Decision Rights: Freedom, Power, and Interference

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Motivation

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- for their **instrumental** value:
  - utility associated to achieving an outcome
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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 trust (Bohnet & Zeckhauser 2004, Bohnet & al. 2008, Butler & Miller 2016)
    - 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

- measure 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 outcomes
- power: My actions are the cause of others' outcomes
- interference: Others' actions are the cause of my outcomes

Procedural motivations

What is "the cause of an outcome"?

$\neq$ an individual's action

the "freedom of choice" literature has shown that 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 outcomes
- power: My type is the cause of others' outcomes
- interference: Others' types are the cause of my outcomes

Procedural motivations

Individuals have:

- *preferences over outcomes (i.e. types)*
  $\rightarrow$ decision rights are valued *instrumentally*
- *preferences over freedom, power, and interference*
  $\rightarrow$ 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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Key idea

players care about the cause of the outcomes
$\rightarrow$
payoffs depend on beliefs about how the game is played
$\rightarrow$
players may change behavior at an earlier stage in order to obtain higher freedom, higher power, or lower interference at a later stage

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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.

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Key feature 2

The causal influence of types on outcomes is measured by how far the conditional distribution of outcomes given types is from the unconditional distribution.

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compared to Battigalli and Dufwenberg 2009

simplification: only 1st-order beliefs, instead of belief hierarchies

extension: imperfect information and own-plan dependence

Theoretical framework

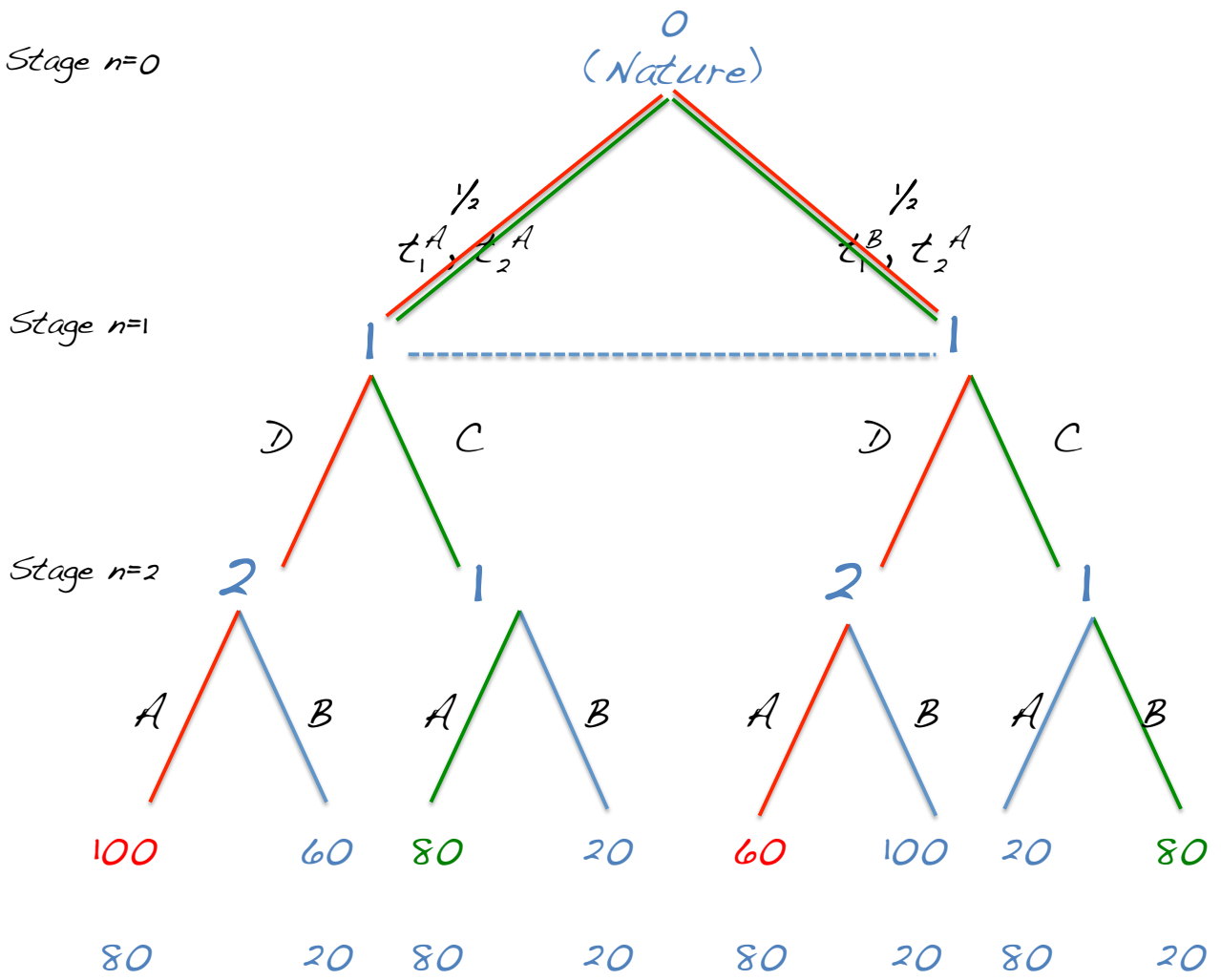
Simplified model and notation:

Theoretical framework

Simplified model and notation:

- Players $i = 1, 2$ and Nature $i = 0$
- stages $n = 0, 1, ...$
- $a^n = (a_1^n, a_2^n)$ profile of actions chosen at stage n
- $h = (a^1, ..., a^N) = (a^n)_{n=1}^N$ history of length N
- $s_{\mathbf{h}}$ local pure strategy at info set $\mathbf{h}$
- $t_i \in T_i$ Player i's type (determined by Nature at stage 0)
- $o_i \in O_i$ Player i's material outcome at the end of the game
- $u_i(o \cap t)$ Player i's utility function
- $\theta_{i,\mathbf{h},s_{\mathbf{h}}}(o \cap t)$ Player i's beliefs at info set $\mathbf{h}$ that, after playing strategy $s_{\mathbf{h}}$, type is t and material outcome is o
- $V_i(\theta)$ Player i's psychological payoff function

Theoretical framework
Example



Beliefs θ

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

Power: degree to which Player 1's types cause Player 2's outcomes
$P_1(\theta) = \sum_{t_1} \sum_{o_2} \theta(o_2 \cap t_1) \log \frac{\theta(o_2|t_1)}{\theta(o_2)}$

Interference: degree to which Player 2's types cause Player 1's outcomes
$I_1(\theta) = \sum_{t_2} \sum_{o_1} \theta(o_1 \cap t_2) \log \frac{\theta(o_1|t_2)}{\theta(o_1)}$

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Expected Utility:
$EU_1(\theta) = \sum_{t_1} \sum_{o_1} \theta(o_1 \cap t_1) u_1(o_1 \cap t_1)$

▸ spec. ▸ lit.

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Psychological Sequential Equilibrium

= Sequential Equilibrium if $V_1(\theta) = EU_1(\theta)$

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Psychological Sequential Equilibrium

$\neq$ Sequential Equilibrium if $V_1(\theta) = \alpha F_1(\theta) + EU_1(\theta)$

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Psychological Sequential Equilibrium

$\neq$ Sequential Equilibrium if $V_1(\theta) = \gamma P_1(\theta) + EU_1(\theta)$

Experiment
Implementing the theory in the lab

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- Players 1 and 2 play a game

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  - allocation of the decision right
  - exercise of the decision right

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- Players 1 and 2 play a game
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    - 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

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- Players 1 and 2 play a game
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- vary the freedom, power, and non-interference associated with the decision right

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risk aversion

bid $\uparrow \Longrightarrow$ payoff uncertainty $\downarrow$

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preferences for freedom/power/non-interference

bid $\uparrow \Longrightarrow$ probability of having the decision right $\uparrow$

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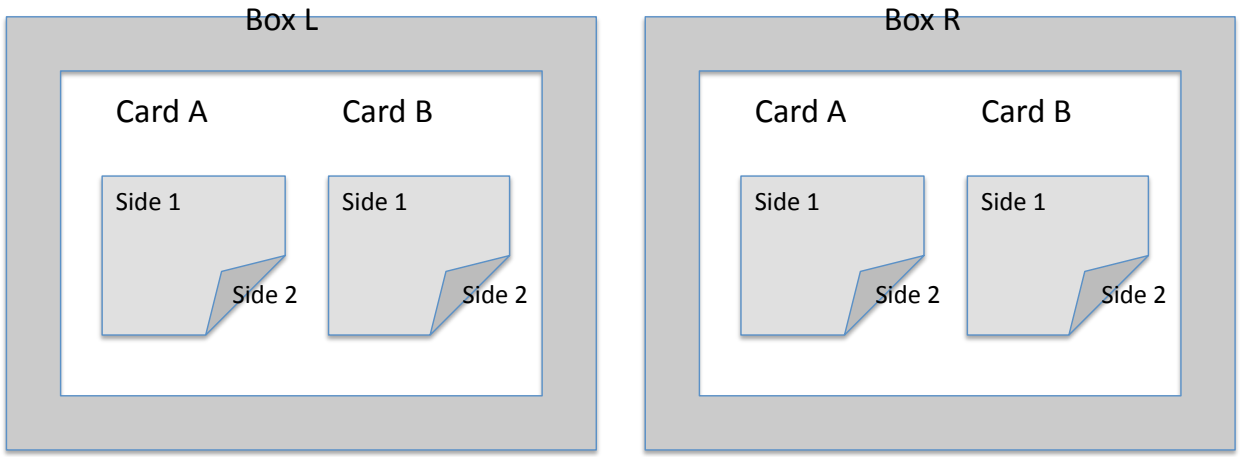
preferences for freedom/power/non-interference

bid $\uparrow \Longrightarrow$ probability of having the decision right $\uparrow$

