Econ 219B
Psychology and Economics: Applications
(Lecture 5)

Stefano DellaVigna

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Outline

1. Labor Supply and Reference Dependence II

2. Loss Aversion and Housing

3. Loss Aversion and Experience

4. Five Applications of Reference Dependence

1 Labor Supply and Reference Dependence II

1.1 Camerer et al (1997)

- Issues with labor supply estimation in Camerer:
  1. Division bias in regressing hours on log wages
     - IV wage using other workers' wage (Camerer)
     - Hazard regression on hours and total earnings (Farber)

2. Are the authors really capturing demand shock or supply shock?

   - Consider standard model above

   - Increase in C (rain) $-> e^* \downarrow$ and $w^* \uparrow$

   - Negative correlation between e^* and w^*

   - Standard issue with estimating demand and supply function

   - Econometric issue: Shocks to both demand and supply

   - Illustrate: Graddy, Fulton fish market

3. What determines the reference point R?

   – Camerer et al.: *Daily* target of earning

   – Does it depend on form of payment?

   – More generally: Intended good performance over a short-enough time frame that allows for keeping track of progress

     * Cab drivers?

     * Stadium vendors?

     * Education?

     * Charitable contributions?

     * Unemployed people

1.2 Oettinger (1999)

- Stadium vendors participation decision
- No data on within-day effort measure
- Data on supply decision across days
- 127 vendors in 81 games
- Observation of:
  - earnings per match
  - vendor participation

- Standard theory:
  - On low-demand games fewer vendors show up
  - Show up on high-demand days
- Model with reference dependence:
  - Same!
  - If framing over homestands, more refined test
- Results. Table 5:
  - OLS estimates
  - 2SLS estimates

TABLE 4

ESTIMATES OF REDUCED-FORM LOG EARNINGS EQUATION

	Definition of Active Status			
	Narrow		Broad	
	(1)	(2)	(3)	(4)
	A. Coefficient Estimates and Standard Errors			
Monday–Thursday day game	−.0565	.1435	−.0492	.1550
	(.0689)	(.0477)	(.0672)	(.0428)
Monday–Thursday night game	−.3058	−.0607	−.3095	−.0645
	(.0517)	(.0455)	(.0548)	(.0465)
Friday (night) game	−.0312	.0480	−.0280	.0463
	(.0582)	(.0406)	(.0594)	(.0406)
Saturday (night) game	.1117	.1152	.1091	.1115
	(.0458)	(.0357)	(.0460)	(.0369)
Promotional date	.1550	.0266	.1702	.0393
	(.0533)	(.0342)	(.0565)	(.0375)
Opponent in first place	.0692	−.0556	.0582	−.0602
	(.0658)	(.0490)	(.0640)	(.0503)

Home team games out of first	−.0404	−.0347	−.0305	−.0260
	(.0248)	(.0150)	(.0220)	(.0132)
Daytime high temperature	.0069	.0047	.0106	.0071
	(.0027)	(.0018)	(.0036)	(.0029)
24-hour rainfall > .25 inch	.1242	.1084	.1247	.1086
	(.0643)	(.0470)	(.0685)	(.0469)
Log of attendance	. . .	.5680	. . .	.5600
		(.0606)		(.0635)
Inverse Mills ratio (selectivity correction)	.1736	.1523	.1051	.0818
	(.0715)	(.0712)	(.0669)	(.0656)
	B. χ^2 Statistic p-Values and Degrees of Freedom			
Individual vendor dummies	<.0001	<.0001	<.0001	<.0001
	[125]	[125]	[126]	[126]
Opponent dummies	<.0001	<.0001	<.0001	.0002
	[12]	[12]	[12]	[12]
Observations	3,579	3,579	3,580	3,580
R^2	.650	.670	.649	.669

NOTE.—The estimated covariance matrix allows for an arbitrary error covariance structure across vendors at any given game but assumes independent errors across games, after allowing for vendor fixed effects. One earnings observation is lost under the narrow definition of active status because there is one vendor who participated at only one game, which took place more than 30 days after the date of hire. All the specifications also include as explanatory variables the log of the number of (other) active vendors, the number of games the opposing team is out of first place, and indicators for the season (before Memorial Day or after Labor Day) and for whether the home team was in first place.

TABLE 5

ESTIMATES OF STRUCTURAL PROBIT MODEL FOR PARTICIPATION

	Definition of Active Status			
	Narrow		Broad	
	(1)	(2)	(3)	(4)
	A. Coefficient Estimates and Standard Errors			
Predicted log hourly earnings	.7644	.7282	.6125	.6045
	(.1990)	(.2173)	(.1819)	(.1934)
Monday–Thursday day game	−.6815	−.7347	−.6258	−.6897
	(.1716)	(.1404)	(.1612)	(.1494)
Monday–Thursday night game	.1624	.0638	.1869	.0966
	(.1735)	(.1882)	(.1665)	(.1942)
Friday (night) game	.4105	.3842	.3783	.3629
	(.2094)	(.2111)	(.1803)	(.1901)
Saturday (night) game	.2923	.2927	.2739	.2729
	(.1714)	(.1581)	(.1539)	(.1462)
Opponent in first place	...	.1203	...	.1504
		(.1022)		(.1015)
Home team games out of first	...	−.0173	...	−.0321
		(.0268)		(.0233)

Daytime high temperature	−.0031	.0078	−.0066	.0002
	(.0054)	(.0042)	(.0060)	(.0039)
24-hour rainfall > .25 inch	−.2690	−.0860	−.2500	−.0853
	(.1288)	(.1087)	(.1239)	(.0883)
	B. χ^2 Statistic p-Values and Degrees of Freedom			
Individual vendor dummies	<.0001	<.0001	<.0001	<.0001
	[123]	[123]	[124]	[124]
Opponent dummies	. . .	<.0001	. . .	<.0001
		[12]		[12]
Vendor demographic indicators × day/time/season dummies	<.0001	<.0001	<.0001	<.0001
	[36]	[36]	[36]	[36]
Sample average elasticity of participation with respect to hourly earnings	.568	.546	.757	.759
Elasticity of participation with respect to hourly earnings at covariate sample means	.511	.480	.677	.675
	(.132)	(.143)	(.199)	(.216)
Observations	6,029	6,029	8,601	8,601
Log likelihood	−2,953.1	−2,907.5	−3,319.9	−3,250.9

Note.—The estimated covariance matrix allows for an arbitrary error covariance structure across vendors at any given game but assumes independent errors across games, after allowing for vendor fixed effects. The sample sizes are slightly smaller than the total number of active observations in tables 1 and 2 because the inclusion of vendor fixed effects eliminates vendors who either always participated or never participated. All the specifications include as explanatory variables indicators for the season (before Memorial Day or after Labor Day). The specifications in cols. 2 and 4 also include as explanatory variables the number of games the opposing team is out of first place and an indicator for whether the home team is in first place.

TABLE 6

Estimates of the Aggregate Participation Model

Dependent Variable: Log of Aggregate Participation

	OLS		2SLS		
	(1)	(2)	(3)	(4)	(5)
	Coefficient Estimates and Standard Errors				
Log of average hourly earnings of participating vendors	.2378	.0858	.5346	.6209	.6457
	(.0986)	(.1107)	(.1508)	(.1525)	(.2064)
Monday–Thursday day game	−.3764	−.4024	−.3640	−.3604	−.3997
	(.0650)	(.0596)	(.0692)	(.0718)	(.0724)
Monday–Thursday night game	.0870	−.0086	.1838	.2120	.1587
	(.0594)	(.0580)	(.0723)	(.0742)	(.0847)
Friday (night) game	.1772	.1515	.2040	.2118	.2114
	(.0586)	(.0514)	(.0630)	(.0653)	(.0646)
Saturday (night) game	.0735	.0841	.0408	.0312	.0286
	(.0587)	(.0508)	(.0635)	(.0657)	(.0636)
Opponent in first place	. . .	.0410	. . .	. . .	.0272
		(.0613)			(.0745)
Home team games out of first	. . .	−.0586	. . .	. . .	−.0313
		(.0212)			(.0269)
Daytime high temperature	.0008	.0057	−.0002	−.0005	.0041
	(.0028)	(.0028)	(.0029)	(.0031)	(.0034)
24-hour rainfall > .25 inch	−.1080	.0027	−.1520	−.1648	−.0734
	(.0621)	(.0613)	(.0679)	(.0703)	(.0774)
	Included as Controls?				
Opponent indicators	no	yes	no	no	yes
Measures of team quality	no	yes	no	no	yes
	Exclusion Restrictions (Instruments for Log Earnings)				
Promotional date indicator	. . .	. . .	yes	yes	yes
Log attendance	. . .	. . .	no	yes	yes
Opponent indicators	. . .	. . .	yes	no	no
Measures of team quality	. . .	. . .	yes	no	no
	Overidentification Test				
p-value	. . .	. . .	.060	.021	.400
Degrees of freedom	. . .	. . .	16	1	1
	Test of Joint Significance of Instruments in First Stage of Regression				
p-value	. . .	. . .	.0013	<.0001	<.0001
Degrees of freedom	. . .	. . .	17	2	2
Observations	81	81	81	81	81
R^2	.727	.847	.692	.669	.774

Note.—All the specifications also include as explanatory variables the log of the total number of active vendors and indicators for the season (before Memorial Day or after Labor Day).

