

Econ 219B

Psychology and Economics: Applications  
(Lecture 1)

Stefano DellaVigna

January 23, 2008

## Outline

1. Introduction / Prerequisites
2. Getting started!  
Psychology and Economics: The Topics
3. Psychology and Economics: Empirical Methods
4. Psychology and Economics by Field
5. Defaults and 401(k)s: The Facts

# 1 Who am I?

Stefano DellaVigna

- Assistant Professor, Department of Economics
- Bocconi (Italy) undergraduate (Econ.), Harvard PhD (Econ.)
- Psych and Econ, Applied Microeconomics, Behavioral Finance, Media
- Evans 515 – OH Th 12-2 + Email for other times

## 2 Who are you?

- PhD student 2nd year and higher. Graduate courses in
  - Econometrics
  - Micro Theory (Contract Theory, Game Theory)
  - Psychology and Economics – Theory (219A)
- Interest in
  - Psychology and Economics
  - Applied, empirical microeconomics (io, labor, public finance, finance)

### 3 What is this class?

- Reading list:
  - distribute required (\*) papers for students enrolled (courtesy of Judi Chan)
  - complete, updated list on course webpage
  - ‘Textbook’: “Psychology and Economics: Evidence from the Field” (for *Journal of Economic Literature* – comments welcome)
  - 8 to 10 Methodological Topics (new this year)
  - Please email me (sdellavi@econ.berkeley.edu) for any issue with class
  - Free to talk after class

- Grade:
  - Four problem sets on models and empirics (30% weight)
  - Final exam (40% weight)
  - Your choice of:
    - \* 10-15 page paper that uses field evidence (30% weight)
    - \* An empirical problem set (30% weight)
- I encourage you to try to write a paper

- Deadlines for paper

- Meet with me about your paper by 2/27
- Brief summary of your research idea by 4/2 (2 pages, research question, data availability)
- Paper due on 5/20

- Information Sheet

## 4 Psychology and Economics: The Topics

- Prototypical economist conception of human behavior (Rabin, 2002a):

$$\max_{x_i^t \in X_i} \sum_{t=0}^{\infty} \delta^t \sum_{s_t \in S_t} p(s_t) U(x_i^t | s_t).$$

- $X_i$  is set of “life-time strategies”,  $S_t$  is set of state spaces
- $p(s_t)$  are rational beliefs,  $\delta \in (0, 1)$  is time-consistent discount factor
- $u(\cdot, s, t)$  is true utility at time  $t$  in state  $s$



- **Improving Psychological Realism**

- **Step 1. Non-Standard Preferences**

1. Present-Biased Preferences: time inconsistency  $(\beta, \delta)$
2. Reference Dependence:  $U(x_i|r, s)$  with  $r$  reference point
3. Social Preferences:  $U(x_i, x_{-i}|s)$  where  $x_{-i}$  is allocation of others

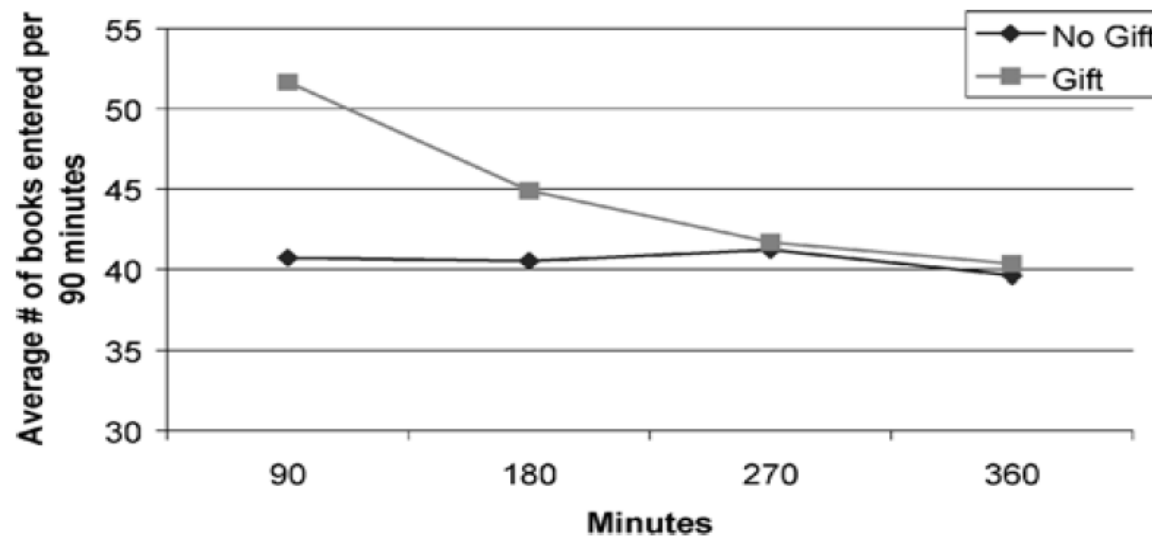
- Example 1. Reference Dependence – Sydnor (2006)
- Sydnor studies deductible choice in home insurance policies
- Menu: \$250, \$500, \$1,000. Higher deductible  $\rightarrow$  Lower premium

- Example 1. Reference Dependence – Sydnor (2006)
- Sydnor studies deductible choice in home insurance policies
- Menu: \$250, \$500, \$1,000. Higher deductible → Lower premium

Chosen Deductible	Number of claims per policy	Increase in out-of-pocket payments <i>per claim</i> with a \$1000 deductible	Increase in out-of-pocket payments <i>per policy</i> with a \$1000 deductible	Reduction in yearly premium per policy with \$1000 deductible	Savings per policy with \$1000 deductible
<b>\$500</b>	<b>0.043</b>	<b>469.86</b>	<b>19.93</b>	<b>99.85</b>	<b>79.93</b>
N=23,782 (47.6%)	(.0014)	(2.91)	(0.67)	(0.26)	(0.71)
<b>\$250</b>	<b>0.049</b>	<b>651.61</b>	<b>31.98</b>	<b>158.93</b>	<b>126.95</b>
N=17,536 (35.1%)	(.0018)	(6.59)	(1.20)	(0.45)	(1.28)
<b>Average forgone expected savings for all low-deductible customers: \$99.88</b>					