- analyze overbidding (i.e. bidding above what is prescribed by risk aversion alone)

Experiment
Card game

- 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

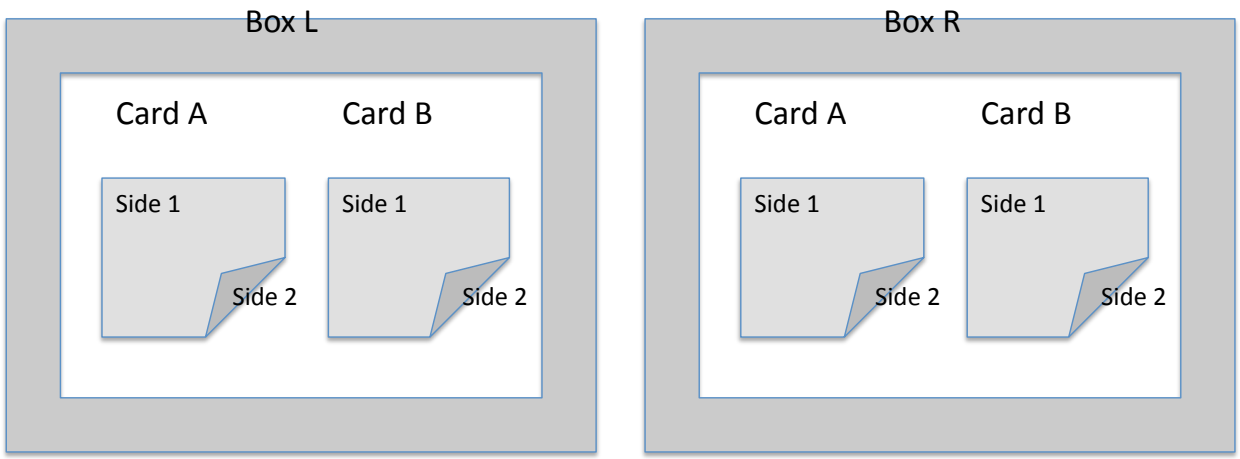


- each side can be Green or Red: color represents payoff ($\pi^{Green} \geq \pi^{Red}$)
- color of side i is payoff-relevant for Player i

Experiment
Card game

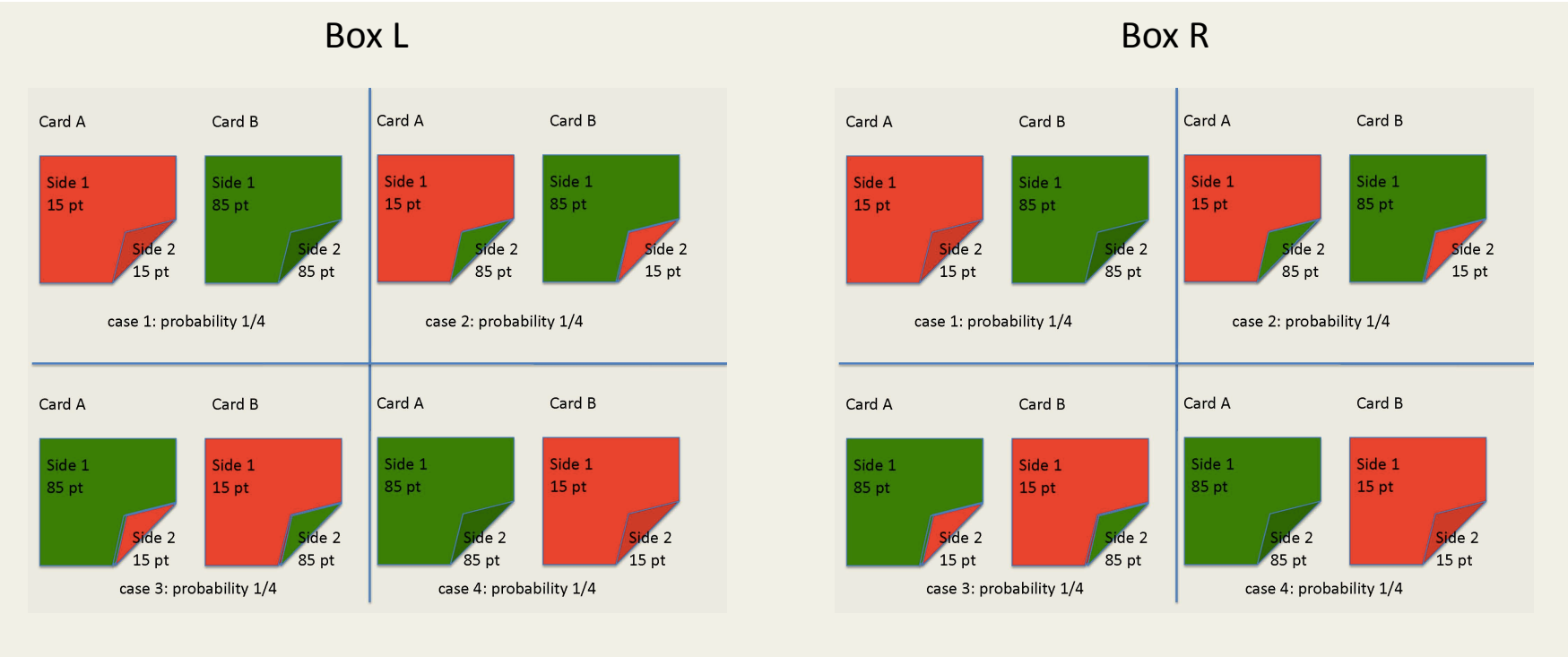
Two stages

1. bidding stage
   - Player 1 bids for the decision right in the choice stage ▸ BDM
2. choice stage
   - either Player 1 chooses from Box L or Player 2 chooses from Box R



