What is Love?

(baby don't hurt me)

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Research Interest

My main interest is seeing how people choose the games they play.

Hypothesis

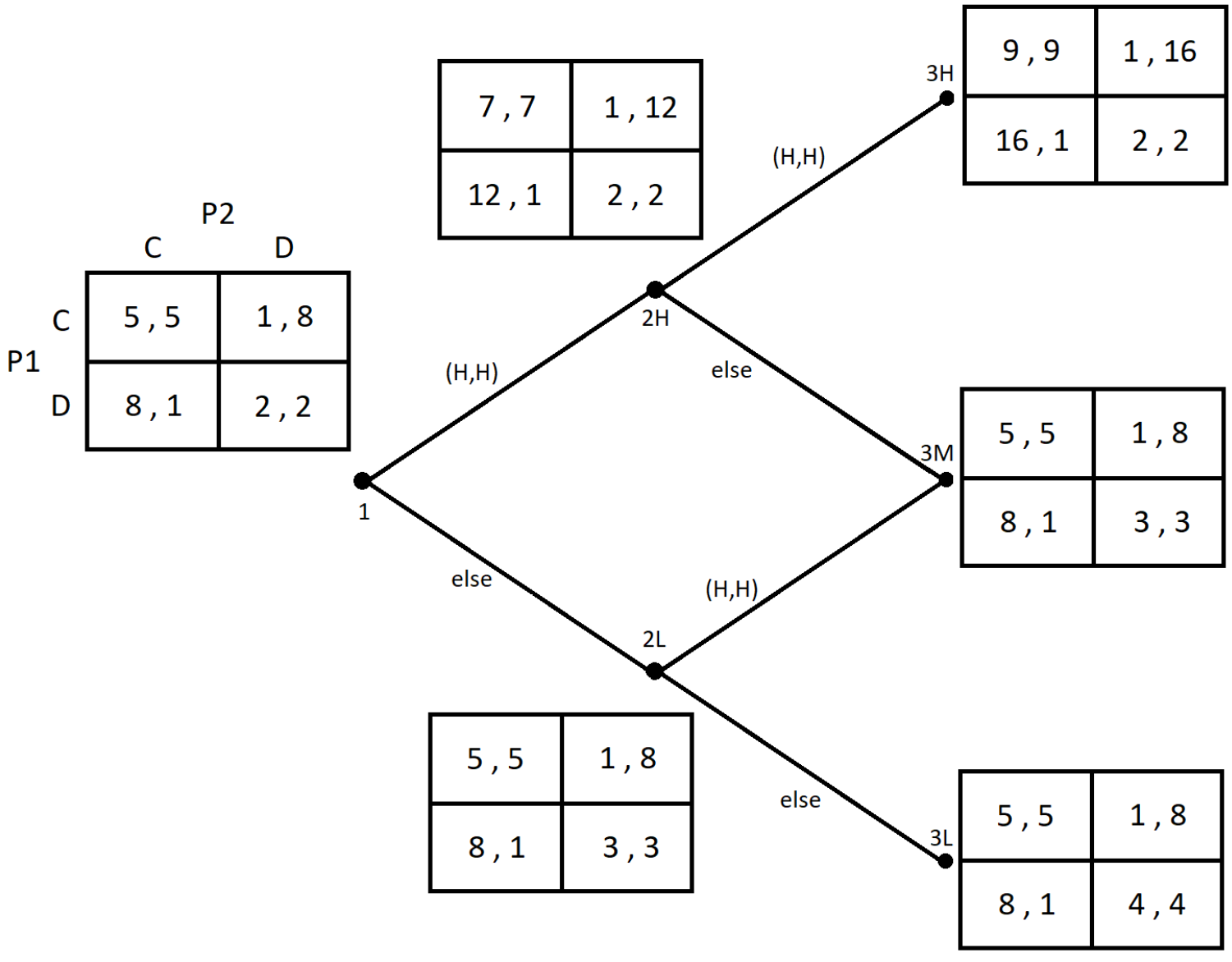
The hypothesis I'm testing with this experiment is if there are certain games that are only played after you find a special player (ex., love).

Structure of the game

The game has the following structure:

- A standard Prisoner's Dilemma game.
- Players independently decide whether to increase or decrease the stakes of the game.
- If they both choose to increase the stakes, they both play a PD with high(er) stakes, and decrease the stakes otherwise.

