

The Bounds of Rationality

Philosophical, Psychological and Economic Aspects of Choice Making

Hermann Brandstätter, Werner Güth and Hartmut Kliemt¹

Abstract: This paper brings together views on choice making as have been developed in philosophy, psychology, and economics. Starting from specific examples the relative merits of different approaches are discussed. The conclusion that models of boundedly rational behavior are the future of social science research is strongly endorsed. But we also admit that it is not completely clear what this implies and take the liberty to speculate on where future research might go.

1. Introduction and overview

Evaluated in entrepreneurial terms neo-classical economics has been a success among the social sciences. The numbers of professionals are ever increasing and economics is well respected in adjacent fields of social inquiry. Some of its core techniques are widely used by other social scientists while economics is so self-confidently tackling all sorts of social science issues within its “optimization” or “rational choice” paradigm that one may indeed speak of “economic

¹ The role of the ZiF in furthering our research in general and in particular when writing this paper is gratefully acknowledged. For other contributions of the research project "making choices" that took place at the ZiF in the academic year 1999/2000, see Frohn, Joachim, Werner Güth, Hartmut Kliemt, and Reinhard Selten eds. 2001. *Making Choices I & II*. München: Accedo., Ahlert, Marlies and Hartmut Kliemt eds. 2001. *Making Choices in Organ Allocation*. Stuttgart: Lucius und Lucius.

imperialism". Political science departments at least in the US lean more and more towards "economic theories of politics" while journals like "Public Choice", "Theory and Decision", "Economics and Philosophy" or "Rationality and Society" are flourishing. Game and decision theory in particular provide a modern "lingua franca" for social science (reaching even into biology). The prisoner's dilemma, the battle of the sexes and the chicken game which all originated from elementary rational choice modeling of social phenomena have taken hold on the minds of social scientists across the board. We see the world as full of "games and decisions" ((Luce, D. and H. Raiffa 1957)), study the "economic games that people play" ((Maital, S. and S. L. Maital 1984)) and generally use "games as models of social phenomena" ((Hamburger, Henry 1979)).

The existence of the common decision and game theoretic *language* along with common paradigm examples of elementary social problems is extremely valuable in facilitating communication about social research. However, interpreting decision and game theoretic language literally implies that human individuals do optimize and choose intentionally on the basis of given preferences. These implications are widely off the mark and should not be accepted.² Nevertheless, they are at root of a neo-classical orthodoxy that quite naturally leans towards the view that the true art of the economist consists in fitting everything to a description in decision theoretic terms.

To describe human action as the result of "optimization under constraints" more often than not amounts to "economic story telling". The stories "explain" social phenomena in a non-scientific sense of explanation. In that regard they are like the myths of classical antiquity. But even though they do not have a firm foundation in actual human motivation, like old myths they may still have quite

² In the German speaking countries a fundamental critique of looking at the world from the point of view of decision theory rather than through the perspective of behavioral science has been offered in particular by Hans Albert since the early sixties, see the collection of papers Albert, Hans. 1967. *Marktsoziologie und Entscheidungslogik*. Neuwied/Berlin.: Luchterhand.

some impact on our thinking and thereby indirectly on our lives. For instance, within a social-constructivist perspective as suggested in psychology theories can often be successful for reasons other than their scientific merits.³ Due to the 'marketing strategies' of their proponents and their social usefulness in a specific cultural and historic context certain theories may prevail. Moreover, a theory may turn into a kind of self-fulfilling prophecy by inducing people to become and to behave as the theory suggests. After all, what humans think about reality is an essential part of reality itself.

Even if the content of what humans imagine may be fictitious, that they believe in its reality is a fact. This may trigger behavior in a direct way but it also may influence it more indirectly by suggesting that certain kinds of institutional rules be put in place. Once the institutions are in place they channel human behavior and can induce it to become "as if" driven by the motives assumed to be operative in theory.

To state that such possibilities exist is not to say though that theories will necessarily exert their influence that way. The recent history of Marxist experiments shows that putting institutions and a complementary system of theoretical beliefs in place will not necessarily bring about changes in human behavior – at least not such as the theory would require. But in other instances the view that theories of human behavior somehow can be self-supporting or selfconfirming does not seem to be too far off the mark. For instance, if people (possibly erroneously) believe that most others are motivated by the pursuit of (material) self-interest it will often seem very plausible, that their beliefs will induce them to act this way, themselves – even if they are "naturally" inclined to show altruistic behavior.

