

The Impact of Procedural Asymmetry in Games of Imperfect Information

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Purely Procedural Aspects

Institutions...

- ▷ ...define our rights of participation and information
- ▷ ...coordinate/weight potentially conflicting rights of several individuals
- ▷ ...structure every-day interactions

The rules of a game define...

- ▷ ...players' sets of actions and players' sets of strategies
- ▷ ...players' information at every decision node
- ▷ ...players' sets of actions and information relative to each other

Do individuals care for institutions?

- ▷ institutions affect happiness (Frey and Stützer 2005)
- ▷ individuals have preferences over institutions (Chlaß/Güth/Miettinen 2009)
- ▷ individuals care for *procedural symmetry*

Research question

What, if individuals are subject to a procedure...

- ▷ ...which *violates* individuals' purely procedural preferences
- ▷ ...granting one player more freedom of choice, more information, and more ways to be unkind to the other
- ▷ ...they cannot modify or exit

Idea

- ▷ use link between procedural preferences and moral preferences (Chlaß /Güth/Miettinen 2009) to *instrument* purely procedural preferences
- ▷ explain off-equilibrium-behavior in an asymmetric procedure by individuals' moral preferences

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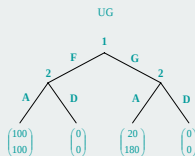
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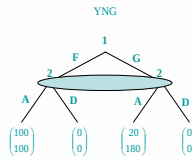
Purely Procedural Aspects: Transparency vs. Simplicity

mini Ultimatum



	AA	AD	DA	DD
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mini Yes-No

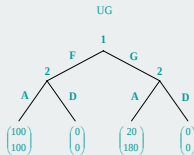


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- ▷ *simplicity*: sum cardinality of parties' pure strategy sets.

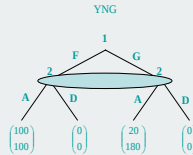
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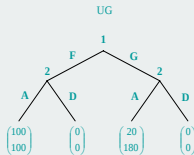


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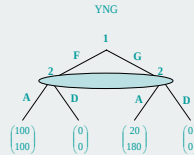
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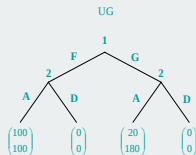
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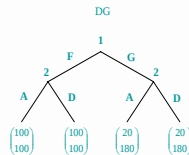
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Purely Procedural Aspects: Equal Opportunities vs. Equal/Zero Unkind Opportunities

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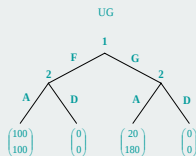
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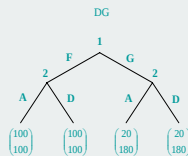
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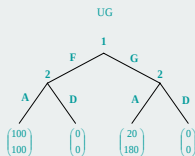
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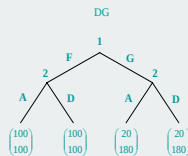
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Outcome-invariance(x,y) $\leftrightarrow$ (100,100), (20,180)

Self interested opportunism.

- ▷ P, R solely care for their own monetary payoff, P expects R to do so.
- ▷ P chooses (100,100), R chooses (A) for all protocols.

Inequity aversion (Fehr and Schmidt 1999).

- ▷ (x,y) enter payoffs such that $x - a \max\{(y-x), 0\} - b \max\{(x-y), 0\}$
- ▷ for $x > y$, $b < 1$, $a \leq 4$, $a \geq b \Rightarrow (0,0) \succ (x,y)$ iff $b > \frac{x}{x-y}$
- ▷ P chooses (100,100), R (A) for all protocols.

Reciprocity (Falk und Fischbacher 2006).

- ▷ j 's kindness toward i at node n : $\varphi_i(n, s_i'', s_i') := \vartheta_j(n, s_i'', s_i') \Delta_j(n, s_i'', s_i')$
- ▷ $\Delta_j > 0 \leftrightarrow$ player kind toward j .
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Are there purely procedural preferences?

