Econ 219B
Psychology and Economics: Applications
(Lecture 9)

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Outline

1. Framing
2. Menu Effects: Introduction
3. Menu Effects: Excess Diversification
4. Methodology II: Clustering Standard Errors
5. Menu Effects: Choice Avoidance
6. Menu Effects: Preference for Familiar
7. Menu Effects: Preference for Salient
8. Menu Effects: Confusion

1 Framing

- Tenet of psychology: context and framing matter

- Classical example (Tversky and Kahneman, 1981 in version of Rabin and Weizsäcker, forthcoming): Subjects asked to consider a pair of '*concurrent decisions. [...]*

  - **Decision 1**. *Choose between: A. a sure gain of £2.40 and B. a 25% chance to gain £10.00 and a 75% chance to gain £0.00.*

  - **Decision 2**. *Choose between: C. a sure loss of £7.50 and D. a 75% chance to lose £10.00 and a 25% chance to lose £0.00.*'

  - Of 53 participants playing for money, 49 percent chooses A over B and 68 percent chooses D over C

- 28 percent of the subjects chooses the combination of A and D
  - This lottery is a 75% chance to lose £7.60 and a 25% chance to gain £2.40
  - Dominated by combined lottery of B and C: 75% chance to lose £7.50 and a 25% chance to gain £2.50
- Separate group of 45 subjects presented same choice in broad framing (they are shown the distribution of outcomes induced by the four options)
  - None of these subjects chooses the A and D combination

- Interpret this with reference-dependent utility function with narrow framing.
  - Approximately risk-neutral over gains –> 49 percent choosing A over B
  - Risk-seeking over losses –> 68 percent choosing D over C.
  - Key point: Individuals accept the framing induced by the experimenter and do not aggregate the lotteries

- General feature of human decisions:
  - judgments are comparative
  - changes in the framing can affect a decision if they change the nature of the comparison

- Presentation format can affect preferences even aside from reference points

- **Benartzi and Thaler (2002): Impact on savings plan choices:**
  - Survey 157 UCLA employees participating in a 403(b) plan
  - Ask them to rate three plans (labelled plans A, B, and C):
    * Their own portfolio
    * Average portfolio
    * Median portfolio
  - For each portfolio, employees see the 5th, 50th, and 95th percentile of the projected retirement income from the portfolio (using Financial Engines retirement calculator)

  - Revealed preferences –> expect individuals on average to prefer their own plan to the other plans

- Results:
  - Own portfolio rating (3.07)
  - Average portfolio rating (3.05)
  - Median portfolio rating (3.86)
  - 62 percent of employees give higher rating to median portfolio than to own portfolio

- Key component: Re-framing the decision in terms of ultimate outcomes affects preferences substantially

- Alternative interpretation: Employees never considered the median portfolio in their retirement savings decision –> would have chosen it had it been offered

- Survey 351 participants in a different retirement plan
  - These employees were explicitly offered a customized portfolio and actively opted out of it
  - Rate:
    * Own portfolio
    * Average portfolio
    * Customized portfolio
  - Portofolios re-framed in terms of ultimate income

- 61 percent of employees prefers customized portfolio to own portfolio
- Choice of retirement savings depends on format of the choices presented
- Open question: Why this *particular* framing effect?
- Presumably because of fees:
  - Consumers put too little weight on factors that determine ultimate returns, such as fees –> Unless they are shown the ultimate projected returns
  - Or consumers do not appreciate the riskiness of their investments –> Unless they are shown returns

- Framing also can focus attention on different aspects of the options

- **Duflo, Gale, Liebman, Orszag, and Saez (2006):** Fied Experiment with H&R Block
  - Examine participation in IRAs for low- and middle-income households
  - Estimate impact of a match

- Field experiment:
  - Random sub-sample of H&R Block customers are offered one of 3 options:
    * No match
    * 20 percent match
    * 50 percent match

  - Match refers to first $1,000 contributed to an IRA
  - Effect on take-up rate:
    * No match (2.9 percent)
    * 20 percent match (7.7 percent)
    * 50 percent match (14.0 percent)

- Match rates have substantial impact

- Framing aspect: Compare response to explicit match to response to a comparable match induced by tax credits in the Saver's Tax Credit program
  - Effective match rate for IRA contributions decreases from 100 percent to 25 percent at the $30,000 household income threshold
  - Compare IRA participation for
    * Households slightly below the threshold ($27,500-$30,000)
    * Households slight above the threshold ($30,000-$32,500)
  - Estimate difference-in-difference relative to households in the same income groups that are ineligible for program
  - Result: Difference in match rate lowers contributions by only 1.3 percentage points –> Much smaller than in H&R Block field experiment

- Why framing difference? Simplicity of H&R Block match –> Attention

- Implication: Consider behavioral factors in design of public policy

2 Menu Effects: Introduction

- Summary of Limited Attention:
  - Too little weight on opaque dimension (*Science* article, shipping cost, posted price, news to customers. indirect link, distant future)
  - Too much weight on salient dimension (*NYT* article, auction price, recent returns or volume)
- Any other examples?

- We now consider a specific context: **Choice from Menu** N (typically, **with large** N)
  - Health insurance plans
  - Savings plans
  - Politicians on a ballot
  - Stocks or mutual funds
  - Type of Contract (Ex: no. of minutes per month for cell phones)
  - Classes
  - Charities
  - ...

- We explore 4 +1 (non-rational) heuristics
  1. Excess Diversification
  2. Choice Avoidance
  3. Preference for Familiar
  4. Preference for Salient
  5. Confusion

- Heuristics 1-4 deal with difficulty of choice in menu
  - Related to bounded rationality: Cannot process complex choice –> Find heuristic solution

- Heuristic 5 (next lecture) – Random confusion in choice from menu

3 Menu Effects: Excess Diversification

- First heuristic: **Excess Diversification or 1/n Heuristics**
  - Facing a menu of choices, if possible allocate
  - (Notice: Not possible for example for health insurance plan)

- Example: Experiment of Simonson (1990)
  - Subjects have to pick one snack out of six (cannot pick >1) in 3 different weeks
  - Sequential choice: only 9 percent picks three different snacks
  - Simultaneous choice ex ante: 64 percent chooses three different snacks

- **Benartzi-Thaler (AER, 2001)**
- Study 401(k) plan choices
- Data:
  - 1996 plan assets for 162 companies
  - Aggregate allocations, no individual data
- Average of 6.8 plan options per company
- Lacking individual data, cannot estimate if allocation is truly 1/n
- Proxy: Is there more investment in stocks where more stocks are offered?

- They estimate the relationship

$$\%Invested\ In\ Equity = \alpha + .36\ (.04) * \%Equity\ Options + \beta X$$

TABLE 7—THE RELATIVE NUMBER OF EQUITY-TYPE INVESTMENT OPTIONS AND ASSET ALLOCATION: A REGRESSION ANALYSIS
(DEPENDENT VARIABLE: THE PERCENTAGE OF PLAN ASSETS INVESTED IN EQUITIES)

WLS regression model	Intercept	Relative number of equity options	Indicator whether the plan offers company stock	Log of the plan assets in thousands	Adjusted R^2
		Panel A: No Industry Indicators (N = 162)			
1	22.09	63.14			34.61 percent
	(4.94)	(9.28)			
2	29.72	36.75	15.05		43.45 percent
	(6.73)	(4.49)	(5.10)		
3	10.57	36.77	14.78	1.40	44.16 percent
	(0.89)	(4.52)	(5.03)	(1.74)	
		Panel B: Including Industry Indicators Based on 2-Digit SIC Codes (N = 142)			
4		58.68			55.12 percent
		(8.29)			
5		43.90	12.93		58.91 percent
		(5.39)	(3.26)		
6		47.07	9.09	4.13	61.79 percent
		(5.93)	(2.25)	(2.96)	

Notes: The initial sample consists of the June 1996 MMD sample of 401(k) plans. Eight plans with less than four investment options were excluded, resulting in a sample of 162 plans. When we include industry indicators, the sample is further reduced to 142 plans due to missing industry information. The table reports WLS regression estimates with plan assets as weights (t-statistics are in parentheses).

- For every ten percent additional offering in stocks, the percent invested in stocks increases by 3.6 percent

- Notice: availability of company stocks is a key determinant of holdings in stocks

- Issues of endogeneity:
  - Companies offer more stock when more demand for it
  - Partial response: Industry controls

- Additional evidence based on a survey
  - Ask people to allocate between Fund A and Fund B
  - Vary Fund A and B to see if people respond in allocation

