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

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Outline

1. Status Quo Effect: 401(k)s
2. Active Choice in 401(k)s
3. Status Quo and Present Bias
4. Firms and Government
5. Status-Quo: Alternative Explanations
6. Lessons of the Day

1 Status Quo Effect: 401(k)s

- Status quo
  - 401(k) savings decisions
  - Contractual choice (health clubs, credit cards)
  - Organ donations...

- Outline:
  1. Document robust phenomenon
  2. Try to explain it

- Status Quo in Retirement Savings (Madrian and Shea, 2001)

- Single most important piece of field evidence on P&E

- Health Care company

- Switch of 401(k) plan features for new hires (Table 1)

- OLD Cohort hired 4/1/96-3/31/97:
  - default: no enrollment
  - 1-year wait period for eligibility

- WINDOW Cohort hired 4/1/97-3/31/98:
  - default: no enrollment
  - wait period for eligibility till 4/1/98

- NEW Cohort hired 4/1/98-3/31/99:
  - default: enrollment in 3 percent money market fund
  - immediate eligibility

- Summary Stats. Different cohorts not too different from each other (Table 3)

- Results:

1. Partecipation rates in 401(k) by June 30, 1999 (Figure 1 and Table 4):
    - OLD: 57%
    - WINDOW: 49%
    - NEW: 86%

2. Contribution level (Figures 2b and 2c):
    - WINDOW: 63% are at 0 percent, 4% at 3 percent

- NEW: 65% are at defaut (3 percent)

3. Allocation of funds in stocks (Figure 3):
    - OLD: 75%
    - WINDOW: 73%
    - NEW: 16%

- Results equally strong with controls (Table 6)
- Results replicated in samples of other companies (Choi et al., 2002)

- Do individuals save too much under saving as default?

- Alternative manipulation
  - Standard, no-saving-default
  - Forced Choice

- Choi et al., Active Decisions

- (from notes of Pete Fishman)

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.

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.

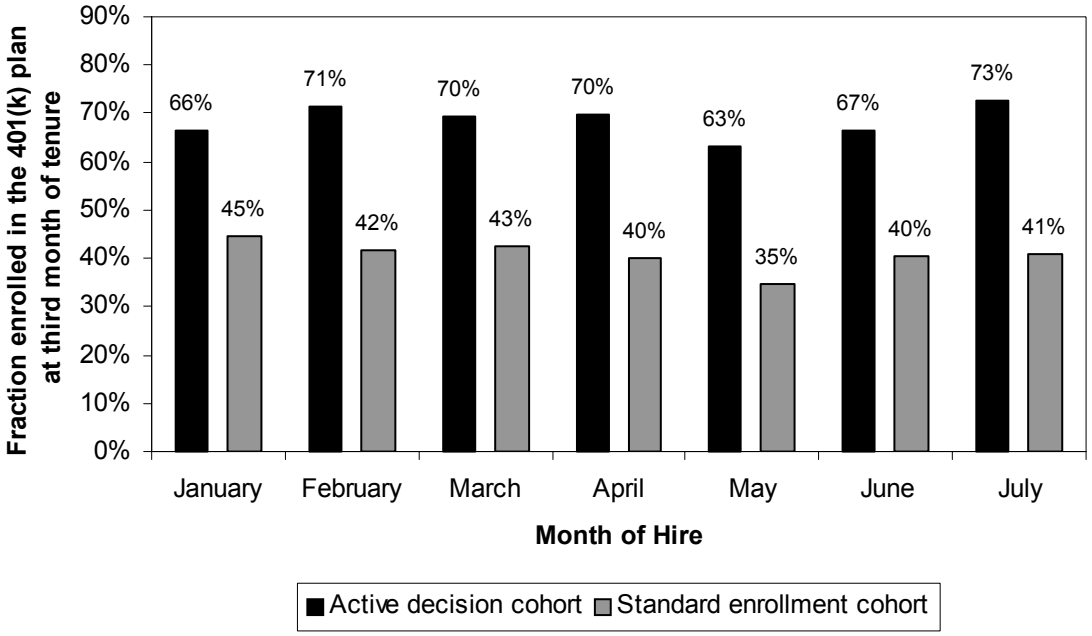

Figure 1. Fraction of employees enrolled in the 401(k), by hire month. The fraction displayed is as of the end of the third month of tenure at the company. The active decision cohort was hired between January and July 1997. The standard enrollment cohort was hired between January and July 1998.

