Costly Signalling of Intentions in the Trust Game

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Intentions in the Trust Game (1)

- Trust is an essential element of social capital which emerges out of an **implicit contract** between two partners A and B.
- For trust to be enforced:
  1. B must perceive A's action as trusting.
  2. B must be willing to reciprocate perceived trust.
  3. A must believe in 1 and 2.
- Thus trust has a **signalling** component: it reflects A's belief that B will reciprocate.
- Trustworthiness emerges as a response to this signal.

Intentions in the Trust Game (2)

- Many recent papers report evidence that **B cares about A's intentions** in games involving cooperation.

- For instance, B cooperates less if a random device chooses for A, if A's decision involves no risk or if A was forced to trust:
  - **Random device approach**: Falk, Fehr and Fischbacher (2008), Stanca (2010), Rand, Fudenberg and Dreber (2013)
  - **Voluntary versus Involuntary Trust Game**: McCabe, Rigdon and Smith (2003)

- Most papers focus on B's behavior.
- **Question: Does A understand the strategic implications?**

Intentions in the trust game (3)

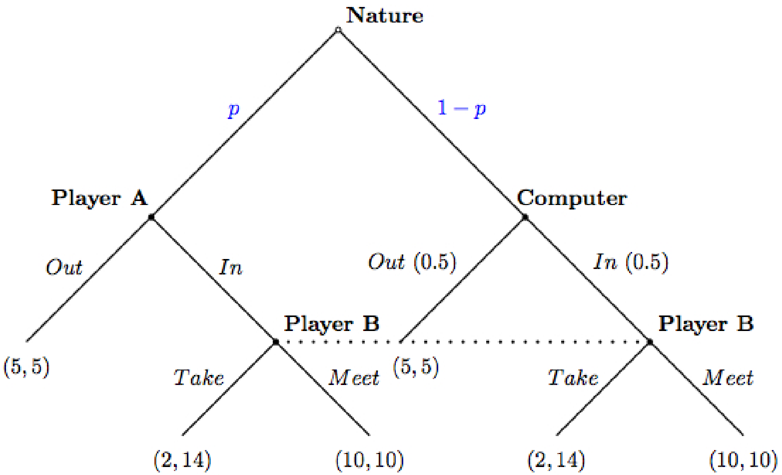
This study takes one step further: studies how B's reciprocity motives may **feed back into A's incentives to trust**.

1. Is A less likely to trust if the signal of trust is more noisy?
2. Would A be willing to pay to signal trust?

To address this question, I **introduce uncertainty** in a standard binary trust game:

- A's decision is implemented only with some noise; this is common knowledge.
- The noise weakens A's signal of trust.

A binary Trust Game with noise



Game Analysis: Beliefs

- Let $\sigma_A \in \{In, Out\}$ and $\sigma_B \in \{Meet, Take\}$ be the strategies of A and B.
- Assume that the computer plays a mixed strategy $\sigma_C = (\frac{1}{2}, \frac{1}{2})$.
- Let σ_A^* be player B's belief that A chose *In*.
  $\Rightarrow$ B's first-order belief (1OB)
- Let σ_A^{**} be player A's belief about B's first-order belief.
  $\Rightarrow$ A's second-order belief (2OB)
- Define B's posterior belief after observing *In*:

$$\mu_B(\sigma_A^*) := \frac{p\sigma_A^*}{p\sigma_A^* + \frac{1}{2}(1-p)}$$

Game Analysis: Preferences

- Let m_i denote the material payoff of player i.
- Assume that A is a standard expected utility maximizer with preferences: $u_A(\sigma) = \mathbb{E}_A[m_A(\sigma)]$.
- B is a mixed type with preferences given by:

$$u_B(\sigma, \sigma_A^*) = m_B(\sigma) + [\alpha + \theta\mu_B(\sigma_A^*)]m_A(\sigma)$$

- $\alpha > 0$ captures B's pure altruism.
- $\theta > 0$ captures B's sensitivity to A's intentions.

