Rationalizing cooperation: Preferences, beliefs, and mechanisms

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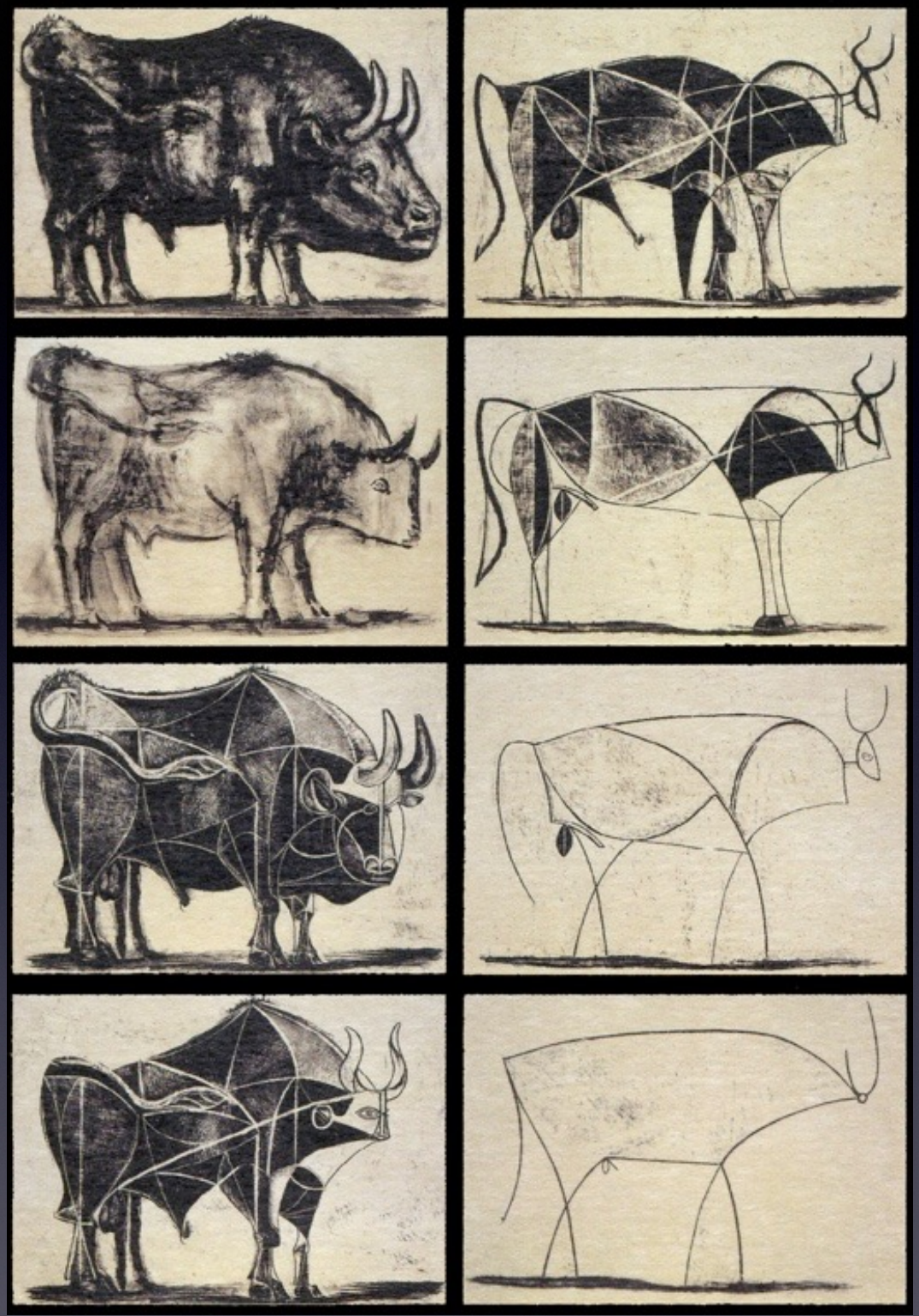
ETH zürich

Rationality and behavior

Decision theory explores rationality, bringing together insights from mathematics, statistics, cognitive science, economics, psychology, sociology, management, finance,…

Normative: Perfect rationality, optimal

Descriptive: How real people think and make decisions



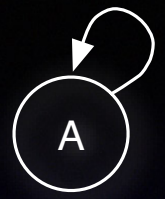
Model building

Often we take a decision problem from the messy real world and distill it into something as simple as possible, in such a way that it still retains the central essence of the original problem.

We strive to develop decision models that are tractable but non-trivial, and amenable to experimentation.

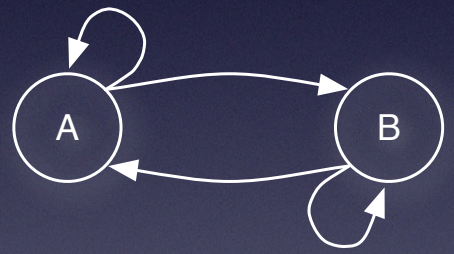
Research activities

- Risky decision making- Decision theory



- Social decision making- Social preferences

- Strategic decision making- Behavioral game theory and experimental economics



Focus today

- Risky decision making- Decision theory

- Social decision making- Social preferences
- Strategic decision making- Behavioral game theory and experimental economics

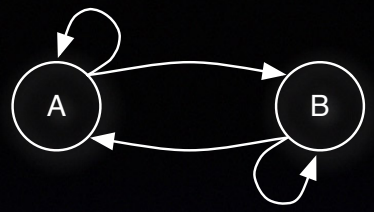
Why do people choose to cooperate?

Structure and outline

- Preferences (measurement) Part 1
- Beliefs (prediction) Part 2
- Mechanisms (control) Part 3

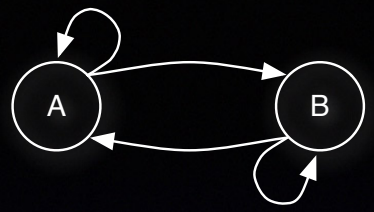
Next parts...

A simple strategic decision



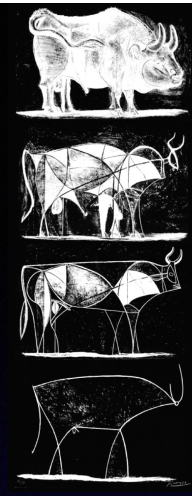
		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3, 3	1, 4
	Defect	4, 1	2, 2

A simple strategic decision



		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3, 3	1, 4
	Defect	4, 1	2, 2

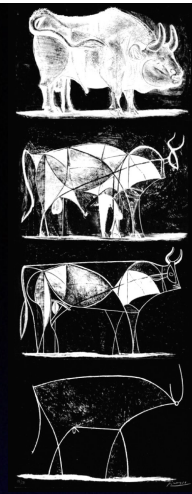
Social dilemma (or a commons dilemma, or a collective action problem)
Failure of the invisible hand (*cf.* Adam Smith)



		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3, 3	1, 4
	Defect	4, 1	2, 2

The most exciting phrase to hear in science, the one that heralds new discoveries, is not "Eureka" but "That's funny..."
- Isaac Asimov

Social dilemma (or a commons dilemma, or a collective action problem)
Failure of the invisible hand (*cf.* Adam Smith)



		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3, 3	1, 4
	Defect	4, 1	2, 2

This is a general model for resource dilemmas.

That is, any situation that pits collective interests against private interests.

Individual ``rationality'' leads to collective malaise.

e.g., Taxes, work groups, investing in a new technology, how much water to use.

Postulates of rationality

- A decision maker (DM) is narrowly self-interested. His goal is to maximize personal payoffs, indifferent to other players' payoffs.

Preferences

- A decision maker believes other decision makers are also narrowly self-interested.
- These qualities are common knowledge. Everyone believes that everyone believes that...

Beliefs &

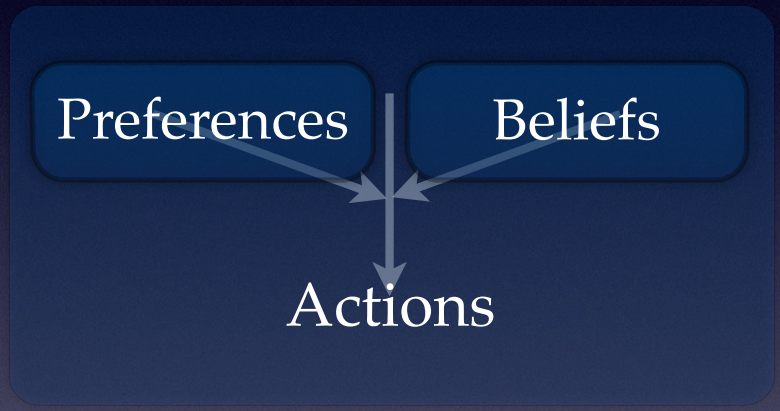
Postulates of rationality

- A decision maker is narrowly self-interested. His goal is to maximize personal payoffs, indifferent to other players' payoffs.

Preferences

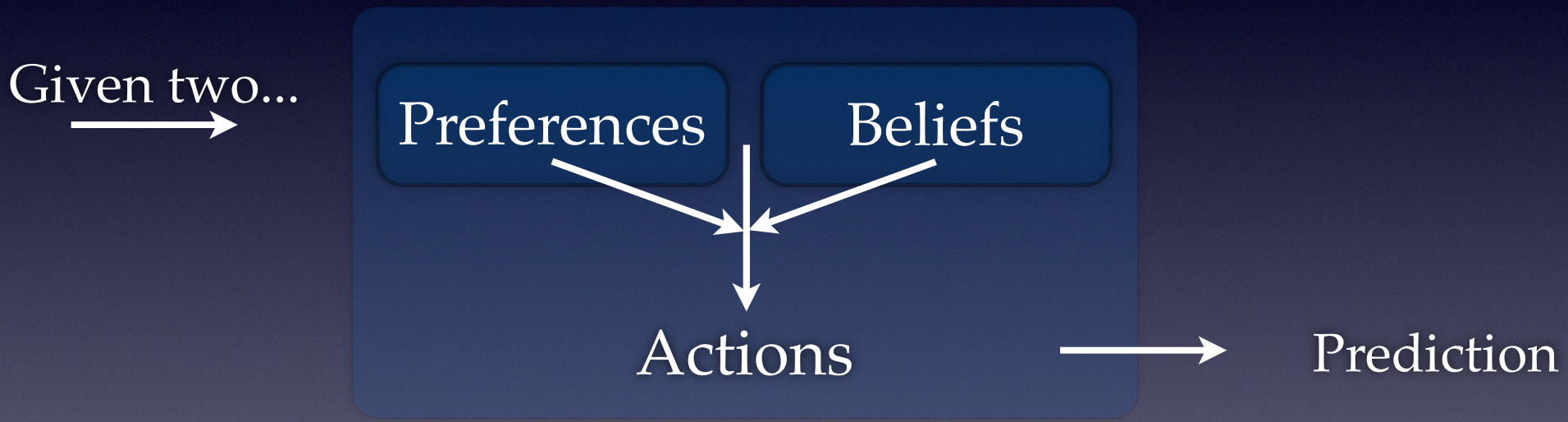
- A decision maker believes other decision makers are also narrowly self-interested.
- These qualities are common knowledge. Everyone believes that everyone believes that... ∞

Beliefs



Rationality

Consistency



Engine of rationality

Postulate of rationality

Selfish

A decision maker is narrowly self-interested. The goal of the DM is to maximize personal payoffs, indifferent to other players' payoffs.

Preferences

Selfishness axiom, Homo economicus

Postulate of rationality

A decision maker is narrowly self-interested. The goal of the DM is to maximize personal payoffs, indifferent to other players' payoffs.

Selfishness axiom, Homo economicus

This is the foundation of a model that is:
Exact, powerful, and often very wrong

Postulate of rationality

A decision maker is narrowly self-interested. The goal of the DM is to maximize personal payoffs, indifferent to other players' payoffs.

Selfishness axiom, Homo economicus

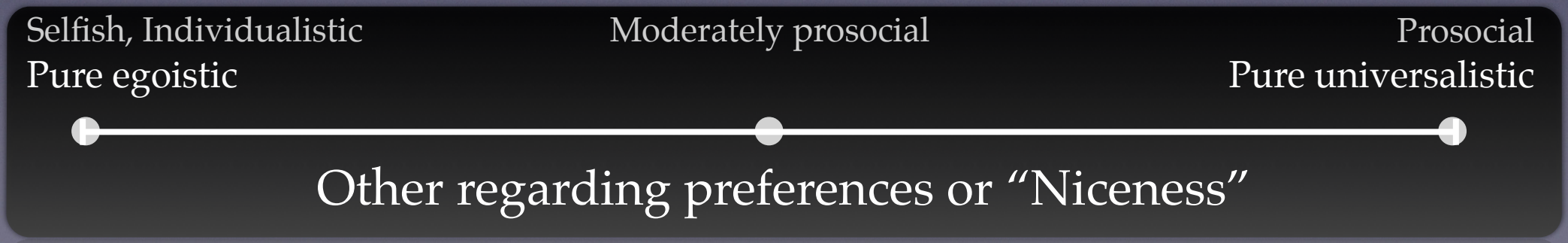
> Essentially, all models are wrong, but some are useful.
>
> G. Box (1987)

For between the two extremes Pure Egoistic and Pure Universalistic there may be an indefinite number of impure methods; wherein the happiness of others as compared by the agent (in a calm moment) with his own, neither counts for nothing, nor yet counts for one, but counts for a fraction.

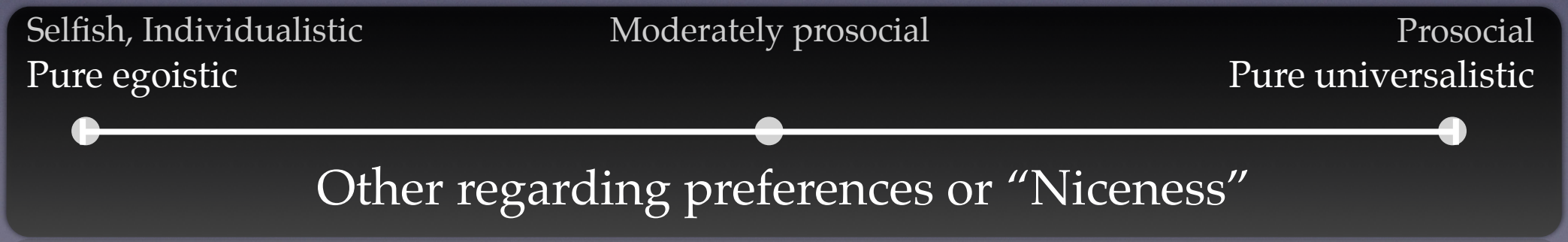
F. Edgeworth (1881)

For between the two extremes Pure Egoistic and Pure Universalistic there may be an indefinite number of impure methods; wherein the happiness of others as compared by the agent (in a calm moment) with his own, neither counts for nothing, nor yet counts for one, but counts for a fraction.

F. Edgeworth (1881)

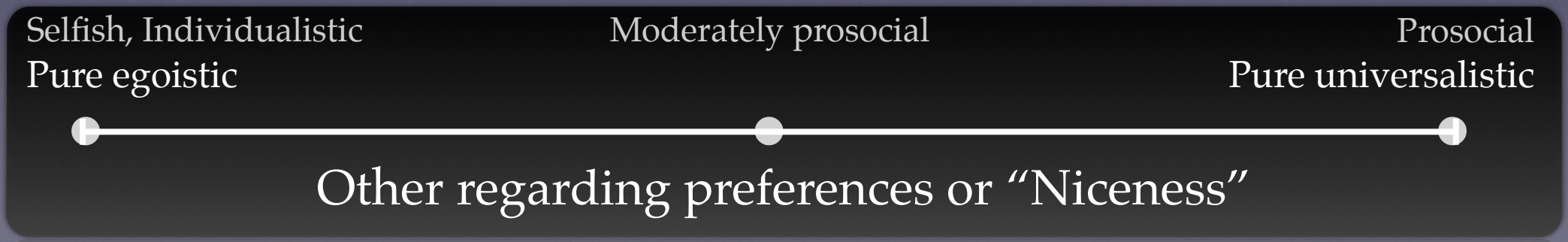


So how can we measure this construct?



Maybe just ask:

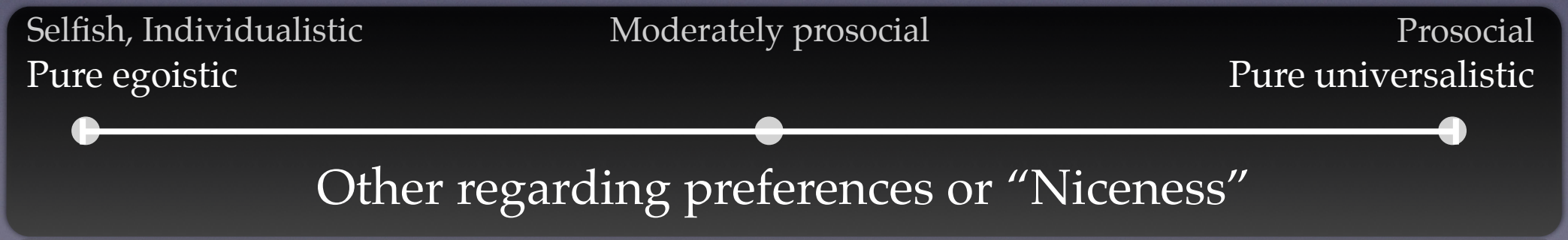
How nice are you?



Maybe just ask:

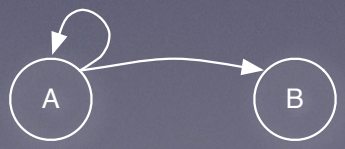
How nice are you?

1. Not nice at all-- actually truth be told, quite selfish
2. Sometimes nice, but rather limited in scope
3. Generally nice
4. Super nice
5. Amazingly nice-- equal mix of saint and monk



Revealed preferences via a resource allocation choice task

Option 1	Option 2
85 to you 85 to an anonymous random other person	100 to you 50 to an anonymous random other person



Not a game- Only one decision maker, but that decision has an effect on both parties.

