Econ 219B
Psychology and Economics: Applications
(Lecture 2, Revised)

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Outline

1. Active Choice in 401(k)s
2. Status Quo and Present Bias
3. Firms and Government
4. Status-Quo: Alternative Explanations
5. Health-Club Industry (finish next time)

1 Active Choice in 401(k)s

Peter Fishman's turn!

Benign Paternalism and Active Decisions:
A Natural Experiment in Savings

James Choi, David Laibson, Bridgette Madrian, Andrew Metrick

Peter Fishman

Economics 219B Presentation

January 28, 2004

Facts

- Decision makers tend to follow the path of least resistance – defaults (Madrian and Shea & Choi et. Al)
- Requiring employees to complete a 401k form leads to active choice about participation.
- Paper and pencil 401k forms (included with other required hiring papers) replaced by telephone enrollment (with non-participation default) in one large financial services firm on Nov. 1, 1997.
- Old regime has participation rates up to 25% higher.
- **OUTSTANDING GSR work**

Active Regime vs. Standard Regime

- Hired between 1/1/97 and 7/31/97
- 17<Age<65, Employed>17 months by 1999
- 30 days to return 401k form as part of packet (with legally required documents)
- “only a small fraction did not return the form”
- Not returning the form was treated as declining a 401k
- Failure to enroll in this period closed enrollment until the following January
- Monthly account valuation and annual statements

- Hired between 1/1/98 and 7/31/98
- 17<Age<65, Employed>17 months by 2000
- Telephone based enrollment
- 24/7/365 enrollment
- Daily Account Valuation and quarterly statements
- Additional investment options
- Matching (tied to company earnings)
- The new matching system exceeded the old system in the first four years
- These Nov. 1 changes became available to all employees

Active Regime vs. Standard Regime

TABLE I
401(k) Plan Features by Effective Date

	Effective January 1, 1997	Effective November 23, 1997
Eligibility		
Eligible employees	U.S. employees Age 18+	U.S. employees Age 18+
First eligible	Immediately upon hire	Immediately upon hire
Match eligible	Immediately upon hire	Immediately upon hire
Enrollment	First 30 days of employment or January 1 of succeeding calendar years	Daily
Contributions		
Employee contributions	Up to 17 percent of compensation	Up to 17 percent of compensation
Non-discretionary match	None	50 percent of employee contribution up to 5 percent of compensation
Discretionary match	Up to 70 percent of employee contribution depending on company profitability	Up to 100 percent of employee contribution depending on company profitability (50 percent for bonus-eligible employees); varied from 0% to 100% from 1997-2000.
Vesting	Immediate	Immediate
Other		
Loans	Not available	Available—2 maximum
Hardship withdrawals	Available	Available
Investment choices	6 options	9 options including company stock

Source: Summary Plan Descriptions and personal communication with company officials.

Characteristics of Cohorts

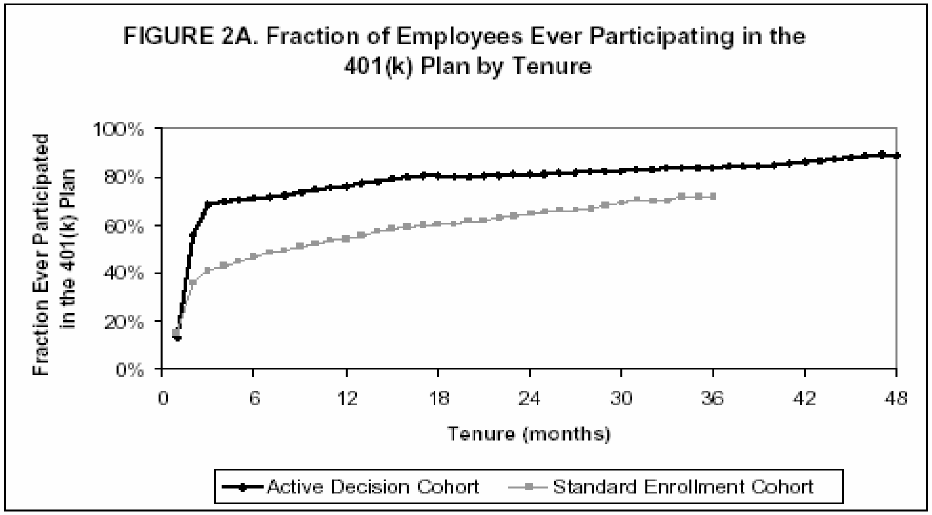
TABLE II
Comparison of Worker Characteristics

