Econ 219A
Psychology and Economics: Foundations
(Lecture 10)

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Outline

1. Reference Dependence: Re-Introduction

2. Reference Dependence: Endowment Effect

3. Methodology: Effect of Experience

1 Reference Dependence: Re-Introduction

- Kahneman and Tversky (1979) — Anomalous behavior in experiments:
  1. *Concavity over gains.* Given \$1000, A=(500,1) $\succ$ B=(1000,0.5;0,0.5)
  2. *Convexity over losses.* Given \$2000, C=(-1000,0.5;0,0.5) $\succ$ D=(-500,1)
  3. *Framing Over Gains and Losses.* Notice that A=D and B=C
  4. *Loss Aversion.* (0,1) $\succ$ (-8,.5;10,.5)
  5. *Probability Weighting.* (5000,.001) $\succ$ (5,1) and (-5,1) $\succ$ (-5000,.001)

- Can one descriptive model theory fit these observations?

- **Prospect Theory** (Kahneman and Tversky, 1979)

- Subjects evaluate a lottery $(y, p; z, 1-p)$ as follows: $\pi(p)\, v(y-r) + \pi(1-p)\, v(z-r)$

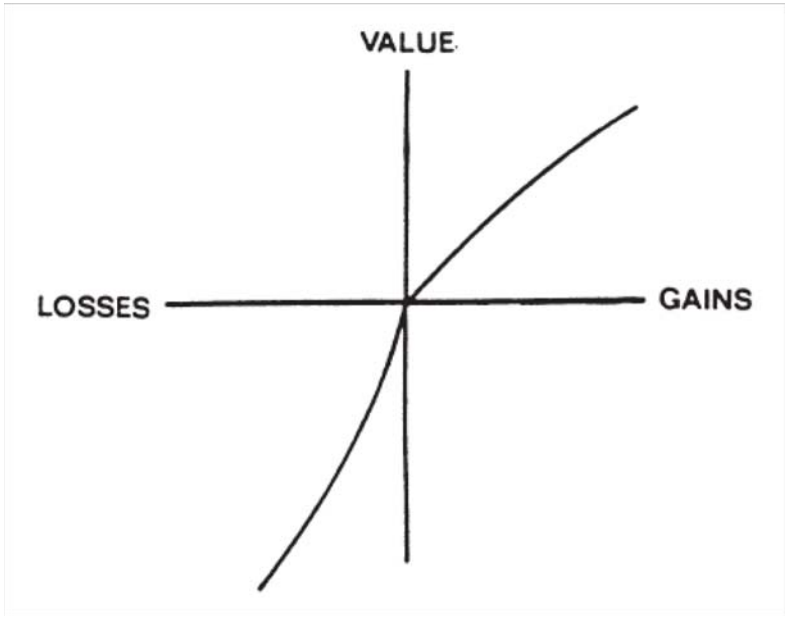
- Five key components:

  1. Reference Dependence

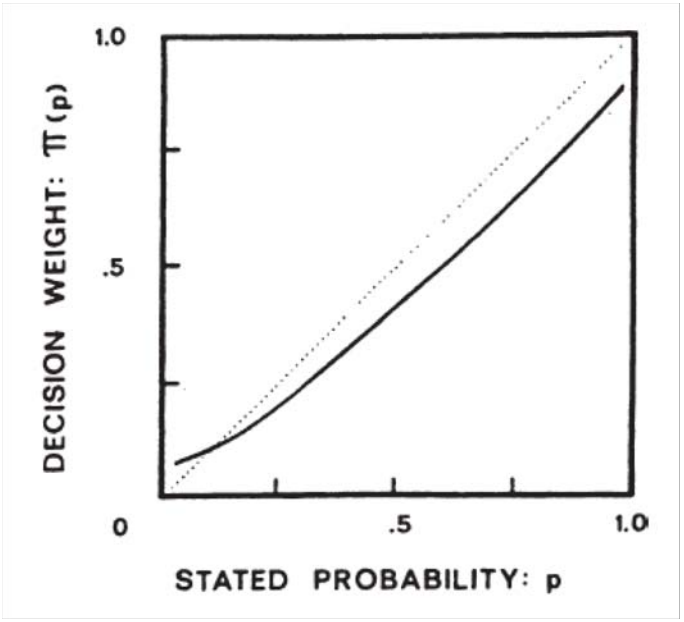
     - Basic psychological intuition that changes, not levels, matter (applies also elsewhere)

