Econ 219B
Psychology and Economics: Applications
(Lecture 6)

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Outline

1. Reference Dependence: Employment and Effort
2. Reference Dependence: Domestic Violence
3. Reference Dependence: Insurance
4. Methodology: Effect of Experience (EXTRA)

1 Reference Dependence: Employment and Effort

- Back to labor markets: Do reference points affect performance?

- **Mas (QJE 2006)** examines police performance

- Exploits quasi-random variation in pay due to arbitration

- Background

  – 60 days for negotiation of police contract –> If undecided, arbitration

  – 9 percent of police labor contracts decided with final offer arbitration

- Framework:
  - pay is $w * (1 + r)$
  - union proposes r_u, employer proposes r_e, arbitrator prefers r_a
  - arbitrator chooses r_e if $|r_e - r_a| \leq |r_u - r_a|$
  - $P(r_e, r_u)$ is probability that arbitrator chooses r_e
  - Distribution of r_a is common knowledge (cdf F)
  - Assume $r_e \leq r_a \leq r_u$ –> Then

    $$P = P(r_a - r_e \leq r_u - r_a) = P(r_a \leq (r_u + r_e)/2) = F\left(\frac{r_u + r_e}{2}\right)$$

- Nash Equilibrium:
  - If r_a is certain, Hotelling game: convergence of r_e and r_u to r_a
  - Employer's problem:

$$\max_{r_e} PU\left(w\left(1+r_e\right)\right)+\left(1-P\right)U\left(w\left(1+r_u^*\right)\right)$$

  - Notice: $U' < 0$
  - First order condition (assume $r_u \geq r_e$):

$$\frac{P'}{2}\left[U\left(w\left(1+r_e^*\right)\right)-U\left(w\left(1+r_u^*\right)\right)\right]+PU'\left(w\left(1+r_e^*\right)\right)w=0$$

  - $r_e^* = r_u^*$ cannot be solution –> Lower r_e and increase utility ($U' < 0$)

– Union's problem: maximizes

$$\max_{r_u} PV\left(w\left(1+r_e^*\right)\right)+\left(1-P\right)V\left(w\left(1+r_u\right)\right)$$

– Notice: $V' > 0$

– First order condition for union:

$$\frac{P'}{2}\left[V\left(w\left(1+r_e^*\right)\right)-V\left(w\left(1+r_u^*\right)\right)\right]+\left(1-P\right)V'\left(w\left(1+r_e^*\right)\right)w=0$$

– To simplify, assume $U\left(x\right)=-bx$ and $V\left(x\right)=bx$

– This implies $V\left(w\left(1+r_e^*\right)\right)-V\left(w\left(1+r_u^*\right)\right)=-U\left(w\left(1+r_e^*\right)\right)-U\left(w\left(1+r_u^*\right)\right)$ ->

$$-bP^*w=-\left(1-P^*\right)bw$$

- Result: $P^* = 1/2$

- Prediction (i) in Mas (2006): "*If disputing parties are equally risk-averse, the winner in arbitration is determined by a coin toss.*"

- Therefore, as-if random assignment of winner

- Use to study impact of pay on police effort

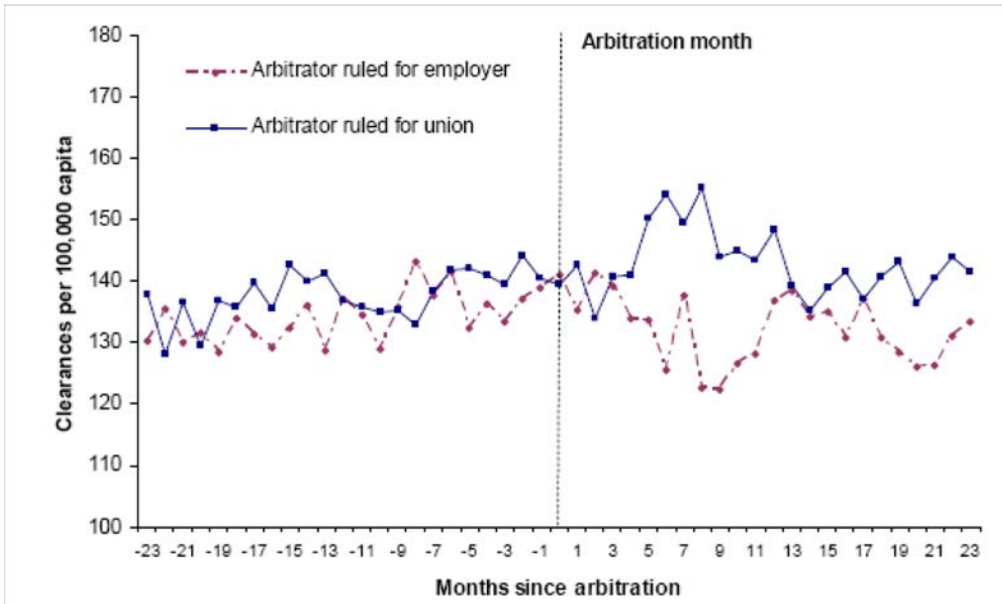
- Data:
  - 383 arbitration cases in New Jersey, 1978-1995
  - Observe offers submitted r_e, r_u, and ruling $\bar{r}_a$
  - Match to UCR crime clearance data (=number of crimes solved by arrest)

- Compare summary statistics of cases when employer and when police wins
- Estimated $\hat{P} = .344 \neq 1/2$ $->$Unions more risk-averse than employers
- No systematic difference between Union and Employer cases except for r_e

Table I
Sample characteristics in the -12 to +12 month event time window

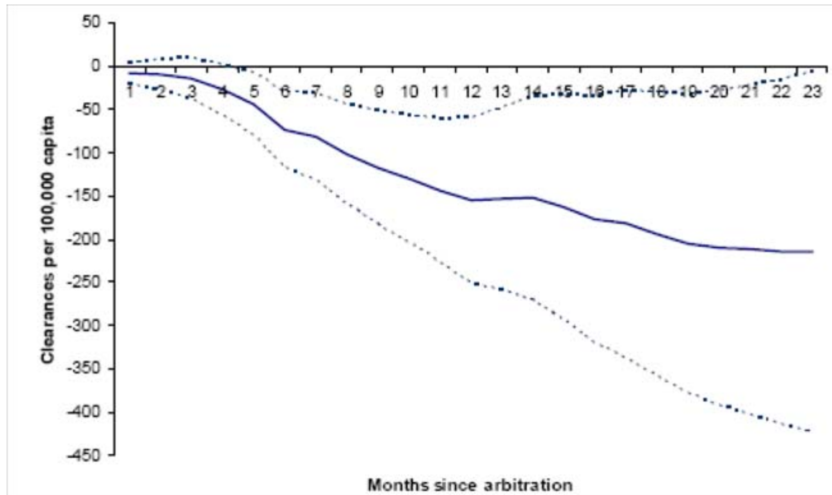
	(1) Full-sample	(2) Pre-arbitration: Employer wins	(3) Pre-arbitration: Employer loses	(4) Pre-arbitration: Employer win-Employer loss
Arbitrator rules for employer	0.344			
Final Offer: Employer	6.11	6.44	5.94	0.50
	[1.65]	[1.54]	[1.68]	(0.18)
Final Offer: Union	7.65	7.87	7.54	0.32
	[1.71]	[2.03]	[1.51]	(0.18)
Population	21,345	22,893	20,534	2,358
	[33,463]	[34,561]	[32,915]	(3,598)
Contract length	2.09	2.09	2.09	0.007
	[0.66]	[0.64]	[0.66]	(0.071)
Size of bargaining unit	42.58	41.36	43.22	-1.86
	[97.34]	[53.33]	[113.84]	(15.66)
Arbitration year	85.56	85.85	85.41	0.436
	[4.75]	[5.10]	[4.56]	(0.510)
Clearances	120.31	122.28	118.57	3.71
per 100,000 capita	[106.65]	[108.76]	[104.35]	(9.46)