³ E.g. Gergen, K.J. (1985). The social constructionist movement in modern psychology. *American Psychologist*, 40, 266-275; Weber, H. & Westmeyer, H. (1999). *Emotionale Intelligenz. Kritische Analyse eines populären Konstrukts*. <http://www.literaturkritik.de/txt/1999-02/1999-02-0004.html>

As Hobbes already noted people who are not driven by egoistic greed may still act as if being selfish out of self-defense (in Hobbesian terminology "defensio" (De Cive)). Individuals do not want to be exploited even if they do not intend to exploit others. If a theory induces them (falsely) to expect others to act selfishly or not to play by the rules then they will feel justified to break the rules themselves and sometimes even by preemptive action. Without the theory they would not have considered the breach of rules an option at all but in light of the theory they seem to have good reason to behave according to the theory (see for instance Miller, D. T. [1999]. The norm of self-interest. *American Psychologist*, 54, 1053-1060).

Relying on the language of rational choice, we might say that people tend to perceive many interactions as assurance games; i.e. they intend to contribute their due even at a considerable costs to themselves but do not want to be exploited.⁴ Often they trust in the good behavior of others in such games. Unless some special reason nurtures the suspicion that other individuals might not contribute to a common project they co-operate. But if actors believe other actors to believe in the theory that human behavior is in general guided by the rational pursuit of self-interest they will be motivated to act according to the theory. If these actors believe in others believing that theory and if they believe themselves in the behavioral law that other individuals will tend to act such as to avoid exploitation by others then they should defend themselves against exploitation by acting as if they themselves were rational actors as construed by standard economic theory.

Such possibilities of "self-fulfillment" notwithstanding, it seems quite clear that the economic model of human behavior is off the mark. In particular, evidence presented by experimental economics (see (Kagel, John H. and Alvin E. Roth 1995) and thus from "inside" economics itself seems to indicate that "explanations" of human behavior based on rational choice and optimization

⁴ A standard prisoner's dilemma becomes an assurance game if the players both assess unilateral deviation from co-operation as worse than full co-operation.

except for the simplest cases must be rejected. More often than not full rationality is a mistaken and misleading assumption. For, real behavior is in all likelihood guided by principles other than optimization and rational choice. It is completely different from optimizing behavior in that it is merely “boundedly rational”. It may therefore not even count as an idealization of real behavioral laws if we assume that behavior is fully rational and optimizing. Behavior is rather of a completely different type.

Herbert A. Simon, presumably the most influential proponent of behavioral economics, since the mid-1950s elaborated his concept of bounded rationality in opposition to the neo-classic rationality construct (see Schwartz, 2002; Simon, 1990). He very convincingly criticized the general "optimization under constraints" paradigm. Contrary to what some neo-classical theorists suggest he was not merely proposing an improvement of the neo-classical model. In particular his claim was not that optimization better take into account costs of choice making. Not to optimize in each instance of choice is not to be explained as the outcome of higher order optimization. Simon rather required that the behavioral laws governing actual behavior are brought in and that economics be firmly grounded on psychological laws that have nothing in common with standard optimization.

Pursuing the research agenda of a bounded rationality approach seems more promising than the old optimization under constraints paradigm. However, even adherents of Herbert Simon's research program should admit that theories of bounded rationality lead to a fragmented view of the world. Explanations in terms of bounded rationality are typically of short range and domain dependent. As opposed to that, decision and game theoretic language convey the impression of a unified view of the world and induces adherents of the traditional optimization under constraints paradigm to think that rational choice theory renders diverse phenomena more intelligible by putting them in (the same) perspective.

The effort to describe affairs in decision theoretic terms at least imposes the discipline of making modeling assumptions explicit. This is indeed an advantage

over traditional verbal accounts that should not be underestimated. Yet if we look more closely at the way the general language of decision and game theory has to be adapted to specific domains by assumptions that are often *ad hoc* it is obvious that the rational choice theorists' claims to universality and unity of their theories are based on a kind of collective self-deception. They have a common language – not a small accomplishment – but not a general theory with empirical content and explanatory power. For, more often than not, greater generality of a social theory is brought about by reducing its empirical content.

That behavioral theories of human behavior lack generality may not be a legitimate complaint. There may simply be no such general psychological laws. “Psychology does not much resemble classical mechanics, nor should it aim to do so. Its laws are, and will be, limited in range and generality and will be mainly qualitative. Its invariants are and will be of the kinds that are appropriate to adaptive systems. Its success must be measured not by how closely it resembles physics but by how well it describes and explains human behavior” (Simon, 1990, p. 2).

Newton's law of gravity, which almost proverbially explains the fall of the apple and the movement of the planets, applies to different spheres without becoming empty. Context invariant laws of human behavior that could link together different behavioral contexts in a similar way are lacking. But if that is so we should take pains to expose as openly as we can where and why our (often over generalized) theories of human behavior fail and what their limitations are. It may be a fruitful research strategy to begin with (fairly) general theories, to find out why they do not work in their original generality and to specify them as to make them better agree with the facts. Still if general theories with empirical content do not work then this should not be concealed behind a veil of deceptively general optimization models.