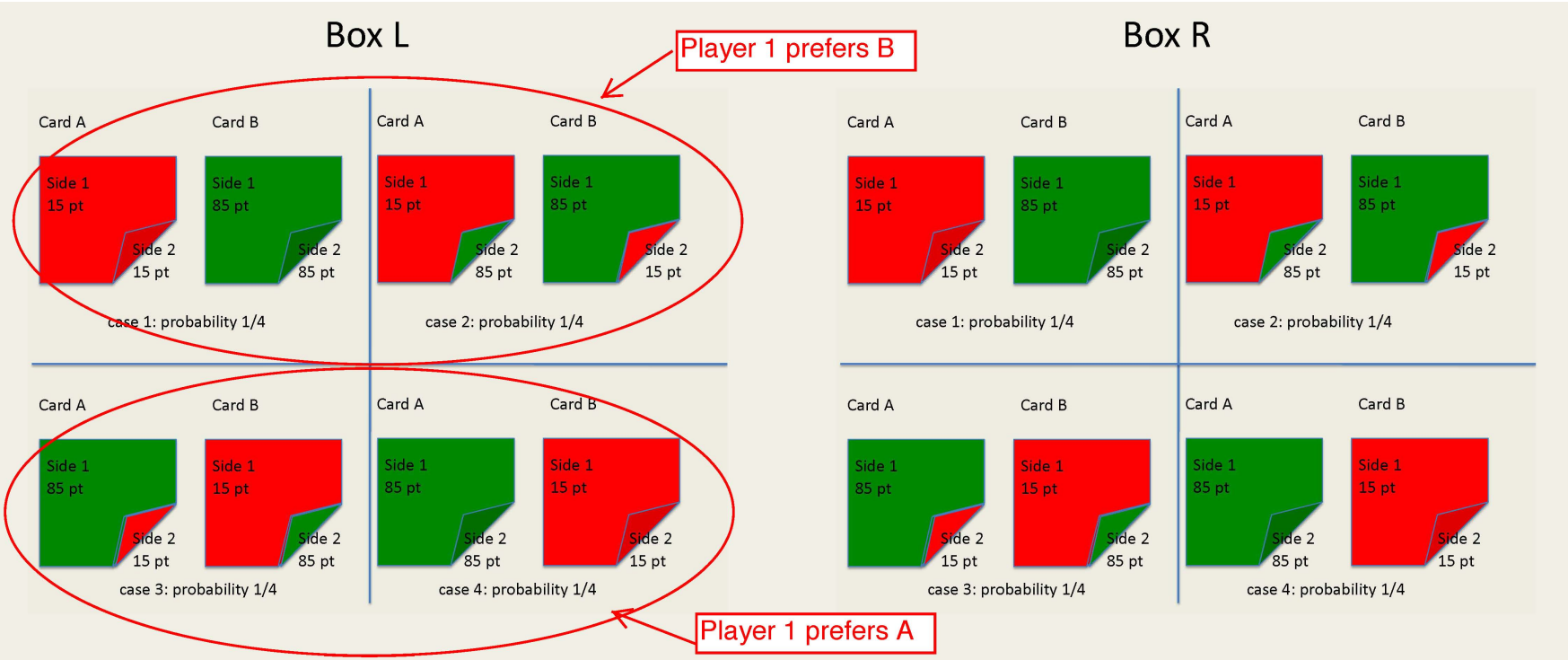
Experiment
Information: example

Bidding stage: types 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

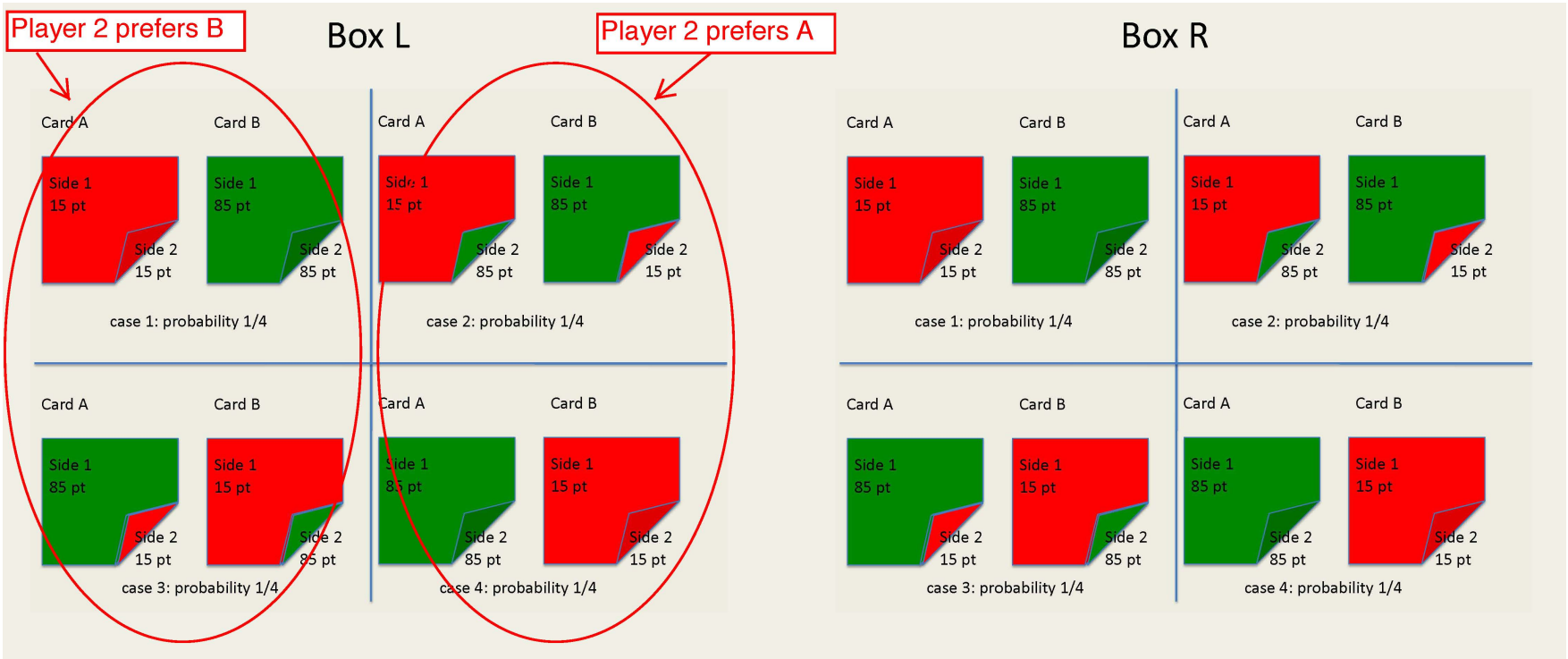
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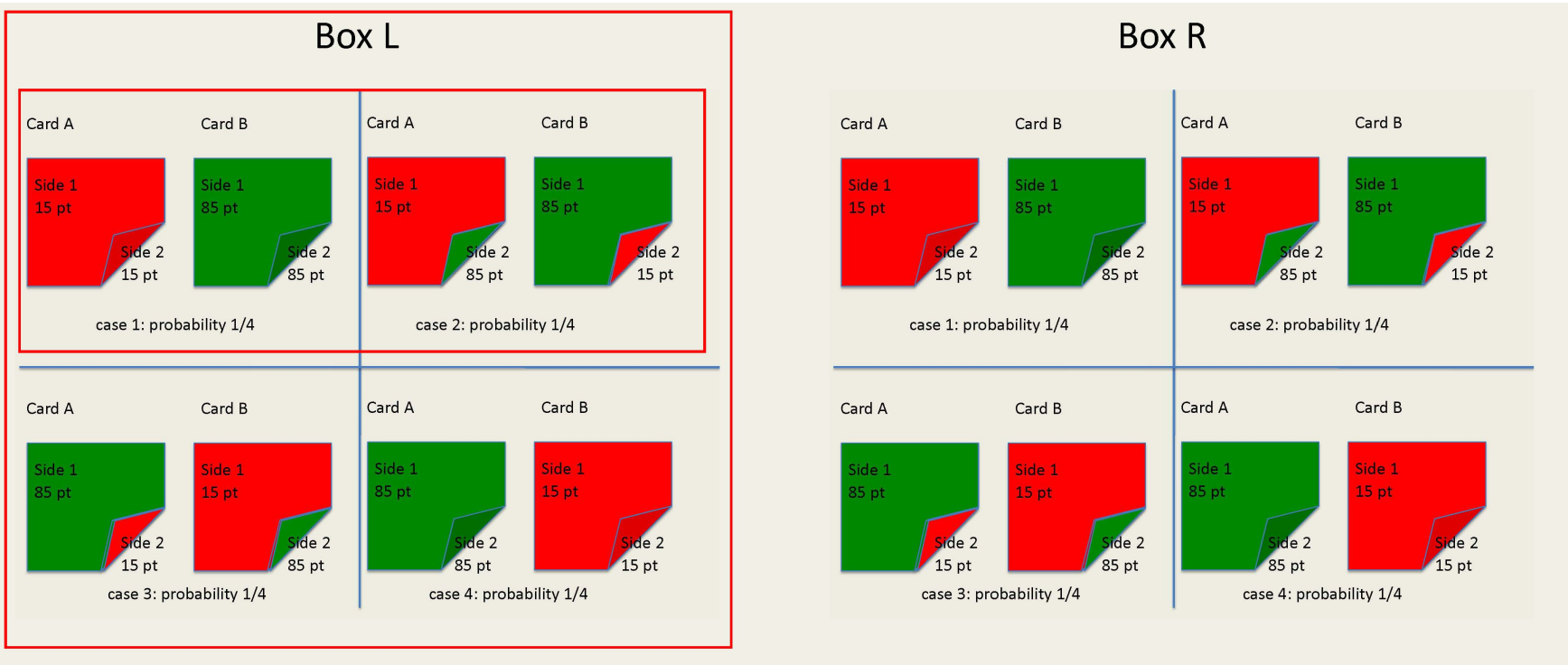
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Experiment
Information: example

Choice stage: types 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

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- stake size $\pi^{Green} - \pi^{Red}$ and payoff level $\frac{\pi^{Green} + \pi^{Red}}{2}$ vary across players and boxes

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
- in 10 rounds the decision right gives Player 1:

freedom	non-interference	power
$\pi_1^{Green,L} > \pi_1^{Red,L}$	$\pi_1^{Green,R} > \pi_1^{Red,R}$	$\pi_2^{Green,L} > \pi_2^{Red,L}$
he affects his outcome	he prevents Player 2 from affecting his outcome	he affects Player 2's outcome

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3 treatments T1 T2 T3

Treatment	Endowments	Rounds	decision right gives Player 1		
			freedom	non-interference	power
T1	100,100	20	*yes*	*yes*	*yes (10 rounds)* *no (10 rounds)*
T2	100,0	20	*yes*	*yes*	*yes (10 rounds)* *no (10 rounds)*
T3	100,0	20	*no*	*yes*	*no*

If Player 1 has the decision right:

Player 1's Payoff $= w_1 +$ Value of Side 1 of Selected Card - r

Player 2's Payoff $= w_2 +$ Value of Side 2 of Selected Card

If Player 2 has the decision right:

Player 1's Payoff $= w_1 +$ Value of Side 1 of Selected Card

Player 2's Payoff $= w_2 +$ Value of Side 2 of Selected Card

w_i = endowment of Player i
r = BDM randomly drawn price

Experiment
Procedures

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)
3. Locus of Control questionnaire
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

Theoretical predictions

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:

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

Theoretical predictions

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:

    $\Delta EU + ... = 0$

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$$\Delta EU + \alpha \Delta F = 0$$

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$$\Delta EU + \beta \Delta NI = 0$$

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$$\Delta EU + \gamma \Delta P = 0$$

Empirical strategy

$\Delta EU_{nt} = 0$	Expected Utility maximization
$\Delta EU_{nt} = -\alpha_n \Delta F_{nt}$	Psychological Payoff max. under pref. for Freedom
$\Delta EU_{nt} = -\beta_n \Delta NI_{nt}$	Psychological Payoff max. under pref. for Non-Interference
$\Delta EU_{nt} = -\gamma_n \Delta P_{nt}$	Psychological Payoff max. under pref. for Power

1st specification: constant

Treatment	ΔF^c	ΔNI^c	ΔP^c
T1 and T2	1	1	$\mathbf{1}_{[\pi_2^{Green} > \pi_2^{Red}]}$
T3	0	1	0

2nd specification: proportional to payoff difference

Treatment	ΔF^d	ΔNI^d	ΔP^d
T1 and T2	$\pi_1^{Green} - \pi_1^{Red}$	$\pi_1^{Green} - \pi_1^{Red}$	$\pi_2^{Green} - \pi_2^{Red}$
T3	0	$\pi_1^{Green} - \pi_1^{Red}$	0

Estimation results
Preview

- Which model best explains the behavior of most participants?
  Psychological Payoff maximization driven by pref. for Non-Interference.
- Is the overbidding driven by pref. for Non-Interference economically sizable?
  Yes, it is appr. 20% of the stake size.
- Benchmark assuming CRRA utility, robustness check assuming CARA utility.

Estimation results
Model selection

Which fraction of participants is best explained by which model?

- Treatments 1&2: 39% EU, 56% Freedom or Non-Interference, 5% Power
- Treatment 3: 23% EU, 77% Non-Interference

			Treatments 1 and 2	Treatment 3
Expected utility max. (excl. procedural preferences)				
	$\hat{\rho}_{MPL}$	$\Delta EU = 0$	5.9	13.6
	$\hat{\rho}_{bid}$	$\Delta EU = 0$	25	4.6
	0	$\Delta EU = 0$	8.3	4.6
Psychological payoff max. (incl. procedural preferences)				
Freedom or Non-Interference	$\hat{\rho}_{MPL}$	$\Delta EU = -\alpha \Delta F^c$ or $-\beta \Delta NI^c$	27.4	
		$\Delta EU = -\alpha \Delta F^d$ or $-\beta \Delta NI^d$	28.6	
Non-Interference	$\hat{\rho}_{MPL}$	$\Delta EU = -\beta \Delta NI^c$		54.5
		$\Delta EU = -\beta \Delta NI^d$		22.7
Power	$\hat{\rho}_{MPL}$	$\Delta EU = -\gamma \Delta P^d$	4.8	

Nonlinear least squares, CRRA utility function, model selection according to Bayesian Information Criterion.

