On the Role of Affect in Economics

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CREED

ORGANIZATION

- Behavioral science
  - cognition, emotion, and behavior the role of affect
- On the role of affect in economics
  - social ties economic significance of affective bonds
  - power to take emotional hazard in taxing and pricing
- Methodological & welfare-economic issues
- Conclusions

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Spinoza (1632-1677)

A Political Treatise

"For they [philosophers] conceive of men, not as they are, but as they themselves would like them to be. Whence it has come to pass that (…) they have never conceived a theory of politics, which could be turned into use (…)"

"And that I might investigate the subject-matter of this science with the same freedom of spirit as we generally use in mathematics, I have laboured carefully, not to mock, lament, or execrate, but to understand human actions; *and to this end I have looked upon passions, such as love, hatred, anger, envy, ambition, pity, and the other perturbations of the mind, not in the light of vices of human nature, but as properties*." [my emphasis]

[Schumpeter: every economist ought to be able to repeat it on his deathbed]

Ethics

Rigorous analytical treatment of emotions.

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Behavioral Science

Bounded rationality

limitations of cognition + interaction with emotion (Simon)

- **cognition**

  information-processing

  perception, attention, memory, reasoning, …

  various *cortical areas* involved

- **emotion**

  brain systems mediating fear or anger etc.

  not a single system mediating 'emotion'

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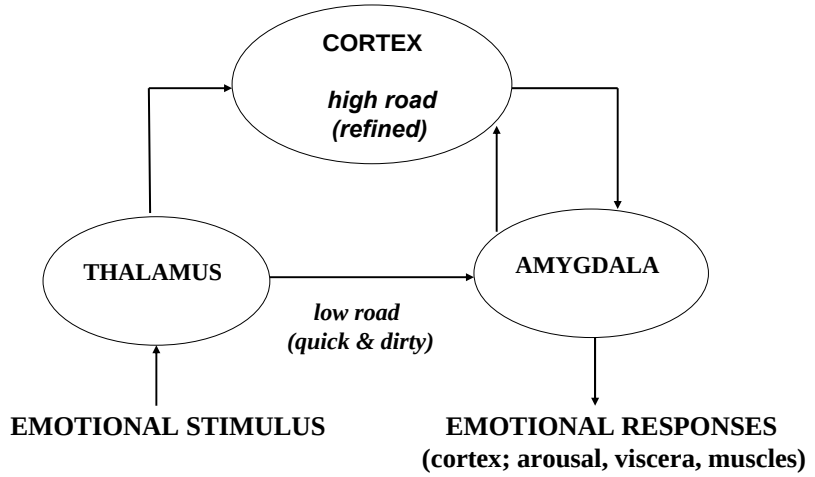
Cognitive-Emotional Interaction in the Brain (Fear)



[LeDoux 1996]

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Properties of emotions

- *unbidden* occur if interest deemed at stake
- *action tendency* urge to avoid or approach
- *largely unconscious*
- *primacy wrt cognition* 'emotional hijacking' possible
- *intensity* determinants: stake, proximity, unexpectedness, arousal, …
- *experienced, anticipated, remembered, imagined*
- *states & traits*

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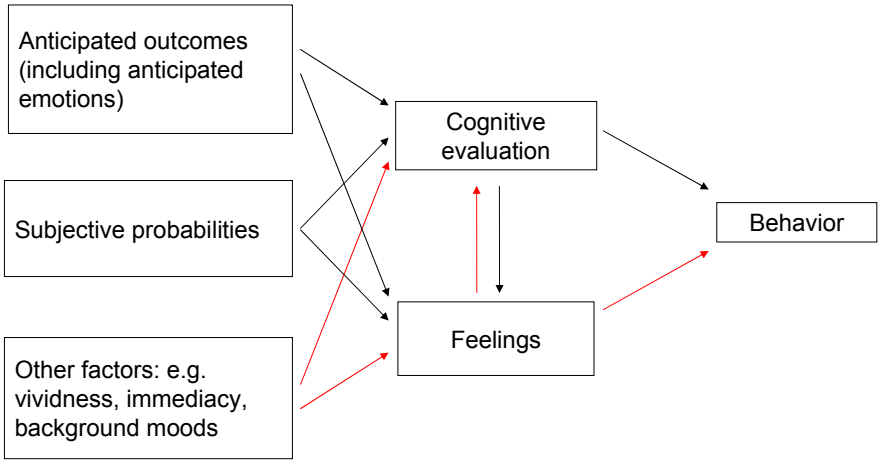
Cognition, Emotion, and Behavior