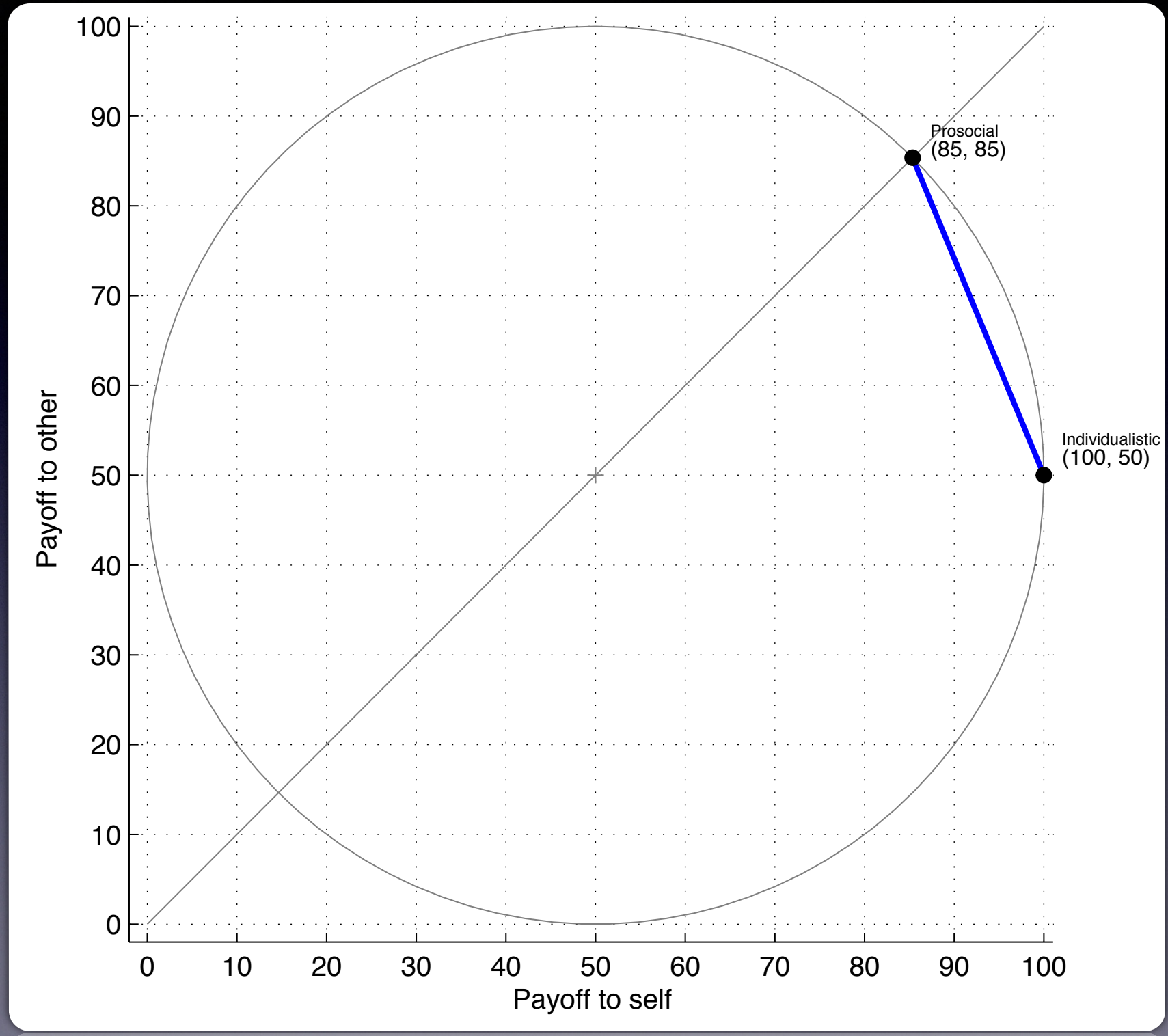
Option 1	Option 2
85 to you	100 to you
85 to an anonymous random other person	50 to an anonymous random other person

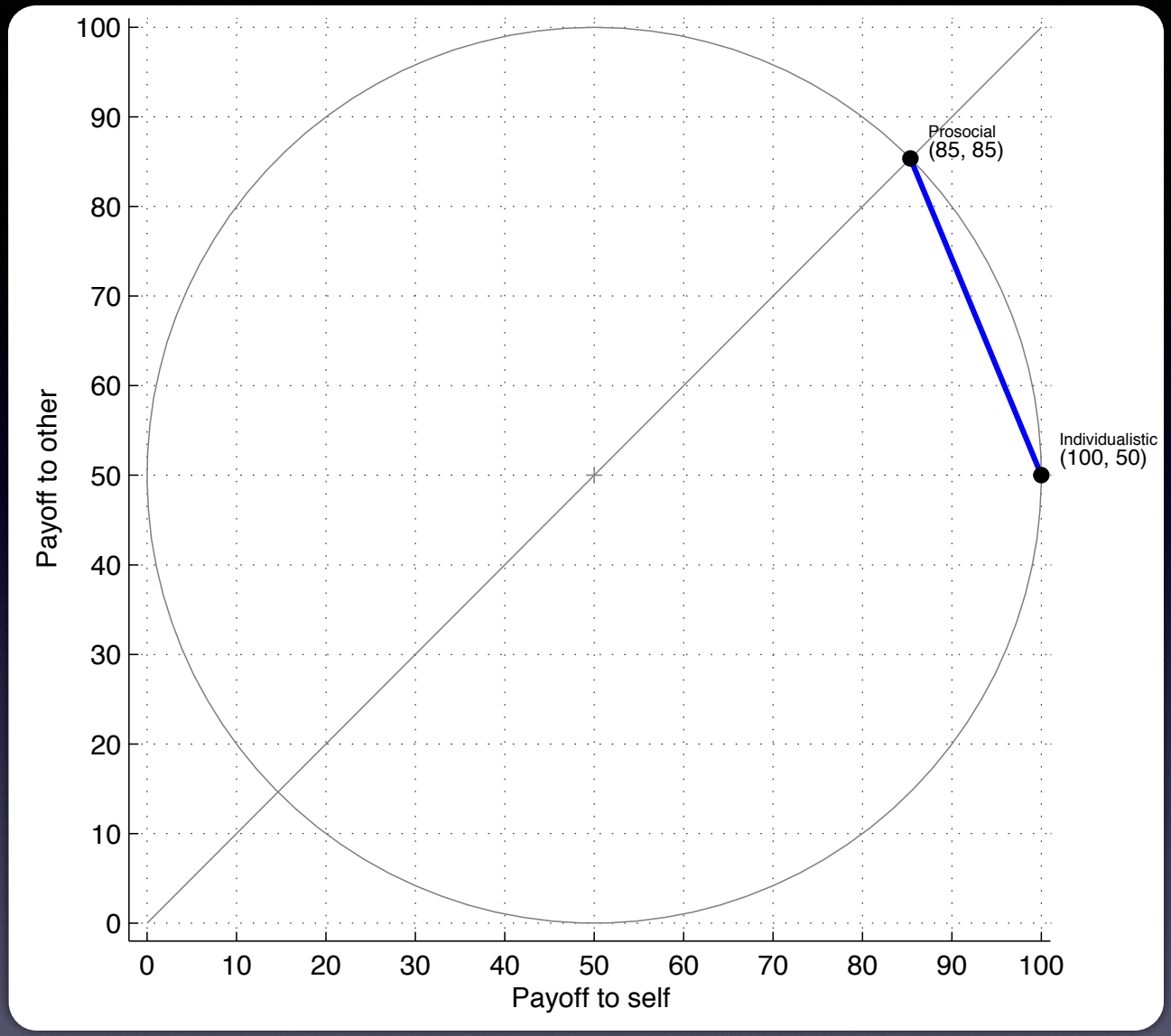
Nothing to see here

Option 1	Option 2
85 to you 85 to an anonymous random other person	100 to you 50 to an anonymous random other person
Prosocial option	Individualistic option

Option 1	Option 2
85 to you 85 to an anonymous random other person	100 to you 50 to an anonymous random other person
Prosocial option	Individualistic option

Chosen about 50%-60% of the time
One shot
Purely anonymous
Incentive compatible

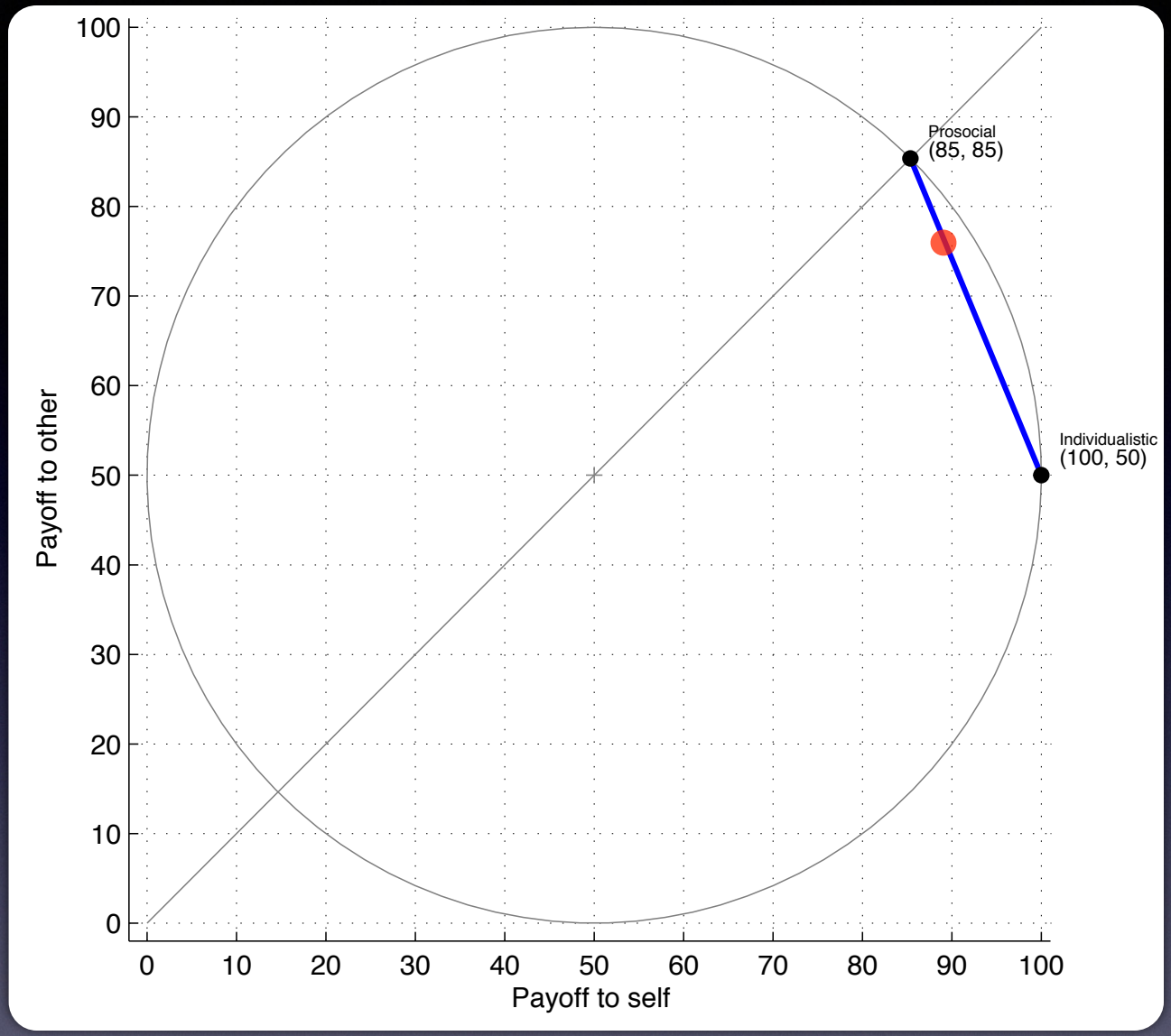

Prosocial
(85, 85)
Individualistic
(100, 50)
Payoff to other
Payoff to self
0
10
20
30
40
50
60
70
80
90
100

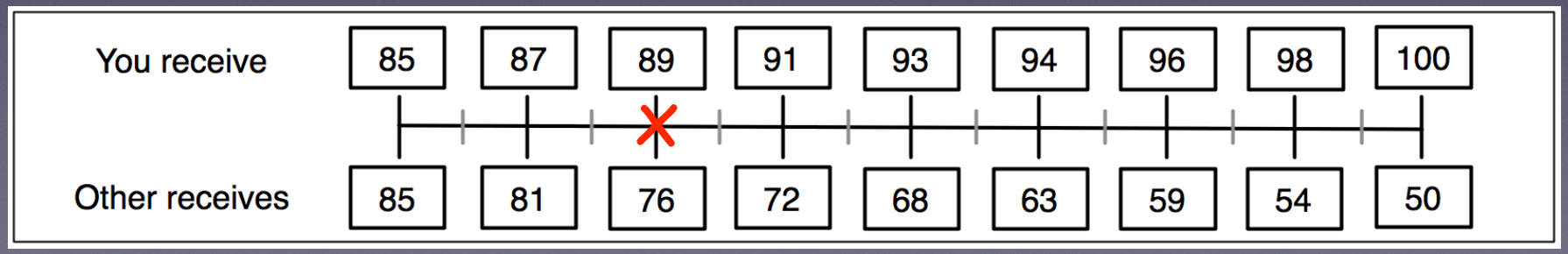


You receive	85	87	89	91	93	94	96	98	100
Other receives	85	81	76	72	68	63	59	54	50

Prosocial option

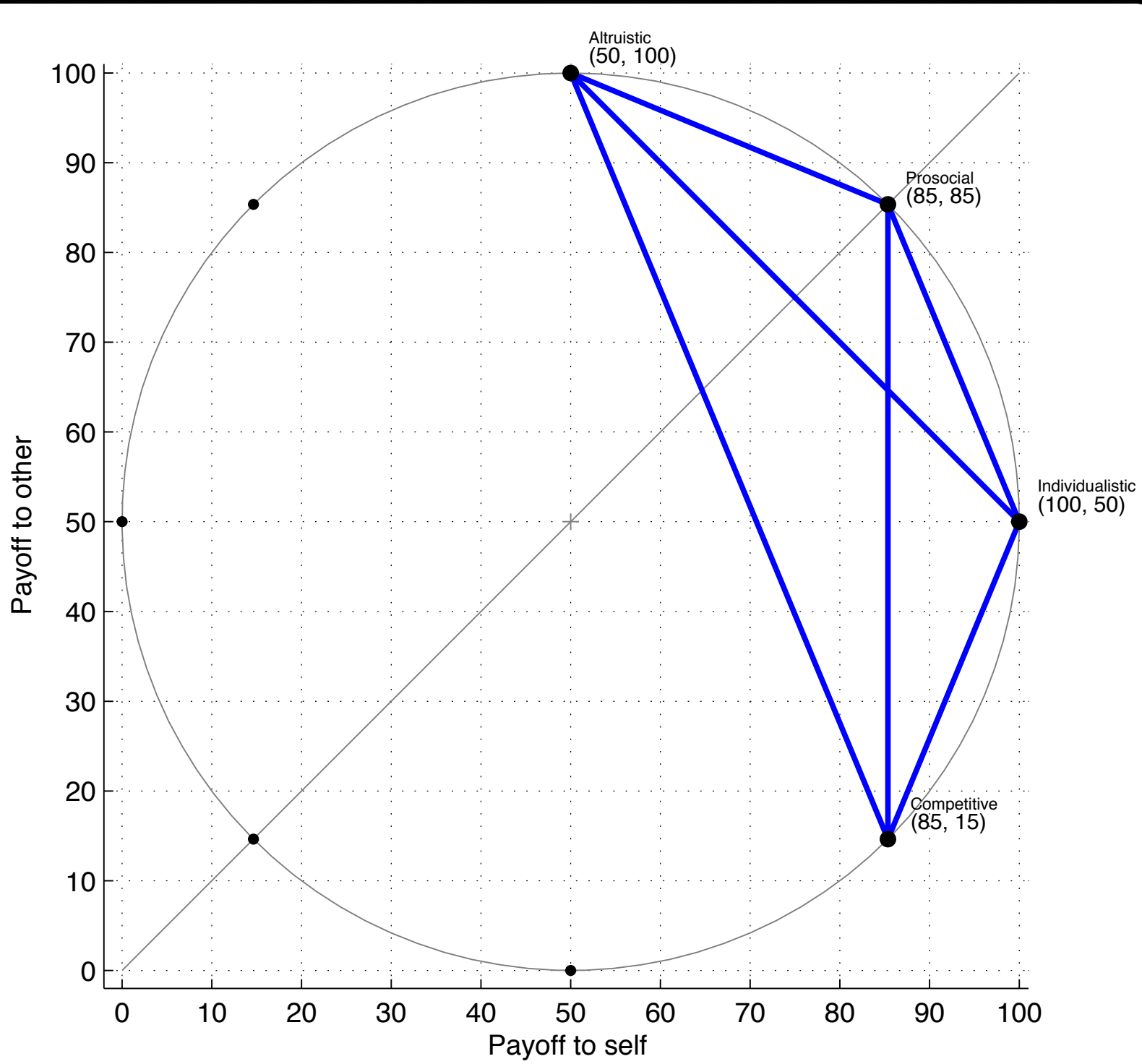
Individualistic option



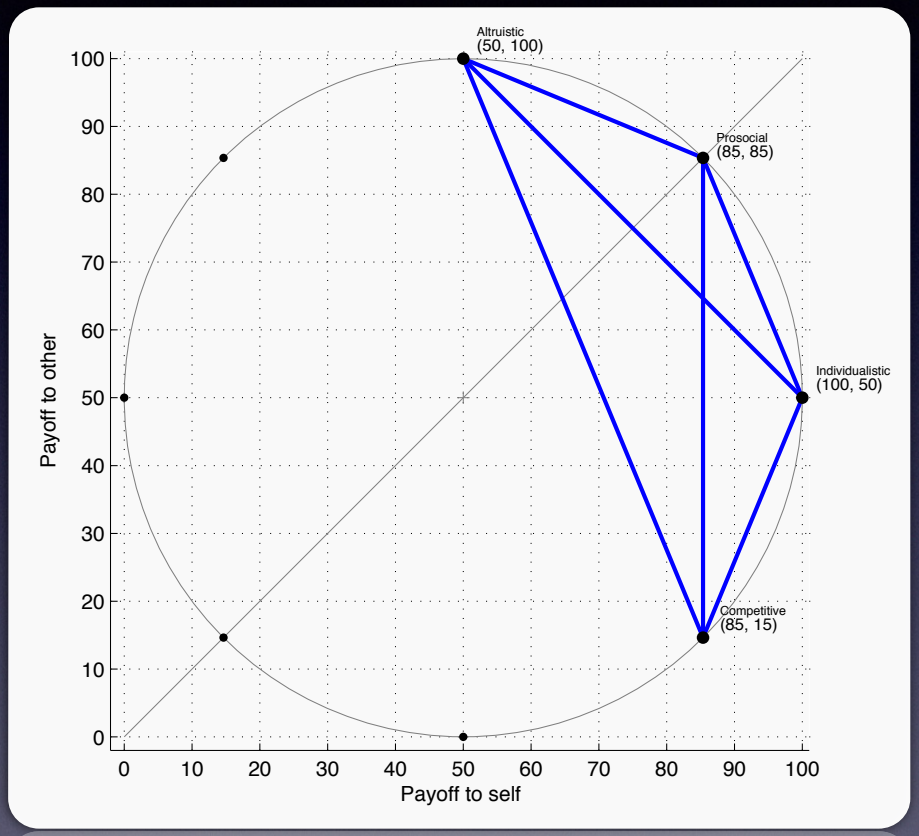


Prosocial option

Individualistic option


Altruistic
(50, 100)
Prosocial
(85, 85)
Individualistic
(100, 50)
Competitive
(85, 15)
Payoff to other
Payoff to self
0
10
20
30
40
50
60
70
80
90
100

SVO Slider Measure



What the DM sees:

You receive	100	98	96	94	93	91	89	87	85
Other receives	50	54	59	63	68	72	76	81	85

You _____

Other _____

You receive	100	94	88	81	75	69	63	56	50
Other receives	50	56	63	69	75	81	88	94	100

You _____

Other _____

You receive	50	54	59	63	68	72	76	81	85
Other receives	100	89	79	68	58	47	36	26	15

You _____

Other _____

You receive	50	54	59	63	68	72	76	81	85
Other receives	100	98	96	94	93	91	89	87	85

You _____

Other _____

You receive	85	87	89	91	93	94	96	98	100
Other receives	15	19	24	28	33	37	41	46	50

You _____

Other _____

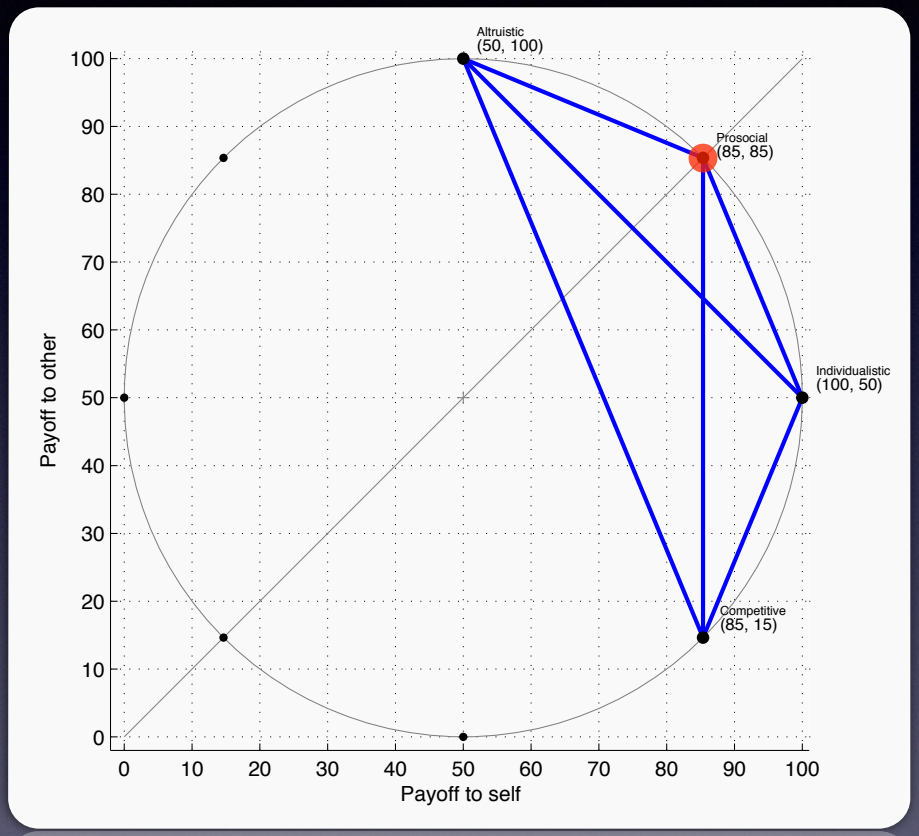
You receive	85	85	85	85	85	85	85	85	85
Other receives	85	76	68	59	50	41	33	24	15

