Equilibrium Theory In Experimental Economics: The Paradox of Voter Participation

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Introduction

- two anomalies in the laboratory
- decision theoretic issues
  - behavior in the small versus large and curvature in the utility function
  - interpersonal preferences: altruism, spite and fairness
- equilibrium issues
- I am going to address the equilibrium issues
- general view: equilibrium theory doesn't work very well in the laboratory
- short-term (play once) versus long-term (opportunity to learn)
- focus on the second – since that is where we might hope equilibrium theory might work
- this was Lucas's basic point: we wouldn't base a theory of the business cycle on the idea that people keep making the same mistakes over and over again

Voter Participation

- the “rational” view of voter participation is widely used in theory
- equally widely viewed as controversial
- “the 'paradox' of voter turnout”
- turnout in large election seems high relative to the probability of being pivotal

The Model

based on the Palfrey and Rosenthal (1985)

N voters, divided into two groups, supporters of candidate A, supporters of candidate B

$N \in \{3,9,27,51\}$ (odd numbers divisible by 3)

drop the Palfrey and Rosenthal assumption that two groups are equal size

size of group A is N_A (minority, underdog)

the size of group B (majority, frontrunner) is N_B with $N_A < N_B$

sizes common knowledge to voters

each electorate size: two subtreatments

landslide $N_B = 2N_A$; *tossup* $N_B = N_A + 1$

voting rule: simple plurality

voters decide simultaneously to vote for preferred candidate or abstain

candidate with votes wins election, ties broken randomly

incentives

if A wins all members of group A receive reward of H; all members of group B receive reward $L < H$

if B wins all members of group B receive reward of H; all members of group A receive reward $L < H$

rewards are common knowledge: $L = 5$ and $H = 105$

voting is costly, and the voting cost is private information

distribution from which costs are drawn are integers drawn uniformly on [0, 55]; this is common knowledge

Protocol

get to play each game 50 times, randomly assigned to a group

instructions read aloud so everyone could hear, and Powerpoint slides were projected in front of the room to help explain the rules and to make all the common knowledge to the extent possible

after instructions were read, subjects were walked through two practice rounds with randomly forced choices and required to correctly answer all questions on a computerized comprehension

after first 50 rounds, a short set of new instructions were read aloud, explaining that the sizes of group A and group B would be different for the next 50 rounds

wording written to induce as neutral an environment as possible

no mention of voting or winning or losing or costs

Table 1: Experimental Design

N	N_A	N_B	#subjects	#sessions	#elections	# obs
3	1	2	51	4	850	2550
9	3	6	81	9	450	4050
9	4	5	81	9	450	4050
27	9	18	108	4	200	5400
27	13	14	108	4	200	5400
51	17	34	102	2	100	5100
51	25	24	102	2	100	5100

Nash Equilibrium

we compute the Nash equilibrium – cannot prove it is unique, but we establish uniqueness by doing a grid search