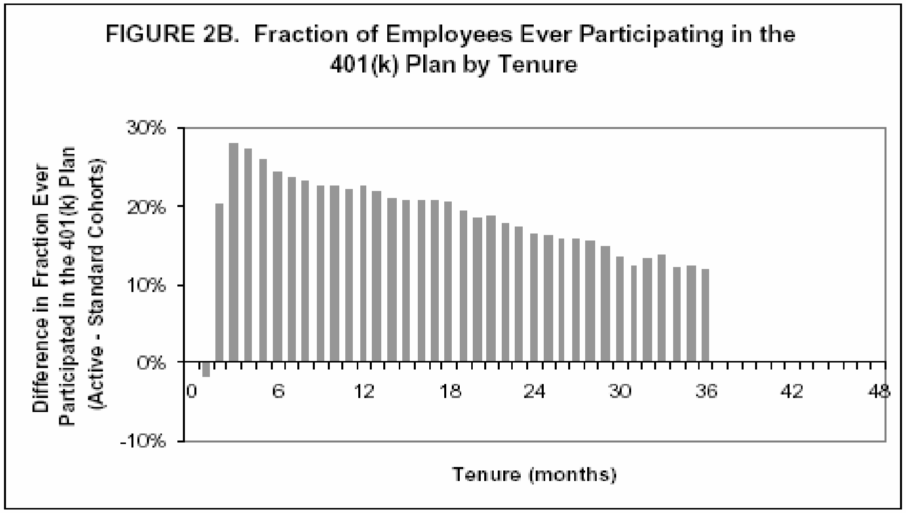
	Study Company			
	Active Decision Cohort 12/31/1998	Standard Cohort 12/31/1999	All Workers 12/31/1999	U.S. Workforce (CPS)
Average age (years)	34.1	34.0	40.5	38.8
Gender				
Male	45.4%	43.4%	45.0%	53.1%
Female	54.6%	56.6%	55%	46.9
Marital Status				
Single	42.8%	47.8%	32.4%	39.0%
Married	57.2%	52.2%	67.6%	61.0%
Compensation				
Avg. monthly base pay	$2,994	$2,911	$4,550	--
Median monthly base pay	$2,648	$2,552	$3,750	--
Avg. annual income[a]	$34,656	$34,001	$52,936	$32,414
Median annual income[a]	$30,530	$29,950	$42,100	$24,108
Highly compensated employee	0.4%	0.4%	14.5%	NA
Geography				
East	10.0%	8.4%	12.1%	18.9%
Midwest	37.9%	39.8%	35.3%	24.1
South	37.1%	39.0%	37.8%	34.7
West	15.0%	12.6%	14.7%	22.4
Number of Employees	N=2205	N=2344	N=46,822	--

Authors' calculations. The sample in the first three columns is individuals employed at the study company on the date in the column head. The sample in the last column is all individuals in the March 1998 Current Population Survey who worked in the previous year (weighted).

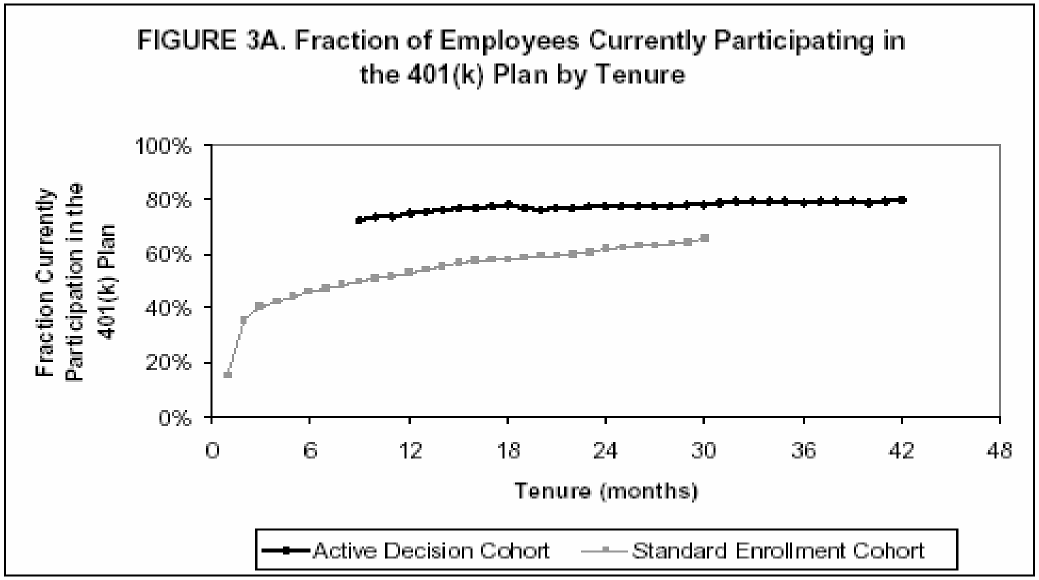
[a] The annual income measure that is reported to us for the study company is the employee's annual taxable (W2) income. Annual income for the U.S. workforce calculated from the CPS is total annual labor earnings in the previous calendar year, some of which may be non-taxable.

