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Mental Representation of Sharing Experiments: Analyzing Choice and Belief Data

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Mental Representation of Sharing Experiments: Analyzing Choice and Belief Data

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Abstract

We confront allocator participants with different sharing games in a within subjects design: the Nash demand game, the ultimatum game, the yes-no-game and the impunity game. We allow participants to opt out rather than play the game under consideration. Beside choice data we also collect belief data to learn more about the mental representations of sharing games.

1 Introduction

Decision makers have to rely on complexity reduction when facing a situation with many structural aspects and feedback loops. But do mental representations also differ from what is experimentally induced even when the decision environment is rather simple?

In our paper, we focus on sharing games that even boundedly rational decision makers can fully comprehend. Specifically, we analyze four sharing games with two participants, one participant proposing how to allocate a monetary amount and the other reacting with varying veto power across games. The four games are the Nash (1950) demand game, the ultimatum game, the yes-no-game, and the impunity game. Before the game, both players independently decide whether or not to play the game under consideration. When at least one player opts out, both players receive their outside option. If neither opts out, they play the respective sharing game.

In spite of their strategic differences, participants may perceive the different games as being similar (Pull, 1999, 2003, Selten, 2000). When mentally representing the games only by

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their characteristic functions, participants, for example, might neglect the difference between an ultimatum game and the Nash demand game (see, e.g. Fischer et al., 2006, and Fischer, Güth and Pull, 2007).

We try to infer mental representation from choice and expectation data of allocator participants whose only strategic concern is how an active or passive recipient will react to their decision. In our view, choice data alone do not sufficiently reveal whether and when veto power is mentally neglected. To assess mental modeling, one cannot submit to a "revealed mental model approach" trying to infer idiosyncratic mental representations from choice data. We do not claim superiority of our data elicitation methodology but hope to shed light on how we cognitively generate choices by engaging in forward looking deliberation.

2 The game types

All four different games types involve two players, X and Y, who independently decide whether or not to play the game under consideration . When at least one player, X or Y, opts out, players receive their outside c_x respectively c_y.

All sharing games start with the participant X's choice of $x \in (0, p)$ which is what participant X demands for herself.

In the demand game DG, participant Y also chooses a demand $y \in (0, p)$, not knowing X's choice of x, yielding the payoffs

$$(u_x(x,y), u_y(x,y)) = \begin{cases} (0,0) & \textit{in case of } \text{x+y>p} \\ (x,y) & \textit{otherwise.} \end{cases}$$

In the ultimatum game UG, participant Y chooses an acceptance threshold $y \in (0, p)$ meaning that all offers $y(x) = p - x \geq y$ are accepted. The payoff consequences are

$$(u_x(x,y), u_y(x,y)) = \begin{cases} (0,0) & \textit{in case of } \text{x+y>p} \\ (x,p-x) & \textit{otherwise} \end{cases}$$

In the Yes-No game YN, participant Y chooses $\delta \in \{0, 1\}$ implying

$$(u_x(x,\delta), u_y(x,\delta)) = \delta(x, p - x)$$

Finally, in the impunity game IG, participant Y, knowing the offer $y(x) = p - x$, chooses $\delta \in \{0, 1\}$ implying the payoffs

$$(u_x(x,\delta), u_y(x,\delta)) = (x, \delta(p - x))$$

Assuming common(ly known) opportunism in the sense of own payoff maximization yields the following benchmark solutions:

(DG) All equilibria (x^*, y^*) with $x^* + y^* = p$ & $x^*, y^* > 0$ are all strict. The benchmark solution is the egalitarian equilibrium $x^* = p/2 = y^*$, i.e. the Nash (1950) bargaining solution.

(UG) The solution by once repeated elimination of weakly dominated strategies and also the unique subgame perfect equilibrium is $x^* = p - \epsilon$ and $\delta^*(\cdot) \equiv 1$ with ϵ (>0) as the smallest positive choice.

(YN) The only equilibrium and thus benchmark solution is $x^* = p - \epsilon$ and $\delta^* = 1$ which can also be derived by once repeated elimination of dominated strategies.

(IG) The only equilibrium and benchmark solution is $x^* = p - \epsilon$ and $\delta^*(\cdot) \equiv 1$, i.e. no offer $p - x$ is rejected.

3 Experimental protocol

In addition to letting participants decide for all four games we confront them with several parameter constellations, namely:

$$(p, c_x, c_y) = A = (30, 10, 5), B = (30, 5, 10), C = (25, 5, 5), D = (20, 5, 0), E = (20, 0, 5)$$

with $c_x, c_y \in \{0, 5, 10\}$ and $p \in \{20, 25, 30\}$ but maintaining the surplus $p - c_x - c_y = 15$. Thus we can explore how behavior reacts to (p, c_x, c_y) within one game type and across game types. Subjects are subsequently and randomly confronted with each parameter constellation and play each randomly ordered game type in that current parameter constellation.