- Graphical evidence of effect of ruling on crime clearance rate

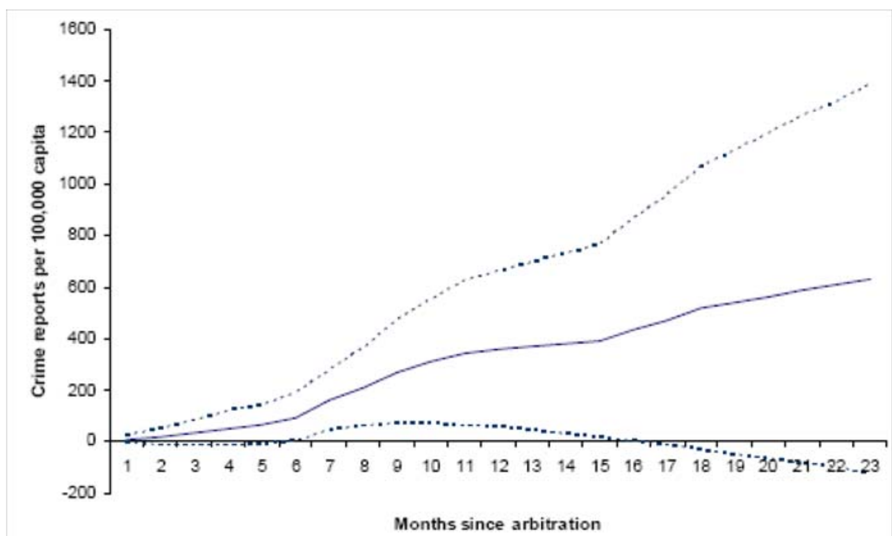


- Significant effect on clearance rate for one year after ruling

- Estimate of the cumulated difference between Employer and Union cities on clearance rates and crime



Clearances per 100,000 capita
Months since arbitration



Crime reports per 100,000 capita
Months since arbitration

- Arbitration leads to an average increase of 15 clearances out of 100,000 each month

Table II
Event study estimates of the effect of arbitration rulings on clearances; -12 to +12 month event time window

	All clearances			Violent crime clearances			Property crime clearances		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	118.57	141.25		63.16	75.10		55.42	66.15	
	(5.12)	(9.94)		(3.13)	(6.86)		(2.88)	(4.55)	
Post-arbitration × Employer win	-6.79	-8.48	-9.75	-2.54	-3.10	-3.77	-4.26	-5.39	-4.45
	(2.62)	(2.20)	(2.70)	(1.75)	(1.35)	(1.78)	(1.62)	(2.25)	(1.87)
Post-arbitration × Union win	4.99	7.92	5.96	4.17	5.62	5.31	0.819	2.31	2.19
	(2.09)	(2.91)	(2.65)	(1.53)	(1.95)	(1.42)	(1.24)	(1.58)	(1.37)
Row 3 – Row 2	11.78	16.40	15.71	6.71	8.71	9.08	5.08	7.69	6.40
	(3.35)	(3.65)	(3.75)	(2.32)	(2.37)	(2.26)	(2.04)	(2.75)	(2.30)
Employer Win (Yes = 1)	3.71	-2.81		2.14	-5.73		1.57	2.92	
	(9.46)	(14.92)		(6.11)	(9.53)		(4.93)	(7.51)	
Fixed-effects?			Yes			Yes			Yes
Weighted sample?		Yes	Yes		Yes	Yes		Yes	Yes
Augmented sample?			Yes			Yes			Yes
Mean of the Dependent variable	120.31	120.31	130.82	64.79	64.79	72.15	55.51	55.51	58.63
	[106.65]	[106.65]	[370.58]	[71.28]	[71.28]	[294.78]	[58.72]	[58.72]	[180.55]
Sample Size	9,538	9,538	59,137	9,538	9,538	59,135	9,538	9,538	59,136
R^2	0.0008	0.005	0.63	0.0007	0.0078	0.59	0.001	0.0015	0.55

- Effects on crime rate more imprecise

Table IV
Event study estimates of the effect of arbitration rulings on crime; -12 to +12 month event time window

	All crime		Violent crime		Property crime	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	612.18		150.26		461.81	
	(63.98)		(23.23)		(42.00)	
Post-arbitration	26.86	24.68	7.75	4.87	19.19	19.86
× Employer win	(25.29)	(14.68)	(7.85)	(4.70)	(18.17)	(11.19)
Post-arbitration	7.64	6.68	7.07	2.49	0.170	4.40
× Union win	(16.24)	(11.42)	(5.46)	(4.46)	(11.68)	(7.87)
Row 3 – Row 2	-19.21	-18.01	-0.68	-2.38	-19.02	-15.46
	(30.06)	(19.12)	(9.56)	(6.63)	(21.60)	(13.96)
Employer Win	-31.81		-20.43		-11.35	
(Yes = 1)	(84.42)		(27.57)		(59.50)	
Fixed-effects?		Yes		Yes		Yes
Mean of the	444.03	519.42	95.49	98.26	348.45	421.28
dependent variable	[364.23]	[2037.4]	[103.16]	[363.76]	[292.10]	[1865.8]
Sample size	9,528	59,060	9,529	59,085	9,537	59,119
R^2	0.001	0.54	0.007	0.76	0.0003	0.42

- Do reference points matter?
- Plot impact on clearances rates (12,-12) as a function of $\bar{r}_a - (r_e + r_u)/2$

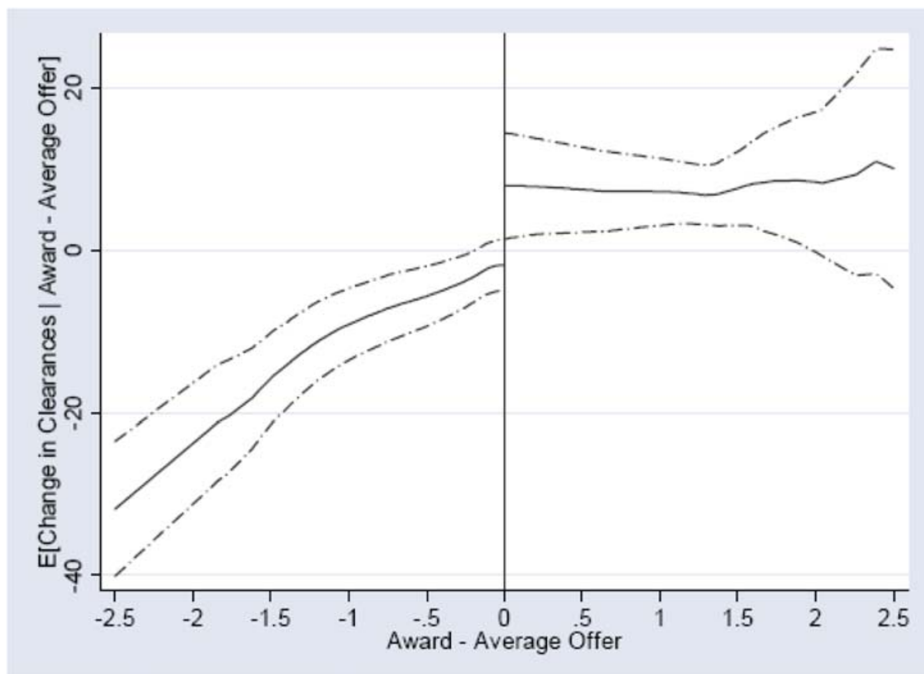


Figure V
Estimated expected change in clearances conditional on the deviation of the award from the average of the offers

- Effect of loss is larger than effect of gain

Table VII
Heterogeneous effects of arbitration decisions on clearances by loss size, award, and deviation from the expected offer; -12 to +12 month event time window

	(1)	(2)	(3)	(4)	(5) Police lose	(6) Police win
Post-Arbitration	5.72	-8.17	12.99	-7.42	4.97	7.30
	(2.31)	(9.58)	(8.45)	(4.76)	(3.14)	(4.17)
Post-Arbitration × Award		1.23	-1.00			
		(1.16)	(0.98)			
Post-Arbitration × Loss size	-10.31		-10.93		-0.20	
	(1.59)		(1.89)		(4.54)	
Post-Arbitration × Union win				13.38		
				(5.32)		
Post-Arbitration × (expected award-award)					-17.72	2.82
					(7.94)	(4.13)
Post-Arbitration × p(loss size)^				Included		
Sample Size	59,137	59,137	59,137	59,137	52,857	55,879
R^2	0.63	0.63	0.63	0.63	0.60	0.62

Standard errors, clustered on the intersection of arbitration window and city, are in parentheses. Standard deviations are in brackets. Observations are municipality × month cells. The sample is weighted by population size in 1976. The dependant variable is clearances per 100,000 capita. Loss size is defined as the union demand (percent increase on previous wage) less the arbitrator award. Amongst cities that underwent arbitration, the mean loss size is 0.489 with a standard deviation of 0.953. The expected award is the mathematical expectation of the award given the union and employer offers and the predicted probability of an employer win. The predicted probability of an employer win is estimated with a probit model using as predictors year of arbitration dummies, the average of the final offers, log population, and the length of the contract. See text for details. The samples in models (1)-(4) consist of the 12 months before to the 12 months after arbitration, for jurisdictions that underwent arbitration, as well as all jurisdictions that never underwent arbitration for all months between 1976 and 1996. The sample in model (5) consists of cities where the union lost in arbitration and the comparison group of non-arbitrating cities. The sample in model (6) consists of cities where the union won in arbitration and the comparison group of non-arbitrating cities. All models include month × year effects (252), arbitration window effects (383), and city effects (452). Author's calculation based on NJ PERC arbitration cases matched to monthly municipal clearance rates at the jurisdiction level from FBI Uniform Crime Reports.