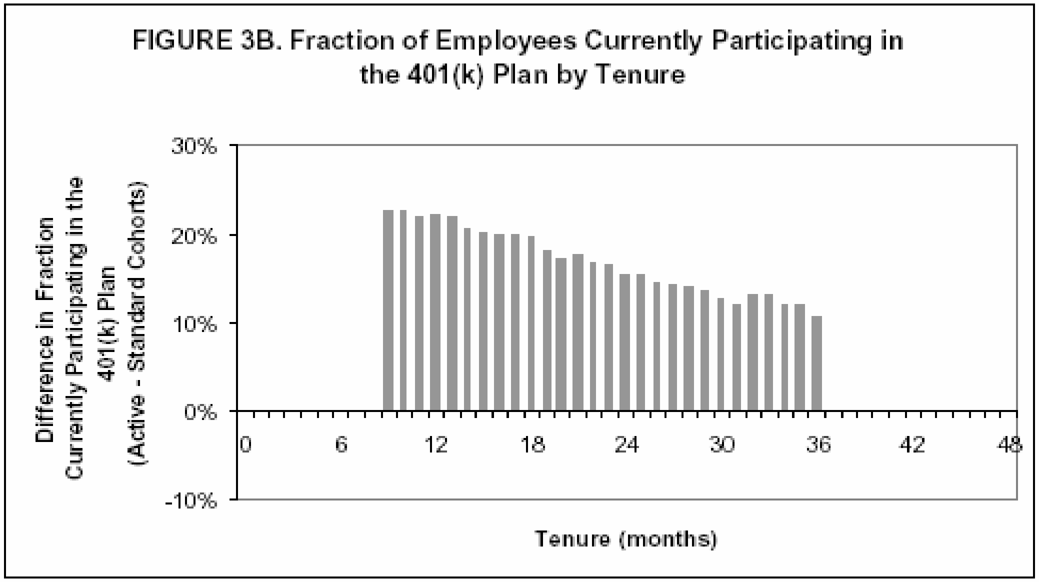
Participation Differences by Cohort



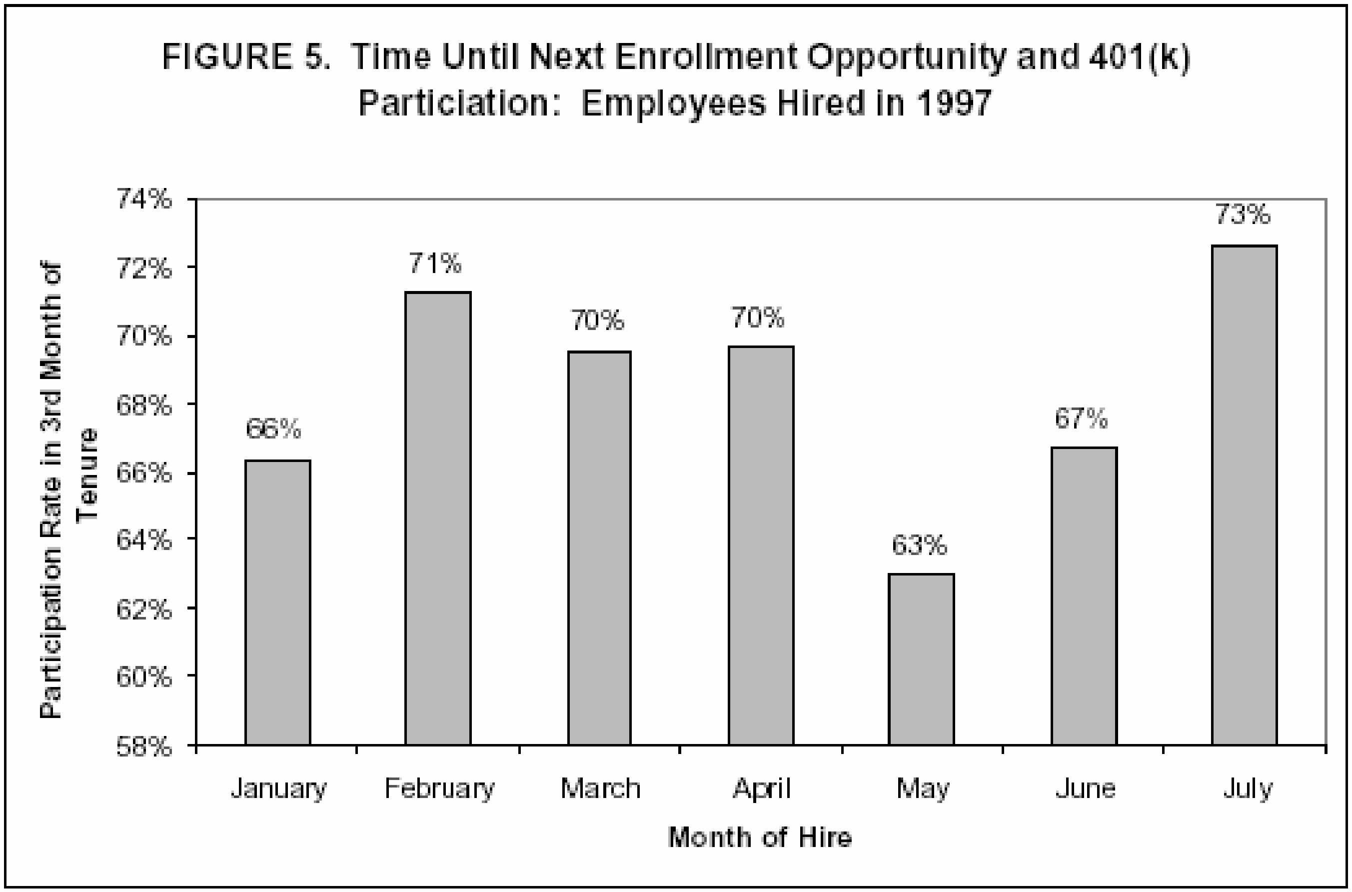


Participation Differences by Cohort





Deadline Effect?



Contribution Rates

- Participation Effect
  - Higher participation → Higher Average Contribution Rate
  - Higher participation → Lower Average Contribution Rate conditional on participation
- Hastened Decision
- Catch up Effect
  - Longer Horizon → Lower Contribution Rate

