Information Processing in Coordination Problems

Piotr Evdokimov and Umberto Garfagnini

October 5, 2022

Motivation

- What makes efficient coordination possible?
- Most prior work looked at settings with complete information
  - (Low) strategic uncertainty (Van Huyck, et al, 1990; Dal Bo and Frechette, 2021)
  - Communication (Blume and Ortmann, 2007)
- We consider a setting with incomplete information
- Players receive signals about the game
- To coordinate efficiently, they a have to process information correctly
- **Propose experiment to study extent to which deviations from Bayesian information processing lead to coordination failure**

The game

- Two urn: orange (2 orange balls, 1 purple ball) and purple (2 purple balls, 1 orange ball)
- Urn is randomly selected using uniform prior
- Computer draws 25 balls from replacement from the selected urn
- Game below is played

	O	P	R
O	$770, 770$	$0, 0$	$330, 470$
P	$0, 0$	$0, 0$	$330, 330$
R	$470, 330$	$330, 330$	$400, 400$

Orange urn

	O	P	R
O	$0, 0$	$0, 0$	$330, 330$
P	$0, 0$	$770, 770$	$330, 470$
R	$330, 330$	$470, 330$	$400, 400$

Purple urn

Predictions

	O	P	R
O	$770, 770$	$0, 0$	$330, 470$
P	$0, 0$	$0, 0$	$330, 330$
R	$470, 330$	$330, 330$	$400, 400$

Orange urn

	O	P	R
O	$0, 0$	$0, 0$	$330, 330$
P	$0, 0$	$770, 770$	$330, 470$
R	$330, 330$	$470, 330$	$400, 400$

Purple urn

- Let μ denote the belief that the state is orange
- If $\mu \geq \bar{\mu}$, the game reduces to a 2×2 stag-hunt (Dal Bo and Frechette, 2021)
- Basin of attraction of O strictly increasing in μ and converging to 0.81 as μ goes to 1
- Risk-dominant selection rule:

$$s(\mu) = \begin{cases} O, & \text{if } \mu \geq 0.635, \\ P, & \text{if } \mu \leq 0.365, \\ R, & \text{otherwise.} \end{cases} \tag{1}$$

Predictions

	O	P	R
O	770, 770	0, 0	330, 470
P	0, 0	0, 0	330, 330
R	470, 330	330, 330	400, 400

Orange urn

	O	P	R
O	0, 0	0, 0	330, 330
P	0, 0	770, 770	330, 470
R	330, 330	470, 330	400, 400

Purple urn

- Even Bayesian subjects following risk-dominant rule will not always coordinate efficiently
- E.g., assume $\mu = 0.7$. Then both subjects choose O, but there is a 30% chance than the state is P
- Under risk dominance, probability of efficient coordination is 74%
- ??? with non-Bayesian beliefs?

Experimental design details

- Subjects matched in teams of 2 to play for 15 rounds
- Beliefs are elicited before subjects make decisions in the game
  - Simple elicitation procedure borrowed from Enke, et al (2021)
- Pseudorandomly drawn sequence of signals held fixed across treatments
- Subjects paid for one random decision in a game task and (independently) one random decision in the guessing task

Treatments:

- **Baseline**: As described above
- **Posterior**: Both subjects informed of Bayesian posterior
- **Communication**: Baseline + free form chat + opportunity to revise beliefs
- **Posterior-Communication**: Bayesian posteriors + free form chat

Questions:

1. To what extent do deviations from Bayesian information processing lead to coordination failure?
2. Does communication help?
3. Do subjects learn to be Bayesian from each other?
   - Are beliefs more accurate in the communication treatment than the baseline?
   - Is the effect of providing posterior smaller when subjects are allowed to communicate?