1.3 Fehr and Goette (2002)

- Bike Messengers

- Slides courtesy of Lorenz Goette

- Combination of:

  - Field Experiment (clean identification) and

  - Lab Experiment (relate to evidence on loss aversion)...

  - ... on the same subjects

The Experimental Setup in this Study

Bicycle Messengers in Zurich, Switzerland

- Data: Delivery records of Veloblitz and Flash Delivery Services, 1999 - 2000.
  - Contains large number of details on every package delivered.

  ➢ Observe hours (shifts) and effort (revenues per shift).

- Work at the messenger service
  - Messengers are paid a commission rate *w* of their revenues r_{it}. (w = „wage“). Earnings wr_{it}
  - Messengers can freely choose the number of shifts and whether they want to do a delivery, when offered by the dispatcher.

  ➢ suitable setting to test for intertemporal substitution.

- Highly volatile earnings
  - Demand varies strongly between days

  ➢ Familiar with changes in intertemporal incentives.

Experiment 1

- **The Temporary Wage Increase**
  - Messengers were randomly assigned to one of two treatment groups, A or B.
    - N=22 messengers in each group

  - Commission rate w was increased by 25 percent during four weeks
    - Group A: September 2000
      (Control Group: B)
    - Group B: November 2000
      (Control Group: A)

- **Intertemporal Substitution**
  - Wage increase has no (or tiny) income effect.
  - Prediction with time-separable prefernces, t= a day:
    - ➢ Work more shifts
    - ➢ Work harder to obtain higher revenues

  - Comparison between TG and CG during the experiment.
    - Comparison of TG over time confuses two effects.

Results for Hours

- Treatment group works 12 shifts, Control Group works 9 shifts during the four weeks.
- Treatment Group works significantly more shifts ($X^2(1) = 4.57, p<0.05$)
- Implied Elasticity: 0.8

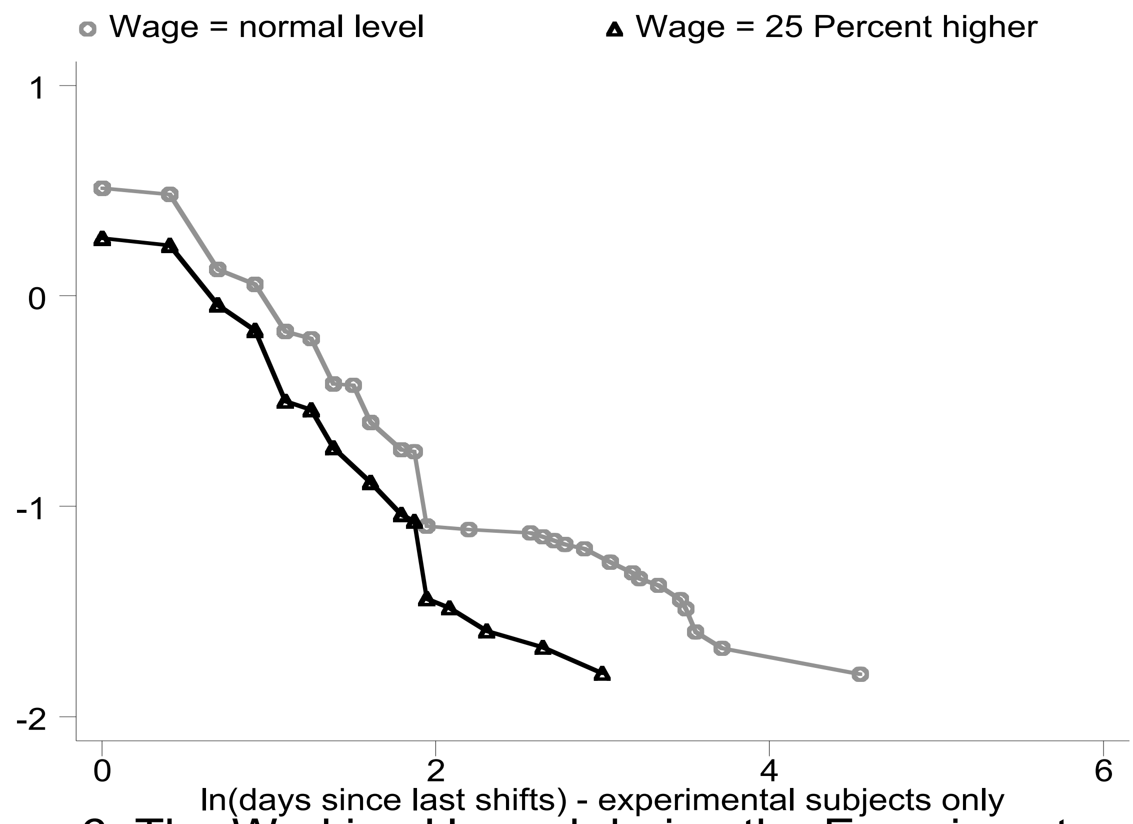
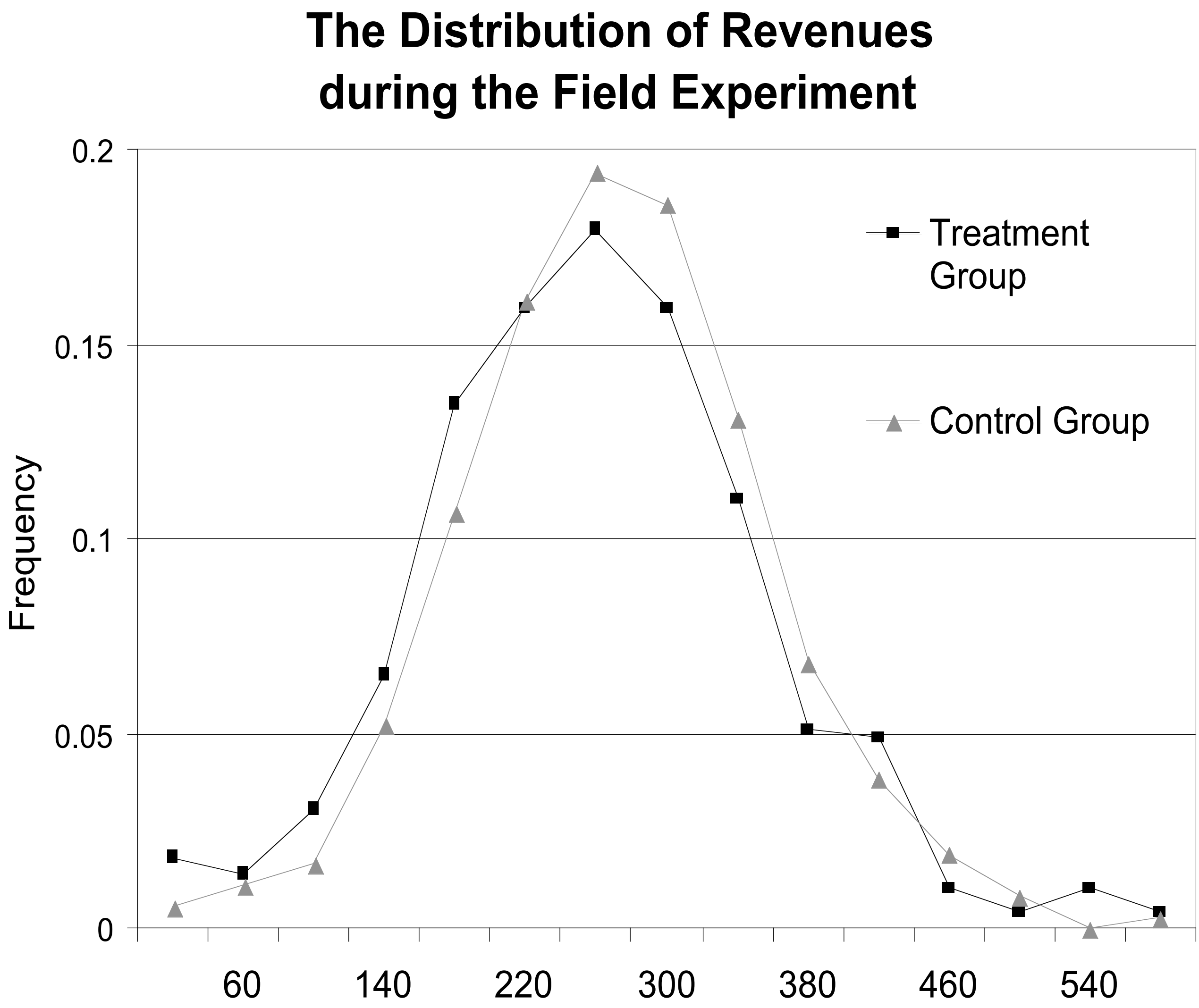


Figure 6: The Working Hazard during the Experiment

Results for Effort: Revenues per shift

- Treatment Group has lower revenues than Control Group: - 6 percent. (*$t = 2.338$, $p < 0.05$*)
- Implied *negative* Elasticity: -0.25



- Distributions are significantly different (KS test; *$p < 0.05$*);

Results for Effort, cont.