[Loewenstein et. al 2001]

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- **Tools for measurement**
  - self-reports (list of emotion words + scale for intensity)
  - physiology (e.g. skin conductance, heart rate)
  - facial expressions
  - neural techniques (e.g. fMRI)

- **Self reports**
  - easy to use
  - very well validated
  - distinguish emotions (e.g. anxiety vs. anger)

  caveat: no direct measure

nevertheless: „most common and potentially the best way to measure“
[Robinson & Clore 2002]

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References to Emotions in Economics

- **models of specific emotions**
  - regret [Bell 1982, Loomes & Sugden 1982]
  - disappointment [Bell 1985, Loomes & Sugden 1986]
  - guilt [Erard & Feinstein 1994]
  - envy [Kirchsteiger 1994]
  - anxiety [Wu 1999, Caplin & Leahy 2001]
- **more general studies**
  - Smith (The Theory of Moral Sentiments 1759/1790)
  - Simon (1967)
  - Scitovsky (1976/1992)
  - Hirshleifer (1987)
  - Frank (1988)
  - Elster (JEL 1998)
  - Camerer et al. (JEL 2005)
- **experimental studies**
  - *self-reports*: Bosman & van Winden (2002), Gächter & Herrmann (2006)
  - *SCR*: Ben-shakhar et al. (2005), Camille et al. (2004)
  - *neuro-imaging*: Sanfey et al. (2003), De Quervain et al. (2004)

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Social Ties

Colleagues in office, partners in trade, call one another brothers; and frequently feel towards one another as if they really were so. Their good agreement is an advantage to all.

Adam Smith, The Theory of Moral Sentiments, Part VI, section II

Essence: care about *specific* other

- incentive to cooperate … [Becker 1974, Granovetter 1985, Coleman 1990]
- but … can be negative → incentive to hurt
- dynamic nature → endogenous preferences
- studies: job search, family, price formation, organizations

[Boorman 1975, Becker 1981, Okun 1981, Rotemberg 1994]

▸ focus here: local public goods

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Private provision of public goods

- *standard model* $U_h(x_h,g)$, $y_h = x_h + g_h$, $g = \sum_i g_i$
  - inefficiency, more serious with more people
  - invariance wrt income distribution and public provision

  [Bergstrom et al. 1986]
- *repeated game*
  - same outcome if finitely repeated
  - any outcome sustainable if infinite or uncertainty wrt length or types
- *experimental results*

  anomalous cooperation

- focus here: *affective* ties formation

  first shot at complex process

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Dynamic model of social ties and public goodprovision

[van Dijk & van Winden 1997]

- two individuals (*h*, *k*)
- care for other → interdependent utility function, with weight α_{hk}

$$V_h = U_h U_k^{\alpha_{hk}} \ (h, k = i, j, h \neq k) \quad \text{or} \quad V_h = \ln U_h + \alpha_{hk} \ln U_k$$

$$U_h = U_h(x_h, g) \ (h = i, j), \quad y_h = x_h + g_h \ \text{and} \ g = g_i + g_j$$

$$\partial g_h / \partial \alpha_{hk} > 0, \ \partial g_k / \partial \alpha_{hk} < 0 \ \text{and} \ \partial g / \partial \alpha_{hk} > 0$$

- special cases: $\alpha_{hk} = 0$ (standard), $\alpha_{hk} = 1$ (efficiency), $\alpha_{hk} = -1$ (g = 0)
- invariance wrt income distribution & public provision: for *given* ties (!)