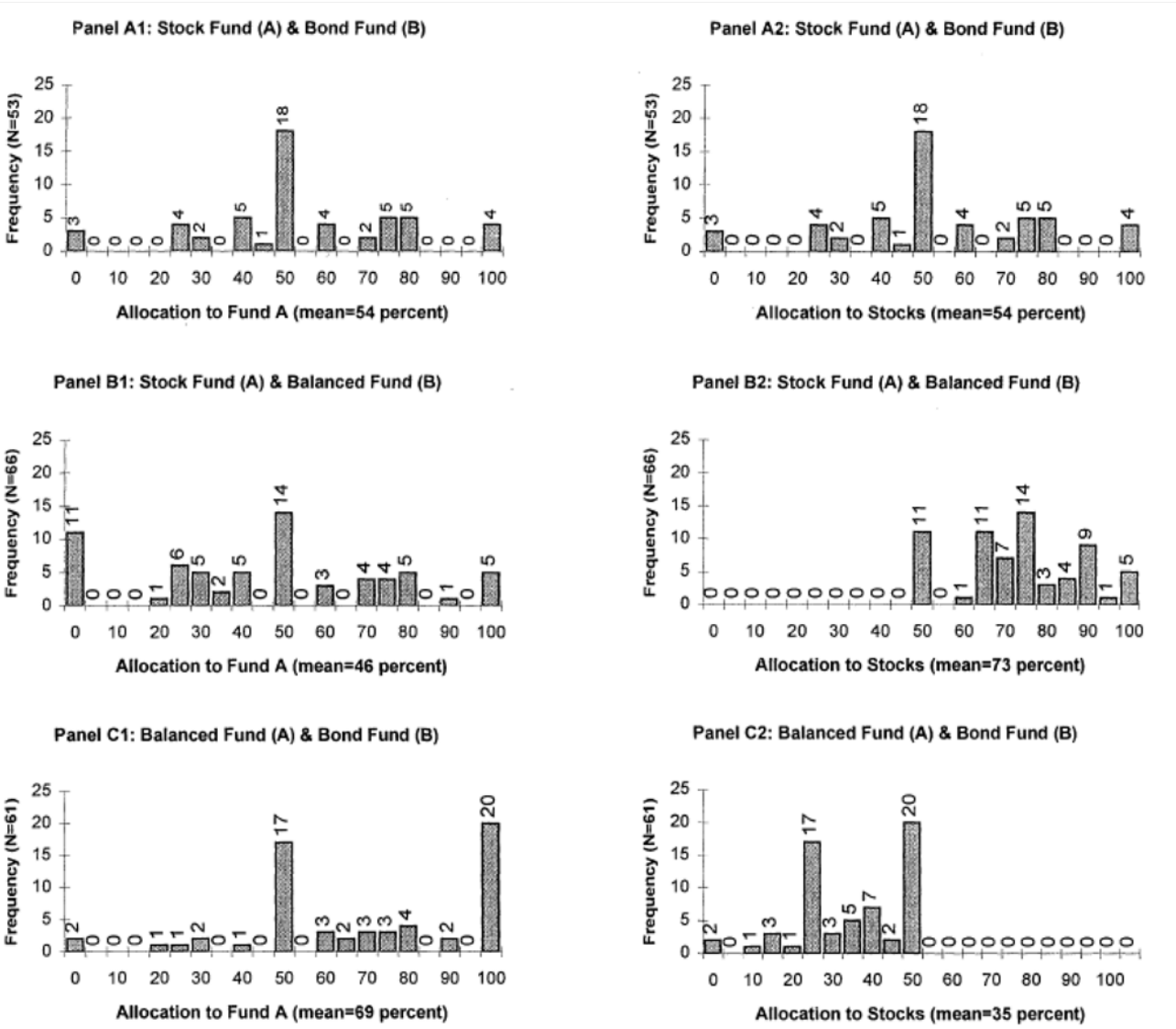


FIGURE 1. VERBAL SAVINGS QUESTIONNAIRE: HISTOGRAMS OF THE ALLOCATION TO FUND A AND THE RESULTING ALLOCATION TO STOCKS

- People respond to changes in content of Fund A and B, but incompletely

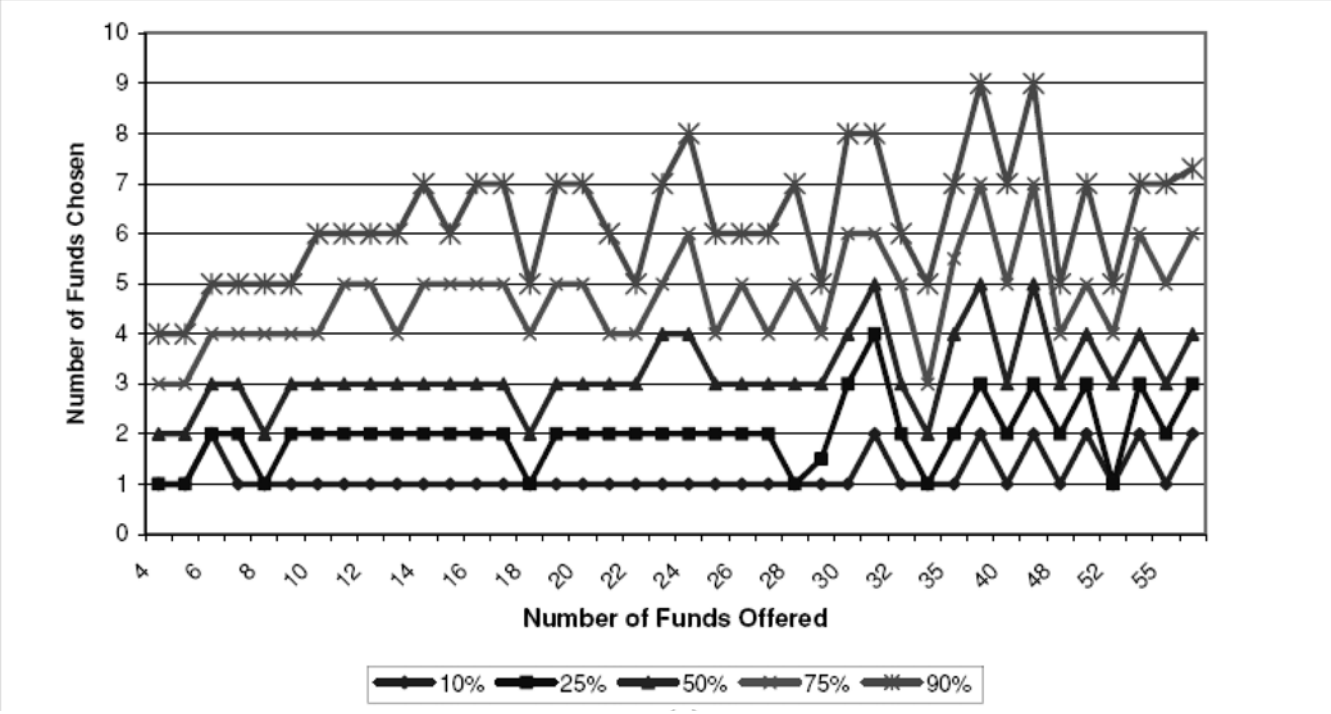
- Issues:
  - Not for real payoff
  - Low response rate (12%)
  - People dislike extreme in responses

- **Huberman-Jiang (JF, 2006)**

- Data:
  - Vanguard data to test BT (2001)
  - Data on individual choices of participants
  - Half a million 401(k) participants
  - 647 Defined Contribution plans in year 2001
  - Average participation rate 71 percent

- Summary Statistics:
  - 3.48 plans choices on average
  - 13.66 plans available on average

- **Finding 1**. People do not literally do 1/n, definitely not for n large
  - Flat relationship between $\#Chosen$ and $\#Offered$ for $\#Offered > 10$
  - BT (2001): could not estimate this + $\#Offered$ rarely above 15



- Regressions specification:

$$\#Chosen = \alpha + \beta * \#Offered + \beta X$$

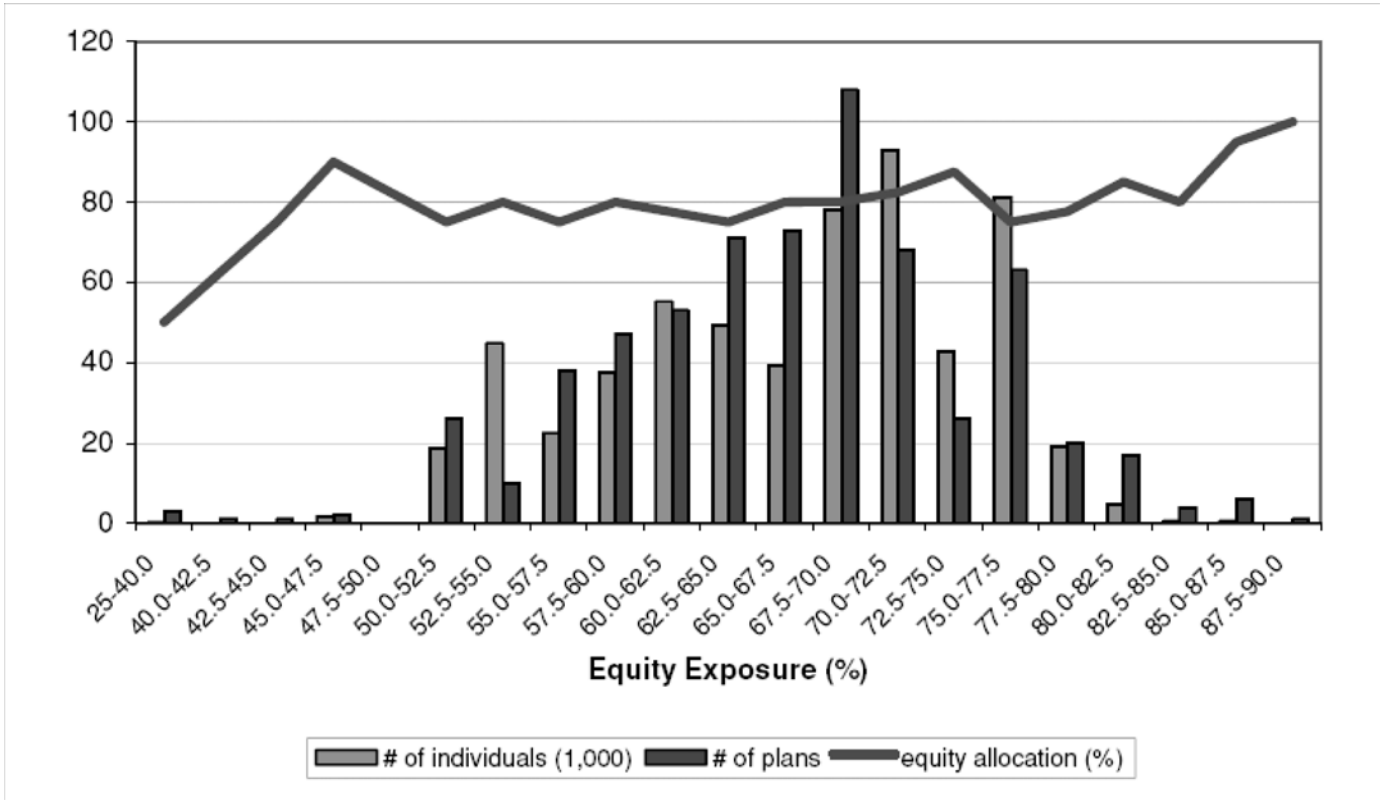
	All Participants			
	NCHOSEN			
	(1)		(2)	
	COEF × 100	SE × 100	COEF × 100	SE × 100
NCHOICE	0.95	0.70	1.03	0.70
CONTRIBUTION	10.54*	0.56	—	—
COMP	−0.02	2.30	33.05*	2.87
WEALTH	1.20*	0.51	3.90*	0.55
FEMALE	14.51*	1.97	14.84*	1.95
AGE	−1.66*	0.10	−1.35*	0.09
TENURE	0.88*	0.26	0.95*	0.26
MATCH	0.00	0.24	0.00	0.23
COMPSTK	70.67*	12.72	67.16*	12.68
DB	−6.31	15.35	−6.06	15.21
WEB	1.17	0.71	1.39	0.71
NEMPLOY	−10.28*	4.79	−9.25*	4.73
Intercept	1036.95	284.44	664.25	290.06
No. of individuals and plans	572,157	641	572,157	641
R^2	0.075		0.060	

- **Finding 2.** Employees do 1/n on the *chosen* funds if
  - number n is small
  - $1/n$ is round number

No. of Funds Chosen (1)	New Entrants (%) (2)	$\underline{H}$ (3)	$\bar{H}$ (4)	$Freq_1$ (%) (5)	$Freq_1/\max_{j\neq 1}(Freq_j)$ (6)
1	38.6	1.0000	1.0000	–	–
2	17.5	0.5000	0.5050	64.0	12.81*
3	15.6	0.3333	0.3356	17.9	1.78*
4	13.2	0.2500	0.2513	37.4	8.89*
5	7.3	0.2000	0.2008	26.6	8.19*
6	3.5	0.1667	0.1672	1.3	0.25
7	1.8	0.1429	0.1433	1.0	0.19
8	1.1	0.1250	0.1253	3.9	1.14
9	0.6	0.1111	0.1114	5.1	1.20
10	0.4	0.1000	0.1002	53.3	13.50*

- **Finding 3.** Equity choice (most similar to BT (2001))

- In aggregate very mild relationship between $\%Equity$ and $\%EquityOffered$



- Split by $\#Offered$:
  1. For $\#Offered \leq 10$, BT finding replicates:

$$\%Equity = \alpha + .292 * \%EquityOffered$$
$$(.063)$$

  2. For $\#Offered > 10$, no effect:

$$\%Equity = \alpha + .058 * \%EquityOffered$$
$$(.068)$$

	(1)		(2)		(3)		(4)	
	All *NFunds*				*NFunds* ≤ 10		*NFunds* > 10	
	COEF	SE	COEF	SE	COEF	SE	COEF	SE
Panel A: Full Sample—Uniform Sensitivity								
%EQOffered	0.175	0.274	0.177*	0.088	0.292*	0.107	0.058	0.09
R^2	0.000		0.061		0.063		0.068	

- Psychologically plausible:
  - Small menu set guides choices –> Approximate 1/n in weaker form
  - Larger menu set does not
- BT-HJ debate: Interesting case
  - Heated debate at beginning
  - At the end, reasonable convergence: we really understand better the phenomenon
  - Convergence largely due to better data

4 Methodology: Clustering Standard Errors

- Econometric issue: Errors correlated across groups of observations

- Example 1–Huberman and Jiang (2006):
  - Errors correlated within a plan over time
  - Cluster at the plan level

- Example 2–Conlin, O'Donoghue, and Vogelsang (2007)
  - Correlations within day due to shock (TV ad)—>Cluster by day
  - Correlation within household over time —>Cluster by household

- Example 3. Earnings announcement panel
  1. Persistent shock to Company over time (Autocorrelation)
  2. Correlation in shocks across companies within date (Cross-Sectional correlation)

- OLS standard errors assume i.i.d. cross-sectionally and over time

- Clustered standard errors can take care of Issue 1 or 2 — not both:
  1. Cluster by State (Company):
     - Assume independence across States (companies)
     - Allow for any correlation over time within State (company)
  2. Cluster by year (date)
     - Assume independence across years (dates)
     - Allow for any correlation within a year (date) across States (companies)

- How does this work?

- Assume simple univariate regression:

$$y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}$$

- OLS estimator:

$$\hat{\beta} = \beta + \left(x'x\right)^{-1} x'\varepsilon = \beta + \frac{Cov\left(x, \varepsilon\right)}{Var\left(x\right)}$$

- $Var\left(\hat{\beta}\right)$ under i.i.d. assumptions (with $\hat{\sigma}^2 = \sum_{it} \hat{\varepsilon}_{it}^2 / NT$):

$$Var\left(\hat{\beta}\right)_{OLS} = \left(x'x\right)^{-1} \sum_{i,t} \left(x_{it}\hat{\varepsilon}_{it}\right)\left(\hat{\varepsilon}_{it}x_{it}\right) \left(x'x\right)^{-1} = \frac{\hat{\sigma}^2}{\sum x_{it}^2}$$

- White-heteroskedastic:

$$Var\left(\hat{\beta}\right)_{Het} = \frac{1}{\sum_{it} x_{it}^2} \sum_{it} \frac{x_{it}^2 \hat{\varepsilon}_{it}^2}{\sum x_{it}^2}$$

- White-heteroskedastic:

$$Var\left(\hat{\beta}\right)_{Het} = \frac{1}{\sum_{it} x_{it}^2} \sum_{it} \frac{\left(x_{it}\hat{\varepsilon}_{it}\right)^2}{\sum x_{it}^2}$$

  - Notice: Second sum is weighted average of $\hat{\varepsilon}_{it}^2$, with more weight given to observations with higher x_{it}^2
  - If high x_{it}^2 is associated with high $\hat{\varepsilon}_{it}^2$, $Var\left(\hat{\beta}\right)_{Het} > Var\left(\hat{\beta}\right)_{OLS}$

- Standard Errors Clustered by I (allow for autocorrelation):

$$Var\left(\hat{\beta}\right)_{Clust} = \frac{1}{\sum_{it} x_{it}^2} \sum_{i} \frac{\left(\sum_t x_{it}\hat{\varepsilon}_{it}\right)^2}{\sum x_{it}^2}$$

  - First sum all the covariances $x_{it}\hat{\varepsilon}_{it}$ within a cluster
  - Then square up and add across the clusters
  - Notice: This is as if one cluster (one i) was one observation

- That is, this form of clustering allows

$$E(u_{it}u_{it'}|X_{it}X_{it'}) \neq 0$$

  - Correlation within cluster i

- Requires

$$E(u_{it}u_{i't'}|X_{it}X_{i't'}) = 0$$

  for $i \neq i'$

  - No correlation across clusters

- When is $Var\left(\hat{\beta}\right)_{Clust} > Var\left(\hat{\beta}\right)_{Het}$?

