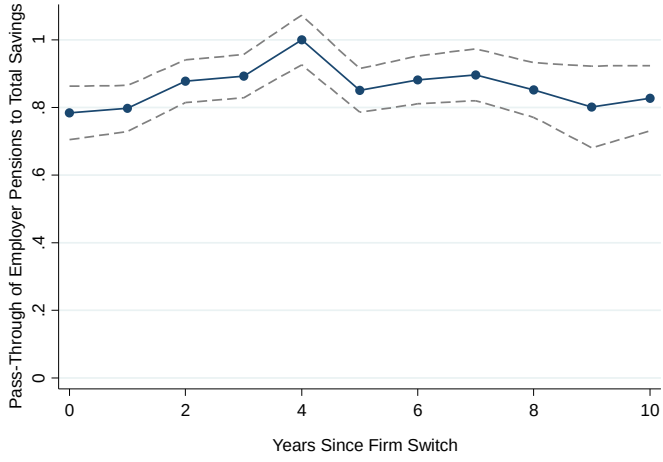
Source : Chetty et al. (2014), Fig. II.b, p. 1171.

Figure 35 – Changes in Total Savings Rates vs. Changes in Labor Income



SOURCE : Chetty et al. (2014), Fig. II.c, p. 1172.

Figure 36 – Pass-Through of Employer Pension to Total Savings by Years Since Firm Switch



Source : Chetty et al. (2014), Fig. III.a, p. 1176.

Figure 37 – Wealth Accrued at Age 60 vs. Changes in Employer Pension Rates at Switch

Source : Chetty et al. (2014), Fig. III.b, p. 1177.

Chetty et al (2014) : Active vs passive savers

Subsidies for retirement saving

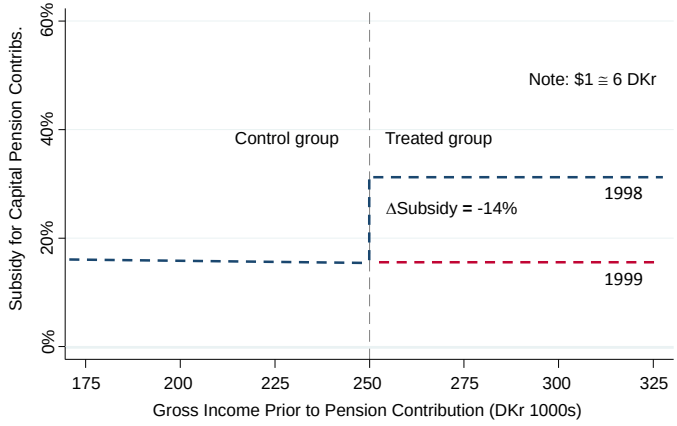
- **Tax favored retirement accounts in Denmark**
  1. Capital pensions : paid as lump sum
  2. Annuity pensions : paid as annuity

Chetty et al (2014) : Active vs passive savers

Subsidies for retirement saving

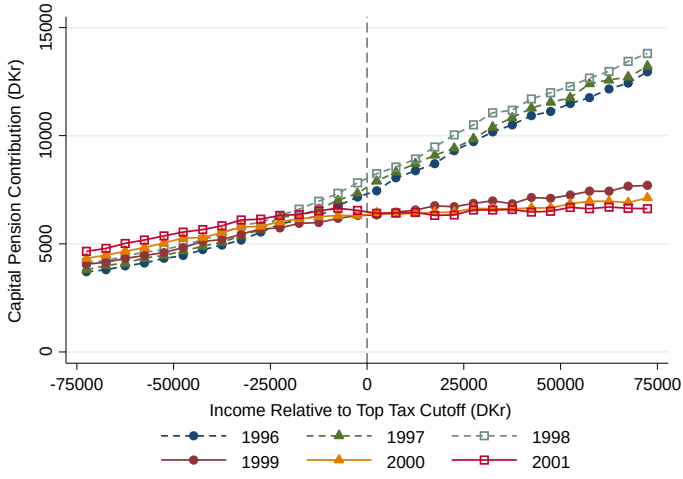
- **Tax favored retirement accounts in Denmark**
  1. Capital pensions : paid as lump sum
  2. Annuity pensions : paid as annuity
- **1999 reform**
  - Cut in subsidy for capital pensions reduced for top income tax bracket by 14 ppt (from 59% to 45%)
  - Tax treatment of annuity pension unchanged
  - Top income tax threshold in Denmark : DKr 251,200 in 1998 (US$38,600), p80

Figure 38 – Subsidy for Capital Pensions Contribs. (1999 vs 1998)



Source : Chetty et al. (2014), slides.