Participation Effect

FIGURE 6A. Average 401(k) Contribution Rate by Tenure

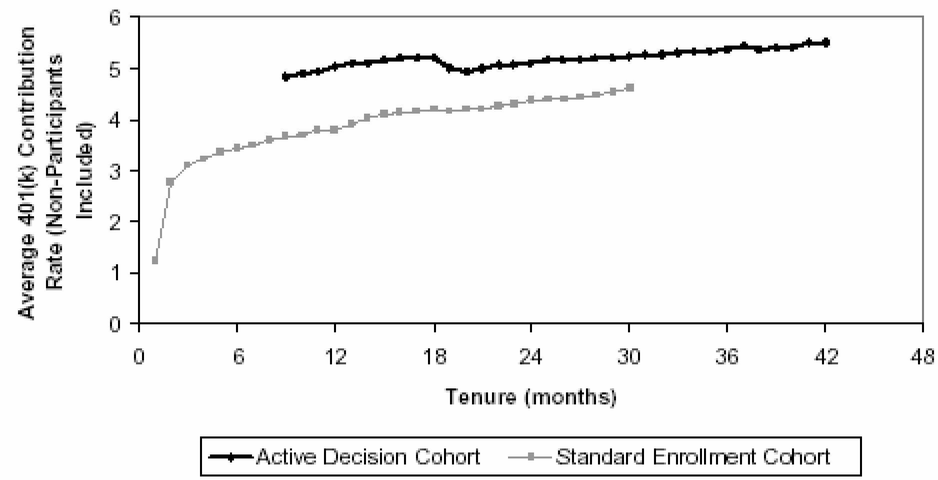
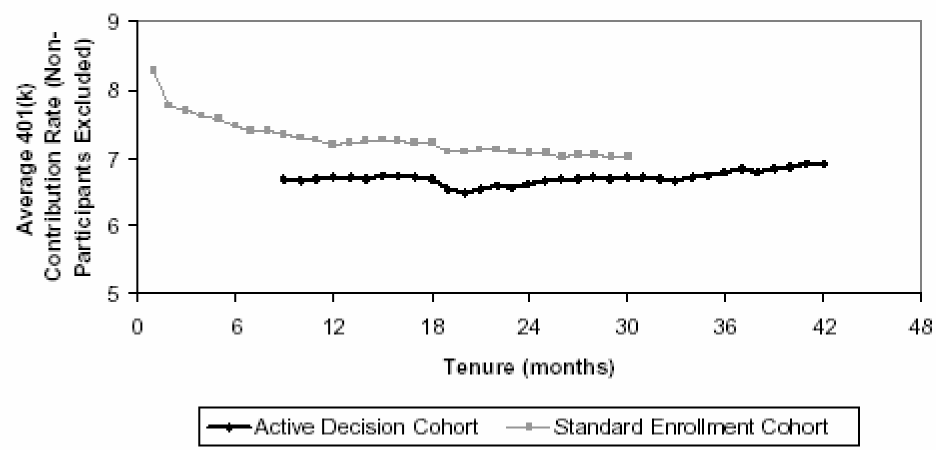