- Example: Assume $I = 2$, $T = 2$

$$Var\left(\hat{\beta}\right)_{Het} = \frac{1}{\sum_{it} x_{it}^2} \frac{(x_{11}\hat{\varepsilon}_{11})^2 + (x_{12}\hat{\varepsilon}_{12})^2 + (x_{21}\hat{\varepsilon}_{21})^2 + (x_{22}\hat{\varepsilon}_{22})^2}{\sum x_{it}^2}$$

- Compare to

$$\begin{aligned} Var\left(\hat{\beta}\right)_{Clust} &= \frac{1}{\sum_{it} x_{it}^2} \frac{(x_{11}\hat{\varepsilon}_{11} + x_{12}\hat{\varepsilon}_{12})^2 + (x_{21}\hat{\varepsilon}_{21} + x_{22}\hat{\varepsilon}_{22})^2}{\sum x_{it}^2} = \\ &= Var\left(\hat{\beta}\right)_{Het} + \frac{1}{\sum_{it} x_{it}^2} \frac{2x_{11}\hat{\varepsilon}_{11}\hat{\varepsilon}_{12}x_{12} + 2x_{21}\hat{\varepsilon}_{21}\hat{\varepsilon}_{22}x_{22}}{\sum x_{it}^2} \end{aligned}$$

  - Hence, $Var\left(\hat{\beta}\right)_{Clust} > Var\left(\hat{\beta}\right)_{Het}$ if $Ex_{i1}x_{i2} > 0$ and $E\hat{\varepsilon}_{i1}\hat{\varepsilon}_{i2} > 0$ –>Positive correlation within cluster (that is, over time) among x variables and ε

  - Positive correlation –> Standard errors understated if no clustering

- Notice that instead this does not capture correlation across clusters, that is, $E\hat{\varepsilon}_{1t}\hat{\varepsilon}_{2t} = 0$ and $Ex_{1t}x_{2t} > 0$

- Assume now that we cluster by T instead (allow for cross-sectional correlation):

$$Var\left(\hat{\beta}\right)_{Clust} = Var\left(\hat{\beta}\right)_{Het} + \frac{1}{\sum_{it} x_{it}^2} \frac{2x_{11}\hat{\varepsilon}_{11}\hat{\varepsilon}_{21}x_{21} + 2x_{12}\hat{\varepsilon}_{12}\hat{\varepsilon}_{22}x_{22}}{\sum x_{it}^2}$$

- Hence, $Var\left(\hat{\beta}\right)_{Clust} > Var\left(\hat{\beta}\right)_{Het}$ if $Ex_{1t}x_{2t} > 0$ and $E\hat{\varepsilon}_{1t}\hat{\varepsilon}_{2t} > 0$ –>Positive correlation within a time period across the observations among x variables and ε

- Calculation of Adjustment of Standard Errors due to Clustering
  - T observations within cluster
  - Within-cluster correlation of x_s: ρ_x
  - Within-cluster correlation of ε: ρ_ε

- Compare $Var\left(\hat{\beta}\right)_{Clust}$ and $Var\left(\hat{\beta}\right)_{OLS}$:

$$Var\left(\hat{\beta}\right)_{Clust} = Var\left(\hat{\beta}\right)_{OLS} * \left(1 + \left(T - 1\right)\rho_x \varrho_\varepsilon\right)$$

  - Standard errors downward biased with OLS if $\rho_x \varrho_\varepsilon > 0$, or positive correlations (as above)
  - No bias if no correlation in *either* x or ε
  - Bias larger the larger is T
  - Illustrative case: Suppose all observations within cluster identical ($\rho_x = \rho_\varepsilon = 1$) –> Bias $= T$

- Issues with clustering:

- Issue 1. **Number of clusters**
  - Convergence with speed I –> Need a large number of clusters I to apply LLN
  - Beware of papers that apply clustering with <20 clusters
  - **Cameron-Gelbach-Miller (2008):** Test with good finite sample properties even for $I \approx 10$

- Issue 2. **Cluster in only one dimension**
  - Clustering by I controls for autocorrelation
  - Clustering by T controls for cross-sectional correlation
  - How can control for both? **Cameron-Gelbach-Miller (2006):** Two-way clustering, can do so

- **Cameron-Gelbach-Miller (2006).** Double-clustered standard errors with respect to I and T

- Procedure:
  1. Compute standard errors clustering by I –> Compute $V\left(\hat{\beta}\right)_{Cl-I}$
  2. Compute standard errors clustering by T–> Compute $V\left(\hat{\beta}\right)_{Cl-T}$
  3. Compute standard errors clustering by $T*I$ (this typically means s.e.s not clustered, just robust)–> Compute $V\left(\hat{\beta}\right)_{Cl-T*I}$
  4. Final variance and covariance matrix is

$$V\left(\hat{\beta}\right)_{DoubleCl} = V\left(\hat{\beta}\right)_{Cl-I} + V\left(\hat{\beta}\right)_{Cl-T} - V\left(\hat{\beta}\right)_{Cl-T*I}$$

- Intuition: It's variance obtained clustering along one dimension (say, I), plus the additional piece of variance along the other dimension that goes beyond the robust s.e.s

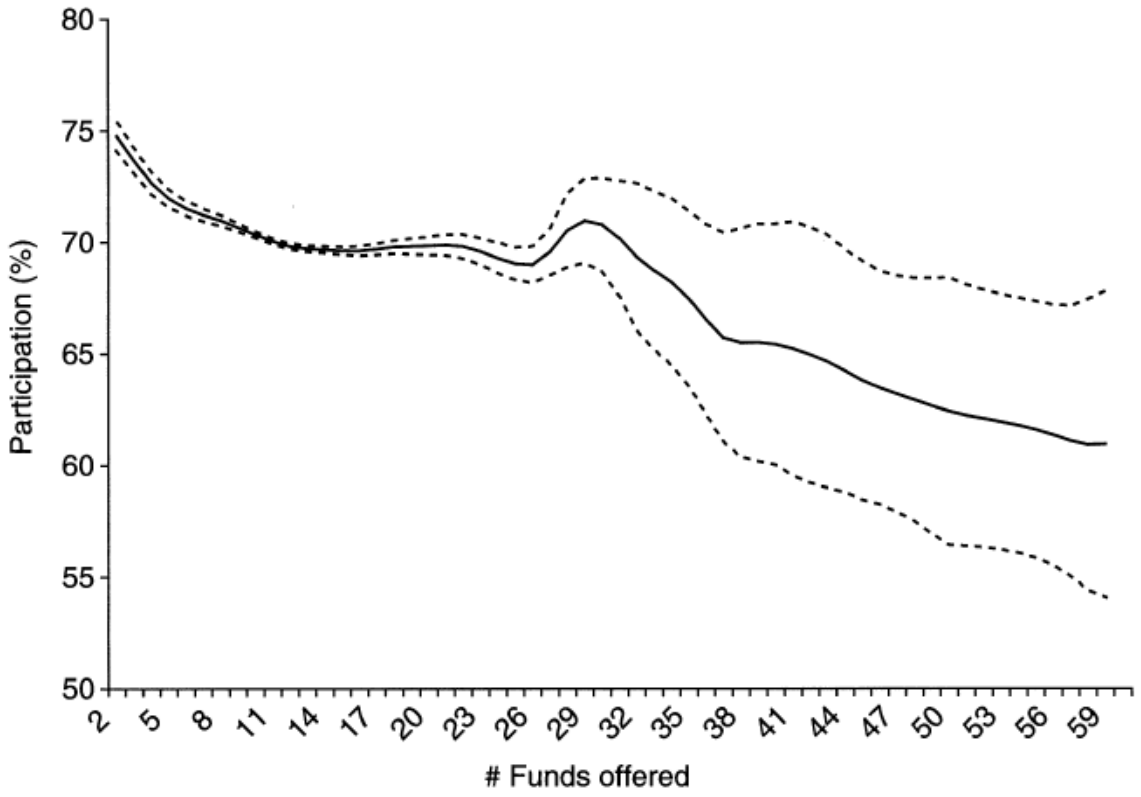
- Readings on clustered standard errors:
  - **Stata Manual** –> basic, intuitive
  - **Bertrand-Duflo-Mullainathan (QJE, 2004)** –> Excellent discussion of practical issues with autocorrelation in diff-in-diff papers, good intuition
  - **Peterson (2007)** –> Fairly intuitive, applied to finance
  - **Cameron-Trivedi (2006) and Wooldridge (2003)** –> More serious treatment
  - **Colin Cameron (Davis)'s website** –> Updates

5 Menu Effects: Choice Avoidance

- Second heuristic: Refusal to choose with choice overload

- **Choice Avoidance.** Classical Experiment (**Yiengar-Lepper, JPSP 2000**)
  - Up-scale grocery store in Palo Alto
  - Randomization across time of day of number of jams displayed for taste
    - Small number: 6 jams
    - Large number: 24 jams
  - Results:
    - More consumers sample with Large no. of jams (145 vs. 104 customers)
    - *Fewer* consumers buy with Large no. of jams (4 vs. 31 customers)

- Field Evidence 1: **Iyengar-Huberman-Lepper (2006)**
- Data set from Fidelity on choice of 401(k) plans
- (Same as for Huberman-Jiang on 1/N)
- Comparison of plans with few options and plans with many options
- Focus on participation rate – Fractions of employees that invest



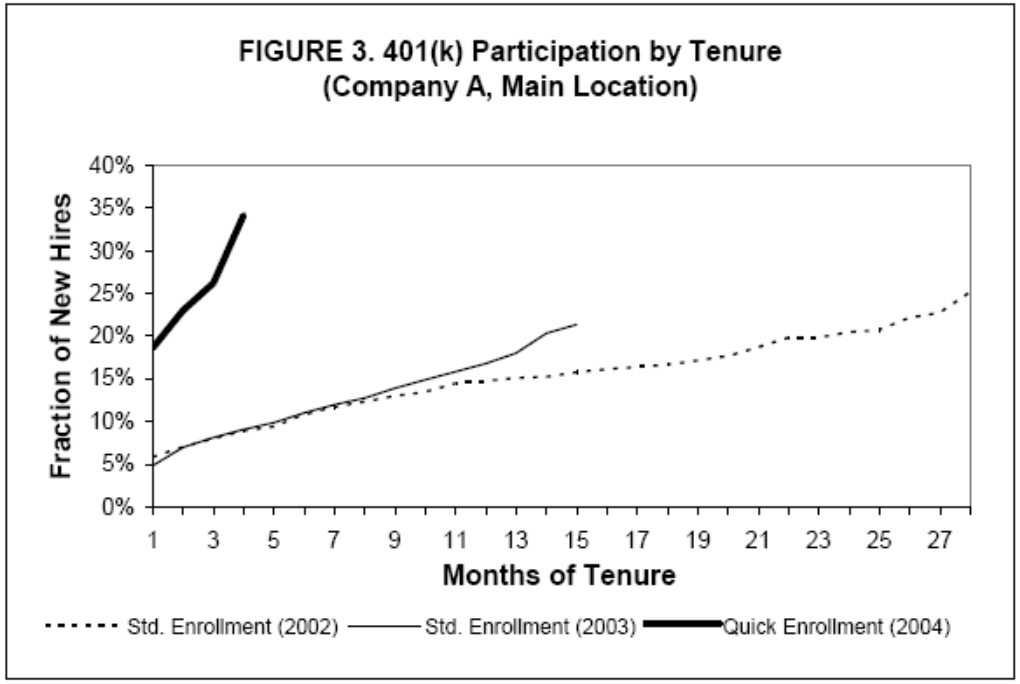
- Suggestive evidence: Participation rate is decreasing in number of funds

- However, number of funds offered is endogenous: perhaps higher where people are close to indifference –> Lower participation