Structure of the game



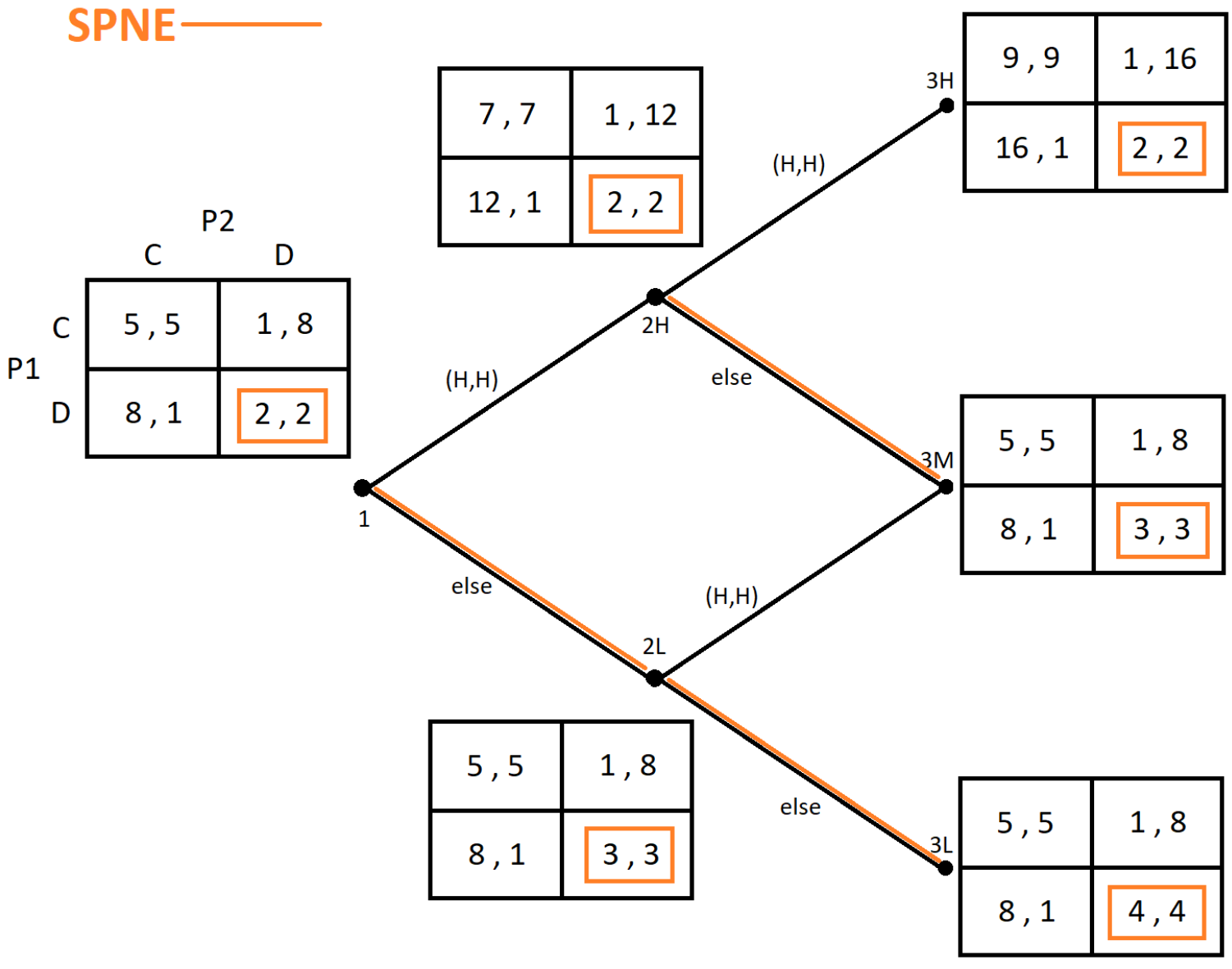
What would love look like?

Each participant plays the game only once, and does so under either of two specifications:

- You play the whole game with the same 'partner'.
- After every stage game, you change partners but you observe their play history.

The idea of the game is to find whether a special relationship is formed by playing repeatedly with the same person (first specification), or if it is all reputational effects (second specification).

Subgame Perfect NE



Effects

- Main Effect: Difference between the number of (H, H) being played under each specification (found a special partner).
- Difference in the percentage of games in which node $3H$ is reached.
- Difference in the percentage of (C, C) (show of love), $(D, C)/(C, D)$ (ultimate betrayal), and (D, D) (failed relationship) being played at node $3H$.