Estimation results
Overbidding

Is preference for Non-Interference driving behavior? Lets inspect its monetary measure.

Overbidding

bid predicted by 'Psychological Payoff max. driven by pref. for Non-Interference'

minus

bid predicted by 'Expected Utility max.'

Estimation results
Overbidding

- overbidding in Treatments 1&2 (involving Non-Interference *and* Freedom) and in Treatment 3 (involving only Non-Interference) are not statistically different
- since treatment assignment is random, behavior in Treatments 1&2 is driven by preference for Non-Interference as in Treatment 3

specification for Non-Interference used to define:		regressors		obs
overbidding	subsample	dummy for Treatment 3	constant	
ΔNI^c	ΔNI^c	0.15 (5.61)	22.77*** (2.14)	35
ΔNI^d	ΔNI^d	-4.69 (4.84)	19.43*** (1.80)	29
ΔNI^c	ΔNI^c or ΔNI^d	-0.30 (4.37)	19.21*** (1.71)	64
ΔNI^d	ΔNI^c or ΔNI^d	-1.50 (3.63)	19.03*** (1.30)	64

Dependent variable: overbidding. Subsample: subjects best explained by 'Psychological Payoff max. driven by pref. for Non-Interference'. Linear regression with s.e. given in parentheses. *, **, *** indicate 5%, 1%, 0.1% levels. Round 5, when $\pi_1^{high} = 75$ and $\pi_1^{low} = 25$.

Estimation results
Overbidding

Overbidding driven by pref. of Non-Interference is appr. 20% of the stake size.

		specification for Non-Interference used to define overbidding					
		'constant'			'proportional to payoff difference'		
round	stake size	mean	% of stake	sd	mean	% of stake	sd
1	70	10.80	15	16.97	13.47	19	21.81
2	50	10.84	22	17.11	9.81	20	15.86
3	30	11.38	38	16.16	6.03	20	9.63
4	70	10.75	15	15.61	13.95	20	20.14
5	50	10.70	21	15.91	10.03	20	14.73
6	30	11.00	37	15.45	6.09	20	8.99
7	70	10.57	15	14.64	14.36	21	19.28
8	50	10.57	21	14.85	10.29	21	13.92
9	30	10.73	36	14.66	6.21	21	8.43
10	100	10.65	11	14.83	17.97	18	24.96
11	50	10.70	21	15.91	10.03	20	14.73
12	50	10.70	21	15.91	10.03	20	14.73
13	50	10.70	21	15.91	10.03	20	14.73
14	50	10.70	21	15.91	10.03	20	14.73
15	50	10.70	21	15.91	10.03	20	14.73
16	70	10.75	15	15.61	13.95	20	20.14
17	30	11.00	37	15.45	6.09	20	8.99
18	50	10.84	22	17.11	9.81	20	15.86
19	50	10.57	21	14.85	10.29	21	13.92
20	100	10.65	11	14.83	17.97	18	24.96
all	50	10.76	**22**	15.63	10.82	**20**	16.75

Conclusion

Conclusion

- We proposed a theoretical framework and an experimental design to represent and measure procedural motivations in the valuation of decision rights: Freedom, Power, and Interference
    - experimental findings: *aversion to interference*

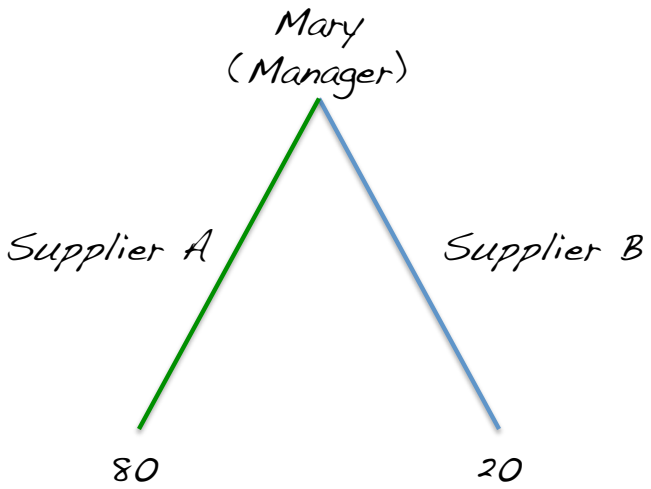
Conclusion

- We proposed a theoretical framework and an experimental design to represent and measure procedural motivations in the valuation of decision rights: Freedom, Power, and Interference
  - experimental findings: *aversion to interference*
- Our framework and findings help interpret and unify previous research. Aversion to interference can explain evidence previously attributed to:
  - *betrayal aversion* (Bohnet and Zeckhauser 2004)
  - *preference for decision rights* (Fehr et al. 2013, Bartling et al. 2014)
  - *preference for payoff autonomy* (Owens et al. 2014)
  - *aversion to a counterpart's intentions* (Butler and Miller 2016)