- Field evidence 2: **Choi-Laibson-Madrian (2006):** Natural experiment

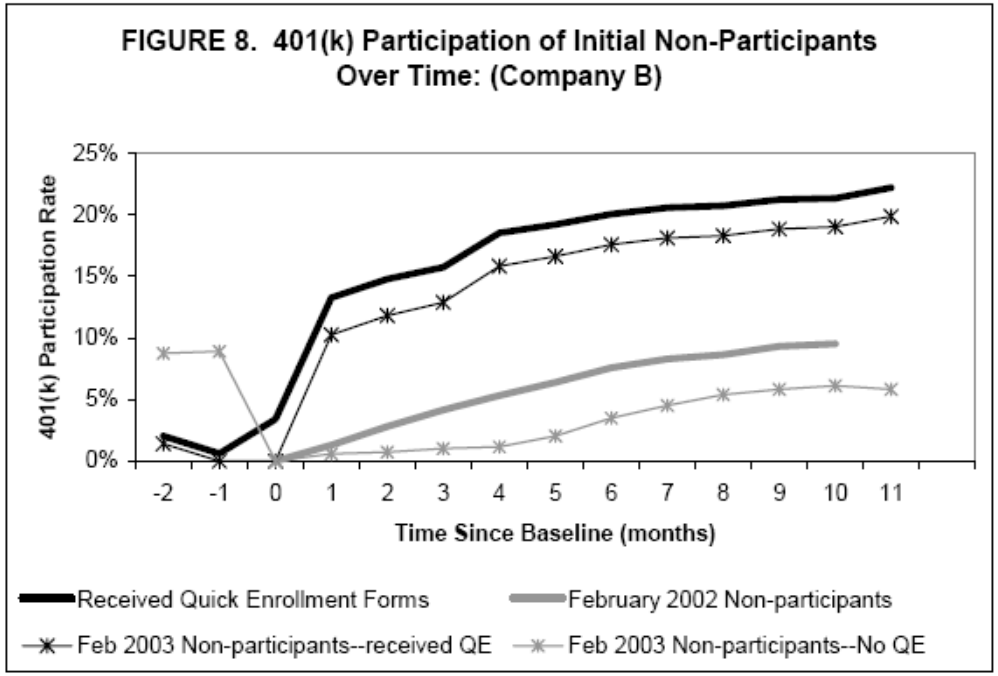
- Introduce in company A of Quick Enrollment
  - Previously: Default no savings
  - 7/2003: Quick Enrollment Card:
    * Simplified investment choice: 1 Savings Plan
    * Deadline of 2 weeks
  - In practice: Examine from 2/2004

- Company B:
  - Previously: Default no savings
  - 1/2003: Quick Enrollment Card
- Notice: This affects
  - Simplicity of choice
  - But also cost of investing + deadline (self-control)



- 15 to 20 percentage point increase in participation – Large effect

- Increase in participation all on opt-in plan



- Very similar effect for Company B

- What is the effect due to?
- Increase may be due to a reminder effect of the card
- However, in other settings, reminders are not very powerful.
- Example: Choi-Laibson-Madrian (2005):
  - Sent a survey including 5 questions on the benefits of employer match
  - Treatment group: 345 employees that were not taking advantage of the match
  - Control group: 344 employees received the same survey except for the 5 specific questions.
  - Treatment had no significant effect on the savings rate.

- Field Evidence 3: **Bertrand, Karlan, Mullainathan, Zinman (2006)**

- Field Experiment in South Africa
  - South African lender sends 50,000 letters with offers of credit
  - Randomization of interest rate (economic variable)
  - Randomization of psychological variables
  - Crossed Randomization: Randomize independently on each of the n dimensions
    * Plus: Use most efficiently data
    * Minus: Can easily lose control of randomization

Table 2
Summary of Randomized Interventions[a]

	(1)	(2)	(3)	(4)	(5)
Sample:	**All**	**Customers who did not take up**	**Customers who took up**	**"High attention" customer**	**"Low attention" customer**
September wave	0.395	0.394	0.401	0.398	0.393
	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
October wave	0.605	0.606	0.599	0.602	0.607
	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
Offer Interest	7.929	7.985	7.233	6.970	8.384
Rate	(2.42)	(2.42)	(2.31)	(2.11)	(2.43)
Small option table	0.432	0.438	0.349	0.250	0.518
	(0.50)	(0.50)	(0.48)	(0.43)	(0.50)
No comparison to	0.200	0.200	0.200	0.202	0.199
competitor	(0.40)	(0.40)	(0.40)	(0.40)	(0.40)
comparison expressed	0.401	0.400	0.408	0.397	0.403
as a gain	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
No photo on mailing	0.202	0.202	0.206	0.198	0.204
	(0.40)	(0.40)	(0.40)	(0.40)	(0.40)
Black photo	0.477	0.477	0.476	0.488	0.472
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Coloured photo	0.071	0.071	0.071	0.072	0.071
	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)
Indian photo	0.125	0.125	0.122	0.123	0.126
	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)
White photo	0.124	0.124	0.125	0.120	0.127
	(0.33)	(0.33)	(0.33)	(0.32)	(0.33)
Female photo	0.399	0.398	0.411	0.398	0.399
	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
Male photo	0.399	0.400	0.383	0.404	0.397
	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
Photo matches	0.534	0.535	0.531	0.537	0.533
customer's race?	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Photo matches	0.401	0.402	0.388	0.403	0.400
customer's gender?	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
Promotional lottery	0.250	0.251	0.246	0.250	0.251
	(0.43)	(0.43)	(0.43)	(0.43)	(0.43)
Suggestion call	0.003	0.003	0.005	0.003	0.003
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)
Sample	53194	49250	3944	17108	36086

- Manipulation of interest here:
  - Vary number of options of repayment presented
    - Small Table: Single Repayment option
    - Big Table 1: 4 loan sizes, 4 Repayment options, 1 interest rate
    - Big Table 2: 4 loan sizes, 4 Repayment options, 3 interest rates
    - Explicit statement that "other loan sizes and terms were available"
  - Compare Small Table to other Table sizes
  - Small Table increases Take-Up Rate by .603 percent
  - One additional point of (monthly) interest rate decreases take-up by .258

Table 3 Effect of Simplicity of Offer Description on Take-Up[a]

Dependent Variable: Take-Up Dummy **Sample:**	**All**	**High attention**	**Low attention**
	(1)	(2)	(3)
Small option table	0.603	1.146	0.407
	(0.239)	(0.674)	(0.219)
Δ interest rate equivalent	[2.337]	[3.570]	[1.887]
Interest rate	-0.258	-0.321	-0.215
	(0.049)	(0.145)	(0.044)
Risk category F.E.?	yes	yes	yes
Experimental wave F.E.?	yes	yes	yes
Sample size	53194	17108	36086

- Small-option Table increases take-up by equivalent of 2.33 pct. interest

- Strong effect of behavioral factor, compared with effect of interest rate

- Effect larger for 'High-Attention' group (borrow at least twice in the past, once within 8 months)

- Authors also consider effect of a number of other psychological variables:
  - Content of photo (large effect of female photo on male take-up)
  - Promotional lottery (no effect)
  - Deadline for loan (reduces take-up)

6 Menu Effects: Preference for Familiar

- Third Heuristic: Preference for items that are more familiar

- Choice of stocks by individual investors (**French-Poterba, AER 1991**)
  - Allocation in domestic equity: Investors in the USA: 94%
  - Explanation 1: US equity market is reasonably close to world equity market
  - BUT: Japan allocation: 98%
  - BUT: UK allocation: 82%

- Explanation 2: Preference for own-country equity may be due to costs of investments in foreign assets

- Test: Examine within-country investment: **Huberman (RFS, 2001)**
  - Geographical distribution of shareholders of Regional Bell companies
  - Companies formed by separating the Bell monopoly
  - Fraction invested in the own-state Regional Bell is 82 percent higher than the fraction invested in the next Regional Bell company

- Third, extreme case: Preference for own-company stock
  - On average, employees invest 20-30 percent of their discretionary funds in employer stocks (**Benartzi JF, 2001**)

Panel C: Company Stock Allocation as a Percentage of the Employee Contributions			
Number of plans	78	58	136
Mean: equally weighted	18	29	23
Mean: weighted by employee contributions	21	33	24
Mean: weighted by the number of active participants	21	31	24

- – Notice: This occurs despite the fact that the employees' human capital is already invested in their company
  - Also: This choice does not reflect private information about future performance

– Companies where a higher proportion of employees invest in employer stock have lower subsequent one-year returns, compared to companies with a lower proportion of employee investment

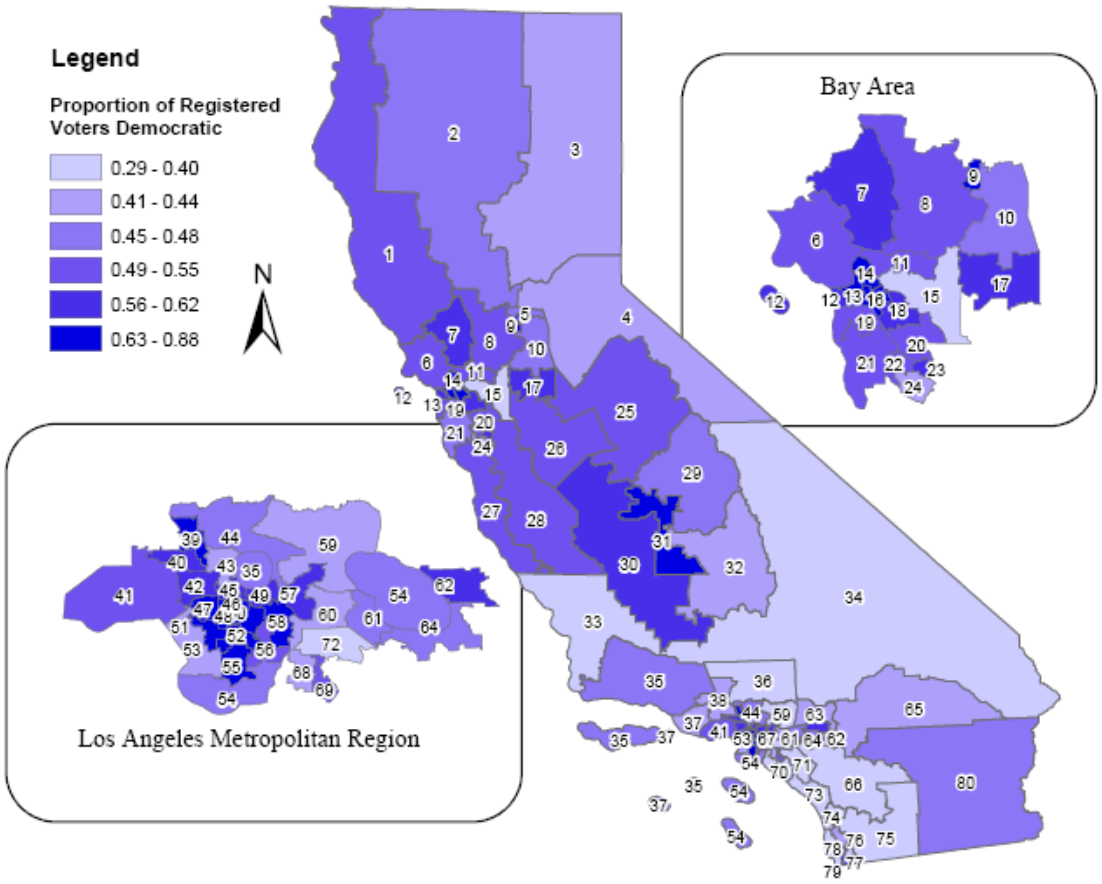
	Allocation to Company Stock					Observed Difference
	(Low) 1	2	3	4	5 (High)	(5 − 1)
Allocation to company stock as a percentage of discretionary contributions	4.59%	12.19%	19.34%	31.85%	53.90%	49.41%
One-year returns	6.64	6.55	1.27	−1.03	0.13	−6.77
Two-year returns	43.69	40.78	38.24	43.33	31.92	−11.77

- Possible Explanation? Ambiguity aversion
  - **Ellsberg (1961)** paradox:
  - Investors that are ambiguity-averse prefer:
    * Investment with known distribution of returns
    * To investment with unknown distribution
  - This occurs even if the average returns are the same for the two investments, and despite the benefits of diversification.

7 Menu Effects: Preference for Salient

- What happens with large set of options if decision-maker uninformed?
- Possibly use of irrelevant, but salient, information to choose
- **Ho-Imai (2004).** Order of candidates on a ballot
  - Exploit randomization of ballot order in California
  - Years: 1978-2002, Data: 80 Assembly Districts
- Notice: Similar studies go back to **Bain-Hecock** (1957)

- Areas of randomization



- Use of randomized alphabet to determine first candidate on ballot

Year	Election	Randomized Alphabet
1982	Primary	S C X D Q G W R V Y U A N H L P B K J I E T O M F Z
	General	L S N D X A M W V T O F I B K Y U P E Q C J Z H R G
1983	Consolidated	L C P K I A U G Z O N B X D W H E M F V R S T Y Q J
1984	Primary	W M F B Q Y T D J U O V I K R H S N P C A E L Z G X
	General	V W I H R Q G J O M T S Y C A F U X K B P E Z N D L
1986	General	Q N H U B J E G M V L W X C K O F D Z R Y I T S P A
1988	Primary	W O K N Q A V T H J F Z L B U D Y M I R G C E S X P
	General	S W F M K J U Y A T V G O N Q B D E P L Z C I X R H
1990	Primary	E J B Y Q F K M O V X L N Z C W A P R D G T H I S U
	General	W F C L D I N J H V K O S A R E Q B T M Y U G Z X P
1992	Primary	U R F A J C D N M K P Z Y X G W O H E B I S V L Q T
	General	F Y U A J S B Z G O E Q R L I M H V N T P D K X C W
1994	Primary	K J H G A M I Q U N C Z S W V R P Y B L O T D F E X
	General	V I A E M S O K L B G N W Y D P U F Z Q J X C R H T
1996	Primary	G E F C Y P D B Z I V A U S M L H K N T O J Q R X W
	General	J Y E P A U S Q B H T R K N L X F D O G M W I Z C V
1998	Primary	L W U J X K C N D O Q A P T Z R Y F E V B H G I M S
	General	W K D N V A G P Y C Z I S T L J X Q O F H R B U M E
2000	Primary	O P C Y I H X Z V R S Q E K L G D W J U T M B F A N
	General	I T F G J S W R N M K U Y L D C Q A H X O E B V P Z
2002	Primary	W I Z C O M A Q U K X E B Y N P T R L V S J H D F G
	General	H M V P E B Q U G N D K X Z J A W Y C O S F I T R L
2003	Recall	R W Q O J M V A H B S G Z X N T C I E K U P D Y F L

Table 1: Randomized Alphabets Used for the California Statewide Elections Since 1982.