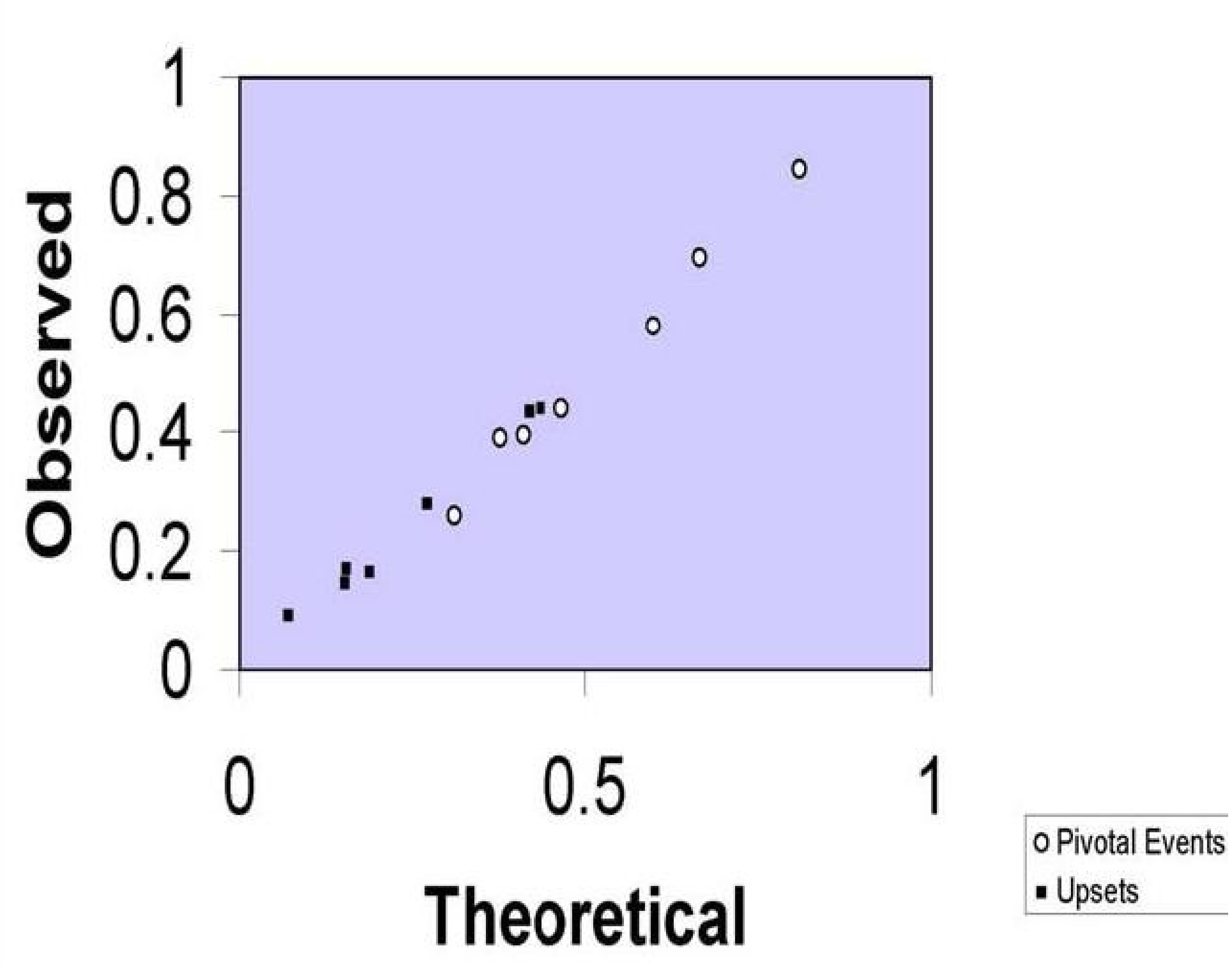
the key to Nash equilibrium is the probability of being pivotal: that is, a tie, or a one vote difference: only in a pivotal election does an individual decision make a difference

so we compute the probability of being pivotal for each set of parameters: ranges from less than half to nearly one

also compute the probability of upsets – the probability the minority party wins: range from near zero to nearly half