- **Important caveat**
  - Do lower revenues relative to control group reflect lower effort or something else?

- **Potential Problem: Selectivity**
  - Example: Experiment induces TG to work on bad days.
  - More generally: Experiment induces TG to work on days with unfavorable states
    - ➢ If unfavorable states raise marginal disutility of work, TG may have lower revenues during field experiment than CG.

- **Correction for Selectivity**
  - Observables that affect marginal disutility of work.
    - ➢ Conditioning on experience profile, messenger fixed effects, daily fixed effects, dummies for previous work **leave result unchanged.**
  - Unobservables that affect marginal disutility of work?
    - Implies that reduction in revenues only stems from sign-up shifts in addition to fixed shifts.
    - ➢ **Significantly lower revenues on fixed shifts, not even different from sign-up shifts.**

Corrections for Selectivity

- **Comparison TG vs. CG without controls**
  - Revenues 6 % lower (s.e.: 2.5%)

- **Controls for daily fixed effects, experience profile, workload during week, gender**
  - Revenues are 7.3 % lower (s.e.: 2 %)

- **+ messenger fixed effects**
  - Revenues are 5.8 % lower (s.e.: 2%)

- **Distinguishing between fixed and sign-up shifts**
  - Revenues are 6.8 percent lower on fixed shifts (s.e.: 2 %)
  - Revenues are 9.4 percent lower on sign-up shifts (s.e.: 5 %)

➢ **Conclusion: Messengers put in less effort**
  - Not due to selectivity.

Measuring Loss Aversion

- **A potential explanation for the results**
  - Messengers have a daily income target in mind
  - They are loss averse around it
  - Wage increase makes it easier to reach income target

  ➢ That's why they put in less effort per shift

- **Experiment 2: Measuring Loss Aversion**
  - Lottery A: Win CHF 8, lose CHF 5 with probability 0.5.
    - 46 % accept the lottery
  - Lottery C: Win CHF 5, lose zero with probability 0.5; or take CHF 2 for sure
    - 72 % accept the lottery
  - Large Literature: Rejection is related to loss aversion.

- **Exploit individual differences in Loss Aversion**
  - Behavior in lotteries used as proxy for loss aversion.

  ➢ Does the proxy predict reduction in effort during experimental wage increase?

Measuring Loss Aversion

- **Does measure of Loss Aversion predict reduction in effort?**
  - Strongly loss averse messengers reduce effort substantially: Revenues are 11 % lower (s.e.: 3 %)
  - Weakly loss averse messenger do not reduce effort noticeably: Revenues are 4 % lower (s.e. 8 %).
  - No difference in the number of shifts worked.

➢ **Strongly loss averse messengers put in less effort while on higher commission rate**

  - Supports model with daily income target

➢ **Others kept working at normal pace, consistent with standard economic model**

  - Shows that not everybody is prone to this judgment bias (but many are)

Concluding Remarks

- **Our evidence does not show that intertemporal substitution in unimportant.**
  - Messenger work more shifts during Experiment 1
  - But they also put in less effort during each shift.

- **Consistent with two competing explanantions**

  - Preferences to spread out workload
    - ➢ But fails to explain results in Experiment 2

  - Daily income target and Loss Aversion
    - ➢ Consistent with Experiment 1 and Experiment 2

    - ➢ Measure of Loss Aversion from Experiment 2 predicts reduction in effort in Experiment 1

    - ➢ Weakly loss averse subjects behave consistently with simplest standard economic model.

    - ➢ Consistent with results from many other studies.

1.4 Final Thoughts

- What identifies the three papers?

- Cab Drivers: Shocks in daily earnings
  - S? D?
  - Have to hope it comes through Demand for cabs

- Stadium vendors: instruments for Demand
  - attendance, quality of opponent

- Bike Messengers: Exogenous variation in prices
  - Randomized variation from field experiment
  - Control for total supply of messengers

2 Loss Aversion and Housing

- Vincent

Vincent Pohl March 2 2005

Loss Aversion and Seller Behavior:

Evidence from the Housing Market

David Genesove and Christopher Mayer

QJE 2001

The Housing Market and Loss Aversion

- Prices and sales volume positively correlated

- Prices and time on market negatively correlated

- Houses sell quickly and at high prices in booms

- In downturns: Prices asked by sellers too high, houses stay in market for long time, often withdrawal

- Possible explanation: Sellers have high reference point (= purchasing price) when selling during downturn → high reservation price → longer time on market

True Model

- Subscripts: i unit, s quarter of previous sale, t quarter of original listing

- Log asking price depends linearly on log selling price and potential loss:

$$L_{ist} = \alpha_0 + \alpha_1 \mu_{it} + mLOSS^*_{ist} + \varepsilon_{it},$$

  where $\mu_{it} = X_i\beta + \delta_t + v_i$ is the expected log selling price, $LOSS^*_{ist} = \max\{P^0_{is} - \mu_{it}, 0\}$ is potential percentage loss, and $P^0_{is} = \mu_{is} + w_{is} = X_i\beta + \delta_s + v_i + w_{is}$ is the previous selling price

- True loss: $LOSS^*_{ist} = \max\{\mu_{is} + w_{is} - \mu_{it}, 0\} = \max\{(\delta_s - \delta_t) + w_{is}, 0\}$, putting everything together:

$$\begin{aligned} L_{ist} = \alpha_0 + \alpha_1 X_i\beta + \alpha_1 \delta_t + \\ m \max\{\delta_s - \delta_t + w_{is}, 0\} + \alpha_1 v_i + \varepsilon_{it} \end{aligned} \quad (1)$$

Estimated Model I

- Noisy measure of loss

- $LOSS_{ist} = \max\{(\delta_s - \delta_t) + v_i + w_{is}, 0\}$, (1) becomes $L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + mLOSS_{ist} + \eta_{it}$, where

$$\eta_{it} = \alpha_1 v_i + m(\max\{\delta_s - \delta_t + w_{is}, 0\} - \max\{\delta_s - \delta_t + v_i + w_{is}, 0\} + \varepsilon_{it}$$

- Two biases

  – v occurs in $LOSS$ and $\eta \rightarrow$ positive correlation $\rightarrow m$ upward biased

  – $LOSS$ instead of $LOSS^*$ $\rightarrow$ measure error $\rightarrow$ attenuation bias

  – First dominates $\rightarrow$ upper bound for m

Estimated Model II

- $v + w$ (residual from P_{is}^0-equation) as noisy proxy for v (unobserved quality)

- (1) becomes $L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + \alpha_1(v_i + w_{is}) + mLOSS_{ist} + u_{it}$, where

$$u_{it} = -\alpha_1 w_{is} + m(\max\{\delta_s - \delta_t + w_{is}, 0\} - \max\{\delta_s - \delta_t + v_i + w_{is}, 0\} + \varepsilon_{it}$$

- Two biases
  - Measurement error $\rightarrow$ attenuation bias
  - w occurs in $LOSS$ and u $\rightarrow$ negative correlation $\rightarrow$ m downward biased
  - Both negative $\rightarrow$ lower bound for m

Data

- Individual property listings, Boston, 1990–1997

- Property characteristics and assessed tax valuations (→ owner-occupant vs. investor)

- Sales and refinancings since 1982 (→ previous ales prices, outstanding mortgage)

- 5785 observations, 3408 houses sold

- LTV: excess of loan to value-ratio over 0.8

TABLE II

LOSS AVERSION AND LIST PRICES

DEPENDENT VARIABLE: LOG (ORIGINAL ASKING PRICE),

OLS equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings	(5) All listings	(6) All listings
LOSS	0.35	0.25	0.63	0.53	0.35	0.24
	(0.06)	(0.06)	(0.04)	(0.04)	(0.06)	(0.06)
LOSS-squared			−0.26	−0.26		
			(0.04)	(0.04)		
LTV	0.06	0.05	0.03	0.03	0.06	0.05
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Estimated value in 1990	1.09	1.09	1.09	1.09	1.09	1.09
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Estimated price index at quarter of entry	0.86	0.80	0.91	0.85		
	(0.04)	(0.04)	(0.03)	(0.03)		
Residual from last sale price		0.11		0.11		0.11
		(0.02)		(0.02)		(0.02)
Months since last sale	−0.0002	−0.0003	−0.0002	−0.0003	−0.0002	−0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dummy variables for quarter of entry	No	No	No	No	Yes	Yes
Constant	−0.77	−0.70	−0.84	−0.77	−0.88	−0.86
	(0.14)	(0.14)	(0.13)	(0.14)	(0.10)	(0.10)
R^2	0.85	0.86	0.86	0.86	0.86	0.86
Number of observations	5792	5792	5792	5792	5792	5792

General Results

- Upper bound of m: 0.35 (10% increase in prospective loss $\Rightarrow$ list price 3.5% higher)

- Lower bound of m (proxy for unobserved quality included): 0.25

- With $LOSS^2$: Marginal increase in list price decreasing in prospective loss

- Market price index: $\delta_t < 1$ (inertia in adjustment to market price changes)

- Robustness

  - Asked prices driven by nominal loss, not by real

  - Estimates not very sensitive to inclusion of δ_s or restriction to $LTV < 50\%$