     - Utility is defined over differences from reference point r –> Explains Exp. 3

2. Diminishing sensitivity.
   - Concavity over gains of v –> Explains (500,1)$\succ$(1000,0.5;0,0.5)
   - Convexity over losses of v –> Explains (-1000,0.5;0,0.5)$\succ$(-500,1)
3. Loss Aversion –> Explains (0,1) $\succ$ (-8,.5;10,.5)



4. Probability weighting function π non-linear –> Explains (5000,.001) $\succ$ (5,1) and (-5,1) $\succ$ (-5000,.001)



- Overweight small probabilities + Premium for certainty

5. Narrow framing (Barberis, Huang, and Thaler, 2006; Rabin and Weizsäcker, forthcoming)
   - Consider only risk in isolation (labor supply, stock picking, house sale)
   - Neglect other relevant decisions

- Tversky and Kahneman (1992) propose calibrated version

$$v(x) = \begin{cases} (x-r)^{.88} & \text{if } x \geq r; \\ -2.25\,(-(x-r))^{.88} & \text{if } x < r, \end{cases}$$

and

$$w(p) = \frac{p^{.65}}{\left(p^{.65} + (1-p)^{.65}\right)^{1/.65}}$$

- Reference point r?
- Open question – depends on context
- Koszegi-Rabin (2006 on): personal equilibrium with rational expectation outcome as reference point
- Not yet tested in field data
- Most field applications use only (1)+(3), or (1)+(2)+(3)

$$v(x) = \begin{cases} x - r & \text{if } x \geq r; \\ \lambda(x - r) & \text{if } x < r, \end{cases}$$

- Assume backward looking reference point depending on context

2 Reference Dependence: Endowment Effect

- Plott and Zeiler (AER 2005) replicating Kahneman, Knetsch, and Thaler (JPE 1990)
  - Half of the subjects are given a mug and asked for WTA
  - Half of the subjects are shown a mug and asked for WTP
  - Finding: $WTA \simeq 2 * WTP$

Table 2: Individual Subject Data and Summary Statistics from KKT Replication

Treatment	Individual Responses (in U.S. dollars)	Mean	Median	Std. Dev.
WTP (n = 29)	0, 0, 0, 0, 0.50, 0.50, 0.50, 0.50, 0.50, 1, 1, 1, 1, 1, 1.50 2, 2, 2, 2, 2, 2.50, 2.50, 2.50, 3, 3, 3.50, 4.50, 5, 5	1.74	1.50	1.46
WTA (n = 29)	0, 1.50, 2, 2, 2.50, 2.50, 3, 3.50, 3.50, 3.50, 3.50, 3.50, 4, 4.50 4.50, 5.50, 5.50, 5.50, 6, 6, 6, 6.50, 7, 7, 7, 7.50, 7.50, 7.50, 8.50	4.72	4.50	2.17

- How do we interpret it? Use reference-dependence in piece-wise linear form
  - Assume only gain-loss utility, and assume piece-wise linear formulation (1)+(3)
  - Two components of utility: utility of owning the object $u(m)$ and (linear) utility of money p
  - Assumption: No loss-aversion over money
  - WTA: Given mug –> $r = \{mug\}$, so selling mug is a loss
  - WTP: Not given mug –> $r = \{\varnothing\}$, so getting mug is a gain
  - Assume $u\{\varnothing\} = 0$

- This implies:
  - WTA: Status-Quo $\sim$ Selling Mug

$$\begin{aligned} u\{mug\} - u\{mug\} &= \lambda\left[u\left\{\varnothing\right\} - u\{mug\}\right] + p_{WTA} \text{ or} \\ p_{WTA} &= \lambda u\{mug\} \end{aligned}$$