- Example 2. Social Preferences – Gneezy and List (2006)
- Recruit workers to enter manually data on books for 6 hours for \$12/hour
- Treatment (gift) group: After hiring, told pay increased to \$20/hour

- Example 2. Social Preferences – Gneezy and List (2006)
- Recruit workers to enter manually data on books for 6 hours for \$12/hour
- Treatment (gift) group: After hiring, told pay increased to \$20/hour



- **Step 2. Non-Standard Beliefs:** beliefs  $\tilde{p}(s) \neq p(s)$

1. Overconfidence: wrong  $E(p)$  or wrong  $Var(p)$

2. Law of Small Numbers: Wrong forecast of  $p(s_{t+1}|s_t)$

3. Projection Bias: wrong forecast of utility:  $\hat{u}(\cdot, s)$

- Example 3 – Conlin, O'Donoghue and Vogelsang (2006)
- Examine mail orders of cold-weather apparel
- Relate temperature on order date to *return* probability
- Standard model: No relation or positive relation (the colder it is now, the more you will need it in 5 days)

- Example 3 – Conlin, O'Donoghue and Vogelsang (2006)
- Examine mail orders of cold-weather apparel
- Relate temperature on order date to *return* probability
- Standard model: No relation or positive relation (the colder it is now, the more you will need it in 5 days)

TABLE 2

Probit Regression Measuring the Effect of Temperature on the Probability Cold Weather Clothing is Returned  
Dependent Variable is Whether Item is Returned (=1 if item returned and 0 otherwise)

	Gloves & Mittens	Winter Boots	Hats	Sports Equipment	Parkas & Coats	Vests	Jackets
Temperature on Day Item was Order	-0.00014** (0.00005)	-0.00021** (0.00008)	-0.00017** (0.00005)	-0.00009 (0.00007)	-0.00007 (0.00007)	-0.00043** (0.00010)	-0.00019 (0.00013)



- Correlation consistent with projection bias
- Current state  $s'$ , future state  $s$ . Predicted future utility

$$\hat{u}(c, s) = (1 - \alpha) u(c, s) + \alpha u(c, s')$$

- Structural estimation of projection bias parameter  $\alpha$

- Correlation consistent with projection bias
- Current state  $s'$ , future state  $s$ . Predicted future utility

$$\hat{u}(c, s) = (1 - \alpha) u(c, s) + \alpha u(c, s')$$

- Structural estimation of projection bias parameter  $\alpha$

TABLE 7  
Structural Estimation

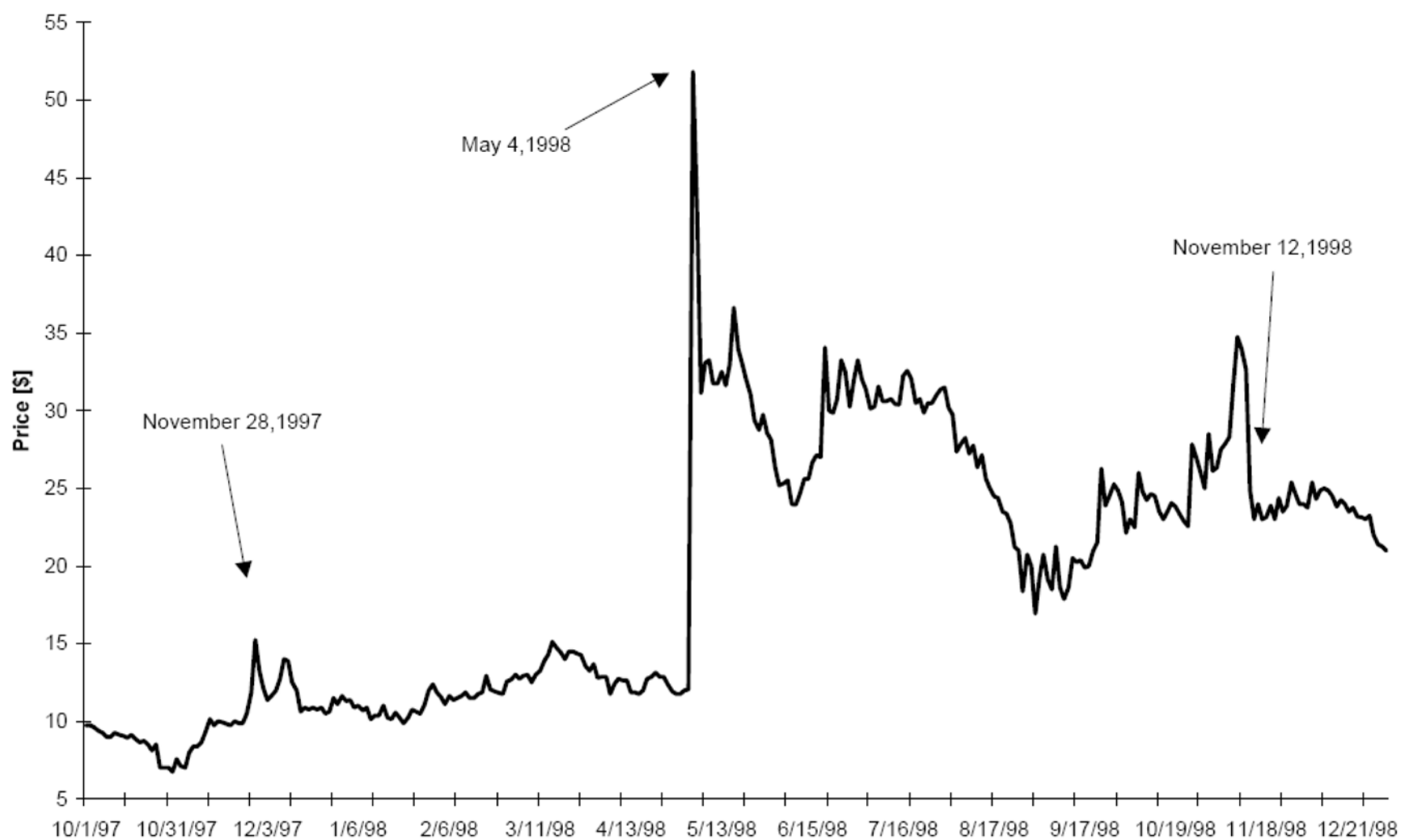
	Winter Boots	Hats	Parkas & Coats	Vests	Jackets
$\alpha$	0.48** (0.0599)	0.64** (0.0390)	0.33** (0.0790)	0.012 (0.0107)	0.41** (0.0488)

