Rational Cognition

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Theorizing Sociological Explanation

- *The* successful paradigm of rational choice sociology: Coleman's boat
  2. Environment shapes individual situation with regard to preferences, restrictions and interpretation.
  1. Individual decides for an option.
  3. Aggregation of consequences to macro result.

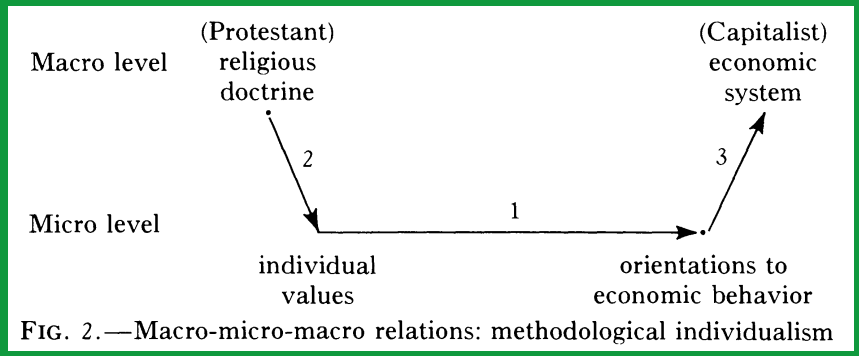

FIG. 2.—Macro-micro-macro relations: methodological individualism

(McClelland 1961, Coleman 1986)

- Discussion
  - Debates focus on hypotheses regarding individual behavior.
  - Less theory on 'bridging hypotheses' regarding how context shapes individual situation.

    (Lüdemann/Rothgang 1996, Opp 2009)

- Done so far:
  - Interpretation based on frames.

    (Kahneman/Tversky 1979, 1984, Lindenberg 1989, Esser 1996, 1999, 2000, Stockè 2002)
  - Not done: preferences.
  - Here: restrictions, i.e. resources.

Overview

Frames and resources

- Frames not only affect interpretation, but are a central capital resource:
  - Human capital: Learning establishes frames which produce simulations guiding actions, so skills are embodied in frames.
  - Social capital is embodied in frames of interactive behavior.
  - Property rights are institutions subject of framed beliefs.
  - Physical capital depends on skills (creation/usage), property rights.
- The term 'frame' is interdisciplinary.
  - Social science applications starting with sociology (Schütz, Goffman 1957)
    - e.g. social movements (Snow/Benford 1992), management (Eisenhardt 1989, Kaplan 2008), communication (Gamson 1992) and political opinion formation (Zaller 1992, Druckman 2003)
  - Psychology (Kahneman/Tversky 1979, 1984, Kahneman 2003)
    - e.g. health behavior (Rothman 1997), spacial reference (Mou 2002)
  - Neurosciences, cognitive psychology (Feldman 1995, Colby 1998, Barsalou 1999)

Frames and simulations (Barsalou 1999)

- During cognition the brain produces frames as active relations of neurons to represent the properties of perceived entities/events.
- The production of frames uses existing frames, i.e. is recursive, but reality-dependent.
- Frames produce simulations with twofold productivity:
  - Inexisting but imaginable events can be simulated.
  - They allow for a faster i.e. 'cheaper' reproduction of perceived events.

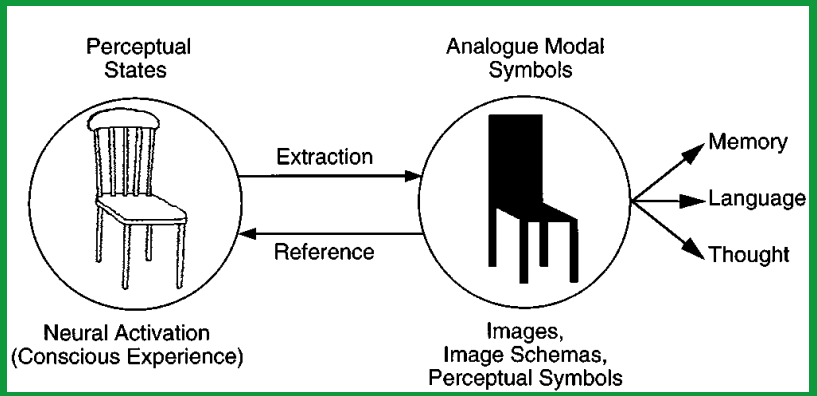

Figure 1. The basic assumption underlying perceptual symbol systems: Subsets of perceptual states in sensory-motor systems are extracted and stored in long-term memory to function as symbols. As a result, the internal structure of these symbols is modal, and they are analogically related to the perceptual states that produced them.