Implications

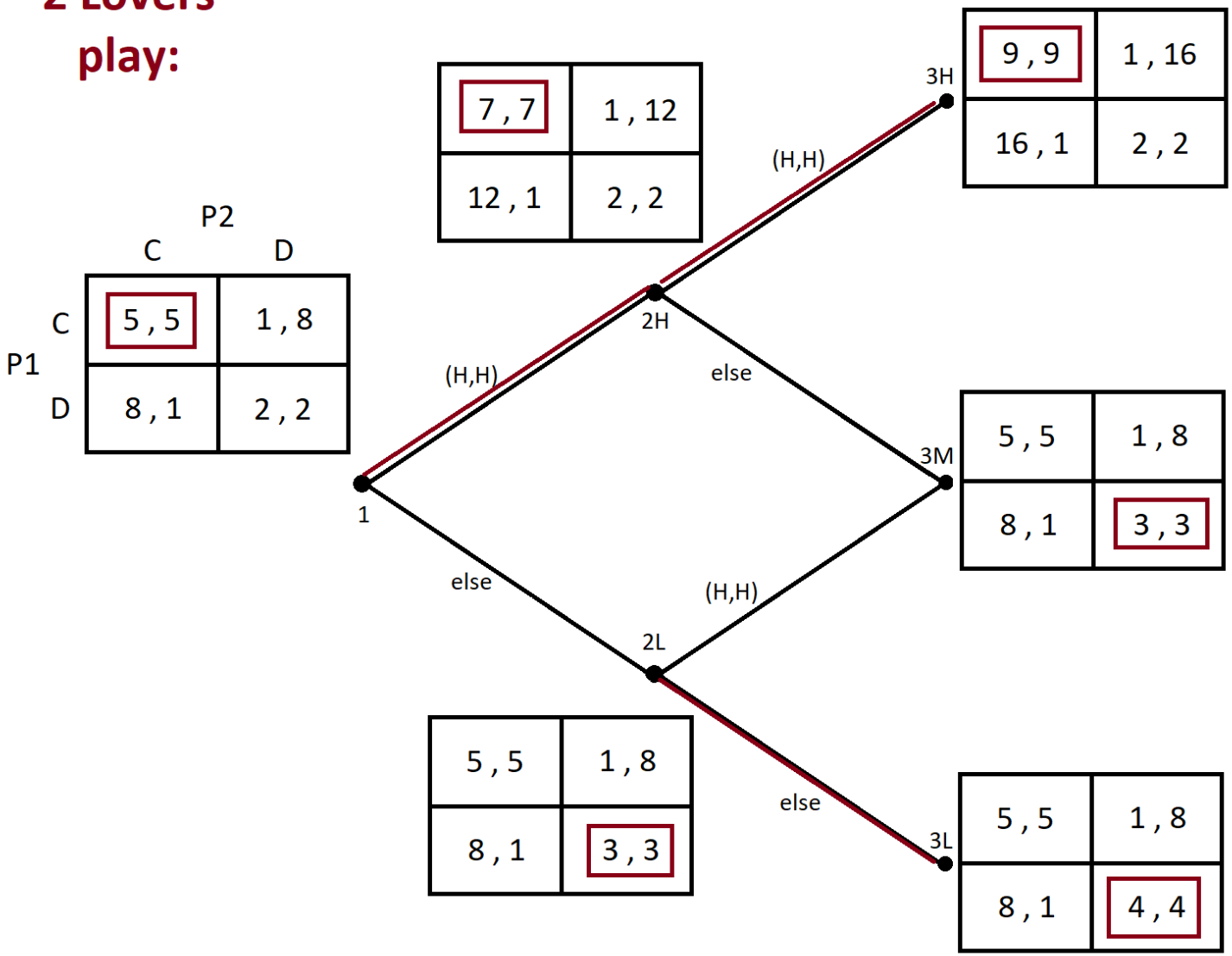
- Would be interesting if people create attachment just by playing.
- If people play differently after finding a special partner, we should be cautious when comparing results across lab experiments (when they have different designs in player match up).

Types of players

- Suppose we find the three types of players: Lovers, Betrayers and SPNE people.