Experiment I. Chlaß et al. (2009) - A significant share of subjects expresses and reveals purely procedural preferences, $n=352$, $n_{invariant} = 155$

role	stated preference		revealed preference	
	estimate	confidence interval	share	confidence interval
$\dots \succ \dots$	0.58	$[0.45, 0.70]_{0.99}$	0.18	$[0.10, 0.29]_{0.99}$
$YNG \succ UG$	0.34	$[0.22, 0.49]_{0.99}$	0.14	$[0.06, 0.26]_{0.99}$
$DG \succ UG$	0.58	$[0.31, 0.82]_{0.99}$	0.21	$[0.05, 0.49]_{0.99}$

Experiment II. Chlaß (2010) - Does experience weaken the preference for simplicity?, $n=100$, $n_{invariant} = 28$

role	stated preference		revealed preference	
	estimate	confidence interval	share	confidence interval
$\dots \succ \dots$	0.64	$[0.38, 0.85]_{0.99}$	0.29	$[0.10, 0.54]_{0.99}$
$YNG \succ UG$	0.21	$[0.06, 0.47]_{0.99}$	0.14	$[0.03, 0.39]_{0.99}$
$UG \succ YNG$	0.43	$[0.20, 0.68]_{0.99}$	0.14	$[0.03, 0.39]_{0.99}$

Is there any logic behind these choices? - I

Why could purely procedural aspects matter to an individual? (Chlaß /Güth/Miettinen 2009)

- ▷ something is morally right because it yields me the best outcome *a1 (preconventional mode.)*
 - ▷ something is morally right because it was done with a good intention/in line with a social norm/ social expectations *a2 (conventional mode.)*
 - ▷ something is morally right because it was done/generated in accordance with some universal principle (equality, consideration of everyone's will). *a3 (postconventional mode.)*
-
- ▷ Purely procedural preferences are part of the *postconventional* mode of argumentation. I.e. *Theoretically, a3, Pscore* are instruments for purely procedural preferences.

Is there any logic behind these choices? - II

Responders: $UG \succ YNG, n = 22$

x_i	$\partial y^* / \partial x_i$	conf.int.
<i>a3</i>	0.30	[0.04, 0.54]

Responders: $UG \succ YNG, n = 45$

x_i	$\partial y^* / \partial x_i$	conf.int.
<i>Pscore</i>	0.13	]0, 0.25]

Proposers: $YNG \succ UG, n = 42$

x_i	$\partial y^* / \partial x_i$	conf.int.
<i>a1</i>	-0.10	[-0.27, 0.67]
<i>a2·a3</i>	-0.26	[-0.47, -0.04]
<i>a3</i>	0.29	[0.10, 0.48]

Proposers: $UG \succ YNG, n = 48$

x_i	$\partial y^* / \partial x_i$	conf.int.
<i>a3</i>	0.28	[0.04, 0.32]

At the aggregate, the association looks as follows:

Evening out others' purely procedural disadvantage, $n=52$, Count $R^2=0.71$

x_i	l^*	$\partial y^* / \partial x_i$	σ	t	p
<i>a1</i>	1	-0.05	0.12	-0.43	0.67
<i>a2·a3</i>	1	-0.42	0.13	-3.01	0.00
<i>a3·Psc.</i>	1	0.35	0.09	3.80	0.00

Evening out one's own purely procedural disadvantage, $n=67$, Count $R^2=0.76$

x_i	l	$\partial y / \partial x_i$	σ	t	p
<i>a1</i>	1	0.09	0.05	1.81	0.07
<i>a2·a3</i>	1	-0.30	0.06	-4.80	0.00
<i>a3·Psc.</i>	1	0.22	0.08	2.74	0.01

A sequential common value auction

Players

- ▷ buyer and seller
- ▷ negotiate whether or not to trade a commodity
- ▷ quality of the commodity is buyer's private information

Structure of the Game

- ▷ $T=0$: Nature draws quality of the commodity $\bar{v}$ with $v \sim f(v)$
- ▷ $T=1$: buyer makes offer p , i.e. $p \in [0, 10]$ → *continuous set of actions*
- ▷ $T=2$: seller decides whether or not to accept p , i.e. $\delta \in \{0, 1\}$ → *discrete set of actions*.