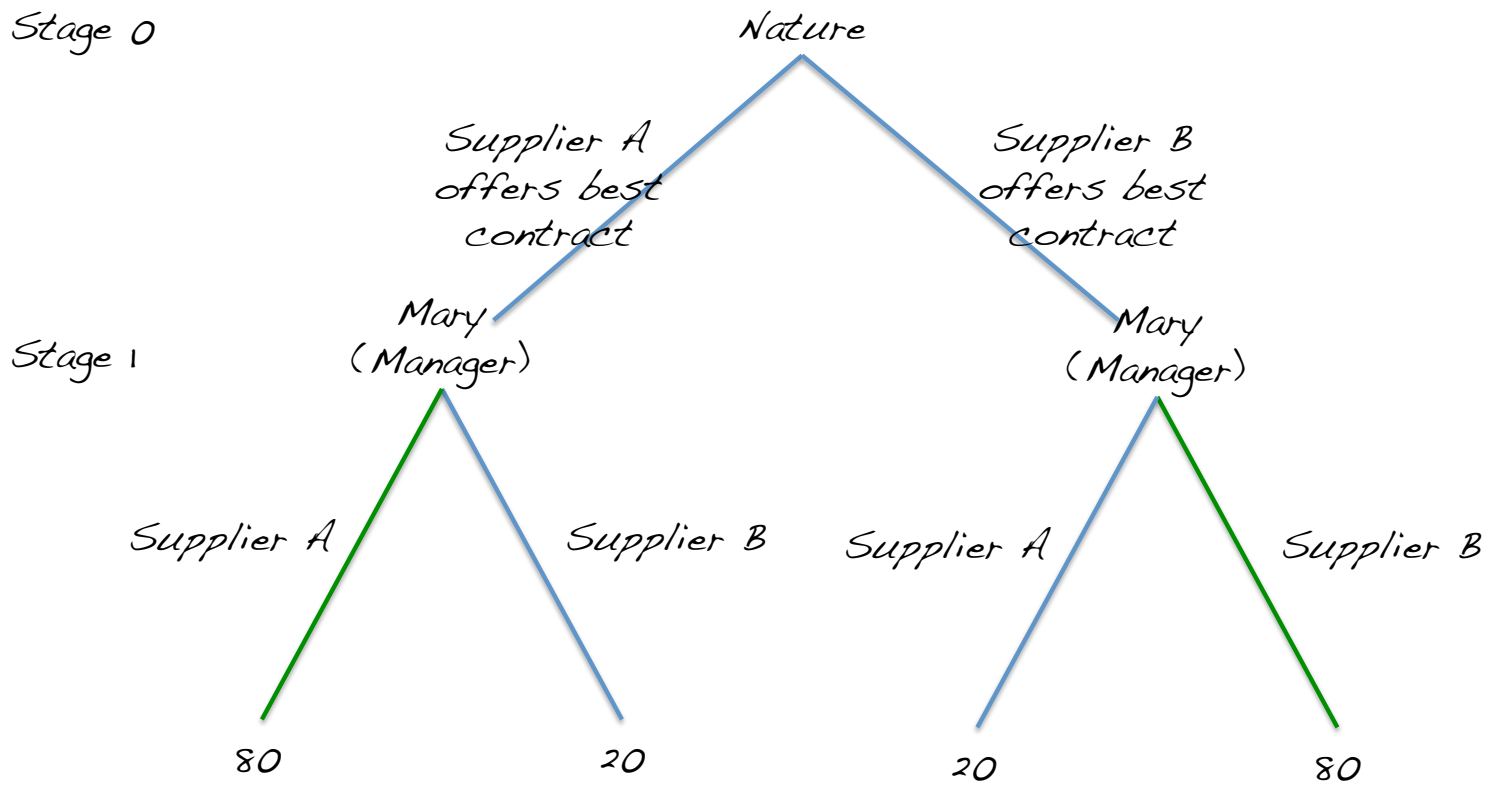
Thank you

Extra slides

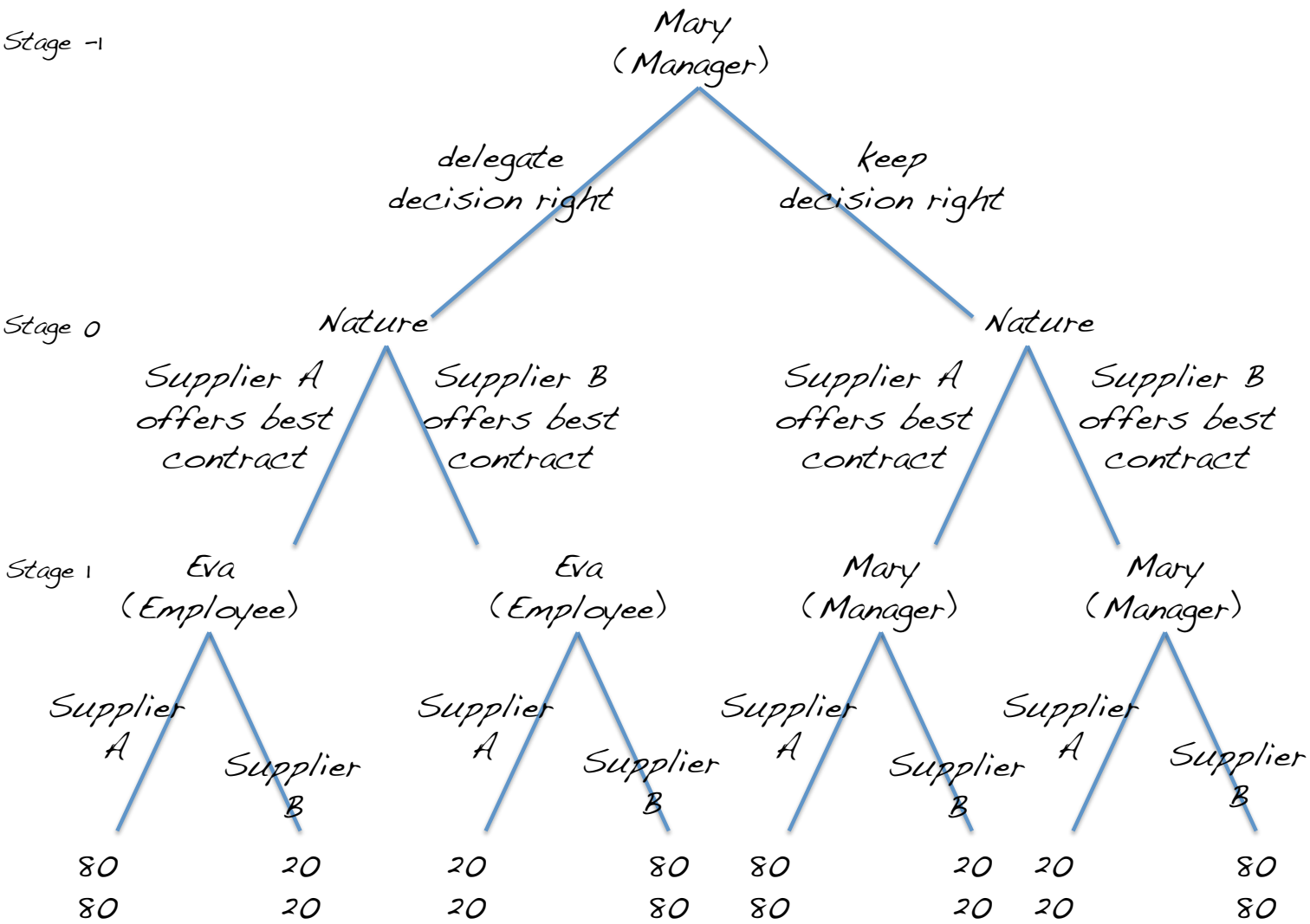
Example



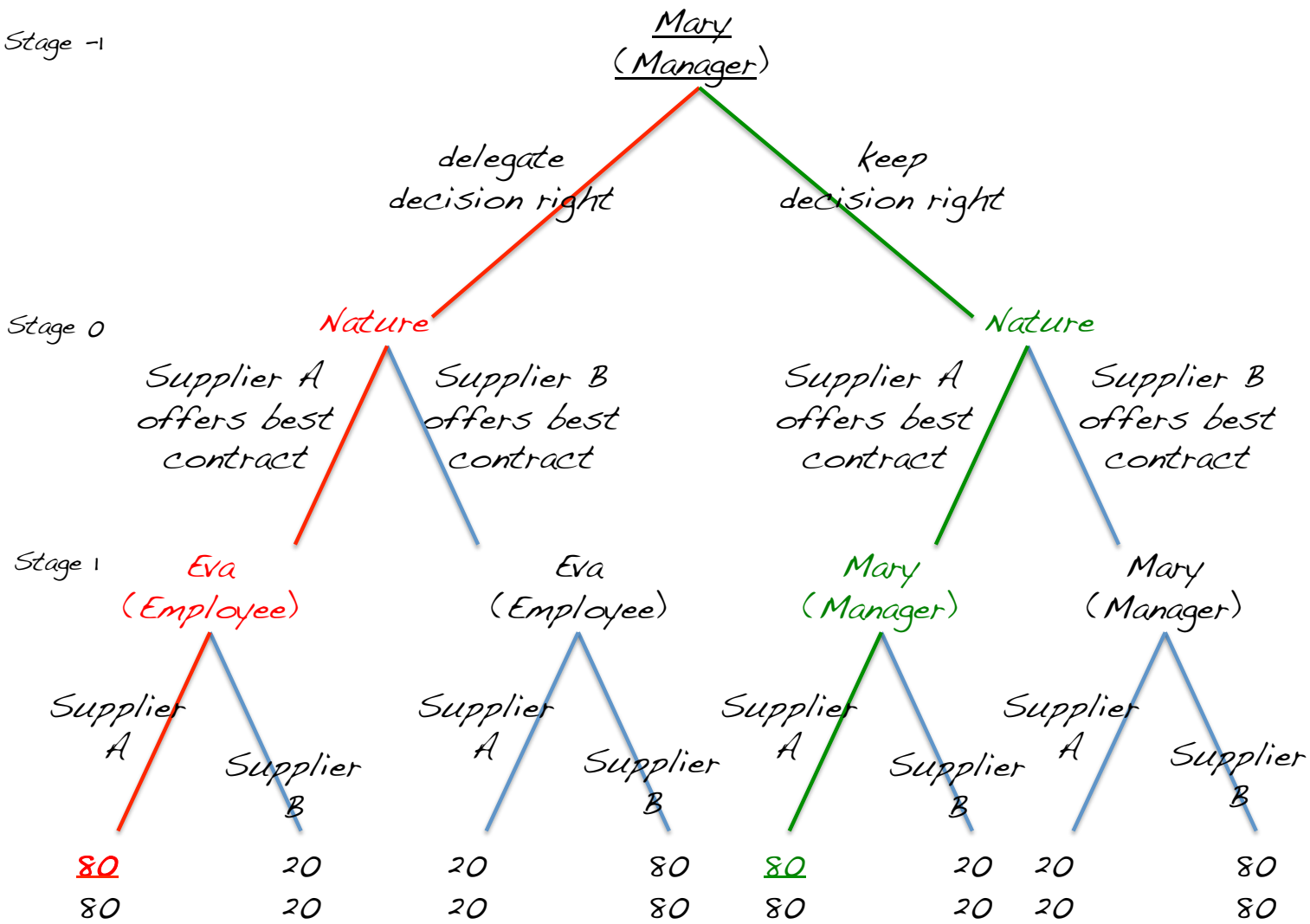
Example


Stage 0
Nature
Supplier A offers best contract
Supplier B offers best contract
Stage 1
Mary (Manager)
Mary (Manager)
Supplier A
Supplier B
Supplier A
Supplier B
80
20
20
80