TABLE IV
LOSS AVERSION AND LIST PRICES: OWNER-OCCUPANTS VERSUS INVESTORS
DEPENDENT VARIABLE: LOG (ORIGINAL ASKING PRICE)
OLS equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × owner-occupant	0.50	0.42	0.66	0.58
	(0.09)	(0.09)	(0.08)	(0.09)
LOSS × investor	0.24	0.16	0.58	0.49
	(0.12)	(0.12)	(0.06)	(0.06)
LOSS-squared × owner-occupant			−0.16	−0.17
			(0.14)	(0.15)
LOSS-squared × investor			−0.30	−0.29
			(0.02)	(0.02)
LTV × owner-occupant	0.03	0.03	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.01)
LTV × investor	0.053	0.053	0.02	0.02
	(0.027)	(0.027)	(0.02)	(0.02)
Dummy for investor	−0.02	−0.02	−0.03	−0.03
	(0.014)	(0.01)	(0.01)	(0.01)
Estimated value in 1990	1.09	1.09	1.09	1.09
	(0.01)	(0.01)	(0.01)	(0.01)
Estimated price index at quarter of entry	0.84	0.80	0.86	0.82
	(0.05)	(0.04)	(0.04)	(0.04)
Residual from last sale price		0.08		0.08
		(0.02)		(0.02)
Months since last sale	−0.0002	−0.0003	−0.0001	−0.0002
	(0.0002)	(0.00015)	(0.0001)	(0.0001)
Constant	−0.80	−0.76	−0.86	−0.84
	(0.16)	(0.16)	(0.14)	(0.16)
R^2	0.85	0.85	0.86	0.86
Number of observations	3687	3687	3687	3687
P-value for test: coefs on loss and LTV are equal, owner-occupants and investor	0.04	0.03	0.03	0.02

Owner-Occupants vs. Investors

- Intuition: Higher psychological pain of selling house for owner-occupants than investors (perhaps!?)

- Owner-occupants' loss aversion twice as high as investors'

- Investors display significant loss aversion

- Main difference in $LOSS^2$: Investors less averse towards large losses

Extensions

- Sold vs. unsold properties
  - Sellers who are not able to sell display higher loss aversion
  - Mainly driven by $LOSS^2$

- Loss aversion and transaction prices
  - $LOSS$-coefficient: Upper bound 0.18, lower bound 0.03 (insignificant)
  - LTV-coefficient unchanged (institutional constraint)

- Time on the market
  - Potential loss $\rightarrow$ higher reservation price $\rightarrow$ longer time on market
  - 10% loss leads to 3 to 6%-decrease in hazard rate of sale

Conclusion

- Loss aversion in housing market: Sellers subject to losses
  - set higher prices
  - get higher prices (but lower than asked ones)
  - it takes them more time to sell

- Larger effects for owner-occupants

- Implication: Loss aversion explains housing market imperfections

Discussion

- Imprecise estimates (10 percentage points between upper and lower bounds): Which one should we consider to be right?

- Same model for owner-occupants and investors?

  - Buy/sell houses for different purposes $\rightarrow$ psychological factors leading to loss aversion likely to differ $\rightarrow$ should be captured by different model

  - Investors and loss aversion!? Are they comparable to experienced owners? (But: Bernatzi-Thaler (1995))

3 Loss Aversion and Experience

- Important open issue: effect of stakes and experience on biases

- Effect of experience in previous papers:

  - Camerer et al.: Experienced agents are less likely to exhibit loss aversion

  - Table: Unstable coefficients on expeirence in cab paper

  - Do experience tas drivers make more money overall? (level effect)

  - In 401(k) investment experience decreases effect of default

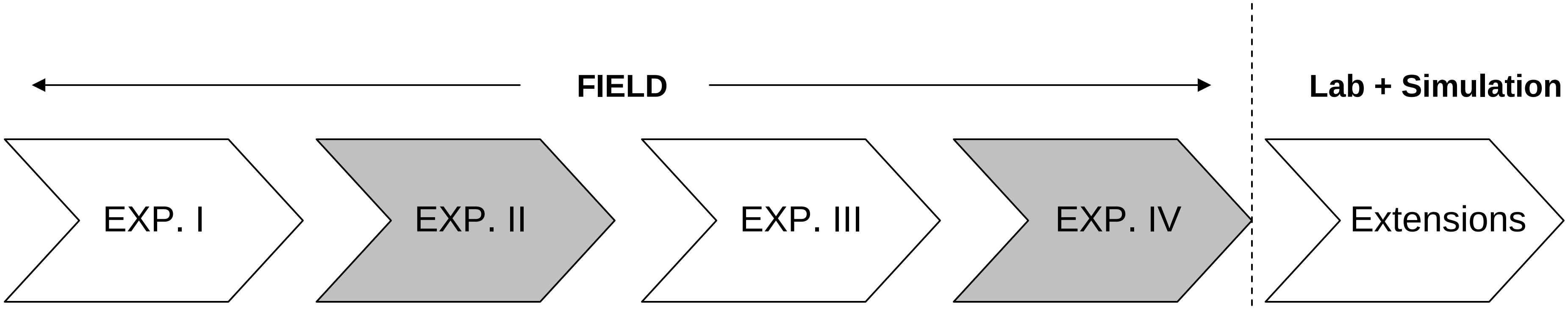
3.1 List (QJE, 2003)

- Mario

Does Market Experience Eliminate Market Anomalies?
John List – QJE 2/2003

- In particular, does experience eliminate the "**endowment effect**"?
- Field Evidence from two different markets (Sports memorabilia and collector Pins)
- 4 field experiments + 1 lab experiment
- Robustness check across markets, institutional changes (direct trade vs. revealed valuation)
- Distinguishes selection vs. treatment effects

Paper Organization



EXP. I	EXP. II	EXP. III	EXP. IV	Extensions
Sports memorabilia (baseball)	**Collector Pins (Walt Disney characters)**	**Sports Memorabilia (baseball)**	**Sports Memorabilia (basketball)**	**Random Objects**
Dealers and non-dealers	**Non-dealers**	**Mainly non-dealers**	**Dealers and non-dealers**	**Students**
Orlando, Fl December 1999	**Orlando, Fl May 2000**	**Orlando, Fl November 1999**	**Tucson, AZ September 2000**	**Univ. of Arizona Feb.- June 2001**
Trading	**Trading**	**Learning (long time)**	**Bidding Behavior**	**Learning**

Experiment I – Sports Market Card

DESCRIPTION

- Sports Card Trading Show
- Good A- Kansas City Royals ticket stub (Cal Ripken)
- Good B – Commemorative dated certificate (Nolan Ryan)
- Dealers (surveyed at their booth before show) vs. non-dealers (surveyed at the entrance to the show)
- 3-step procedure (survey, potential to trade, transaction and exit interview)

TABLE I
SELECTED CHARACTERISTICS OF PARTICIPANTS

	Sportscard market I		Pin market	Sportscard market II
	Dealers mean (std. dev.)	Nondealers mean (std. dev.)	Consumers mean (std. dev.)	Nondealers mean (std. dev.)
Trading experience	14.82 (11.0)	5.66 (6.42)	6.98 (13.63)	6.84 (7.98)
Years of market experience	10.36 (6.75)	6.95 (9.37)	5.05 (5.64)	7.13 (9.05)
Income	4.26 (1.92)	4.04 (2.06)	4.06 (2.25)	4.36 (1.82)
Age	34.68 (11.98)	34.70 (14.06)	31.48 (13.68)	34.83 (12.51)
Gender (percent male)	0.93 (0.25)	0.86 (0.34)	0.48 (0.50)	0.89 (0.32)
Education	3.42 (1.42)	3.84 (1.49)	3.10 (1.53)	3.85 (1.50)
Good B	0.527 (0.50)	0.527 (0.50)		—
Good D	—	—	0.50 (0.50)	—
Good F	—	—	—	0.53 (0.50)
N	74	74	80	53

a. *Trading experience* represents the number of trades made in a typical month.
b. *Years of market experience* denotes years that the subject has been active in the market.
c. *Income* denotes categorical variable (1–8): 1) Less than \$10,000, 2) \$10,000 to \$19,999, 3) \$20,000 to \$29,999, 4) \$30,000 to \$39,999, 5) \$40,000 to \$49,999, 6) \$50,000 to \$74,999, 7) \$75,000 to \$99,999, 8) \$100,000 or over.
d. *Age* denotes actual age in years.
e. *Gender* denotes categorical variable: 0 if female, 1 if male.
f. *Education* denotes categorical variable 1) Eighth grade or less, 2) High School, 3) 2-Year College, 4) Other Post-High School, 5) 4-Year College, 6) Graduate School Education.
g. *Good B (D) (F)* denotes the subject's initial endowment, and =1 if the subject was endowed with *Good B (D) (F)*, 0 otherwise.

Experiment I – Sports Market Card

TABLE II
SUMMARY TRADING STATISTICS FOR EXPERIMENT I: SPORTSCARD SHOW

Variable	Percent traded	p-value for Fisher's exact test
Pooled sample (n = 148)		
Good A for Good B	32.8	<0.001
Good B for Good A	34.6	
Dealers (n = 74)		
Good A for Good B	45.7	0.194
Good B for Good A	43.6	
Nondealers (n = 74)		
Good A for Good B	20.0	<0.001
Good B for Good A	25.6	

a. Good A is a Cal Ripken, Jr. game ticket stub, circa 1996. Good B is a Nolan Ryan certificate, circa 1990.
b. Fisher's exact test has a null hypothesis of no endowment effect.