(Barsalou 1999)

Rational Cognition

- The inexpensiveness of simulation is a first aspect of rational cognition:
  - Conscious behavior always depends on existing frames which allow for a simulation of the behavior.
  - Therefore even one-shot cognitions can build simulations to make behavior possible which was not possible before.
  - This is true even for inexpensive and accidental cognitions where no real choice is involved.

Rational Cognition

- Simulation makes cognition a choice situation:
  Being confronted with some event, one can
  - either be satisfied with the simulations available
  - or closer inspect the event, implying some cost.
- From a rational choice perspective, cognition is investment under risk:
  - It can open up new successful, preferred possibilities,
  - it can likewise lead into a dead end without any positive pay-off.
- These investments are not independent from each other:
  - They can have a strongly positive linkage,
  - while they can leave each other at best unaffected.
- If cognitive investments are costly and interaction effects are uncertain,
  how do we get information which cognitive investments go well together?

Rational Cognition

- The answer is coupling.
  There are two coupling types:

1. Ego's coupling
   - Situations may arise in which a sequence of cognitions is passed with high probability, more or less involuntary.
   - Since cognition situations are coupled which are passed by the perceiving subject, I term this ego's coupling.
2. Alter's coupling
   - Since behavior is guided by frames, in the opposite direction behavior can be used to deduce others' frames.
   - Here, situations may arise in which a sequence of frames can be observed for one or more others, and a more or less voluntary co-adoption can be assumed. I term this alter's coupling.

- The types are not mutually exclusive, but open up a dimension.

Rational Cognition

Both coupling types are beneficial for the estimation of interaction effects:

1. Ego's coupling is efficient:
   - Analogous perception situation chains allow the low-cost simulation of parts of the situations.
2. Alter's coupling is informative:
   - The usage of coupled frames is a hint for positive interaction effects.

Both kind of coupling processes improve the cost/benefit ratio of derived cognitions. Currently we do not study differences.

- The central heuristic for understanding resource endowments is, then, to look for coupled cognitive situations, i.e. frames which are either involuntarily or voluntarily linked.

Applications

- There are diverse applications possible:
  - Dynamics behind broken window theory and first mover advantages.
  - Understanding secular rises in cognition levels:
    - Important for survey research: Complex routines once invented being accessible only for trained personnel can become everyday frames and accessible for everyone (e.g. slider, Murphy 2010).
  - Within sociology, based on Rational Cognition one can argue for the use of central theoretical toolkits, e.g. of Rational Choice theory, instead of non-replicative additions:
    - Frames once established (goal attainment, relative prices etc.) can be re-used in various applications.
- In this talk, I present two new applications and
  - sketch a large scale app with powerful results: *Industrial society*
  - concentrate on an app with clear-cut evidence: *Debate knowledge*

Rational Cognition and Industrial Society

What was industrial society?

Comparison	2000
New technologies	Internet, cell phone, airlines
Social inequality	Rising inequalities
Institutional change	Democracy, third wave
Challenged hegemony	USA (from 1945)
Terrorism	Islamism
Terrorists' success	New York 11.9.2001
Economic crisis	Lehman Brothers

What was industrial society?

Comparison	2000	1900
New technologies	Internet, cell phone, airlines	Railway, steam ship, telegraph, postal union
Social inequality	Rising inequalities	Rising inequalities
Institutional change	Democracy, third wave	Democracy, first wave
Challenged hegemony	USA (from 1945)	UK (from 1805)
Terrorism	Islamism	Anarchism
Terrorists' success	New York 11.9.2001	Sarajevo 28.6.1914
Economic crisis	Lehman Brothers	Black Friday

Coupled cognitive situations in the long run

- The coupling of cognitive situations appears in two dimensions:
  - Stability over time (diachronously).
  - Comparability over individuals within time points (synchronously).
- In both dimensions, decoupling processes take place over historical time:
  - Stability is decoupled through acceleration processes.
    (Simmel 1897, Schumpeter 1912, Harvey 1990, Van den Bulte 2000, Ludwig/Pfeiffer 2006)
  - Comparability is decoupled through individualization processes.
    (Beck 1986, Schnell/Kohler 1995, Dogan 1995, Müller 1997, Scholtz 2010)

