Decision Rights: Freedom, Power, and Interference

Claudia Neri (University of St.Gallen)
and
Hendrik Rommeswinkel (National Taiwan University)

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Motivation

Why do we value decision rights?
Why do we value decision rights?

- for their **instrumental** value:
  - utility associated to achieving an outcome
  - standard assumption in economic models
Why do we value decision rights?

- for their **instrumental** value:
  - utility associated to achieving an outcome
  - standard assumption in economic models

- for their **intrinsic** value:
  - beyond the utility associated to achieving an outcome
  - experimental evidence:
    - reluctance to delegate (Fehr & al. 2013, Bartling & al. 2014)
    - reluctance to give up control (Owens & al. 2014)
What we propose

Theoretical model

- decision rights allocation and choice
- individuals value decision rights instrumentally and *intrinsically*
  - they have *procedural motivations*
  - they care about *the cause* of the outcomes
    - freedom, power, and interference
- psychological game theory

Experimental design

- identify the effect of attitudes towards freedom, power, and interference
Procedural motivations

What is “the cause of an outcome”? 
Procedural motivations

What is “the cause of an outcome”?

= an individual’s action

- freedom: My actions are the cause of my own outcomes
- power: My actions are the cause of others’ outcomes
- interference: Others’ actions are the cause of my own outcomes
What is “the cause of an outcome”?

≠ an individual’s action

insight from the “freedom of choice” literature:

- freedom must be defined in the context of a variation in a player’s preferences over the outcomes, i.e. type
Procedural motivations

What is “the cause of an outcome”? = an individual’s type

- freedom: My type is the cause of my own outcomes
- power: My type is the cause of others’ outcomes
- interference: Others’ types are the cause of my own outcomes
Procedural motivations

Individuals have:

- *preferences over outcomes (i.e. types)* → decision rights are valued *instrumentally*
- *preferences over freedom, power, and interference* → decision rights are valued *intrinsically*
Theoretical framework

- model of decision right allocation and choice
- dynamic psychological game (Battigalli and Dufwenberg 2009)
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- dynamic psychological game (Battigalli and Dufwenberg 2009)

### Key idea

- players care about the cause of the outcomes
  - payoffs depend not only on actions but also on beliefs about how the game is played
  - players may change behavior at an earlier stage in order to obtain higher freedom, higher power, or lower interference at a later stage
Theoretical framework

- model of decision right allocation and choice
- dynamic psychological game (Battigalli and Dufwenberg 2009)

Key idea

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Key feature 1

*Each player may be of different types.*

Why? Freedom, power, and interference require a variation in preferences over outcomes, which is modeled as uncertainty about types.
Theoretical framework

- model of decision right allocation and choice
- dynamic psychological game (Battigalli and Dufwenberg 2009)

Key idea

players care about the cause of the outcomes
→ payoffs depend not only on actions but also on beliefs about how the game is played
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Key feature 2

The causal influence of types on outcomes is measured by how far the distribution of outcomes conditional on types $\theta(o|t)$ is from the unconditional distribution $\theta(o)$. 
Theoretical framework

- model of decision right allocation and choice
- dynamic psychological game (Battigalli and Dufwenberg 2009)

Key idea

players care about the cause of the outcomes
→ payoffs depend not only on actions but also on beliefs about how the game is played
→ players may change behavior at an earlier stage in order to obtain higher freedom, higher power, or lower interference at a later stage

compared to Battigalli and Dufwenberg 2009

simplification: only 1st-order beliefs, instead of belief hierarchies
extension: incomplete information and own-plan dependence
Theoretical framework

Example

Stage $n=0$

Stage $n=1$

Stage $n=2$

$0$ (Nature)

$\frac{1}{2} t_1, t_2$

$\frac{1}{2} t_1, t_2$

$A ! B$

$A ! B$

$A ! B$

$0 ! (Nature)$

$D ! C ! D ! C !$
Theoretical framework

Example

Stage $n=0$

Stage $n=1$

Stage $n=2$

Neri and Rommeswinkel

Decision Rights: Freedom, Power, and Interference
Beliefs $\theta$

Player 1’s beliefs about the joint distribution of types and outcomes $\theta(o \cap t)$

**Freedom**: degree to which Player 1’s types cause his outcomes

$F_1(\theta) = \sum_{t_1} \sum_{o_1} \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1 | t_1)}{\theta(o_1)}$

**Power**: degree to which Player 1’s types cause Player 2’s outcomes

$P_1(\theta) = \sum_{t_1} \sum_{o_2} \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2 | t_1)}{\theta(o_2)}$

**Interference**: degree to which Player 2’s types cause Player 1’s outcomes

$I_1(\theta) = \sum_{t_2} \sum_{o_1} \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1 | t_2)}{\theta(o_1)}$

---

Psychological payoff $V_1(\theta)$

Player 1’s psychological payoff function given his beliefs $\theta$

---

Psychological Sequential Equilibrium

$= \text{Sequential Equilibrium if } V_1(\theta) = EU_1(\theta)$

$\neq \text{Sequential Equilibrium if } V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta)$
Theoretical framework
Psychological Sequential Equilibrium

**Beliefs \( \theta \)**
Player 1’s beliefs about the joint distribution of types and outcomes \( \theta(o \cap t) \)

**Freedom**: degree to which Player 1’s types cause his outcomes
\[
F_1(\theta) = \sum_{t_1} \sum_{o_1} \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1|t_1)}{\theta(o_1)}
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**Power**: degree to which Player 1’s types cause Player 2’s outcomes
\[
P_1(\theta) = \sum_{t_1} \sum_{o_2} \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2|t_1)}{\theta(o_2)}
\]