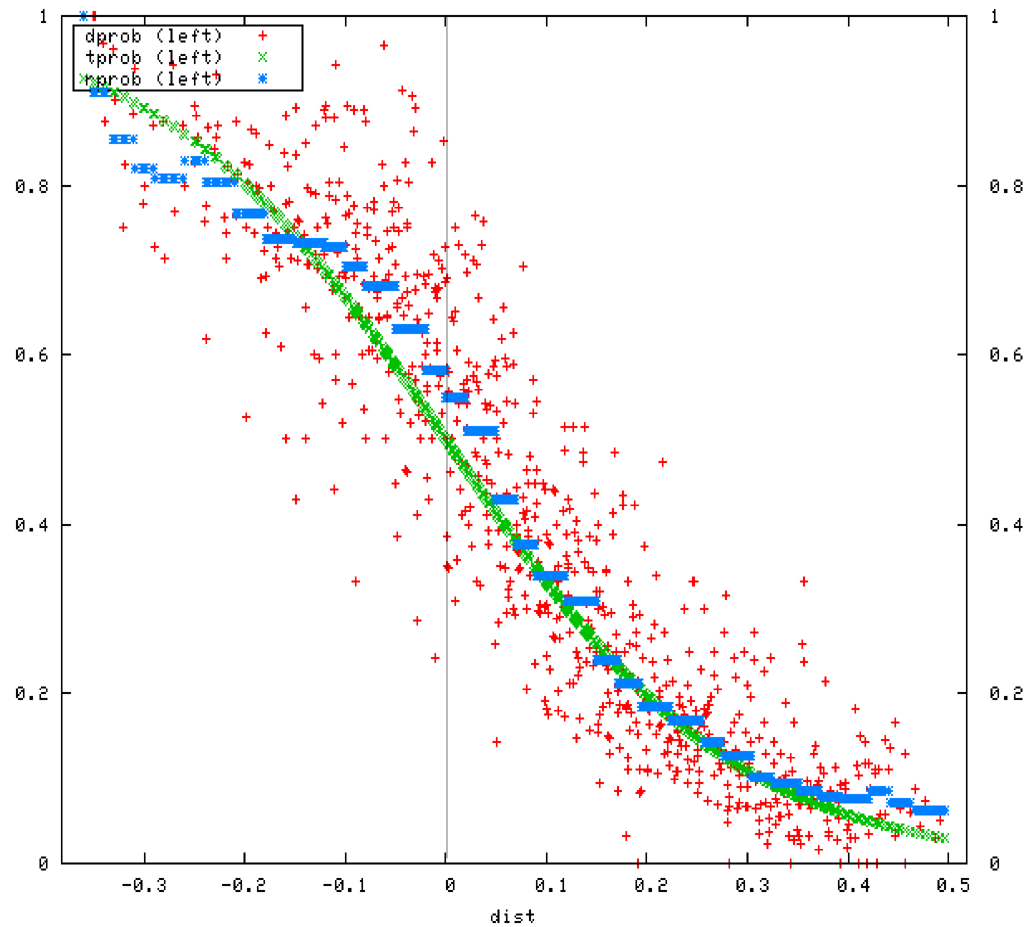
note that there is no estimation: everything is computed from the parameters

then we can determine from the experimental data the empirical values – when we plot the data against the theory, the points should lie on the 45 degree line


1
0.8
0.6
0.4
0.2
0
Observed
0
0.5
1
Theoretical
Pivotal Events
Upsets

- the fit between theory and data is about as good as you might get if you computed the gravitational constant by dropping baseballs off of balconies
- the paper has all sorts of other comparisons between theory and data in the aggregate: the upshot is that the theory works exceptionally well

- so what about individual behavior?
- calculate the equilibrium cost “cutpoint”
- measure the difference between the cost drawn and the cutpoint
- lower cost: participate for sure
- higher cost: don't participate for sure



dprob (left)
tprob (left)
nprob (left)
1
0.8
0.6
0.4
0.2
0
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
dist

- this is completely typical of experimental data
- lots of individual heterogeneity
- some games (centipede, repeated games) are sensitive to this heterogeneity
- others (double oral auctions) are not
- in the voting setting the key question is the truncation

Quantal Response

voter's turnout probability with voting cost is c

$$\tau_j(c;\lambda) = \frac{1}{1 + e^{\lambda(c - \pi_j)}}$$

where λ is the "logit response parameter"

voter's ex ante turnout probability

$$p_j^*(\lambda) = \int_{-\infty}^{\infty} \tau_j(c;\lambda) f(c)\, dc$$

logit response parameter, λ, a free parameter

estimate a single value of λ using MLE over all treatments

maximum likelihood estimate is $\lambda = 7$

QRE Asymptotics

Nash: as number of voters goes to infinity, participation goes to zero

QRE: participation rate $p_j^*(\lambda) = \int_0^{.55} \frac{1}{1+e^{\lambda(c-\pi_j)}} \frac{1}{.55} dc$

asymptotically probability of being pivotal $\pi_j \to 0$

TABLE 10. Large Population Participation Rates

λ	0	1	2	3	4	5	6	7	28
p	0.50	0.43	0.37	0.31	0.27	0.23	0.20	0.17	0.05

The Broader Message

should we “reject” Newtonian mechanics because of quantum effects?

Would we adopt a theory that says “objects fall up” because it might explain some particular quantum effect? A lot of behavioral theories fall into this category

We have a theory – Nash equilibrium – that explains a broad range of observations inside and outside the lab

We have a pretty good idea of the domain where this does predict well and when it doesn't – tools such as epsilon-equilibrium and QRE that tell us when the theory works well and poorly

any *useful* alternative theory has to remain consistent with these basic facts