Altogether the action data X_i of each X-participant i is of the following format:

$$X_i = \left((I_i, x_i(p, c_x, c_y/j)) : \begin{array}{c} \textit{all } (p, c_x, c_y) \textit{ and} \\ j = DG, UG, YN, IG \end{array} \right).$$

Without incentivizing, we also ask X-participants for all game types to state

- the choice $\widehat{x}_i$ they think that Y expects from them (second-order action beliefs)
- the choice x_i^+ recommended before role (X or Y) assignment
- the most frequent choice $x_i^\oslash$ of all X-participants.

4 Results

The first column of Table 1 depicts the percentage of participants in UG, YN and IG respectively with the same demand x as in DG, the same expectation $\widehat{x}$ on what Y-participants expect them to demand as in DG, the same recommended demand x_i^+ before role assignment as in DG and the same expected most frequent choice $x_i^\oslash$ as in DG. The next columns give the shares of participants with lower, respectively higher, levels than in DG. More than 70 percent of X-participants make the same choices and/or state the same expectations in UG as in DG. For YN and IG, the corresponding share range from a little more than 20 percent ($x_i^\oslash$ in IG) to more than 50 percent of X-participants (x_i^+ in YN). That is, for a non-negligible share of X-participants, DG seems to serve also as mental model for UG and – although less so – also for YN and IG.

To further explore whether DG serves as the mental representation of other sharing games, we regressed the values of x, $\widehat{x}$, x_i^+ and $x_i^\oslash$ on the type of sharing game with DG representing the reference category. We controlled for varying outside option payoffs and their interactions with the different sharing games (see Table 2). Regressions (1) and (2) refer to x, regressions (3) and (4) to $\widehat{x}$, regressions (5) and (6) to x_i^+ and regressions (7) and (8) to $x_i^\oslash$. To compare demands across varying pie sizes, we use relative demands as dependent variable (e.g., for the choice data we use $d_x = \frac{x}{p}$).

With respect to the choice data (d_x), we find Y-participants' outside options c_y to reduce relative demands. This effect disappears once we include interaction terms between game type and outside option payoffs. The same is true for the effect of game type UG vs. DG: once we include interaction terms between game type and outside option payoffs, relative demands in UG are no longer different from those in DG. To the contrary, relative demands in YN and IG are different from those in DG, and the reactions to c_y in YN and IG also differ from the one in DG.

Concerning belief data ($d_{\widehat{x}}$, $d_{x_i^+}$ and $d_{x_i^\oslash}$) there are similarities as well as differences compared to choice data. The similarity is that beliefs in YN and IG are different from those in DG (and remain to be different even when including interaction terms with outside option payoffs), and beliefs in UG do not differ from those in DG – at least not when interaction terms are included. In contrast to choice data, none of the interaction terms is significant: X-participants do not react differently to outside option payoffs in the different games.

Game theoretically, there are substantial differences between the four game types which should be reflected in the choices as well as by the various beliefs elicited from X-participants. As shown above, however, many X-participants either do not perceive the differences in Y's veto power across game types or, if they do, prefer to neglect them.

5 Conclusions

We compare four sharing games, the Nash demand game, the ultimatum game, the yes-no-game, and the impunity game, and allow participants to opt out rather than play the game under consideration. We test whether participants use the demand game as their mental model also when playing the other game types.

We find average relative demands (choice data and beliefs) by allocators to be significantly lower in the demand game than in the yes-no-game and the impunity game. Furthermore, allocators in the yes-no-game and the impunity game react differently to the recipient's outside option payoff than in the demand game. Second order action beliefs, recommended choices and expectations of most frequent choices in the yes-no- and the impunity game are, not differently affected by the recipient's outside option payoff than in the demand game. For the ultimatum game the demand game seems to serve as the mental model for many allocators: neither do allocators' relative demands vary between demand game and ultimatum game, nor do outside option payoffs of allocators or recipients differently affect the relative demands in the two games. This is true for the choice as well as for the belief data.

Findings as ours suggest that subtle strategic aspects will often be neglected. There is, of course, also the opposite phenomenon: behavior and behavioral expectations often react to differences which, from a rational choice perspective, are completely irrelevant (see, e.g. Kahneman and Tversky, 1981). Taken together this suggests that the – still dominating – rational choice approach has to be supplemented by behavioral theory paying more than lip-service to the psychology of human decision making.