- **Step 3. Non-Standard Decision-Making**

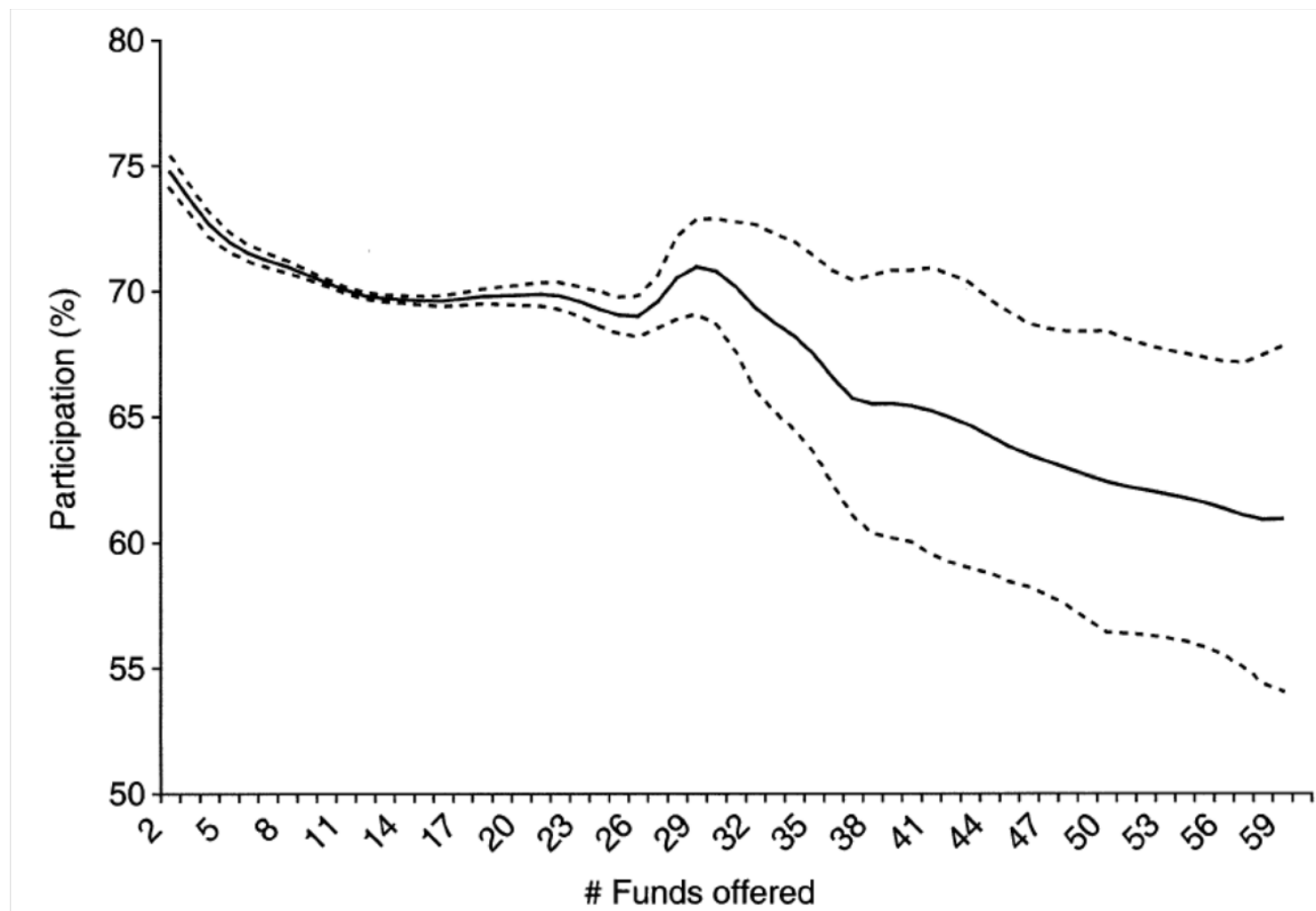
1. Limited Attention: maximization set  $\neq X_i$  (neglect less salient alternatives)
2. Menu Effects: Do not  $\max U$
3. Persuasion and Social Pressure
4. Emotions

- Example 4. Limited Attention – Huberman and Regev (2002)
- November 28, 1997: EntreMed company (biotech) discovers cure for cancer – Articles on Science, Nature, NYT (page 23)
- May 3, 1998: NYT repeats article on page 1

Figure 5: ENMD Closing Prices and Trading Volume 10/1/97-12/30/98



- Example 5. Menu Effects – Iyengar, Huberman, and Lepper (2006)
- Data set on choice of 401(k) plans
- Comparison of plans with few options and plans with many options
- Focus on participation rate – Fractions of employees that invest



- **Step 4. Market Response to Biases**

- Integrate these findings into a market

1. Firms (Behavioral IO)
2. Employers (Behavioral Labor)
3. Investors (Behavioral Finance)
4. Managers (Behavioral Corporate Finance)
5. Politicians (Behavioral Political Economy)
6. ...



- Example 6 – DellaVigna and Malmendier (2004) (applied theory paper)
- Credit card customers are:
  - tempted to over-consume (self-control problems)
  - naive about self-control problems
- How should credit-card companies price cards?
- Offer no yearly fee + bonuses (cash back, airline miles)...
- ...AND charge high interest rates