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dynamics of ties

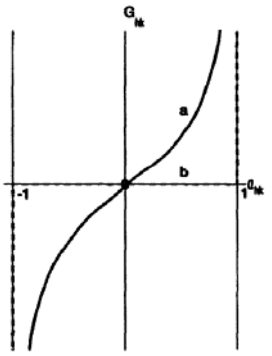
- affect is key component
- develop through prolonged interaction
- decay over time
- sentiments generated by success/failure of interaction

[Homans 1950, Granovetter 1973, Baumeister & Leary 1995, Lawler et al. 1995]

Stimulus: $G_{hk} \equiv g_k - \varepsilon_h \cdot g_h > (<)\, 0$

$$d\alpha_{hk}/dt = f_h(G_{hk}, \alpha_{hk})$$

Phase-diagram



(a) $f_h = 0$ with attrition; (b) $f_h = 0$ without attrition.

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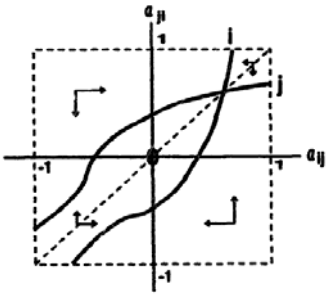
important assumptions

- ties unconscious byproduct of interaction
- myopic behavior

→ series of contributions connected via ties development

$$d\alpha_{hk}/dt = f_h(G_{hk}(\alpha_{hk}, \alpha_{kh}), \alpha_{hk})$$

Phase diagram



(identical individuals) i: $f_i = 0$, j: $f_j = 0$.
$0 < \varepsilon < 1$

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main results

- unique and stable social-ties equilibrium
- if equal preferences and income:
  - ties symmetric & positive ($\alpha_{hk} = \alpha_{kh} > 0$)
  - g(ties) > g(standard)
- if different preferences or incomes:
  - ties asymmetric (can be negative)
  - if incomes different: g(ties) ≥ < g(standard)

also

- public provision can lead to *lower total* provision !
  via negative effect on ties → crowding out of intrinsic motivation
- reduction not quickly taken over by private provision
  ties formation takes time

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First Experimental Evidence – Public Good Provision

[van Dijk, Sonnemans & van Winden 2002]

Design

- Game:
  - two-person, repeated pg-game, partners
  - interior standard Nash-equilibrium
  - contributing everything is group optimal
- Tie measure:
  requires evidence on 2 attitudes:
  (1) wrt generalized other
  (2) wrt specific person interacted with

  tool: 'Ring-test' (Liebrand 1984)

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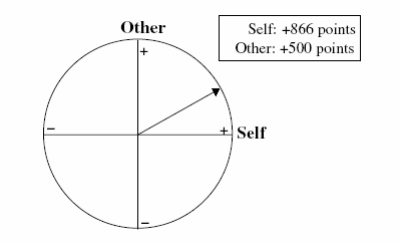
(1) Attitude towards generalized other (measured *before game*)

Ring-test of 'social value orientation' (SVO)

- each subject randomly & anonymously matched with another subject
- subject repeatedly chooses between two 'self–other' payoff combinations
- all combinations (x, y) are located on a circle: $x^2 + y^2 = z^2$ (radius z)
- each allocation represented by a vector

‣ *angle* of aggregate vector shows *care for generalized other* (SVO)



length of aggregate vector is maximally 2xz (showing consistency)

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(2) Attitude towards *specific* other (measured *after game*)

applying Ring-test again, now with person interacted with

→ *2nd angle*, showing *care for specific other*

‣ ***measure of tie***: difference between 2nd and 1st angle

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Results for equal endowment & game interrupted for 2nd Ring-test

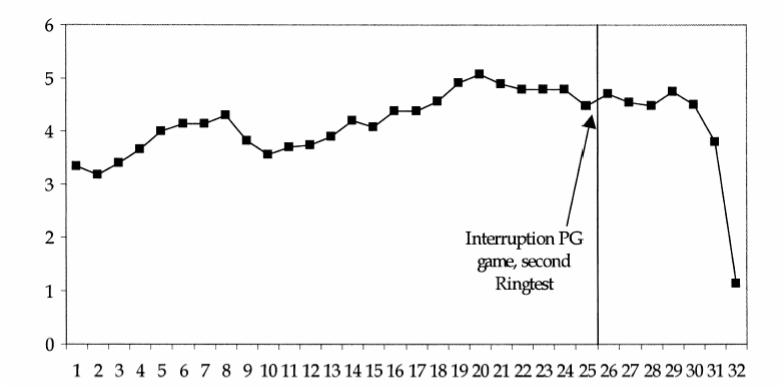

Fig. 2. Average contribution level to the public good per period in the second experiment. The number of markers allocated to the public account according to the dominant strategy is subtracted.