TABLE III
NONDEALER SUMMARY STATISTICS FOR EXPERIMENT I: SPORTSCARD SHOW

Variable	Percent traded	p-value for Fisher's exact test
Experienced nondealers (n = 30)	46.7	0.32
Inexperienced nondealers (n = 44)	6.80	<0.001

a. Experienced nondealers are those consumers who trade 6 or more times per month (5.66 is the mean level of monthly trades for nondealers). Inexperienced nondealers trade less than 6 times per month.
b. Fisher's exact test has a null hypothesis of no endowment effect.

Experiment I – Sports Market Card

- Logit Model to control for other factors that might affect propensity to trade:

trade = g (a + B' X)

TABLE IV
ESTIMATION RESULTS FOR EXPERIMENT I: SPORTSCARD SHOW

	Dealers		Nondealers	
Variable	Logit trade function	Logit trade function	Logit trade function	Logit trade function
Constant	−0.58	−0.41	−4.41**	−5.12**
	(1.20)	(1.25)	(1.93)	(1.96)
Trading experience	0.03	0.01	0.14**	0.50**
	(0.02)	(0.06)	(0.05)	(0.16)
(Trading experience)^2	—	0.0005	—	−0.014**
		(0.001)		(0.005)
Years of market experience	−0.04	−0.04	−0.001	0.02
	(0.04)	(0.04)	(0.04)	(0.04)
Income	−0.28	−0.29	0.19	0.14
	(0.18)	(0.18)	(0.21)	(0.23)
Age	0.01	0.01	0.002	−0.02
	(0.03)	(0.03)	(0.03)	(0.04)
Gender	0.30	0.30	1.59	1.11
	(1.01)	(0.99)	(1.29)	(1.19)
Education	0.30	0.31	−0.006	−0.02
	(0.21)	(0.21)	(0.21)	(0.22)
Good B	−0.30	−0.30	0.13	0.37
	(0.51)	(0.50)	(0.70)	(0.74)
N	74	74	74	74

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good B = 1 if subject was endowed with Good B, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in columns 2 and 4 are logit coefficients.
c. **Denotes coefficient estimate is significant at the $p < .05$ level.

Experiment II – Is previous effect robust in a different markets?

DESCRIPTION

- Collector pin market
- Walt Disney collector pins
- Good C- Mickey and Minnie Valentine '00 pin (~ $20)
- Good D – Mickey, Paddy's day '00 (~ $20)
- Mainly female non-dealers
- 3-step procedure (survey, potential to trade, transaction and exit interview)

TABLE VI
ESTIMATION RESULTS FOR EXPERIMENT II: PIN TRADING STATION

	Pin consumers		
Variable	Logit trade function	Logit trade function	Logit trade function
Constant	−2.44**	−2.57**	−4.65
	(0.91)	(0.95)	(1.37)
Trading experience	0.05**	0.08*	0.74**
	(0.02)	(0.05)	(0.24)
(Trading experience)^2	—	−0.004	−0.04**
		(0.006)	(0.02)
(Trading experience)^3	—	—	0.007**
			(0.003)
Years of market experience	0.03	0.03	0.04
	(0.05)	(0.05)	(0.05)
Income	−0.11	−0.10	−0.03
	(0.18)	(0.18)	(0.19)
Age	0.005	0.006	0.005
	(0.02)	(0.03)	(0.03)
Gender	0.90	0.90	0.41
	(0.55)	(0.55)	(0.61)
Education	0.20	0.20	0.26
	(0.23)	(0.23)	(0.26)
Good D	0.26	0.29	0.84
	(0.55)	(0.56)	(0.63)
N	80	80	80

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good D = 1 if subject was endowed with Good D, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in column 2 are logit coefficients.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.

Experiment II – Collector Pin Market

TABLE V
SUMMARY TRADING STATISTICS FOR EXPERIMENT II: PIN TRADING STATION

Variable	Percent traded	*p*-value for Fisher's exact test
Pooled sample (n = 80)		
Good C for Good D	25.0	<0.001
Good D for Good C	32.5	
Inexperienced consumers (<7 trades monthly; n = 60)	25.0	<0.001
Experienced consumers (≥ 7 trades monthly; n = 20)	40.0	0.26
Inexperienced consumers (<5 trades monthly; n = 50)	18.0	<0.001
Experienced consumers (≥ 5 trades monthly; n = 30)	46.7	0.30

a. Good C is a cloisonné Valentine's Day pin portraying Mickey and Minnie Mouse, circa 2000. Good D is a cloisonné St Patrick's Day 2000 portraying Mickey Mouse, circa 2000.

b. Experienced consumers are those consumers who trade 7 (or 5) or more times per month (6.55 is the mean level of monthly trades). Inexperienced consumers trade less than 7 (or 5) times per month.

c. Fisher's exact test has a null hypothesis of no endowment effect.

Experiment III – Do experienced consumers exhibit no endowment effect due to experience (treatment) or do they trade more often because of this prior disposition (selection)?

- Sports Memorabilia (follow-up from experiment I)
- 72 subjects from previous year show (contacted previously by mail)
- Focus on 53 non-dealers
- Same 3 step procedure with one extra question (how did your number of trades evolved?)
- Good E 8 x 5 photo autographed by "Mex" Johnson (~ $15)
- Good F baseball autographed by same person (same approximate value)

TABLE VII
NONDEALER DATA SUMMARY FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

Variable	Percent traded	*p*-value for Fisher's exact test
Pooled sample (n = 53)		
Good E for Good F	40.0	<0.08
Good F for Good E	35.7	
Experienced consumers (n = 21)		
Good E for Good F	45.5	0.99
Good F for Good E	60.0	
Inexperienced consumers (n = 32)		
Good E for Good F	35.7	<0.02
Good F for Good E	22.2	

a. Good E is an autographed 5 × 8 photo of Byron "Mex" Johnson.
b. Good F is an official National League baseball autographed by Byron "Mex" Johnson.
c. Experienced consumers are those consumers who trade 7 or more times per month (6.84 is the average level of monthly trades). Inexperienced consumers trade less than 7 times per month.
d. Fisher's exact test has a null hypothesis of no endowment effect.

Experiment III – Sports Memorabilia

- Did only those subjects still interested on trading showed up in this experiment?
- If so, previous numbers are affected by selection bias
- Correct by running a bivariate probit model with sample selection

TABLE VIII
ESTIMATION RESULTS FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

	Sportscard consumers		
Variable	Logit trade function	Probit trade function	Sample-selection bivariate probit trade function
Constant	−2.40	−1.45	−1.26
	(1.81)	(1.06)	(0.98)
Trading experience	0.18**	0.112**	0.106**
	(0.08)	(0.044)	(0.040)
Years of market experience	−0.09	−0.06	0.02
	(0.09)	(0.05)	(0.05)
Income	0.18	0.09	0.07
	(0.29)	(0.17)	(0.15)
Age	−0.05	−0.03	−0.02
	(0.04)	(0.03)	(0.02)
Gender	−0.34	−0.15	−0.24
	(1.03)	(0.63)	(0.55)
Education	0.52	0.30	0.26
	(0.28)	(0.16)	(0.14)
Good F	0.29	0.19	0.16
	(0.78)	(0.47)	(0.47)
N	53	53	74

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise. Gender = 1 if male, 0 otherwise; Good F = 1 if subject was endowed with Good F, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates. Parameter estimates in column 2 are probit coefficients, while estimates in column 3 are probit coefficients corrected for sample selectivity.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.

Experiment III – How about within person variation?

Selection vs. treatment is only disentangled by looking at persons fixed effects which by definition controls for individual specific heterogeneity. A first approach would look at individuals trading rates over time…

TABLE IX
SUMMARY STATISTICS FOR EXPERIMENT III: FOLLOW-UP SPORTSCARD SHOW

	Increased number of trades	Stable number of trades	Decreased number of trades
No trade in Experiment I; trade in Experiment III	13	1	2
No trade in Experiment I; no trade in Experiment III	8	7	11
Trade in Experiment I; Trade in Experiment III	4	0	0
Trade in Experiment I; No trade in Experiment III	2	0	5
N	27	8	18

a. Columns denote changes in subjects' trading experience over the year; rows denote subjects' behavior in the two field trading experiments.
b. Fifty-three subjects participated in both Experiment I and the follow-up experiment.