TABLE II  
CREDIT CARD INDUSTRY—REPRESENTATIVE CONTRACTS<sup>†</sup>

	Type of credit card offer (1)	Regular interest rate (APR) (2)	Annual fee in \$ (3)	Benefits (4)	Introductory interest rate (APR) (5)	Length of introductory offer (6)
Citibank	Platinum Select Visa	Prime + 12.99%	0		2.90%*	9 months
MBNA	Platinum Plus Visa	12.99%	0		3.90%*	6 months
First USA	Platinum Visa	Prime + 6.50%	0		9.90%*	9 months
Chase Manhattan	Wal-Mart Mastercard	Prime + 3.98% to Prime + 11.98%	0		0%	6 months
Bank of America	Visa Gold	Prime + 7.99% to Prime + 12.99%	0		3.90%	6 months
Household Bank	GM Mastercard	Prime + 9.99%	0	5% toward GM	2.90%	6 months
Providian	Visa Platinum	Prime + 3.24%	0		0%	3 months
	Visa Gold Prestige	Prime + 10.24%	0		0%	2 months
	Visa Gold Preferred	Prime + 13.24%	0		0%	2 months
	Visa Classic	Prime + 17.24%	0-59-89		0%	2 months
Capital One	Platinum Visa	9.90%	0		N/A	N/A
	Gold Visa	14.90%	0		2.90%*	6 months
	Classic Visa	19.80%	49		N/A	N/A
Discover	Platinum Card	13.99%	0	1% Cashback	1.70%*	6 months
American Express	Blue Credit Card	9.99%	0		0%	6 months
	Optima Credit Card	Prime + 7.99%	0		7.90%	6 months
	(Gold) Charge Card	N/A	55-75		N/A	N/A

## 5 Psychology and Economics: Empirical Methods

- P&E is encounter of... Psychology and Economics
  - Idea from Psychology (Self-control, Reference Dependence, Overconfidence, Inattention, Social Preferences, Persuasion,...)
  - Setting in Economics (Asset Pricing, Charitable Giving, Consumption and Savings, Job search, ...)
- Each setting has specific methodologies → Variety of methodologies
- Defining feature for the field is idea, not technique or methodology

- However: Five main methodologies in Field P&E

## 1. **Menu choice**

- (a) Example 1. Sydnor (2005) on small-scale risk aversion
- (b) Compare behavior in a menu (Ex.: deductibles)
- (c) Given a model, make inferences about preferences, beliefs, etc. (Ex.: Risk aversion)

## 2. **Natural Experiments**

- (a) Example 4. Huberman and Regev (2002) on limited attention
- (b) Treatment vs. Control comparison
- (c) Quasi-random Naturally occurring events(Ex.: timing of article publication)

## 3. **Field experiment**

- (a) Example 2. Gneezy and List (2006) on gift exchange
- (b) Treatment vs. Control comparison
- (c) Explicit randomization in a field setting (Ex.: Additional pay)

#### **4. Correlational studies**

- (a) Example 5. Iyengar, Huberman, and Lepper (2006) on choice overload
- (b) Test correlation of two variables (Ex.: No. options and participation)
- (c) Derive conclusion – Correlation, not causality here

#### **5. Structural Identification**

- (a) Example 3. Conlin, O'Donoghue and Vogelsang (2006) on projection bias
- (b) Write out model
- (c) Estimate the parameters of the model (Ex.: projection bias)

# 6 Psychology and Economics by Field

## 1. Public Finance

- (a) Present-bias (addiction, sin taxes, retirement savings)
- (b) Social preferences (charitable contributions)
- (c) Limited attention (incidence of taxes)

## 2. Environmental Economics

- (a) Reference dependence (WTA/WTP)
- (b) Framing effects (value of a life)

### 3. Labor Economics

- (a) Reference dependence (labor supply, wage setting)
- (b) Social preferences (wage setting)
- (c) Money Illusion (wage setting)

### 4. Development Economics

- (a) Present-bias (commitment devices in savings, choice of crops)
- (b) Social preferences (group savings, trust)



## 5. Industrial organization

- (a) Present-bias (Credit cards)
- (b) Reference dependence (sales)
- (c) Demand estimation + Profit maximization

## 6. Marketing

- (a) Menu effects (Strategic pricing of products)
- (b) Present-bias (Placement of tempting products)

## 7. Law and Economics

- (a) Present-bias (Cooling off period)
- (b) Emotions (litigation)

## 8. Political Economy

- (a) Market Reaction (manipulation of hatred or inattention)
- (b) Welfare Enhancement (SMRT plan)

## 9. Asset pricing

- (a) Overconfidence (overtrading)
- (b) Heterogeneity and Market Reaction (noise traders)
- (c) Limited attention (footnotes in accounting, demographics, large events)

## 10. Corporate finance

- (a) Overconfidence (investment, mergers, options)
- (b) Limited attention (media)

## 11. Macro – Consumption/Savings

- (a) Present-bias (low saving + mostly illiquid wealth)
- (b) Reference dependence (nominal wage rigidity)

## 7 Defaults and 401(k)s: The Facts

- 401(k) savings most common voluntary savings vehicle in the US
  - Set aside money for retirement
  - Choice of percent contribution, and stocks/bonds composition
  - Penalty for early withdrawal
  - Sometimes: Company matching of contribution up to a threshold
- Patterns of 401(k) investment (Highly recommended survey: Choi et al., 2006 – “*Saving for Retirement on the Path of Least Resistance*”)

- Today: Focus on Default Effects
- **Fact 1. Majority of investors follows Default Plan (at least initially)**
- Madrian and Shea (QJE, 2001): Single most important piece of field evidence on P&E
- Details:
  - Health Care company
  - Paper-and-pencil 401(k) choice
  - Can enroll any day

- Design (Table 1)
  - Discontinuity of 401(k) plan defaults depending on date of hire
  - After 4/1/1998 investment by default
  - 50 percent match up to 6% contribution
  - Observe effect on investment decisions

**TABLE I**  
**401(k) PLAN FEATURES BY PLAN DATE**

	Before 4/1/1998	After 4/1/1998
<i>Eligibility</i>		
Eligible employees	All except union and temporary employees	All except union and temporary employees
First eligible	After one year of employment	Immediately upon hire
Employer match eligible	After one year of employment	After one year of employment
<i>Contributions</i>		
Employee contributions	1 percent to 15 percent of compensation <sup>a</sup>	1 percent to 15 percent of compensation <sup>a</sup>
Employer match	50 percent of employee contribution up to 6 percent of compensation <sup>a</sup>	50 percent of employee contribution up to 6 percent of compensation <sup>a</sup>
<i>Vesting</i>		
Vesting of employee contributions	Immediate	Immediate
Vesting of employer contributions	2-year cliff	2-year cliff
<i>Participation</i>		
Default participation decision	No	Yes
Default contribution rate	None	3 percent of compensation
Default fund allocation	None	Money market fund