- Contributions and SVO are correlated
- Evidence of reciprocity

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Results cont.

- Evidence of social tie formation

Linear regressions with the angle measured by the second Ring-test as dependent variable and, as independent variables, the social value orientation (angle measured by the first Ring-test) and earnings in the last five periods of the public good game

Experiment 2	*B*	SE *B*	*β*	*t*	Sign. *t*
Social value orientation	0.715	0.141	0.564	5.056	0.000
Earnings period 21–25	0.048	0.019	0.283	2.536	0.015
Constant	−33.074	14.661		−2.256	0.029
Multiple *R*: 0.712					
Adjusted *R* square: 0.484					

- Similar results with different measures of interaction success
  or with 2nd Ring-test at very end
- Note that reputation effects are excluded and real money is at stake

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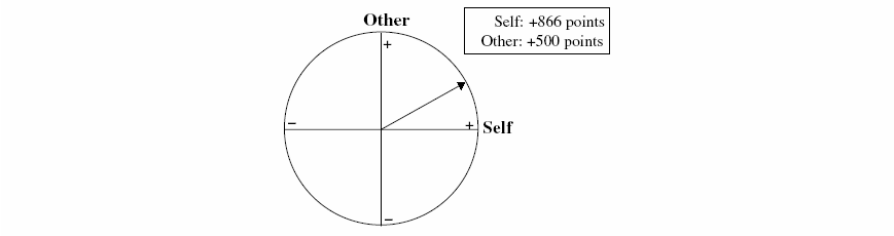
With larger groups: Ring-test time consuming tool

→ Circle-test: single decision

[Sonnemans, van Dijk & van Winden 2006]



computer screen of Circle-test

arrow can be changed by clicking on circle

numbers (points) automatically updated

single decision made

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Social ties structures in groups

public good game with 4 players per group

RESULTS

• average contributions similar, but … large variance between groups

• successful groups → more positive ties … but cohesion not guaranteed

cf. 'minimal group paradigm'

• differences in post-angles correlated with differences in contributions

• willingness to continue game with a partner correlated with sentiment and tie

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- **Summary on social ties**
  - important concept for welfare economics
    - intrinsic motivation for cooperation … or aggression, if negative
    - government policies may *crowd out* or *crowd in* this motivation
  - can be modeled
  - some experimental support
- **Issue**

  are feelings driving factor?
- **Research strategy**

  focus first on a simpler context for role of affect

  appropriation ▸ anger ▸ Power-to-Take game (PTT)

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Power to Take

Power-to-Take Game

[Bosman & van Winden, 2002; Bosman, Sutter & van Winden 2005]

two-person one-shot game

randomly matched A (proposer) and B (responder)

same income/endowment

two-stages:

- *1st stage:* A claims % of B's income (= *take rate*)
- *2nd stage:* B decides to *destroy* nothing, part or all of *own* income (destroyed income lost to both !)

[cf. Ultimatum Game: 1 pie, claim on total, all or nothing destroyed]

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Behavioral findings

- mean/median take rate: 60%
- 58% of income destroyed if take rate above 80%

  only 8% if take rate below 60%
- 37.5% of the responders destroy

  24.7% of endowment destroyed → *pure welfare loss*

Note: take rates similar to proposals in Ultimatum Game ….

but not quite … only responder's income at stake in PTT !

[in UG about 40% for responder … in PTT only 20%]

In sequel focus on responders

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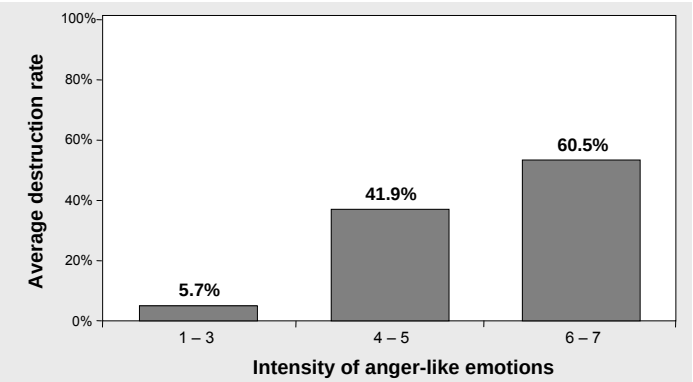
Evidence of role emotions

measured through self-reports

▸ destruction related to *anger* (anger, irritation, contempt)