Game Analysis: Optimal strategies

- Assume *In* is realized. Then *B* will choose *Meet* if and only if:

$$10 + 10[\alpha + \theta\mu_B(\sigma_A^*)] \geq 14 + 2[\alpha + \theta\mu_B(\sigma_A^*)]$$

$$\Leftrightarrow \frac{p\sigma_A^*}{p\sigma_A^* + \frac{1}{2}(1-p)} \geq \frac{1-2\alpha}{2\theta}$$

- If $\alpha > \frac{1}{2}$, *B* chooses *Meet* irrespective of his 1OB σ_A^* and therefore *A* chooses *In*.
- If $\alpha + \theta < \frac{1}{2}$, *B* chooses *Take* irrespective of his 1OB σ_A^* and thus *A* chooses *Out*.
- If $\alpha < \frac{1}{2}$ and $\theta + \alpha \geq \frac{1}{2}$, then *B*'s (*A*'s) propensity to choose *Meet* (*In*) increases with *p* and σ_A^* (σ_A^{**}).

Design and Treatments

Two main treatment variables:

- Within subjects:
  vary $\boldsymbol{p} \in \{0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100\}$.
- Between subjects: **vary the feedback** received by B.

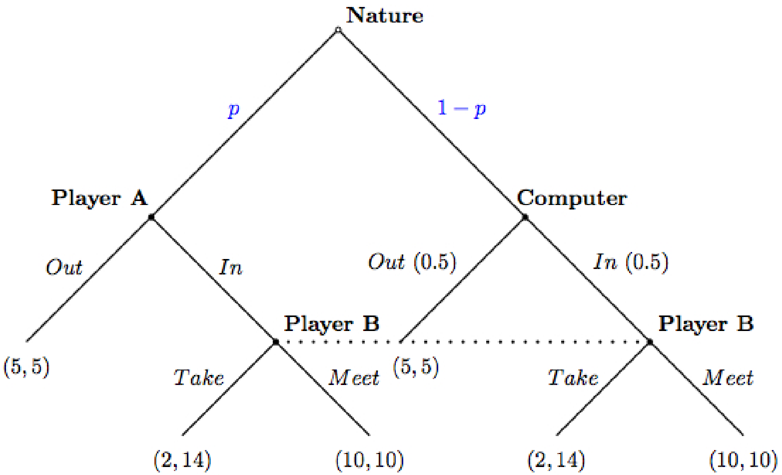
3 treatments:

- II: **Incomplete Information with noise**: B makes a choice without knowing A's decision.

- CI: **Complete Information with noise**: B is informed of A's decision before making a choice: $\sigma_A^* \in \{0, 1\}$

- SIG: **Signal with noise**: Before B makes a choice, A can pay $1 to inform B of his/her decision.

A binary Trust Game with noise



Design and Treatments

1. Strategies are elicited using the **strategy method**:
   - *A* and *B* make a choice for each possible value of *p*.
   - *B* makes a choice for each possible choice of *A*.
     - 2 cases in *CI*: *CI-In* and *CI-Out*
     - 3 cases in *SIG*: *SIG-In*, *SIG-Out* and *No-SIG*.
   - One value of *p* is randomly selected for payment.

2. Afterwards, **beliefs are elicited for each value of *p***:
   - *B* is asked to guess how likely *A* chose *In* (1OB).
   - In *SIG*: *B* is also asked to guess how likely *A* paid to inform *B* in case he/she chose *In* (chose *Out*).
   - *A* is asked to guess *B*'s answer(s) (2OB).

Main predictions

Suppose intentions matter: $\alpha < \frac{1}{2}$ and $\theta + \alpha \geq \frac{1}{2}$.

Predictions:

1. In all treatments, the fraction of A's (B's) who choose *In* (*Meet*) should be increasing in *p*.

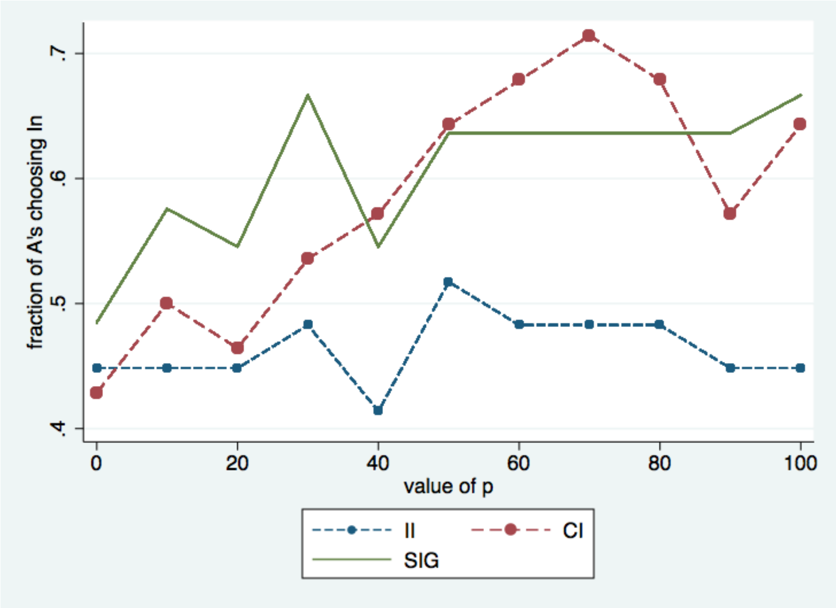
2. Fixing *p*, the fraction of B's who choose *Meet* should be:
   - weakly higher in $CI\text{-}In$ than in II and finally $CI\text{-}Out$.
   - weakly higher in $SIG\text{-}In$ than in $No\text{-}SIG$ and finally $SIG\text{-}Out$.

3. If the A's understand 2:
   - the fraction of A's who go *In* should be higher in CI than II.
   - in SIG, an increasing fraction of A's should signal *In* as *p* increases.

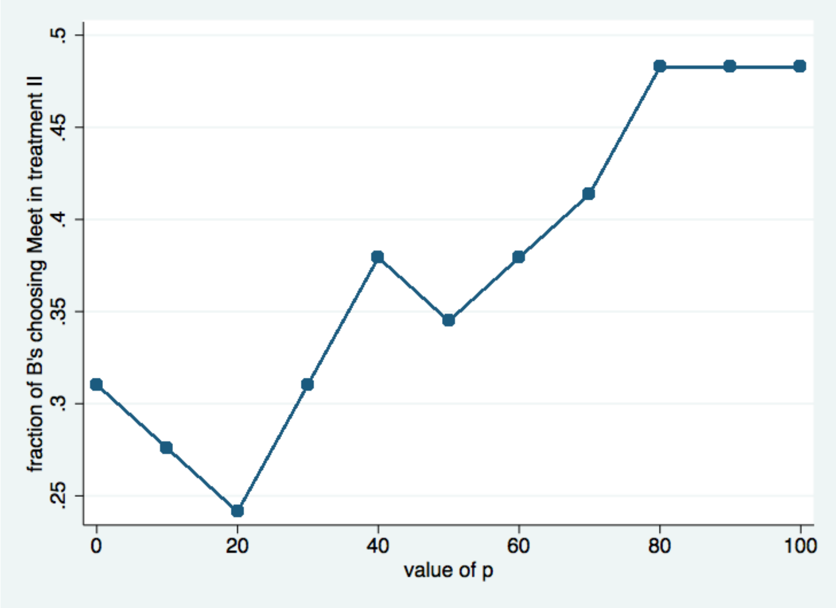
Dataset

- Ran a total of 11 sessions at the CESS Lab of NYU.
- On average, 16 subjects per session; about 30 pairs per treatment.
- Average earnings between \$10 and \$15.
- Average time: 50 minutes.

Prediction 1: Is A more trusting as p increases?



Prediction 1: Is B more cooperative as p increases?