		Same as in DG	Less than in DG	More in DG
x	UG	73.1	18.2	8.7
	YN	34.2	63.9	1.9
	IG	22.1	76.4	1.4
$\widehat{x}$	UG	70.3	21.5	8.2
	YN	31.1	63.9	5.0
	IG	22.6	74.2	3.2
x^{+}	UG	77.4	11.9	10.6
	YN	52.9	41.6	5.5
	IG	49.4	47.4	3.2
$x^{\oslash}$	UG	74.7	18.1	7.3
	YN	31.1	63.9	5.0
	IG	20.3	77.3	2.4

Table 1: Percentage of demands of X-participants across games

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UG	0.021**	0.028	0.033***	0.044	0.005	0.006	0.025**	0.041
	(0.007)	(0.020)	(0.008)	(0.029)	(0.008)	(0.027)	(0.008)	(0.028)
YN	0.206***	0.259***	0.205***	0.205***	0.111***	0.131***	0.216***	0.239***
	(0.008)	(0.027)	(0.008)	(0.029)	(0.008)	(0.027)	(0.008)	(0.028)
IG	0.267***	0.321***	0.271***	0.282***	0.150***	0.146***	0.295***	0.294***
	(0.008)	(0.028)	(0.008)	(0.029)	(0.008)	(0.027)	(0.008)	(0.028)
c_x	-0.027	-0.023	-0.029	-0.026	-0.071*	-0.047	-0.033	-0.015
	(0.030)	(0.053)	(0.030)	(0.060)	(0.028)	(0.056)	(0.030)	(0.059)
c_y	-0.192***	-0.048	-0.061*	-0.035	-0.063*	-0.064	-0.058*	-0.026
	(0.030)	(0.001)	(0.001)	(0.060)	(0.028)	(0.056)	(0.001)	(0.059)
UG*c_x		-0.225		-0.029		-0.019		-0.044
		(0.075)		(0.084)		(0.078)		(0.083)
YN*c_x		0.051		0.070		-0.059		-0.028
		(0.083)		(0.084)		(0.078)		(0.083)
IG*c_x		-0.036		-0.053		-0.017		-0.000
		(0.087)		(0.084)		(0.078)		(0.083)
UG*c_y		-0.012		-0.028		0.013		-0.038
		(0.075)		(0.084)		(0.078)		(0.083)
YN*c_y		-0.371***		-0.072		-0.045		-0.095
		(0.080)		(0.084)		(0.078)		(0.083)
IG*c_y		-0.291***		-0.003		0.038		-0.004
		(0.085)		(0.084)		(0.078)		(0.083)
Period	0.000	0.000	0.000	0.000	0.001*	0.001*	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
const	0.517***	0.491***	0.507***	0.501***	0.481***	0.477***	0.499***	0.489***
	(0.015)	(0.025)	(0.016)	(0.023)	(0.016)	(0.022)	(0.016)	(0.023)
Variable	x	x	$\widehat{x}$	$\widehat{x}$	x^+	x^+	$x^\oslash$	$x^\oslash$
N	1850	1850	2480	2480	2480	2480	2480	2480
logLik	1150	1164	1120	1112	1292	1282	1158	1149

Table 2: The impact of game type and outside option payoffs on X- participants' relative decisions and expectations. Random effects GLS model with independent random effects for each participant. Standard deviation in parentheses. Significance levels: 0.001 '***' 0.01 '**' 0.05 '*'.

References

[1] Judith Avrahami, Werner Güth, Ralph Hertwig, Yaakov Kareev, and Hironori Otsubo. Learning (not) to yield: An experimental study of evolving ultimatum game behavior. Jena Economic Research Papers 2010-092, December 2010.

[2] Sven Fischer, Werner Güth, Wieland Müller, and Andreas Stiehler. From ultimatum to nash bargaining: Theory and experimental evidence. *Experimental Economics*, 9(1):17–33, April 2006.

[3] Sven Fischer, Werner Güth, and Kerstin Pull. Is there as-if bargaining? *The Journal of Socio-Economics*, 36(4):546–560, August 2007.

[4] Werner Güth. Satisficing players. March 2011.

[5] Werner Güth, Steffen Huck, and Amnon Rapoport. The limitations of the positional order effect: Can it support silent threats and non-equilibrium behavior? *Journal of Economic Behavior & Organization*, 34(2):313–325, February 1998.

[6] Werner Güth, M. Vittoria Levati, and Matteo Ploner. Making the world a better place: Experimental evidence from the generosity game. Jena Economic Research Papers 2009-071, September 2009.

[7] Elon Kohlberg and Jean-Francois Mertens. On the strategic stability of equilibria. *Econometrica*, 54(5):1003–37, September 1986.

[8] John Nash. The bargaining problem. *Econometrica*, 18(2):155–162, April 1950.

[9] John Nash. Two-person cooperative games. *Econometrica*, 21(1):128–140, April 1953.

[10] Kerstin Pull. What is a fair wage?- a model of as-if-cooperation. Trier:Quint-Essenzen 58, 1999.

[11] Kerstin Pull. Ultimatum games and wages: Evidence of an "implicit bargain"? *Schmalenbach Business Review (sbr)*, 55(2):161–171, April 2003.

[12] Reinhard Selten. Thünen-vorlesung: Eingeschränkte rationalität und ökonomische motivation. *Zeitschrift für Wirtschafts- und Sozialwissenschaften*, 9:129–157, 2000.

[13] Amos Tversky and Daniel Kahnemann. The framing of decision and rational choice. *Science*, 211:453–458, 1981.

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