- 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

TABLE II  
EMPLOYEE COHORTS FOR COMPARATIVE ANALYSIS

	OLD	WINDOW	NEW
Dates of hire <sup>a</sup>	4/1/1996 to 3/31/1997	4/1/1997 to 3/31/1998	4/1/1998 to 3/31/1999
First eligible to participate in 401(k) plan	One year after date of hire	4/1/1998	Date of hire
First eligible for employer match	One year after date of hire	One year after date of hire	One year after date of hire
Automatically enrolled in 401(k) plan	No	No	Yes
Default contribution rate	None	None	3 percent
Default fund allocation	None	None	Money market fund

- Step 1. Check Design (endogeneity issues)
  - Compare different cohorts: No large differences

TABLE III  
COMPARISON OF WORKER CHARACTERISTICS

	Study company				
	OLD cohort	WINDOW cohort	NEW cohort	All workers	U. S. workforce
<i>Average age (years)</i>	37.2	36.0	34.5	37.6	38.8
<i>Gender</i>					
Male	25.4%	23.9%	22.0%	22.1%	53.1%
Female	74.6	76.1	78.0	77.9	46.9
<i>Ethnicity<sup>a</sup></i>					
White	77.1%	71.7%	68.8%	75.1%	74.6%
Black	12.5	16.8	18.9	14.1	11.3
Hispanic	7.1	8.2	6.7	6.6	9.5
Other	3.3	3.4	5.6	4.2	4.6
<i>Hours</i>					
Full-time (HPW > 35)	96.7%	95.6%	95.8%	94.6%	78.8%
Part-time (HPW < 35)	3.3	4.4	4.2	5.4	21.2
<i>Compensation<sup>b</sup></i>					
Mean	\$41,970	\$38,424	\$34,264	\$40,180	\$28,248
Median	\$33,470	\$30,530	\$26,519	\$31,333	\$20,400

- Step 2. Compare plan choices:

1. *Participation* rates in 401(k) by June 30, 1999 (Figure I and Table IV):

- OLD: 57%, WINDOW: 49%, NEW: 86%

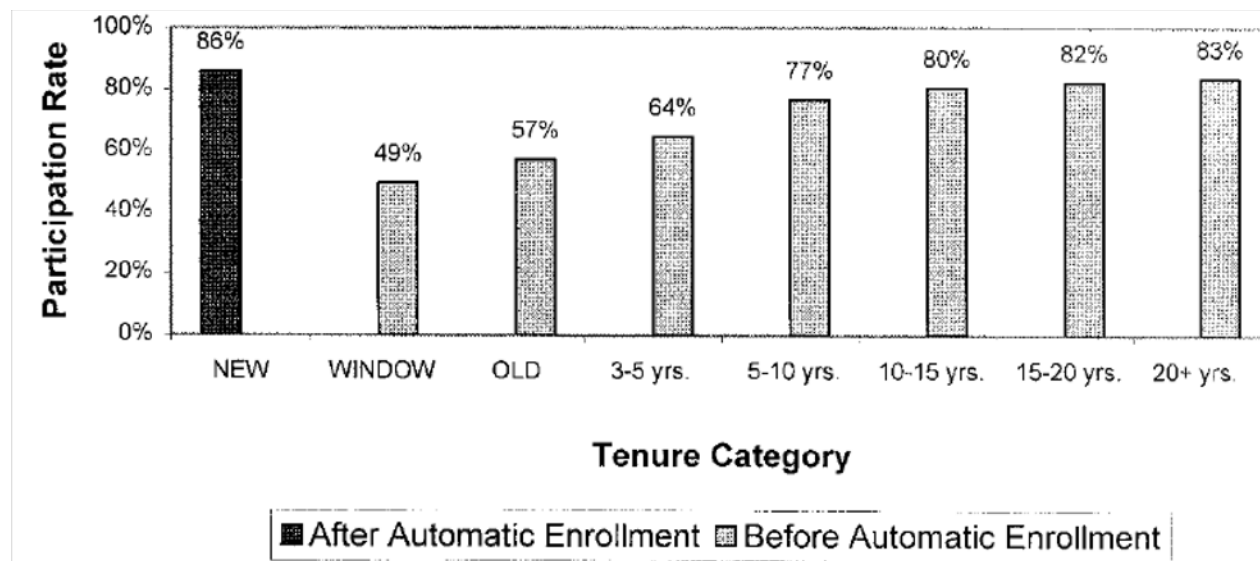


TABLE IV  
THE EFFECTS OF AUTOMATIC ENROLLMENT AND IMMEDIATE ELIGIBILITY  
ON 401(k) PARTICIPATION

	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
<i>Overall</i>	37.4%	85.9%	48.7%	49.4%
<i>Gender</i>				
Male	42.3	85.7	56.1	55.9
Female	35.9	86.0	46.3	47.4
<i>Race/ethnicity</i>				
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
<i>Age</i>				
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
<i>Compensation</i>				
<\$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
<i>Sample size</i>	N = 4249	N = 5801	N = 3275	N = 4247

1. *Contribution* rates (Figures IIc):

- WINDOW: 63% are at 0 percent, 4% at 3 percent
- NEW: 65% are at 3 percent (Default)