**Non-Interference**: negative degree to which Player 2’s types cause Player 1’s outcomes
\[
NI_1(\theta) = -I_1(\theta) = -\sum_{t_2} \sum_{o_1} \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1|t_2)}{\theta(o_1)}
\]

**Psychological payoff \( V_1(\theta) \)**
Player 1’s psychological payoff function given his beliefs \( \theta \)

**Psychological Sequential Equilibrium**

= Sequential Equilibrium if \( V_1(\theta) = EU_1(\theta) \)
\( \neq \) Sequential Equilibrium if \( V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta) \)
Experiment
Implementing the theory in the lab

Players 1 and 2 play a game that varies the freedom, power, and non-interference associated with the decision right. They estimate how Player 1's preferences affect his valuation of the decision right, as revealed by his bid.
Players 1 and 2 play a game
Players 1 and 2 play a game

- allocation of the decision right

exercise of the decision right

- payoff consequences are uncertain
- player with the decision right makes a final choice

- payoff consequences for both players vary the freedom, power, and non-interference associated with the decision right

- estimate how Player 1's preferences affect his valuation of the decision right, as revealed by his bid

- analyze overbidding (i.e. bidding above what is prescribed by risk aversion alone)
Players 1 and 2 play a game

- allocation of the decision right
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it

- exercise of the decision right
Players 1 and 2 play a game

- allocation of the decision right
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  - payoff consequences for both players
Players 1 and 2 play a game

- allocation of the decision right \([\text{payoff consequences are uncertain}]\)
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it

- exercise of the decision right \([\text{payoff consequences are known}]\)
  - player with the decision right makes a final choice
  - payoff consequences for both players
Players 1 and 2 play a game
- allocation of the decision right \([\text{payoff consequences are uncertain}]\)
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it
- exercise of the decision right \([\text{payoff consequences are known}]\)
  - player with the decision right makes a final choice
  - payoff consequences for both players
- vary the freedom, power, and non-interference associated with the decision right
Players 1 and 2 play a game
- allocation of the decision right \([\text{payoff consequences are uncertain}]\)
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it
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  - player with the decision right makes a final choice
  - payoff consequences for both players

vary the freedom, power, and non-interference associated with the decision right

estimate how Player 1’s preferences affects his valuation of the decision right, as revealed by his bid
Players 1 and 2 play a game
- allocation of the decision right \textit{[payoff consequences are uncertain]}: Player 1 bids for the decision right. If bids succeeds, Player 1 has the decision right, otherwise Player 2 has it.
- exercise of the decision right \textit{[payoff consequences are known]}: player with the decision right makes a final choice. Payoff consequences for both players vary the freedom, power, and non-interference associated with the decision right.

Estimate how Player 1’s preferences affects his valuation of the decision right, as revealed by his bid.

\textbf{risk aversion}

\textbf{bid $\uparrow$ $\implies$ payoff uncertainty $\downarrow$}
Players 1 and 2 play a game

- allocation of the decision right [payoff consequences are uncertain]
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it

- exercise of the decision right [payoff consequences are known]
  - player with the decision right makes a final choice
  - payoff consequences for both players

- vary the freedom, power, and non-interference associated with the decision right
- estimate how Player 1’s preferences affects his valuation of the decision right, as revealed by his bid

**Risk Aversion**

- bid ↑ → payoff uncertainty ↓

**Freedom/Power/Non-interference**

- bid ↑ → probability of having the decision right ↑
Players 1 and 2 play a game

- allocation of the decision right \([payoff consequences are uncertain]\)
  - Player 1 bids for the decision right
  - if bids succeeds, Player 1 has the decision right, o/w Player 2 has it
- exercise of the decision right \([payoff consequences are known]\)
  - player with the decision right makes a final choice
  - payoff consequences for both players

- vary the freedom, power, and non-interference associated with the decision right
- estimate how Player 1’s preferences affects his valuation of the decision right, as revealed by his bid

**risk aversion**

- \(\text{bid} \uparrow \implies \text{payoff uncertainty} \downarrow\)

**freedom/power/non-interference**

- \(\text{bid} \uparrow \implies \text{probability of having the decision right} \uparrow\)

- analyze overbidding (i.e. bidding above what is prescribed by risk aversion alone)
two players, 1 and 2

- two boxes, L and R
- each box contains two cards, A and B
- each card has two sides, 1 and 2

Each side can be Green or Red: color represents payoff ($\pi^{\text{Green}} \geq \pi^{\text{Red}}$)

Color of side $i$ is payoff-relevant for Player $i$
Two stages

1 bidding stage
   - Player 1 bids for the decision right in the choice stage

2 choice stage
   - either Player 1 chooses from Box L or Player 2 chooses from Box R
**Experiment Information:** example

**Bidding stage:** payoff consequences are not known

- **Box L**
  - Card A: Side 1 15 pt, Side 2 85 pt
  - Card B: Side 1 15 pt, Side 2 85 pt
  - Case 1: probability 1/4
  - Case 2: probability 1/4
  - Case 3: probability 1/4
  - Case 4: probability 1/4

- **Box R**
  - Card A: Side 1 15 pt, Side 2 85 pt
  - Card B: Side 1 15 pt, Side 2 85 pt
  - Case 1: probability 1/4
  - Case 2: probability 1/4
  - Case 3: probability 1/4
  - Case 4: probability 1/4

- Players **know** the payoffs associated with 'Green' and 'Red', for each box and for each player.
- Player **do not know** which card is preferred, for either box or by either player.
Experiment

Information: example

Bidding stage: payoff consequences are not known

- players know the payoffs associated with ‘Green’ and ‘Red’, for each box and for each player
- player do not know which card is preferred, for either box or by either player
Experiment
Information: example