You _____

Other _____

Murphy, Ackermann and Handgraaf (2011)

SVO Slider Measure



How the DM makes a choice:

You receive	100	98	96	94	93	91	89	87	85
Other receives	50	54	59	63	68	72	76	81	85

You 85
Other 85

You receive	100	94	88	81	75	69	63	56	50
Other receives	50	56	63	69	75	81	88	94	100

You _____
Other _____

You receive	50	54	59	63	68	72	76	81	85
Other receives	100	89	79	68	58	47	36	26	15

You _____
Other _____

You receive	50	54	59	63	68	72	76	81	85
Other receives	100	98	96	94	93	91	89	87	85

You _____
Other _____

You receive	85	87	89	91	93	94	96	98	100
Other receives	15	19	24	28	33	37	41	46	50

You _____
Other _____

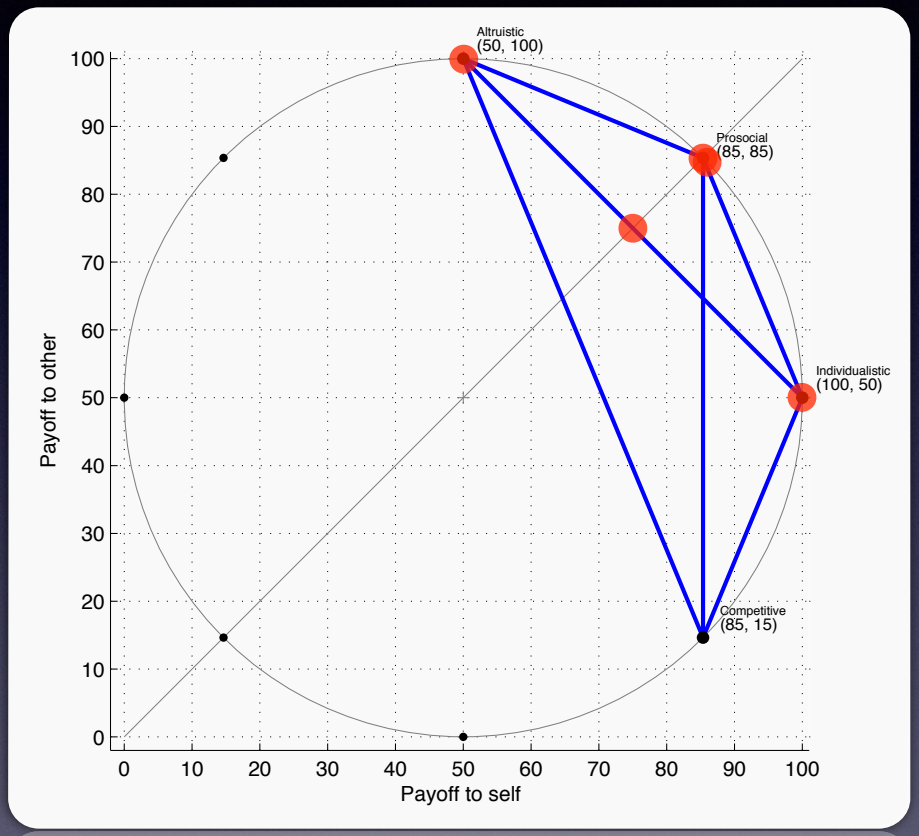
You receive	85	85	85	85	85	85	85	85	85
Other receives	85	76	68	59	50	41	33	24	15

You _____
Other _____

Murphy, Ackermann and Handgraaf (2011)

SVO Slider Measure

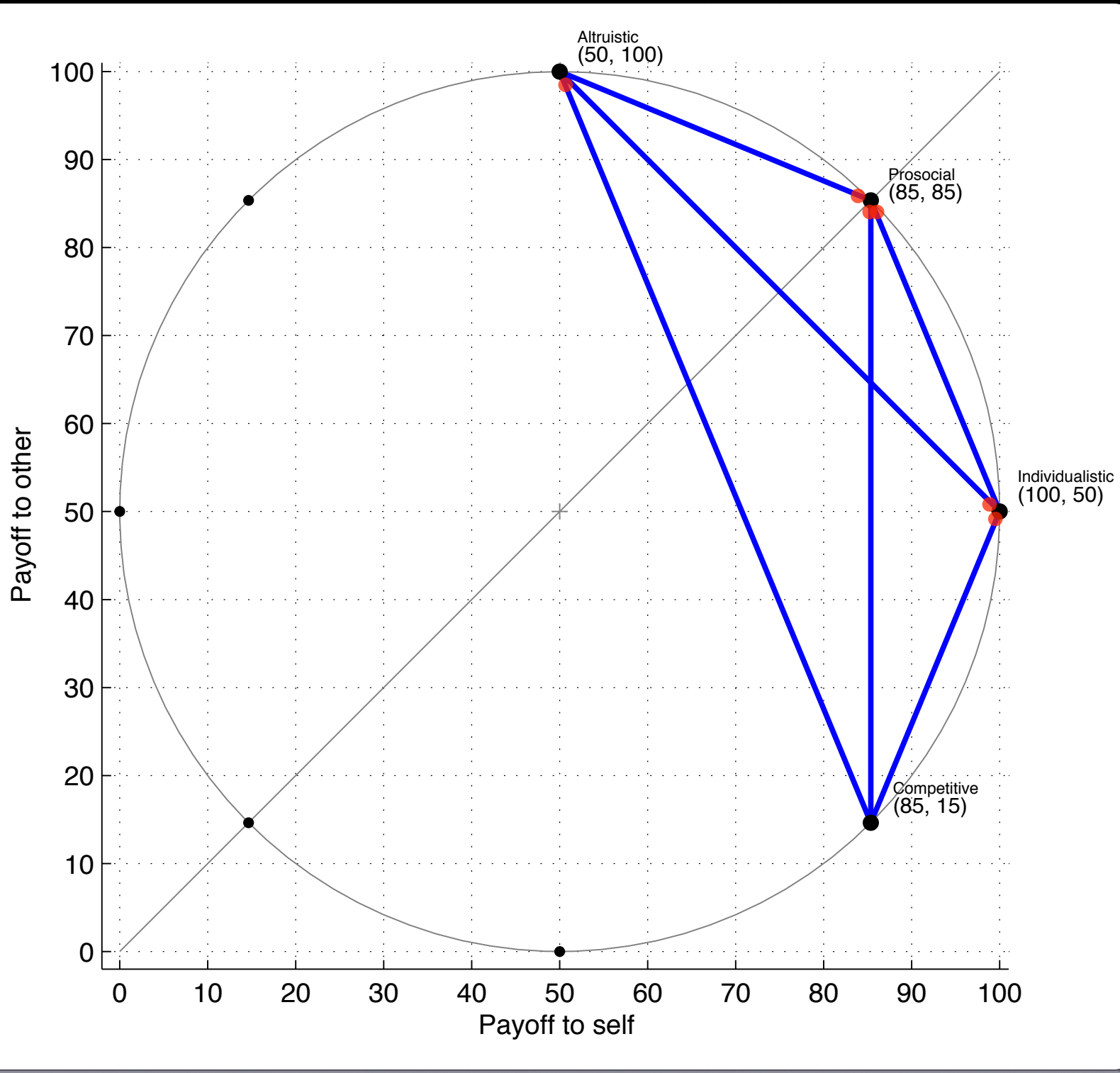
6 joint allocation choices

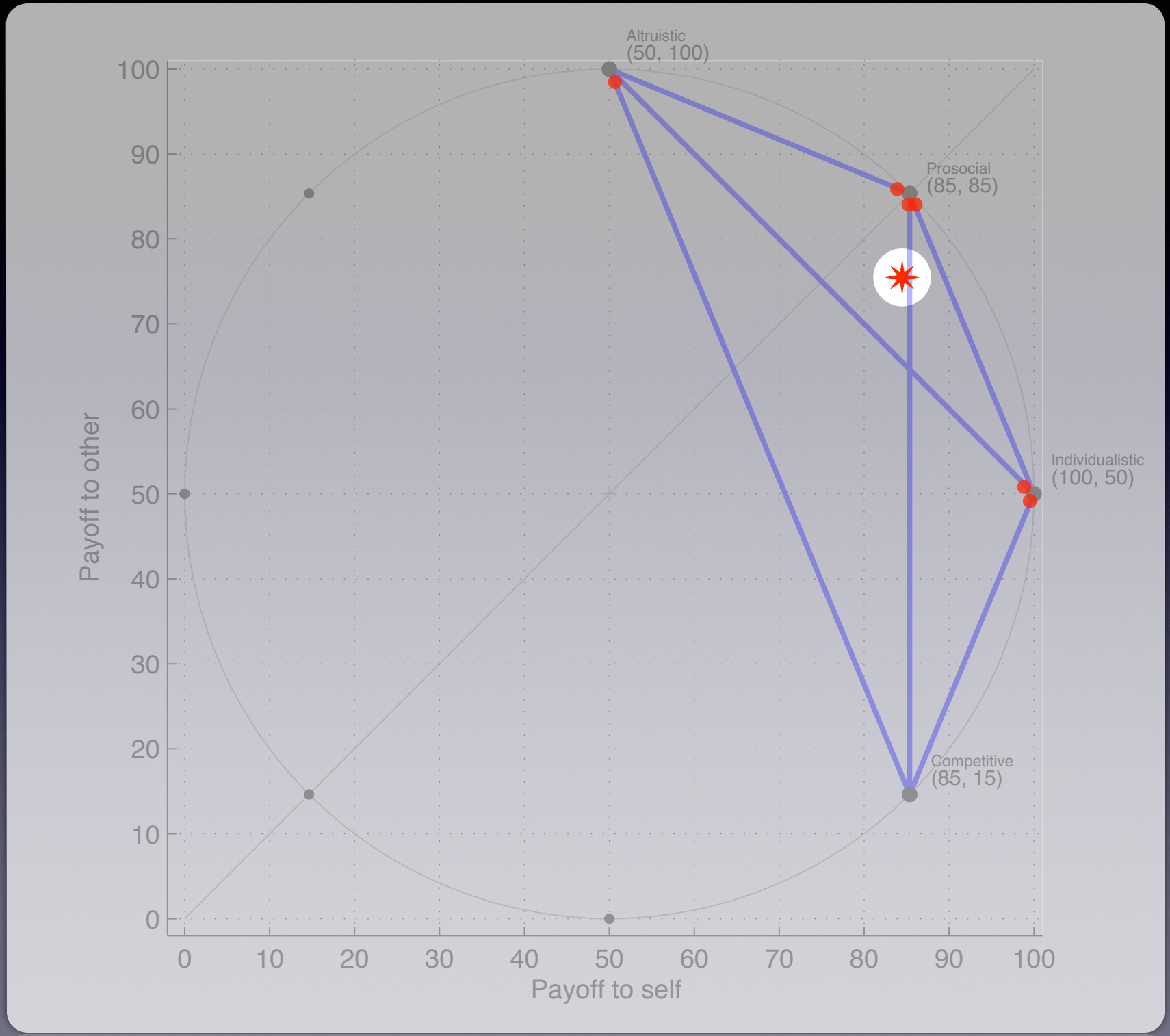


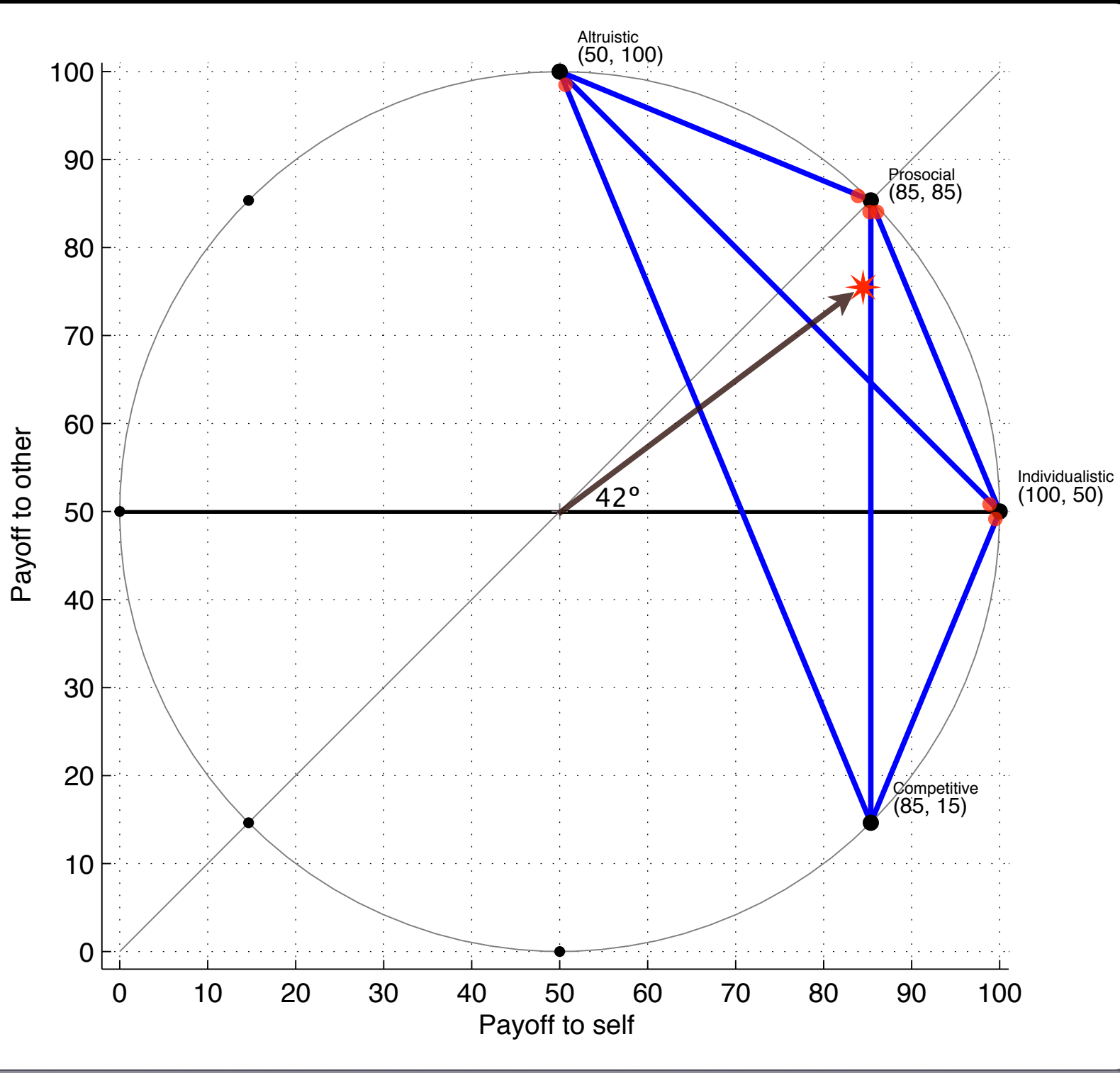
How the DM makes a choice:

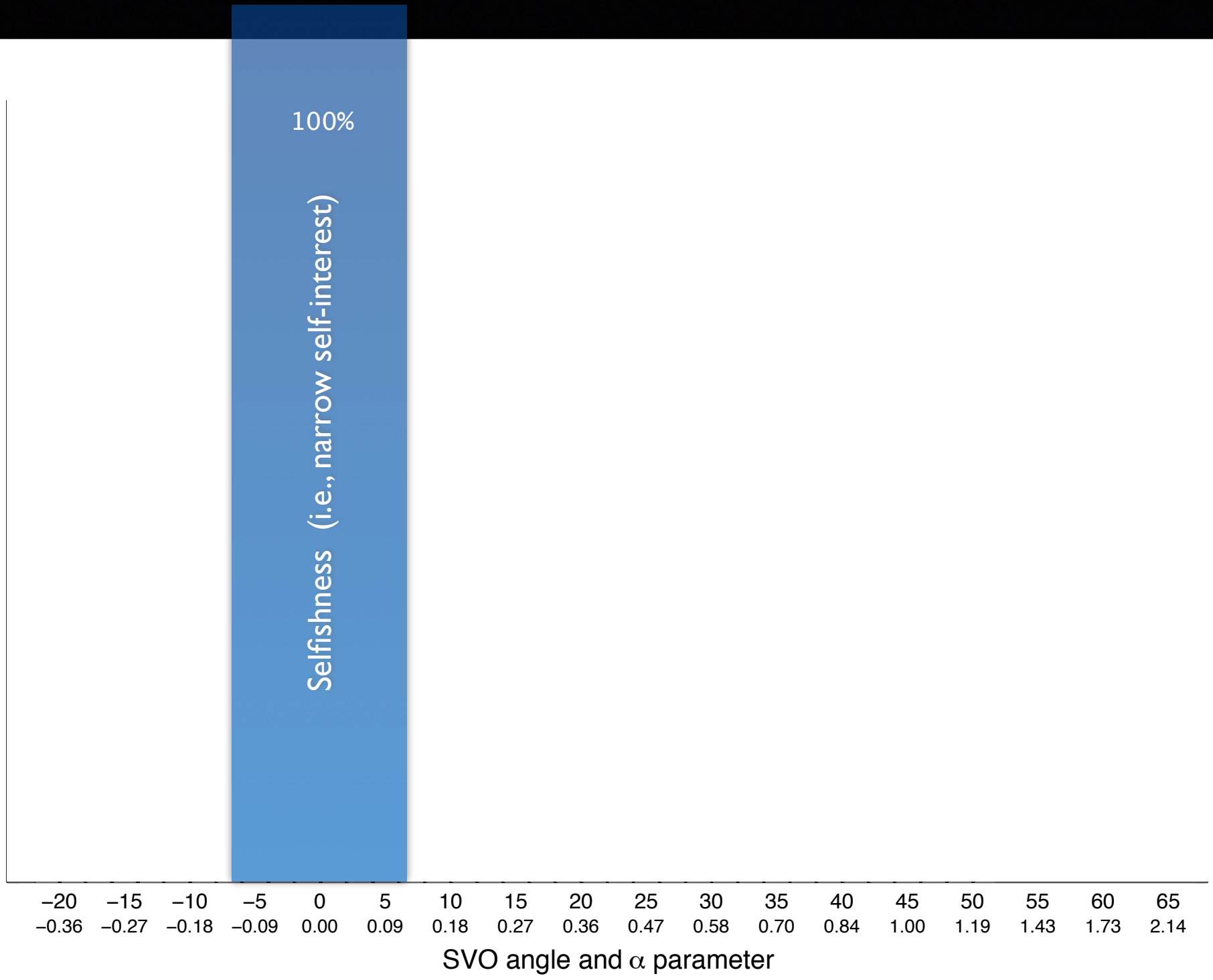
You receive	100	98	96	94	93	91	89	87	**85**	You 85
Other receives	50	54	59	63	68	72	76	81	85	Other 85
You receive	100	94	88	81	**75**	69	63	56	50	You 75
Other receives	50	56	63	69	75	81	88	94	100	Other 75
You receive	**50**	54	59	63	68	72	76	81	85	You 50
Other receives	100	89	79	68	58	47	36	26	15	Other 100
You receive	50	54	59	63	68	72	76	81	**85**	You 85
Other receives	100	98	96	94	93	91	89	87	85	Other 85
You receive	85	87	89	91	93	94	96	98	**100**	You 100
Other receives	15	19	24	28	33	37	41	46	50	Other 50
You receive	**85**	85	85	85	85	85	85	85	85	You 85
Other receives	85	76	68	59	50	41	33	24	15	Other 85

Murphy, Ackermann and Handgraaf (2011)