  - WTP: Status-Quo $\sim$ Buying Mug

$$\begin{aligned} u\left\{\varnothing\right\} - u\left\{\varnothing\right\} &= u\{mug\} - u\left\{\varnothing\right\} - p_{WTP} \text{ or} \\ p_{WTP} &= u\{mug\} \end{aligned}$$

  - It follows that

$$p_{WTA} = \lambda u\{mug\} = \lambda p_{WTP}$$

  - If loss-aversion over money,

$$p_{WTA} = \lambda^2 p_{WTP}$$

- Result $WTA \simeq 2 * WTP$ is consistent with loss-aversion $\lambda \simeq 2$

- Plott and Zeiler (*AER* 2005): The result disappears with
  - appropriate training
  - practice rounds
  - incentive-compatible procedure
  - anonymity

Pooled Data	WTP (n = 36)		6.62	6.00	4.20
	WTA (n = 38)		5.56	5.00	3.58

- What interpretation?

- Interpretation 1. Endowment effect and loss-aversion interpretation are wrong

  - Subjects feel bad selling a 'gift'

  - Not enough training

- Interpretation 2. In Plott-Zeiler (2005) experiment, subjects did not perceive the reference point to be the endowment

- Koszegi-Rabin: reference point is (.5, $\{mug\}$; .5, $\{\varnothing\}$) in both cases
  - WTA:

$$\left[\begin{array}{c} .5 * [u\{mug\} - u\{mug\}] \\ +.5 * [u\{mug\} - u\{\varnothing\}] \end{array}\right] = \left[\begin{array}{c} .5 * \lambda [u\{\varnothing\} - u\{mug\}] \\ +.5 * [u\{\varnothing\} - u\{\varnothing\}] \end{array}\right] + p_{WTA}$$

  - WTP:

$$\left[\begin{array}{c} .5 * \lambda [u\{\varnothing\} - u\{mug\}] \\ +.5 * [u\{\varnothing\} - u\{\varnothing\}] \end{array}\right] = \left[\begin{array}{c} .5 * [u\{mug\} - u\{mug\}] \\ +.5 * [u\{mug\} - u\{\varnothing\}] \end{array}\right] - p_{WTP}$$

  - This implies no endowment effect:

$$p_{WTA} = p_{WTP}$$

- Notice: Open question, with active follow-up literature
  - Plott-Zeiler (*AER* 2007): Similar experiment with different outcome variable: Rate of subjects switching
  - Isoni, Loomes, and Sugden (*AER* forthcoming):
    * In Plott-Zeiler data, there is endowment effect for lotteries in training rounds on lotteries!
    * New experiments: for lotteries, mean WTA is larger than the mean WTP by a factor of between 1.02 and 2.19
- Need for rejoinder paper(s)

- List (*QJE* 2003) – Further test of endowment effect and role of experience

- Protocol:
  - Get people to fill survey
  - Hand them memorabilia card A (B) as thank-you gift
  - After survey, show them memorabilia card B (A)
  - "Do you want to switch?"
  - "Are you going to keep the object?"
  - Experiments I, II with different object

- Prediction of Endowment effect: too little trade

- Experiment I with Sport Cards – Table II

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.

- Experiment II with Pins – Table V

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

- **Finding 1.** Strong endowment effect for inexperienced dealers

- How to reconcile with Plott-Zeiler?
  - Not training? No, nothing difficult about switching cards)
  - Not practice? No, people used to exchanging cards)
  - Not incentive compatibility? No
  - Is it anonymity? Unlikely
  - Gift? Possible

- **Finding 2.** Substantial experience lowers the endowment effect to zero
  - Getting rid of loss aversion?
  - Expecting to trade cards again? (Koszegi-Rabin, 2005)

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

- Experiment III with follow-up of experiment I – Table IX

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.

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

- People do not know own preferences – Table XI

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)

- 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?

- List (*EMA*, 2004): Field experiment similar to experiment I in List (2003)

- Sports traders but 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?"