- Column (3): Effect of a gain relative to $(r_e + r_u)/2$ is not significant; effect of a loss is

- Columns (5) and (6): Predict expected award $\hat{r}_a$ using covariates, then compute $\bar{r}_a - \hat{r}_a$

  - $\bar{r}_a - \hat{r}_a$ does not matter if union wins

  - $\bar{r}_a - \hat{r}_a$ matters a lot if union loses

- Assume policeman maximizes

$$\max_e \left[\bar{U} + U(w)\right] e - \theta \frac{e^2}{2}$$

where

$$U(w) = \begin{cases} w - \hat{w} & \text{if} \quad w \geq \hat{w} \\ \lambda(w - \hat{w}) & \text{if} \quad w < \hat{w} \end{cases}$$

- Reduced form of reciprocity model where altruism towards the city is a function of how nice the city was to the policemen $(\bar{U} + U(w))$

- F.o.c.:

$$\bar{U} + U(w) - \theta e = 0$$

Then

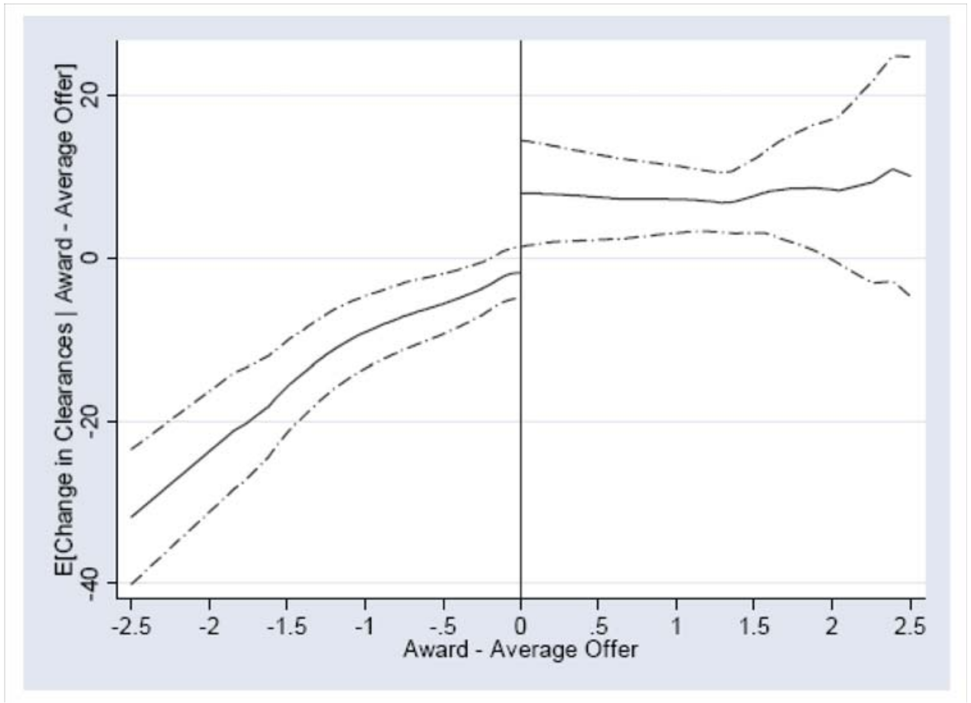
$$e^*(w) = \frac{\bar{U}}{\theta} + \frac{1}{\theta} U(w)$$

- It implies that we would estimate

$$Clearances = \alpha + \beta\left(\bar{r}_a - \hat{r}_a\right) + \gamma\left(\bar{r}_a - \hat{r}_a\right)1\left(\bar{r}_a - \hat{r}_a < 0\right) + \varepsilon$$

with $\beta > 0$ (also in standard model) and $\gamma > 0$ (not in standard model)

- Compare to observed pattern



- Close to predictions of model

2 Reference Dependence: Domestic Violence

- Consider a man in conflicted relationship with the spouse

- What is the effect of an event such as the local football team losing or winning a game?

- With probability h the man loses control and becomes violent
  - Assume $h = h(u)$ with $h' < 0$ and u the underlying utility
  - Denote by p the ex-ante expectation that the team wins
  - Denote by $u(W)$ and $u(L)$ the consumption utility of a loss

- Using a Koszegi-Rabin specification, then ex-post the utility from a win is

$$\begin{aligned} U(W|p) &= u(W) \text{ [consumption utility]} \\ &\quad +p[0]+(1-p)\eta[u(W)-u(L)] \text{ [gain-loss utility]} \end{aligned}$$

- Similarly, the utility from a loss is

$$U(L|p) = u(L) + (1-p)[0] - \lambda p \eta [u(W) - u(L)]$$

- Implication:

$$\partial U(L|p)/\partial p = -\lambda\eta[u(W) - u(L)] < 0$$

  - The more a win is expected, the more a loss is painful −> the more likely it is to trigger violence

  - The (positive) effect of a gain is higher the more unexpected (lower p)

- **Card and Dahl (QJE 2011)** test these predictions using a data set of:
  - Domestic violence (NIBRS)
  - Football matches by State
  - Expected win probability from Las Vegas predicted point spread

- Separate matches into
  - Predicted win (+3 points of spread)
  - Predicted close
  - Predicted loss (-3 points)

Table 4. Emotional Shocks from Football Games and Male-on-Female Intimate Partner Violence Occurring at Home, Poisson Regressions.

	Intimate Partner Violence, Male on Female, at Home				
			Baseline Model		
	(1)	(2)	(3)	(4)	(5)
Coefficient Estimates					
Loss * Predicted Win (*Upset Loss*)	.083	.077	.080	.074	.076
	(.026)	(.027)	(.027)	(.028)	(.028)
Loss * Predicted Close (*Close Loss*)	.031	.034	.036	.024	.026
	(.023)	(.024)	(.024)	(.025)	(.025)
Win * Predicted Loss (*Upset Win*)	-.002	.011	.021	.013	.011
	(.027)	(.027)	(.028)	(.029)	(.029)
Predicted Win	-.004	-.019	-.015	.000	-.068
	(.022)	(.032)	(.032)	(.033)	(.044)
Predicted Close	-.012	-.017	-.016	-.007	-.074
	(.023)	(.032)	(.032)	(.034)	(.044)
Predicted Loss	-.000	-.004	-.011	.006	-.057
	(.022)	(.031)	(.031)	(.033)	(.042)
Non-game Day	---	---	---	---	---
Nielsen Rating					.009
					(.004)
Municipality fixed effects	X	X	X	X	X
Year, week, & holiday dummies		X	X	X	X
Weather variables			X	X	X
Nielsen Data Sub-sample				X	X
Log likelihood	-42,890	-42,799	-42,784	-39,430	-39,428
Number of Municipalities	765	765	765	749	749
Observations	77,520	77,520	77,520	71,798	71,798

- Findings:
  1. Unexpected loss increase domestic violence
  2. No effect of expected loss
  3. No effect of unexpected win, if anything increases violence

- Findings 1-2 consistent with ref. dep. and 3 partially consistent (given that violence is a function is very negative utility)

- Other findings:
  - Effect is larger for more important games
  - Effect disappears within a few hours of game end –> Emotions are transient
  - No effect on violence of females on males

3 Reference Dependence: Insurance

- Much of the laboratory evidence on prospect theory is on risk taking

- Field evidence considered so far (mostly) does not involve risk:
  - House Sale
  - Merger Offer

- Field evidence on risk taking?