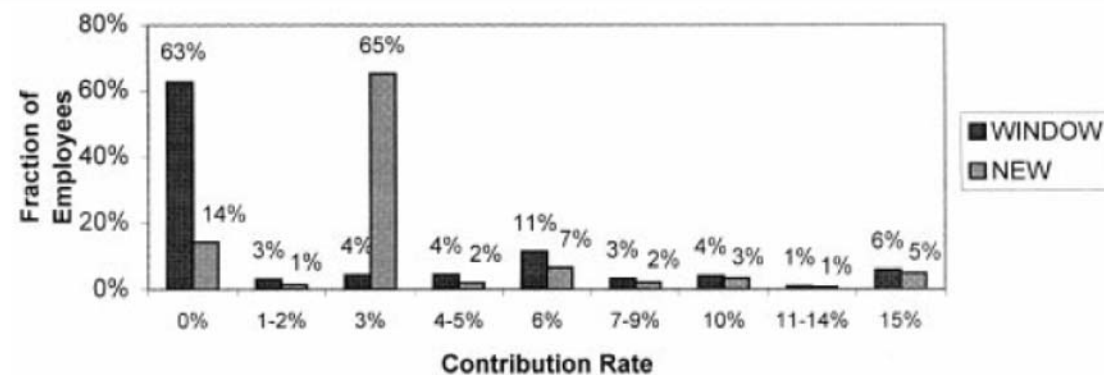
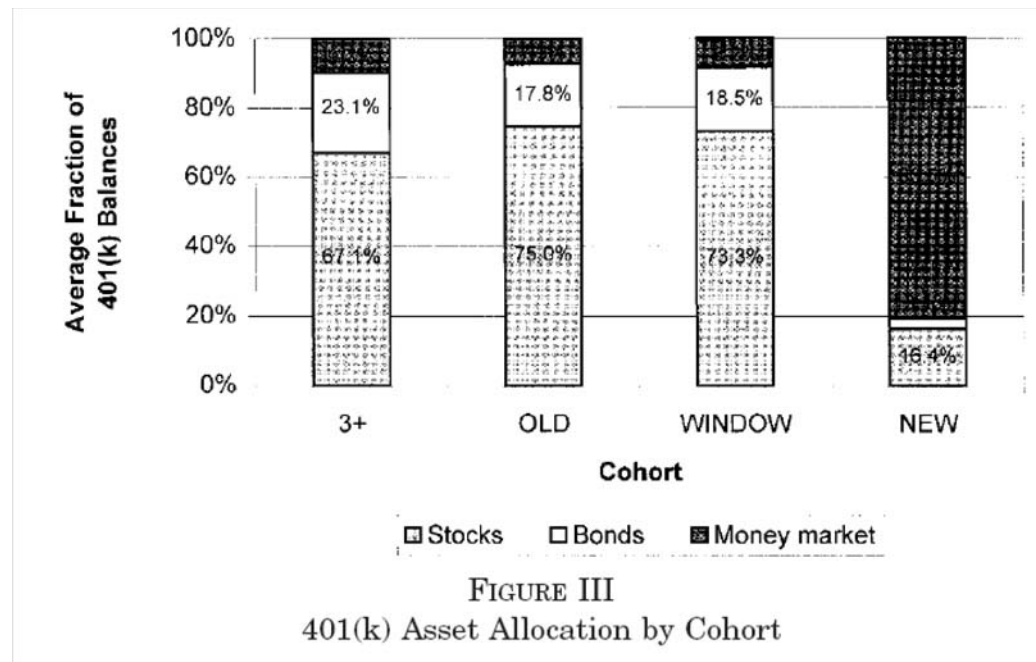


FIGURE IIc  
Distribution of 401(k) Contribution Rates for the WINDOW and NEW Cohorts  
Including Nonparticipation

1. *Allocation of funds in stocks (Figure III):*

- OLD: 75%, WINDOW: 73%, NEW: 16%



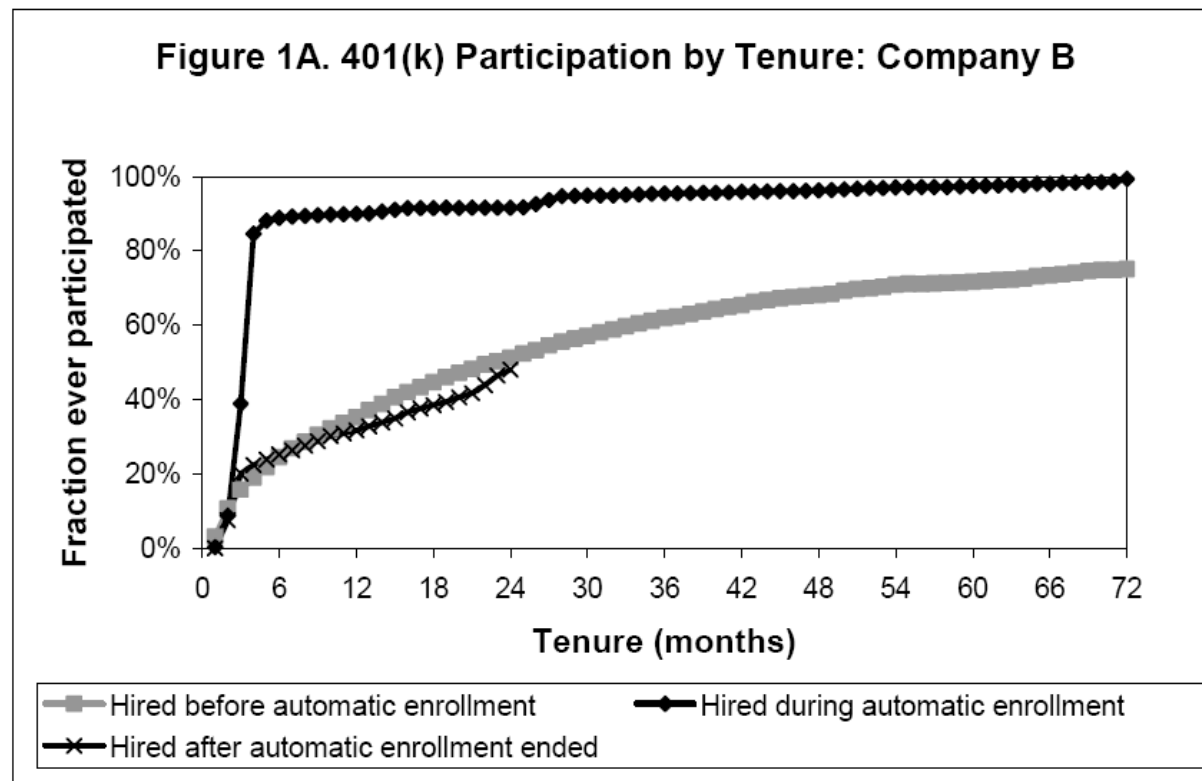
- Results equally strong with controls (Table VI)