**Bidding stage: payoff consequences are not known**

- players *know* the payoffs associated with ‘Green’ and ‘Red’, for each box and for each player
- player *do not know* which card is preferred, for either box or by either player
**Choice stage: payoff consequences are known**

Player 1 has the decision right and he selects a card from Box L.
Player 1 *knows* that he prefers Card B.
Player 1 *does not know* which card Player 2 prefers.
Experiment
Rounds and treatments
Experiment
Rounds and treatments

20 rounds
Experiment
Rounds and treatments

20 rounds

- stake size $\pi_{\text{Green}} - \pi_{\text{Red}}$ and payoff level $\frac{\pi_{\text{Green}} + \pi_{\text{Red}}}{2}$ vary across players and boxes
Experiment
Rounds and treatments

20 rounds

- stake size $\pi_{\text{Green}} - \pi_{\text{Red}}$ and payoff level $\frac{\pi_{\text{Green}} + \pi_{\text{Red}}}{2}$ vary across players and boxes
- in 10 rounds the decision right gives Player 1:

<table>
<thead>
<tr>
<th>freedom</th>
<th>non-interference</th>
<th>power</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_1^{\text{Green},L} &gt; \pi_1^{\text{Red},L}$</td>
<td>$\pi_1^{\text{Green},R} &gt; \pi_1^{\text{Red},R}$</td>
<td>$\pi_2^{\text{Green},L} &gt; \pi_2^{\text{Red},L}$</td>
</tr>
<tr>
<td>he affects</td>
<td>he prevents Player 2 from affecting his outcome</td>
<td>he affects Player 2's outcome</td>
</tr>
<tr>
<td>his outcome</td>
<td></td>
<td></td>
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20 rounds

- stake size $\pi^{Green} - \pi^{Red}$ and payoff level $\frac{\pi^{Green} + \pi^{Red}}{2}$ vary across players and boxes
- in 10 rounds the decision right gives Player 1:

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<th>Power</th>
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<td>$\pi^{Green, L}_1 &gt; \pi^{Red, L}_1$</td>
<td>$\pi^{Green, R}_1 &gt; \pi^{Red, R}_1$</td>
<td>$\pi^{Green, L}_2 = \pi^{Red, L}_2$</td>
</tr>
<tr>
<td>he affects</td>
<td>he prevents Player 2 from affecting his outcome</td>
<td>he affects does not affect Player 2's outcome</td>
</tr>
<tr>
<td>his outcome</td>
<td>affecting his outcome</td>
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Experiment
Rounds and treatments

20 rounds

- stake size $\pi^{Green} - \pi^{Red}$ and payoff level $\frac{\pi^{Green} + \pi^{Red}}{2}$ vary across players and boxes
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<td>$\pi^{Green,R} &gt; \pi^{Red,R}$</td>
<td>$\pi^{Green,L} = \pi^{Red,L}$</td>
</tr>
</tbody>
</table>

- he affects his outcome
- he prevents Player 2 from affecting his outcome
- he affects does not affect Player 2's outcome

3 treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Endowments</th>
<th>Rounds</th>
<th>freedom</th>
<th>decision right gives Player 1</th>
<th>power</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>100,100</td>
<td>20</td>
<td>yes</td>
<td>yes</td>
<td>yes (10 rounds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>no (10 rounds)</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>100,0</td>
<td>20</td>
<td>yes</td>
<td>yes</td>
<td>yes (10 rounds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>no (10 rounds)</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>100,0</td>
<td>20</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>
Ruling out procedural motivations:

- **choice stage:**
  - Player with the decision right chooses his preferred card

- **bidding stage:**
  - Player 1 maximizes his valuation, which depends only on expected utility
  - optimal bid $y^*$ in Sequential Equilibrium:

$$
\Delta = u(w_1 + \pi_1^{\text{Green}} - y^*) - \frac{u(w_1 + \pi_1^{\text{Green}}) + u(w_1 + \pi_1^{\text{Red}})}{2} = 0
$$

for each participant we estimate $\rho_{\text{CRRA}}$ and for robustness $r_{\text{CARA}}$
Allowing for procedural motivations:

- choice stage: unchanged

- bidding stage:
  - Player 1 maximizes his valuation, which depends not only on Expected Utility, but also on Freedom, Non-Interference, or Power
  - optimal bid $y^*$ in Psychological Sequential Equilibrium:
    \[ \Delta + \ldots = 0 \]
Allowing for procedural motivations:

- choice stage: unchanged

- bidding stage:
  - Player 1 maximizes his valuation, which depends not only on Expected Utility, but also on Freedom, Non-Interference, or Power
  - optimal bid $y^*$ in Psychological Sequential Equilibrium:
    \[ \Delta + \alpha V^F + \beta V^{NI} + \gamma V^P = 0 \]
### Estimation results

<table>
<thead>
<tr>
<th>Model maximizes valuation driven by:</th>
<th>Treatments 1 and 2</th>
<th>Treatment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Utility only</td>
<td>35.6</td>
<td>7.1</td>
</tr>
<tr>
<td>Expected Utility and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Interference or Freedom</td>
<td>56.3</td>
<td>-</td>
</tr>
<tr>
<td>Non-Interference</td>
<td>-</td>
<td>92.9</td>
</tr>
<tr>
<td>Power</td>
<td>8.0</td>
<td>-</td>
</tr>
</tbody>
</table>

Percentage of participants whose behavior is best explained by each model according to RSS from nonlinear least squares estimation.
Estimation results: overbidding

Overbidding is defined wrt what is already captured by risk preferences

Estimated density over subsample best explained by preference for Non-Interference.