[based on data Reuben & van Winden 2006]

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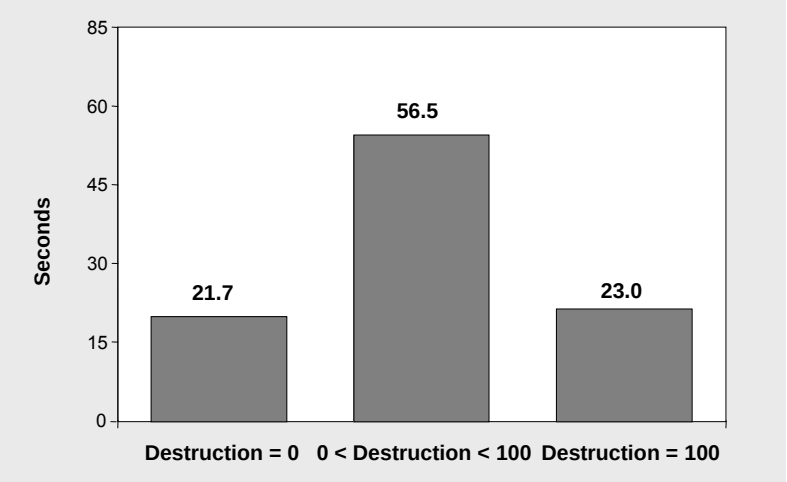
Responders' average decision time



[based on data Reuben & van Winden 2006]

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- anger related to take rate …

  and *expected* take rate …

  ... but *not* the fair take rate !

TABLE C2 – ORDERED PROBIT MODEL ESTIMATING THE INTENSITY OF ANGER-LIKE EMOTIONS

Variable	Coefficient	Std. Error	*p* value
Take Rate	0.0146	0.0071	0.039
Take Rate – Expected Take Rate	0.0143	0.0039	0.000
Take Rate – Fair Take Rate	0.0002	0.0037	0.957
Economist	0.2178	0.2007	0.278
Female	–0.3185	0.1930	0.099
Friends	–0.0018	0.1891	0.992
Number of obs. = 126		LR $\chi^2(6)$ = 47.49	
Log likelihood = –322.955		Prob > χ^2 = 0.000	

[Reuben & van Winden 2008]

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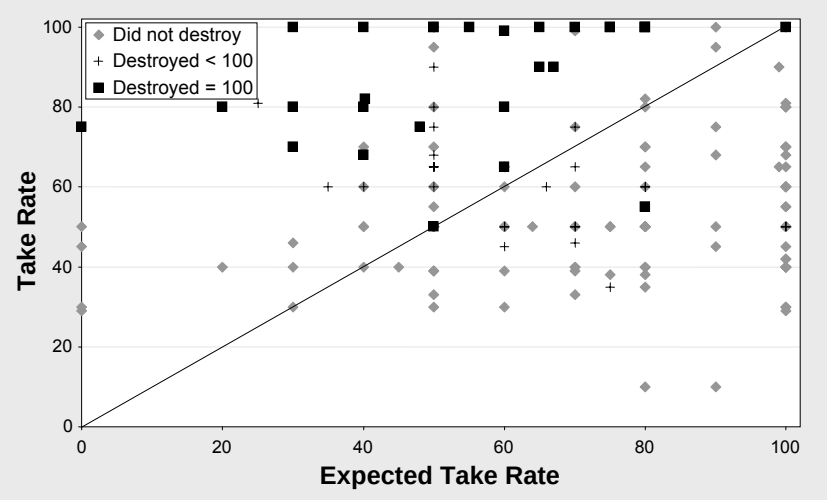
Destruction: optimists ($t^e < t$) vs. pessimists ($t^e > t$)



[based on data Reuben & van Winden 2006]

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Physiological support – skin conductance response