Figure 39 – Total Contributions vs. Taxable Income 1996-2001



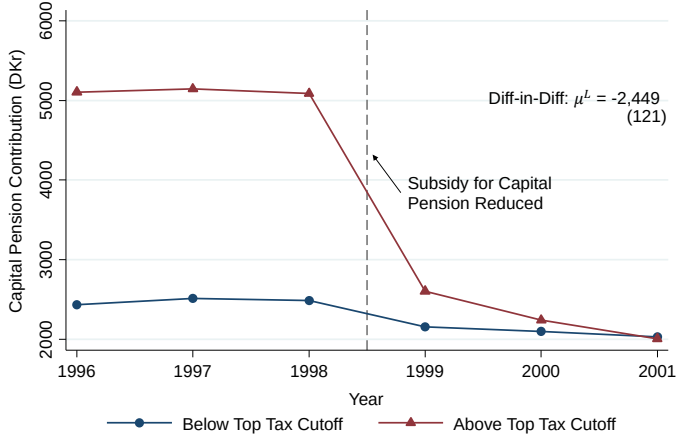
Source : Chetty et al. (2014), Fig. V.a, p. 1186.

Chetty et al (2014) : Active vs passive savers

Subsidies for retirement saving

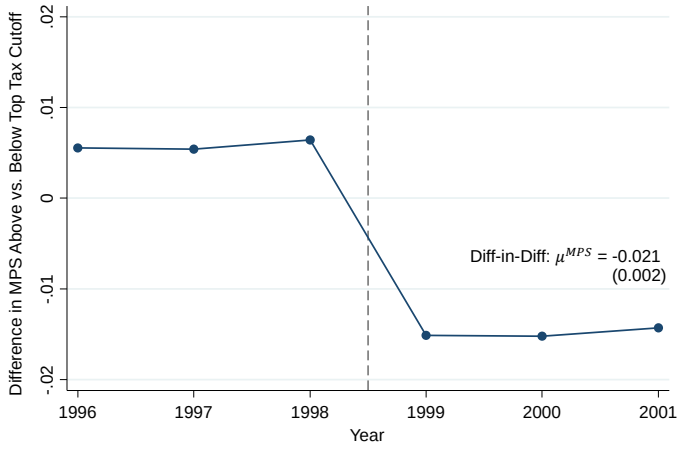
- **Two DiD estimators**
  - Using difference in levels of capital pensions contributions (i.e., change in average level of contributions)
  - Using difference in marginal propensity to save (MPS) (i.e., change in the slope of pension contributions to income)
- **Results**
  - Levels : 48% reduction (DKr 2,449/DKr 5,113)
  - MPS : 84% reduction (0.021/0.025)

Figure 40 – Ind. Contributions Above vs. Below Top Tax Cutoff



Source : Chetty et al. (2014), Fig. V.b, p. 1186.

Figure 41 – Diff. in MPS Above vs. Below Top Tax Cutoff



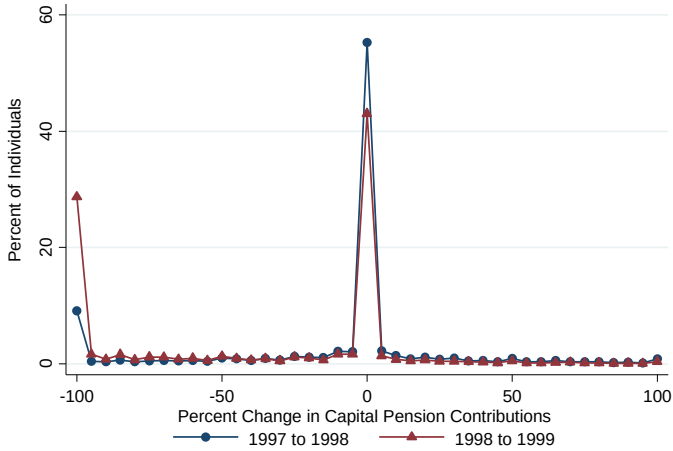
Source : Chetty et al. (2014), Fig. V.c, p. 1187.