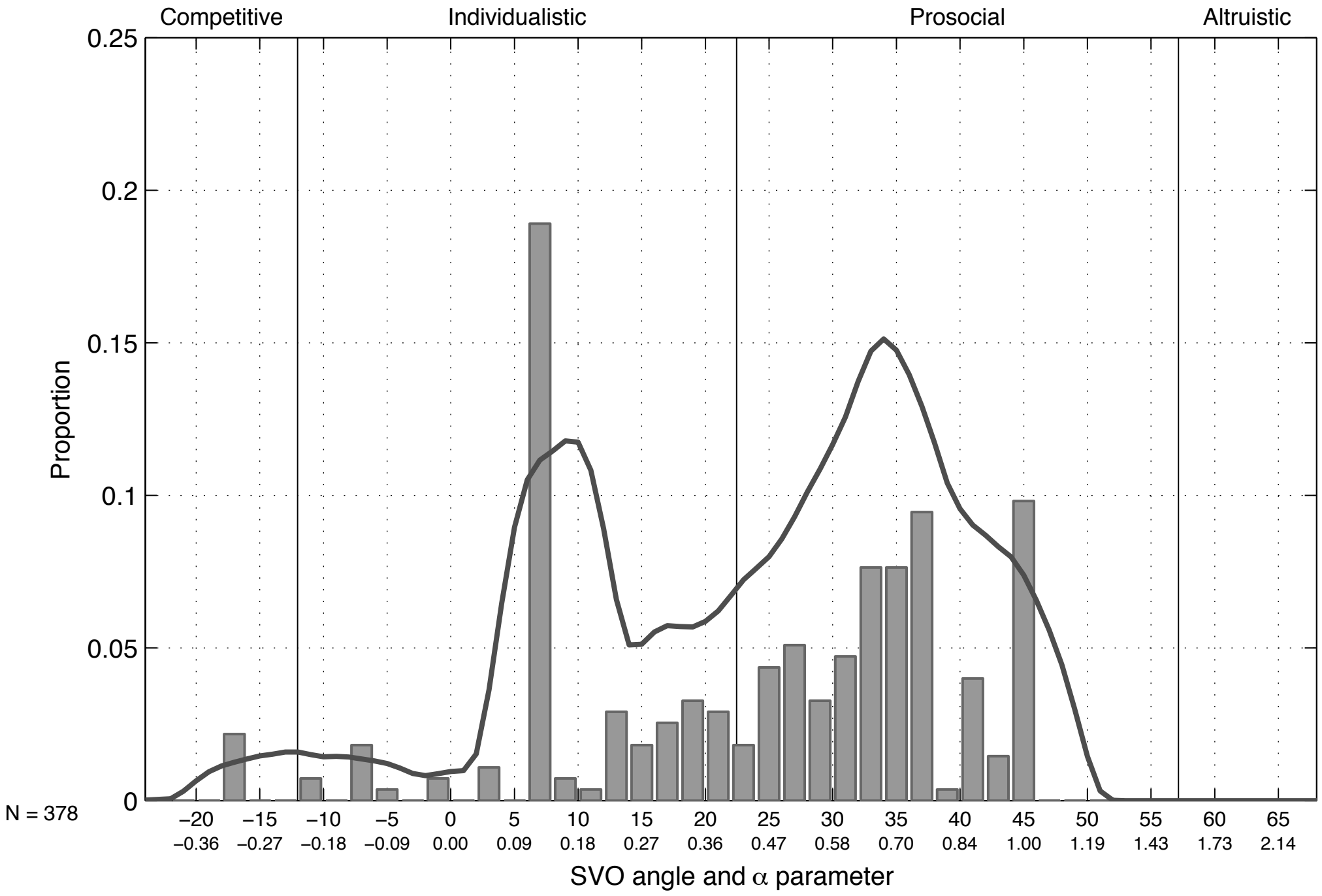

Altruistic
(50, 100)
Prosocial
(85, 85)
Individualistic
(100, 50)
Competitive
(85, 15)
Payoff to other
Payoff to self
0
10
20
30
40
50
60
70
80
90
100


Altruistic
(50, 100)
Prosocial
(85, 85)
Individualistic
(100, 50)
Competitive
(85, 15)
Payoff to other
Payoff to self
0
10
20
30
40
50
60
70
80
90
100


Altruistic
(50, 100)
Prosocial
(85, 85)
Individualistic
(100, 50)
Competitive
(85, 15)
42°
Payoff to other
Payoff to self
0
10
20
30
40
50
60
70
80
90
100


100%
Selfishness (i.e., narrow self-interest)
−20 −0.36
−15 −0.27
−10 −0.18
−5 −0.09
0 0.00
5 0.09
10 0.18
15 0.27
20 0.36
25 0.47
30 0.58
35 0.70
40 0.84
45 1.00
50 1.19
55 1.43
60 1.73
65 2.14
SVO angle and α parameter

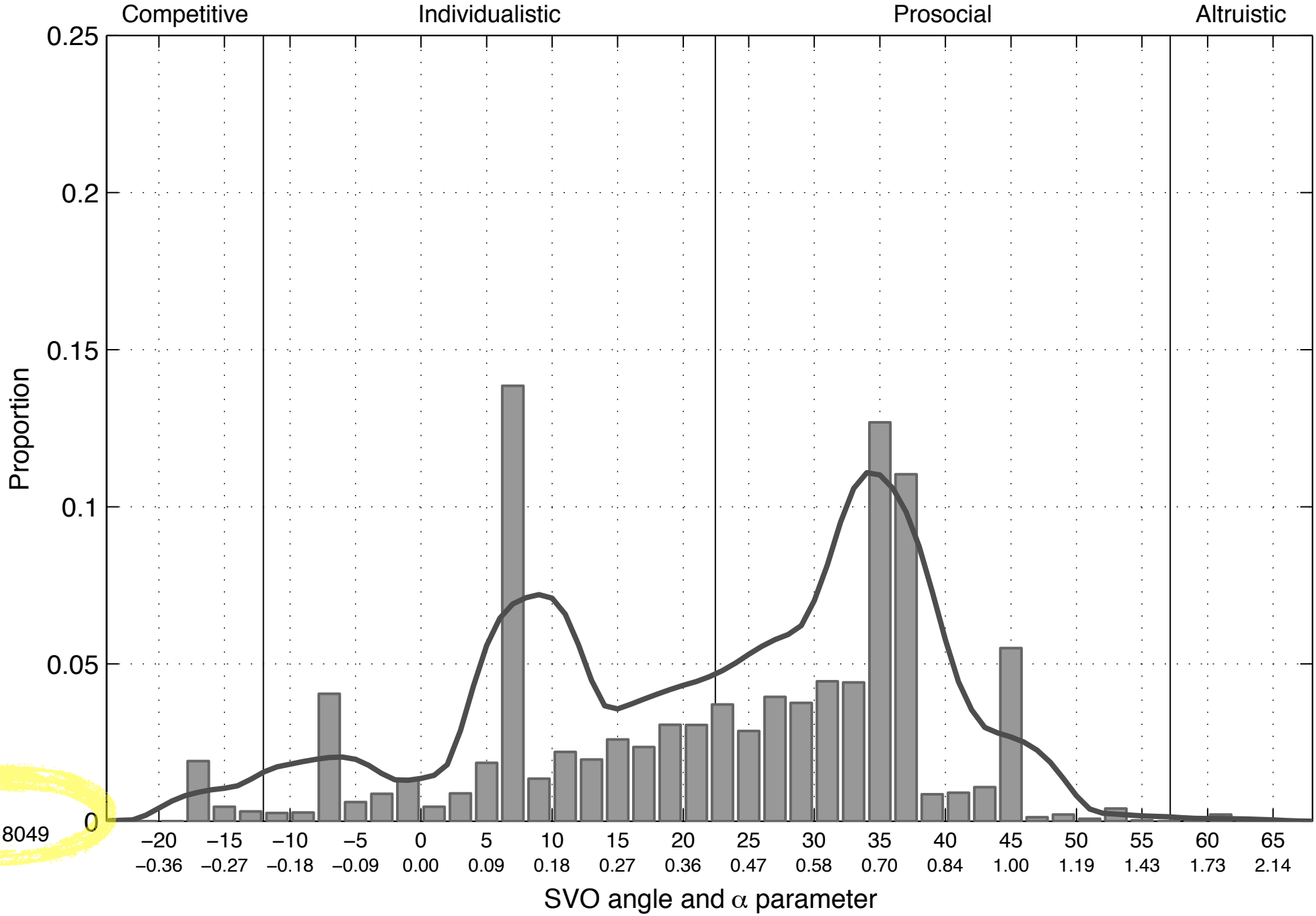
Part 1: Results from multiple studies measuring social preferences

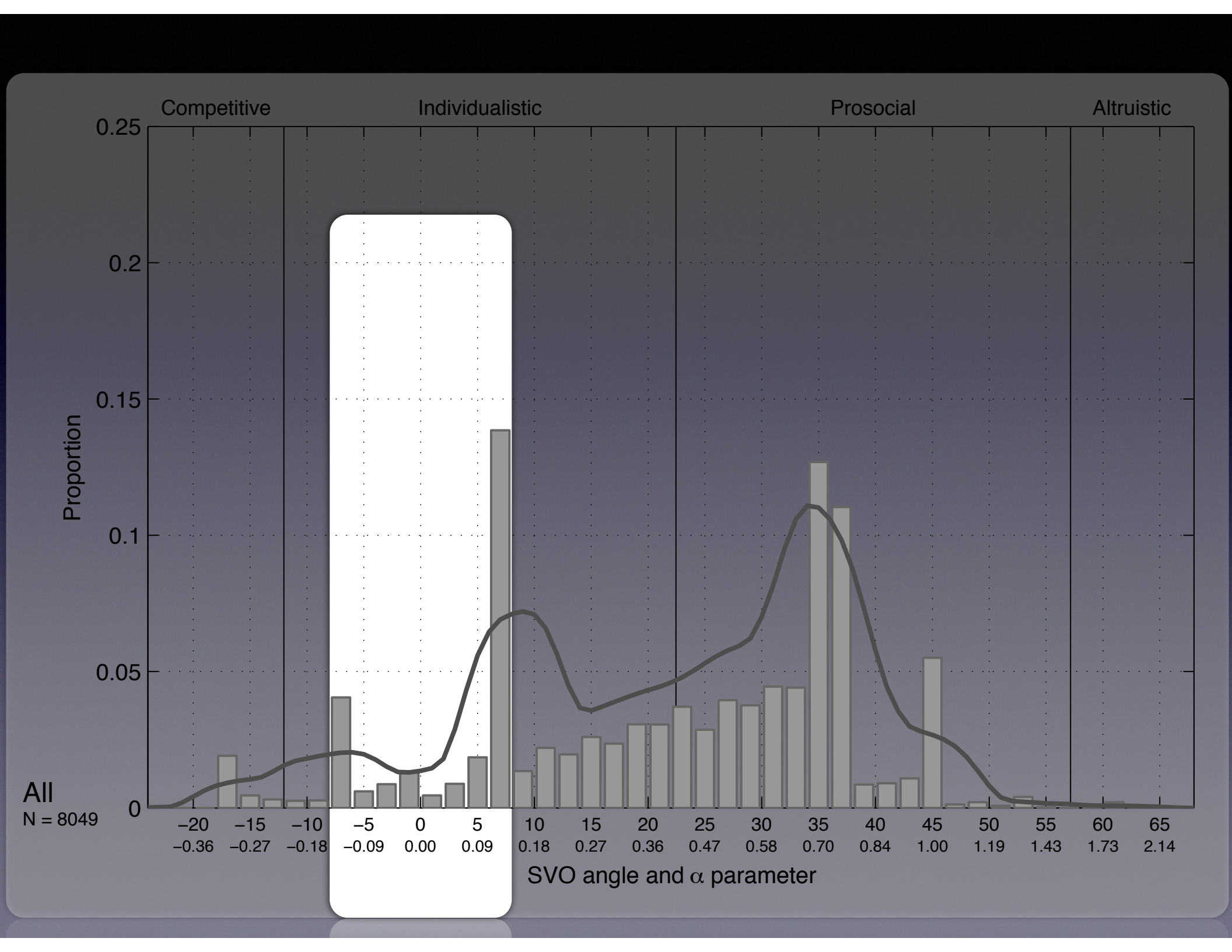


Cross National Project on Trust, SVO, and Social Mindfulness (van Doesum, Van Lange, Murphy, et al., 2015)

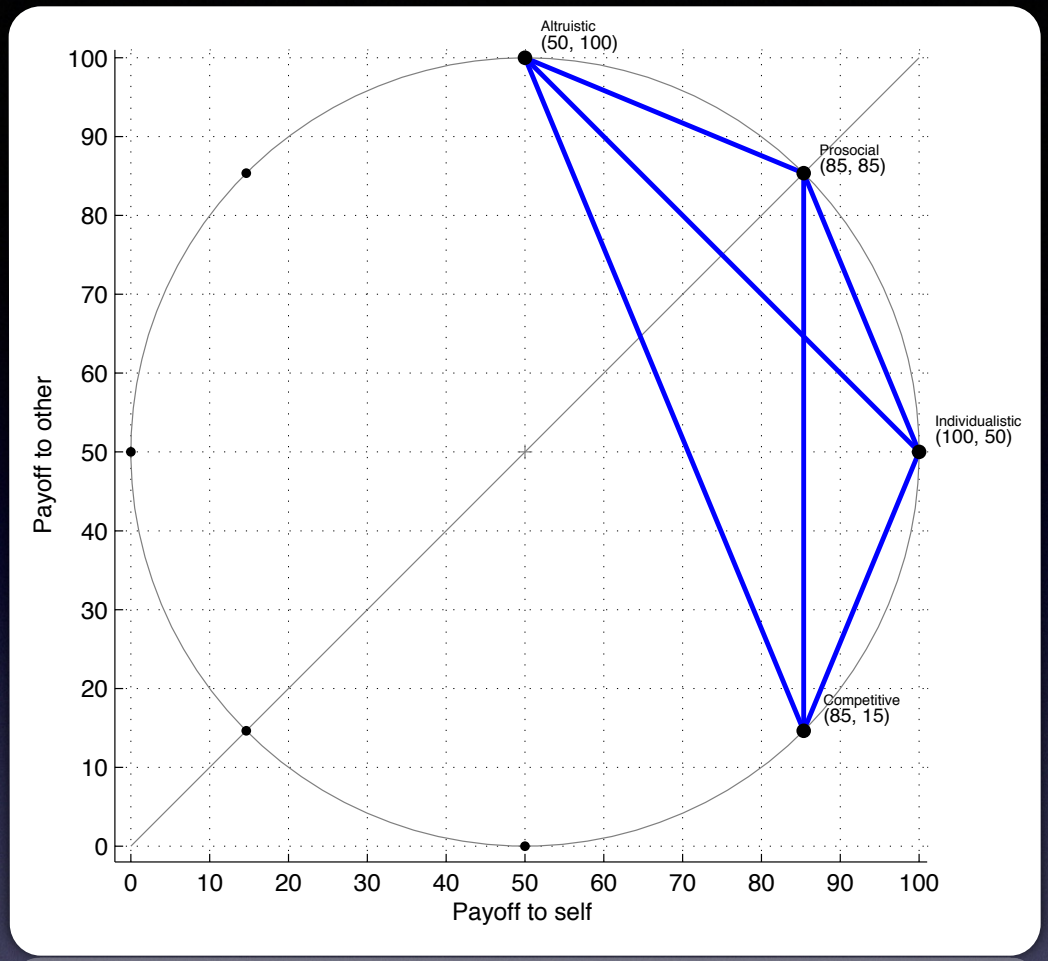
Total	8049
Argentina	99
Australia	86
Austria	428
Belgium	93
Canada	292
Chile	159
China	649
Czech Republic	217
France	206
Germany	699
Greece	86
Hong Kong	305
India	163
Indonesia	181
Israel	322
Japan	273
Mexico	150
Netherlands	228
Poland	71
Portugal	151
R. of Korea	307
Romania	70
Russian Federation	118
Singapore	129
South Africa	208
Spain	143
Sweden	164
Switzerland	196
Turkey	346
UK	462
USA	1048

Cross National Project on Trust, SVO, and Social Mindfulness (van Doesum, Van Lange, Murphy, et al., 2015)




Competitive
Individualistic
Prosocial
Altruistic
0.25
0.2
0.15
0.1
0.05
0
Proportion
All
N = 8049
−20 −15 −10 −5 0 5 10 15 20 25 30 35 40 45 50 55 60 65
−0.36 −0.27 −0.18 −0.09 0.00 0.09 0.18 0.27 0.36 0.47 0.58 0.70 0.84 1.00 1.19 1.43 1.73 2.14
SVO angle and α parameter

Social Value Orientation (SVO) Slider Measure



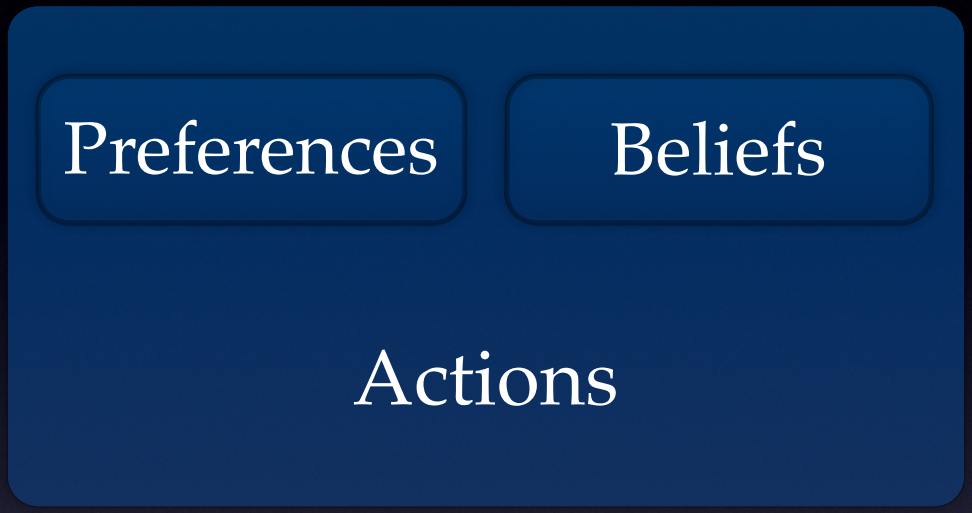
- High resolution measure of other regarding preferences
- Strong psychometric properties
- Sensitive to individual differences (and there is substantial heterogeneity)

http://vlab.ethz.ch/svo/SVO_Slider/

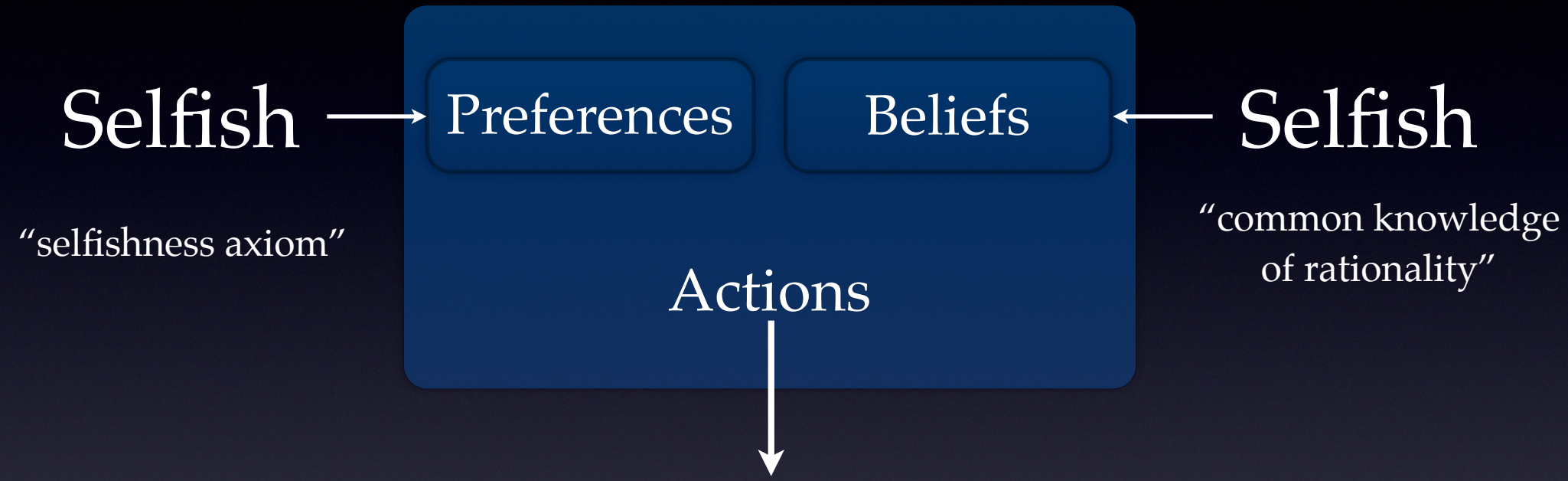
Murphy, R. O., Ackermann, K. A., & Handgraaf, M. J. (2011). Measuring social value orientation. *Judgment and Decision Making*, 6(8), 771-781.

