The Game of Life

: Gabriel CR

: gabrielcr@ucsd.edu

: UCSD

: Modeling Behavioral Economics - Manu Vespa

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Motivation

Research Interest

Seeing how people choose the games they play.

Inspiration

From the biology and psychology literature:

- Jaak Panksepp
- Discovered the play circuit in mammals (along with other six affective systems, big deal in his field).
- He did experiment using rats. He put them in one on one settings, and found that they would engage in rough and tumble play.

Inspiration: Rats

From Jaak Panksepp's book (Panksepp, 1998):

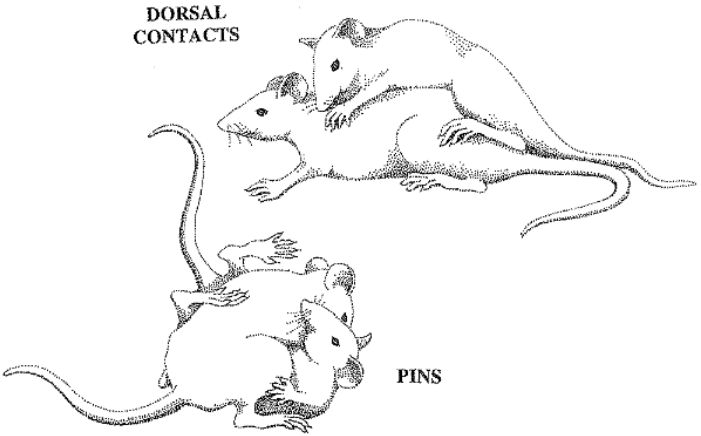

Figure 15.2. Two major play postures that are used to quantify rough-and-tumble play.

Inspiration: Rats

From Panksepp (1998):

- After several play episodes, one rat typically tends to become the “winner”, in that it ends up on top more often during pins.
- The winner ends up on top about 70% of the time, but the continuation of play appears to require reciprocity and the stronger partner’s willingness to handicap itself. If one animal becomes a ”bully” and aspires to end up on top all the time, playful activity gradually diminishes and the less successful animal begins to ignore the winner.
- There are reasons to believe that similar dynamics are present in human verbal play, which is a common way for folks to get to know each other and to best each other.

Some other examples of self-handicap in mammals.

Balinese long-tailed macaques (Gunst et al., 2023):

Some other examples of self-handicap in mammals.

Canines in general (Bauer and Smuts, 2007):

Some other examples of self-handicap in mammals.

Self-handicapping has been documented in (almost) every mammal, including whales.

Objective: [We] ain't nothing but mammals.

Examples of self-handicapping

There are various forms of self-handicapping which we (as humans) display:

- In tournaments:
  - Chess: A senior player might start without certain pieces.
  - Golf: Points are adjusted in a curve.
  - Sailing: Times are adjusted by characteristics of the vessel.
  - Horse racing: Horses carry different amounts of extra weight.
  - TCG: Banning cards.
- Team Sports:
  - Basketball: Order of the draft.
  - Football: Players are not allowed to earn more than certain amount (meaning that the richest team does not get all of the best players).
- Games with friends:
  - House rules (banning certain strategies. Board games, card games, hide and seek).
  - Teams are picked in order to balance skill.
  - Loosing on purpose.

Reasons for self-handicapping

There are various reasons for self-handicapping:

- Honing skills.
- Maintaining a sense of fairness.
- Staying in the zone of proximal development (playing with kids).
- Convincing the other person to play with you.
- Making the outcome of the match non-predictable (and thus, playing more exciting).
- Ensuring the enjoyment of all players.

My objective

My objective is to study rule formation in games. And how even purely selfish reasons can lead to self-handicapping.

Model

1vs1 Games

Setting:

- Suppose agents 1 and 2 decide to play a game in the class of games $\mathcal{G}$.
- Each game $g \in \mathcal{G}$, is defined by its rules. Rules determine how probable is that a person with lower ability beats someone with higher ability, $l_g \in [0, \frac{1}{2}]$.
- A game in which $l_g = 0$ is a game of pure ability, in which the higher ability player will always win, and $l_{g'} = \frac{1}{2}$ is a game of pure luck, in which ability plays no role.
- For simplicity, assume player 2 has a higher ability in all of the games in $\mathcal{G}$.

Setting:

- Then, any given player is willing to play g as long as their expected payoff is greater than zero, i.e., $\mathbb{E}[u_i|l_g] \geq 0$, for $i = 1, 2$. Let the payoff of winning a game be a, and of losing $-b$, with $a > b > 0$ for all games in $\mathcal{G}$. In this two player setting the conditions for a game to be voluntarily played are:

$$\mathbb{E}[u_1|l] = [a\,l - b(1-l)] = [a - (a+b)(1-l)] \geq 0$$

$$\mathbb{E}[u_2|l] = [a - (a+b)(l)] \geq 0$$

Observation 1

The games both players can agree on playing are characterized by:

$$l_g \in [\frac{b}{a+b}, \frac{a}{a+b}] \cap [0, \frac{1}{2}]$$

1vs1 Games, with N participants.

Setting:

- Now suppose that $N > 2$ participants are trying to agree on the rules of a particular 1vs1 game. $g \in \mathcal{G}$ is also characterized by its rules, which determine the probability that a lower ability player beats a higher ability one, $l_g \in [0, \frac{1}{2}]$.
- Playing is voluntary, so that any player can decide to stop playing before the stage begins, or be part of a coalition that decides to play under some other rules from $\mathcal{G}$.
- Players $i, j \in \{1, ..., N\}$ are such that if $i > j$, then player i has higher ability than player j.

Observation 2

Which rules they agree to play under, is a function of a parameter β, which determines how important is that multiple people play under this particular set of rules. Under one extreme case (it does not matter how many people play the game), we get the same result as before:

$$l_g \in [\frac{b}{a+b}, \frac{a}{a+b}] \cap [0, \frac{1}{2}]$$

But under the other extreme case (it matters how many people play the game), the only set of rules they can agree on is:

$$l_g = \frac{1}{2}$$

Experiment

Game of Cards

Subjects play a game of ”Highest Card”: whoever shows the greater card, wins.

- Here the asymmetry of ability comes from the amount of cards each player can draw. Which cards they end up drawing is the luck component.
- Players come in with a certain base amount of money, and bet (a fraction of) it every round they play. The lower ability player decides whether they keep playing or not.

Game of Cards

I would like to test two types of self-handicapping.

- Uncommitted handicap: in which the high ability player will decide to play a loosing card, even if they have a winning hand.
- Committed handicap: in which the high ability player will decide to change the rules such that they draw less cards.

References

References

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