Experiment III – Sports Memorabilia

Panel Data Logit model controlling for individual heterogeneity and thus for static preferences towards trading (ie. selection effect)…

TABLE X
ESTIMATION RESULTS USING PANEL DATA FROM EXPERIMENTS I AND III

	Logit trade function			Chamberlain trade function		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−1.57**	−2.01**	−2.91**	—	—	—
	(0.34)	(0.44)	(0.65)			
Trading experience	0.11**	0.21**	0.55**	0.23*	0.45**	1.33**
	(0.04)	(0.07)	(0.17)	(0.12)	(0.20)	(0.51)
(Trading experience)²	—	−0.003*	−0.03**	—	−0.005*	−0.07**
		(0.002)	(0.01)		(0.003)	(0.03)
(Trading experience)³	—	—	0.004**	—	—	0.009**
			(0.002)			(0.004)
χ^2 ($\mu_i = 0$)	—	—	—	3.98**	5.29*	8.47**
N	106	106	106	106	106	106

a. Dependent variable equals 1 if subject chose to trade, 0 otherwise.
b. Standard errors are in parentheses beneath coefficient estimates.
c. **(*) Denotes that coefficient estimate is significant at the $p < .05$ (.10) level.
d. χ^2 ($\mu_i = 0$) is a simple Hausman test of the Chamberlain fixed effects model. Each test suggests that there are unobserved fixed effects at the $p < .10$ level; hence the Chamberlain trade estimates are appropriate.

Experiment IV – Are results robust to different market institutions?

Description

- Value Auctions
- Random nth-price auction
- Good: Sheet of University or Wyoming basketball trading card (Theo Ratliff)
- 4-step procedure (survey, inspection of the good, actual bid, debriefing)
- Participants were contacted within 3 days if awarded object (or sold object).
- Successful bidders were shipped object (cash) and successively cash (objects) was mailed back to them

TABLE XI
SELECTED CHARACTERISTICS OF TUCSON SPORTSCARD PARTICIPANTS

	Dealers		Nondealers	
	WTA mean (std. dev.)	WTP mean (std. dev.)	WTA mean (std. dev.)	WTP mean (std. dev.)
Bid or offer	8.15	6.27	18.53	3.32
	(9.66)	(6.90)	(19.96)	(3.02)
Trading experience	16.67	15.78	4.00	3.73
	(19.88)	(13.71)	(5.72)	(3.46)
Years of market experience	10.23	10.57	5.97	5.60
	(5.61)	(8.13)	(5.87)	(6.70)
Income	3.46	3.40	3.37	3.40
	(2.17)	(2.03)	(2.14)	(2.24)
Age	29.20	31.00	28.40	29.00
	(12.20)	(14.70)	(14.90)	(15.30)
Gender (percent male)	0.87	0.90	0.90	0.90
	(0.35)	(0.31)	(0.31)	(0.31)
Education	3.36	3.40	3.03	3.23
	(1.77)	(2.03)	(1.73)	(1.81)
N	30	30	30	30

a. *Trading experience* represents the number of trades made in a typical month.
b. *Years of market experience* denotes years that the subject has been active in the market.
c. *Income* denotes categorical variable (1–8): 1) Less than $10,000, 2) $10,000 to $19,999, 3) $20,000 to $29,999, 4) $30,000 to $39,999, 5) $40,000 to $49,999, 6) $50,000 to $74,999, 7) $75,000 to $99,999, 8) $100,000 or over.
d. *Age* denotes actual age in years.
e. *Gender* denotes categorical variable: 0 if female, 1 if male.
f. *Education* denotes categorical variable 1) Eighth grade or less, 2) High School, 3) 2-Year College, 4) Other Post-High School, 5) 4-Year College, 6) Graduate School Education.

CONCLUSION

- There is an overall endowment effect
- Behavior converges to neo-classical predictions as trading experience intensifies
- Useful “cognitive capital” builds up slowly (days or years) rather than in the short run of an experiment

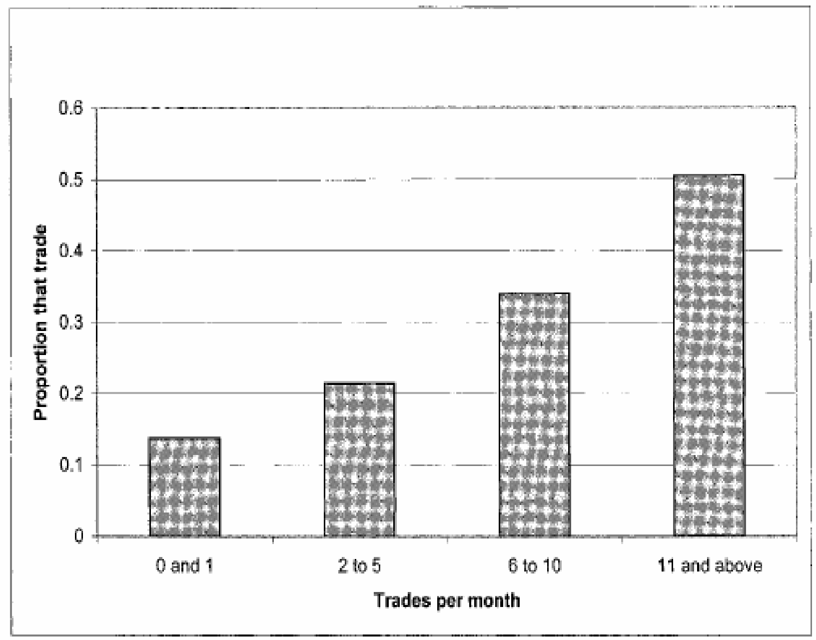


FIGURE I
Summary of Trading Results

- Objection 1: Is it experience or is it just sorting?

- Experiment III with follow-up of experiment I

- Objection 2. Are inexperienced people indifferent between different cards?

- Last Table

- Objection 3. What are people learning about?

- Getting rid of loss-aversion? Learning better value of cards?

- If do not know value, adopt salesman technique

- Is learning localized or do people generalize the learning to other goods?

3.2 List (EMA, 2004)

- Field experiment on sport cards

- Similar to experiment I in List (2003), except that objects are mugs and chocolate

- Trading in four groups:

  1. Mug: "Switch to Chocolate?"
  2. Chocolate: "Switch to Mug?"
  3. Neither: "Choose Mug or Chocolate?"
  4. Both: "Switch to Mug or Chocolate?"

- Large endowment effect for inexperienced card dealers

TABLE I

SELECTED CHARACTERISTICS OF PARTICIPANTS

	Dealers Mean (Std. Dev.)	Nondealers Mean (Std. Dev.)	Nondealers Mean (Std. Dev.)
Trading intensity	11.81	4.94	6.88
	(10.9)	(6.58)	(6.39)
Yrs. of market experience	9.88	7.15	7.21
	(9.79)	(9.83)	(8.03)
Income	4.15	4.10	4.18
	(1.75)	(1.69)	(1.81)
Age	36.55	34.54	37.04
	(13.1)	(14.41)	(14.1)
Gender (% male)	.94	.85	.82
	(.24)	(.35)	(.39)
Education	3.54	3.44	3.54
	(1.40)	(1.33)	(1.54)
Sample Sizes:			
Private			
Treatment $E_{candybar}$	30	31	—
Treatment E_{both}	32	30	—
Treatment $E_{neither}$	35	33	—
Treatment E_{mug}	32	30	—
Public			
Treatment $E_{candybar}$	—	—	33
Treatment E_{both}	—	—	28
Treatment $E_{neither}$	—	—	29
Treatment E_{mug}	—	—	35

Notes: 1. Trading intensity represents the number of trades made in a typical month. 2. Yrs. of market experience denotes years that the subject has been active in the market. 3. Income denotes categorical variable (1–8): (1) Less than \$10,000, (2) \$10,000 to \$19,999, (3) \$20,000 to \$29,999, (4) \$30,000 to \$39,999, (5) \$40,000 to \$49,999, (6) \$50,000 to \$74,999, (7) \$75,000 to \$99,999, (8) \$100,000 or over. 4. Age denotes actual age in years. 5. Gender denotes categorical variable: 0 if female, 1 if male. 6. Education denotes categorical variable (1–6): (1) Eighth grade or less, (2) High School, (3) 2-Year College, (4) Other Post-High School, (5) 4-Year College, (6) Graduate School Education. 7. "Private" and "Public" sample sizes denote the number of subjects in Experiments 1A and 1B, respectively.

variability in the level of trading intensity and years of market experience, permitting an empirical analysis of the effect of market experience on behavior. In the data analysis below, I focus on the effects of trading intensity on behavior. Yet I should note that if I use a measure of the stock of market experience—the product of trading intensity and years of market experience—empirical results are qualitatively similar. Thus, I interchange "market intensity" and "market experience" for the remainder of this study.