Murphy, R. O., & Ackermann, K. A. (2014). Social value orientation: Theoretical and measurement issues in the study of social preferences. *Personality and Social Psychology Review*, 18(1), 13-41.

Rationality

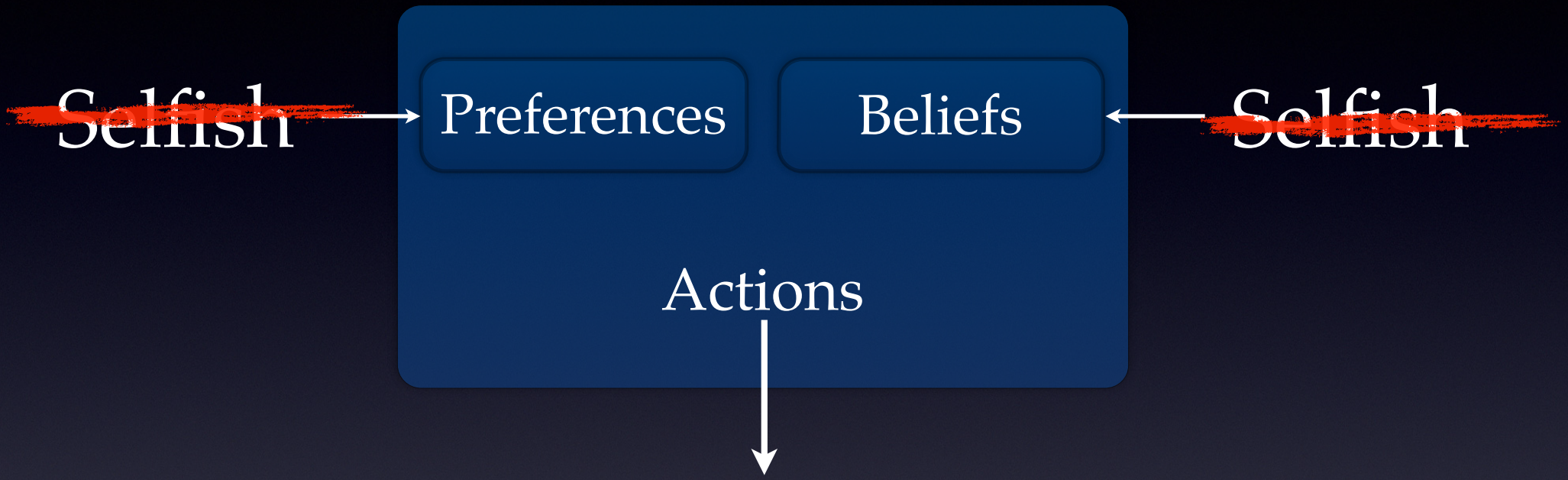


Rationality



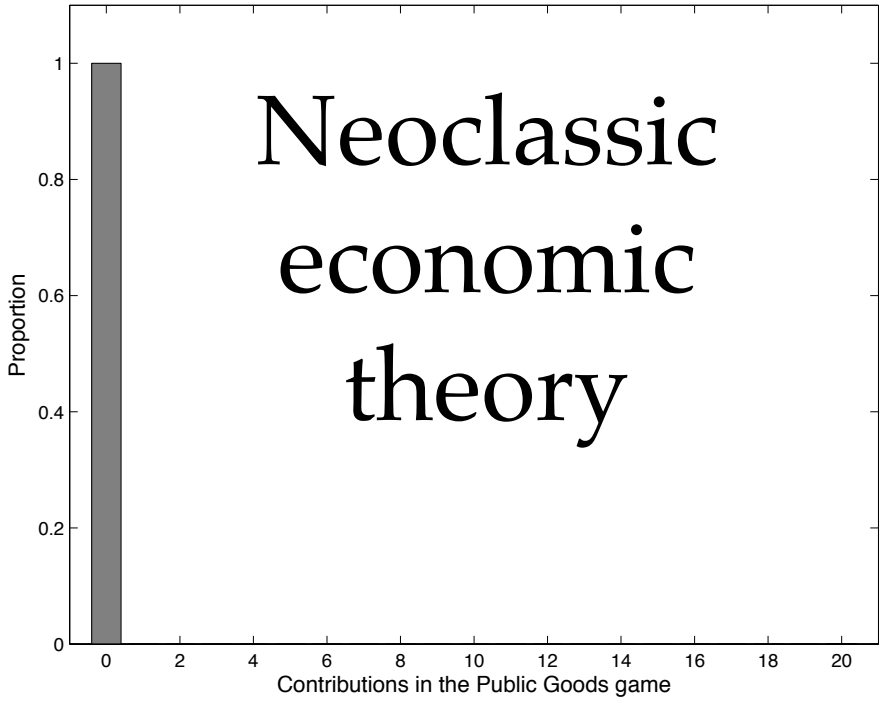
Engine of rationality

Rationality

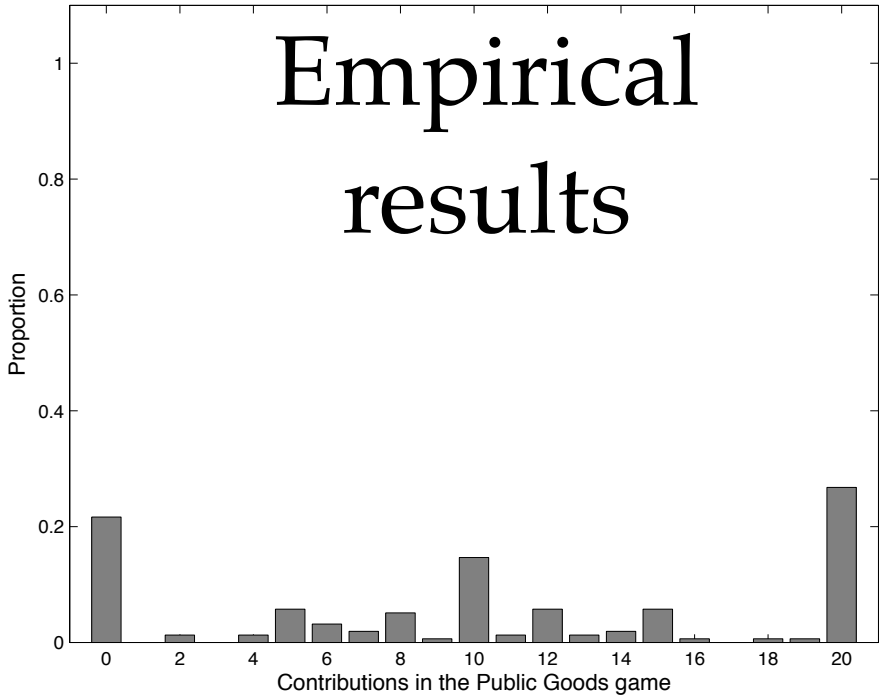


Can we make better predictions
about choice behavior?
Can we account for cooperation?

Neoclassic economic theory



Empirical results



Cooperation choices in a Public Goods game (PGG) are considered. This is a strategic interaction with 4 players and each having to decide how much to contribute to a common good. Everyone would be better off if everyone contributed, but there is always a temptation to free ride.

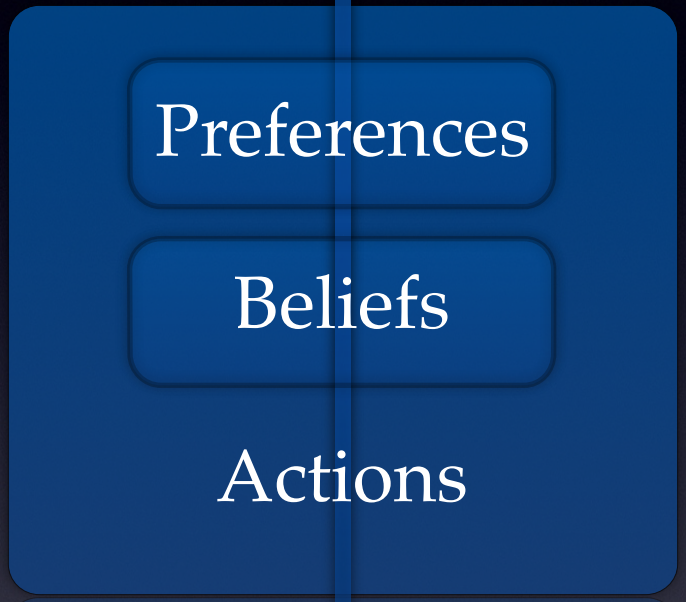
Part 2

- An experiment that requires players do the following:
  - Complete the SVO slider measure — Preferences
  - Estimate other players' SVO choices
  - Estimate other players' contribution choices — Beliefs
  - Play a one-shot anonymous 4 player PGG (1.6x) — Action
- N = 124 subjects in the DeSciL
- Laboratory study, fully within subjects design, fully confidential, no deception, incentive compatible, standard experimental economics setup

Rationality

~~Selfish~~

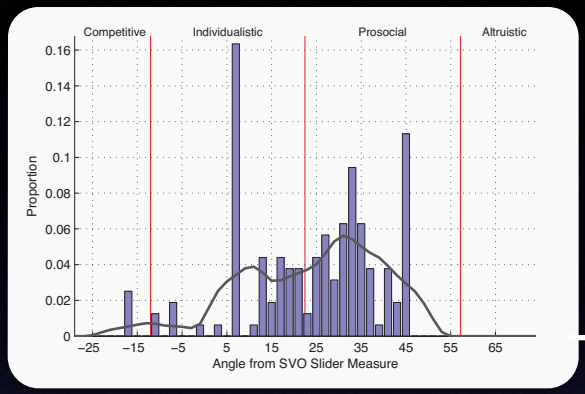
Social preferences



Predicting behavior in a Public Goods game

Rationality

~~Selfish~~



Social preferences

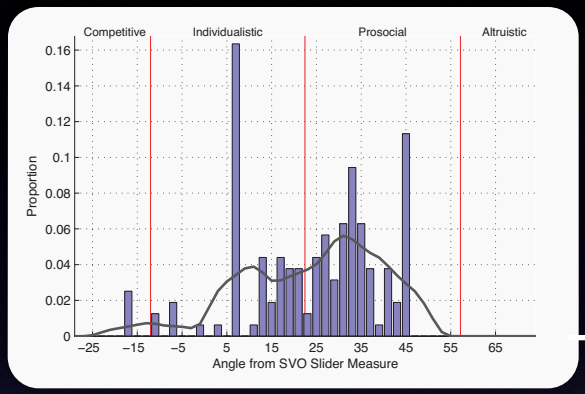
Preferences

Beliefs

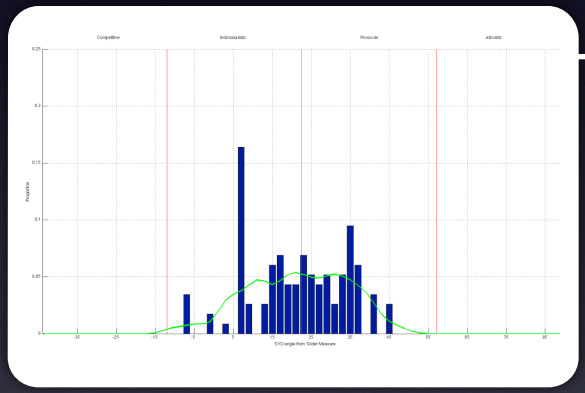
Actions

Predicting behavior in a Public Goods game

Rationality



Social preferences



Beliefs about others' social preferences

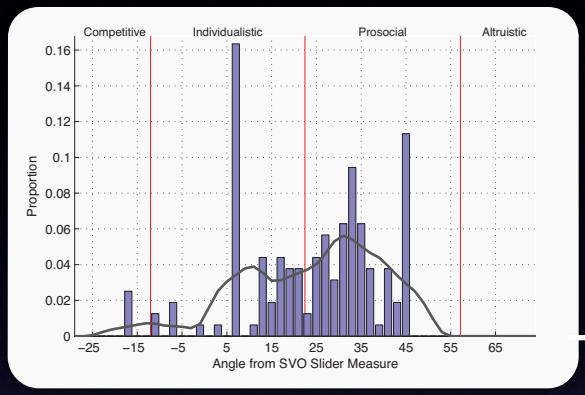
Preferences

Beliefs

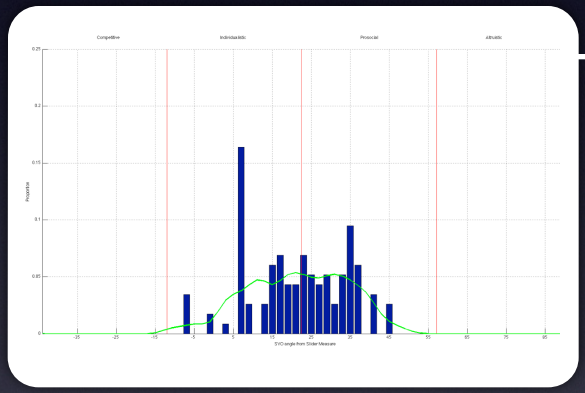
Actions

Predicting behavior in a Public Goods game

Rationality



Social preferences

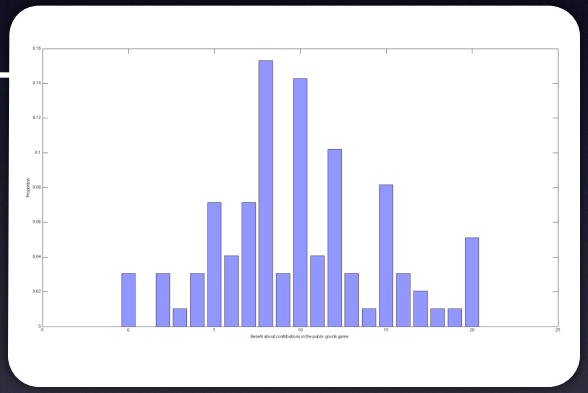


Beliefs about others' social preferences

Preferences

Beliefs

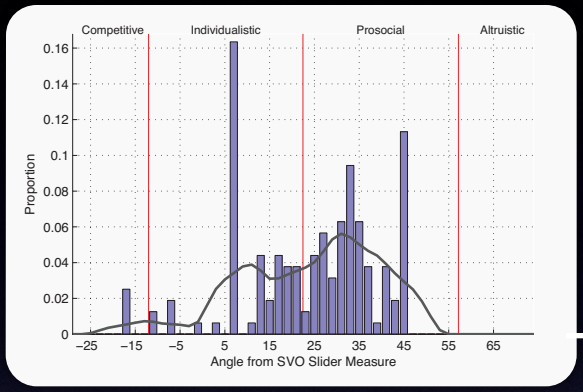
Actions



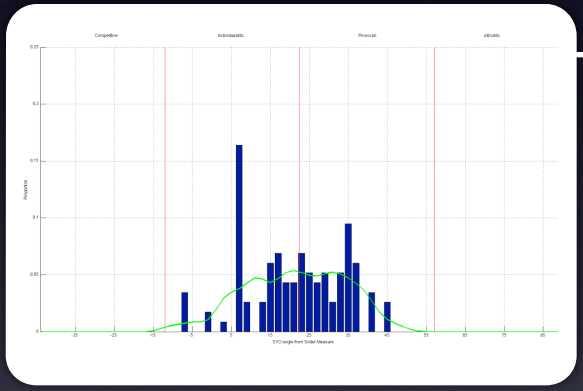
Beliefs about others' PG contributions

Predicting behavior in a Public Goods game

Rationality broadly considered



Social preferences

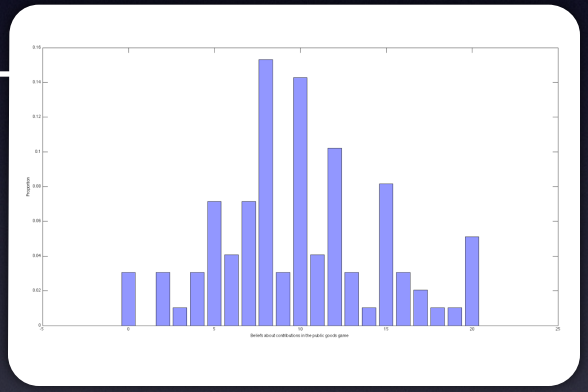


Beliefs about others' social preferences

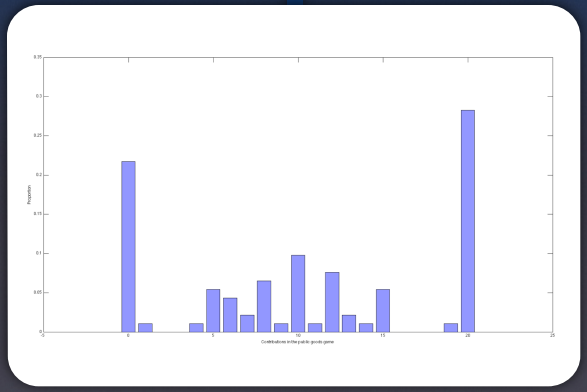
Preferences

Beliefs

Actions



Beliefs about others' PG contributions



Public Goods game contributions

Model $R^2 = .60$

Making better predictions

Predicting contributions in the one-shot PGG

SVO

	Dependent variable: Contributions in the one-shot PGG	
Model	(1)	(2)
SVO	0.26***	0.26**
PG belief	0.71***	0.67***
SVO belief	-0.19*	-0.20*
SVO x PG belief		-0.08
SVO x SVO belief		-0.02
SVO belief x PG belief		-0.01
SVO x SVO belief x PG belief		0.11
R square	*0.60*	*0.61*
Adjusted R square	*0.59*	*0.59*

Bivariate correlation: $r = .32^{***}$

Predicting contributions in the one-shot PGG

PG belief

	Dependent variable: Contributions in the one-shot PGG	
Model	(1)	(2)
SVO	0.26***	0.26**
PG belief	0.71***	0.67***
SVO belief	-0.19*	-0.20*
SVO x PG belief		-0.08
SVO x SVO belief		-0.02
SVO belief x PG belief		-0.01
SVO x SVO belief x PG belief		0.11
R square	*0.60*	*0.61*
Adjusted R square	*0.59*	*0.59*

Bivariate correlation: $r = .75^{***}$

Predicting contributions in the one-shot PGG

SVO belief

	Dependent variable: Contributions in the one-shot PGG	
Model	(1)	(2)
SVO	0.26***	0.26**
PG belief	0.71***	0.67***
SVO belief	-0.19*	-0.20*
SVO x PG belief		-0.08
SVO x SVO belief		-0.02
SVO belief x PG belief		-0.01
SVO x SVO belief x PG belief		0.11
R square	*0.60*	*0.61*
Adjusted R square	*0.59*	*0.59*

Bivariate correlation: $r = .09$

Predicting contributions in the one-shot PGG

SVO belief

	Dependent variable: Contributions in the one-shot PGG	
Model	(1)	(2)
SVO	0.26***	0.26**
PG belief	0.71***	0.67***
SVO belief	-0.19*	-0.20*
SVO x PG belief		-0.08
SVO x SVO belief		-0.02
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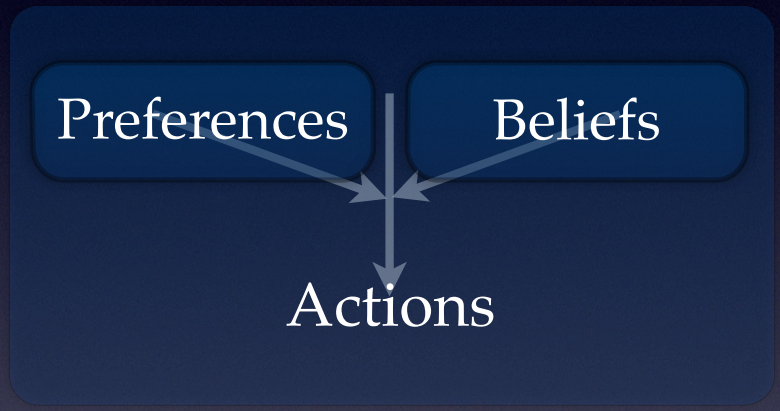
R square	*0.60*	*0.61*
Adjusted R square	*0.59*	*0.59*

Murphy, R. O., & Ackermann, K. A. (2015). Explaining behavior in public goods games: How preferences and beliefs affect cooperation. Under review.