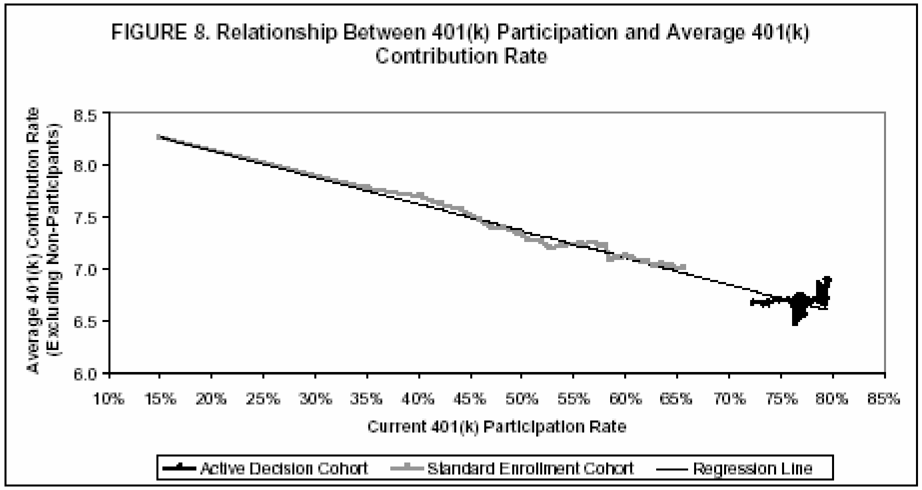
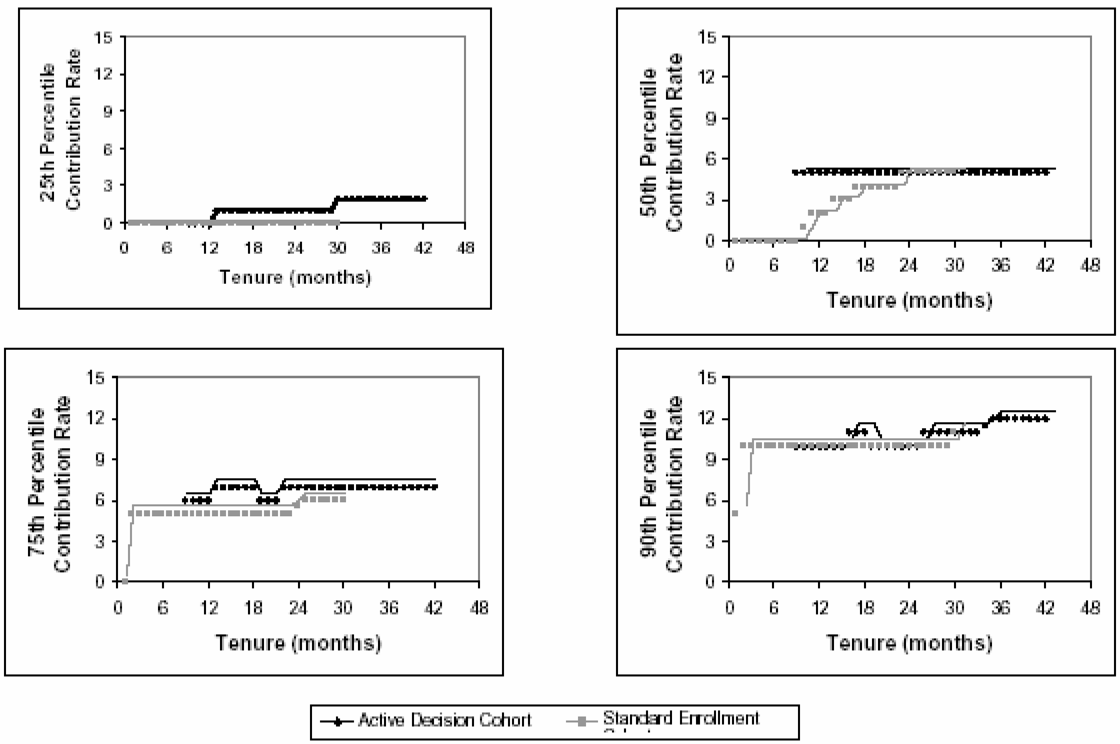


FIGURE 7A. Average 401(k) Contribution Rate Conditional on Participation by Tenure



Catch up Effect?





