Individuals' Social Preferences in Joint-Activity Choice: The Role of Fairness and Asymmetric Evaluation of Costs and Rewards

Theo Arentze

Urban Planning Group
Eindhoven University of Technology,
The Netherlands

TU/e Technische Universiteit Eindhoven University of Technology

Group decision making - literature

- **Numerous studies on joint activity choice**
  - **within household**
  - **group utility function**

- **Stated choice experiments**
  - **negotiation – dominance relationships between parties (Hensher et al. 2007)**
  - **preferences conditional on preferences of others (Delleart et al. 1998, Molin et al. 1999)**

- **Negotiation protocols**
  - **concepts and formal models – no empirical studies (Ma et al. 2011, 2012)**

Social psyhological studies on bargaining and negotation

Two-players ultimatum game

One player proposes a distribution of a fixed amount of money

The other player has the option to either accept or reject the offer

If the person accepts he receives the amount offered; if he rejects the persons receive nothing

What would be the outcome under the assumption of rationality?

What do people do in these games?

Findings

- human bias - fairness plays an important role
- Loewenstein et al. (1989) found asymmetry in social utility function
  - fairness more important when costs a.o.t rewards are distributed

- What about human bias in joint activity choice?

Assumptions and hypotheses

- **Assumptions joint decision making process**
  - **no group utility function**
  - **no central controller**
  - **personal preferences are shared among the group**
  - **persons do proposals and respond to proposals of others**

- **Hypotheses**
  - **fairness plays a significant role**
  - **heterogeneity in social styles – way of trading-off preference differences**
  - **asymmetry between costs (travel time) and rewards (positive preferences)**

Experiment – joint activity choice (1)

Assume you are planning a joint activity with two friends

The preferences in the group are as follows

	Activity A	Activity B	Activity C
Yourself	9	5	7
Friend 1	5	9	7
Friend 2	5	7	9

Which proposal would you do?

- Activity A
- Activity B
- Activity C

Maximizes own outcome

Maximizes group outcome

Experiment – joint activity choice (2)

Another example

The preferences in the group are as follows

	Activity A	Activity B	Activity C
Yourself	5	9	7
Friend 1	9	5	7
Friend 2	5	9	7

Which proposal would you do?

- Activity A
- Activity B
- Activity C

Maximizes group and own outcome

Equal distribution

Experiment – joint activity choice – variant (1)

This time the travel times differ

The travel times in the group are as follows (minutes)

	Location A	Location B	Location C
Yourself	5	15	25
Friend 1	5	25	15
Friend 2	25	15	5

Which proposal would you do?

- Location A
- Location B
- Location C

Does this condition make a difference?

Experiment – joint activity choice – variant (2)

This time one of the friends does a proposal

The preferences in the group are as follows

	Activity A	Activity B	Activity C
Yourself	9	5	7
Friend 1	5	9	7
Friend 2	5	7	9

Friend 1 proposes to do: **Activity B**

What would you do?