In Table II, which provides a summary of the trading data for both nondealers and dealers, Panel A can be read as follows: row 1, column 1, at the intersection of "Treatment $E_{candybar}$" and "Number of Subjects Choosing Candy Bar," denotes that 25 nondealer subjects out of 31 (81 percent) that were initially endowed with a candy bar chose to keep the candy bar. The figure in row 1, column 2, complements this result and indicates that 6 out of 31 (19 percent) nondealers opted to trade their chocolate

TABLE II

SUMMARY OF EXPERIMENTAL RAW DATA

	Number of Subjects Choosing Candy Bar	Number of Subjects Choosing Mug	Pearson χ^2
Panel A. Nondealers (Private)			
Treatment $E_{candybar}$	25 (81%)	6 (19%)	19.21 (3 df)
Treatment E_{both}	18 (60%)	12 (40%)	
Treatment $E_{neither}$	15 (45%)	18 (55%)	
Treatment E_{mug}	7 (23%)	23 (77%)	
Panel B. Nondealers (Public)			
Treatment $E_{candybar}$	29 (88%)	4 (12%)	34.79 (3 df)
Treatment E_{both}	16 (57%)	12 (43%)	
Treatment $E_{neither}$	17 (59%)	12 (41%)	
Treatment E_{mug}	6 (17%)	29 (83%)	
Panel C. Dealers (Private)			
Treatment $E_{candybar}$	14 (47%)	16 (53%)	.54 (3 df)
Treatment E_{both}	14 (44%)	18 (56%)	
Treatment $E_{neither}$	18 (51%)	17 (49%)	
Treatment E_{mug}	14 (44%)	18 (56%)	

	Preferred Exchange	p-Value for Fisher's Exact Test
Panel D. Trading Rates		
Pooled nondealers ($n = 129$)	.18 (.38)	$< .01$
Inexperienced consumers (< 6 trades monthly; $n = 74$)	.08 (.27)	$< .01$
Experienced consumers (≥ 6 trades monthly; $n = 55$)	.31 (.47)	$< .01$
Intense consumers (≥ 12 trades monthly; $n = 16$)	.56 (.51)	.64
Pooled dealers ($n = 62$)	.48 (.50)	.80

Notes: 1. The Pearson chi-square tests in Panels A–C are distributed with 3 degrees of freedom and each have a null hypothesis of Hicksian preferences. 2. Data in Panel D are pooled from Treatments $E_{candybar}$ and E_{mug}. For nondealers, data from "public" and "private" are pooled. Standard deviations are in parentheses. 3. Experienced consumers are those consumers who trade 6 or more times per month (6 is roughly the mean level of monthly trades). Intense consumers trade 12 or more times per month (12 is roughly the mean plus one standard deviation). 4. Fisher's exact test in Panel D has a null hypothesis of no endowment effect.

bar for the coffee mug. The third column in Table II presents Pearson chi-square tests, which examine the null hypothesis of H_0: $p_{candybar} = p_{both} = p_{neither} = p_{mug}$, where p_i are the parameters of 4 independent binomially distributed random variables, and therefore the null hypothesis tests whether there is a treatment effect. If the null hypothesis cannot be rejected, then evidence is in favor of neoclassical theory; rejection of the null (with the correct p_i signs) provides evidence in favor of prospect theory.

Overall, empirical results in Panel A provide strong support for prospect theory. As we move downward in column 1 of Panel A from Treatment $E_{candybar}$ to Treatment E_{mug}, a considerable number of subjects exhibit behavior in line with prospect theory: whereas 81 percent of nondealers in Treatment $E_{candybar}$ departed with the candy

- No endowment effect for experienced card dealers!

- Learning generalizes beyond original domain

3.3 Haigh and List (JF, 2004)

- Experienced traders vs. students

- Compare attitude to risk

- Invest up to 100 points in a gamble:

  - $p = 1/3$: get 350 points

  - $p = 2/3$: get 0 points

  - Not explained too well (Sarah)

- Conversion rates 1:1 (students) and 4:1 (investors)

- Nine rounds

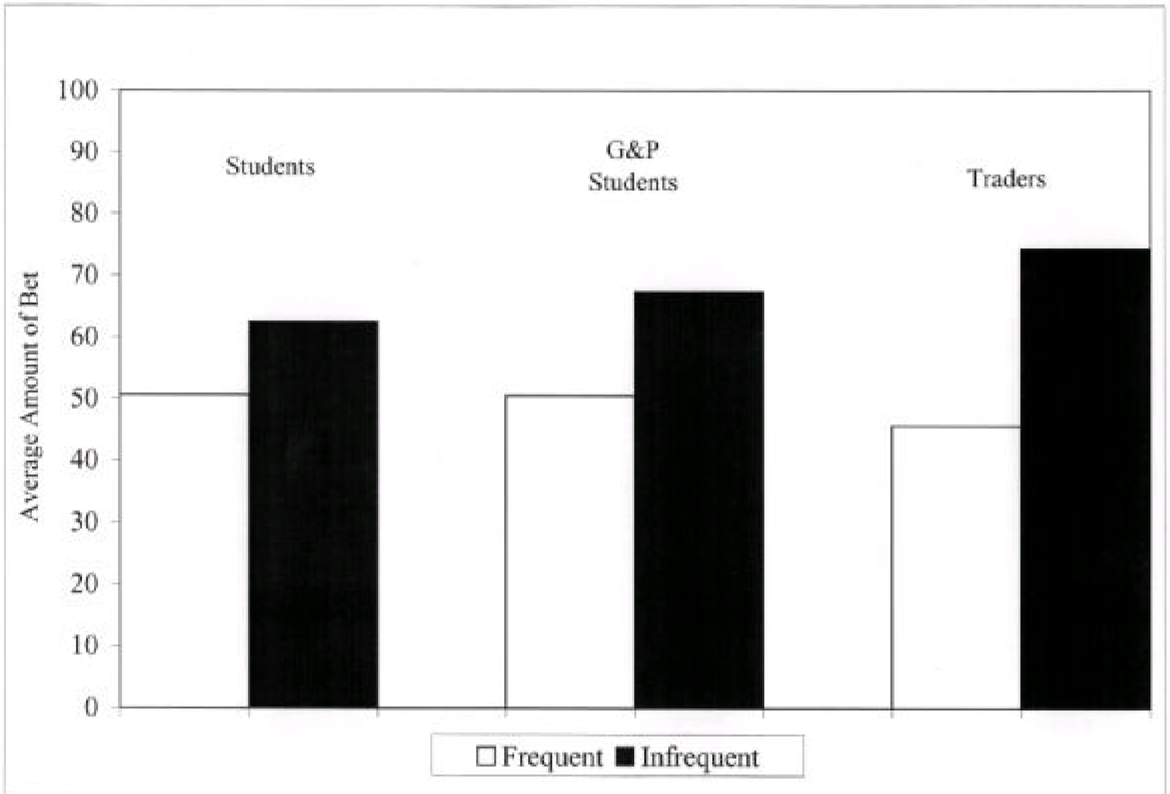
- Frequent feedback: invest every period, with feedback every period

- Infrequent feedback: invest every 3 periods, with feedback every 3 periods

- Myopic Loss Aversion: Invest more with infrequent feedback (losses less frequent)

- Standard Theory: Does not matter

- Myopic Loss Aversion effect for both students and traders



Note: G&P denotes Gneezy and Potters (1997).

Figure 1. Comparing betting patterns.

Table II
Regression Results

Variable	**Specification** (1)	(2)
Constant	85.2*	81.9*
	(3.0)	(3.2)
Student	-16.9*	-10.3*
	(3.9)	(3.8)
Treatment F	-36.7*	-38.5*
	(4.1)	(4.9)
*Student*Treatment F*	22.7*	13.4*
	(5.5)	(6.3)
R^2	0.11	0.11
c^2(3 d.f.)	42.1*	200.6*
Subject Random Effects	No	Yes
Time Effects	No	Yes
N	1062	1062

Notes:
1. Dependent variable is the individual bet. "Trader" is the omitted subject category and therefore represents the baseline group. *Student (Treatment F)* is the student (treatment) indicator variable that equals 1 if the subject was a student (in Treatment F), 0 otherwise. *Student*Treatment F* is the student indicator variable interacted with the frequent feedback treatment variable.
2. Specification (1) is a Tobit model. Specification (2) is a random effects Tobit model.
3. The c^2 values provide evidence of the models' explanatory power. In both cases our model is significant at the $p <$ .01 level.
4. Standard errors are in parentheses beneath coefficient estimates; * denotes significance at the $p < .05$ level.

- Effect stronger for traders!

- Why?
  - Traders ‘trained’ that losses are bad
  - Fear of lawsuits if extreme losses

4 Five Applications of Reference Dependence

- (Mostly) two categories of applications of prospect theory/reference dependence:

  1. **Field Test (F).** Field evidence

  2. **Experimental Test (E).** Lab evidence

  3. (**Theory (T).** Applied theory almost absent)

- Features of literature:

  – Lack of theory serious issue

  – Crucial choice of reference point

  – Mostly use loss aversion + linear value function

  – Some use concavity + convexity

4.1 Endowment Effect

- Kahneman, Knetsch and Thaler (1991) **(E)**

- List (2003,2004) **(F)**

- Recent critical survey by Plott and Zeiler (2003)

- See previous lecture

- WTA>WTP

- Decreased volume of trade

4.2 Myopic Loss Aversion

- Benartzi and Thaler (1995) **(F)**

- Equity premium.