- overbidding is lower in Treatments 1 and 2
- statistically significant? evidence of aversion to Freedom?
- regress overbidding over a constant and a treatment dummy
- effect of preference for Freedom is not statistically significant
Conclusion
What we learned

- theoretical framework to represent procedural motivations in the valuation of decision rights: Freedom, Power, and Interference
- experimental design to measure such motivations
- experimental evidence: interference aversion

individuals like decision rights in virtue of the absence of decision rights of others
Thank you
Extra slides
Example

Mary (Manager)

Supplier A
80

Supplier B
20

Manager Mary chooses between Supplier A and Supplier B. Does Mary have freedom of choice? No.

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Example

Manager Mary chooses between Supplier A and Supplier B. One supplier offers a better contract than the other. Which supplier offers the best contract is determined by Nature at stage 0. When Mary chooses at stage 1, she knows which supplier offers the best contract. Depending on the case, Mary chooses a different supplier and obtains a different outcome.

Does Mary have freedom of choice? Yes.

Stage 0
- Nature
  - Supplier A offers best contract
  - Supplier B offers best contract

Stage 1
- Mary (Manager)
  - Supplier A
    - 80
  - Supplier B
    - 20
Example

Stage -1

Mary (Manager)

delegate decision right

keep decision right

Stage 0

Nature

Supplier A

Supplier B

Supplier A

Supplier B

Supplier A

Supplier B

Supplier A

Supplier B

Nature

Stage 1

Eva (Employee)

Eva (Employee)

Mary (Manager)

Mary (Manager)

Supplier A

Supplier A

Supplier A

Supplier A

Supplier A

Supplier A

Supplier B

Supplier B

Supplier B

Supplier B

Supplier B

Supplier B

Nature

Supplier A offers best contract

Supplier B offers best contract

Supplier A offers best contract

Supplier B offers best contract

Supplier A offers best contract

Supplier B offers best contract

Nature

Supplier A

Supplier A

Supplier A

Supplier A

Supplier A

Supplier A

Supplier B

Supplier B

Supplier B

Supplier B

Supplier B

Supplier B

80

80

20

20

80

80

20

20

80

80

20

20

80

80

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Example

Stage -1

Mary (Manager)

delegate decision right

keep decision right

Stage 0

Nature

Supplier A offers best contract

Supplier B offers best contract

Stage 1

Nature

Supplier A offers best contract

Supplier B offers best contract

Eva (Employee)

Mary (Manager)

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Example

Stage -1

Mary
(Manager)

delegate
decision right

keep
decision right

Stage 0

Nature

Supplier A
offers best
contract

Supplier B
offers best
contract

Supplier A
offers best
contract

Supplier B
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contract

Stage 1

Eva
(Employee)

Nature

Supplier A
offers best
contract

Supplier B
offers best
contract

Supplier A
offers best
contract

Supplier B
offers best
contract

80

80

+ freedom

+ power

+ no-interference

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diversity (Nehring and Puppe 2009)
power indices (Penrose 1946, Shapley & Shubik 1954, Banzhaf 1965, Diskin & Koppel 2010)
positive and negative liberty (Berlin 1958)
Theoretical framework

**Freedom, Non-Interference, and Power**

\[
F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1) \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1 | t_1)}{\theta(o_1)}
\]

\[
NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2) \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1 | t_2)}{\theta(o_1)}
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\[
P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1) \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2 | t_1)}{\theta(o_2)}
\]

- Logarithmic terms capture the probabilistic causal influence of types on outcomes.
- \(g(o, t)\) captures the *qualitative effect* of that dependence.
  - A strong dependence may matter little if the alternative outcomes are qualitatively very similar, e.g. if they generate similar payoffs.
Theoretical framework

Freedom, Non-Interference, and Power

\[ F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1) \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1 | t_1)}{\theta(o_1)} \]

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- Logarithmic terms capture the probabilistic causal influence of types on outcomes.
- \( g(o, t) \) captures the qualitative effect of that dependence.
- A strong dependence may matter little if the alternative outcomes are qualitatively very similar, e.g. if they generate similar payoffs.
Empirical strategy

\[ V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta) \]

\[ F_1(\theta) = \sum_{t_1} \sum_{o_1} \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1|t_1)}{\theta(o_1)} \]

\[ NI_1(\theta) = -\sum_{t_2} \sum_{o_1} \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1|t_2)}{\theta(o_1)} \]

\[ P_1(\theta) = \sum_{t_1} \sum_{o_2} \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2|t_1)}{\theta(o_2)} \]

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<th>Non-Interference ( NI_1(\theta) )</th>
<th>Power ( P_1(\theta) )</th>
</tr>
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<tbody>
<tr>
<td>T1 and T2</td>
<td>( \frac{\gamma}{100} )</td>
<td>( -\frac{100-\gamma}{100} )</td>
<td>( \frac{\gamma}{100} 1 (\pi_2^{Green} &gt; \pi_2^{Red}) )</td>
</tr>
<tr>
<td>T3</td>
<td>0</td>
<td>( -\frac{100-\gamma}{100} )</td>
<td>0</td>
</tr>
</tbody>
</table>
Empirical strategy

\[ V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta) \]

\[ F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1) \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1|t_1)}{\theta(o_1)} \]

\[ NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2) \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1|t_2)}{\theta(o_1)} \]

\[ P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1) \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2|t_1)}{\theta(o_2)} \]
Empirical strategy

\[ V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta) \]

\[ F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1) \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1 | t_1)}{\theta(o_1)} \]

\[ NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2) \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1 | t_2)}{\theta(o_1)} \]

\[ P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1) \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2 | t_1)}{\theta(o_2)} \]
Empirical strategy

\[ V_1(\theta) = \alpha F_1(\theta) + \beta NI_1(\theta) + \gamma P_1(\theta) + \delta EU_1(\theta) \]

\[ F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1) \theta(o_1 \cap t_1) \log_2 \frac{\theta(o_1 | t_1)}{\theta(o_1)} \]

\[ NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2) \theta(o_1 \cap t_2) \log_2 \frac{\theta(o_1 | t_2)}{\theta(o_1)} \]

\[ P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1) \theta(o_2 \cap t_1) \log_2 \frac{\theta(o_2 | t_1)}{\theta(o_2)} \]

\[ g(o_i, t) = \pi_i^{\text{Green}} - \pi_i^{\text{Red}} \]