TABLE VI  
RAW AND REGRESSION-ADJUSTED EFFECTS OF AUTOMATIC ENROLLMENT  
AND IMMEDIATE ELIGIBILITY

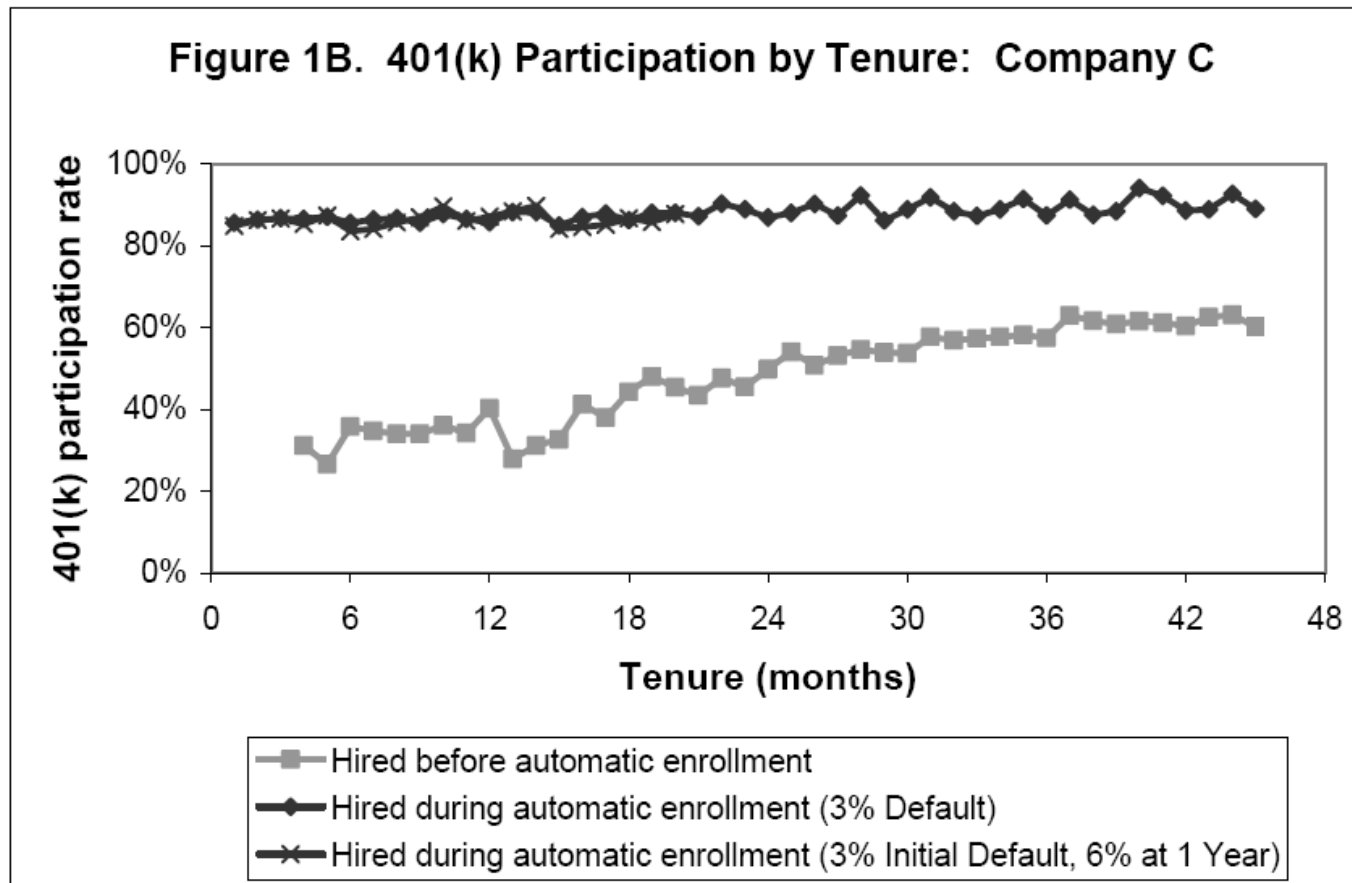
	Effect of Automatic enrollment: Window cohort on 6/30/98 vs. New cohort on 6/30/99	Effect of Immediate eligibility: Old cohort on 6/30/98 vs. Window cohort on 6/30/99
<i>401(k) Participation rate</i>		
Raw difference	48.5%*	0.6%
Regression-adjusted difference	50.4%*	4.1%*
<i>401(k) Contribution rate</i>		
Raw difference	−2.9%*	−0.1%
Regression-adjusted difference	−2.2%*	0.2%



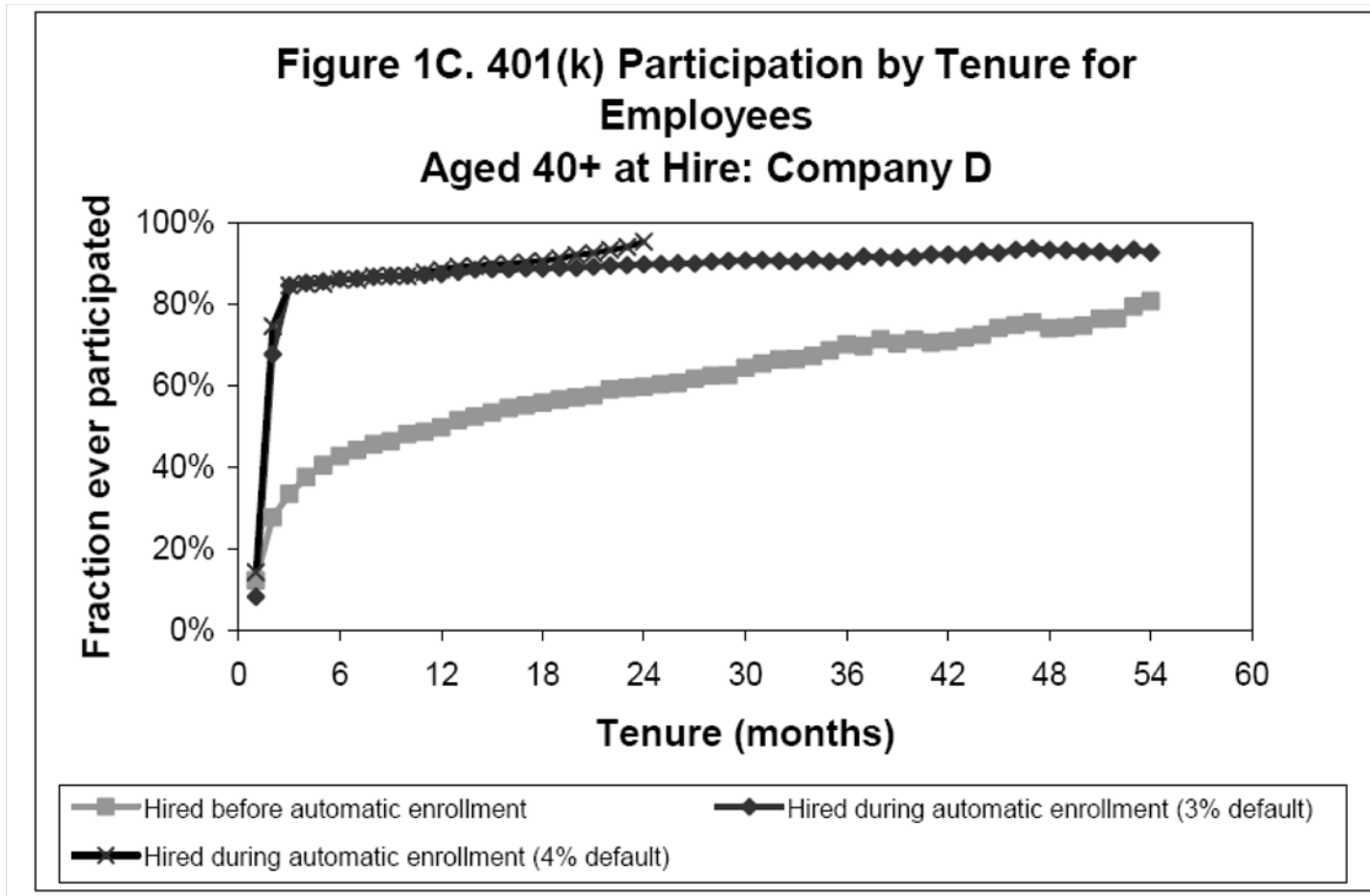
- Results very robust. Choi et al. (2004) Survey paper:
- Company B switches from OLD to NEW to OLD