- **Sydnor (AEJ Applied, 2010)** on deductible choice in the life insurance industry

- Menu Choice as identification strategy as in DellaVigna and Malmendier (2006)

- Slides courtesy of Justin Sydnor

Dataset

- 50,000 Homeowners-Insurance Policies
  - 12% were new customers
- Single western state
- One recent year (post 2000)
- Observe
  - Policy characteristics including deductible
    - 1000, 500, 250, 100
  - Full available deductible-premium menu
  - Claims filed and payouts by company

Features of Contracts

- Standard homeowners-insurance policies (no renters, condominiums)
- Contracts differ only by deductible
- Deductible is *per claim*
- No experience rating
  - Though underwriting practices not clear
- Sold through agents
  - Paid commission
  - No “default” deductible
- Regulated state

Summary Statistics

Variable	Full Sample	Chosen Deductible 1000	500	250	100
Insured home value	206,917	266,461	205,026	180,895	164,485
	(91,178)	(127,773)	(81,834)	(65,089)	(53,808)
Number of years insured by the company	8.4	5.1	5.8	13.5	12.8
	(7.1)	(5.6)	(5.2)	(7.0)	(6.7)
Average age of H.H. members	53.7	50.1	50.5	59.8	66.6
	(15.8)	(14.5)	(14.9)	(15.9)	(15.5)
Number of paid claims in sample year (claim rate)	0.042	0.025	0.043	0.049	0.047
	(0.22)	(0.17)	(0.22)	(0.23)	(0.21)
Yearly premium paid	719.80	798.60	715.60	687.19	709.78
	(312.76)	(405.78)	(300.39)	(267.82)	(269.34)
N	49,992	8,525	23,782	17,536	149
Percent of sample	100%	17.05%	47.57%	35.08%	0.30%

* Means with standard errors in parentheses.

Deductible Pricing

- X_i = matrix of policy characteristics
- $f(X_i)$ = "base premium"
  - Approx. linear in home value
- Premium for deductible D
  - $P_i^D = \delta_D f(X_i)$
- Premium differences
  - $\Delta P_i = \Delta\delta f(X_i)$
- $\Rightarrow$Premium differences depend on base premiums (insured home value).

Premium-Deductible Menu

Available Deductible	Full Sample
1000	\$615.82 (292.59)
500	+99.91 (45.82)
250	+86.59 (39.71)
100	+133.22 (61.09)

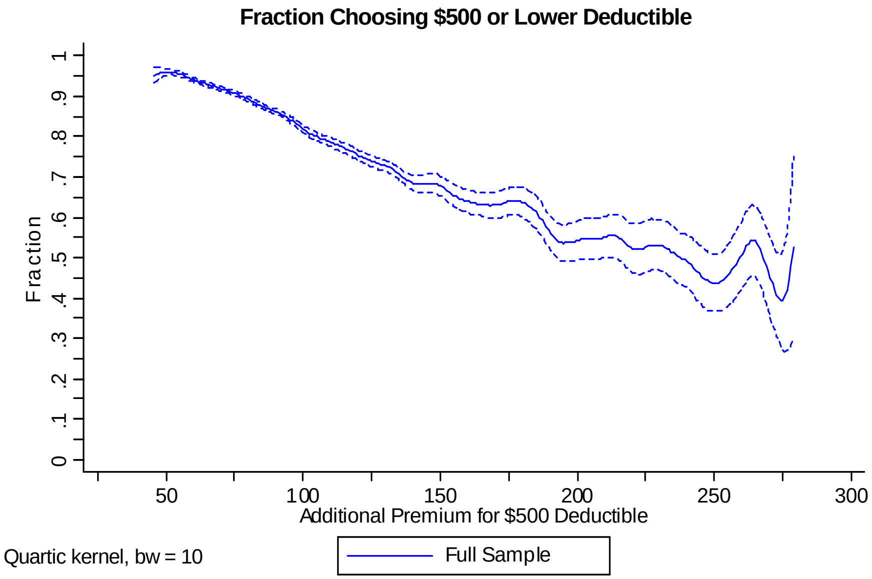
* Means with standard deviations in parentheses

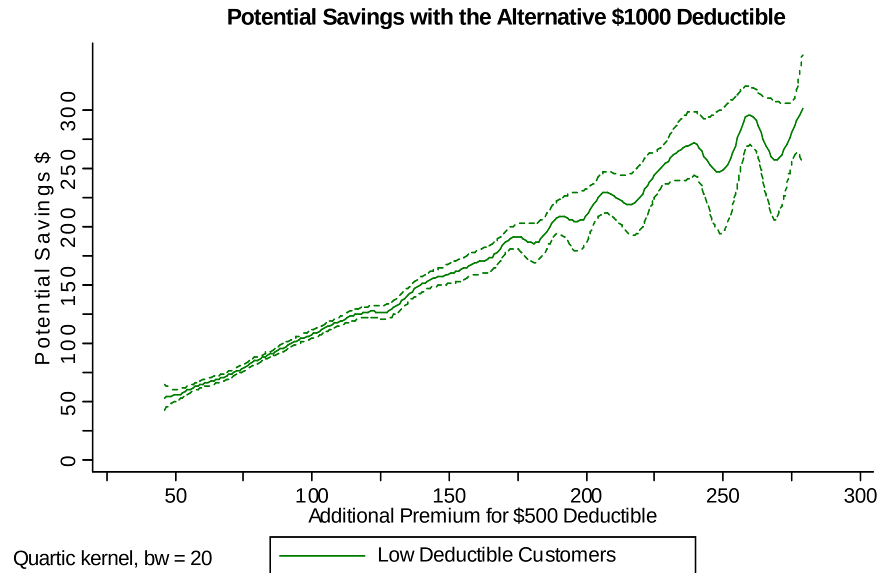
Risk Neutral Claim Rates?

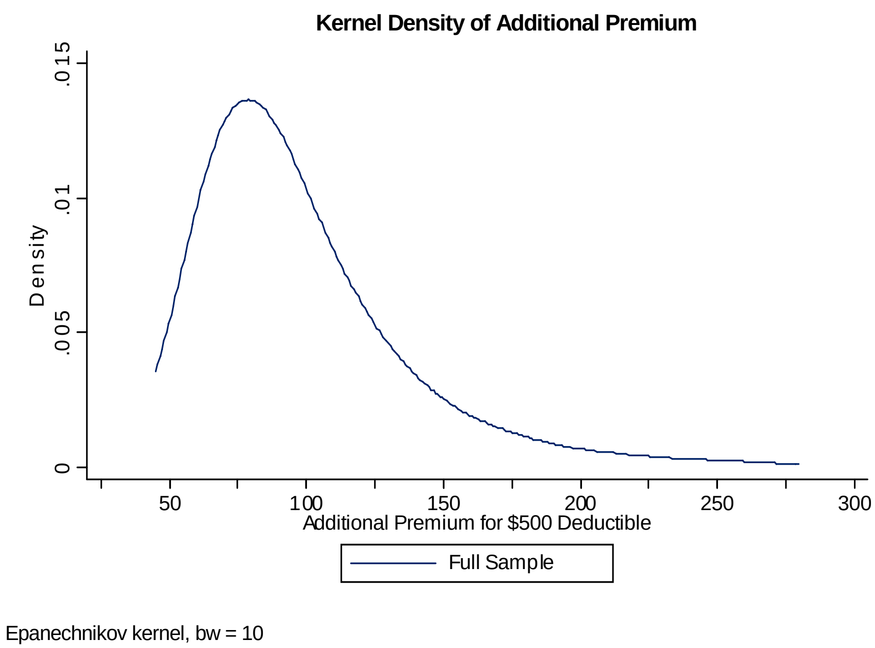
100/500 = 20%

87/250 = 35%

133/150 = 89%







What if the x-axis were insured home value?

Potential Savings with 1000 Ded

Claim rate?

Value of lower deductible?

Additional premium?

Potential savings?