Lovers

2 Lovers play:

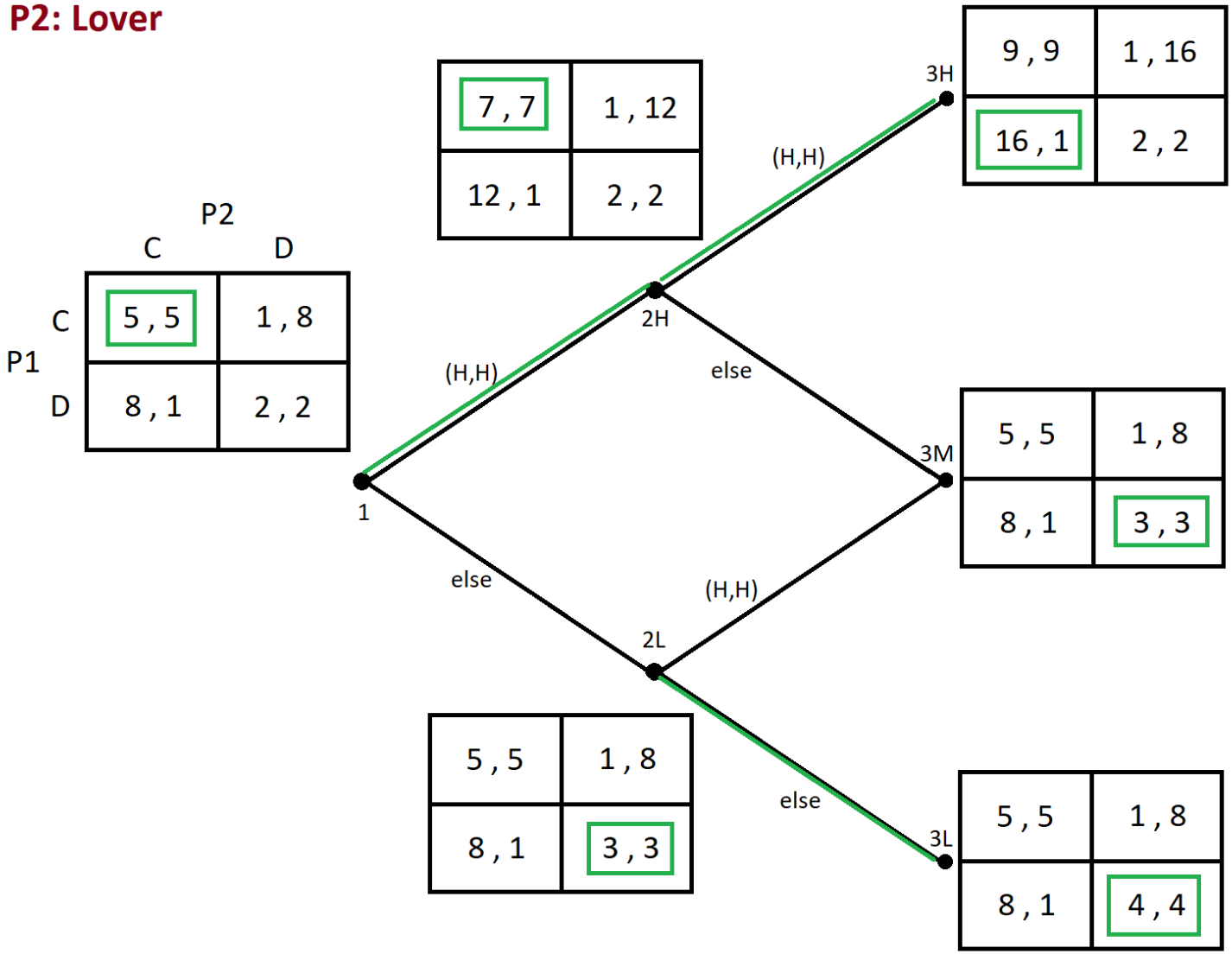


Note: They play grimm trigger if other deviates.

Betrayer and Lover

P1: Betrayer

P2: Lover



Note: They play grimm trigger if other deviates.

Types of players

- For simplicity, we treat the percentage of SPNE players p_S as the residual of the percentage of Lovers and Betrayers:

$$p_S = 1 - p_L - p_B$$

- Then, the expected utilities would be:
  - $E(u_L) = 8 + 13p_L + 5p_B$
  - $E(u_B) = 8 + 20p_L + 6p_B$
  - $E(u_S) = 9 + 6(p_L + p_B)$

Symbiosis

- Obs 1: Increasing the number of Lovers and Betrayers benefits both of them. They have a symbiotic relationship (between and across):
  - $\frac{E(u_L)}{p_L}, \frac{E(u_L)}{p_B} > 0$
  - $\frac{E(u_B)}{p_L}, \frac{E(u_B)}{p_B} > 0$

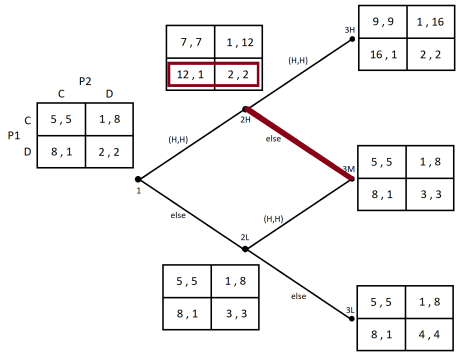
  Lovers benefit from the existence of Betrayers, and vice versa.