- Observe each candidate in different orders in different districts

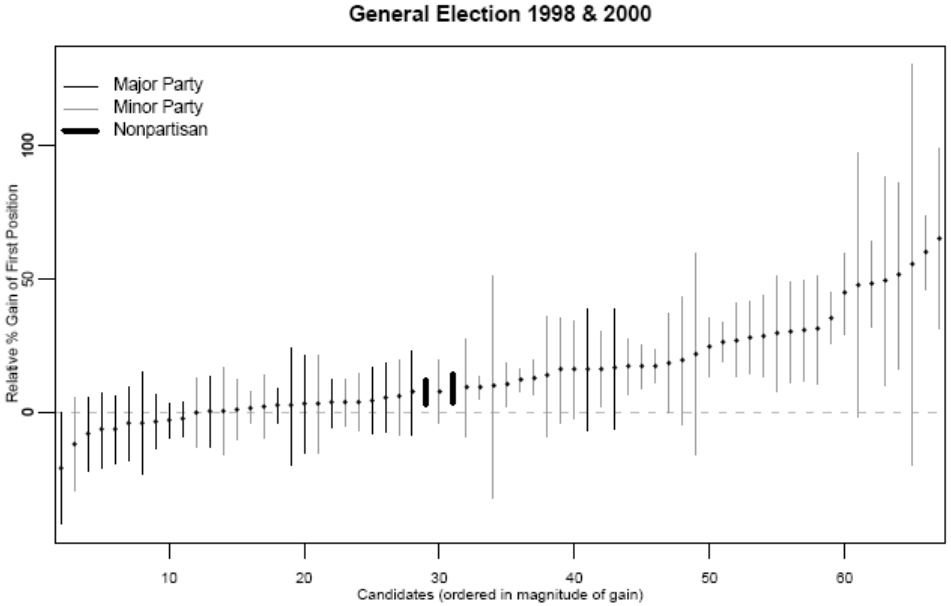
- Compute absolute vote (Y) gain

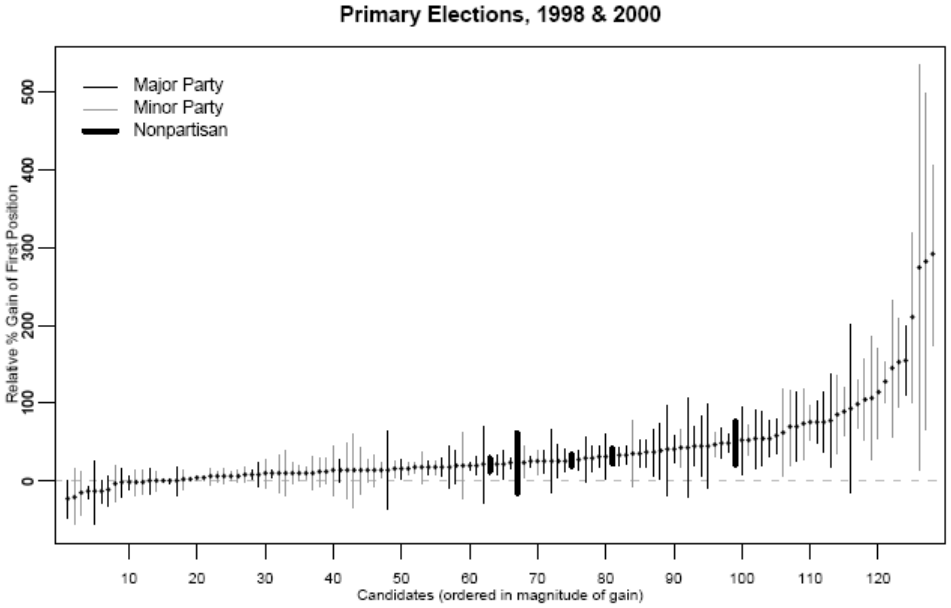
$$E\left[Y\left(i=1\right)-Y\left(i\neq 1\right)\right]$$

  and percentage vote gain

$$E\left[Y\left(i=1\right)-Y\left(i\neq 1\right)\right]/E\left[Y\left(i\neq 1\right)\right]$$

- Result:
  - Small to no effect for major candidates
  - Large effects on minor candidates


General Election 1998 & 2000
Major Party
Minor Party
Nonpartisan
Relative % Gain of First Position
0
50
100
10
20
30
40
50
60
Candidates (ordered in magnitude of gain)


Primary Elections, 1998 & 2000
Major Party
Minor Party
Nonpartisan
Relative % Gain of First Position
0
100
200
300
400
500
10
20
30
40
50
60
70
80
90
100
110
120
Candidates (ordered in magnitude of gain)

	General				Primary			
	Absolute		Relative		Absolute		Relative	
	ATE	SE	ATE	SE	ATE	SE	ATE	SE
Democratic	0.05	0.46	0.25	0.90	1.89	0.32	43.58	5.53
Republican	-0.06	0.53	-0.43	1.29	2.16	0.46	33.62	5.91
American Independent	0.16	0.02	20.83	1.39	2.33	0.15	26.76	3.55
Green	0.56	0.17	21.18	5.82	3.15	1.16	6.24	3.54
Libertarian	0.23	0.02	14.56	1.03	6.59	1.42	71.92	13.55
Natural Law	0.31	0.06	26.13	2.85	0.40	0.08	44.78	5.45
Peace and Freedom	0.28	0.03	25.49	2.15	6.31	0.53	14.75	1.43
Reform	0.26	0.07	19.57	2.23	4.11	1.56	48.45	9.66
Nonpartisan	1.95	0.30	9.21	3.31	3.44	0.78	19.42	4.05

Table 3: Party-Specific Average Causal Effects of Being Listed in First Position on Ballots Using All Races from 1978 to 2002. ATE and SE represent the average causal effects and their standard errors, respectively. For general and primary elections, the left two columns present the estimates of average absolute gains in terms of the total or party vote, respectively, while the right two columns show those of average relative gains. Each candidate-specific effect is averaged over different races to obtain the overall average effect for each party. In general elections, only minor party and nonpartisan candidates are affected by the ballot order. In primaries, however, the candidates of all parties are affected. The largest effects are found for nonpartisan candidates.

- **Barber-Odean (2004).** Investor with limited attention
  - Stocks in portfolio: Monitor continuously
  - Other stocks: Monitor extreme deviations (*salience*)

- Which stocks to purchase? High-attention (salient) stocks. On days of high attention, stocks have
  - Demand increase
  - No supply increase
  - Increase in net demand

- Heterogeneity:
  - Small investors with limited attention attracted to salient stocks
  - Institutional investors less prone to limited attention

- Market interaction: Small investors are:
  - Net buyers of high-attention stocks
  - Net sellers of low-attention stocks.

- Measure of net buying is Buy-Sell Imbalance:

$$BSI_t = 100 * \frac{\sum_i NetBuy_{i,t} - \sum_i NetSell_{i,t}}{\sum_i NetBuy_{i,t} + \sum_i NetSell_{i,t}}$$

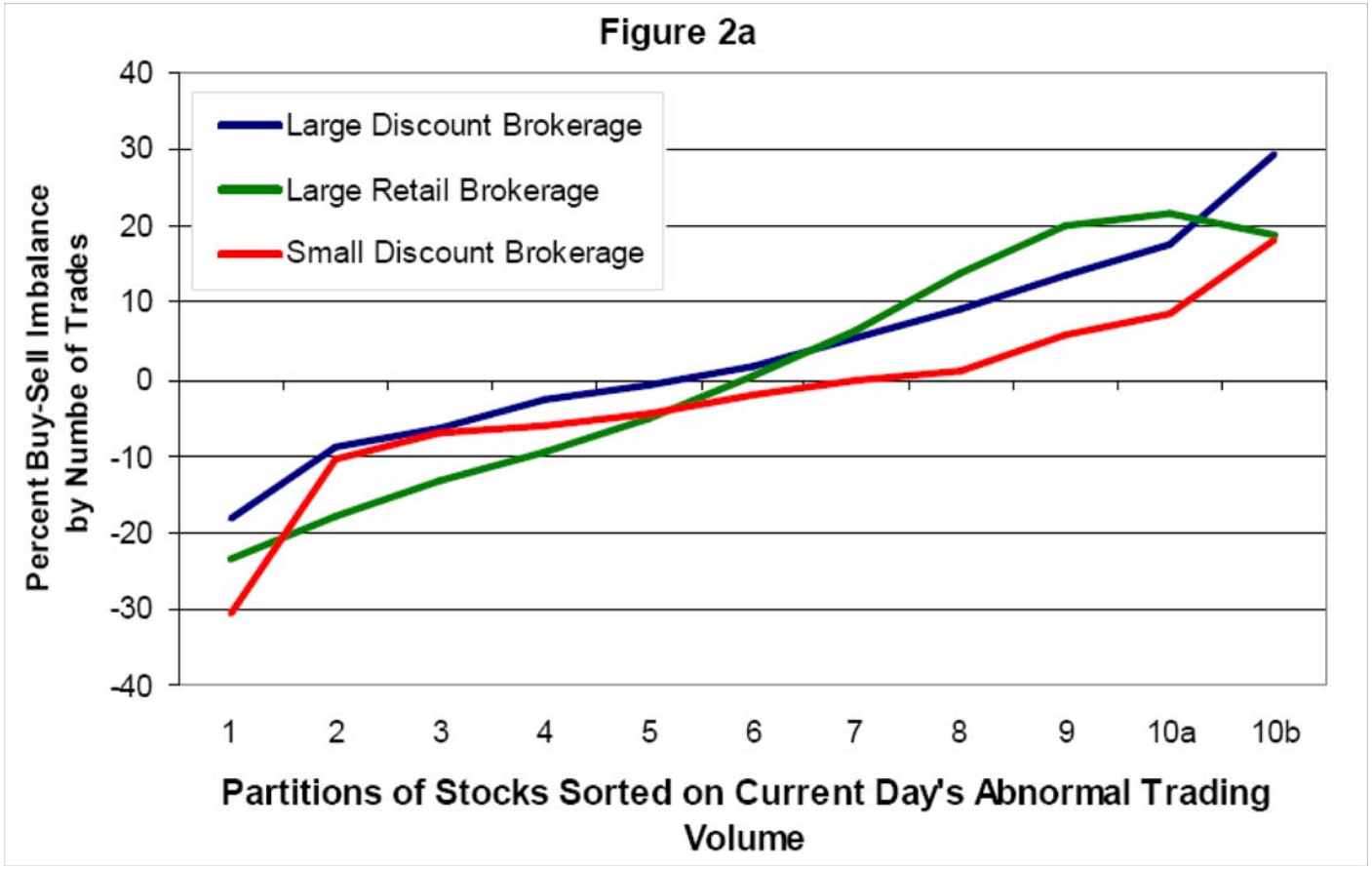
- Notice: Unlike in most financial data sets, here use of individual trading data