Selfish $\neq$ Rationality



Part 3

Structure and outline

- Preferences (measurement)
- Beliefs (prediction)
- Mechanisms (control)

Part 3

Structure and outline

- Mechanisms (control)
  - Using decision frames in strategic interactions to nudge people to be more cooperative
  - Frames- Superficial differences between fundamentally identical decision contexts
  - Community game vs. Wall Street game vs. Environmental game vs. Game (baseline condition)

Liberman et al. (2004)

Frames and Strategic choice

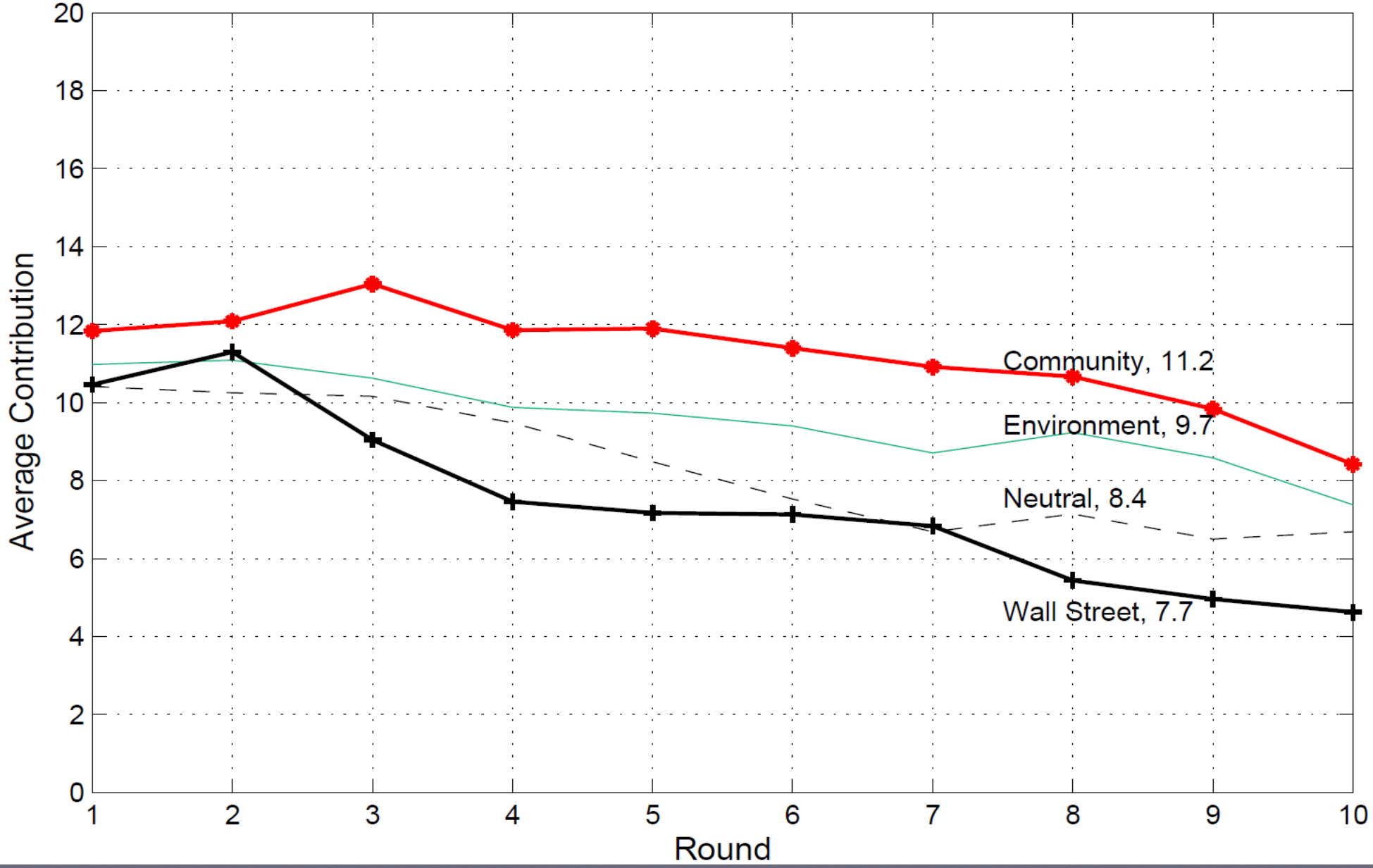
The name of the game

- Develop a laboratory based experiment where people make choices in a Public Goods game, but frame it by different names
- Measure people's SVO, and their beliefs about other's choices, and then have them make potentially cooperative choices
- Mixed evidence from the existing literature and no clear evidence for why this framing manipulation might have any effect

Frames and Strategic choice

The name of the game

- Nudging decision makers toward cooperation
  - Frames: Community game vs. Wall Street game vs. Environmental Game vs. Game (baseline condition)
    - Preferences pathway?
    - Beliefs pathway?



Repeated PGG with 4 players (*N=178*)

- No difference at all in social preferences between the different experimental conditions

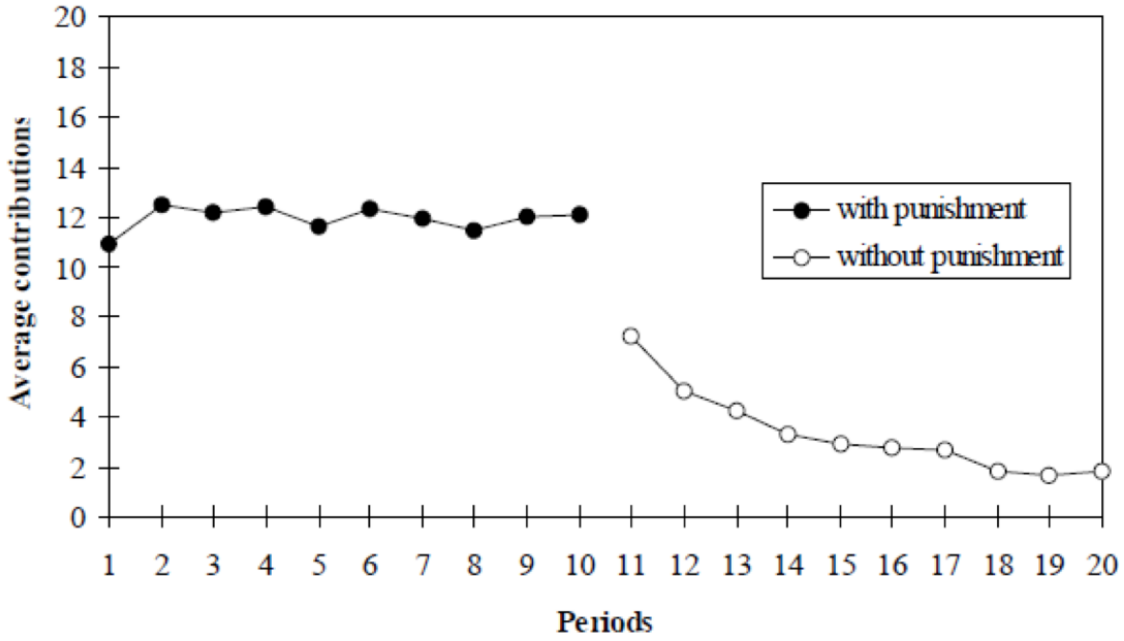
	Neutral	Community	Wall Street	Environment
Belief	0.76***	0.82***	0.62***	0.86***
Social Preferences	0.24***	0.17**	0.02	0.13*
R-Square	0.76	0.87	0.40	0.79
n	41	48	45	44

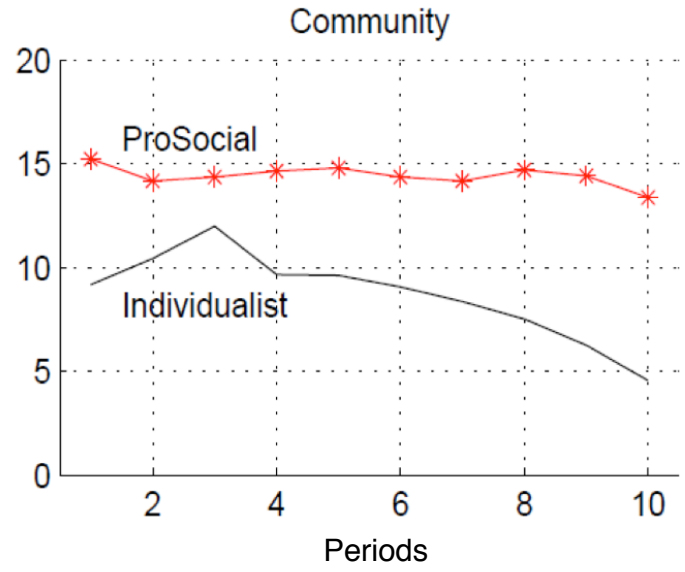
- Preferences pathway
- Beliefs pathway

Strategic choice framing

Cost effective and resilient

Fehr and Gächter (2000)





Bernold, E., Gsottbauer, E., Ackermann, K. A., & Murphy, R. O. (2015). Social framing and cooperation: The role and interaction of preferences and beliefs. Under review.

FNSNF
Fonds national suisse
Schweizerischer Nationalfonds
Fondo nazionale svizzero
Swiss National Science Foundation

Frames and Strategic choice

The name of the game

- Strategic frames can nudge decision makers toward cooperation
- These frames change decision maker's beliefs and can serve as a way to coordinate (especially for prosocial people)
- Yields greater cooperation and does so more efficiently and resiliently than other heavy handed institutional mechanisms

Next Parts...

A simple strategic decision like before

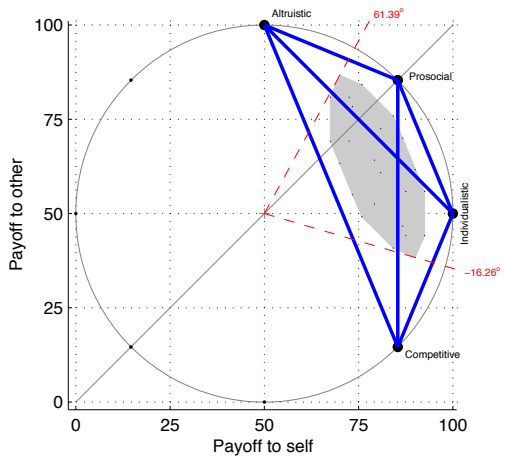
		Player B: Cooperate	Player B: Defect
Player A	Cooperate	8, 8	0, 10
	Defect	10, 0	5, 5

Next Parts...

A simple strategic decision like before

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	8, 8	0, 10
	Defect	10, 0	5, 5

		Player B: Coop-erate	Player B: Defect
Player A	Cooperate	8, 8	0, 10
Player A	Defect	10, 0	5, 5



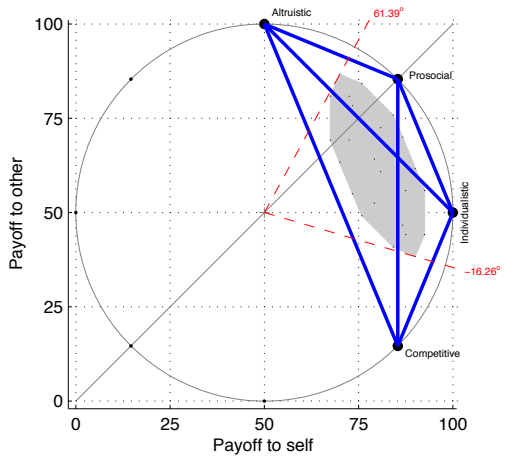
Preferences

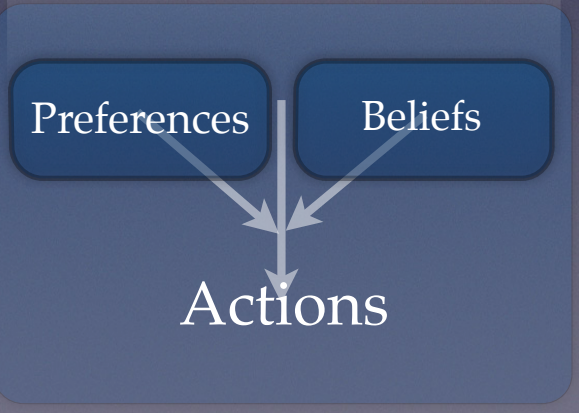
Beliefs

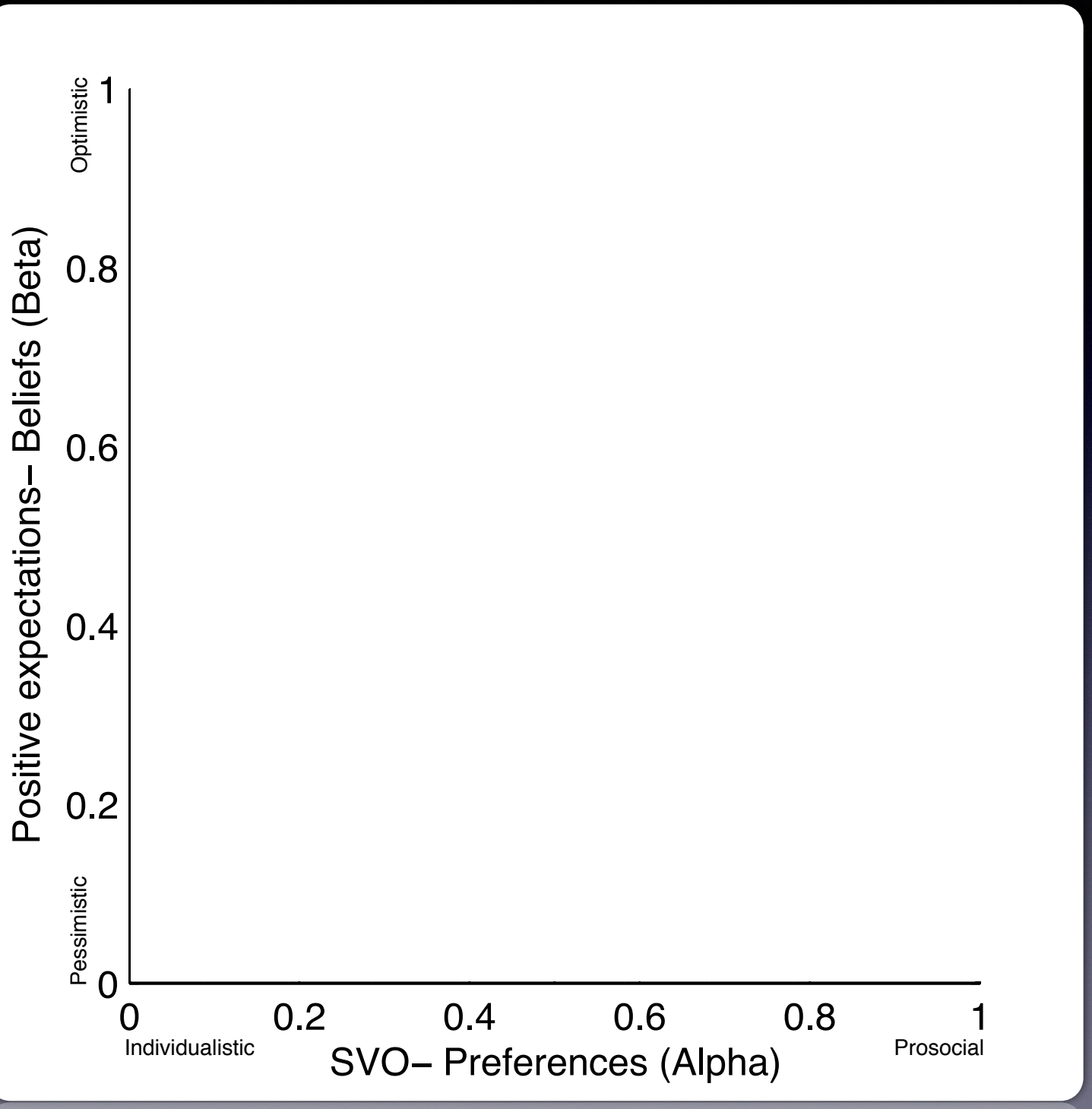
Actions

Player B

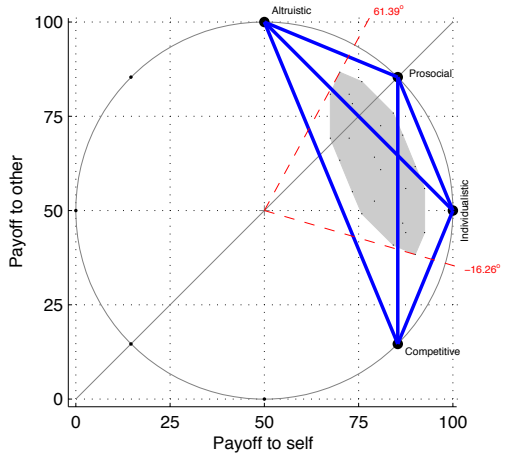
Player A	Coop-erate	Defect
Cooperate	8, 8	0, 10
Defect	10, 0	5, 5

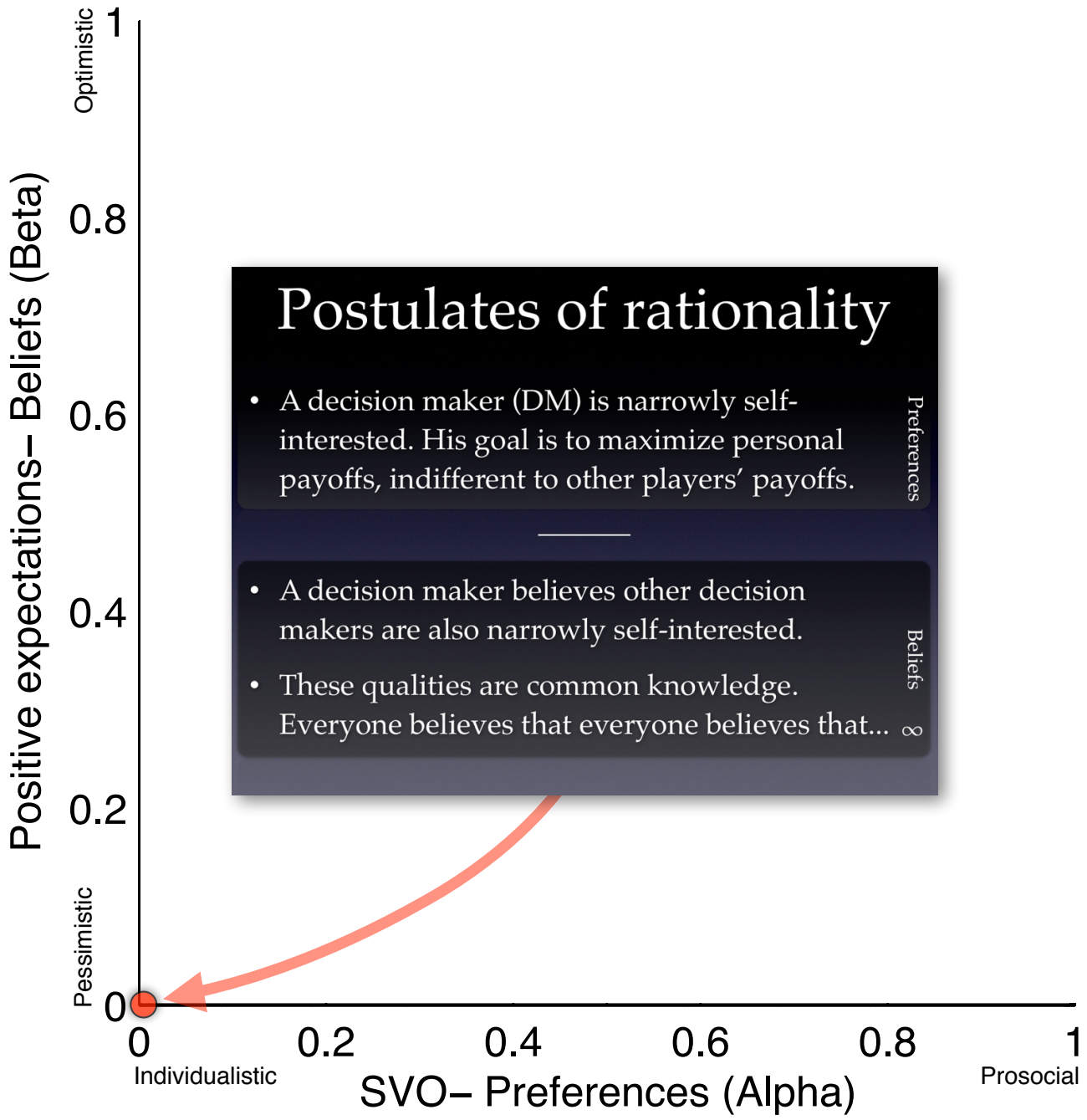






		Player B: Coop-erate	Player B: Defect
Player A	Cooperate	8, 8	0, 10
Player A	Defect	10, 0	5, 5