Pinning down Irrationality

- Obs 2: Under no circumstance is it better to be a Lover than a Betrayer. For every (p_L, p_B),
  $E(u_L) = 8 + 13p_L + 5p_B \leq 8 + 20p_L + 6p_B = E(u_B)$
  iff $0 \leq 7p_L + p_B$
  So it is safe to say that no rational agent would ever be a Lover.

Rational Betrayers

- Obs 3: On the contrary, Betrayers can be explained by rationality. Suppose there are only Lovers and rational people. Then if the following condition holds:
  $E(u_S) = 9 + 6p_L \leq 8 + 20p_L = E(u_B)$
  iff $\frac{1}{14} \leq p_L$
  Betrayers cannot be differentiated fron rational agents.
  Simplifying assumption: If rational agents have the prior $p_B = 0$, being a Betrayer is better than playing D on $2H$.



Alternate Specifications

- Can people learn to love?
  - Inducing trust by lowering the stakes of node 1 or by adding intermediate stages with a more gradual increase in stakes.
  - Introduce learning through repeated games (if sample size big enough).
- Holding constant the basin of attraction of always playing D.
- Put a commitment device between $2H$ and $3H$, like paying \$1 before being able to play the last (H, H). A sunken cost (i.e., marriage or having kids, I've been told).
- Vary the payoff matrices and horizon to check how dependant the plays are on these magnitudes (something I would rather not do since it has been amply studied, see Literature Review).

Literature Review: Can people learn to love?

- We can introduce some variation on the experiment by changing initial stakes or by adding stages and a more gradual increase in stakes. This might make more cautious people play differently.
- One common source of variation is introduced through supergames. In the leanest version of this work I would rather not add them:
  - The prospect of playing again might change the strategies being played.
  - The intuitions gained might be similar. And,
  - Embrey et al. (2018), warn us that PDs are subject to convergence into threshold m type strategies (start by playing C, and D if other played D or if $round > m$), after repeated play. This might obfuscate what we are trying to measure.

Literature Review: Can people learn to love?

- But if we have sufficient participants we would be able to:
  - How predictive is behaviour (and final outcome) from previous supergames to behaviour in current supergame.
  - Mix designs (ex., 1SG: partner 2SG: history).
  - Have permanent partners across supergames, and different variations of historic information for the ones with different partners.

Literature Review: Basin of attraction

- The basin of attraction of playing always D (baD), is a statistic that increases with the (normalized) payoff of betraying, and decreases with the number of remaining stage games and the payoff of cooperating.
- Embrey et al. (2018), find that more than remaining stage games and payoffs, baD is the one that captures most of the variation on the decision to play always Defect in PD games.
- By finding appropriate payoffs, we might be able to get rid of some of the noise that is generated by constantly changing the baD across different stages. The design that we are using should get rid of this issue (see Identification), but fixing baD might give more power to our estimations.

Identification

- In the framework of Diff in Diff,

$$y_i = \alpha + \beta \mathbb{I}_{partner_i} + \epsilon_i \tag{1}$$

- Where $\mathbb{I}_{partner_i}$ is the indicator function for player i having a "permanent" partner. $\epsilon_{parner_i} = \epsilon_{-parner_i} = \epsilon_i$, since subjects are drawn from the same distribution previous to the experiment (and thus have "paralel pretrends").
- Using this approach we can calculate the effect that being with a permanent partner β has on our various outcome variables (ex. number of (H, H) being played).

We found that special players exist, now what?

- We can explore two frameworks:
- Evolutionary GT: The lover and betrayer strategies both feed on each other (the lover has higher payoff because first two stages are played with "cooperate" with more probability than without the betrayer, and the betrayer's best response is no longer defect from the start if there are enough lovers in the pool of players), and thus there are evolutionary reasons for them to exist.
- Is love a mistake?: The results could also be explained by people making mistakes (due to playfulnes, misunderstanding of the game mechanics, or curiosity) and then updating beliefs after the other player also does something unexpected (like playing C when the SPNE is D). A double coincidence of mistakes.