- In fact: No obvious prediction on prices

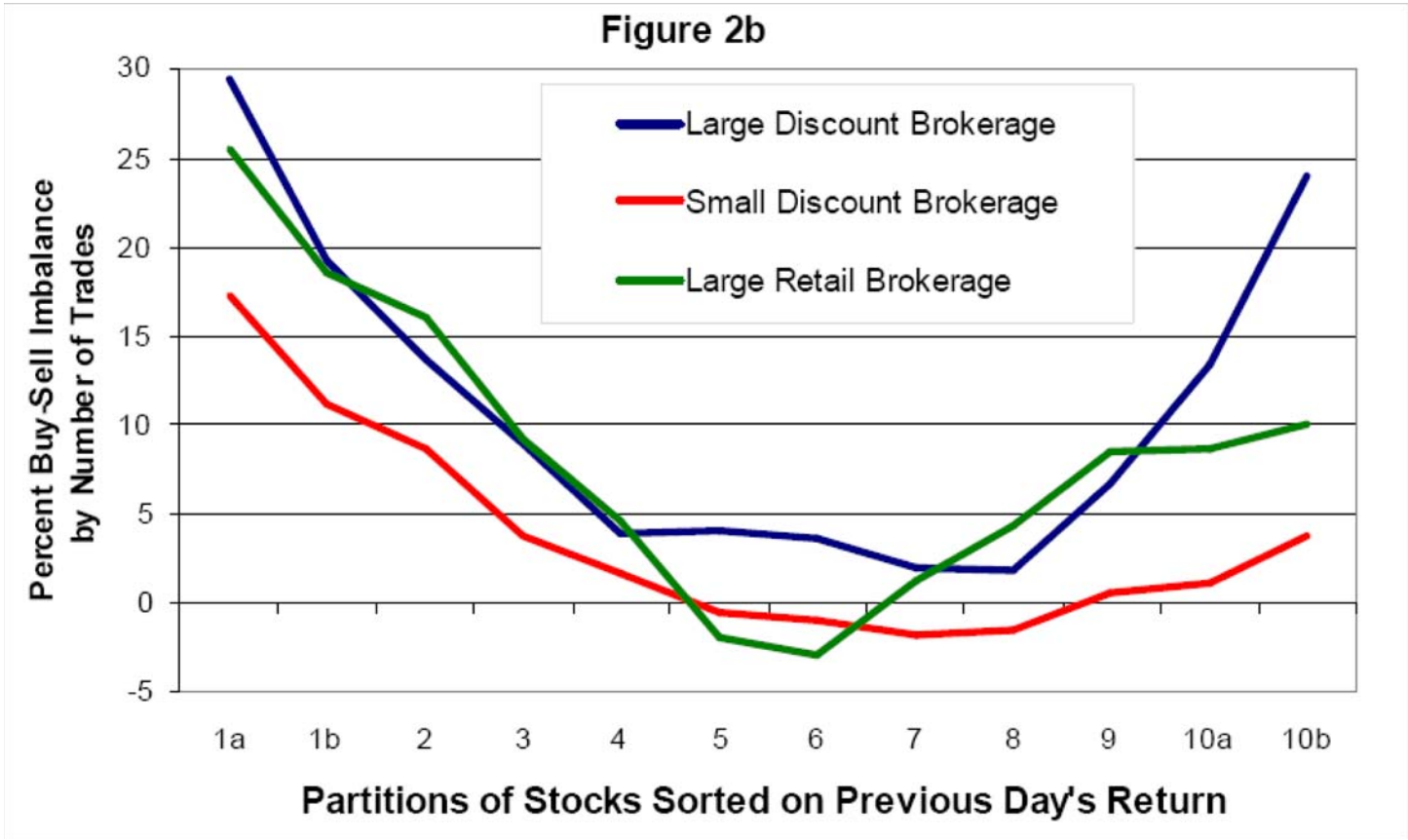
- Measures of attention:
  - same-day (abnormal) volume V_t
  - previous-day return r_{t-1}
  - stock in the news (Using Dow Jones news service)

- Use of sorting methodology
  - Sort variable (V_t, r_{t-1}) and separate into equal-sized bins (in this case, deciles)
    - Example: $V_t^1, V_t^2, V_t^3, ..., V_t^{10a}, V_t^{10b}$
    - (Finer sorting at the top to capture top 5 percent)
  - Classical approach in finance
  - Benefit: Measures variables in a non-parametric way
  - Cost: Loses some information and magnitude of variable

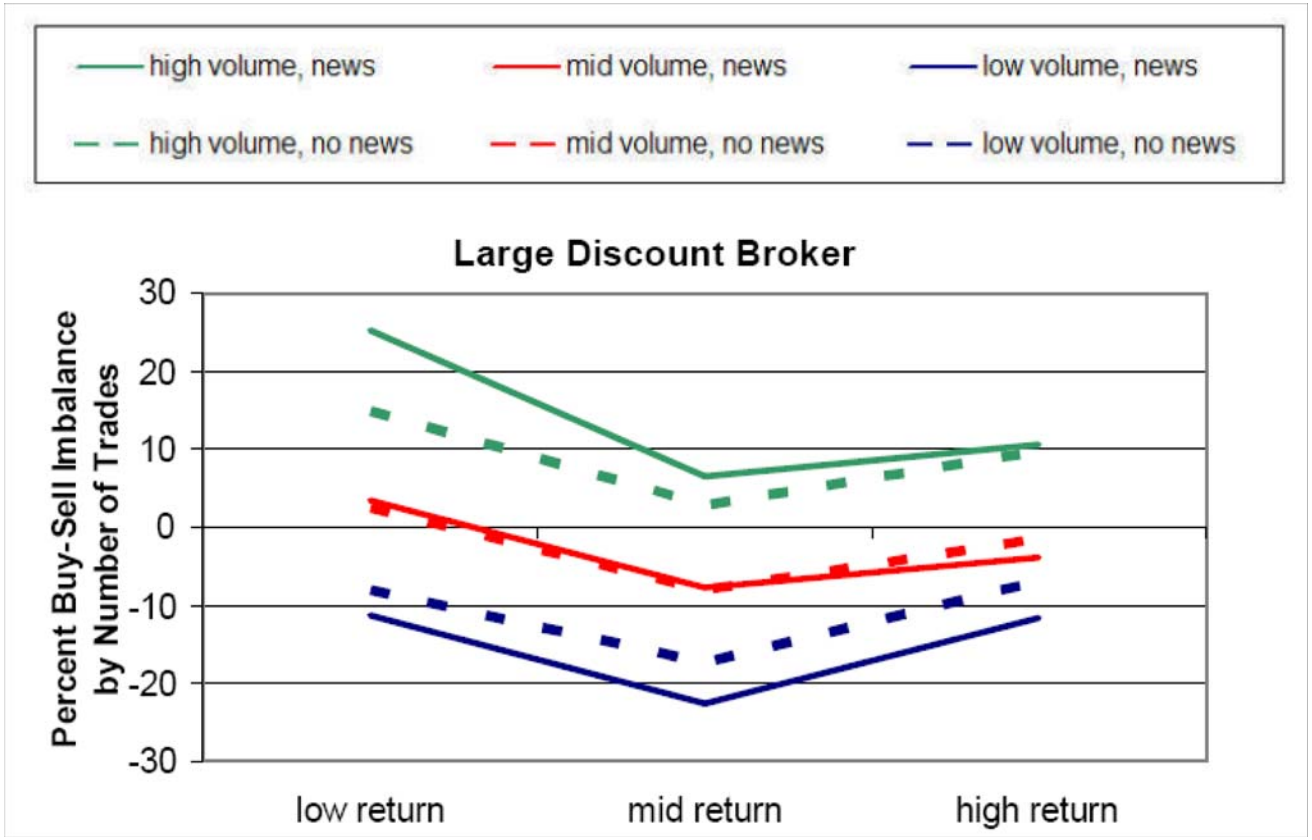
- Effect of same-day (abnormal) volume V_t monotonic (Volume captures 'attention')



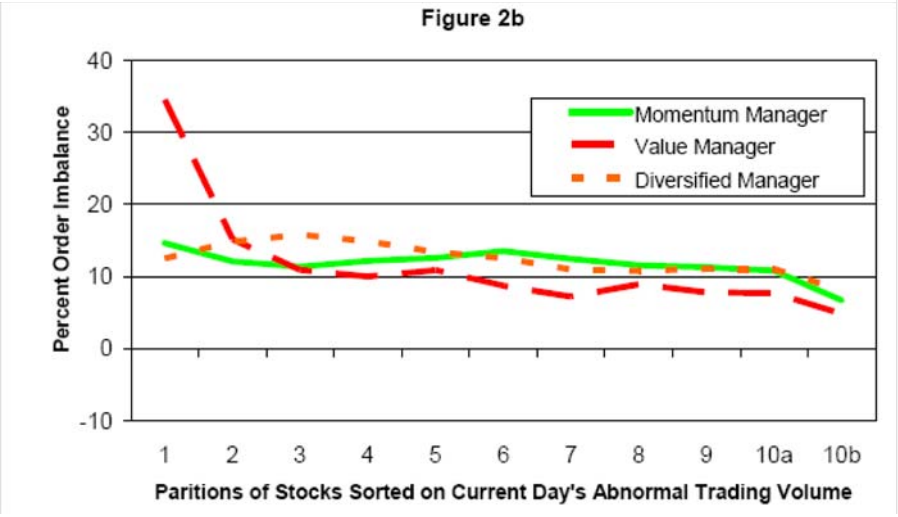
- Effect of previous-day return r_{t-1} U-shaped
  (Large returns—positive or negative—attract attention)

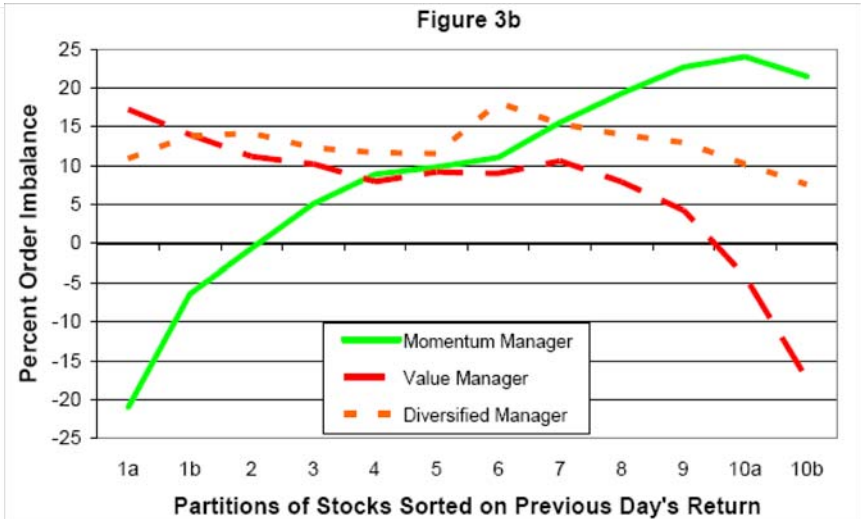


- Notice: Pattern is consistent across different data sets of investor trading
- Figures 2a and 2b are 'univariate' — Figure 3 is 'multivariate'



- Patterns are the opposite for institutional investors (Fund managers)





- Alternative interpretations of results:
- Small investors own few stocks, face short-selling constraints
- (To sell a stock you do not own you need to borrow it first, then you sell it, and then you need to buy it back at end of lending period)
- If new information about the stock:
  - buy if positive news
  - do nothing otherwise
- If no new information about the stock:
  - no trade
- Large investors are not constrained

- Study pattern for stocks that investors already own

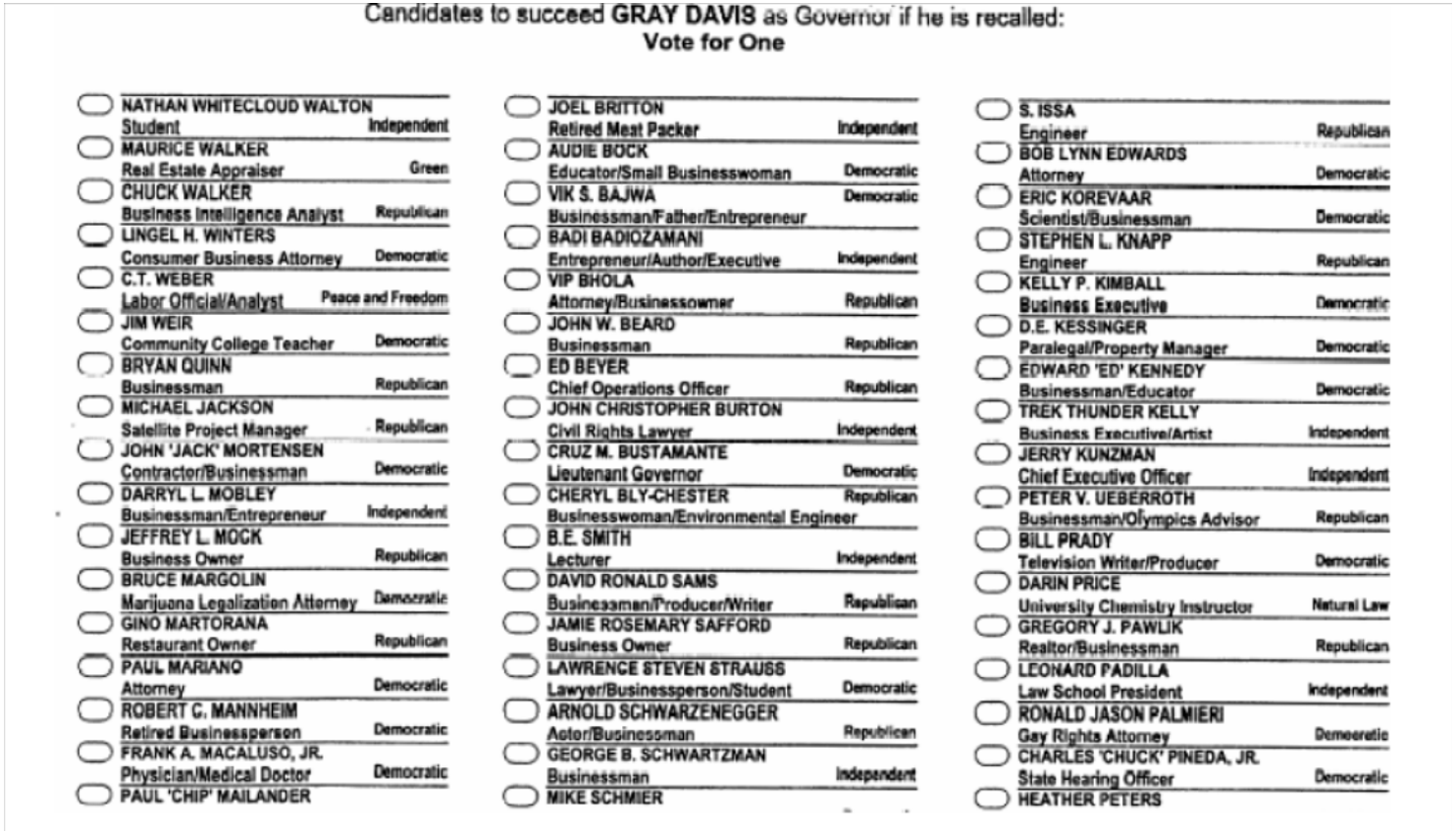
Panel A: Buy-sell imbalance for Stocks Already Owned Sorted on Current Day's Abnormal Trading Volume.