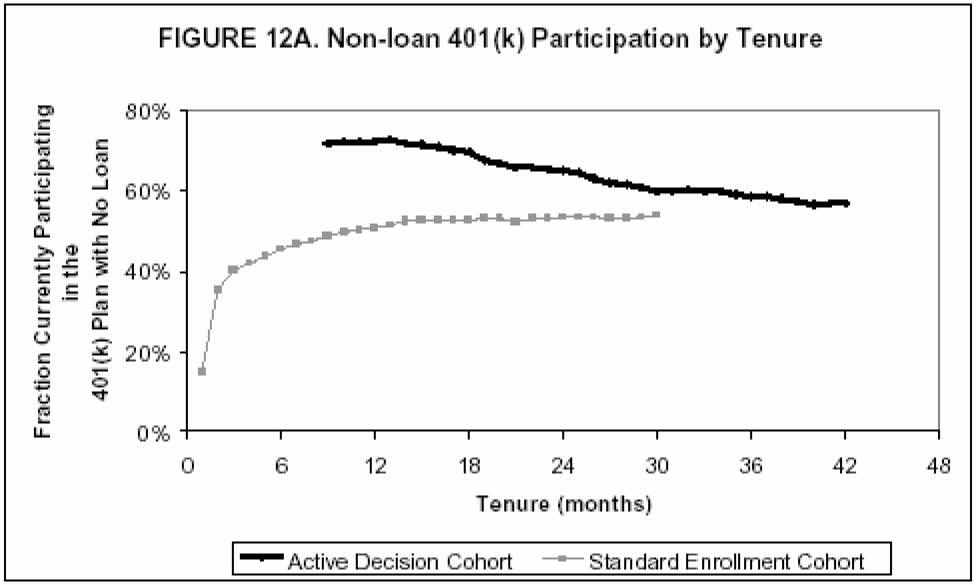
Asset Accumulation

- Affected by time varying factors
- Non-Loan 401k Balances / Pay
- At 30 months tenure
  - 16.7% of pay for Active Cohort
  - 11.4% of pay for Standard Cohort
  - Difference of 33%
- Consistent with paper’s other results

401k Loans

- By 30 months tenure, the active cohort is 6.8 percentage points (59%) more likely to have a 401k loan.
- Higher Participation Rate
  - Includes “marginal savers”
  - Still higher conditional on participation
- “Hasty Decision”

401k Loans



- Active > Standard for all tenure
- "incremental participants resulting from the active decision enrollment process have not all subsequently taken out 401k loans."

Conclusions

- Active decision about 401k encourages participation (relative to zero percent default with more attractive enrollment features)
- A “benign paternalism” because it’s relatively non-coercive while seemingly making large outcome changes.

Madrian and Shea

- Dramatic behavior differences between the different cohorts.
- Exhibited status quo anchoring
  - Both papers at 0% default
  - Conservative default in Madrian & Shea
    - Choi et al. (2003)
- This paper addresses some concerns about default as “implied advice.”

Discussion

- Possible Time Consistent Explanations
  - Very costly to make a 401k decision
  - 0% default as advice
  - Strong Within Cohort Network Effects
- Evidence difficult to explain with a time consistent model (with reasonable parameter values).
  - The long range benefits at the initial decision time were higher in the standard cohort. But they faced a non-immediately costly alternative. Likely need naïveté to sustain these results.
  - The difference in accumulation after 30 months is approximately 5% of 1 year's pay.

2 Status Quo and Present Bias

Present-bias:

$$U_t = u_t + \beta \sum_{s=1}^{\infty} \delta^s u_{t+s}$$

with $\beta \leq 1$. Discount function: $1,\ \beta\delta,\ \beta\delta^2,\ \beta\delta^3, ...$

(1) Time inconsistency

Discount factor for self t is

- $\beta\delta$ between t and $t+1 \Longrightarrow$ short-run impatience;
- δ between $t+1$ and $t+2 \Longrightarrow$ long-run patience.

(2) Naiveté about time inconsistency

Agent believes futures selves have discount function:
$1,\ \hat{\beta}\delta,\ \hat{\beta}\delta^2,\ \hat{\beta}\delta^3, ...$,with $\hat{\beta} \geq \beta$.

Non-Automatic Enrollment

- Madrian and Shea (2001), OLD cohort

- Decision to invest (O'Donoghue and Rabin, 2001)

- Default: no investment

- Investing:
  - immediate cost $k_N > 0$ with $k_N = k'_N + k''_N$:
    - $k'_N > 0$ – effort of filling up forms
    - $k''_N > 0$ – effort of finding out optimal plan
  - benefit tomorrow $b > 0$
  - $T = 1$ (can change investment every day)

- When does investment take place?