Payoffs

- ▷ $\Pi_b = \delta(\bar{v} - p) \leftrightarrow$ buyer values commodity by $\bar{v}$.
- ▷ $\Pi_s = \delta(p - q \cdot \bar{v}) \leftrightarrow$ seller values commodity by $q\bar{v}$

Bayesian Nash Equilibrium & Cursed Equilibria

Seller in round 2 ensures nonnegative profits

- ▷ every rational offer p implies a nonnegative profit for buyer b $E(v|p) = E(v|v \geq p)$
- ▷ $p = p | (\Pi_b \geq 0) \Rightarrow p = p | (v \geq p)$
- ▷ $E(\Pi_s) = p - qE(v|v \geq p) \geq 0$
- ▷ $\delta_{BNE} = \begin{cases} 1 : & p \geq qE(v|v \geq p) \\ 0 : & \text{else} \end{cases}$

Buyer in round 1 eliminates dominated strategies and ensures nonnegative profits

- ▷ $\min_p p \text{ s.t. } E(\Pi_s) \geq 0, \Pi_b = \bar{v} - p > 0$
- ▷ $p_{BNE} = \begin{cases} q \cdot E(v|v \geq p) : & p \leq \bar{v} \\ 0 : & \text{else} \end{cases}$

equilibrium prices for different $f(v)$

- ▷ uniform distribution $f(v) = u(0, 10)$: $p_{u(0,10)}^{BNE} = \frac{10q}{2-q}$.
- ▷ positive skewness $f(v) = s(0, 10, 0)$: $p_{s(0,10,0)}^{BNE} = \frac{-10 \cdot q}{-3+2q}$.
- ▷ negative skewness $f(v) = s(0, 10, 10)$: $p_{s(0,10,10)}^{BNE} = \frac{15-10q-5\sqrt{9+12q-12q^2}}{-3+2q}$.

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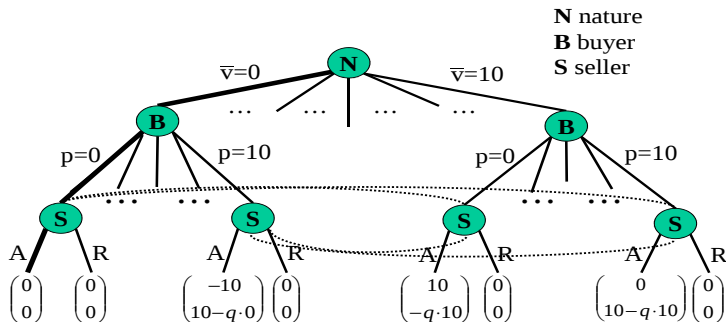
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Institutional Aspects of the Game



- seller disadvantaged relative to buyers in three procedural criteria:
- **information** (see sets of information)
- **freedom of choice** (see actions per potential paths of play)
- **freedom to punish**, (see unkind actions per potential path of play)

Hypotheses

*If preferences for procedural symmetry **exist** and are **violated**,*

- H1: disadvantaged party might require a compensatory premium
- H2: advantaged party might grant such a premium

Buyers b...

- ⌚ *increase offers*, i.e. deviate from equilibrium such that $p^{ppp} > p^{BNE}$.
- ⌚ $p \uparrow \rightarrow$ sellers encounter less nonprofitable offers $\rightarrow$ winner's curse $\downarrow$

Sellers s...

- ⌚ *lift acceptance thresholds* $p_{min: \delta=1}^{ppp} > p_{min: \delta=1}^{BNE}$
- ⌚ $p_{min: \delta=1} \uparrow \rightarrow$ winner's curse $\downarrow$

Experiment

Design

- ▷ *2x3x2 factorial Design, $q \in \{0.2, 0.6\}$,
 $f(v) \sim U(0, 10), f(v) \sim S(0, 10, 0), f(v) \sim S(0, 10, 10)$, order of q*
- ▷ *q varied within-subjects, $f(v)$ and order between-subjects*
- ▷ *lottery-based elicitation of risk preferences*
- ▷ *10 repetitions per q -Konstellation*
- ▷ *MJT to elicit moral preferences*

Instrumenting purely procedural preferences

Purely Procedural Preferences...

- ▷ correlate **positively** with postconventional moral preferences
- ▷ correlate **negatively** with conventional moral preferences
- ▷ **do not** correlate with preconventional moral preferences

Are there other paths by which the instrument can affect behavior?
buyers, $a2 \cdot a3$, $a3$.

- ▷ **Inequity aversion.** $a2 \cdot a3 : \pi_s = \pi_b \leftrightarrow p_{ia} = \frac{1}{2} \bar{v} \cdot (1 + q)$. For $p_{ia} < p^{BNE}$, and $\forall(a, b)$ s.t. $a > b$ there is no direct negative link to excess equilibrium offers. Per definition, there is no direct link between $a3$, and excess equilibrium offers.
- ▷ **Reciprocity.** $\forall v : a2 \cdot a3$ must **positively** link to any excess equilibrium offer. Per definition, there is no direct link between $a3$, and excess equilibrium offers.