	Large Discount Brokerage		Large Retail Brokerage		Small Discount Brokerage	
Decile	Number Imbalance	Value Imbalance	Number Imbalance	Value Imbalance	Number Imbalance	Value Imbalance
1 (lowest volume)	-54.22	-55.64	-28.74	-33.99	-24.25	-33.22
	(1.43)	(1.89)	(1.42)	(1.84)	(6.28)	(7.58)
2	-51.13	-53.20	-29.46	-34.09	-33.80	-29.67
	(0.78)	(1.07)	(1.09)	(1.36)	(3.18)	(4.47)
3	-48.27	-49.69	-29.54	-31.25	-31.76	-30.05
	(0.64)	(0.95)	(1.04)	(1.31)	(1.71)	(2.44)
4	-47.19	-49.51	-28.69	-32.96	-35.65	-33.93
	(0.56)	(0.88)	(0.94)	(1.11)	(1.26)	(1.96)
5	-45.95	-47.59	-26.71	-31.04	-32.34	-30.01
	(0.53)	(0.81)	(0.90)	(1.07)	(1.12)	(1.63)
6	-45.01	-48.65	-24.32	-29.71	-30.00	-26.50
	(0.49)	(0.71)	(0.90)	(1.04)	(0.97)	(1.42)
7	-42.36	-45.85	-21.83	-30.29	-29.85	-26.21
	(0.50)	(0.71)	(0.84)	(0.89)	(0.95)	(1.33)
8	-39.43	-43.75	-18.72	-27.21	-28.20	-26.23
	(0.51)	(0.71)	(0.81)	(0.87)	(0.87)	(1.22)
9	-35.64	-40.68	-15.45	-21.79	-27.07	-24.99
	(0.52)	(0.70)	(0.78)	(0.91)	(0.85)	(1.21)
10a	-33.03	-39.31	-12.27	-19.97	-26.81	-27.99
	(0.63)	(0.85)	(0.97)	(1.12)	(1.06)	(1.42)
10b (highest volume)	-24.97	-32.82	-15.01	-20.04	-17.32	-19.38
	(0.69)	(0.92)	(1.04)	(1.19)	(0.98)	(1.42)

8 Menu Effects: Confusion

- Previous heuristics reflect preference to avoid difficult choices or for salient options
- Confusion is simply an error in the implementation of the preferences
- Different from most behavioral phenomena which are directional biases
- How common is it?
- Application 1. **Shue-Luttmer (2007)**
  - Choice of a political candidate among those in a ballot
  - California voters in the 2003 recall elections

- Do people vote for the candidate they did not mean to vote for?



Candidates to succeed **GRAY DAVIS** as Governor if he is recalled:
Vote for One

NATHAN WHITECLOUD WALTON Student	Independent	
MAURICE WALKER Real Estate Appraiser	Green	
CHUCK WALKER Business Intelligence Analyst	Republican	
LINGEL H. WINTERS Consumer Business Attorney	Democratic	
C.T. WEBER Labor Official/Analyst	Peace and Freedom	
JIM WEIR Community College Teacher	Democratic	
BRYAN QUINN Businessman	Republican	
MICHAEL JACKSON Satellite Project Manager	Republican	
JOHN 'JACK' MORTENSEN Contractor/Businessman	Democratic	
DARRYL L. MOBLEY Businessman/Entrepreneur	Independent	
JEFFREY L. MOCK Business Owner	Republican	
BRUCE MARGOLIN Marijuana Legalization Attorney	Democratic	
GINO MARTORANA Restaurant Owner	Republican	
PAUL MARIANO Attorney	Democratic	
ROBERT C. MANNHEIM Retired Businessperson	Democratic	
FRANK A. MACALUSO, JR. Physician/Medical Doctor	Democratic	
PAUL 'CHIP' MAILANDER		

JOEL BRITTON Retired Meat Packer	Independent	
AUDIE BOCK Educator/Small Businesswoman	Democratic	
VIK S. BAJWA Businessman/Father/Entrepreneur	Democratic	
BADI BADIOZAMANI Entrepreneur/Author/Executive	Independent	
VIP BHOLA Attorney/Businessowner	Republican	
JOHN W. BEARD Businessman	Republican	
ED BEYER Chief Operations Officer	Republican	
JOHN CHRISTOPHER BURTON Civil Rights Lawyer	Independent	
CRUZ M. BUSTAMANTE Lieutenant Governor	Democratic	
CHERYL BLY-CHESTER Businesswoman/Environmental Engineer	Republican	
B.E. SMITH Lecturer	Independent	
DAVID RONALD SAMS Businessman/Producer/Writer	Republican	
JAMIE ROSEMARY SAFFORD Business Owner	Republican	
LAWRENCE STEVEN STRAUSS Lawyer/Businessperson/Student	Democratic	
ARNOLD SCHWARZENEGGER Actor/Businessman	Republican	
GEORGE B. SCHWARTZMAN Businessman	Independent	
MIKE SCHMIER		

S. ISSA Engineer	Republican	
BOB LYNN EDWARDS Attorney	Democratic	
ERIC KOREVAAR Scientist/Businessman	Democratic	
STEPHEN L. KNAPP Engineer	Republican	
KELLY P. KIMBALL Business Executive	Democratic	
D.E. KESSINGER Paralegal/Property Manager	Democratic	
EDWARD 'ED' KENNEDY Businessman/Educator	Democratic	
TREK THUNDER KELLY Business Executive/Artist	Independent	
JERRY KUNZMAN Chief Executive Officer	Independent	
PETER V. UEBERROTH Businessman/Olympics Advisor	Republican	
BILL PRADY Television Writer/Producer	Democratic	
DARIN PRICE University Chemistry Instructor	Natural Law	
GREGORY J. PAWLIK Realtor/Businessman	Republican	
LEONARD PADILLA Law School President	Independent	
RONALD JASON PALMIERI Gay Rights Attorney	Democratic	
CHARLES 'CHUCK' PINEDA, JR. State Hearing Officer	Democratic	
HEATHER PETERS		

County of Sacramento
Statewide Special Election
October 7, 2003

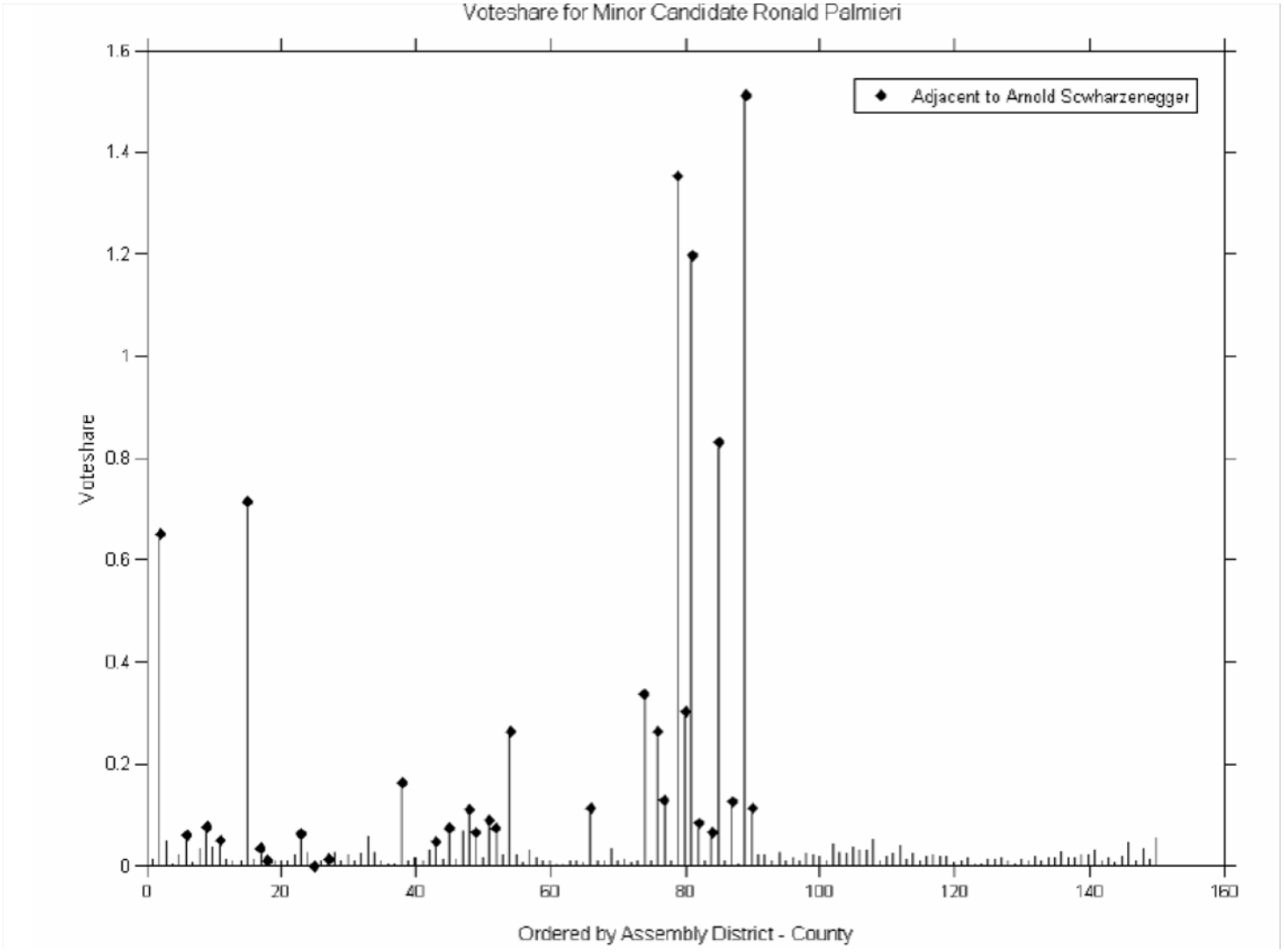
Candidates Continued / Candidatos Continúa

54	**ANGELYNE**, Independent Entertainer/Artista
55	**DOUGLAS ANDERSON**, Republican Mortgage Broker/Agente hipotecario
56	**IRIS ADAM**, Natural Law Business Analyst/Analista empresarial
57	**BROOKE ADAMS**, Independent Business Executive/Ejecutiva de empresa
58	**ALEX-ST. JAMES**, Republican Public Policy Strategist/Estratega de política pública
59	**JIM HOFFMANN**, Republican Teacher/Maestro
60	**KEN HAMIDI**, Libertarian State Tax Officer/Funcionario impositivo estatal
61	**SARA ANN HANLON**, Independent Businesswoman/Mujer de negocios
62	**IVAN A. HALL**, Green Custom Denture Manufacturer/Fabricante de dentaduras postizas a medida
63	**JOHN J. "JACK" HICKEY**, Libertarian Healthcare District Director/Director de distrito de atención de la salud
64	**RALPH A. HERNANDEZ**, Democratic District Attorney Inspector/Inspector de fiscalía
65	**C. STEPHEN HENDERSON**, Independent Teacher/Maestro
66	**ARIANNA HUFFINGTON**, Independent Author/Columnist/Mother/Escritora/columnista/madre
67	**ART BROWN**, Democratic Film Writer/Director/Guionista y director de cine
68	**JOEL BRITTON**, Independent Retired Meat Packer/Empacador de carne jubilado
69	**AUDIE BOCK**, Democratic Educator/Small Businesswoman/Educadora/propietaria de pequeña empresa
70	**VIK S. BAJWA**, Democratic Businessman/Father/Entrepreneur/Hombre de negocios/padre/empresario
71	**BADI BADIOZAMANI**, Independent Entrepreneur/Author/Executive/Empresario/escritor/ejecutivo
72	**VIP BHOLA**, Republican Attorney/Businessowner/Abogado/propietario de empresa
73	**JOHN W. BEARD**, Republican Businessman/Hombre de negocios
74	**ED BEYER**, Republican Chief Operations Officer/Funcionario principal de operaciones
75	**JOHN CHRISTOPHER BURTON**, Independent Civil Rights Lawyer/Abogado de derechos civiles
76	**CRUZ M. BUSTAMANTE**, Democratic Lieutenant Governor/Vicegobernador
77	**CHERYL BLY-CHESTER**, Republican Businesswoman/Environmental Engineer/Mujer de negocios/ingeniera ambiental
78	**B.E. SMITH**, Independent Lecturer/Conferencista