  - Stocks not so risky

  - Do not covary much with GDP growth

  - BUT equity premium 3.9% over bond returns (US, 1871-1993)

- Need very high risk aversion: $RRA \geq 20$

- Benartzi and Thaler: Need loss aversion + narrow framing

- Periodically evaluate returns from stocks

- Loss aversion from (nominal) losses—> Deter from stocks

- More frequent evaluation—>Losses more likely –> Fewer stock holdings

- Calibrate model with λ (loss aversion) 2.25 and full prospect theory specification

- If evaluate every year, indifferent between stocks and bonds

- (Similar results with piecewise linear utility)

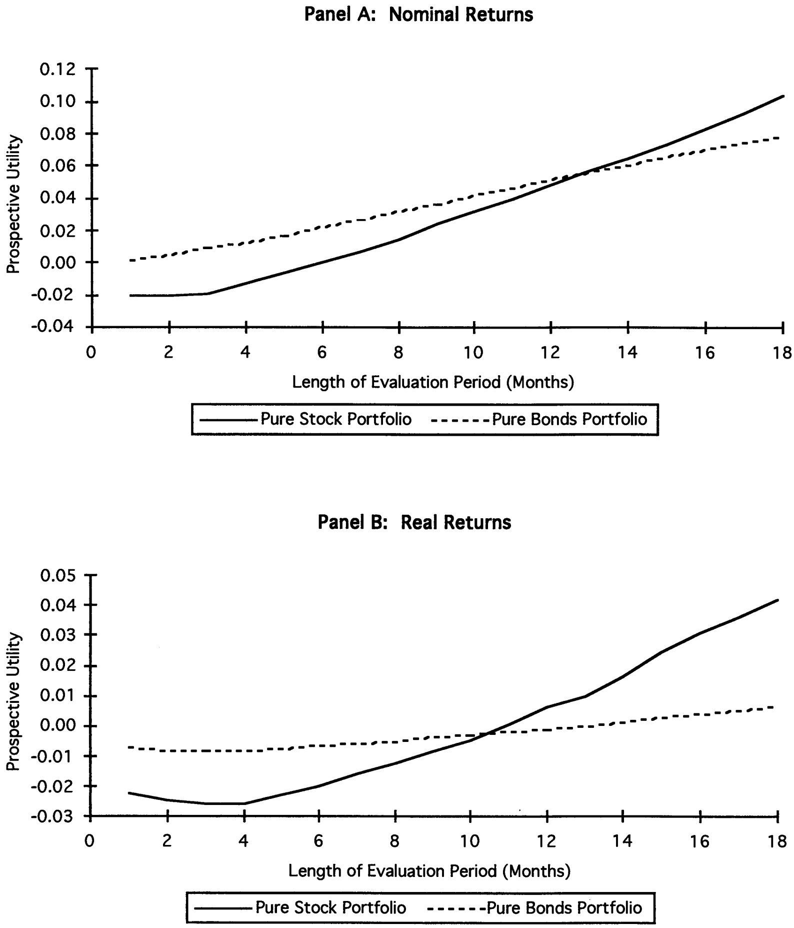


FIGURE I
Prospective Utility as Function of the Evaluation Period

a reliability check on the previous results. Suppose that an investor is maximizing prospective utility with a one-year horizon. What mix of stocks and bonds would be optimal? We investigate this question as follows. We compute the prospective utility of each portfolio mix between 100 percent bonds and 100 percent stocks, in 10 percent increments. The results are shown in Figure II, using nominal returns. (Again, the results for real returns are similar.) As the figure shows, portfolios between about 30 percent and 55 percent stocks all yield approximately the same prospective value.

sion plays the role of risk aversion in standard models, and can be considered a fact of life (or, perhaps, a fact of preferences). In contrast, the frequency of evaluations is a policy choice that presumably could be altered, at least in principle. Furthermore, as the charts in Figure I show, stocks become more attractive as the evaluation period increases. This observation leads to the natural question: by how much would the equilibrium equity premium fall if the evaluation period increased?

Figure III shows the results of an analysis of this issue using real returns on stocks, and the real returns on five-year bonds as the comparison asset. With the parameters we have been using, the actual equity premium in our data (6.5 percent per year) is consistent with an evaluation period of one year. If the evaluation period were two years, the equity premium would fall to 4.65 percent. For five, ten, and twenty-year evaluation periods, the corresponding figures are 3.0 percent, 2.0 percent, and 1.4 percent. One way to think about these results is that for someone with a twenty-year investment horizon, the psychic costs of evaluating the portfolio annually are 5.1 percent per year! That is, someone with a twenty-year horizon would be indifferent between stocks and bonds if the equity premium were only 1.4 percent, and the remaining 5.1 percent is potential rents payable to those who are

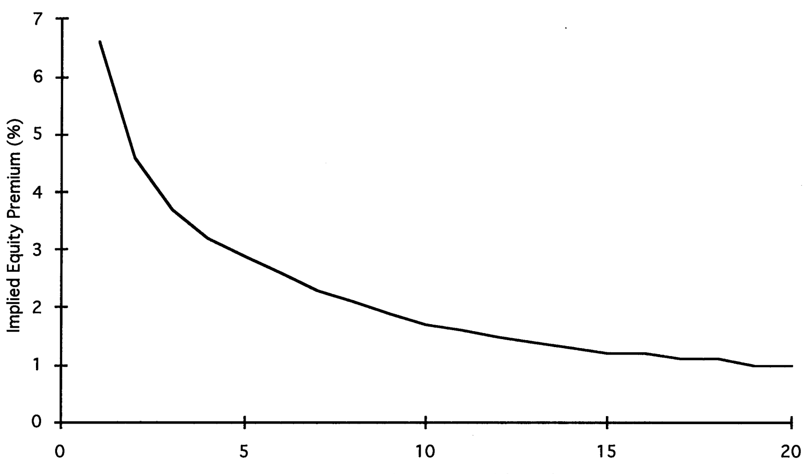


FIGURE III
Implied Equity Premium as Function of the Evaluation Period

4.3 Asset prices

- Barberis, Huang, and Santos (2001) **(T+F)**

- Piecewise linear utility, $\lambda = 2.25$

- Narrow framing at aggregate stock level

- Range of implications for asset pricing

- Barberis and Huang (2001)

- Narrowly frame at individual stock level (or mutual fund)

4.4 Disposition effect

- Odean (1998) **(F)**

- Do investors sell winning stocks more than losing stocks?

- (Similar to not selling ‘losing’ house)

- Tax advantage to sell losers

- Losers outperform winners in long-run

- Prospect theory:

  - reference point: price of purchase

  - convexity over losses —> gamble, hold on stock

- concavity over gains —> risk aversion, sell stock

- Discount brokerage house (1987-1993)

- Compute share:

$$PGR = \frac{\text{Realized Gains}}{\text{Realized Gains+Paper Gains}}$$

and similar for Losses, PGL

- PGR>PGL for all months, except end of year (tax reasons)

4.5 Preferences for increasing sequences

- Loewenstein-Sicherman, *Do Workers Prefer Increasing Wage Profiles?* **(E)**

- Reference point past wage

- Aversion to nominal wage cut

- Choice between paths of wages over lifetime

- N=80, Museum of Science visitors, survey

	Wages	Rental income
Prefer increasing	83%	56%
Prefer decreasing	17%	44%

- Interesting debiasing experiment.

- Present arguments both for increasing and for decreasing

- Increase in choices consistent with PVmax: 7% to 22% (wages)

- Increase in choices consistent with PVmax: 23% to 28% (rental income)

- Taste for consistency — debiasing as between manipulation

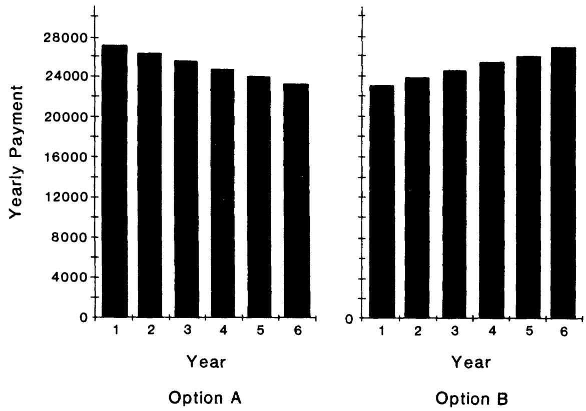


FIG. 2.—Graphical depiction of increasing and decreasing payment options

Next, respondents were presented with the same two sequences, depicted graphically, and with conflicting arguments why they should prefer one or the other. The argument favoring decreasing payments read, "Some researchers believe people should prefer option A [the declining sequence]. Their argument is that you can put part of the extra money you get at the beginning into the bank and withdraw it with interest later on. In fact, by choosing option A you could have more money every year."

The argument favoring increasing payments was, "Other researchers believe people should prefer option B [the increasing payment profile]. Their argument is that, first, it is satisfying to get a bigger payment each year. Second, even though you *could* save money in the first few years, it is often difficult to save money. Option B gives more spending later without worrying about putting money away in the first few years."

Respondents specified which argument they found more convincing, or whether they found both arguments equally convincing. Finally, they were asked to rerank the seven payment sequences in light of the arguments.

IV. Findings

To begin with, we focus on rankings made prior to exposure to the arguments. For wage payments, only 7.3% of the sample (three out of 41) based their choice solely on present-value consideration (i.e., they ranked the declining sequence first, the flat sequence next, etc.). For rental income, 23.1% (nine out of 39) of choices conformed to present-value maximization. The difference between the two groups is significant ($\chi^2(1) = 3.9, p < .05$). If we look more broadly at the number of respondents who ranked the declining profile highest, a similar pattern emerges. For wage payments, 12.2% of respondents preferred the declining profile over all other options. The comparable figure for rental income payments is 33.3%. On average,