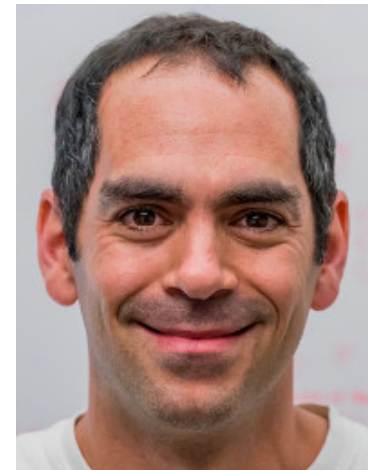


ITAI ARIELI (TECHNION)

YAKOV BABICHENKO (TECHNION)

FEDOR SANDOMIRSKIY (TECHNION, HSE ST.PETERSBURG)

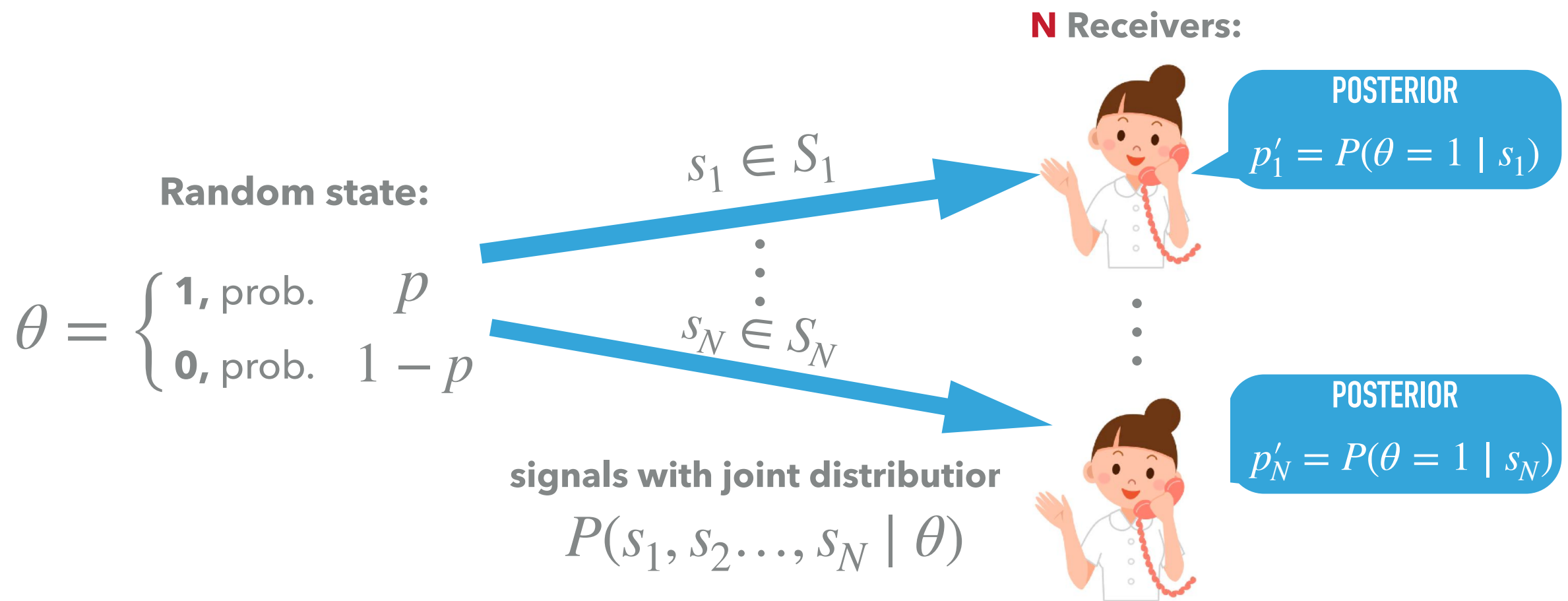
OMER TAMUZ (CALTECH)



FEASIBLE JOINT POSTERIOR BELIEFS



BAYESIAN COMMUNICATION



? What joint distributions of posteriors on $[0,1]^N$ are feasible ?

KNOWN RESULTS

N=1:

SPLITTING LEMMA (R.AUMANN & M.MASCHLER / D.BLACKWELL)

μ on $[0,1]$ is feasible $\iff$ satisfies
martingale property $\int_{[0,1]} x d\mu(x) = p$

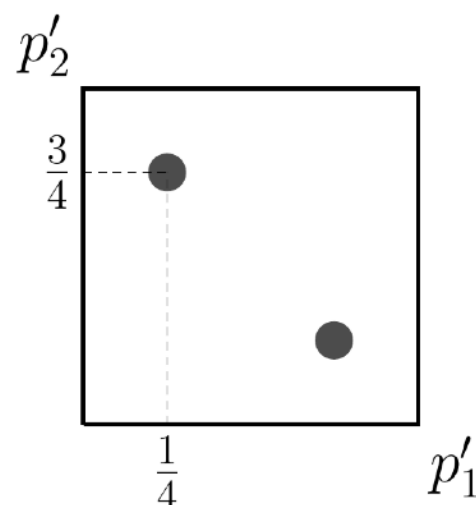
N>1:

- ▶ Ziegler (2020)
 - ▶ A necessary condition for feasibility
- ▶ Mathevet, Perego, and Taneva (2019)
 - ▶ Belief hierarchies

NO ANALOG OF SPLITTING LEMMA IS KNOWN!