[Ben-Shakhar, Bornstein, Hopfensitz & van Winden 2007]

SCR reflects emotional arousal (sweat → conductance of electricity)

RESULTS

- behavioral findings replicated

  destruction again related to frustrated expectations

- similar role of anger – frustrated expectations again important

- *skin conductance related to destruction & self-reported anger*

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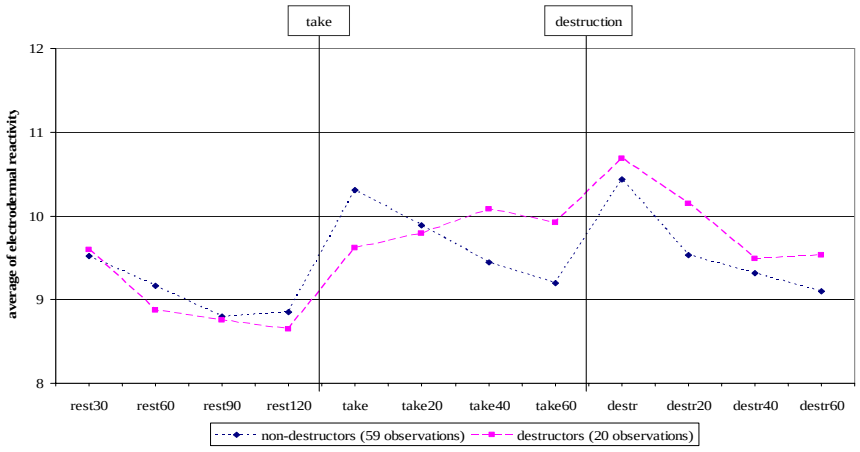
Skin conductance level & behavior of responders



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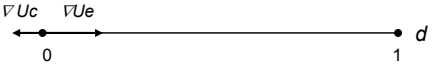
Modeling responder behavior in PTT

[van Winden 2001]

- relevant action space: [0, 1] interval for rate of destruction (*d*)
- dual system approach: (1) cognitive system & (2) emotional system
  both involved in (expected) reward processing
- simple representation (using Weber-Fechner), given take rate *t*:
  - cognitive reward represented by gradient/force: $\nabla U_c = -c/(1-d)$
  - emotional reward represented by: $\nabla U_e = e/d$ (*e:* emotional intensity)



outcome (interior): $\nabla Ue + \nabla Uc = 0 \longrightarrow d^* = 1/(1 + c/e)$

if $e = exp[\varepsilon_1 t + \varepsilon_2(t - t^e)]$ and $c = exp(\gamma) \longrightarrow ln\,[d^*/(1-d^*)] = \varepsilon_1 t + \varepsilon_2(t - t^e) - \gamma$

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➢ Summary on Power-to-Take experiments

- affect can be measured (self-reports, neuro techniques)
- significant role of affect in reciprocity
- can be modeled (two-systems cognition-affect model)
- other PTT experiments: stake size (China), groups, gender, repeated game, prior contest game

➢ Next issues

(1) direct evidence of feelings underlying social ties?

(2) do social ties affect responder behavior in PTT?

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Back to Ties

Direct support for affective component of ties

[Brandts, Riedl & van Winden 2006]

Design: repeated social dilemma (partners)
sequence of events:
(1) circle test
(2) social dilemma game
(3) manikin (sad → glad face)
(4) emotions list (+ intensity scales)
(5) circle test

	0	*10*
0	160, 160	410, 40
10	40, 410	290, 290

stage game

Finding: *attitude towards partner (final angle)*
- *directly related to emotions*
- only indirectly to earnings

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	coef.	st.err.	# obs.and fit
general well-being			
interaction success	.00099**	.00019	$n = 52$
	(0.000)		
constant	-1.0332	1.4152	adj. $R^2 = .35$
	(0.469)		
anger			
interaction success	-.00072**	.00016	$n = 52$
	(0.000)		
constant	8.0992**	1.2272	adj. $R^2 = .27$
	(0.000)		
joy			
interaction success	.00065**	.00015	$n = 52$
	(0.000)		
constant	-1.0619	1.1228	adj. $R^2 = .27$
	(0.349)		
guilt			
interaction success	.00020	.00012	$n = 52$
	(0.096)		
constant	.26935	.90073	adj. $R^2 = .04$
	(0.766)		
irritation			
interaction success	-.00084**	.00017	$n = 52$
	(0.000)		
constant	9.4749**	1.2504	adj. $R^2 = .33$
	(0.000)		
surprise			
interaction success	-.00031	.00019	$n = 52$
	(0.113)		
constant	5.5645**	1.4368	adj. $R^2 = .03$
	(0.000)		
contempt			
interaction success	-.00049**	.00017	$n = 52$
	(0.005)		
constant	6.0928**	1.2599	adj. $R^2 = .13$
	(0.000)		