It seems clear that in the foreseeable future most theories of human behavior will be based on quite precarious assumptions. It will be impossible to pick any well-corroborated general theories from the shelf and to apply them more or less schematically to specific social problems. As far as applications to practical

matters are concerned general laws on which reasoned advice for choice making could be based may not exist. Nevertheless, a social science education or training may be useful. For instance, we may be able to train people in the art of forming their (subjective) short-range and domain specific theories. On the basis of this training they may learn to utilize their personal knowledge of circumstances better. For example, case studies of management science and business administration seem to train individuals for management tasks even though general theories of social behavior with explanatory content are lacking. The demand for graduates of business schools may be due to selection and signaling of abilities that are present without training but we think that graduates carry high market value at least in part also because of their training.

The market success of business schools and the success of the economic profession in the university system is one thing, the success or failure of economics as measured in terms of explanatory power of its theories another one. In the following somewhat programmatic interdisciplinary considerations of a psychologist, an economist and a philosopher we will be concerned only with the latter, methodological aspects of modeling and explaining choice making. In a first step we will discuss the merits of generality in social theory formation in some more depth (2.). We then turn to claims of generality as contained in the neo-classical theories of fully rational behavior (3.). The next section deals with some neo-classical repairs and the difficulties that they encounter (4.). The deficiencies of explaining the results of reward allocation, dictator and ultimatum games in a perfect rationality framework are discussed then (5.). A speculative sketch of some attempts to explain experimental results in a bounded rationality framework follows (6.). We then take a look at the relationships between bounded rationality and irrationality (7.). Final remarks conclude the paper (8.).

2. Generality of social theories?

The integration of otherwise diverse experiences into one body of knowledge is among the chief purposes of theorizing. General theories shed light on relation-

ships, bring to attention common aspects and build bridges between seemingly separate matters. The aforementioned law of gravity of Newtonian physics provides the standard example here: With plain common sense hardly anybody would suspect that the movement of planets and the fall of an apple from a tree have something in common. But natural science tells us that these apparently different processes follow the same general law.

In the realm of social phenomena it would obviously be desirable to have access to theories of comparable scope that could impose some unity on our diverse experiences. Accordingly, classics like most prominently David Hume, thought that those who succeeded to develop a theory of “human nature” would hold the key to a universal theory of the social world (see [Hume, 1739/1978 #253]). In the famous opening passage of Hume’s “treatise of human nature” he says: “Here then is the only expedient, from which we can hope for success in our philosophical researches, to leave the tedious lingering method, which we have hitherto followed, and instead of taking now and then a castle or village on the frontier, to march up directly to the capital or center of these sciences, to human nature itself; which being once masters of, we may every where else hope for an easy victory.”

But social science, after Hume, developed into domain specific theories rather than focusing on human nature and on universal behavioral assumptions about human actors.⁵ Economics is no exception to this. From its beginnings at least to the middle of the 20-th century in particular neo-classical economics saw itself as a domain specific theory confined to market behavior, to exchange and commercial relationships as narrowly defined. Only in the second half of the 20-th century neo-classical economics ventured into new territory beyond the realm of the “commercial”. The theory of games developed, public choice theory originated as a theory of non-market decision making (the aforementioned

⁵ Incidentally, Hume’s treatise was translated into German language by a psychologist who indeed saw Hume as one of the “giants” (in the sense of Merton) on whose shoulders he tried to stand as a psychologist.

journal “Public Choice” started out as “papers on non-market decision making”), the “law and economics” movement and the “new institutional (and constitutional) economics” took off (with contributions ranging from (Buchanan, James M. and Gordon Tullock 1962), over (Milgrom, Paul and John Roberts 1993) to (Young, H. Peyton 1998)). Since then the so-called “new world of economics” (see (McKenzie, Richard B. and Gordon Tullock 1979)) laid out a theoretical image of the social and institutional world that promises a unified view of all social phenomena. It is a world of rational decision-makers, of utility maximizers who act on the basis of given preferences (see for instance (Becker, Gary 1976)).

In all contexts from family to politics the same *rational, expecting, maximizing, men* (REMM, see (Meckling, W. 1976)) are acting. The corresponding theory of rational decision-making forms the core of the economic approach to human behavior. It promises to connect diverse phenomena in one unified body of mathematical social theory. Thereby social science seems to reach a state of unity and mathematical precision comparable to that of natural science. This is in the last resort accomplished by the assumption that humans act “opportunistically rational”, which basically means that “they take advantage of any situation that will help them personally, without considering whether their actions are right or wrong” (Pons, English Language Dictionary, (p. 1010). London: Collins). According to this assumption, in each and every act of choice making the rational individual, first, distinguishes between those aspects of the action situation that are causally affected by the individual's own actions and those that are not and then, second, seizes all subjectively perceived opportunities to better his situation as evaluated according to his own standards of value.