Chetty et al (2014) : Active vs passive savers

Subsidies for retirement saving

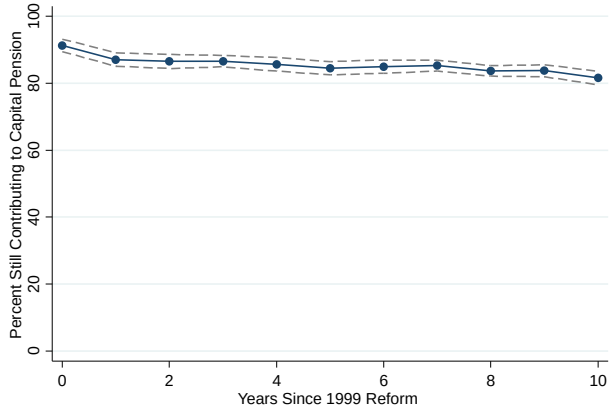
- **Who actively react to the change ?**
  - 26.1% of treated do not change their contributions
  - Many other changes not driven by the reoptimization
- **Aggregate reductions accounted for by 19.3% of individuals**
  - Extensive margin mostly : 15.9% exit capital pensions

Figure 42 – Changes in Capital Pension Contributions for Prior Contributors



SOURCE : Chetty et al. (2014), Fig. VI.a, p. 1193.

Figure 43 – Effect of 1999 Reform on Fraction of Capital Pension Contributors by Year for Individuals Contributing Prior to Reform



Source : Chetty et al. (2014), Fig. VI.c, p. 1194.

Chetty et al (2014) : Active vs passive savers

Crowding-out

1. **Shifting across pension accounts**
   - Annuity vs Capital pensions
   - Relevant parameter for impacts of a policy that targets one type of retirement account
   - Results : 57% shifted to annuity pension

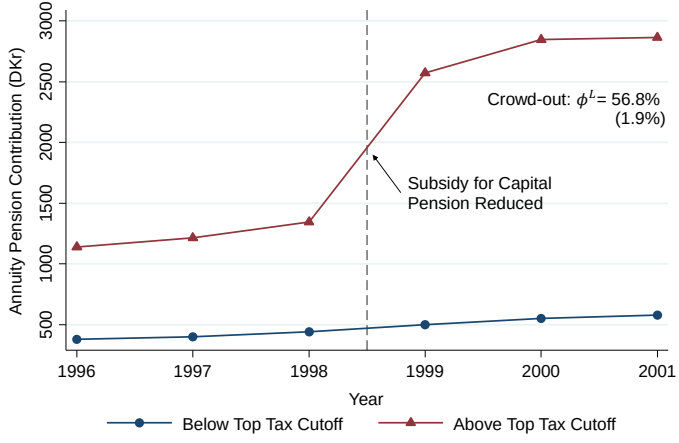
Chetty et al (2014) : Active vs passive savers

Crowding-out

1. **Shifting across pension accounts**
   - Annuity vs Capital pensions
   - Relevant parameter for impacts of a policy that targets one type of retirement account
   - Results : 57% shifted to annuity pension