Table 5: Determinants of the final angles of A and B players in NCC (Seemingly unrelated regressions)

	A and B players towards each other (#a equations) and unrelated third player (#b equations)					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Initial	.4870**	.4601**	.3926*	.3910**	.3937*	.3910**
angle	(.003)	(.000)	(.014)	(.000)	(.014)	(.000)
Interaction	.0549		.0200			
success	(.320)		(.751)			
Sadness			-1.499	1.034	-1.684	1.034
			(.526)	(.471)	(.463)	(.471)
Fear			.5779	-3.223	.4419	-3.223
			(.855)	(.100)	(.888)	(.100)
Guilt			4.504*	2.296	4.612*	2.296
			(.050)	(.106)	(.043)	(.106)
Surprise			3.808*	-.1007	3.780*	-.1007
			(.022)	(.923)	(.023)	(.923)
Contempt			-5.075**	-.0354	-5.120**	-.0354
			(.007)	(.976)	(.006)	(.976)
Happiness			-.6068	2.3760	-.3247	2.3760
			(.790)	(.071)	(.878)	(.071)
Constant	-10.43	2.602	-3.713	-6.678	.7016	-6.678
	(.450)	(.264)	(.837)	(.351)	(.951)	(.351)
R^2	.1845	.2986	.3608	.3911	.3586	.3911
N^a	52	52	52	52	52	52
Model comparisons		Model 1 vs Model 2		Model 2 vs Model 3		
LR χ^2		23.20		.0100		
p-value		.0275		.7514		

Ties matter for negative reciprocity

[Reuben & van Winden 2008]

PTT with 2 responders: friends vs. strangers responders

Findings:

(1) friends destroy more and more frequently

due to high destruction rates when faced with high take rates

(2) friends are better predictors of other's destruction rate

(3) friends have greater (emotional) incentives to coordinate

WHY?

(i) friends do not experience the strong negative emotions of strangers when destroying more than other responder

(ii) unlike strangers, friends get a positive emotional boost from coordinating on same destruction

► may be helpful for understanding collective action

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Related neural substrates

Negative reciprocity in Ultimatum Game [Sanfey et al. 2003]

- Interaction between: *anterior insula* (INS) emotion
  and
  dorsolateral prefrontal cortex (DLPFC) cognition
- Relative activation of INS correlated with rejection of offer

Reaction to cooperation in PD Game [Rilling et al. 2004]

- Activation of *striatum* (reward area) if mutual cooperation experienced
  in excess (!) of activation if same payoff with computer

Reaction to defector in PD Game [de Quervain et al. 2004; Singer et al. 2006]

- Activation of *striatum* when punished (no matter who punishes)

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Method. & Welfare Econ. Issues

On modeling … utility function tinkering …

- Some tradition (envy, guilt) – new impulses [Rabin 1993, Cox et al. 2007]
- Fehr et al. (2005): economic approach to emotions

  emotions change the hedonic consequences of actions
  yet, given these consequences
  subjects decide *rationally* by weighing the costs and benefits

  neglects: impact on attention, memory, arousal, …; connectivity

Properties of emotions & interaction with cognition to be studied.