	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

- Large endowment effect for inexperienced card dealers
- No endowment effect for experienced card dealers!
- Learning (or reference point formation) generalizes beyond original domain

3 Methodology: Effect of Experience

- Effect of experience is debated topic
- Does Experience eliminate behavioral biases?
- Argument for 'irrelevance' of Psychology and Economics
- Opportunities for learning:
  - Getting feedback from expert agents
  - Learning from past (own) experiences
  - Incentives for agents to provide advice
- This will drive away 'biases'

- However, four arguments to contrary:

  1. Feedback is often infrequent (house purchases) and noisy (financial investments) –> Slow convergence

  2. Feedback can exacerbate biases for non-standard agents:

     – Ego-utility (Koszegi, 2001): Do not want to learn

     – Learn on the wrong parameter

     – See Haigh and List (2004) below

3. No incentives for Experienced agents to provide advice
   - Exploit naives instead
   - Behavioral IO –> DellaVigna-Malmendier (2004) and Gabaix-Laibson (2006)

4. No learning on preferences:
   - Social Preferences or Self-control are non un-learnt
   - Preference features as much as taste for Italian red cars (undeniable)

- Empirically, four instances:

- **Case 1. Endowment Effect**. List (2003 and 2004)
  - Trading experience –> Less Endowment Effect
  - Effect applies across goods
  - Interpretations:
    * Loss aversion can be un-learnt
    * Experience leads to update reference point –> Expect to trade

- **Case 2. Nash Eq. in Zero-Sum Games.**

- Palacios-Huerta-Volij (2006): Soccer players practice –> Better Nash play

- Idea: Penalty kicks are practice for zero-sum game play

$1\backslash 2$	A	B
A	.60	.95
B	.90	.70

- How close are players to the Nash mixed strategies?

- Compare professional (2nd League) players and college students – 150 repetitions

Table E - Summary Statistics in Penalty Kick's Experiment

		Equilibrium	Professional Soccer Players	College Students: Soccer Experience	College Students: No Soccer Experience
I. Aggregate Data					
Row Player frequencies	*L*	0.363	0.333	0.392	0.401
	R	0.636	0.667	0.608	0.599
Column Player frequencies	*L*	0.454	0.462	0.419	0.397
	R	0.545	0.538	0.581	0.603
Row Player Win percentage		0.7909	0.7947	0.7927	0.7877
(std. deviation)		(0.0074)			
II. Number of Individual Rejections of Minimax Model at 5 (10) percent					
Row Player (All Cards)		1 (2)	0 (1)	1 (3)	2 (3)
Column Player (All Cards)		1 (2)	1 (2)	2 (2)	3 (10)
Both Players (All Cards)		1 (2)	1 (1)	1 (3)	3 (9)
All Cards		4 (8)	4 (7)	9 (12)	12 (20)

- Surprisingly close on average

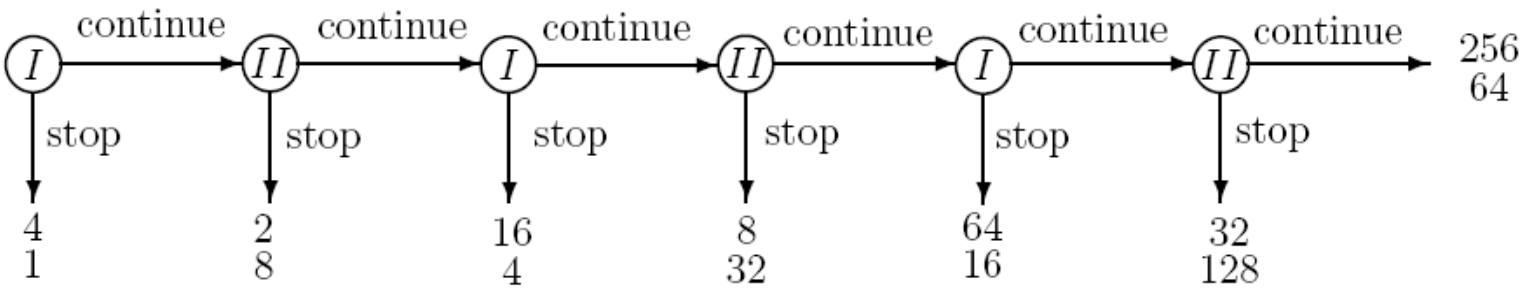
- More deviations for students –> Experience helps (though people surprisingly good)