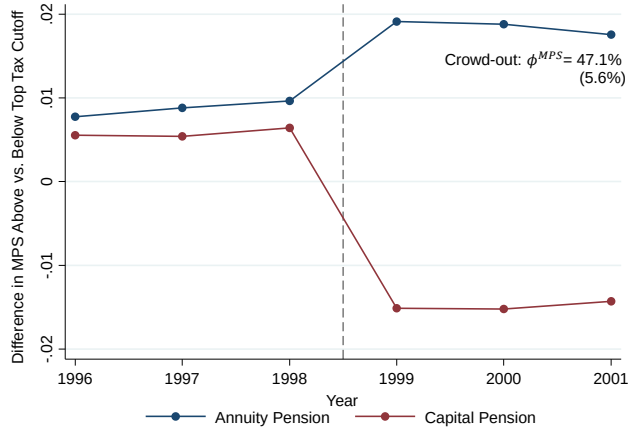
2. **Shifting from pension accounts to taxable savings accounts**
   - What happens to each DKr 1 taken out of pension savings ?
   - Relevant parameter for determining overall impact of retirement savings subsidies on total savings

Figure 44 – Level of Annuity Contributions Above vs. Below Top Tax Cutoff



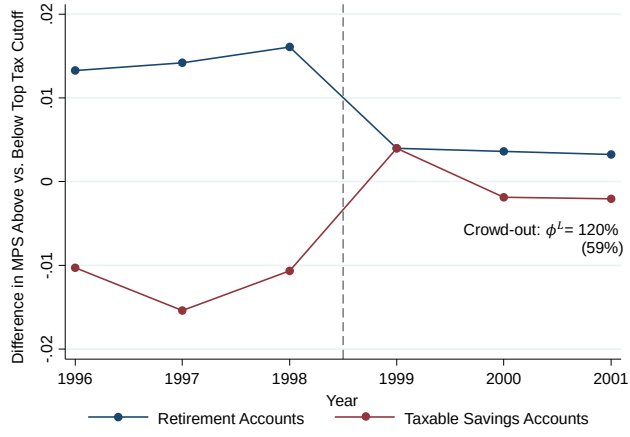
Source : Chetty et al. (2014), Fig. VII.a, p. 1199.

Figure 45 – Change in Marginal Propensity to Save in Annuity vs. Capital Accounts at Top Tax Cutoff by Year



Source : Chetty et al. (2014), Fig. VII.b, p. 1199.

Figure 46 – Change in Marginal Propensity to Save in Retirement vs. Non-Retirement Accounts at Top Tax Cutoff by Year



Source : Chetty et al. (2014), Fig. VIII.a, p. 1203.

Table 5 – Crowd-Out of Taxable Saving Induced By Subsidy

Dep. Var. :	(1) Taxable saving	(2) Trimmed taxable saving	(3) Median taxable saving	(4) Median total saving	(5) Taxable saving threshold	(6) Taxable saving threshold	(7) Net saving threshold
Ind. pension contribution	-1.200 (0.588)	-0.984 (0.267)			-0.994 (0.241)	-0.940 (0.215)	-1.462 (0.379)
Above cutoff × post $\times Y^{tax}$			0.0098 (0.0025)	0.0003 (0.0030)			
Controls						X	
No. of Obs.	7,026,187	7,026,187	7,026,187	7,026,187	7,026,187	7,026,187	7,026,187

SOURCE : Chetty et al. (2014), Table VII, p. 1205.

Chetty et al (2014) : Active vs passive savers

Results

1. **First stage : impact of subsidy on capital pensions**
   - Negative effect on capital pensions very clear
   - Driven by 19% of prior contributors who exit

Chetty et al (2014) : Active vs passive savers

Results

1. **First stage : impact of subsidy on capital pensions**
   - Negative effect on capital pensions very clear
   - Driven by 19% of prior contributors who exit

2. **Second stage : shifting to tax favored annuity pensions**
   - "57 cents of each DKr that would have been contributed to capital pension is shifted to annuity pension"

Chetty et al (2014) : Active vs passive savers

Results

1. **First stage : impact of subsidy on capital pensions**
   - Negative effect on capital pensions very clear
   - Driven by 19% of prior contributors who exit

2. **Second stage : shifting to tax favored annuity pensions**
   - "57 cents of each DKr that would have been contributed to capital pension is shifted to annuity pension"