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Brain systems & dynamics

- negative and positive emotions differ

  "bad is stronger than good" [Baumeister et al. 2001]

- also among themselves – different brain systems involved

  for example: anger ▸ risk seeking, anxiety ▸ avoidance

- emotion states are dynamic

  for example: fear can turn into anger

- hot-cold empathy gap [Loewenstein 1996]

  difficult to recall or predict (one's own or others') emotions

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Welfare economic issues

- *Emotional hazard*

  risk of welfare loss due to emotional responses

  - even if lump-sum taxation!
  - morals need not be involved [moral hazard as special case]

- *Social ties → intrinsic motivation for cooperation*

  - social capital
  - intervention may cause crowding-out / crowding-in
  - influence of mobility & migration

- *Decision utility vs. experienced utility* [Kahneman et al. 1997]

  anticipated emotions differ from experienced emotions

  - hot-cold empathy gap
  - Adam Smith (TMS): ambition → industry → wealth … not happiness!

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Conclusions

- Affect matters in economics
- Welfare economic consequences

  many open issues
- Affect can be measured

  various complementary tools available
- Modeling possible

  systems approach required

  properties emotions to be studied

  … not just utility function tinkering

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Thanks for your attention!

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APPENDIX

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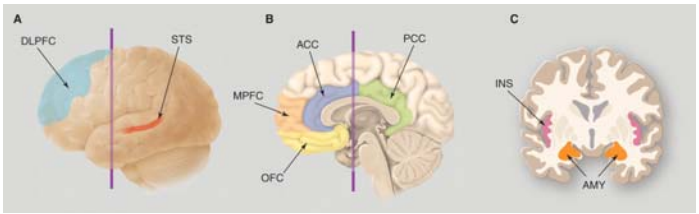
Map of brain areas commonly activated in social decision-making studies



[Sanfey 2007]

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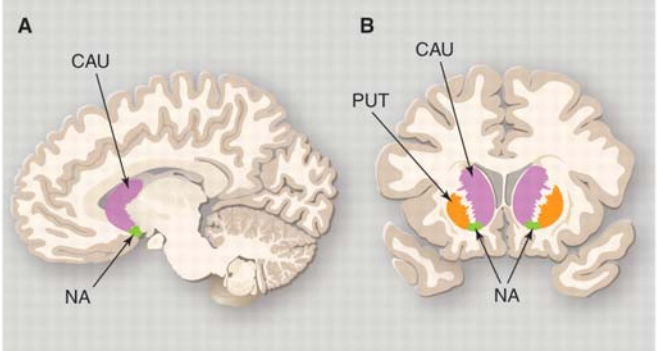
Subcomponents of the Striatum, involved in the processing of reward



[Sanfey 2007]

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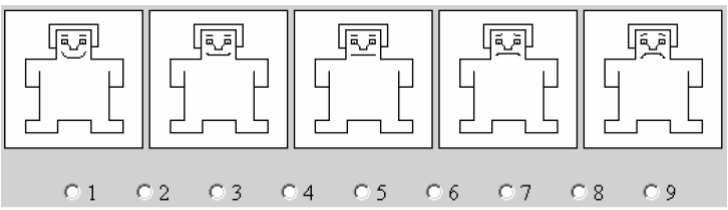
Example: list of emotions with scale for experienced intensity

We would like to know how you feel at this very moment [or: how you felt when you observed …]. Please, look carefully at the following list of emotion words. We kindly ask you to indicate next with what intensity you experience [experienced] each of these emotions:

- sadness: not at all |__|__|__|__|__|__|__| very intensely
- joy: not at all |__|__|__|__|__|__|__| very intensely
- shame: not at all |__|__|__|__|__|__|__| very intensely
- anger: not at all |__|__|__|__|__|__|__| very intensely

Example: Self-Assessment Manikin for general well-being



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Public Good

characteristics: - no one can be excluded
- fully consumed by all (no rivalry in consumption)

example of public good experiment (voluntary provision)

- 2 players: A and B
- each endowment of 10 euros
- to be allocated to a *private account* and/or a *public account* (public good)
- each euro put into the private account pays 1 euro
- each euro in the public account pays 0.70 euro, to *both* players

Suppose contribution A (B) to the public good is c_A (c_B) euro

then: payoff A = $(10 - c_A)1 + 0.70\ (c_A + c_B)$, and similarly for B

if rational, selfish (payoff maximixing) players: $c_A = c_B = 0$ (A,B: 10 euro)

efficient (welfare maximixing) outcome is: $c_A = c_B = 10$ (A,B: 14 euro)

Important: - return priv acc > return pub acc for each player
- return priv acc < return pub acc summed over all players

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