Society	Agrarian	Industrial	Post-industrial
Stability	between generations	within generations	none
vs. change	none	between generations	within generations
Comparability	between groups	within groups	none
vs. difference	none	between groups	within groups
Coupling	via traditions	via organizations	via institutions

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The sequence of making industrial society

- The core of social change is institutional innovation.
  - Since institutions always involve coordination, the size of organizations matters.
- 19. century: Institutional innovation towards industrial society employs organizational orientation in small-n-organizations:
  - Household formation: Individual mating became standard.
  - Educational demand: Primary education made compulsory.
- Social problems
  - 1800–1914: Rising inequality through diffusion process.
  - 1914–1945: Manifest problems (major crises, wars).
- After 1945: Institutional innovation towards industrial society employs organizational orientation in large-n-organizations:
  - Politics: Acceptance of representative democracy and UN system.
  - Workplace: Bargaining unions, occupation roles.

The sequence of making post-industrial society

- The core of social change is institutional innovation.
  - Since institutions always involve coordination, the size of organizations matters.
- 1970s–1990s: Institutional innovation towards post-industrial society employs institutional orientation in small-n-organizations:
  - Household formation: Individual responsibility for stability.
  - Educational demand: Tertiary education demand grows.
- Social problems
  - 1970s–??: Rising inequality through diffusion process.
  - 2001–??: Manifest problems (major crisis, wars).
- 20??–??: Institutional innovation towards post-industrial society employs institutional orientation in large-n-organizations:
  - Politics: Use of non-partitioning aggregation.
  - Workplace: Use of strategic qualification management support.

Evidence

- Income distributions follow an enhanced model: Between 1985 and 2005, trends of monetary income skewness in different welfare states follow the prediction of the orientation diffusion model.
- Responses to external shocks follow an orientation change model: Over time, the income scar of an unemployment spell becomes lighter for good-educated and heavier for bad-educated people.
- The effect of socio-economic differentiation on inequality turns from decreasing to increasing with modernization, as the theory predicts.
- An ideal test of the theory is possible, but not with existing data. Human resources scholars show the presence of the two workplace orientations, (Rousseau 1989, 1997), instruments exist, but we lack enough measurement to test the hypothesized spread of institutional orientation.

Rational Cognition and Debate Knowledge

Two problems of scientific discourse

- Individual problem: How to get into a good journal? And will I be read?
  - Evaluation based on publication success gains importance.
  - Journal quality
    - with current relevance in evaluations.
  - Individual citation success
    - may get more importance in the future,
    - has an strong intrinsic motivation aspect.
- The collective problem: Why don't we work together?
  - Science is marked by deep differences
  - Between scientific disciplines:
    - e.g. social network analysis (Ziegler 2010)
  - Within scientific disciplines: Sub-disciplinary discourses
    - e.g. explanation-oriented vs cultural sociology

Debate knowledge

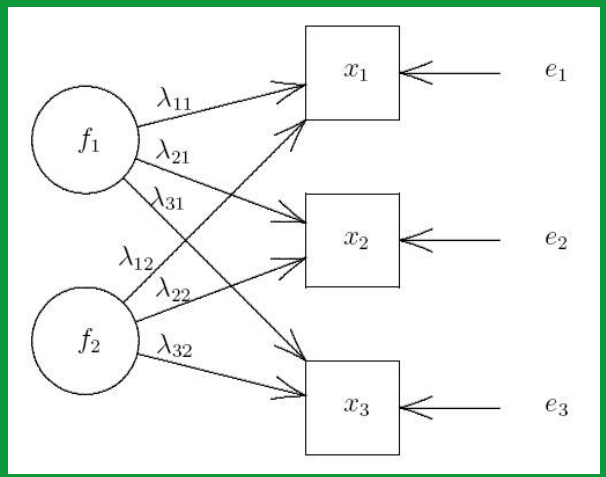
- General rule of Rational Cognition: Use coupled cognitions.
  - Recurring frames serve as mutually successful simulators and allow efficiently for basing actions;
  - e.g. in industrial society, use the frames you embody in the coupled experiences in the organizations you belong to.
- Special rule for the interested researcher: Use coupled cognitions.
  - Use items as arguments, notions, data, methods, texts, journals, authors, keywords... that others have used together.
    - The fact that others use items together implies that these items include or refer to frames that serve as mutually successful simulators.
  - That means: Know your debates!
    - A debate is a fuzzy set of items used together in the literature.
    - Choose a debate and use as many of its items as possible.