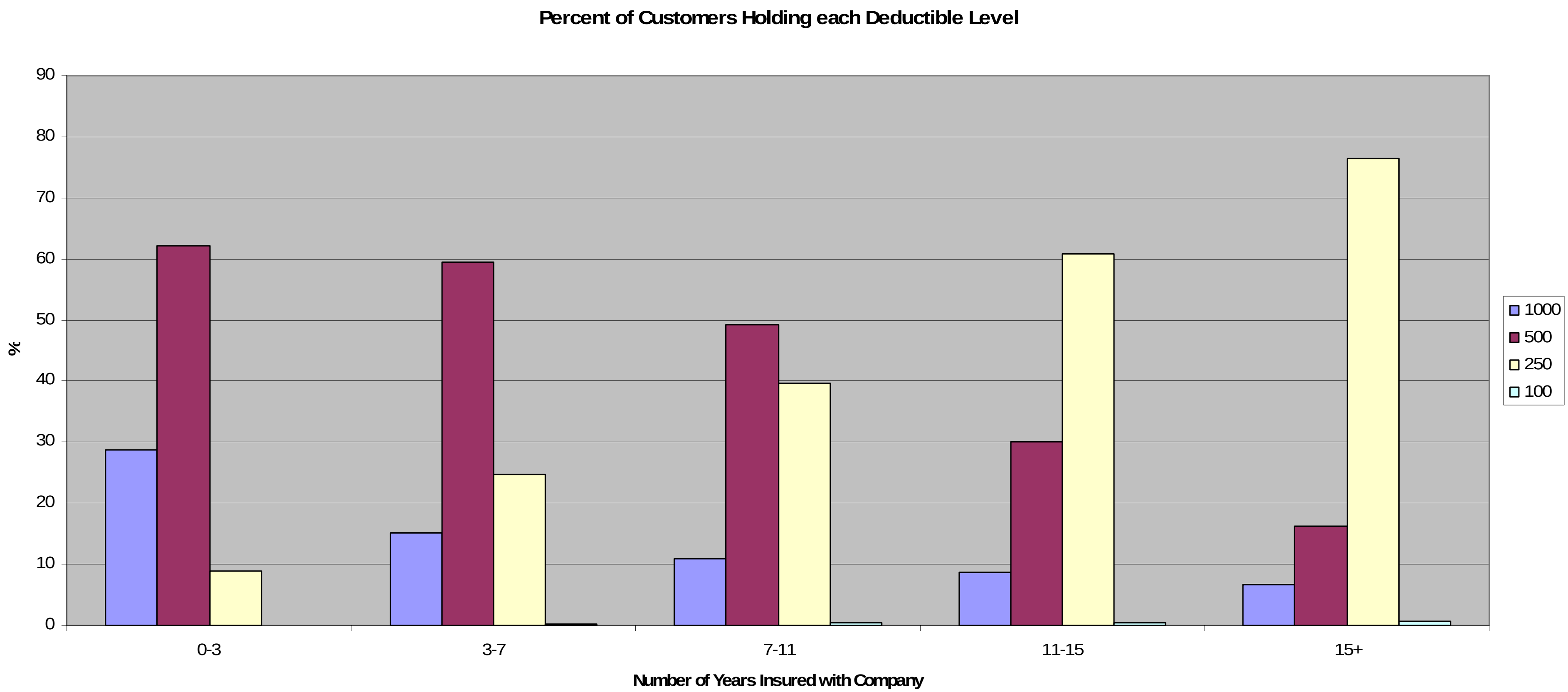
Chosen Deductible	Number of claims per policy	Increase in out-of-pocket payments *per claim* with a $1000 deductible	Increase in out-of-pocket payments *per policy* with a $1000 deductible	Reduction in yearly premium per policy with $1000 deductible	Savings per policy with $1000 deductible
$500	0.043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

* Means with standard errors in parentheses

Back of the Envelope

- BOE 1: Buy house at 30, retire at 65, 3% interest rate $\Rightarrow$ \$6,300 expected
  - With 5% Poisson claim rate, only 0.06% chance of losing money
- BOE 2: (Very partial equilibrium) 80% of 60 million homeowners could expect to save \$100 a year with “high” deductibles $\Rightarrow$ \$4.8 billion per year

Consumer Inertia?



Look Only at New Customers

Chosen Deductible	Number of claims per policy	Increase in out-of-pocket payments *per claim* with a $1000 deductible	Increase in out-of-pocket payments *per policy* with a $1000 deductible	Reduction in yearly premium per policy with $1000 deductible	Savings per policy with $1000 deductible
$500	0.037	475.05	17.16	94.53	77.37
N = 3,424 (54.6%)	(.0035)	(7.96)	(1.66)	(0.55)	(1.74)
$250	0.057	641.20	35.68	154.90	119.21
N = 367 (5.9%)	(.0127)	(43.78)	(8.05)	(2.73)	(8.43)

Average forgone expected savings for all low-deductible customers: $81.42

Risk Aversion?

- Simple Standard Model
  - Expected utility of wealth maximization
  - Free borrowing and savings
  - Rational expectations
  - Static, single-period insurance decision
  - No other variation in lifetime wealth

Model of Deductible Choice

- Choice between (P_L,D_L) and (P_H,D_H)
- π = probability of loss
  - Simple case: only one loss
- EU of contract:
  - $U(P,D,\pi) = \pi u(w-P-D) + (1-\pi)u(w-P)$

Bounding Risk Aversion

Assume CRRA form for u:

$$u(x) = \frac{x^{(1-\rho)}}{(1-\rho)} \quad for\ \rho \neq 1, \quad and \quad u(x) = \ln(x)\ \ for\ \rho = 1$$

Indifferent between contracts iff:

$$\pi \frac{(w - P_L - D_L)^{(1-\rho)}}{(1-\rho)} + (1-\pi)\frac{(w - P_L)^{(1-\rho)}}{(1-\rho)} = \pi \frac{(w - P_H - D_H)^{(1-\rho)}}{(1-\rho)} + (1-\pi)\frac{(w - P_H)^{(1-\rho)}}{(1-\rho)}$$

Getting the bounds

- Search algorithm at individual level
  - New customers
- Claim rates: Poisson regressions
  - Cap at 5 possible claims for the year
- Lifetime wealth:
  - Conservative: $1 million (40 years at $25k)
  - More conservative: Insured Home Value

CRRA Bounds

Chosen Deductible	Measure of Lifetime Wealth (W): (Insured Home Value)		
	W	min ρ	max ρ
$1,000	256,900	- infinity	794
N = 2,474 (39.5%)	{113,565}		(9.242)
$500	190,317	397	1,055
N = 3,424 (54.6%)	{64,634}	(3.679)	(8.794)
$250	166,007	780	2,467
N = 367 (5.9%)	{57,613}	(20.380)	(59.130)

Interpreting Magnitude

- 50-50 gamble:
  Lose \$1,000/ Gain \$10 million
  - 99.8% of low-ded customers would reject
  - Rabin (2000), Rabin & Thaler (2001)
- Labor-supply calibrations, consumption-savings behavior $\Rightarrow \rho < 10$
  - Gourinchas and Parker (2002) -- 0.5 to 1.4
  - Chetty (2005) -- < 2

Prospect Theory

- Kahneman & Tversky (1979, 1992)
- Reference dependence
  - Not final wealth states
- Value function
  - Loss Aversion
  - Concave over gains, convex over losses
- Non-linear probability weighting

Model of Deductible Choice

- Choice between (P_L, D_L) and (P_H, D_H)
- π = probability of loss
- EU of contract:
  - $U(P,D,\pi) = \pi u(w-P-D) + (1-\pi)u(w-P)$
- PT value:
  - $V(P,D,\pi) = v(-P) + w(\pi)v(-D)$
- Prefer (P_L, D_L) to (P_H, D_H)
  - $v(-P_L) - v(-P_H) < w(\pi)[v(-D_H) - v(-D_L)]$

Loss Aversion and Insurance

- Slovic et al (1982)
  - Choice A
    - 25% chance of $200 loss **[80%]**
    - Sure loss of $50 **[20%]**
  - Choice B
    - 25% chance of $200 loss **[35%]**
    - Insurance costing $50 **[65%]**

No loss aversion in buying

- Novemsky and Kahneman (2005)
  (Also Kahneman, Knetsch & Thaler (1991))
  - Endowment effect experiments
  - Coefficient of loss aversion = 1 for "transaction money"
- Köszegi and Rabin (forthcoming QJE, 2005)
  - Expected payments
- Marginal value of deductible payment > premium payment (2 times)

So we have:

- Prefer (P_L, D_L) to (P_H, D_H):

$$v(-P_L) - v(-P_H) < w(\pi)[v(-D_H) - v(-D_L)]$$

- Which leads to:

$$P_L^\beta - P_H^\beta < w(\pi)\lambda[D_H^\beta - D_L^\beta]$$

- Linear value function:

$$WTP = \Delta P = \boxed{w(\pi)\lambda}\Delta D$$

= 4 to 6 times EV

Parameter values

- Kahneman and Tversky (1992)
  - λ = 2.25
  - β = 0.88
- Weighting function

$$w(\pi) = \frac{\pi^{\gamma}}{(\pi^{\gamma} + (1-\pi)^{\gamma})^{1/\gamma}}$$

  - γ = 0.69

Choices: Observed vs. Model

Chosen Deductible	Predicted Deductible Choice from Prospect Theory NLIB Specification: $\lambda = 2.25$, $\gamma = 0.69$, $\beta = 0.88$				Predicted Deductible Choice from EU(W) CRRA Utility: $\rho = 10$, W = Insured Home Value			
	1000	500	250	100	1000	500	250	100
$1,000 N = 2,474 (39.5%)	**87.39%**	11.88%	0.73%	0.00%	**100.00%**	0.00%	0.00%	0.00%
$500 N = 3,424 (54.6%)	18.78%	**59.43%**	21.79%	0.00%	100.00%	**0.00%**	0.00%	0.00%
$250 N = 367 (5.9%)	3.00%	44.41%	**52.59%**	0.00%	100.00%	0.00%	**0.00%**	0.00%
$100 N = 3 (0.1%)	33.33%	66.67%	0.00%	**0.00%**	100.00%	0.00%	0.00%	**0.00%**

- **Barseghyan, Molinari, O'Donoghue, and Teitelbaum (AER 2013)**
  - Micro data for same person on 4,170 households for 2005 or 2006 on
    - home insurance
    - auto collision insurance
    - auto comprehensive insurance

- Estimate a model of reference-dependent preferences with Koszegi-Rabin reference points
  - Separate role of loss aversion, curvature of value function, and probability weighting

- Key to identification: variation in probability of claim:
  -
    - home insurance –> 0.084
    - auto collision insurance –> 0.069
    - auto comprehensive insurance –> 0.021

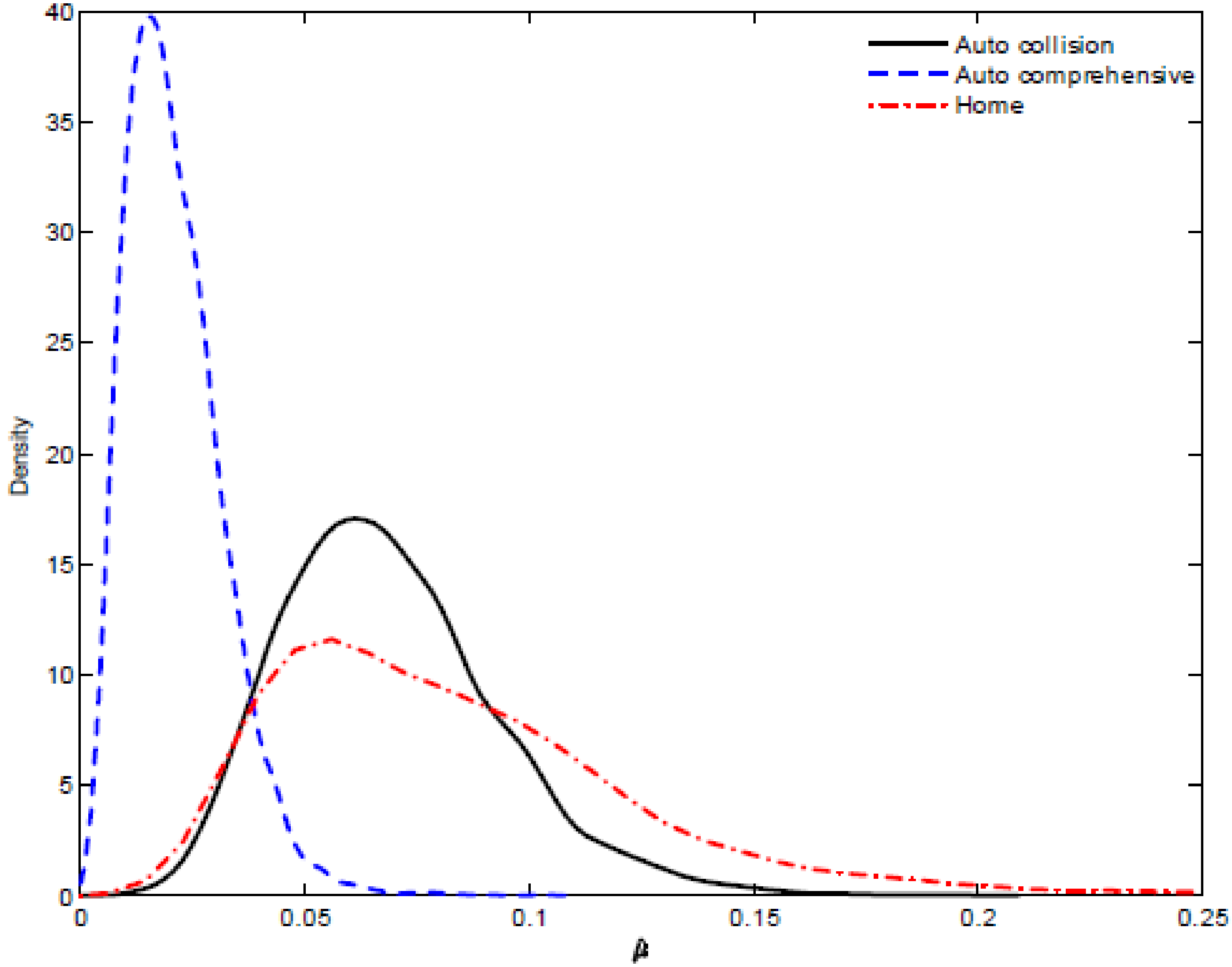


Figure 1: Empirical Density Functions for Predicted Claim Probabilities

- This allows for better identification of probability weighting function

- Main result: Strong evidence from probability weighting, implausible to obtain with standard risk aversion

- Share of probability weighting function

- With probability weighting, realistic demand for low-deductible insurance

- [**Next year write model**]