Postulates of rationality

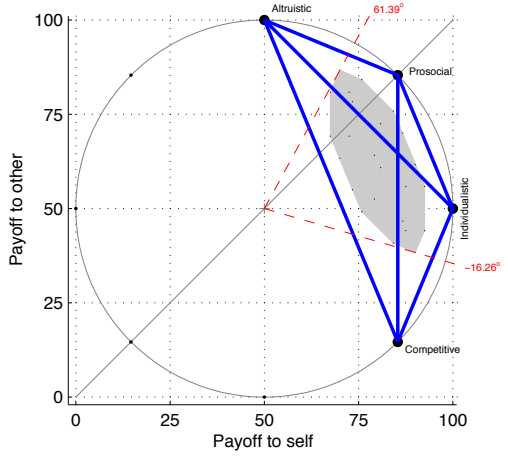
Preferences

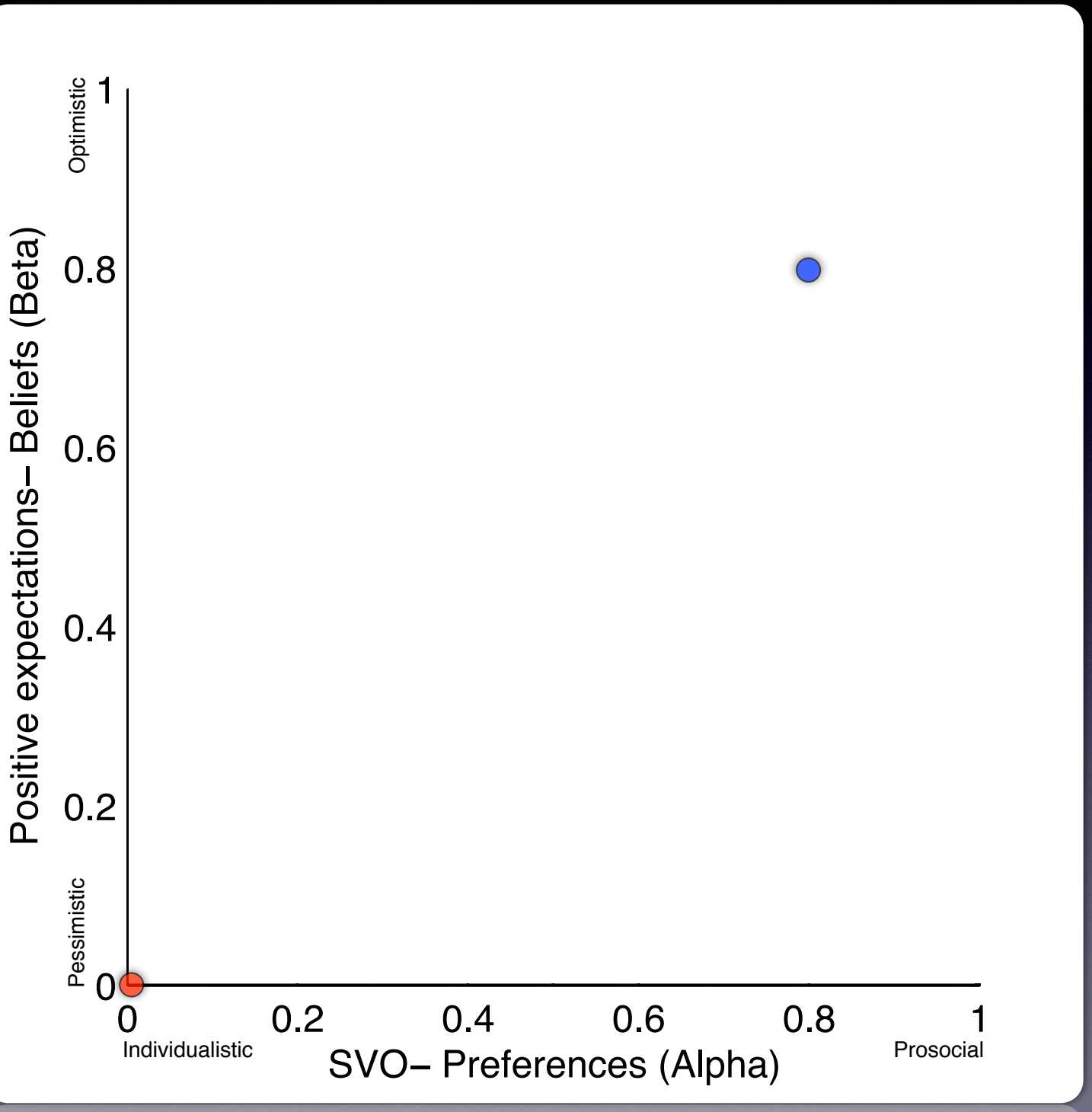
- A decision maker (DM) is narrowly self-interested. His goal is to maximize personal payoffs, indifferent to other players' payoffs.

Beliefs & ∞

- A decision maker believes other decision makers are also narrowly self-interested.
- These qualities are common knowledge. Everyone believes that everyone believes that...

		Player B: Coop-erate	Player B: Defect
Player A	Cooperate	8, 8	0, 10
Player A	Defect	10, 0	5, 5





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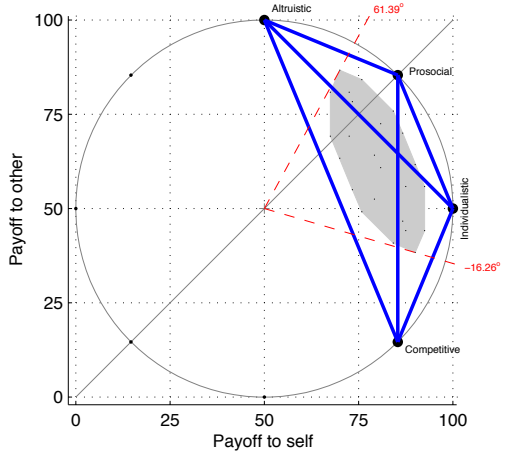
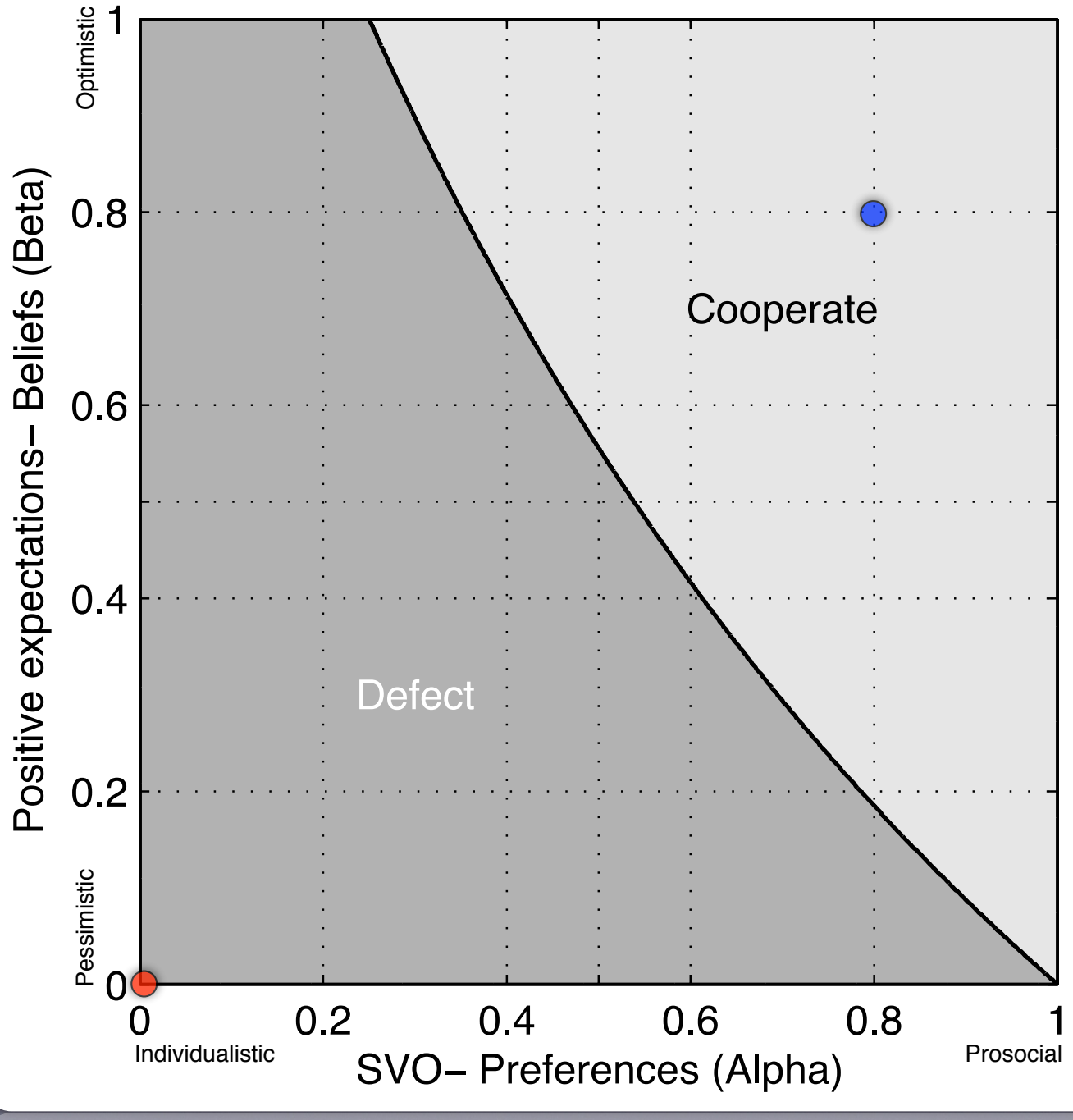
Player A	Cooperate	8, 8	0, 10
Player A	Defect	10, 0	5, 5





$$u(\pi_s, \pi_o) = \pi_s + \alpha \cdot \pi_o \qquad \alpha \in [0, 1]$$

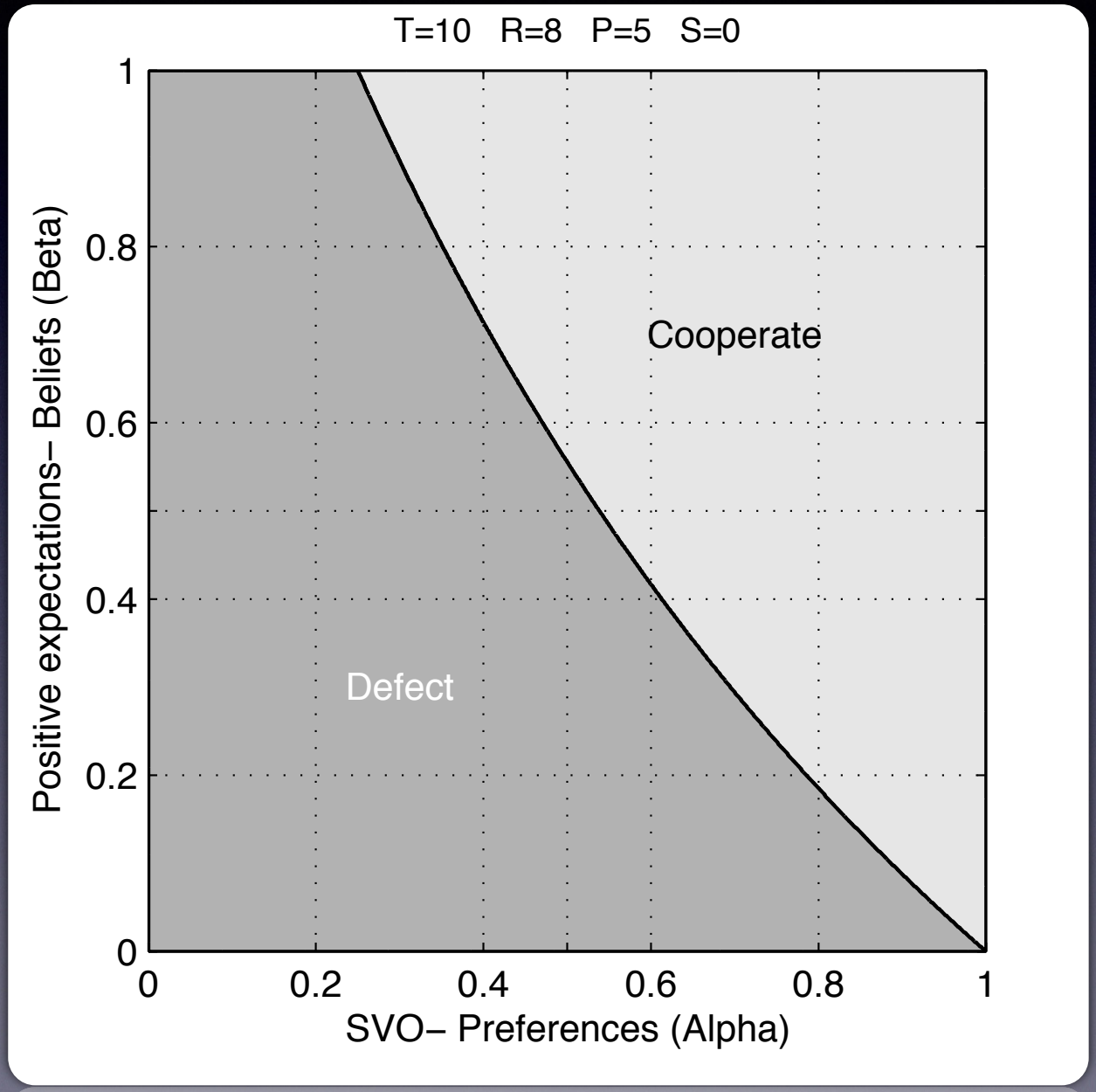
$$u(\mathrm{C}) = [\beta \cdot (R + \alpha \cdot R)] + [(1 - \beta) \cdot (S + \alpha \cdot T)]$$

$$u(\mathrm{D}) = [\beta \cdot (T + \alpha \cdot S)] + [(1 - \beta) \cdot (P + \alpha \cdot P)]$$

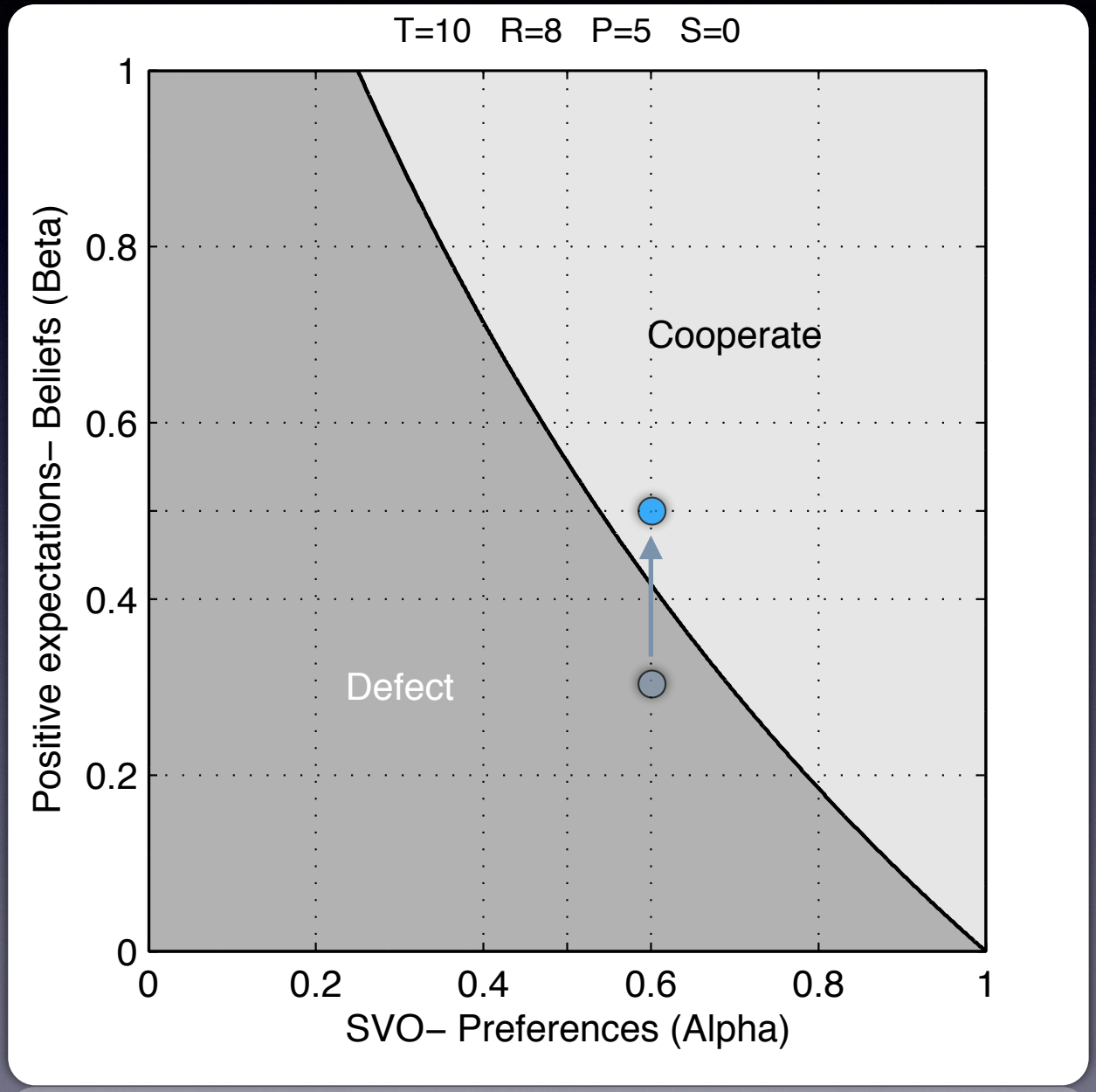
$$\beta_{crit} = \frac{P - S + \alpha P - \alpha T}{P + R - S - T + \alpha P + \alpha R - \alpha S - \alpha T}$$