Basic Idea (2)

- Debate knowledge is helpful.
  - It helps you to write a better text.
    - The probability is higher that what you have read is indeed helpful for you.
    - This argument is related to paper quality.
  - It helps your reviewers to easier understand what you want.
    - The probability is higher to get a reviewer with a large subset of overlapping perceptions with yours.
    - This argument is not related to paper quality.
    - Unfortunately, we cannot yet distinguish the two effects.
- Debate knowledge pays off with regards to success.
  - You get into better journals. (H_1)
  - Even after controlling journal quality, you get more citations. (H_2)

Operationalization of debate knowledge

- We measured coupled item usage in five arbitrary thematic data sets.
  - *Web of Science* data related to civil society, class, multi-level analysis, the public-private dichotomy, and welfare reform.
  - Measured items are citations of specific authors, papers, journals, used keywords, and appearances in specific journals. (See appendix.)
- If the appearance of two or more items shows high correlations, a weighted average is constructed.



- Weights are derived from correlation sizes.
- We apply factor analysis for the calculation of the recurrences.
- In each data set, 12 factors with the respective factor values are computed.
- The maximum of the 12 factor values is coded as debate knowledge.

Other operationalizations

- The data provide other 'success measures' identified in the literature, i.e. page length l_p and number of references b_p. (Judge et.al. 2007, Haslam et.al. 2008)
  - Missing values for l_p set to 0, adding 'unknown length' dummy.
- Most measures are right-skewed and follow a log-normal logic,
  - i.e. more appropriate to interpret relative than absolute changes, distribution results from i.i.d. effects with equal relative influence.
  - 0's exist for citations, but each paper is its own first citation.
  - Therefore $c_p = \ln(TC + 1)$, $l_p = \ln(BP - EP + 1)$, $b_p = \ln(NC + 1)$.
- Journal quality defined as average citation success after controlling time.
  - All journals with < 5 papers in each data set are merged.
  - Long-run success better measured than through impact factor.
  - Practical reason: computable within data set.
  - High reliability: corr's $\approx .7$ between overlapping data sets.
- Time controls through logged paper age: $t_p = \ln(2011 - PY)$.

Causality structure

Paper citation success has a causal chain structure:

- The bibliography length b_p is driven by the paper's page length l_p.
- Our measure of debate knowledge d_p is related to the length of the reference list and may be driven likewise by the overall length of the paper: $d_p = \beta_{10} + \beta_{11} b_p + \beta_{12} l_p + \varepsilon^{d_p}$
- We assume the probability of acceptance in a good journal, expressed in the journal quality j_p, to be depending on the foregoing measures b_p, l_p, and d_p
- The recognition success measured in the number of citations c_p will depend on the time between paper publication and sampling and all of the foregoing measures b_p, l_p, d_p and j_p.

Causality structure

- Transforming these causality assumptions into an equation system which can be solved recursively:

$$
\begin{aligned}
& b_p = \beta_{00} + \beta_{01} l_p + \varepsilon^{b_p} \\
& d_p = \beta_{10} + \beta_{11} l_p + \beta_{12} b_p + \varepsilon^{d_p} \\
H_1 \rightarrow \; & j_p = \beta_{20} + \beta_{21} l_p + \beta_{22} b_p + \beta_{23} d_p + \varepsilon^{j_p} \\
& c_p = \beta_{30} + \beta_{31} l_p + \beta_{32} b_p + \beta_{33} d_p + \beta_{34} j_p + \beta_{35} t_p + \varepsilon^{c_p}
\end{aligned}
$$

- Research questions:
  - Does debate knowledge lead to publication in better journals? (H_1)
  - Does debate knowledge lead to higher individual citation success, after controlling journal quality? (H_2)
- We concentrate on the effects of debate knowledge and journal quality on citation success and subtract citation success explained by time and lengths (l_p and b_p) to derive the dependent variable of interest:

$$
\begin{aligned}
& c_p = \beta_{40} + \beta_{41} l_p + \beta_{42} b_p + \beta_{45} t_p + \varepsilon^{c_p,1} \\
H_2 \rightarrow \; & \varepsilon^{c_p,1} = \beta_{50} + \beta_{53} d_p + \beta_{54} j_p + \varepsilon^{c_p,2}
\end{aligned}
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\end{aligned}
$$