3. **Third stage : shifting to taxable savings accounts**
   - Positive effect on taxable savings, so that there is no reduction in total pension + taxable savings
   - "Each DKr 1 of government expenditure on subsidies for retirement saving generates less than 1 cent of net new saving"

Chetty et al (2014) : Active vs passive savers

- **Very influential paper**
  - Implies that tax subsidies policies (like 401K in the US) are not very efficient tools to increase savings
  - Suggest that enrollment by default is much cheaper/effective
  - U.K. government has introduced pension savings by default in 2010 ; idem KiwiSaver in New Zealand

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  - Suggest that enrollment by default is much cheaper/effective
  - U.K. government has introduced pension savings by default in 2010 ; idem KiwiSaver in New Zealand
- **"Libertarian paternalism"**
  - Thaler and Sunstein (2005)
  - Changing the default imposes minimal costs on rational individuals
  - Can nudge non-rational agents in desirable decision

References (1/3)

- Aguiar, Mark, and Erik Hurst (2005), "Consumption versus Expenditure". *Journal of Political Economy* 113 (5) : 919-48.
- Attanasio, Orazio P., and Agar Brugiavini (2003), "Social Security and Households' Saving". *The Quarterly Journal of Economics* 118 (3) : 1075-1119.
- Attanasio, Orazio P., and Susann Rohwedder (2003), "Pension Wealth and Household Saving : Evidence from Pension Reforms in the United Kingdom". *The American Economic Review* 93 (5) : 1499-1521.
- Banks, James, Richard Blundell, Richard Disney, and Carl Emmerson (2002), "Retirement, Pensions and the Adequacy of Saving : A Guide to the Debate". IFS Briefing Notes, no. 29.
- Banks, James, Richard Blundell, and Sarah Tanner (1998) "Is There a Retirement-Savings Puzzle ?" *The American Economic Review* 88 (4) : 769-88.
- Barro, Robert J., and Glenn M. MacDonald (1979) "Social Security and Consumer Spending in an International Cross Section". *Journal of Public Economics* 11 (3) : 275–89.
- Benartzi, S. and Thaler, R. (2007) "Heuristics and Biases in Retirement Savings Behavior", *The Journal of Economic Perspectives*, Vol. 21, No. 3, pp. 81–104.
- Bernheim, D. (2002) "Taxation and Saving", in A. Auerbach and M. Feldstein, *Handbook of Public Economics*, Volume 3, Chapter 18, Amsterdam : North Holland, 2002, Section 4.
- Bernheim, B. Douglas, Jonathan Skinner, and Steven Weinberg (2001), "What Accounts for the Variation in Retirement Wealth among U.S. Households ?" *The American Economic Review* 91 (4) : 832-57.
- Card, D. and Ransom, M. (2011) "Pension Plan Characteristics and Framing Effects in Employee Savings Behavior", *Review of Economics and Statistics*, 93(1), 228–243,
- Carroll, G., Choi, J., Laibson, D., Madrian, B. and Metrick, A. (2009) "Optimal Defaults and Active Decisions". *Quarterly Journal of Economics*, 36.
- Chetty, R., Friedman, J., Leth-Petersen, S., Nielsen, T. and Olsen, T. (2014) "Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts : Evidence from Denmark". *The Quarterly Journal of Economics* 129 (3) : 1141–1219.
- De Nardi, Mariacristina, Eric French, and John Bailey Jones. 2009. "Life Expectancy and Old Age Savings". *The American Economic Review* 99 (2) : 110-15.

References (2/3)