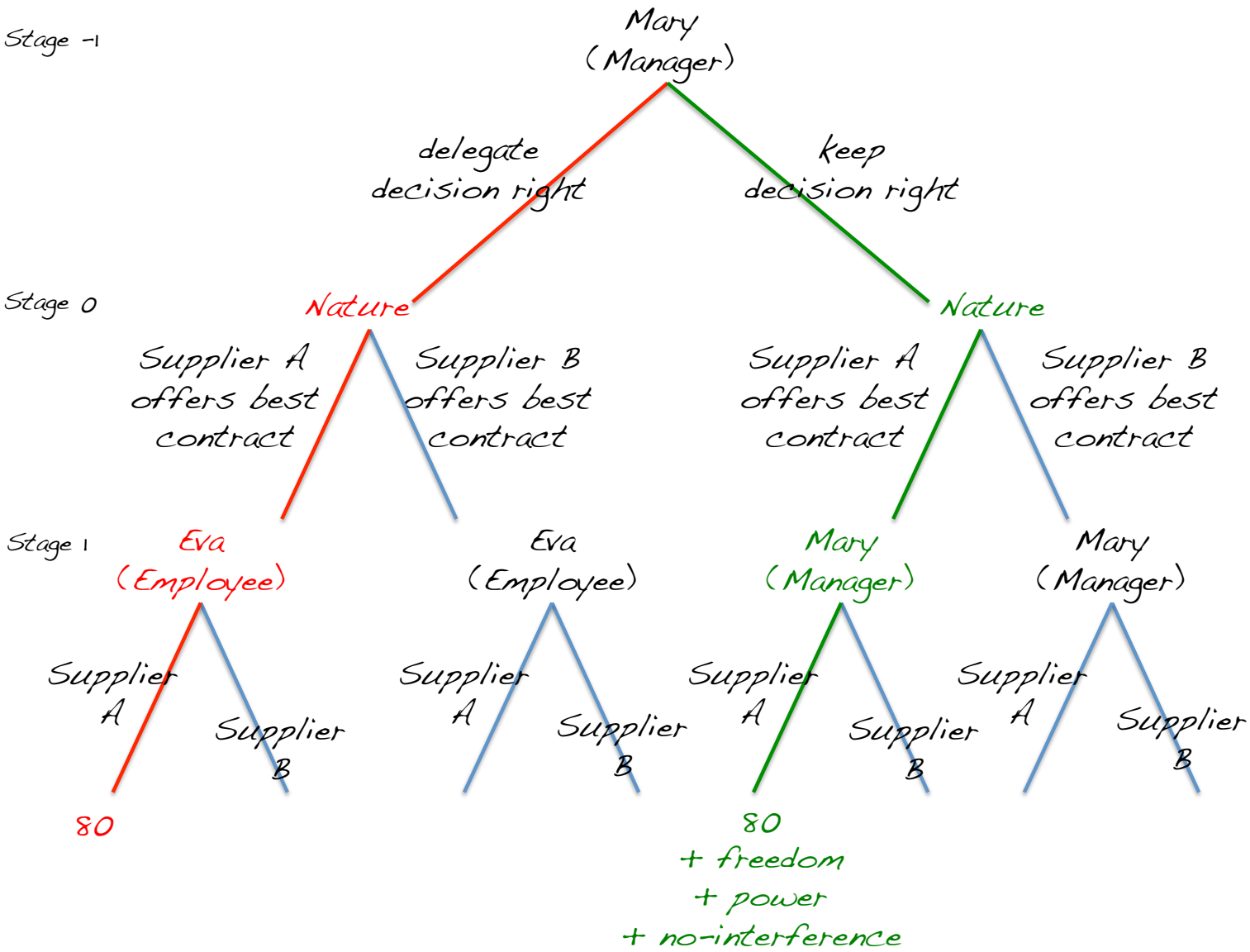
Example


Stage -1
Mary
(Manager)
delegate
decision right
keep
decision right
Stage 0
Nature
Nature
Supplier A
offers best
contract
Supplier B
offers best
contract
Supplier A
offers best
contract
Supplier B
offers best
contract
Stage 1
Eva
(Employee)
Eva
(Employee)
Mary
(Manager)
Mary
(Manager)
Supplier
A
Supplier
B
Supplier
A
Supplier
B
Supplier
A
Supplier
B
Supplier
A
Supplier
B
80
80
20
20
20
20
80
80
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80
20
20
20
20
80
80

Example


Stage -1
Mary
(Manager)
delegate
decision right
keep
decision right
Stage 0
Nature
Nature
Supplier A
offers best
contract
Supplier B
offers best
contract
Supplier A
offers best
contract
Supplier B
offers best
contract
Stage 1
Eva
(Employee)
Eva
(Employee)
Mary
(Manager)
Mary
(Manager)
Supplier
A
Supplier
B
Supplier
A
Supplier
B
Supplier
A
Supplier
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Supplier
A
Supplier
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80
20
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20
80

Example


Stage -1
Mary
(Manager)
delegate
decision right
keep
decision right
Stage 0
Nature
Nature
Supplier A
offers best
contract
Supplier B
offers best
contract
Supplier A
offers best
contract
Supplier B
offers best
contract
Stage 1
Eva
(Employee)
Eva
(Employee)
Mary
(Manager)
Mary
(Manager)
Supplier
A
Supplier
B
Supplier
A
Supplier
B
Supplier
A
Supplier
B
Supplier
A
Supplier
B
80
80
+ freedom
+ power
+ no-interference

- freedom of choice (Barberà&al. 2004, Baujard 2007, Dowding&vanHees 2009)
- diversity (Nehring&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

$$F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1)\theta(o_1 \cap t_1) \log \frac{\theta(o_1|t_1)}{\theta(o_1)}$$

$$NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2)\theta(o_1 \cap t_2) \log \frac{\theta(o_1|t_2)}{\theta(o_1)}$$

$$P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1)\theta(o_2 \cap t_1) \log \frac{\theta(o_2|t_1)}{\theta(o_2)}$$

- 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

Empirical strategy

$$F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1)\theta(o_1 \cap t_1) \log \frac{\theta(o_1|t_1)}{\theta(o_1)}$$

$$NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2)\theta(o_1 \cap t_2) \log \frac{\theta(o_1|t_2)}{\theta(o_1)}$$

$$P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1)\theta(o_2 \cap t_1) \log \frac{\theta(o_2|t_1)}{\theta(o_2)}$$

1st specification: constant

$$g(o_i, t) = 1$$

Treatment	Freedom $F_1(\theta)$	Non-Interference $NI_1(\theta)$	Power $P_1(\theta)$
T1 and T2	$\frac{y}{100}$	$-\frac{100-y}{100}$	$\frac{y}{100}\mathbf{1}_{[\pi_2^{Green} > \pi_2^{Red}]}$
T3	0	$-\frac{100-y}{100}$	0

Empirical strategy

$$F_1(\theta) = \sum_{t_1} \sum_{o_1} g(o_1, t_1)\theta(o_1 \cap t_1) \log \frac{\theta(o_1|t_1)}{\theta(o_1)}$$

$$NI_1(\theta) = -\sum_{t_2} \sum_{o_1} g(o_1, t_2)\theta(o_1 \cap t_2) \log \frac{\theta(o_1|t_2)}{\theta(o_1)}$$

$$P_1(\theta) = \sum_{t_1} \sum_{o_2} g(o_2, t_1)\theta(o_2 \cap t_1) \log \frac{\theta(o_2|t_1)}{\theta(o_2)}$$

2nd specification: proportional to payoff difference

$$g(o_i, t) = \pi_i^{Green} - \pi_i^{Red}$$

Treatment	Freedom $F_1(\theta)$	Non-Interference $NI_1(\theta)$	Power $P_1(\theta)$
T1 and T2	$\frac{y}{100}\left(\pi_1^{Green} - \pi_1^{Red}\right)$	$-\frac{100-y}{100}\left(\pi_1^{Green} - \pi_1^{Red}\right)$	$\frac{y}{100}\left(\pi_2^{Green} - \pi_2^{Red}\right)$
T3	0	$-\frac{100-y}{100}\left(\pi_1^{Green} - \pi_1^{Red}\right)$	0

Intuition: Logarithmic terms capture the probabilistic causal influence of types on outcomes and $g(o, t)$ 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.

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.

Box L		Box R	
$\pi_1^{Green,L}$ / $\pi_1^{Red,L}$	$\pi_2^{Green,L}$ / $\pi_2^{Red,L}$	$\pi_1^{Green,R}$ / $\pi_1^{Red,R}$	$\pi_2^{Green,R}$ / $\pi_2^{Red,R}$
100/30	70/70	100/30	100/30
90/40	70/70	90/40	90/40
80/50	70/70	80/50	80/50
85/15	70/70	85/15	85/15
75/25	70/70	75/25	75/25
65/35	70/70	65/35	65/35
70/0	70/70	70/0	70/0
60/10	70/70	60/10	60/10
50/20	70/70	50/20	50/20
100/0	70/70	100/0	100/0

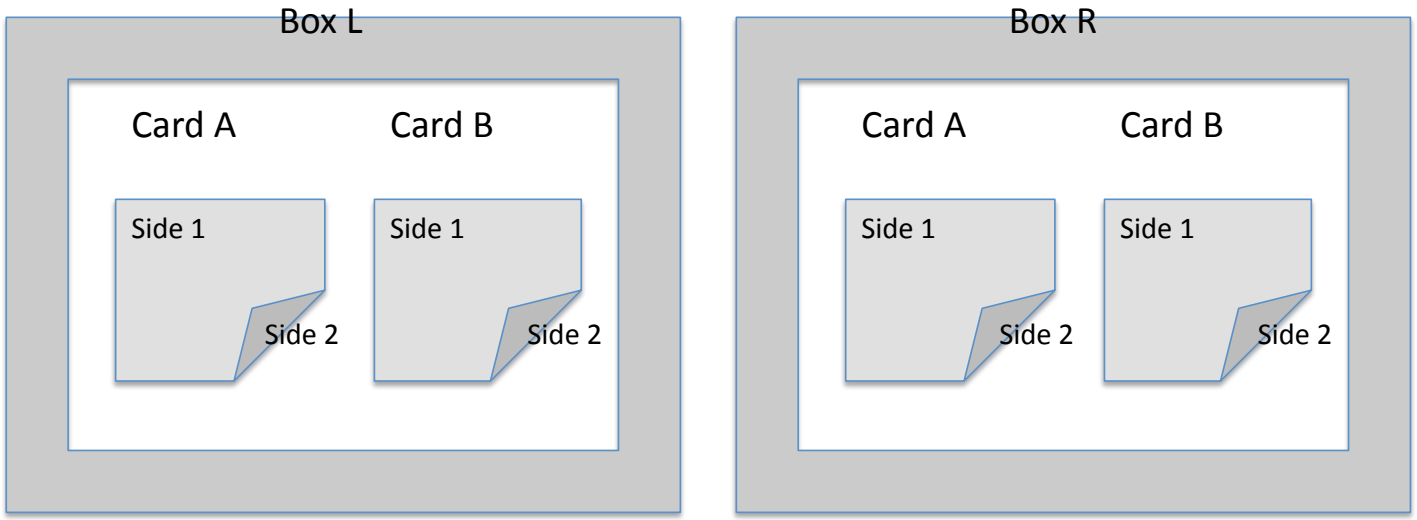
- $\pi_1^{Green,L} = \pi_1^{Green,R} = \pi_1^{Green}$ and $\pi_1^{Red,L} = \pi_1^{Red,R} = \pi_1^{Red}$
- stake size: $\pi_i^{Green} - \pi_i^{Red} \in \{30, 50, 70\}$
- payoff level: $\frac{\pi_i^{Green} + \pi_i^{Red}}{2} \in \{35, 50, 65\}$

Benchmark Treatment (T1). Rounds *with* Power.