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Freedom ( F_1(\theta) )</th>
<th>Non-Interference ( NI_1(\theta) )</th>
<th>Power ( P_1(\theta) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 and T2</td>
<td>( \frac{\gamma}{100} (\pi_1^{\text{Green}} - \pi_1^{\text{Red}}) )</td>
<td>( -\frac{100-\gamma}{100} (\pi_1^{\text{Green}} - \pi_1^{\text{Red}}) )</td>
<td>( \frac{\gamma}{100} (\pi_2^{\text{Green}} - \pi_2^{\text{Red}}) )</td>
</tr>
<tr>
<td>T3</td>
<td>0</td>
<td>( -\frac{100-\gamma}{100} (\pi_1^{\text{Green}} - \pi_1^{\text{Red}}) )</td>
<td>0</td>
</tr>
</tbody>
</table>

Intuition: the decision between two outcomes yielding very similar payoffs may be seen as providing less causal influence than a decision between two outcomes yielding very different payoffs.
Empirical strategy

\[-\Delta_{nt} = \alpha_n V_{nt}^F + \beta_n V_{nt}^{NI} + \gamma_n V_{nt}^P + \epsilon_{nt}\]

1st specification: constant

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Freedom  ( V^F )</th>
<th>Non-Interference  ( V^{NI} )</th>
<th>Power  ( V^P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 and T2</td>
<td>1</td>
<td>1</td>
<td>1 ((\pi^\text{Green}_2 &gt; \pi^\text{Red}_2))</td>
</tr>
<tr>
<td>T3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

2nd specification: proportional to payoff difference

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Freedom  ( V^F )</th>
<th>Non-Interference  ( V^{NI} )</th>
<th>Power  ( V^P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 and T2</td>
<td>(\pi^\text{Green}_1 - \pi^\text{Red}_1)</td>
<td>(\pi^\text{Green}_1 - \pi^\text{Red}_1)</td>
<td>(\pi^\text{Green}_2 - \pi^\text{Red}_2)</td>
</tr>
<tr>
<td>T3</td>
<td>0</td>
<td>(\pi^\text{Green}_1 - \pi^\text{Red}_1)</td>
<td>0</td>
</tr>
</tbody>
</table>
How can the experimenter vary how much freedom/power/interference participants have?
How can the experimenter vary how much freedom/power/interference participants have?
Experiment

How can the experimenter vary how much freedom/power/interference participants have?

- **Freedom**: own type $\rightarrow$ own outcomes
- **Power**: own type $\rightarrow$ others’ outcomes
- **Interference**: others’ types $\rightarrow$ own outcomes

Induced freedom/power/interference: moves by ‘Nature’ create variation in players’ type

Induced-value: the experimenter induces preferences via monetary payments
How can the experimenter vary how much freedom/power/interference participants have?

- **Freedom:** \(\text{own type} \rightarrow \text{own outcomes}\)
- **Power:** \(\text{own type} \rightarrow \text{others’ outcomes}\)
- **Interference:** \(\text{others’ types} \rightarrow \text{own outcomes}\)

- **Induced freedom/power/interference:** moves by ‘Nature’ create variation in players’ type
How can the experimenter vary how much freedom/power/interference participants have?

- **Freedom**: own type $\rightarrow$ own outcomes
  - **Power**: own type $\rightarrow$ others’ outcomes
  - **Interference**: others’ types $\rightarrow$ own outcomes

- **induced freedom/power/interference**: moves by ‘Nature’ create variation in players’ type

- **$\approx$ induced-value**: the experimenter induces preferences via monetary payments
Experiment
Bidding Stage

- Becker-DeGroot-Marschak (BDM) method
- like a 2nd price auction against a random draw
- Player 1 bids integer $y \in \{0, 100\}$
- random draw of an integer $r \in \{1, 100\}$
- $y \geq r$: Player 1 pays $r$ and gets decision right
- $y < r$: Player 1 pays 0 and Player 2 gets decision right
Benchmark Treatment (T1). Rounds *without* Power.

<table>
<thead>
<tr>
<th>Box L</th>
<th>Box R</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_{1, Green,L} / \pi_{1, Red,L}$</td>
<td>$\pi_{2, Green,R} / \pi_{1, Red,R}$</td>
</tr>
<tr>
<td>100/30</td>
<td>100/30</td>
</tr>
<tr>
<td>90/40</td>
<td>90/40</td>
</tr>
<tr>
<td>80/50</td>
<td>80/50</td>
</tr>
<tr>
<td>85/15</td>
<td>85/15</td>
</tr>
<tr>
<td>75/25</td>
<td>75/25</td>
</tr>
<tr>
<td>65/35</td>
<td>65/35</td>
</tr>
<tr>
<td>70/0</td>
<td>70/0</td>
</tr>
<tr>
<td>60/10</td>
<td>60/10</td>
</tr>
<tr>
<td>50/20</td>
<td>50/20</td>
</tr>
<tr>
<td>100/0</td>
<td>100/0</td>
</tr>
</tbody>
</table>

- $\pi_{1, Green,L} = \pi_{1, Green,R} = \pi_{1, Red,L} = \pi_{1, Red,R}$
- stake size: $\pi_i^{Green} - \pi_i^{Red} \in \{30, 50, 70\}$
- payoff level: $\frac{\pi_i^{Green} + \pi_i^{Red}}{2} \in \{35, 50, 65\}$
Benchmark Treatment (T1). Rounds *with* Power.