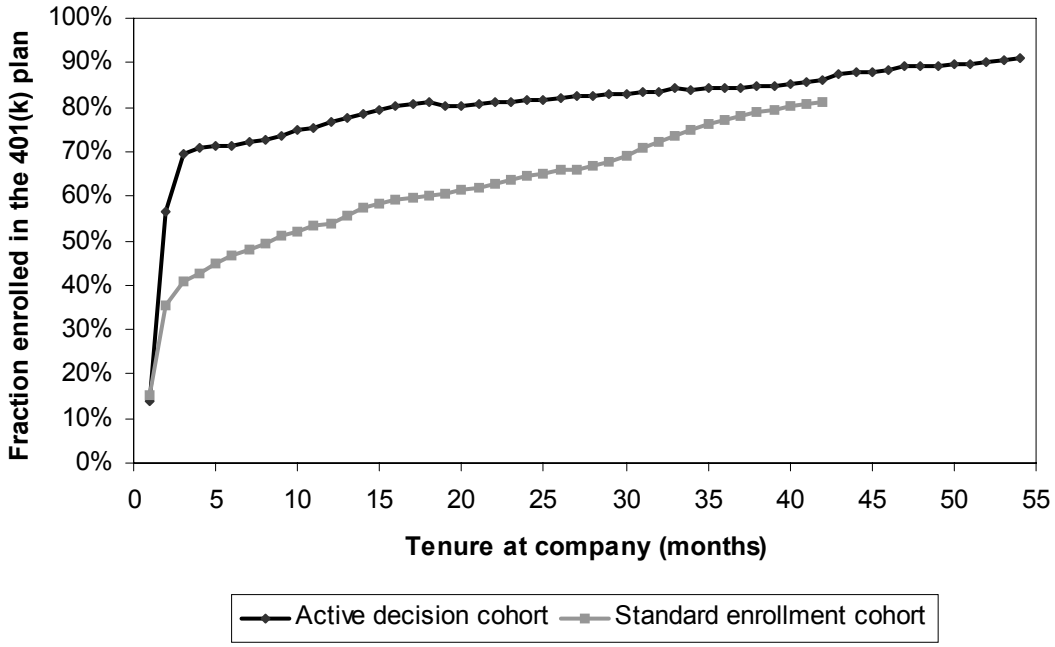

Figure 2. Fraction of employees enrolled in the 401(k) plan, by tenure at company. An employee is counted enrolled in the 401(k) plan even if he or she is not currently contributing to the plan. The series are not monotonically rising because they are constructed from multiple cross-sections, so the samples are not fixed over time.