- However: Levitt-List-Reley (2007): Replicate in the US
  - Soccer and Poker players, 150 repetition
  - No better at Nash Play than students

- Maybe hard to test given that even students are remarkably good

- **Case 3. Backward Induction.** Palacios-Huerta-Volij (2007)

- Play in centipede game



- – Optimal strategy (by backward induction) –> Exit immediately

  – Continue if:

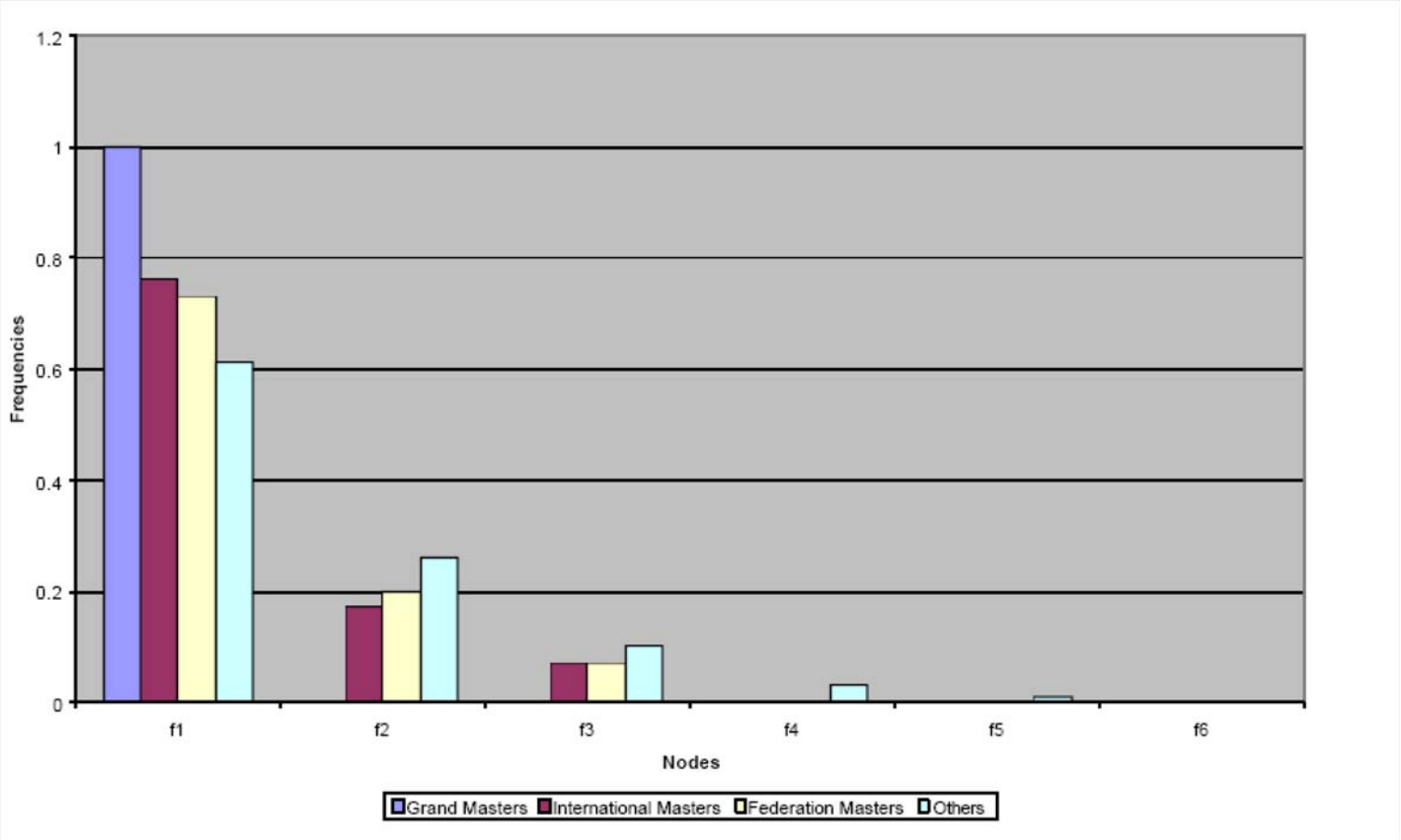
    * No induction

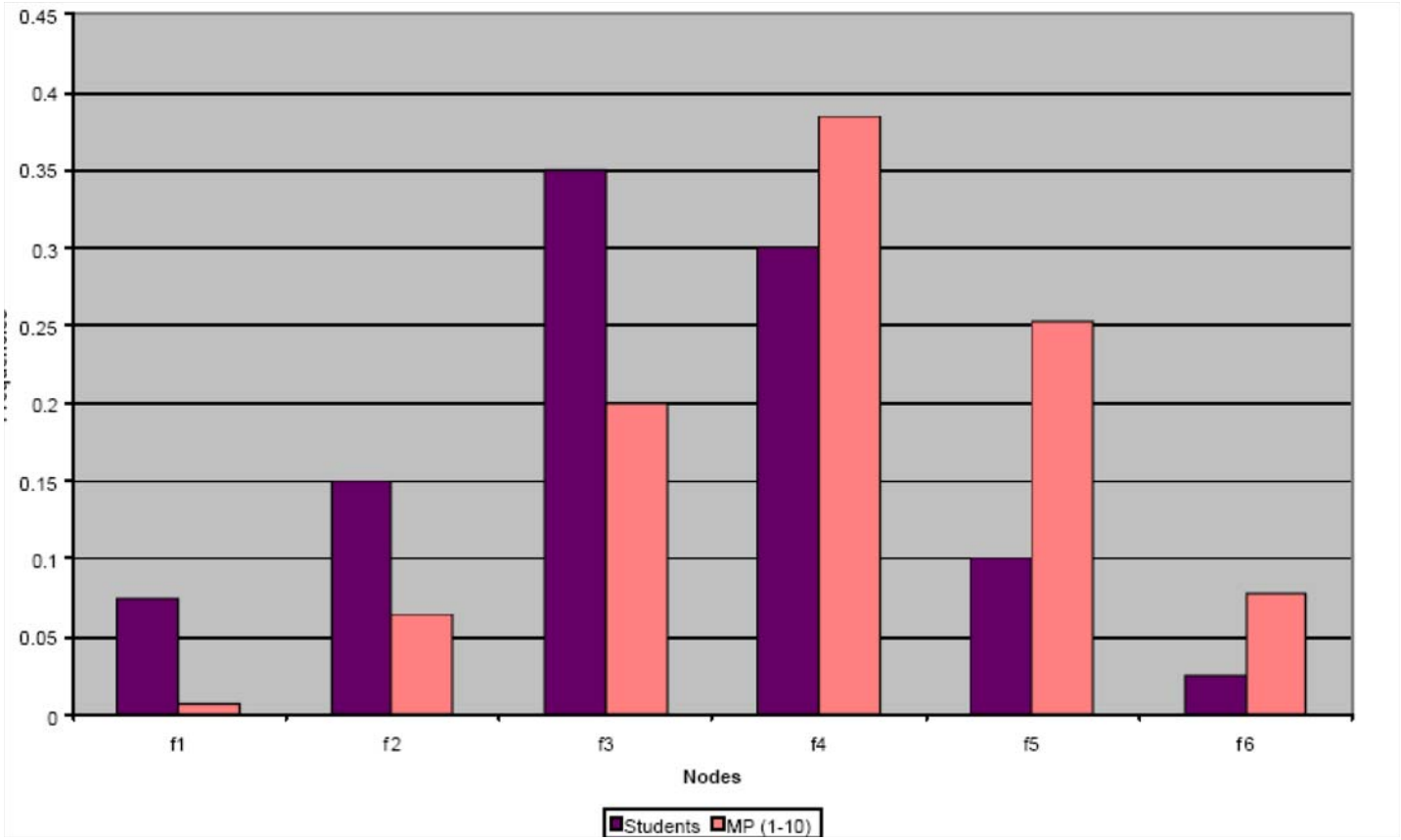
    * Higher altruism

- Test of backward induction: Take Chess players
  - 211 pairs of chess players at Chess Tournament
  - Randomly matched, anonymity
  - 40 college students
  - Games with SMS messages