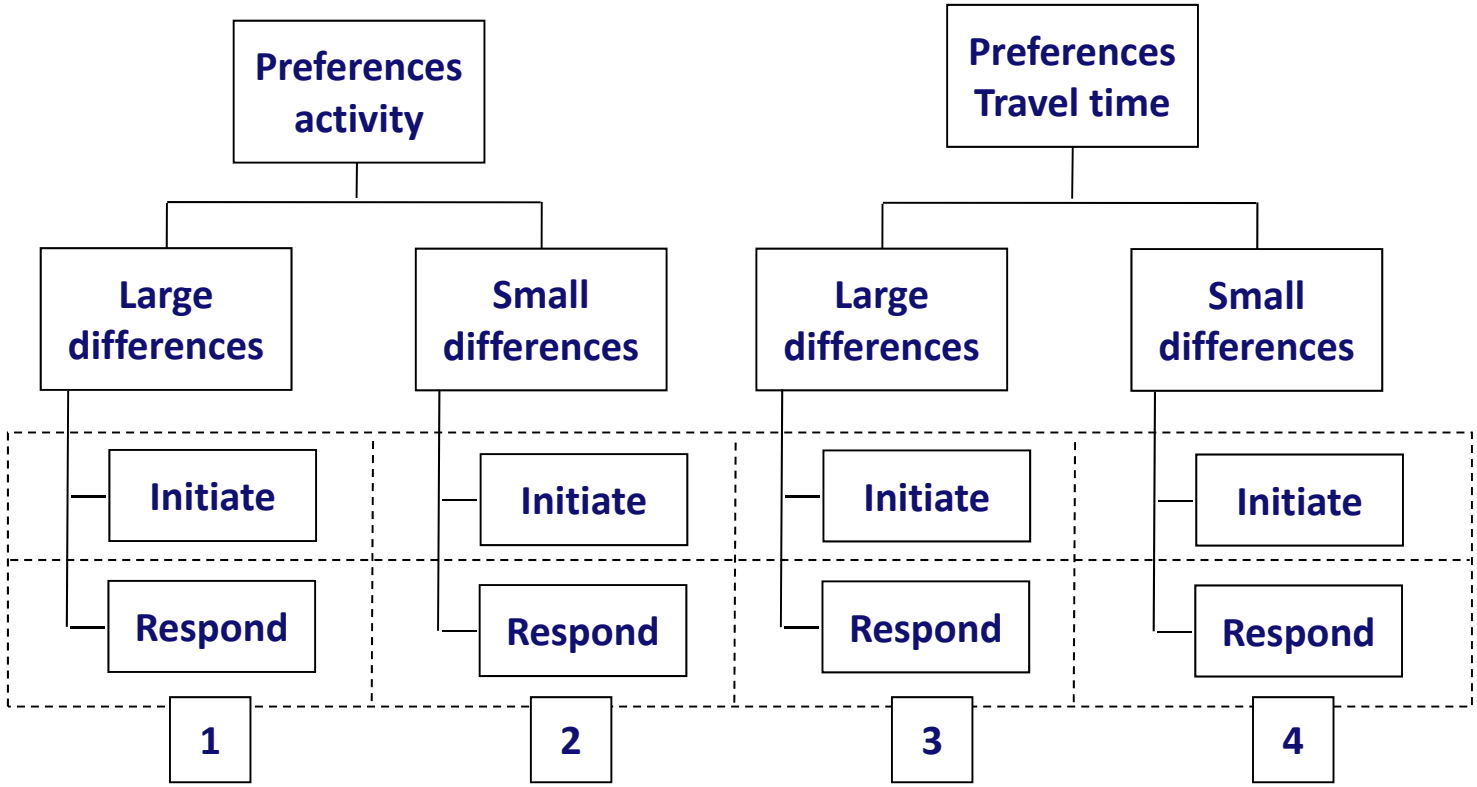
- Accept the proposal

Do another proposal, namely

- Activity A
- Activity C

Does this condition make a difference?

Choice tasks overview



Social utility function

$$U_{ik} = \underbrace{\beta_{0k} \cdot I_i}_{\text{proposed}} + \underbrace{\beta_{1k} \cdot Z_{ik}}_{\text{self}} + \underbrace{\beta_{2k} \cdot \Sigma_{m \neq k} Z_{im}}_{\text{others}} + \underbrace{\beta_{3k} \cdot D(Z_{i\bullet})}_{\text{inequity}}$$

U_{ik} is the social utility person k assigns to option i

Z_{ik} is the preference value person k assigns to option i

m is an index for the others in the group

$Z_{i\bullet}$ is a person-vector of preference values for option i

D is some measure of dispersion (inequality)

I_i is a binary variable indicating whether option i is proposed by a friend

β_{0k} is relative weight person k assigns to proposal status

$\beta_{1k} - \beta_{3k}$ are relative weights person k assigns to particular outcomes

Theory

- **Under rationality assumption**
  - **persons either maximize an own (selfishness), others' (altruism) or group (neutral) outcome**
  - **equality in outcomes (fairness) does not play a role**
  - **proposal status does not play a role**
  - **costs / rewards difference does not play a role**

- **Hypotheses**
  - **fairness plays a significant role**
  - **proposal status plays a role (people are cooperative)**
  - **there is an asymmetry between costs and rewards**

Experiment

- 315 persons participated
- Representative sample
- Each person received
  - 8 tasks – 4 x initiating and 4 x responding
- Scenarios
  - Activity versus travel time
  - High versus low consequences
- Outcome tables were varied by an efficient design

Results – basic MNL model

Activity

Parameter	Value (β)	t-value (β)
Self-interest (β_1)	0.532	14.0
Other ones interest (β_2)	0.319	11.1
Inequity (β_3)	-1.16	-11.9
Proposal status (β_0)	0.928	9.21
Scale - small consequences	1.33	2.15
Scale - large consequences	1	

inequity / self = 2.18

Fairness plays a significant role

Proposal status plays a significant role

Travel time

Parameter	Value (β)	t-value (β)
Self-interest (β_1)	-0.063	-9.55
Other ones interest (β_2)	-0.027	-7.01
Inequity (β_3)	-0.215	-10.5
Proposal status (β_0)	1.58	13.0
Scale - small consequences	1	
Scale - large consequences	0.608	-4.72