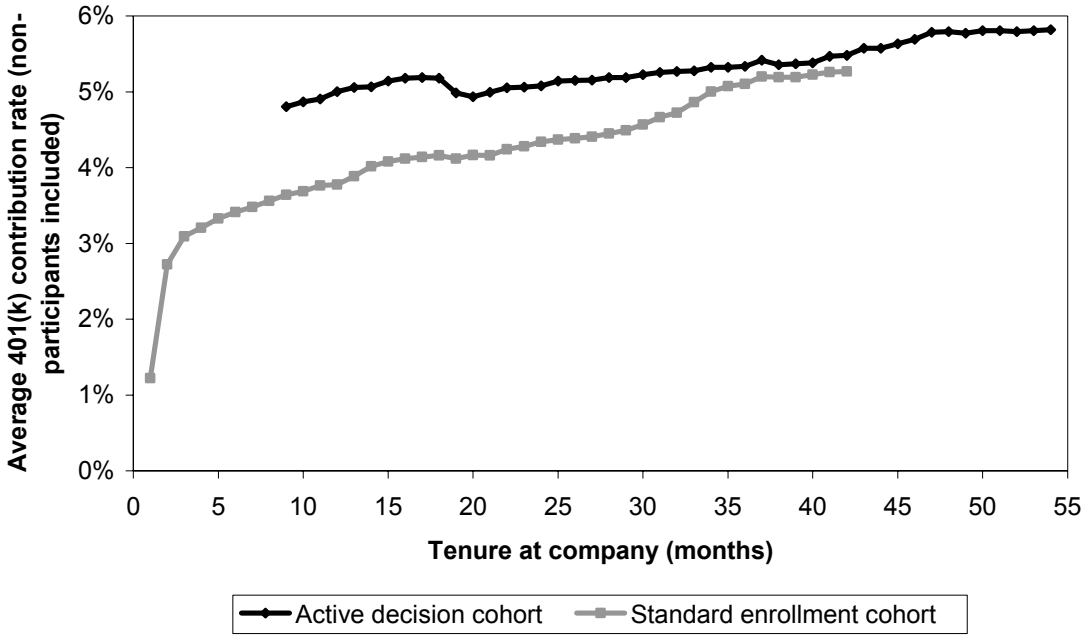

Figure 3. Average 401(k) contribution rate by tenure at company. At each point, the averages include employees not currently contributing to the 401(k) plan; their contribution rate is zero.

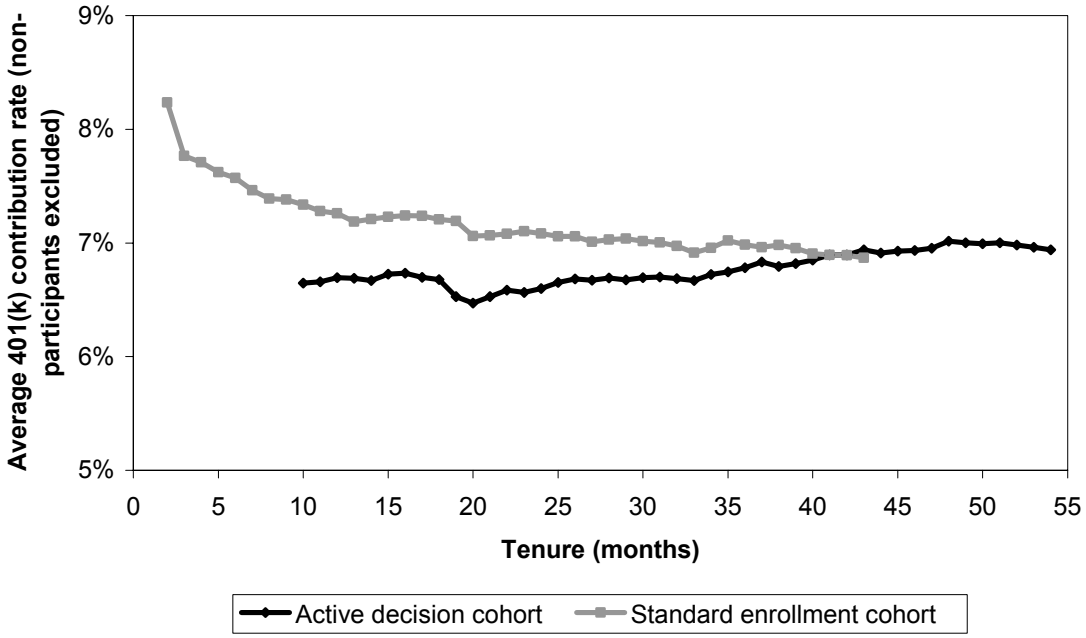

Figure 4. Average 401(k) contribution rate among 401(k) participants by tenure at company. At each point, the averages exclude employees not currently contributing a positive amount to the 401(k) plan.

2 Status Quo and Present Bias

Present-bias ((quasi-) hyperbolic discounting – (β, δ) preferences):

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

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

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

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

  - 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 Non-Aut.
  - 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:

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

where $V^e\left(k^e\right)$ 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

5 Lessons of the day

1. Empirical evidence of type 1 (Madrian and Shea; Choi et al.:):
   - **Time Series** (or **Event Study**) evidence
   - At time t, change in regime
   - Simple difference: Look at (After t - Before t)
   - Similar to Huberman and Regev
   - Worries:
   (a) Endogeneity of change
   (b) Other changes occurring at same time
   (c) How many observations? Maybe $n = 1$?

2. Simple evidence is great
    - Easy to test
    - Do not need sophisticated econometrics
    - Easy to explain

3. Modelling and interpretation
    - Always calibrate your models, even if back-of-the-envelope calibration
    - Easy to misinterpret which theory the evidence supports
    - Look at magnitude of effects, not just statistical significance