- Results:
  - Chess Players end sooner

– More so the more experience




0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
f1
f2
f3
f4
f5
f6
Nodes
Students
MP (1-10)

- Interpretations:
  - Cognition: Better at backward induction
  - Preferences More selfish
- Open questions:
  - Who earned the higher payoffs? almost surely the students
  - What would happen if you mix groups and people know it?

- **Case 4. Myopic Loss Aversion.**

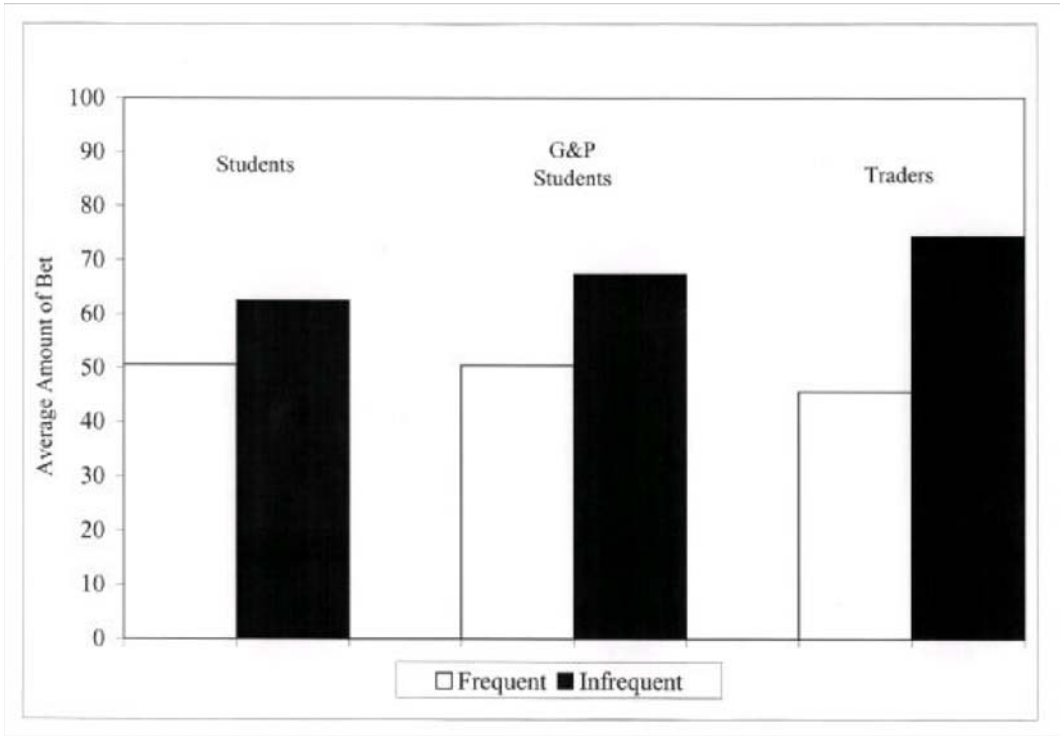
- Lottery: 2/3 chance to win 2.5X, 1/3 chance to lose X
  - Treatment F (Frequent): Make choice 9 times
  - Treatment I (Infrequent): Make choice 3 times in blocks of 3

- Standard theory: Essentially no difference between F and I

- Prospect Theory with Narrow Framing: More risk-taking when lotteries are chosen together —> Lower probability of a loss

- Gneezy-Potters (*QJE*, 1997): Strong evidence of myopic loss aversion with student population

- Haigh and List (2004): Replicate with
  - Students
  - Professional Traders –> *More* Myopic Loss Aversion



- Summary: Effect of Experience?
  - Can go either way
  - Open question

4 Next Lecture

- Reference-Dependent Preferences
  - Insurance
  - Housing
  - Finance
  - Workplace

- Problem Set due in two weeks