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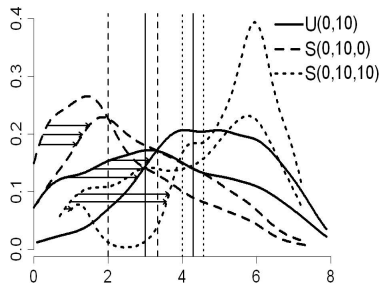
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- ▷ **Reciprocity.** see above.

No curse under information asymmetry.

price offers p und $p|\delta = 1$ $q = 0.6$



welfare measures and market efficiency in ECU.

$f(v)$	$\bar{\pi}_s$	$\delta = 0$	$\Pi_{s,b} > 0$	$\Pi_s < 0$
$v \sim U(0, 10)$	0.59 (-0.31)	0.44 (0.58)	0.49 (0.16)	0.07 (0.26)
$v \sim S(0, 10, 0)$	0.33	0.44	0.48	0.08
$v \sim S(0, 10, 10)$	0.64	0.45	0.46	0.09

buyer b

- ▷ group buyer deviations according to their strength
- ▷ ordinal logit model with individual random components
- ▷ class $l=0$ in every group $\leftrightarrow$ non-deviation, $l=1 \leftrightarrow$ deviation
- ▷ highly significant thresholds: $\tau_{01} = -1.74$, $\tau_{12} = 0.28$, $TQ=0.47$ (0.39,0.29,0.62)

x_d	$\hat{\beta}_d$	Std. Error	z-Value	p-Value
$a1 \cdot \bar{v}$	1.36	0.15	9.18	0.00
$a2 \cdot a3 \cdot \bar{v}$	-1.25	0.13	-9.77	0.00
$a3 \cdot \bar{v}$	1.71	0.23	7.51	0.00
N	-0.24	0.08	-2.93	0.01
Period	0.03	0.01	3.59	0.00

- ▷ deviations the more likely, the more likely instrument predicts procedural preferences
- ▷ buyers grant compensation for sellers' purely procedural disadvantage
- ▷ compensation depends upon pie size $\bar{v}$

sellers' winner's curse

seller deviations $\delta = 1 | (p < p^{BNE})$ '**curse**'

j	n	x_d	$\hat{\beta}_d$	σ	t	$ p > z$	$\hat{\psi}_{id}$	Count R^2
1	367	Intercept	-2.71	0.51	-5.33	0.00	5.98	0.71
		$a3 \cdot \text{Period}$	-0.82	0.33	-2.48	0.02	(-)	
		$a2 \cdot a3$	0.57	0.21	2.69	0.01	(-)	
		Ex	0.52	0.24	2.18	0.03	(-)	
2	333	Intercept	-0.96	0.29	-3.37	0.01	4.43	0.54
		$a3 \cdot \text{Period}, f(v)=S(0,10,0)$	-0.73	0.26	-2.78	0.01	(-)	
		$a3 \cdot \text{Period}, f(v)=S(0,10,10)$	-0.64	0.25	-2.59	0.01	(-)	
		$a2 \cdot a3$	0.30	0.23	1.29	0.20	(-)	
		Ex	0.59	0.26	2.25	0.03	(-)	
3	525	Intercept	-0.36	0.13	-2.86	0.01	0.77	0.53
		$a3 \cdot \text{Period}$	-0.30	0.12	-2.52	0.02	(-)	
		$a2 \cdot a3$	0.32	0.15	2.19	0.03	(-)	

- ▶ the stronger the purely procedural preferences as predicted by the instrument, the higher sellers' acceptance thresholds
- ▶ the stronger the purely procedural preference as predicted by the instrument, the smaller the winner's curse under information asymmetry

How do purely procedural preferences affect behavior?

Purely procedural preferences

- ▷ *are preferences purely over the rules of a game*
- ▷ *involve moral reasoning*
- ▷ *yield a design of symmetric rules which treat players equally.*

If individuals are subject to institutions which violate symmetry

- ▷ *...persistent deviations from standard results occur (→ no winner's curse)*
- ▷ *...which can be tied to the same moral arguments as purely procedural preferences*
- ▷ *...the asymmetry is compensated monetarily*

Implications...

- ▷ *design of institutions in line with individuals purely procedural preferences*
- ▷ *asymmetric official institutions might trigger spontaneous implicit institutions*
- ▷ *Game theory: aspects of the game itself affect players subjective payoffs.*

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