inequity / self = 3.40

Fairness has a bigger influence

Proposal status has a bigger influence

Parameter scale correction

Results – discrete mixture model

Activity

Parameter	Mass point	Value (β)	t-value (β)	Probability (π)	t-value (π)	
Self-interest (β_1)	1	1.10	11.3	0.687	10.8	69 %
	2	0.062	0.74	0.313	4.94	
Other ones interest (β_2)	1	0.718	8.74	0.777	13.8	78 %
	2	-0.085	-1.27	0.223	3.95	
Inequity (β_3)	1	0.250	0.85	0.288	4.62	71 %
	2	-2.50	-9.03	0.712	11.4	
Proposal status (β_0)	1	1.17	7.92	0.930	25.7	26 %
	2	5.80	3.73	0.070	1.94	

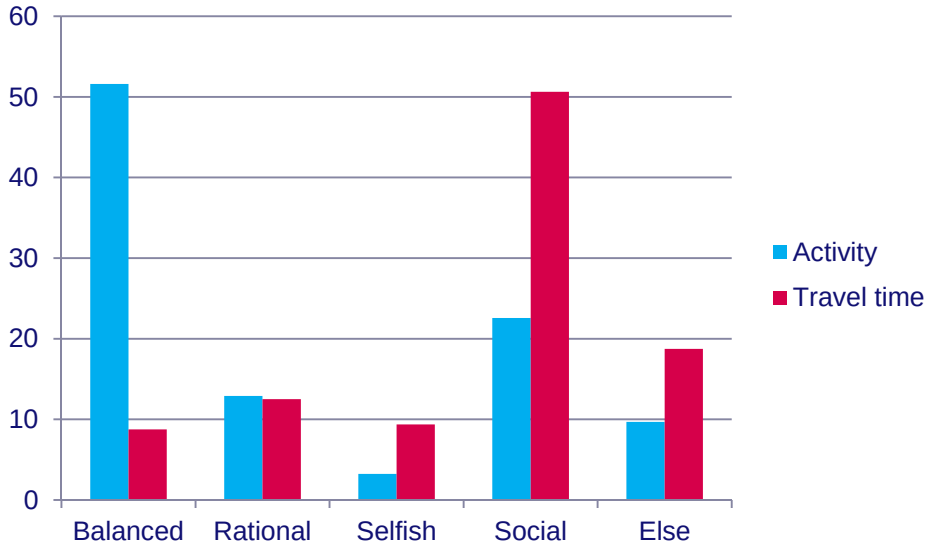
Travel time

Parameter	Mass point	Value (β)	t-value (β)	Probability (π)	t-value (π)	
Self-interest (β_1)	1	-0.020	-1.64	0.525	7.11	48 %
	2	-0.190	-8.39	0.475	6.43	
Other ones interest (β_2)	1	-0.121	-5.26	0.364	3.46	36 %
	2	-0.019	-2.11	0.636	6.04	
Inequity (β_3)	1	-0.601	-9.02	0.550	6.74	55 %
	2	-0.079	-1.80	0.450	5.51	
Proposal status (β_0)	1	8.19	5.95	0.261	5.08	26 %
	2	1.39	6.98	0.739	14.42	

There is considerable heterogeneity

Styles

- **Balanced style:** self & others & equity
- **Rational style:** self & others
- **Selfish style:** self
- **Social style:** equity, equity & self / others
- **Else:** others; none



Strong asymmetry

Activity
Balanced style dominates

Travel time
Social style dominates

Style memberships: estimation results MNL model

Style	Parameter	Activity		Travel time	
		Value	t-value	Value	t-value
Balanced	Constant	1.67	5.95	-0.762	-2.35
Rational	Constant	0.074	0.19	-0.819	-1.99
	age < 35 years	0.230		-1.37	
	age 35 -< 55 years	-1.28	-2.49	0.309	0.69
	age 55+ years	1.05	2.94	1.06	2.49
Selfish	Constant	-1.10	-2.13	-0.693	-2.19
Social	Constant	0.847	2.75	1.02	4.69
	Male			-0.541	
	Female			0.541	3.29
Else	Constant	0		0	
Adjusted rho-square		0.207		0.169	

Older age group more often rational style

Females more often social style in case of travel times

Conclusions

- Considerable heterogeneity in styles
- Bounded rationality
  - Fairness is important
  - Process is important (proposal status)
  - Asymmetry costs and rewards
- Implications
  - People favor compromise solutions for joint activities / travel
  - E.g., they are willing to travel further when this leads to more equal distribution of travel times
- The new model of joint activity choice takes process and human bias into account

Thank you for your attention

Questions