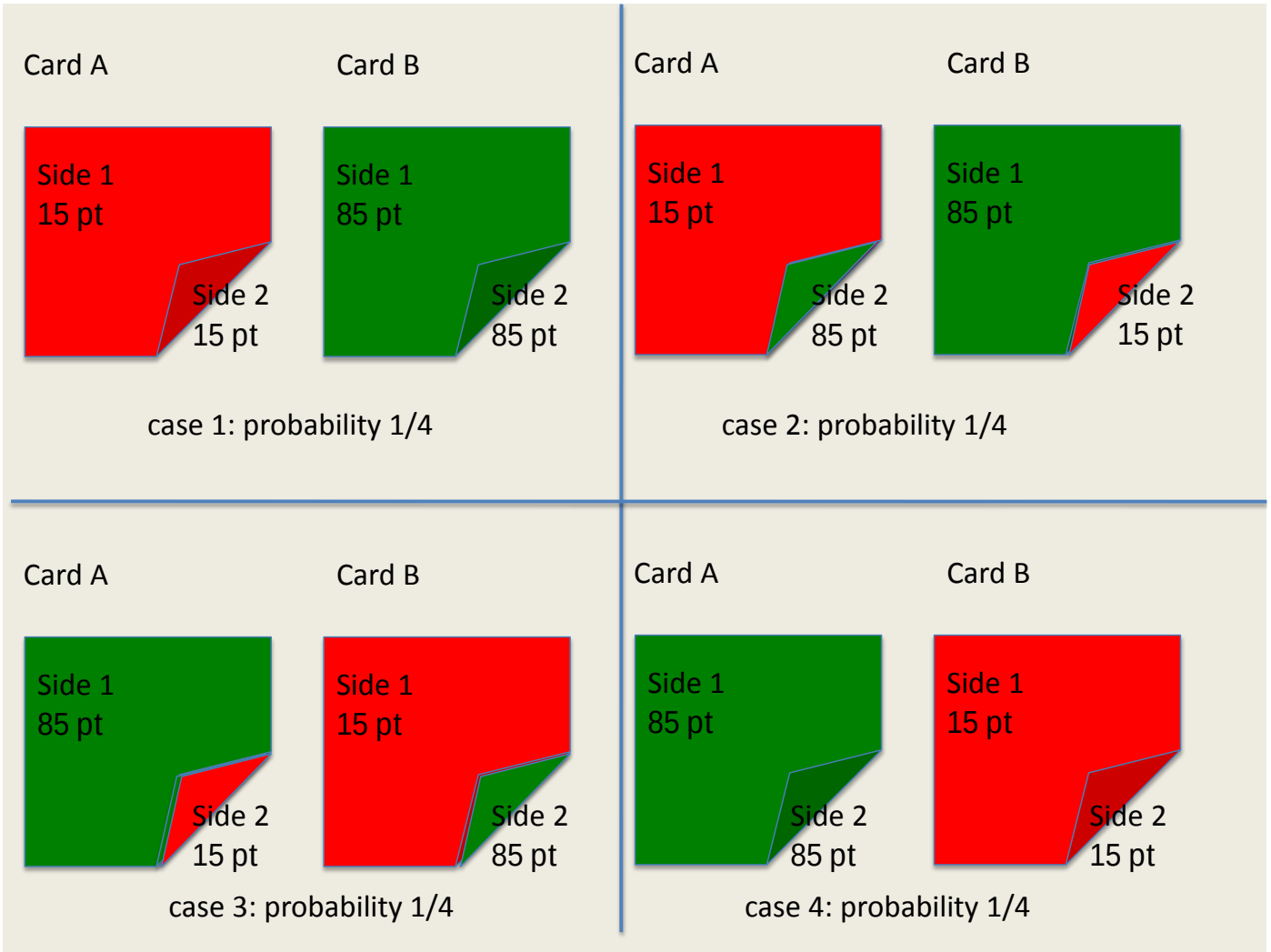
Box L		Box R	
$\pi_1^{Green,L}$ / $\pi_1^{Red,L}$	$\pi_2^{Green,L}$ / $\pi_2^{Red,L}$	$\pi_1^{Green,R}$ / $\pi_1^{Red,R}$	$\pi_2^{Green,R}$ / $\pi_2^{Red,R}$
75/25	85/15	75/25	85/15
75/25	75/25	75/25	75/25
75/25	65/35	75/25	65/35
75/25	90/40	75/25	90/40
75/25	60/10	75/25	60/10
85/15	75/25	85/15	75/25
65/35	75/25	65/35	75/25
90/40	75/25	90/40	75/25
60/10	75/25	60/10	75/25
100/0	100/0	100/0	100/0

- $\pi_1^{Green,L} = \pi_1^{Green,R} = \pi_1^{Green}$ 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