- Follow-up work: distinguish probability weighting from probability distortion

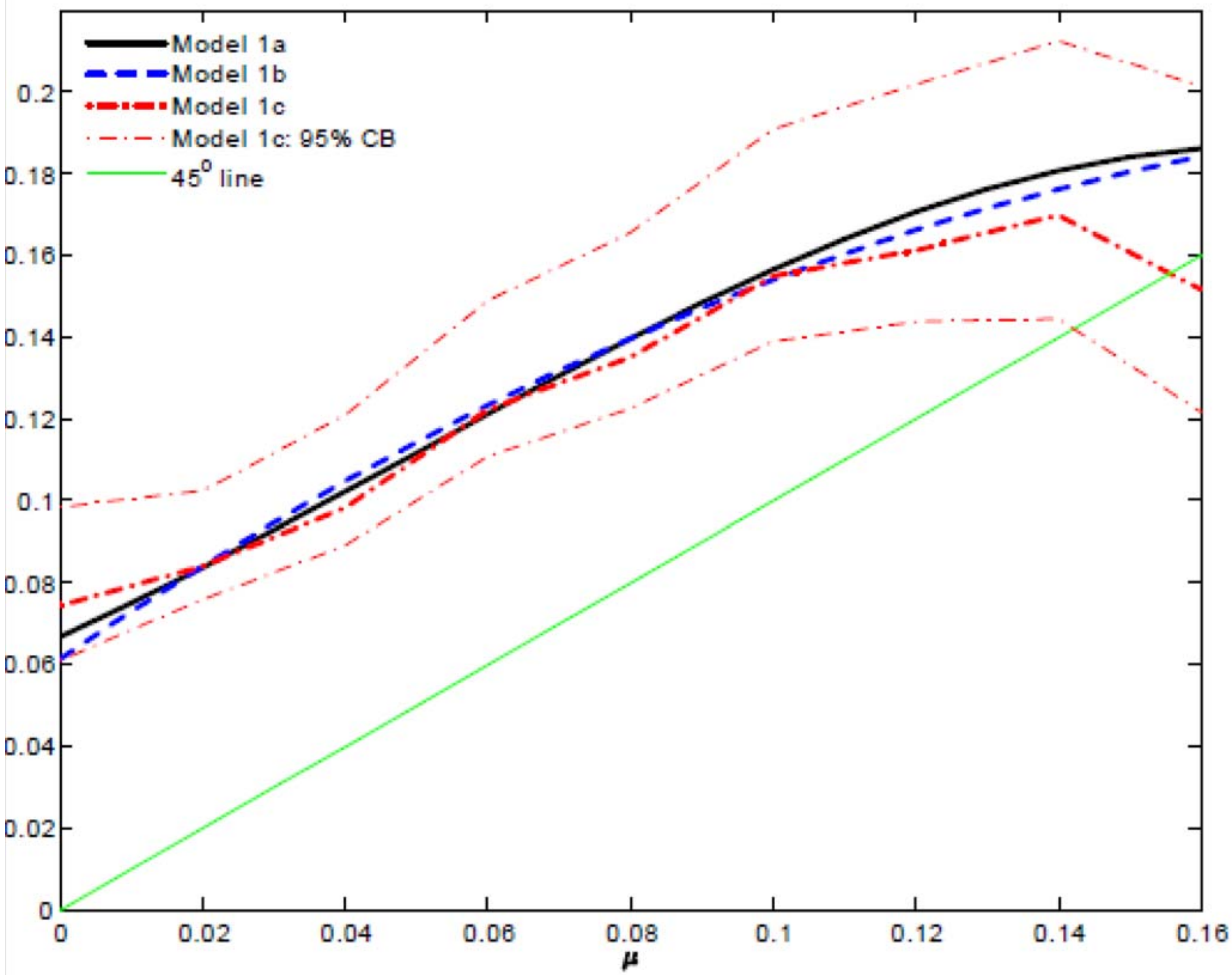


Figure 2: Estimated $\Omega(\mu)$ – Model 1

Table 6: Economic Significance

	(1)	(2)	(3)	(4)	(5)
Standard risk aversion	**r=0**	**r=0.00064**	**r=0**	**r=0.00064**	**r=0.0129**
Probability distortions?	**No**	**No**	**Yes**	**Yes**	**No**
μ	**WTP**	**WTP**	**WTP**	**WTP**	**WTP**
0.020	10.00	14.12	41.73	57.20	33.76
0.050	25.00	34.80	55.60	75.28	75.49
0.075	37.50	51.60	67.30	90.19	104.86
0.100	50.00	68.03	77.95	103.51	130.76
0.125	62.50	84.11	86.41	113.92	154.00

Notes: WTP denotes—for a household with claim rate μ, the utility function in equation (2), and the specified utility parameters—the household's maximum willingness to pay to reduce its deductible from $1000 to $500 when the premium for coverage with a $1000 deductible is $200. Columns (3) and (4) use the probability distortion estimates from Model 1a.

4 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 (*EMA* 2008): 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)

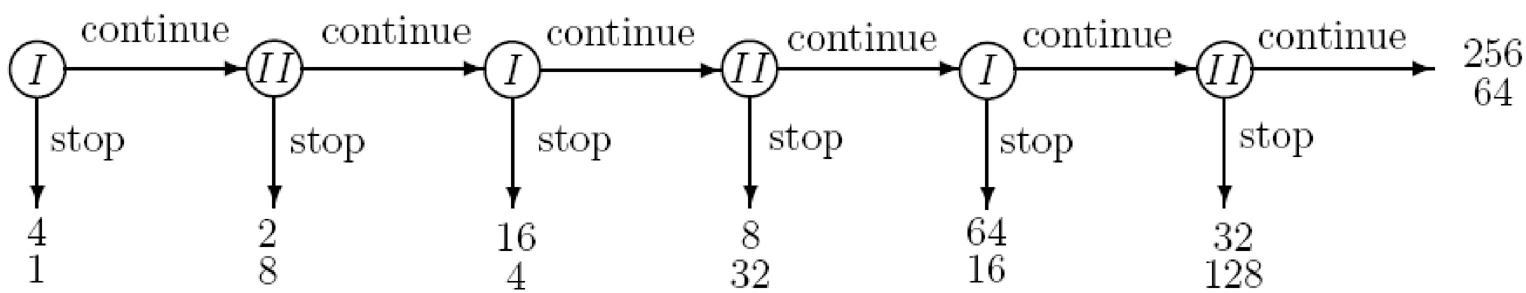
- However: Levitt-List-Reley (*EMA* 2010): Replicate in the US

  - Soccer and Poker players, 150 repetition

  - No better at Nash Play than students

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

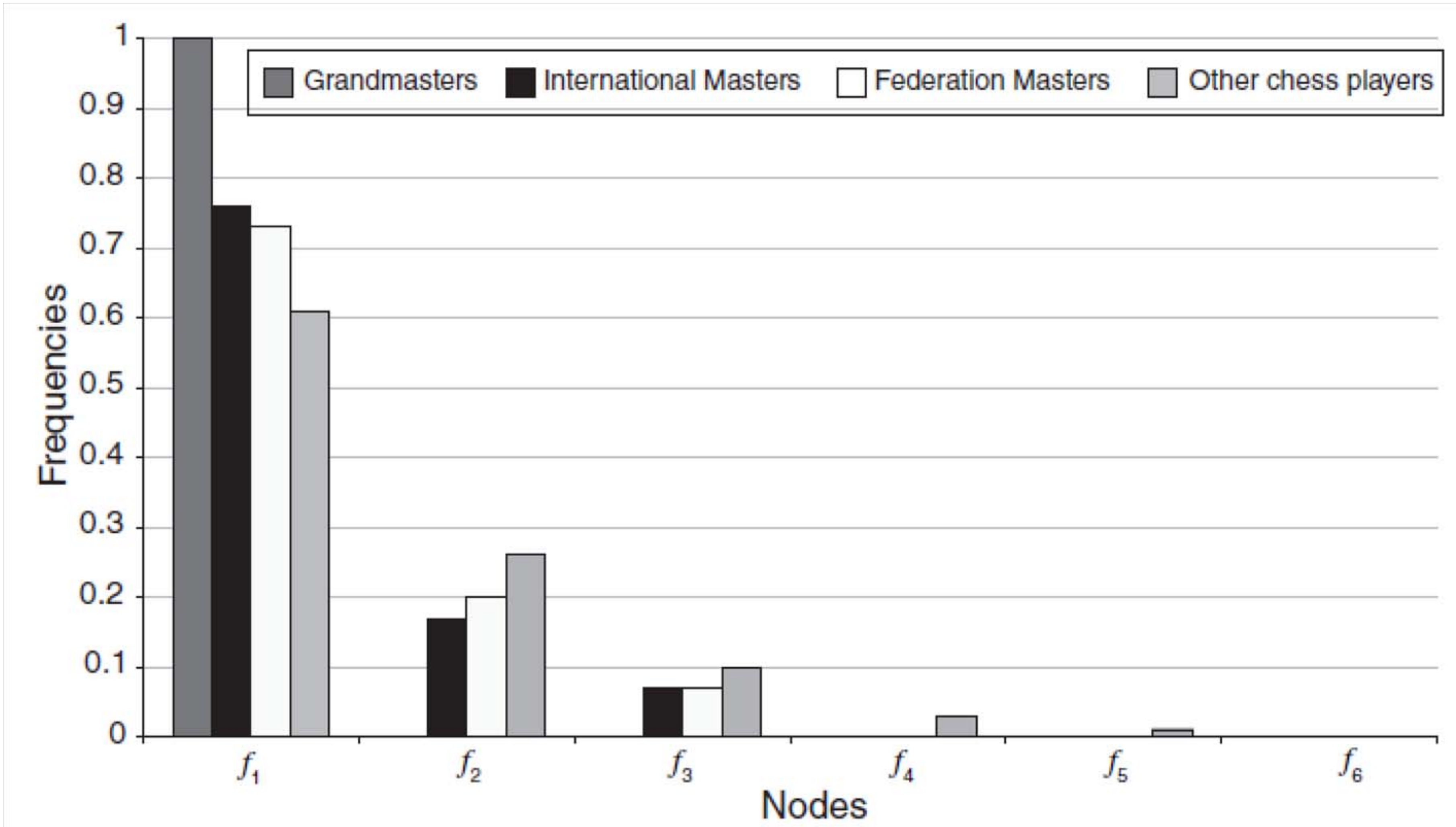
- **Case 3. Backward Induction.** Palacios-Huerta-Volij (*AER* 2009)