Results

Analysis	Civil society		Class		Multilevel		Public-private		Welfare reform	
Model	(1.1)	(1.2)	(2.1)	(2.2)	(3.1)	(3.2)	(4.1)	(4.2)	(5.1)	(5.2)
Dependent	j_p	$\varepsilon^{c_p,1}$	j_p	$\varepsilon^{c_p,1}$	j_p	$\varepsilon^{c_p,1}$	j_p	$\varepsilon^{c_p,1}$	j_p	$\varepsilon^{c_p,1}$
Journal quality		0.834***		0.896***		0.826***		0.809***		0.839***
		(21.9)		(16.8)		(18.7)		(18.6)		(10.7)
Debate inclusion	0.082***	0.116***	0.111***	0.139***	0.049***	0.082***	0.056***	0.118***	0.016**	0.066***
	(9.33)	(10.6)	(11.2)	(9.06)	(6.69)	(6.84)	(8.21)	(11.2)	(2.39)	(4.59)
Biblio length	0.067***	(.)	0.105***	(.)	0.130***	(.)	0.0469***	(.)	0.105***	(.)
	(3.41)		(3.32)		(6.37)		(2.68)		(6.88)	
Paper length	0.162***	(.)	-0.100**	(.)	0.202***	(.)	0.107***	(.)	-0.0449	(.)
	(3.97)		(-1.98)		(8.10)		(3.37)		(-1.59)	
Unknown length	0.457***	(.)	-0.882***	(.)	0.411***	(.)	-0.201*	(.)	-0.0677	(.)
	(3.65)		(-5.30)		(4.46)		(-1.78)		(-0.64)	
Constant	-0.861***	-0.201***	-0.295***	-0.295***	-1.169***	-0.175***	-0.503***	-0.200***	-0.272***	-0.131***
	(-9.10)	(-7.22)	(-2.60)	(-6.92)	(-16.8)	(-5.56)	(-7.34)	(-6.44)	(-3.89)	(-3.35)
Observations	1370	1370	968	968	1732	1732	1469	1469	878	878
R-squared	0.17	0.30	0.20	0.27	0.20	0.19	0.13	0.24	0.08	0.13

Conclusion

Rational cognition is not yet a fully developed theory. But:

- It is based within the Rational Choice paradigm.
  - It uses the 'investment under risk' concept and cost/benefit ratio improvements.
- It is relevant for understanding mechanisms in society.
  - It allows to understand current social change and to derive practical consequences.
- It is relevant for understanding mechanisms in science.
  - It allows to understand the importance of debate knowledge and to derive practical consequences.

Analyses

Analysis	Civil Soc.	Class	Multilevel	Public/priv.	Welfare Ref.
Articles	1370	999	1732	1469	868
All items	239	457	483	244	241
Papers	33.5%	48.6%	49.1%	33.2%	42.3%
Authors	28.5%	33.0%	22.4%	31.1%	30.3%
Journals (cited)	10.0%	5.0%	13.5%	16.4%	9.5%
Keywords	21.8%	8.3%	11.6%	15.6%	14.9%
Journals (host)	6.3%	5.0%	3.5%	3.7%	2.9%

Analyses

Analysis	Definition criteria	Subject areas	Excl.	Lang-uages	Publi-cation years	Data-bases	Down-load date	# Articles
Civil society	Topic=('civil society')	Sociology + 3	19	EN GE FR SP	All Years	SSCI, A&HCI, CPCI-SSH.	31.08.10	1370
Class	Title=(class)	Sociology	5	EN GE	1987-2010	SSCI	21.02.10	999
Multi-Level Analysis	Topic=(multilevel or 'multi-level' or 'fixed-effects' or 'random-effects')	Sociology + 9	27	All	1993-2010	SSCI, A&HCI.	31.03.10	1732
Public vs. private	Title=(public and privat*)	Sociology + 5	28		All Years	SSCI, A&HCI.	26.09.10	1469
Welfare reform	Topic=('welfare-reform')	Sociology + 7	0		1995-2010	SSCI, A&HCI.	16.09.10	868

Overview