- Diamond, Peter A., and J. A. Hausman. 1984. "Individual Retirement and Savings Behavior". Journal of Public Economics 23 (1) : 81-114.
- Duflo, Esther, William Gale, Jeffrey Liebman, Peter Orszag, and Emmanuel Saez (2006), "Saving Incentives for Low- and Middle-Income Families : Evidence from a Field Experiment with H&R Block". *The Quarterly Journal of Economics* 121 (4) : 1311-46.
- Duflo, Esther, William Gale, Jeffrey Liebman, Peter Orszag, and Emmanuel Saez (2007), "Savings Incentives for Low- and Moderate-Income Families in the United States : Why Is the Saver's Credit Not More Effective ?" *Journal of the European Economic Association* 5 (2/3) : 647-61.
- Duflo, Esther, and Emmanuel Saez. 2003. "The Role of Information and Social Interactions in Retirement Plan Decisions : Evidence from a Randomized Experiment". *The Quarterly Journal of Economics* 118 (3) : 815-42.
- Engen, E., Gale, W. and Scholz, J. K. (1996) "The Illusory Effects of Saving Incentives on Saving", *The Journal of Economic Perspectives* 10 (4) : 113–138.
- Feldstein, Martin (1974), "Social Security, Induced Retirement, and Aggregate Capital Accumulation". Journal of Political Economy 82 (5) : 905-26.
- Feldstein, Martin (1980), "International Differences in Social Security and Saving". *Journal of Public Economics* 14 (2) : 225-44.
- Feldstein, Martin, and Anthony Pellechio. 1979. "Social Security and Household Wealth Accumulation : New Microeconometric Evidence". *The Review of Economics and Statistics* 61 (3) : 361.
- Feldstein, Martin S. 1996. "Social Security and Saving : New Time Series Evidence". *National Tax Journal* 49 (2) : 151-64.
- Gelber, A. (2011) "How do 401(k)s Affect Saving ? Evidence from Changes in 401(k) Eligibility", *American Economic Journal : Economic Policy*, Vol. 3, No. 4, pp. 103–122.
- Gravelle, Jane G. 1991. "Do Individual Retirement Accounts Increase Savings ?" *The Journal of Economic Perspectives* 5 (2) : 133-48.
- Horioka, Charles. 1980. "International Differences in Social Security and Saving : A Comparison of the Barro and Feldstein Estimates". *Journal of Public Economics* 14 (2) : 238-44.

References (3/3)

- Kotlikoff, Laurence J., Avia Spivak, and Lawrence H. Summers (1982), "The Adequacy of Savings". *The American Economic Review* 72 (5) : 1056-69.
- Leimer, Dean R., and Selig D. Lesnoy (1982), "Social Security and Private Saving : New Time-Series Evidence". *Journal of Political Economy* 90 (3) : 606-29.
- Madrian, Brigitte C., and Dennis F. Shea (2001), "The Power of Suggestion : Inertia in 401(k) Participation and Savings Behavior". *The Quarterly Journal of Economics* 116 (4) : 1149-87.
- Novos, Ian E. (1989), "Social Security Wealth and Wealth Accumulation : Further Microeconomic Evidence". *The Review of Economics and Statistics* 71 (1) : 167-71.
- Page, Ben. (1998), "Social Security and Private Saving : A Review of the Empirical Evidence". Congressional Budget Office, July.
- Poterba, James M., Steven F. Venti, and David A. Wise (1996), "How Retirement Saving Programs Increase Saving". *The Journal of Economic Perspectives* 10 (4) : 91-112.
- Poterba, James, Steven Venti, and David Wise (2011), "The Composition and Drawdown of Wealth in Retirement". *The Journal of Economic Perspectives* 25 (4) : 95-117.
- Saez, E. (2009) "Details Matter : The impact of Presentation and Information in the Take-up of Financial Incentives for Retirement Savings", *American Economic Journal : Economic Policy*, Vol. 1, 204–228.
- Samuelson, P. (1958), "An Exact Consumption Loan Model of Interest With or Without the Social Contrivance of Money", *Journal of Political Economy*, Vol. 66, No 6, pp. 467–482.
- Skinner, J. (2007), "Are You Sure You're Saving Enough for Retirement ?" *The Journal of Economic Perspectives* 21 (3) : 59-80.
- Thaler, R. and S. Benartzi, S. (2004) "Save More Tomorrow : Using Behavioral Economics to Increase Employee Saving", *Journal of Political Economy*, Vol. 112, pp. S164–S187.
- Venti, S. and D. Wise (1990) "Have IRAs Increased U.S. Saving ? Evidence from Consumer Expenditure Surveys", *Quarterly Journal of Economics*, Vol. 105, 661–698.