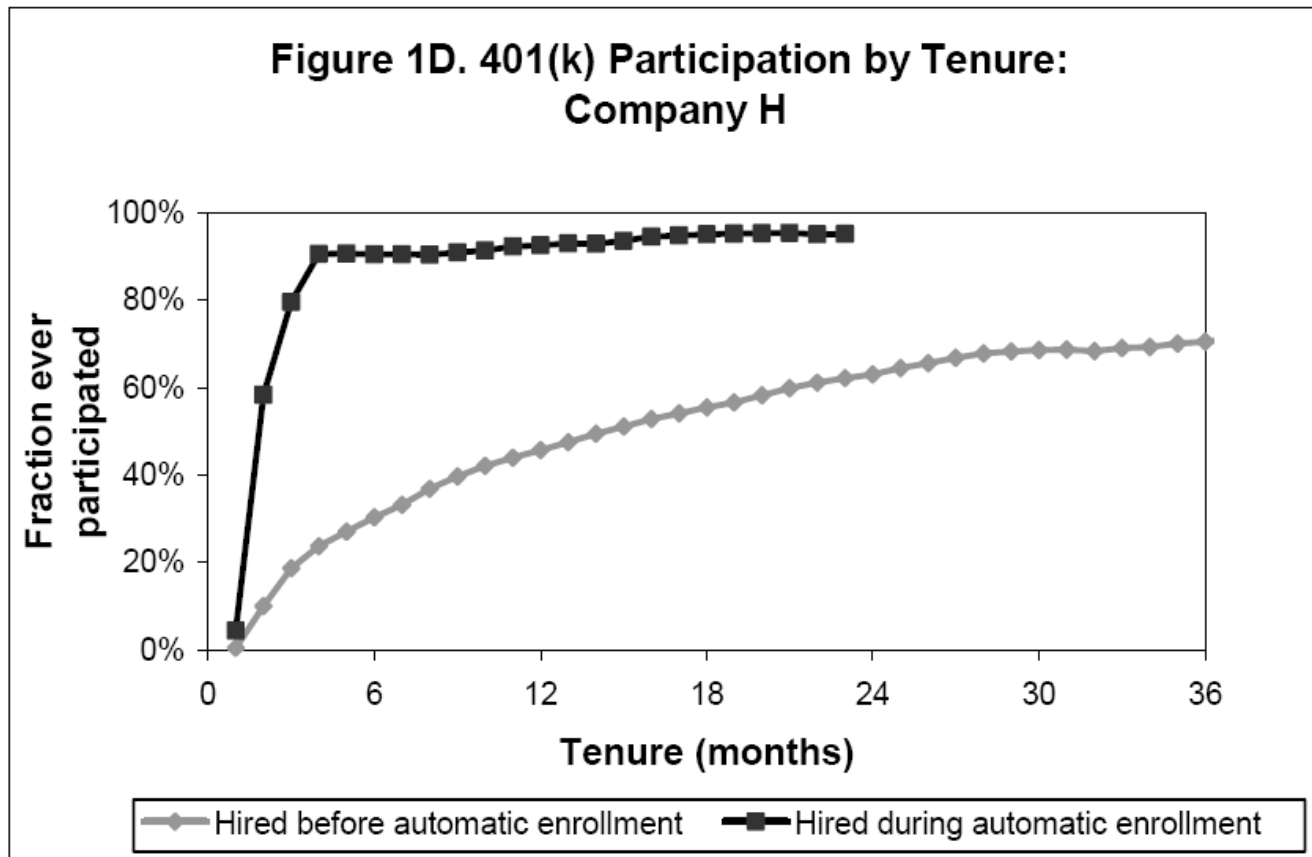
- Company C switches from OLD to NEW to NEW2



- Company D switches from OLD to NEW to NEW2



- Company H switches from OLD to NEW



- Summary.

- OLD and NEW cohorts invest very differently one year after initial hire

- \* Fact 1. **Fact 1. Most investors follow Default Plan**

- \* Fact 1a. Applies to participation (yes/no)

- \* Fact 1b. Applies also to contribution level and allocation

- (Less commonly cited) WINDOW cohort resembles OLD cohort

- \* Fact 2. **'Suggested choice' not very attractive unless default**

## 8 Next Lecture

- More defaults effects in 401(k) savings
  - Present-biased preferences
  - Interpretation facts using present-biased preferences
- Consumption Choices
  - *Investment Good*. Homework
- Problem Set 1 is due next week