Candidate listing continues on next page /
La lista de candidatos continúa en la página siguiente →

1 ☐	27 ☐	53 ☐	79 ☐	105 ☐	131 ☐	157 ☐	183 ☐	209 ☐	235 ☐	261 ☐	287 ☐
2 ☐	28 ☐	54 ☐	80 ☐	106 ☐	132 ☐	158 ☐	184 ☐	210 ☐	236 ☐	262 ☐	288 ☐
3 ☐	29 ☐	55 ☐	81 ☐	107 ☐	133 ☐	159 ☐	185 ☐	211 ☐	237 ☐	263 ☐	289 ☐
4 ☐	30 ☐	56 ☐	82 ☐	108 ☐	134 ☐	160 ☐	186 ☐	212 ☐	238 ☐	264 ☐	290 ☐
5 ☐	31 ☐	57 ☐	83 ☐	109 ☐	135 ☐	161 ☐	187 ☐	213 ☐	239 ☐	265 ☐	291 ☐
6 ☐	32 ☐	58 ☐	84 ☐	110 ☐	136 ☐	162 ☐	188 ☐	214 ☐	240 ☐	266 ☐	292 ☐
7 ☐	33 ☐	59 ☐	85 ☐	111 ☐	137 ☐	163 ☐	189 ☐	215 ☐	241 ☐	267 ☐	293 ☐
8 ☐	34 ☐	60 ☐	86 ☐	112 ☐	138 ☐	164 ☐	190 ☐	216 ☐	242 ☐	268 ☐	294 ☐
9 ☐	35 ☐	61 ☐	87 ☐	113 ☐	139 ☐	165 ☐	191 ☐	217 ☐	243 ☐	269 ☐	295 ☐
10 ☐	36 ☐	62 ☐	88 ☐	114 ☐	140 ☐	166 ☐	192 ☐	218 ☐	244 ☐	270 ☐	296 ☐
11 ☐	37 ☐	63 ☐	89 ☐	115 ☐	141 ☐	167 ☐	193 ☐	219 ☐	245 ☐	271 ☐	297 ☐
12 ☐	38 ☐	64 ☐	90 ☐	116 ☐	142 ☐	168 ☐	194 ☐	220 ☐	246 ☐	272 ☐	298 ☐
13 ☐	39 ☐	65 ☐	91 ☐	117 ☐	143 ☐	169 ☐	195 ☐	221 ☐	247 ☐	273 ☐	299 ☐
14 ☐	40 ☐	66 ☐	92 ☐	118 ☐	144 ☐	170 ☐	196 ☐	222 ☐	248 ☐	274 ☐	300 ☐
15 ☐	41 ☐	67 ☐	93 ☐	119 ☐	145 ☐	171 ☐	197 ☐	223 ☐	249 ☐	275 ☐	301 ☐
16 ☐	42 ☐	68 ☐	94 ☐	120 ☐	146 ☐	172 ☐	198 ☐	224 ☐	250 ☐	276 ☐	302 ☐
17 ☐	43 ☐	69 ☐	95 ☐	121 ☐	147 ☐	173 ☐	199 ☐	225 ☐	251 ☐	277 ☐	303 ☐
18 ☐	44 ☐	70 ☐	96 ☐	122 ☐	148 ☐	174 ☐	200 ☐	226 ☐	252 ☐	278 ☐	304 ☐
19 ☐	45 ☐	71 ☐	97 ☐	123 ☐	149 ☐	175 ☐	201 ☐	227 ☐	253 ☐	279 ☐	305 ☐
20 ☐	46 ☐	72 ☐	98 ☐	124 ☐	150 ☐	176 ☐	202 ☐	228 ☐	254 ☐	280 ☐	306 ☐
21 ☐	47 ☐	73 ☐	99 ☐	125 ☐	151 ☐	177 ☐	203 ☐	229 ☐	255 ☐	281 ☐	307 ☐
22 ☐	48 ☐	74 ☐	100 ☐	126 ☐	152 ☐	178 ☐	204 ☐	230 ☐	256 ☐	282 ☐	308 ☐
23	49	75	101	127	153	179	205	231	257	283	309

- Design:
  - Exploit closeness on ballot
  - Exploit specific features of closeness
  - Exploit random variation in placement of candidates on the ballot (as in Ho-Imai)
- First evidence: Can this matter?
- If so, it should affect most minor party candidates


Voteshare for Minor Candidate Ronald Palmieri
Adjacent to Arnold Scwharzenegger
Voteshare
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
120
140
160
Ordered by Assembly District - County

- Model:
  - Share β_1 of voters meaning to vote for major candidate j vote for neighboring candidate i
  - Estimate β_1 by comparing voting for i when close to j and when far from j
  - Notice: The impact depends on vote share of j
  - Specification:

$$VoteShare_i = \beta_0 + \beta_1 * VSAdjacent_j + Controls + \varepsilon$$

  - Rich set of fixed effects, so identify off changes in order

Table 2: Primary Results

Dependent Variable: *Voteshare* = (votes / total votes)×100	(1)	(2)	(3)
Adjacent	0.104** (0.018)		
Adjacent* × *Schwarzenegger		0.088** (0.025)	
Adjacent* × *Bustamante		0.143** (0.025)	
Adjacent* × *McClintock		0.107* (0.045)	
Adjacent Dummy			0.037** (0.006)
Observations	1,817,904	1,817,904	1,817,904
R-Squared	0.8676	0.8676	0.8676

- Results:
  - 1 in 1,000 voters vote for adjacent candidate
  - Difference in error rate by candidate (see below)
  - Notice: Each candidate has 2.5 adjacent candidates –> Total misvoting is 1 in 400 voters

- Interpretations:

  1. Limited Attention: Candidates near major candidate get reminded in my memory

  2. Trembling Hand: Pure error

- To distinguish, go back to structure of ballot.

  – Much more likely to fill-in the bubble on right side than on left side if (2)

  – No difference if (1)

Table 3: Robustness Checks

Dependent Variable: *Voteshare* = (votes / total votes)×100	(1)	(2)	(3)	(4)	(5)	(6)
Adjacent	0.082**			0.104**	0.113**	
	(0.027)			(0.018)	(0.018)	
Adjacent Dummy	0.010					
	(0.007)					
Adjacent Dummy × CA Voteshare		0.112**				
		(0.019)				
North Adjacent			0.082**			0.082**
			(0.022)			(0.022)
South Adjacent			0.111**			0.111**
			(0.033)			(0.033)
East Adjacent			0.143**			
			(0.035)			
West Adjacent			0.038**			
			(0.011)			
Diagonally Adjacent				0.002		
				(0.003)		
Punchcard Adjacent					0.030+	
					(0.018)	
Horizontally Adjacent						0.031**
						(0.008)
Horizontally Adjacent × Confusing Side						0.123**
						(0.038)
Observations	1,817,904	1,817,904	1,817,904	1,817,904	1,817,904	1,817,904
R-Squared	0.8676	0.8676	0.8677	0.8676	0.8677	0.8677

- Effect is mostly due to Trembling hand / Confusion

- Additional results:

  – Spill-over of votes larger for more confusing voting methods (such as punch-cards)

Table 7: Interactions with Voting Technology

Dependent Variable: *Voteshare* = (votes / total votes)×100	(1)	(2)	(3)	(4)
Adjacent* × *punch card	0.197**	0.200**		
	(0.020)	(0.019)		
Adjacent* × *optical scan	0.100**	0.108**		
	(0.020)	(0.019)		
Adjacent* × *touch screen	0.065**	0.067**		
	(0.016)	(0.015)		

- – Spill-over of votes larger for precincts with a larger share of lower-education demographics –> more likely to make errors when faced with large number of option

Table 4: Overall Effect of Precinct Demographic Ch

Dependent Variable: *Voteshare* = (votes / total votes)×100	(1)	(2)	(3)
Adjacent	0.6368**	0.0544**	0.3353**
	(0.1012)	(0.0162)	(0.0467)
Adjacent* × *% HS Graduates	-0.0062**		
	(0.0013)		
Adjacent* × *% College Graduates	-0.0056**		
	(0.0010)		

- This implies (small) aggregate effect: confusion has a different prevalence among the voters of different major candidates

- **Rashes (JF, 2001)** Similar issue of confusion for investor choice

- Two companies:
  - Major telephone company MCI (Ticker MCIC)
  - Small investment company (ticker MCI)
  - Investors may confuse them
  - MCIC is much bigger –> this affects trading of company MCI

Summary Statistics

Daily return and volume information is shown for Massmutual Corporate Investors fund (MCI), MCI Communications (MCIC), and AT&T (T) for the sample period 11/21/94–11/13/97. The return for security j is expressed in percentages and defined as $\text{Log}[(P_{j,t+1} + D_{j,t+1})/P_{j,t}]$, where $P_{j,t}$ and $D_{j,t}$ are the price and dividend, respectively, for security j on day t.

	Mean (Return)	*SD* (Return)	Mean (Volume)	*SD* (Volume)	Mean (Price)
MCI	0.078	0.7136	4,155	4,497	36.14
MCIC	0.087	2.3645	4.154×10^6	4.713×10^6	28.07
T	0.055	1.6440	4.810×10^6	2.837×10^6	38.64

- Check correlation of volume (Table III)
  - High correlation
  - What if two stocks have similar underlying fundamentals?
  - No correlation of MCI with another telephone company (AT&T)

Table III

Daily Volume Correlation Coefficient Matrices

This table presents the correlation of daily volumes between Massmutual Corporate Investors fund (MCI), MCI Communications (MCIC), AT&T (T) and the New York Stock Exchange Composite Index (NYSE). The pairwise Pearson product-moment correlations are shown with the standard error of these coefficients in parentheses.

	MCI	MCIC	T	NYSE
Panel A: Sample Period 11/21/94–11/13/97				
MCI	1			
MCIC	0.5592	1		
	(0.0302)			
T	0.0291	0.1566	1	
	(0.0364)	(0.0360)		
NYSE	0.1162	0.2817	0.3397	1
	(0.0362)	(0.0350)	(0.0343)	

- Predict returns of smaller company with bigger company (Table IV)

- Returns Regression:

$$r_{MCI,t} = \alpha_0 + \alpha_1 r_{MCIC,t} + \beta X_t + \varepsilon_t$$

Constant	MCIC Return	(MCIC Return) * dummy (MCIC return <0)	T Return	S&P 500 Return	S&P Smallcap Return Residual	Lehman Long Bond Index Return	R^2
Panel A: Sample Period 11/22/94–11/13/97							
0.0956				0.0372	0.1011	0.0932	0.0286
(2.6223)				(0.9370)	(1.9233)	(2.3438)	0.0247
0.0954	0.0862			0.0128	0.1068	0.0905	0.0353
(2.6243)	(2.2779)			(0.3128)	(2.0356)	(2.2818)	0.0301
0.0957	0.0851		0.0171	0.0052	0.1077	0.0907	0.0355
(2.6306)	(2.2430)		(0.4190)	(0.1166)	(2.0501)	(2.2862)	0.0290
0.0721	0.1205	−0.0722		0.0149	0.1070	0.0913	0.0360
(1.5202)	(2.0557)	(−0.7664)		(0.3630)	(2.0375)	(2.3015)	0.0296

- Results:
  - Positive correlation α_1 –> The swings in volume have some impact on prices.
  - Difference between reaction to positive and negative news:

    $$r_{MCI,t} = \alpha_0 + \alpha_1 r_{MCIC,t} + \alpha_2 r_{MCIC,t} * \mathbf{1}\left(r_{MCIC,t} < 0\right) + \beta X_t + \varepsilon_t$$

  - Negative α_2. Effect of arbitrage –> It is much easier to buy by mistake than to short a stock by mistake

- Size of confusion? Use relation in volume.
  - We would like to know the result (as in Luttmer-Shue) of

    $$V_{MCI,t} = \alpha + \beta V_{MCIC,t} + \varepsilon_t$$

- Remember: $\beta = Cov(V_{MCI,t}, V_{MCIC,t})/Var(V_{MCIC,t})$
- We know (Table I)

$$.5595 = \rho_{MCI,MCIC} = \frac{Cov(V_{MCI,t}, V_{MCIC,t})}{\sqrt{Var(V_{MCI,t})Var(V_{MCIC,t})}} =$$

$$= \beta * \frac{\sqrt{Var(V_{MCIC,t})}}{\sqrt{Var(V_{MCI,t})}}$$

- Hence, $\beta = .5595 * \sqrt{Var(V_{MCI,t})}/\sqrt{Var(V_{MCIC,t})} = .5595 * 10^{-3} = 5 * 10^{-4}$
- Hence, the error rate is approximately $5 * 10^{-4}$, that is, 1 in 2000

- Conclusion
  - Deviation from standard model: confusion.
  - Can have an aggregate impact, albeit a small one
  - Can be moderately large for error from common choice to rare choice
  - Other applications: eBay bidding on misspelled names (find cheaper items when looking for 'shavre' [shaver] or 'tyo' [toy]

9 Next Lecture

- Persuasion

- Social Pressure