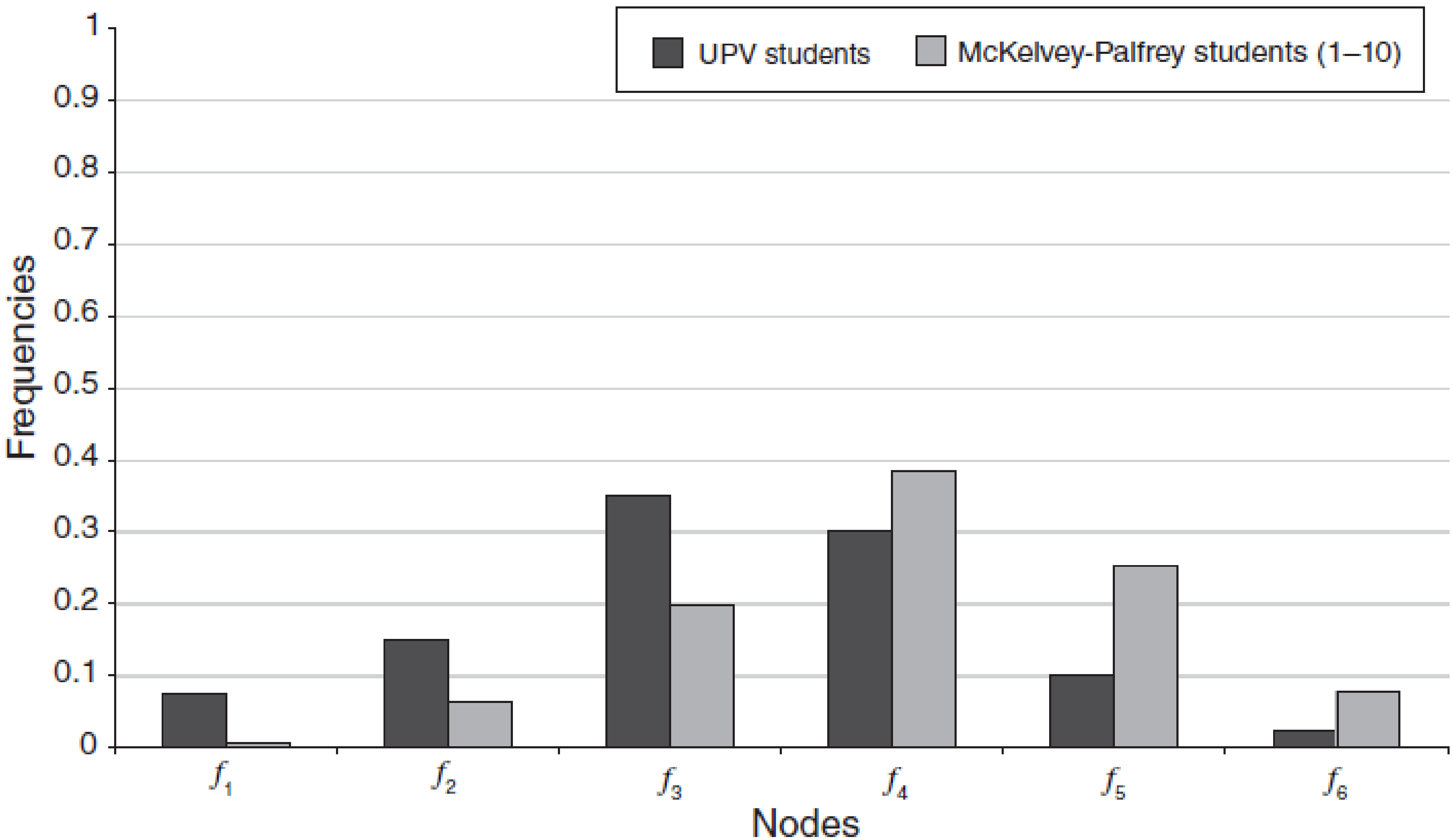


- Play in centipede game
  - Optimal strategy (by backward induction) –> Exit immediately
  - Continue if
    - ∗ No induction
    - ∗ Higher altruism

- 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


Grandmasters
International Masters
Federation Masters
Other chess players
Frequencies
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
f_1
f_2
f_3
f_4
f_5
f_6
Nodes


UPV students
McKelvey-Palfrey students (1–10)
Frequencies
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
f_1
f_2
f_3
f_4
f_5
f_6
Nodes

- 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?

- Laboratory experiment (added after the initial study)
  - Recruit students and chess players (not masters) in Bilbao
  - Create 2*2 combinations, with composition common knowledge

TABLE 5—PROPORTION OF OBSERVATIONS AND IMPLIED STOP PROBABILITIES AT EACH TERMINAL NODE

	Session	N	f_1	f_2	f_3	f_4	f_5	f_6	f_7
Panel A: Proportion of observations f_i									
I. Students versus students	1	100	0.04	0.15	0.40	0.27	0.13	0.01	0
	2	100	0.02	0.18	0.28	0.33	0.14	0.04	0.01
	Total 1–2	200	0.030	0.165	0.340	0.300	0.135	0.025	0.005
II. Students versus chess players	3	100	0.28	0.36	0.19	0.11	0.06	0	0
	4	100	0.32	0.37	0.22	0.07	0.02	0	0
	Total 3–4	200	0.300	0.365	0.205	0.090	0.040	0	0
III. Chess players versus students	5	100	0.37	0.26	0.22	0.09	0.06	0	0
	6	100	0.38	0.29	0.17	0.10	0.06	0	0
	Total 5–6	200	0.375	0.275	0.195	0.095	0.060	0	0
IV. Chess players versus chess players	7	100	0.69	0.19	0.11	0.01	0	0	0
	8	100	0.76	0.16	0.07	0.01	0	0	0
	Total 7–8	200	0.725	0.175	0.090	0.010	0	0	0

- Mixed groups exhibit very different behavior
- Possibility 1: Social preferences I
  - Students care less about chess players than about other students
  - Chess players care more about students than about other chess players
  - Part 2 is very unlikely
- Possibility 2: Social Preferences II
  - Belief that students are more reciprocal
- Possibility 3: Knowledge of rationality matters

  - It is common knowledge that chess players stop early, and that students stop late
  - Where exactly does this belief come from?

- Would be useful to compute whether strategies employed are profit-maximizing against opponent strategies

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

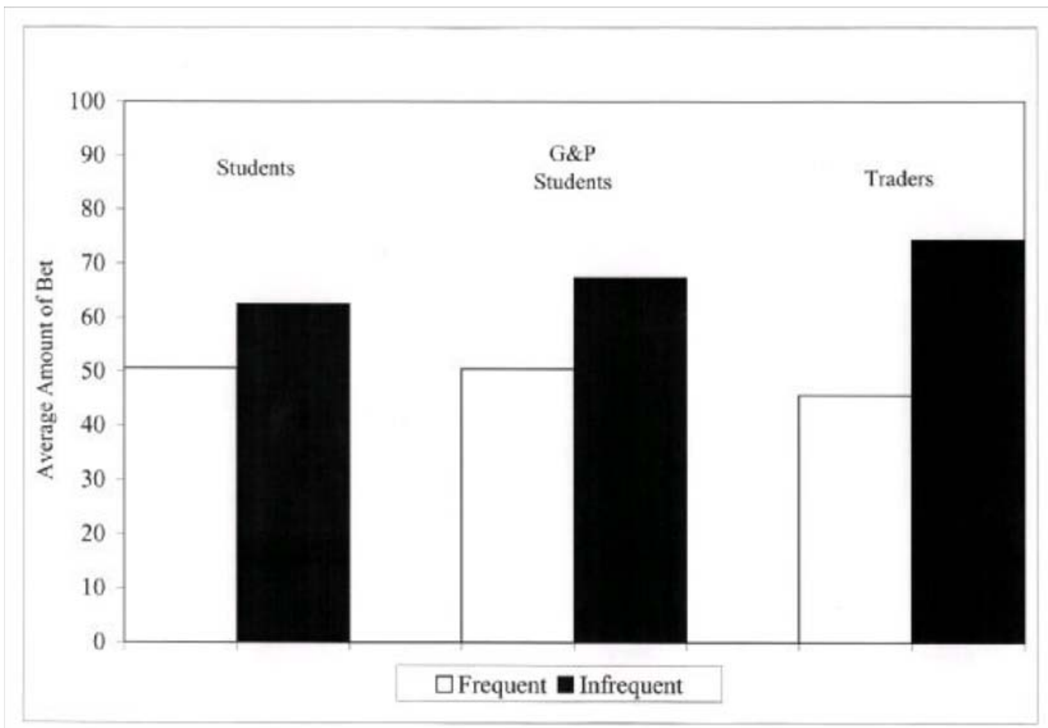
- Lottery: 2/3 chance to win 2.5X, 1/3 chance to lose X
  - Treatment F (Frequent): Make choice 9 times
  - Treatment I (Infrequent): Make choice 3 times in blocks of 3

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



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