<table>
<thead>
<tr>
<th>Box L</th>
<th>Box R</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_{1}^{Green,L} / \pi_{1}^{Red,L}$</td>
<td>$\pi_{1}^{Green,R} / \pi_{1}^{Red,R}$</td>
</tr>
<tr>
<td>$\pi_{2}$</td>
<td>$\pi_{2}$</td>
</tr>
<tr>
<td>75/25</td>
<td>85/15</td>
</tr>
<tr>
<td>75/25</td>
<td>75/25</td>
</tr>
<tr>
<td>75/25</td>
<td>65/35</td>
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<tr>
<td>75/25</td>
<td>90/40</td>
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<tr>
<td>75/25</td>
<td>60/10</td>
</tr>
<tr>
<td>85/15</td>
<td>75/25</td>
</tr>
<tr>
<td>65/35</td>
<td>75/25</td>
</tr>
<tr>
<td>90/40</td>
<td>75/25</td>
</tr>
<tr>
<td>60/10</td>
<td>75/25</td>
</tr>
<tr>
<td>100/0</td>
<td>100/0</td>
</tr>
</tbody>
</table>

- $\pi_{1}^{Green,L} = \pi_{1}^{Green,R} = \pi_{1}^{Green}$ and $\pi_{1}^{Red,L} = \pi_{1}^{Red,R} = \pi_{1}^{Red}$
- fix Player $i$’s payoffs at $\pi_{i}^{Green} = 75$, $\pi_{i}^{Red} = 25$ (stake size 50, payoff level 50)
- vary Player $j$’s stake size $\{30, 70\}$ or payoff level $\{35, 65\}$
Experiment
Treatment 1 and 2

If Box L is opened, Player 1 must choose between Card A and Card B.

If Box R is opened, Player 2 must choose between Card A and Card B.

In either boxes, whether Card A or Card B is selected has payoff consequences for both Player 1 and Player 2. The payoff consequences are described on Slide 8.

A priori, before either Box L or Box R is opened, Player 1 and Player 2 have the same information about Card A and Card B in either boxes.

After a specific box is opened, Player 1 and Player 2 receive additional (but different) information about Card A and Card B in that box.
Experiment
Treatment 1 and 2: example

Case 1: probability 1/4
Case 2: probability 1/4
Case 3: probability 1/4
Case 4: probability 1/4

Box L
Experiment
Treatment 1 and 2: example

Card A Card B

Side 1 15 pt Side 1 15 pt
Side 2 15 pt Side 2 15 pt

case 1: probability 1/4 case 2: probability 1/4

Card A Card B

Side 1 85 pt Side 1 85 pt
Side 2 85 pt Side 2 85 pt

Card A Card B

Side 1 15 pt Side 1 15 pt
Side 2 15 pt Side 2 15 pt

case 3: probability 1/4 case 4: probability 1/4

Box R
Experiment
Treatment 3

Box L

Card C

Side 1
Side 2

Box R

Card A

Side 1
Side 2

Card B

Side 1
Side 2

Neri and Rommeswinkel
Decision Rights: Freedom, Power, and Interference
Experiment
Treatment 3: example

Box L

<table>
<thead>
<tr>
<th>Card C</th>
<th>Card C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side 1</td>
<td>Side 1</td>
</tr>
<tr>
<td>85 pt</td>
<td>85 pt</td>
</tr>
<tr>
<td>Side 2</td>
<td>Side 2</td>
</tr>
<tr>
<td>85 pt</td>
<td>15 pt</td>
</tr>
</tbody>
</table>

case 1: probability 1/2
case 2: probability 1/2
Experiment
Treatment 3: example

Card A

Case 1: probability 1/4

- Side 1: 15 pt
- Side 2: 15 pt

Card B

- Side 1: 85 pt
- Side 2: 85 pt

Case 2: probability 1/4

Card A

- Side 1: 15 pt
- Side 2: 15 pt

Card B

- Side 1: 85 pt
- Side 2: 85 pt

Case 3: probability 1/4

Card A

- Side 1: 85 pt
- Side 2: 15 pt

Card B

- Side 1: 15 pt
- Side 2: 85 pt

Case 4: probability 1/4

Card A

- Side 1: 85 pt
- Side 2: 15 pt

Card B

- Side 1: 15 pt
- Side 2: 85 pt

Box R
## Experiment

### Treatment 3: Rounds

<table>
<thead>
<tr>
<th>Box L</th>
<th>Box R</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_1^{\text{Green},L}$</td>
<td>$\pi_1^{\text{Green},R}$ / $\pi_1^{\text{Red},R}$</td>
</tr>
<tr>
<td>$\pi_2^{\text{Green},L}$ / $\pi_2^{\text{Red},L}$</td>
<td>$\pi_2^{\text{Green},R}$ / $\pi_2^{\text{Red},R}$</td>
</tr>
<tr>
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<tr>
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<td>75/25</td>
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<td>75/25</td>
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<tr>
<td>60</td>
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<tr>
<td>100</td>
<td>75/25</td>
</tr>
<tr>
<td>100</td>
<td>100/0</td>
</tr>
</tbody>
</table>
The first set of questions in the lottery-choice questionnaire. The values (85,15) are replaced by (75,25) in the second set and by (65,35) in the third set.
Experiment
Procedures: Part 3, Locus of Control Questionnaire