- **Exponential** employee ($\beta = \hat{\beta} = 1$):

- Compares investing now to never investing:

$$-k_N + \sum_{t=1}^{\infty} \delta^t b = -k_N + \frac{\delta b}{1-\delta} \geq 0$$

- Invests if

$$k_N \leq \frac{\delta b}{1-\delta}$$

- **Sophisticated** t.i. employee ($\beta = \hat{\beta} < 1$):

- Would like to invest tomorrow if:

$$\beta\delta \left[-k_N + \frac{\delta b}{1-\delta} \right] \geq 0$$

- Would like to invest now if:

$$-k_N + \beta\delta \frac{b}{1-\delta} \geq 0$$

- War of attrition between selves

- Multiple equilibria in the investing period

- BUT: Bound on delay in investment

- Agent prefers investing now to waiting for T periods if

$$-k_N + \beta\delta \frac{b}{1-\delta} \geq \beta\delta^T \left[-k_N + \frac{\delta b}{1-\delta} \right]$$

- Simplify to

$$k_N \leq \beta\delta \frac{b\left(1-\delta^T\right)}{(1-\delta)\left(1-\beta\delta^T\right)} \approx \frac{\beta\delta b T}{\left(1-\beta\delta^T\right)} \approx \frac{\beta b T}{(1-\beta)}$$

[Taylor expansion of $1-\delta^T$ for δ going to 1: $0 - T(\delta-1) = (1-\delta)T$]

- Maximum delay $\bar{T}$:

$$\bar{T} = k_N \frac{1-\beta}{\beta\delta}$$

- (Fully) **Naive** t.i. employee ($\beta < \hat{\beta} = 1$)

- Expects to invest next period if

$$-k_N + \frac{\delta b}{1-\delta} \geq 0$$

- Compares investment today or at the next occasion (in T days).

- Invest today if

$$-k_N + \beta\delta\frac{b}{1-\delta} \geq \beta\delta^T \left[-k_N + \frac{\delta b}{1-\delta}\right]$$

- Procrastinate forever if

$$\frac{\beta T b}{(1-\beta)} \lessapprox k_N \leq \frac{\delta b}{1-\delta}$$

- Calibration:
- Cost k_N?
  - Time cost: 3 hours
  - $k_N \approx 3 * \$12 = \$36$
- Benefit b?
  - NPV of future net benefit at retirement of saving today, net of disutility from consumption decrease.
  - Choice bw. consumption at T_0 or at T_R
  - Assumption 1: consumption today is taxed at rate τ_0, consumption at retiment is taxed at rate τ_R
  - Assumption 2: same marginal utility of consumption today (time T_0) or at retirement (time T_R)

– Net gain from delayed consumption of sw:

$$\begin{aligned} b &= \delta^{T_R - T_0} (1 - \tau_R)(1 + \alpha) sw (1 + r)^{T_R - T_0} \\ &\quad - (1 - \tau_0) sw \end{aligned}$$

with s savings rate, w daily wage, and α firm matching rate. Assume $\delta = 1/(1+r)$.

– Savings are

$$b = [\tau_0 + \alpha - \tau_R (1 + \alpha)] sw$$

– Conservative calibration: saving rate $s = .1$, no matching ($\alpha = 0$), tax saving $\tau_0 - \tau_R = .3 - .2 = .1$, daily $w = \$80$ (median individual income \$28,269, census 2000)

– $b \approx .1 * .1 * 80 = \$.8$

– Comparative statics:

  * What happens if $\alpha = .5$ instead?

  * What happens is marginal utility at retirement is 10 percent lower than at present?

- What does model predict for different types of agents?

- **Exponential** agent invests if

$$k_N \leq \frac{\delta b}{1-\delta}$$

  - For $\delta^{365} = .97, \delta b/\left(1-\delta\right) = 10,000 * b$
  - For $\delta^{365} = .9, \delta b/\left(1-\delta\right) = 3,464 * b$

  - Invest immediately!

- **Sophisticated** maximum delay in days:

$$\bar{T} = k_N \frac{1-\beta}{\beta\delta}$$

  - For $\beta = 1$, $\bar{T} = 0$ days
  - For $\beta = .9$, $\bar{T} = 36/9 = 4$ days
  - For $\beta = .8$, $\bar{T} = 36/4 = 9$ days
  - For $\beta = .5$, $\bar{T} = 36$ days
  - Sophisticated waits at most 1 month or so

- **(Fully) Naive** t.i. invests if

$$k_N \lessapprox \frac{\beta T b}{(1-\beta)}$$

  - For $T = 1$ (I'll do it tomorrow), investment if $36 < .8 * \beta / (1-\beta)$
  - For $T = 7$ (I'll do it next week), investment if $36 < 5.6 * \beta / (1-\beta)$
  - For $T = 30$ (I'll do it next month), investment if $36 < 24 * \beta / (1-\beta)$

  - Investment depends on frequency of decision
  - Procrastination more likely if agent can change allocation every day

- **Non-enrollment as default**

- Evidence:

- 48.7% participation rate for OLD cohort

Automatic Enrollment

- Madrian and Shea (2001), NEW cohort

- Model:

  - $k'_A < 0$ – not-enrolling requires effort

  - $k''_A = 0$? – do not look for optimal plan

  - $k_A = k'_A + k''_A < 0$

  - $T = 1$ (can enroll any day)

- Exp., Soph., Naive invest as long as $b > 0$

- Evidence:

- 85.9% participation rate for NEW cohort

- Can b be negative?