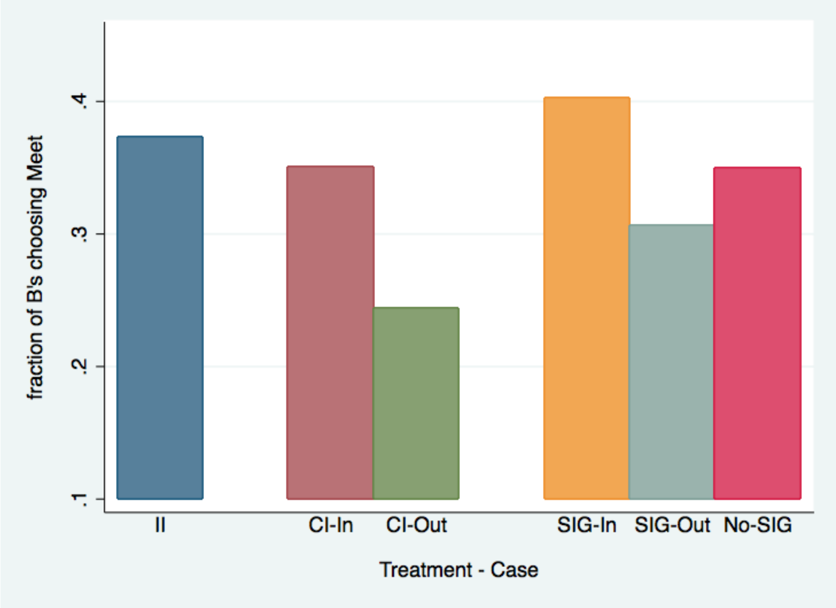


Prediction 1: How to explain the non monotonicities for A?

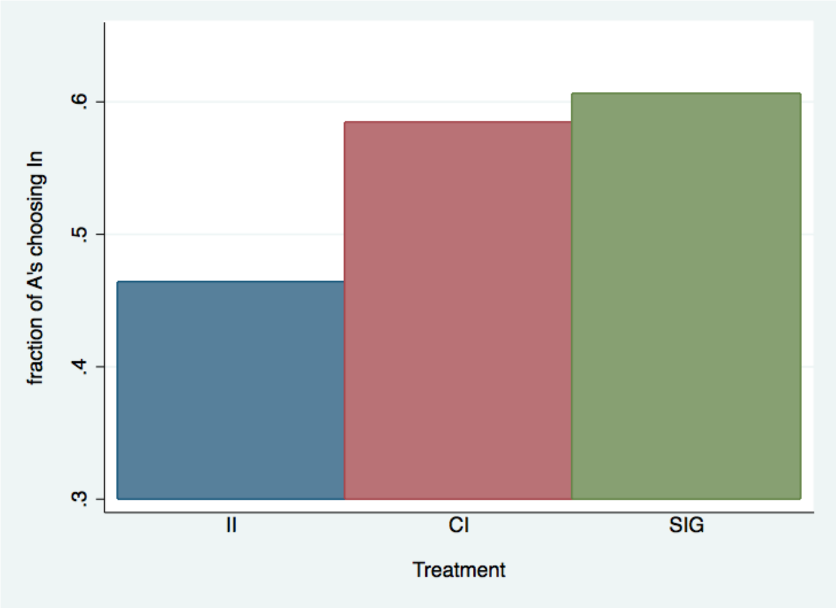
Action pattern of *A*	Parameter values	Freq.	Percentage
non monotone	X	2	6.90
monotone –	X	5	17.24
monotone +	$\alpha < \frac{1}{2}$ and $\alpha + \theta \geq \frac{1}{2}$	6	20.69
always *In*	$\alpha > \frac{1}{2}$	9	31.03
always *Out*	$\alpha + \theta < \frac{1}{2}$	7	24.14
Total		29	100

Table : Pattern of choice of *A* in baseline *II* across the 11 values of *p*

Prediction 2: Is B's behavior responsive to A's action?



Prediction 3: Does A understand the strategic implications?



Prediction 3: Paying to Signal *In*?

- Almost 50% of the A's in SIG paid to signal their action for at least one of the 11 values of p.
- 80% of the decisions to signal were made to signal *In* (pooling across subjects).
- The A's understand the strategic nature of signalling: signalling is more likely as p increases.

Prediction 3: Paying to Signal *In* when p is high?

choice of (*Action*, *Info*)	% for p <50 (freq.)	% for $p \geq 50$ (freq.)
(*Out*, *Signal*)	5.45 (9)	3.03 (6)
(*Out*, *No Signal*)	38.18 (63)	32.83 (65)
(*In*, *No Signal*)	45.45 (75)	42.93 (85)
(*In*, *Signal*)	10.91 (18)	21.21 (42)
Total	100 (363)	100 (363)

Conclusion

A's intentions matter for B.

- In particular, B is less likely to choose *Meet*:
  - when the signal of trust is more noisy (i.e. as *p* decreases).
  - when B knows that A chose *Out* (cases $CI\text{-}Out$ & $SIG\text{-}Out$.).

A understands B's concerns. In particular:

- A is more likely to choose *In*:
  - when the signal of trust is more transparent (as *p* increases)
  - when B is informed of A's action (CI versus II).
- A is more likely to signal *In* when the signal is stronger (i.e. *p* increases).