1. (I) Whether or not I get to be a leader depends mostly on my ability.
2. (C) To a great extent my life is controlled by accidental happenings.
3. (P) I feel like what happens in my life is mostly determined by powerful people.
4. (I) Whether or not I get into a car accident depends mostly on how good a driver I am.
5. (I) When I make plans, I am almost certain to make them work.
6. (C) Of ten there is no chance of protecting my personal interests from bad luck happenings.
7. (C) When I get what I want, it is usually because I'm lucky.
8. (P) Although I might have good ability, I will not be given leadership responsibility without appealing to those positions of power.
9. (I) How many friends I have depends on how nice a person I am.
10. (C) I have often found that what is going to happen will happen.
11. (P) My life is chiefly controlled by powerful others.
12. (C) Whether or not I get into a car accident is mostly a matter of luck.
13. (P) People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups.
14. (C) It’s not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.
15. (P) Getting what I want requires pleasing those people above me.
16. (C) Whether or not I get to be a leader depends on whether I’m lucky enough to be in the right place at the right time.
17. (P) If important people were to decide they didn’t like me, I probably wouldn’t make many friends.
18. (I) I can pretty much determine what will happen in my life.
19. (I) I am usually able to protect my personal interests.
20. (P) Whether or not I get into a car accident depends mostly on the other driver.
21. (I) When I get what I want, it’s usually because I worked hard for it.
22. (P) In order to have my plans work, I make sure that they fit in with the desires of people who have power over me.
23. (I) My life is determined by my own actions.
24. (C) It’s chiefly a matter of fate whether or not I have a few friends or many friends.

I = Internal Scale, P = Powerful Others Scale, C = Chance Scale
244 participants (8 sessions: 3 T1, 3 T2, 2 T3)

Each session:

1. Card game (random assignment, fixed matching, quiz + trial + 20 rounds)
2. Lottery-choice questionnaire (Multiple Price List, Holt&Laury 2002)
3. Locus of Control questionnaire (Levenson 1981)
4. Feedback

- Part 1: 1 round is randomly selected and paid out
- Part 2: 1 chosen lottery is randomly selected, played out and paid out
- Part 3: no remuneration
If Player 1 has the decision right:

Player 1’s Payoff = \( w_1 + \text{Value of Side 1 of Selected Card} - r \)

Player 2’s Payoff = \( w_2 + \text{Value of Side 2 of Selected Card} \)

If Player 2 has the decision right:

Player 1’s Payoff = \( w_1 + \text{Value of Side 1 of Selected Card} \)

Player 2’s Payoff = \( w_2 + \text{Value of Side 2 of Selected Card} \)

\( w_i = \text{endowment of Player } i \)

\( r = \text{BDM randomly drawn price} \)
Random Coefficient GMM

\[-\Delta_{nt} = \alpha_n V_{nt}^F + \beta_n V_{nt}^{NI} + \epsilon_{nt}\]

\[\alpha_n = \alpha + \epsilon_{\alpha n}\]
\[\beta_n = \beta + \epsilon_{\beta n}\]

\[E[\epsilon_{nt} V_{nt}^F] = 0\] error independent of regressor
\[E[\epsilon_{nt} V_{nt}^{NI}] = 0\] error independent of regressor
\[E[\epsilon_{\alpha n} - \alpha] = 0\] identify population parameter \(\alpha\)
\[E[\epsilon_{\beta n} - \beta] = 0\] identify population parameter \(\beta\)
\[E[\epsilon_{\beta n 1_{nT3}}] = 0\] identify individual parameters \(\alpha_n\) in T1 and T2
(mean of \(\beta_n\) in T3 is equal to T1 and T2)
What is the monetary value of non-interference? Consider this thought experiment:

- Player 2 holds the decision right and thus Player 1 is exposed to interference
- How much would Player 1 pay to replace Player 2 with a randomizing device (which selects either card with equal probability)?
- Player 1’s EU would not change, but interference would be eliminated
- median $7.37 \approx 15\%$ of the expected payoff of the implied lottery $(\frac{1}{2}, 100; \frac{1}{2}, 0)$

Kernel density estimate of the monetary value of non-interference.

T1 Round 10: $w_1 = 100, \pi_1^{\text{Green}} = 100, \pi_1^{\text{Red}} = 0$. Epanechnikov kernel function and bandwidth 3.86536.
bids in Treatment 3 (when the decision right gives only Non-Interference) are significantly higher than bids in Treatment 1 (when the decision right additionally gives Freedom or Power&Freedom)
### Descriptive Results