- It can: liquidity-constrained agent not interested in saving

- (consumption-savings decision not modeled here)

- $b < 0$ for at least 14% of workers.

- Large effect of small change in k suggests importance of naivete'

- Is there too much 401(k) investment with automatic enrollment?

- With $T = 1$ and $k_A < 0$, naive guys may invest even if $b < 0$.

Active Choice

- Choi et al. (2002)

- Model:

  - $k'_C = 0$ – not-enrolling requires effort

  - $k''_C > 0$? – harder to guess optimal plan than to set 0 investment

  - $k_C = k'_C + k''_C > 0$ but smaller than it was before

  - $T = 360$ (this could matter a lot)

- Solution:
  - Exponentials and Sophisticates: Changes in k_N and T should matter little
  - Naives:
    - $0 < k_C < k_A$ –> More enrollment than in NonAut., but less than in Aut.
    - $T = 360$ –> More enrollment than in NonAut, still less than in Aut.
  - More likely to capture 'real' preferences of employees.

- Empirics:
  - Substantially higher participation relative to NonAut.
  - Somewhat lower participation relative to Aut.

Stochastic cancellation costs

- Assume stochastic cancellation costs $k \sim K$
- Dynamic programming problem
- Solution for **exponential** agent. Threshold k^e:
  - enroll if $k \leq k^e$;
  - wait otherwise.
- For $k = k^e$ indifference between investing and not:

$$-k^e + \frac{\delta b}{1-\delta} = \delta V^e(k^e)$$

  where $V^e(k^e)$ is continuation payoff for exponential agent assuming that threshold rule k^e is used in the future.

- Threshold k^n for **naive** agent satisfies:

$$-k^n + \beta \frac{\delta b}{1-\delta} = \beta \delta V^e\left(k^e\right)$$

- This implies

$$k^n = \beta k^e$$

- Compare investment probability of exponential and naive agent. Investment probability:

$$\Pr\left(k \leq k^e\right) = K\left(k^e\right)$$

and

$$\Pr\left(k \leq k^n\right) = K\left(\beta k^e\right)$$

3 Firms and Government

1. Firm incentives

- What is optimal 401(k) plan for companies?

- *Exponential/sophisticated agents*: It does not matter much
- *Naive agents*:
  - Non-automatic enrollment
  - Charge lower wage, advertise 401(k) plan
  - Take advantage of naivete' / overconfidence
  - Unlikely to be important

- Why do firms *really* offer these plans?

2. Political economy

- Government passed nondiscrimination testing rules.

- Requirement of minimal difference in 401(k) take-up between HCE (highly-compensated employees) and NHCE

- Firms comply in order to get tax deduction for top management

- An example of smart government

4 Status-Quo: Alternative explanations

1. Super-Rational stories
   (a) Time effect between 1998 and 1999
      - compare Window and New cohort
      - BUT: No time effect

   (b) Change is endogenous (political economy)
      - trends before and after
      - other changes? No.

(c) Cost of choosing plan is very high

- HR staff very unfriendly
- Switch investment elsewhere (no net effect on savings)

(d) Selection effect

- People choose this firm because they know of commitment device for 401(k)
- Or choose because 401(k) available right away rather than after 1 year.
- BUT: Why choose a firm, though, with default at 3%?

2. Bounded Rationality: Problem is too hard

- Individual cannot solve problem

- Estimated benefits b small

- BUT: In surveys employees say they would like to save more

- Would be nice to measure losses more directly (health club data)

3. Persuasion

   (a) Implicit suggestion of firm

   (b) Conformity

- BUT: Why should individuals trust firms?

- BUT: Window cohort should resemble New cohort

- Window cohort instead is like Old cohort, except for riskyness of investment

4. Memory

- Individuals forget that they should invest

- BUT: If individuals are aware of this, they should absolutely invest before they forget!

- Need limited memory + naiveté

5. Reference point and loss aversion relative to firm-chosen status-quo

   - First couple month people get used to current consumption level

   - Under NonAut., employees unwilling to cut consumption

   - BUT: Why wait for couple of months to chose?

   - BUT: Forward-looking individuals do not want to raise reference point today