Evolution and the Framing of Norms of Behavior

Joint work with Kevin Zollman

Fairness and the Commons

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Evolutionary analysis often does not match behavior in experiments.

Prisoner's Dilemma

Public Goods Provision Games

Stag Hunt Games

Ultimatum Bargaining

Subjects do not do a game theoretic analysis of the task at hand. (Costa-Gomez, Crawford and Brosetta 2001)

Rather they apply some social norm or convention.

These norms are not formed for single games, but rather for classes of social interactions.

Everyone believes this.

"In particular we suggest that initial play reflects decision rules that have evolved in real-life bargaining situations that are superficially similar to the Ultimatum Game. These bargaining games generally feature more symmetric allocations of bargaining power than the Ultimatum Game, yielding initial play in the Ultimatum Game experiments that need not be close to [sequentially rational play]"

-Gale, Binmore and Samuelson 1995

(see also Skyrms 1996)

… but where are the models?

- Zollman (2008) “Explaining Fairness in Complex Environments” *Philosophy, Politics and Economics.*
- Mengel (2008) “Learning Across Games” *working paper.*

Zollman (2008)

Class of games considered consists of symmetric Nash bargaining together with ultimatum bargaining.

Evolutionary dynamics is single population replicator dynamics.

Mini-Ultimatum

Demands are either 1/3, ½, or 2/3.

Strategy is a pair:

<demand, minimum amount to accept>

Equal chances of being proposer or responder.

Combined Games

Mini-Nash: Demand 1/3, ½ or 2/3

Nature chooses Mini-Nash or Ultimatum

(if ultimatum, reservation price comes into play)

Basins of attraction of the equal split

- Nash---------- .86
- Ultimatum---------- .34
- Half Nash - Half Ultimatum - .93

Mengel (2008)

2 agents repeatedly play a variety of games.

They partition games into similarity classes & games in the same similarity class are treated the same way.

Partitions cost according to their fineness.

Strategies and partitions co-evolve according to a reinforcement learning dynamics.

Rubinstein Alternating –offers bargaining with a shrinking pie.

A player's strategy is a pair:

<proportion to demand, minimum proportion to accept>

Note: If discount factor = 0, this is ultimatum bargaining.

Subgame Perfect Equilibrium

- There are many Nash equilibria $\frac{1}{1+d}$

- Unique subgame perfect equilibrium

$$1/(1+d)$$

Mengel considers a class of 2 Rubinstein Games with $d_1=0, d_2>0$.

- A there is a bargaining norm sustainable with small partition costs with division between the subgame equilibria for d_1 and d_2.

Experimental Framing Effects

- Nash bargaining -Mehta, Starmer, and Sugden (1992)

  Cards - entitlement

- Ultimatum Bargaining - Hoffman, McCabe, Shachat, and Smith (1994).

  Entitlement, Market

We need more than one partition
– *or perhaps something different* –
to account for such framing.

Signaling

Classical Signaling Games

- Sender – Receiver
- Separating, Pooling and Partial-pooling equilibria
- Dynamics

Dynamic Results

- 2 by 2 by 2 States Equiprobable
- States not equiprobable
- N by N by N
- L by N by M

Framing as Signaling

- Framing a game consists of a signal
- The signal activates a norm.
- The norm covers a class of games, of which the game in question is an instance.

Consequences

Behavior may be suboptimal for the game.

Different Frames may lead to different behavior in a single game.

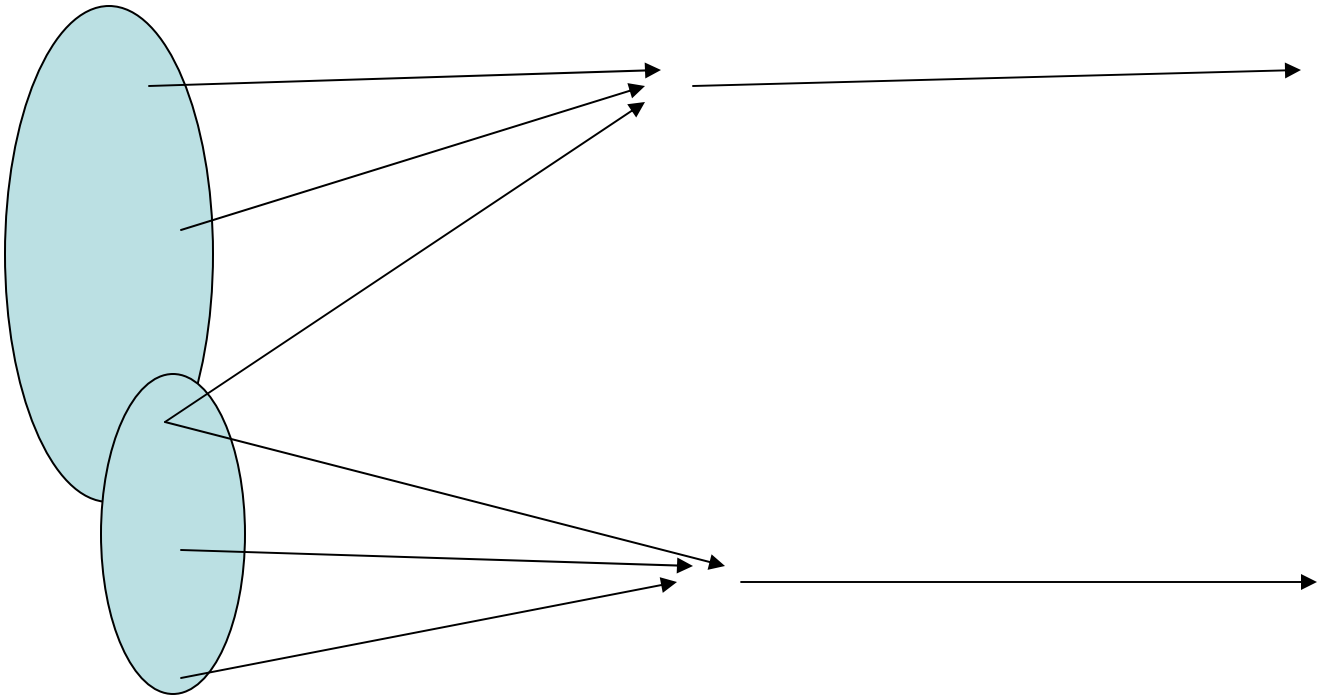
Different subjects may pick up different cues.

In different cultures different classes of games may be available

Evolution of Framing
(at least a first cut)

- Games trigger frames or cues.
- Number of frames is limited
- Frames trigger norms or heuristics.

These evolve probabilistically.



Equilibrium Problem?

Suppose (as is typical in framing effects) a game can be associated with one of several different frames, and each of the frames can trigger a different norm.

Typically, the different norms should have different payoffs for that game, so we should eventually learn to associate it with that norm.

Possible answers

The individual games are not played often enough. – *i.e. this is an out of equilibrium phenomenon.* … or …

A psychologically richer model is appropriate.

… or both.

Related Literature

Rubenstein *JET* 1988 “Similarity and Decision Making Under Risk”

Kahneman and Tversky *Econometrica* 1979.

“… framing a Decision can be a moral act…”

- K.&T.

Thank you.