#### Bidding Behavior

<table>
<thead>
<tr>
<th>round</th>
<th>treatment</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>all</th>
<th>T1 vs T2</th>
<th>T2 vs T3</th>
<th>T1 vs T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>35</td>
<td>44</td>
<td>57</td>
<td>44</td>
<td></td>
<td>z = -2.492 (0.0127)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>45</td>
<td>46</td>
<td>51</td>
<td>47</td>
<td>z = -2.357 (0.0184)</td>
<td>z = -1.709 (0.0874)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>31</td>
<td>36</td>
<td>27</td>
<td>32</td>
<td>z = -3.073 (0.0021)</td>
<td>z = -2.884 (0.0039)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>45</td>
<td>43</td>
<td>64</td>
<td>49</td>
<td>z = -1.781 (0.0749)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>37</td>
<td>42</td>
<td>50</td>
<td>42</td>
<td>z = -2.968 (0.0030)</td>
<td>z = -3.000 (0.0027)</td>
<td></td>
</tr>
<tr>
<td>6</td>
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<td>26</td>
<td>29</td>
<td>36</td>
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<td>z = -2.198 (0.0280)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>45</td>
<td>44</td>
<td>64</td>
<td>49</td>
<td>z = -2.893 (0.0038)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>32</td>
<td>28</td>
<td>48</td>
<td>34</td>
<td>z = -2.489 (0.0128)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>22</td>
<td>31</td>
<td>37</td>
<td>29</td>
<td>z = -1.945 (0.0518)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>47</td>
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<td>72</td>
<td>57</td>
<td>z = -2.043 (0.0411)</td>
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<tr>
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<td>52</td>
<td>43</td>
<td>z = -1.703 (0.0886)</td>
<td>z = -1.977 (0.0481)</td>
<td></td>
</tr>
<tr>
<td>12</td>
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<td>35</td>
<td>28</td>
<td>50</td>
<td>35</td>
<td>z = -2.296 (0.0217)</td>
<td>z = -2.430 (0.0151)</td>
<td></td>
</tr>
<tr>
<td>13</td>
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<td>37</td>
<td>51</td>
<td>40</td>
<td>z = -1.719 (0.0856)</td>
<td>z = -1.909 (0.0562)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>36</td>
<td>37</td>
<td>33</td>
<td>35</td>
<td>z = -1.706 (0.0880)</td>
<td>z = -1.941 (0.0523)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>37</td>
<td>29</td>
<td>50</td>
<td>36</td>
<td>z = -2.586 (0.0097)</td>
<td>z = -2.916 (0.0035)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>43</td>
<td>47</td>
<td>64</td>
<td>50</td>
<td>z = -2.411 (0.0159)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>26</td>
<td>33</td>
<td>43</td>
<td>33</td>
<td>z = -1.860 (0.0628)</td>
<td>z = -2.614 (0.0089)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>40</td>
<td>46</td>
<td>59</td>
<td>47</td>
<td>z = -3.073 (0.0021)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>24</td>
<td>35</td>
<td>43</td>
<td>32</td>
<td>z = -1.709 (0.0874)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>70</td>
<td>64</td>
<td>68</td>
<td>67</td>
<td>z = -2.884 (0.0039)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all</td>
<td></td>
<td>37</td>
<td>40</td>
<td>50</td>
<td>42</td>
<td>z = -1.831 (0.0671)</td>
<td>z = -1.781 (0.0749)</td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis of expected-utility-maximizing behavior is rejected

- compare CE in lottery-choice (Part 2) to CE implied in bidding (Part 1)

\[ \Delta CE = \pi_{Green}^1 - y - CE_{lottery} \left( \frac{1}{2}, \pi_{high}^1; \frac{1}{2}, \pi_{Red}^1 \right) \]

- if \( \Delta CE < 0 \), more risk aversion in bidding
- due to imprecise measurement \( \Delta CE \sim U \left( 0, \sqrt{\frac{25}{12}} \right) \),
  instead mean = \(-14.11\) and sd = 25.41
In more than 98 percent of the observations, the decision right is exercised by selecting the card that gives the decision-maker his highest payoff.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Player 1</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>has decision</td>
<td>chooses preferred card</td>
</tr>
<tr>
<td>1</td>
<td>0.41</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0.4</td>
<td>0.99</td>
</tr>
<tr>
<td>3</td>
<td>0.55</td>
<td>1</td>
</tr>
<tr>
<td>all</td>
<td>0.44</td>
<td>1</td>
</tr>
</tbody>
</table>
Our framework and findings help interpret and unify previous experimental evidence.

Aversion to interference can explain evidence previously attributed to:

- *betrayal aversion* in Bohnet and Zeckhauser (2004)
- *preference for decision rights* in Fehr et al. (2013) and Bartling et al. (2014)
- *preference for payoff autonomy* in Owens et al. (2014)
- *aversion to a counterpart’s intentions* in Butler and Miller (2015)
Aversion to strategic uncertainty instead of aversion to interference?

- Player 1 perceives strategic uncertainty if he believes that Player 2 will not necessarily choose the option in his best interest.
- This alternative mechanism is not supported by data.
  - In 98% of observations, participants choose the option in their best interest.
  - It would require either a very strong aversion or very far-off beliefs.
May lack of evidence of preference for Power depend on the design?

- Player 1 learns his own preferences, but not Player 2’s preferences
- PROS: no confounds with social preferences
- CONS: Player 1 may not find the exercise of power valuable
Results
Inequality Aversion (Fehr and Schmidt 1999)

- $b^* - \frac{\pi_{\text{Green}} - \pi_{\text{Red}}}{2} = \lambda V^{\text{dis}} + \mu V^{\text{adv}}$

$V^{\text{dis}} = \text{difference in disadvantageous inequality between Box L and Box R}$

$V^{\text{adv}} = \text{difference in advantageous inequality between Box L and Box R}$

$V^{\text{dis}} = \max \left(0, \pi_{\text{Green}}^2 + \pi_{\text{Red}}^2 + w_2 - \pi_{\text{Green}} - w_1 + b\right) - \max \left(0, \pi_{\text{Green}}^2 + w_2 - \frac{\pi_{\text{Green}} + \pi_{\text{Red}}}{2} - w_1\right)$

$V^{\text{adv}} = \max \left(0, \pi_{\text{Green}}^1 + w_1 - b - \frac{\pi_{\text{Green}}^2 + \pi_{\text{Red}}^2}{2} - w_2\right) - \max \left(0, \frac{\pi_{\text{Green}} + \pi_{\text{Red}}}{2} + w_1 - \pi_{\text{Green}}^2 - w_2\right)$

- $b = b^*(\lambda, \mu) + \gamma + \epsilon$

NLS estimates: $\hat{\lambda} = 0.013$ $\hat{\mu} = -0.089^*$ $\hat{\gamma} = 12.44^{***}$

- aversion to interference is still the main driver
- possible reasons
  - in complex tasks individuals focus on their own payoffs
  - game is not framed as a game with a moral obligation to share