CHARACTERISATION OF FEASIBILITY FOR $N=2$

MARTINGALE PROPERTY IS NOT SUFFICIENT



Infeasible:

- ▶ Posteriors are common knowledge
- ▶ Bayesian-rationals cannot **agree to disagree** Aumann (1976)

NEW QUANTITATIVE BOUND ON DISAGREEMENT

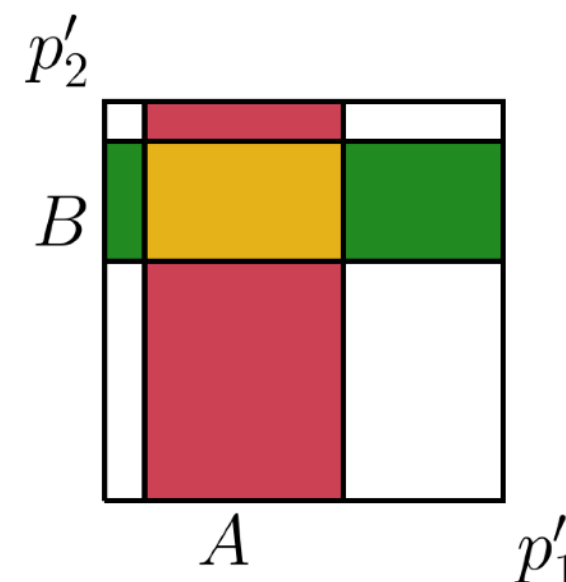
▶ Define $\delta(A, B) =$

$$= \int_{A \times [0,1]} x d\mu - \int_{[0,1] \times B} y d\mu$$

▶ Then

$$\mu(A \times \bar{B}) \geq \delta(A, B) \geq -\mu(\bar{A} \times B)$$

for any feasible μ and $A, B \subset [0,1]$.



MAIN THEOREM

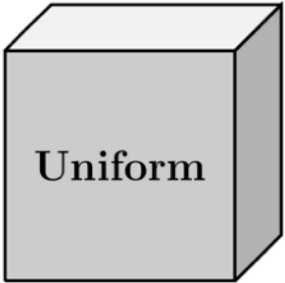
A distribution is feasible $\iff$ satisfies

- ▶ **Martingale Property**
- ▶ **Quantitative bound on disagreement**

APPLICATIONS

INDEPENDENT POSTERIORIORS

Is  feasible? **Yes!**

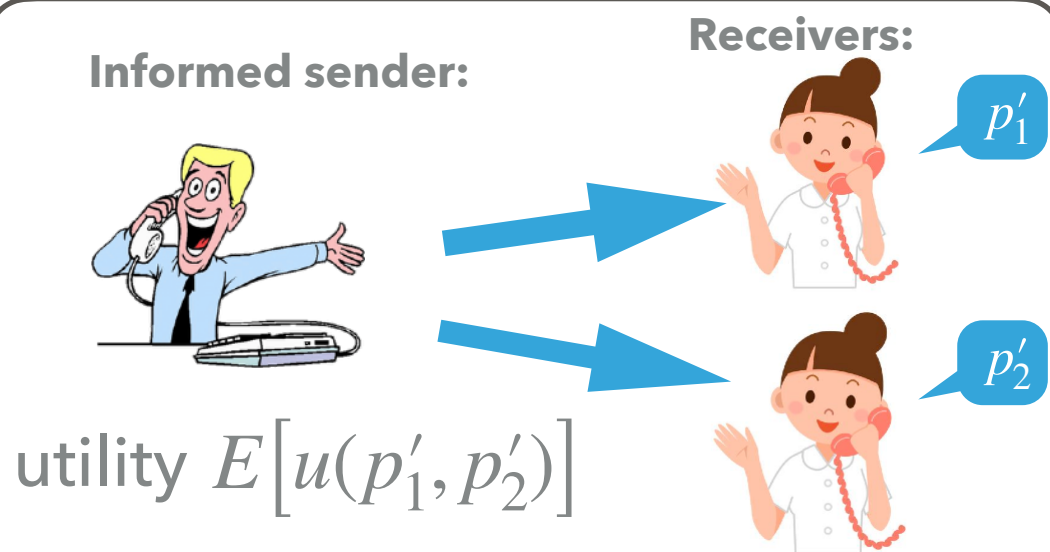
Is  feasible? **No!**

FEASIBILITY FOR PRODUCT DISTRIBUTIONS

Measure ϕ on $[0,1]$, symmetric around $\frac{1}{2}$.

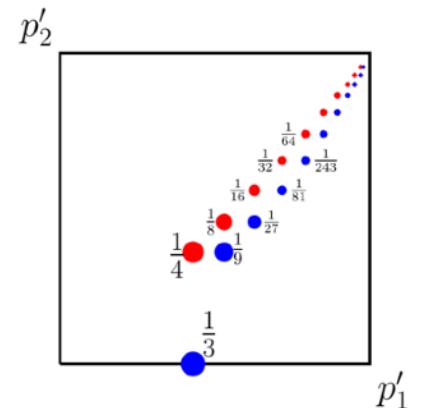
$$\phi \times \phi \text{ is feasible} \iff \phi \geq_{SOSD} \text{Uniform}$$

BAYESIAN PERSUASION



HOW MANY SIGNALS DO WE NEED?

- Feasible set has extreme points with infinite support
- Persuasion may require **infinite number of signals**
 - For $N=1$, two signals are enough



EXAMPLE

- Sender **minimises** $\text{cov}[p'_1, p'_2] = E[(p'_1 - 0.5)(p'_2 - 0.5)]$
- value** $= -\frac{1}{32}$