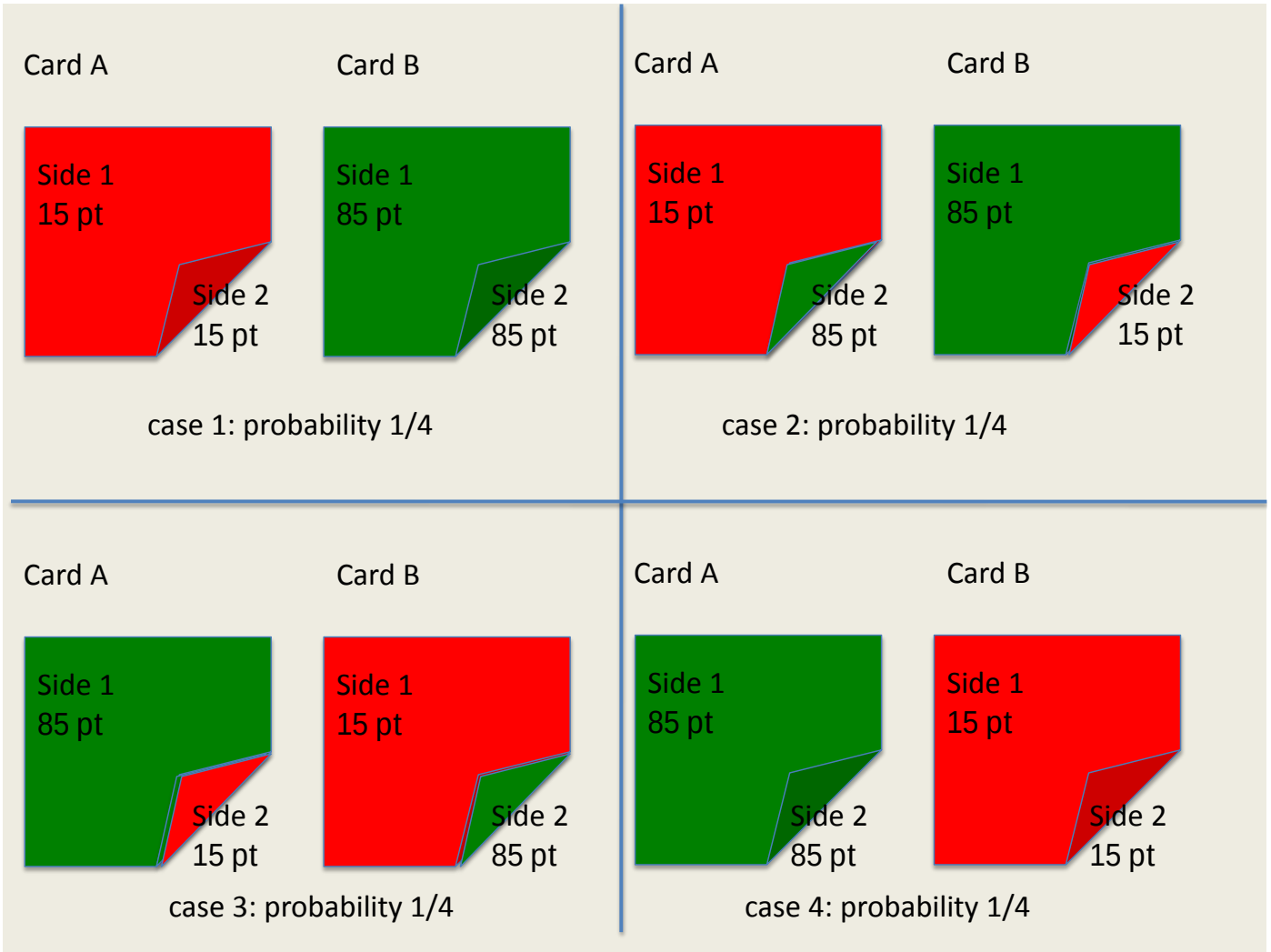


Experiment
Treatment 1 and 2: example



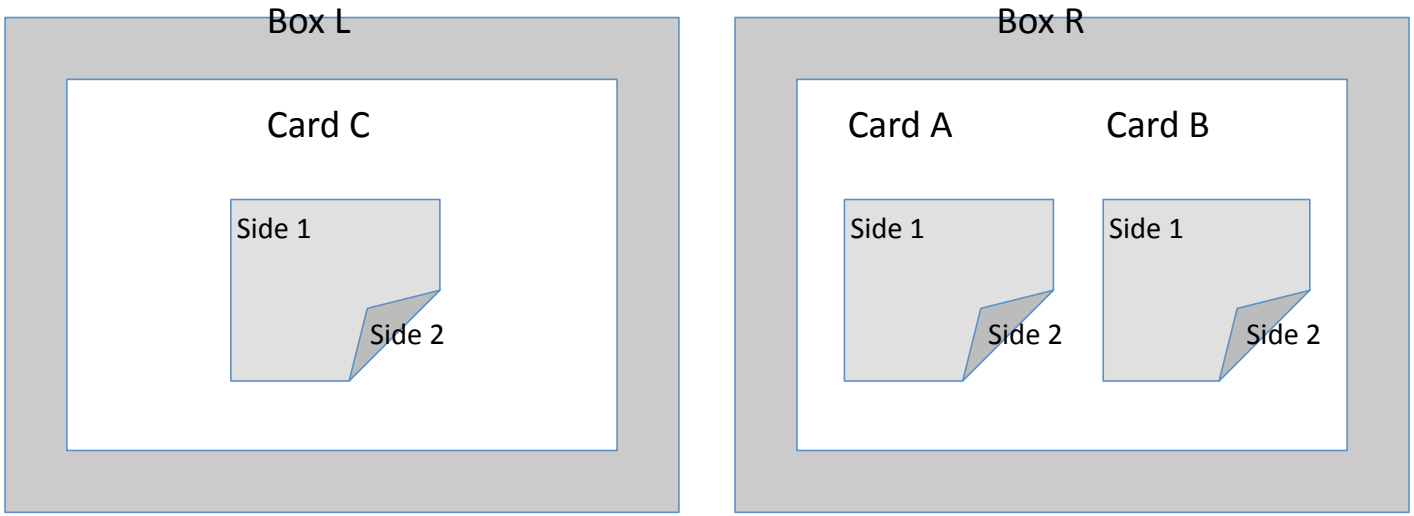
Box L

Experiment
Treatment 1 and 2: example

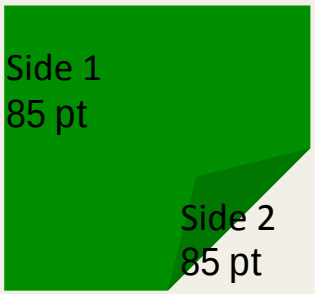


Box R

Experiment
Treatment 3

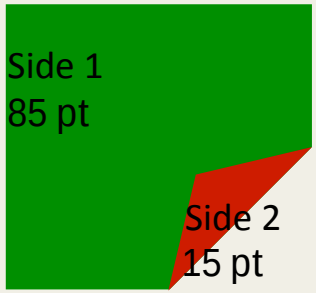


Card C



case 1: probability 1/2

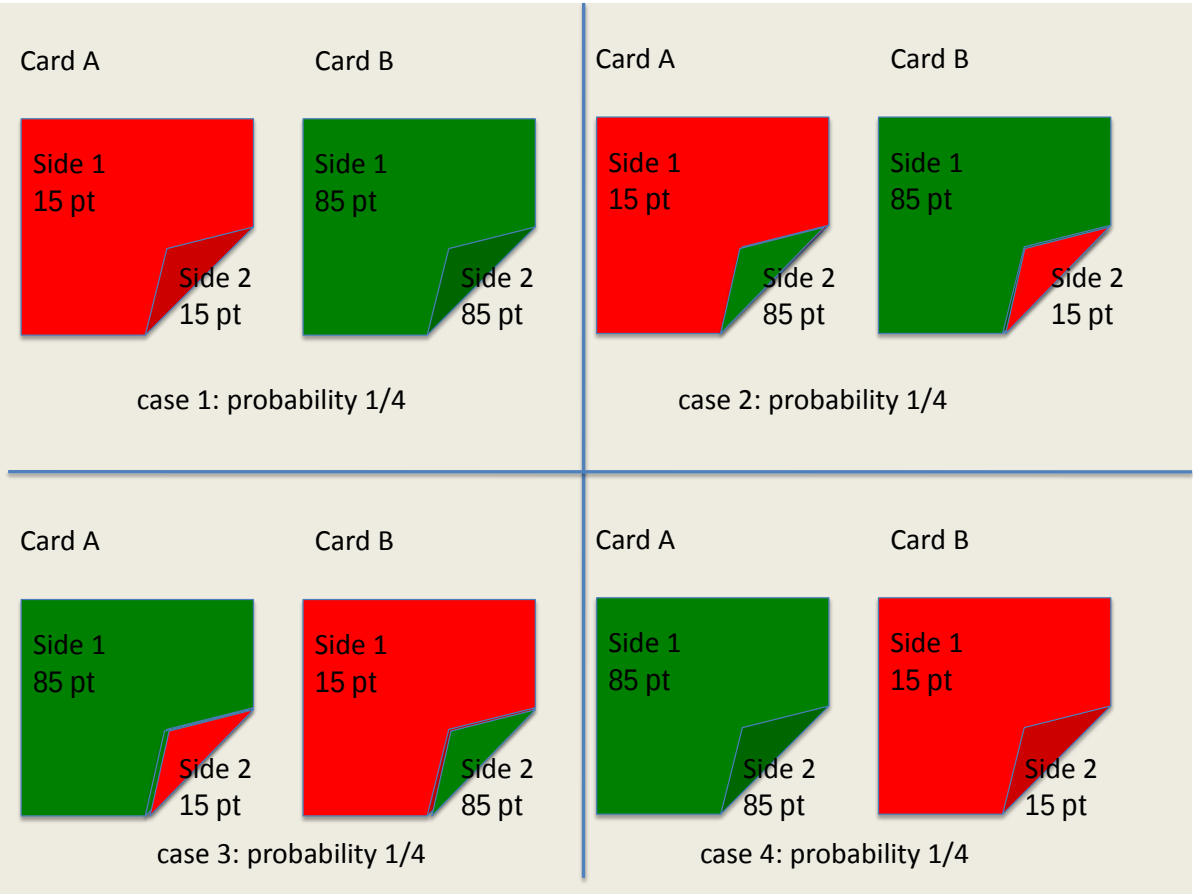
Card C



case 2: probability 1/2

Box L

Experiment
Treatment 3: example



Box R

Experiment
Treatment 3: Rounds

Box L		Box R	
$\pi_1^{Green,L}$	$\pi_2^{Green,L}$ / $\pi_2^{Red,L}$	$\pi_1^{Green,R}$ / $\pi_1^{Red,R}$	$\pi_2^{Green,R}$ / $\pi_2^{Red,R}$
100	70/70	100/30	100/30
90	70/70	90/40	90/40
80	70/70	80/50	80/50
85	70/70	85/15	85/15
75	70/70	75/25	75/25
65	70/70	65/35	65/35
70	70/70	70/0	70/0
60	70/70	60/10	60/10
50	70/70	50/20	50/20
100	70/70	100/0	100/0
75	85/15	75/25	85/15
75	75/25	75/25	75/25
75	65/35	75/25	65/35
75	90/40	75/25	90/40
75	60/10	75/25	60/10
85	75/25	85/15	75/25
65	75/25	65/35	75/25
90	75/25	90/40	75/25
60	75/25	60/10	75/25
100	100/0	100/0	100/0

Option A	Option B	your choice
30	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
35	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
40	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
45	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
50	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
55	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
60	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
65	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
70	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
75	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐
80	85 with $\frac{1}{2}$ probability; 15 with $\frac{1}{2}$ probability	A ☐ B ☐

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 form 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

Descriptive Results
Bidding Behavior

- bids don't differ significantly in rounds *with* and *without* Power
- in Treatments 1 and 2 bids are not significantly different
- in Treatment 2 (when decision right gives Non-Interference *and* Freedom) bids are significantly lower than
  in Treatment 3 (when decision right gives only Non-Interference)

Descriptive Results
Bidding Behavior

round	treatment						
	T1	T2	T3	all	T1 vs T2	T2 vs T3	T1 vs T3
1	35	44	57	44			z = -2.492 (0.0127)
2	45	46	51	47		z = -2.357 (0.0184)	
3	31	36	27	32			z = -1.709 (0.0874)
4	45	43	64	49		z = -3.073 (0.0021)	z = -2.884 (0.0039)
5	37	42	50	42			z = -1.831 (0.0671)
6	26	29	36	30			z = -1.781 (0.0749)
7	45	44	64	49		z = -2.968 (0.0030)	z = -3.000 (0.0027)
8	32	28	48	34			z = -2.198 (0.0280)
9	22	31	37	29	z=-2.489 (0.0128)		z = -2.893 (0.0038)
10	47	59	72	57		z = -1.945 (0.0518)	
11	37	42	52	43			z = -2.043 (0.0411)
12	35	28	50	35		z = -1.703 (0.0886)	z = -1.977 (0.0481)
13	36	37	51	40		z = -2.296 (0.0217)	z = -2.430 (0.0151)
14	36	37	33	35		z = -1.719 (0.0856)	z = -1.909 (0.0562)
15	37	29	50	36		z = -1.706 (0.0880)	z = -1.941 (0.0523)
16	43	47	64	50		z = -2.586 (0.0097)	z = -2.916 (0.0035)
17	26	33	43	33			z = -2.411 (0.0159)
18	40	46	59	47		z = -1.860 (0.0628)	z = -2.614 (0.0089)
19	24	35	43	32			
20	70	64	68	67			
all	37	40	50	42			

Hypothesis of expected-utility-maximizing behavior is rejected

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

$$\Delta CE = \pi_1^{Green} - y - CE_{lottery}\left(\frac{1}{2}, \pi_1^{high}; \frac{1}{2}, \pi_1^{Red}\right)$$

- 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

Treatment	Player 1		Player 2	
	has decision right	chooses preferred card	has decision right	chooses preferred card
1	0.41	1	0.59	0.98
2	0.4	0.99	0.6	0.99
3	0.55	1	0.45	0.94
all	0.44	1	0.56	0.98

Conclusion

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 obs., participants choose the option in their best interest
  - it would require either a very strong aversion or very far-off beliefs

Conclusion

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

- $b^* - \frac{\pi_1^{Green} - \pi_1^{Red}}{2} = \lambda V^{dis} + \mu V^{adv}$
  V^{dis} = difference in disadvantageous inequality between Box L and Box R
  V^{adv} = difference in advantageous inequality between Box L and Box R

$$V^{dis} = \max\left(0, \frac{\pi_2^{Green} + \pi_2^{Red}}{2} + w_2 - \pi^{Green} - w_1 + b\right) - \max\left(0, \pi_2^{Green} + w_2 - \frac{\pi_1^{Green} + \pi_1^{Red}}{2} - w_1\right)$$

$$V^{adv} = \max\left(0, \pi_1^{Green} + w_1 - b - \frac{\pi_2^{Green} + \pi_2^{Red}}{2} - w_2\right) - \max\left(0, \frac{\pi_1^{Green} + \pi_1^{Red}}{2} + w_1 - \pi_2^{Green} - w_2\right)$$

- $b = b^*(\lambda, \mu) + \beta + \epsilon$
  NLS estimates: $\hat{\lambda} = 0.013$ $\hat{\mu} = -0.089^*$ $\hat{\beta} = 12.44^{***}$
- 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