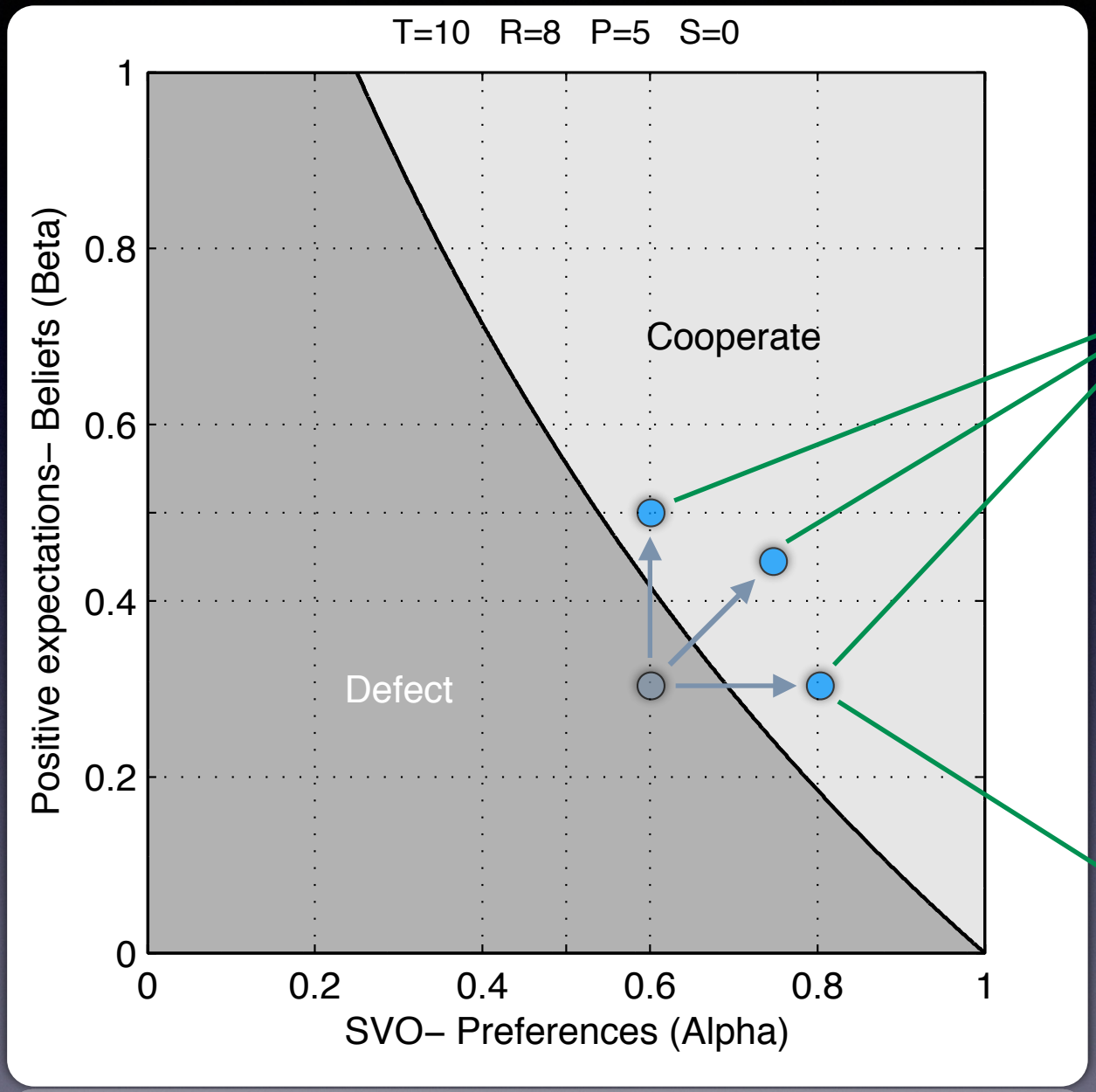
Murphy, R. O., & Ackermann, K. A. (2015). Social preferences, positive expectations, and trust based cooperation. Under review.

$$\beta_{crit} = \frac{P - S + \alpha P - \alpha T}{P + R - S - T + \alpha P + \alpha R - \alpha S - \alpha T}$$



$$\beta_{crit} = \frac{P - S + \alpha P - \alpha T}{P + R - S - T + \alpha P + \alpha R - \alpha S - \alpha T}$$

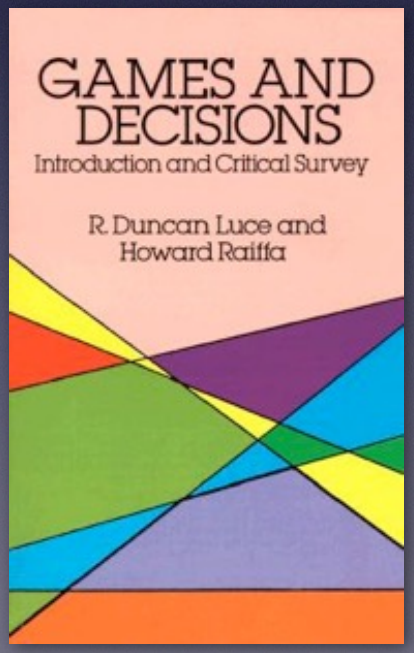




Bernold, E., Gsottbauer, E., Ackermann, K. A., & Murphy, R. O. (2015). Social framing and cooperation: The roles and interaction of preferences and beliefs. (The name of the game project)

Ackermann, K. A., Fleiss, E., Fleiss, J., Murphy, R. O., & Posch, A. (2015). Save the planet for humans' sake: The relation between social and environmental value orientations.

Indeed, one hopes that the unrealistic assumptions and the resulting theory will lead to experiments designed in part to improve the descriptive character of the theory.

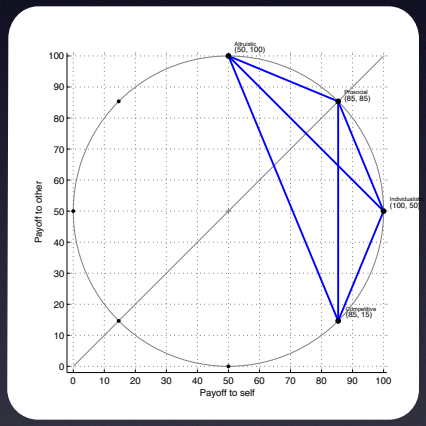


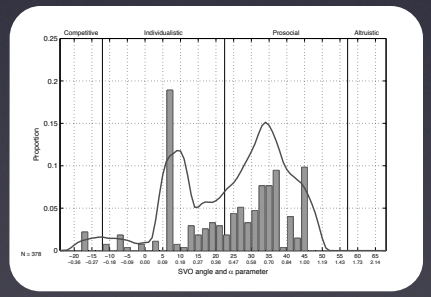
-Luce and Raiffa (1957) Games and Decisions, p. 5

Measurement

Preferences

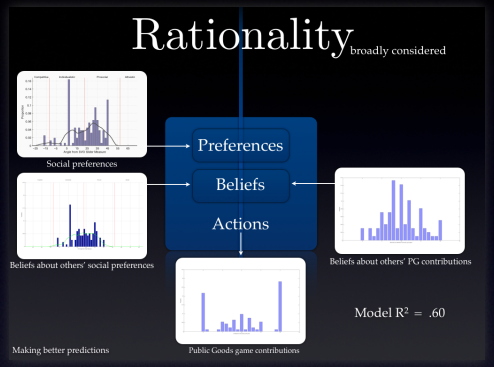
	Cooperate	Defect
Cooperate	3, 3	1, 4
Defect	4, 1	2, 2





Prediction

Beliefs



	Dependent variable: Contributions in the one-shot PGG	
Model	(1)	(2)
SVO	0.26***	0.26**
PG belief	0.71***	0.67***
SVO belief	-0.19*	-0.20*
SVO x PG belief		-0.08
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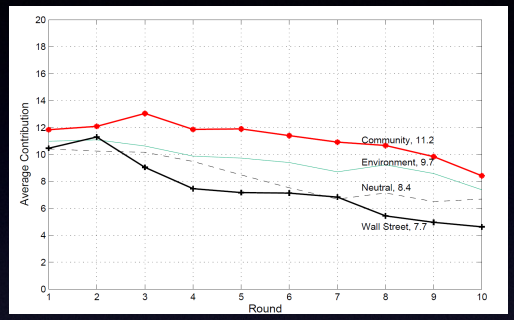
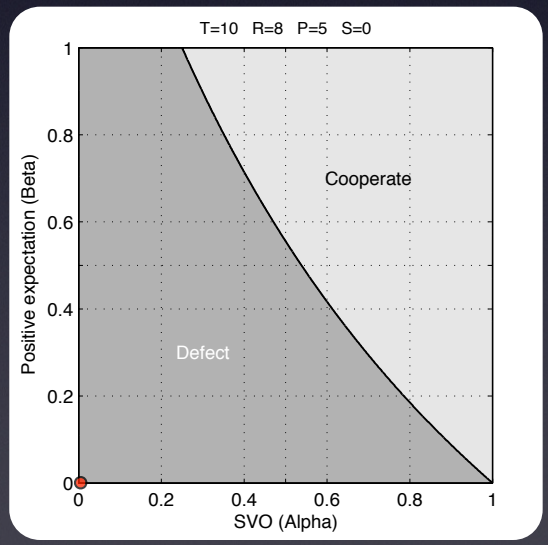
SVO belief x PG belief		-0.01
SVO x SVO belief x PG belief		0.11
R square	*0.60*	*0.61*
Adjusted R square	*0.59*	*0.59*

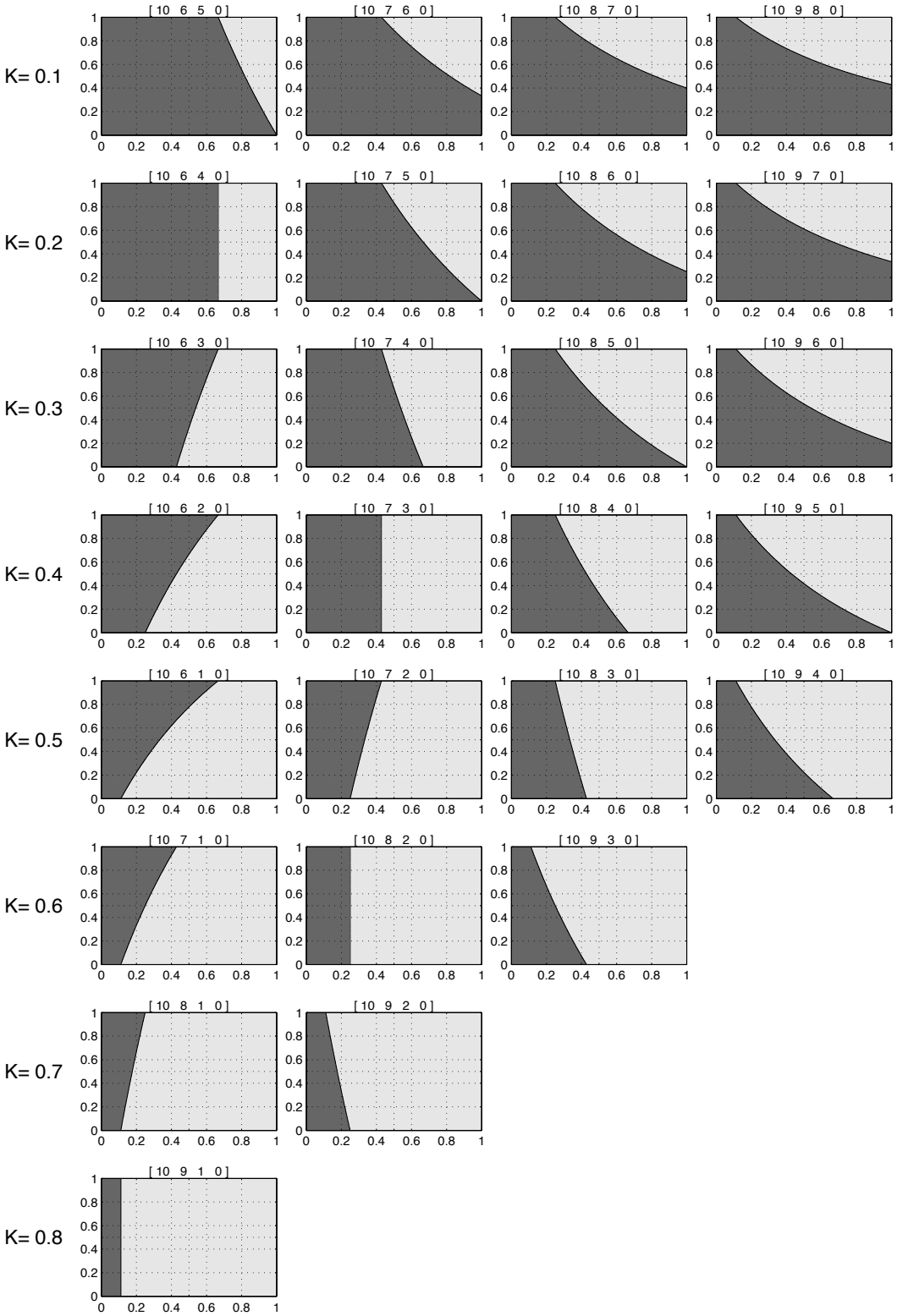
Selfish
≠
Rationality

Control

Mechanisms

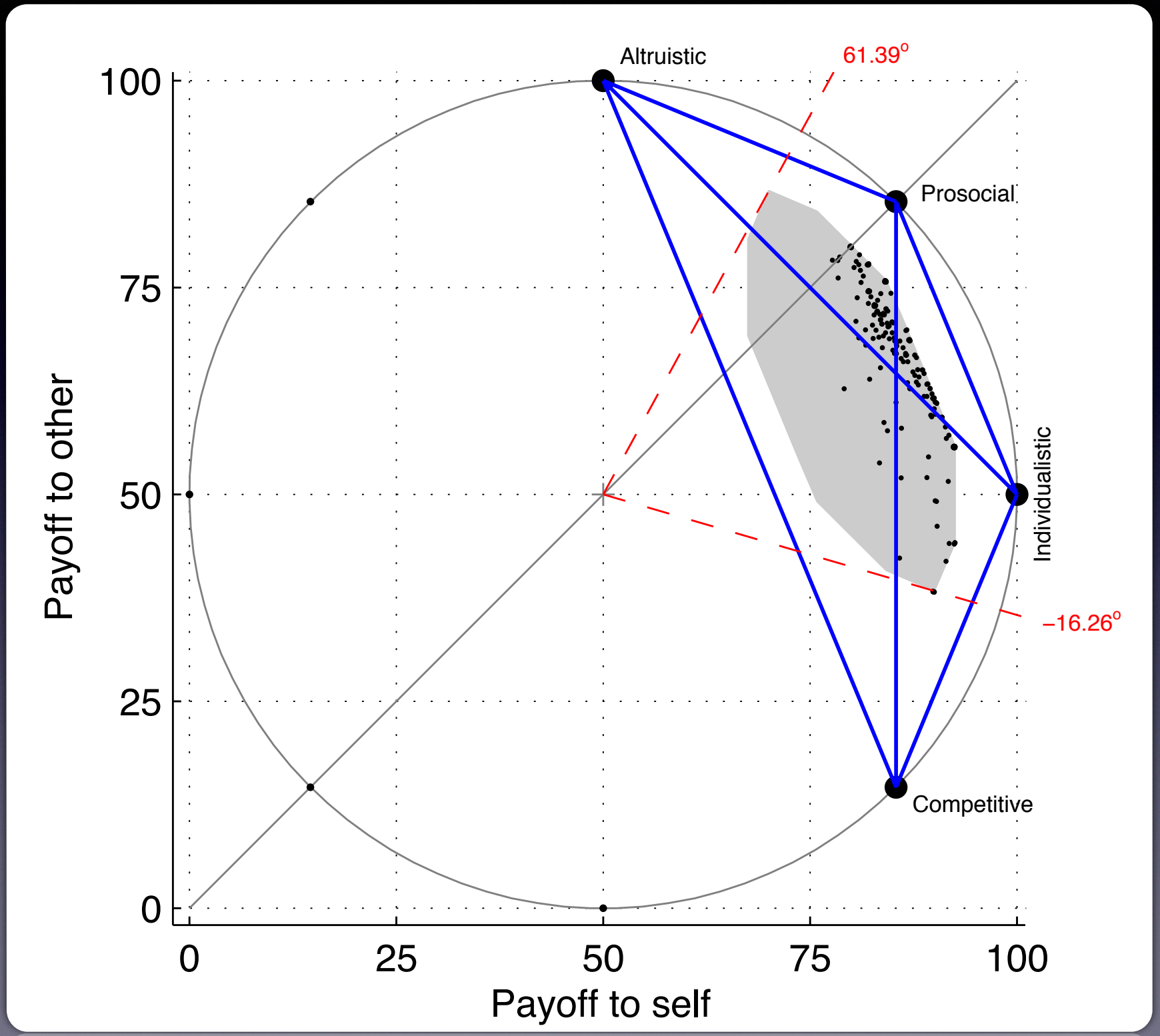


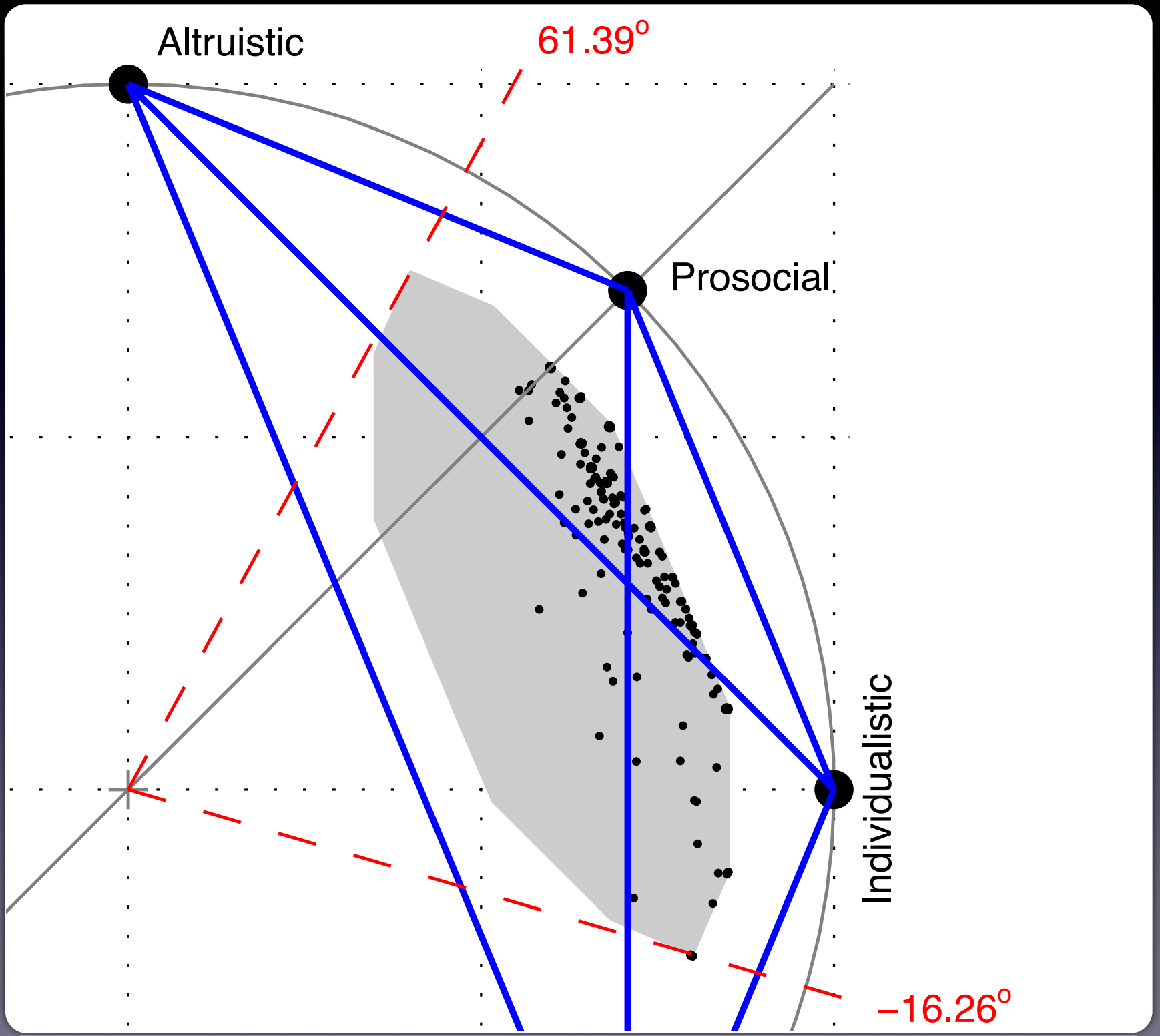




Variations in "cooperation thresholds"

Formal subjective expected utility modeling across different strategic situations


Altruistic
61.39°
Prosocial
Individualistic
−16.26°
Competitive
100
75
50
25
0
0
25
50
75
100
Payoff to other
Payoff to self


Altruistic
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