Choice making that is in the preceding sense opportunistically rational is strictly forward looking in that only the future causal effects of acts matter. Due to the distinction between causal effects and other elements of the action situation it takes each choice separately and evaluates that choice according to the causal effects expected to be brought about by the chosen action. The notorious questions of “what if I would do always the same or would make it a rule to act

in that way?" and "what if everybody would always do the same?" are ruled out (as rule bound behavior in general) as violating fundamental principles of rationality as rooted in the faculty to choose opportunistically and the basic principle that the actor to be rational must understand causality.

It is a very distinctive faculty of the human mind by which humans can seize opportunities on the basis of complicated models of their action situation. That they can do so is characteristic of human kind. So it seems *prima facie* not absurd to generalize this feature to form an ideal type of human rationality as in standard economic theory. However, if it were in fact true that the assumptions of "opportunity taking" or, for short, "opportunistic" behavior underlying "rational economic man" would form a universally applicable model of human behavior leading to valid explanations in social realms as diverse as the competition of parties at the polls and the competition of firms for nearby customers (phenomena as diverse as the fall of apples and the movement of planets) the world of social science would be fundamentally altered. However, regardless of the charms of the economic approach to human behavior and its unifying language it did not come up with unifying behavioral laws that would be applicable to several realms and not devoid empirical content.

True enough, humans command the faculty to act opportunistically on the basis of a cognitive schema of the action situation. Therefore the so-called over-socialized model of man according to which human behavior is to be explained *exclusively* in terms of internalized values, norms and rules is certainly mistaken. The over-socialized model of man may have many characteristics of a strawman anyway. But in their efforts to keep clear of (social-)psychology the adherents of for instance Durkheim or Parsons often came very close to expressing the view that behavior is entirely guided by the individuals' desire for role conformity. Thereby they put to the extreme and thus beyond its proper limits the factor of rules and roles in explaining human behavior. However, the economic approach that models behavior without exception as opportunistic case-by-case maximization of utility is at least as far off the mark as the classical sociological one. It either has no empirical content or in its concrete specifications tends to be as fragmented as other social theories.

If the behavioral model of the economic approach to human behavior is reduced to the maximization of pecuniary income (classical profit rather than utility maximization) the model has empirical content. But in this narrow traditional interpretation it is obviously neither universally applicable to all realms of human behavior (in particular not to those in which pecuniary motives play no role) nor is it the sole valid explanation of behavior in the presence of pecuniary incentives. Motives other than pecuniary ones do play a role throughout – even when pecuniary motives are present.

The claim that all people always maximize their utility leaves room for additional motives besides pecuniary ones. But if our criterion for utility is entirely derived from the choice making of individuals then utility cannot anymore be employed in explaining behavior. To put it slightly otherwise, if the choice of A in the presence of B is the sole criterion for ascribing higher utility to action A than to action B then the higher utility of A is as helpful in explaining the choice making as the "dormitory" power of opium is for the explanation of why sleepiness emerges after the consumption of opium.

One can hardly imagine that humans are not hedonistic in the sense of preferring the subjectively better to the good and the bad to the worse. In social psychological research on the relationship between attitudes and actions (e. g. recently, Ajzen, Icek [2001], Nature and operation of attitudes. Annual Review of Psychology, 52, 27-58) an attempt is made to measure expected utility (with its various cognitive and affective components: expectancy-value model) separately of observing the behavior to be explained by the desire for improving one's situation. But even if we accept that utility can be independently measured and then be a theoretical concept with explanatory as well as predictive value this does not justify utility maximization as an explanatory concept. We would at most have an argument supporting opportunity-seeking behavior as if "individuals tend to choose among *perceived* opportunities those with higher utility". But this is certainly not an argument justifying the restless efforts to reach global utility maximization that are conceptually implied in the neo-classical framework. In sum, the assumption of universal utility maximization is

either trivially true and at odds with methodological norms or methodologically acceptable but quite trivially false.

Very often, economists regardless of their claims that they are searching for an empirical science of behavior do not seem to keep focused on the pursuit of behavioral laws. In particular the thesis that maximization under constraints can be an answer to the fundamental theoretical challenge of developing general theories is as strange as it is common among economists.⁶ Things that quite naturally could and should be expressed otherwise are put into the Procrustes bed of “economic maximization under constraints”. Even though there is no such maximization process in the human psyche things are made to look “as if” actors maximize under constraints across the board.

However, to say that individuals act “as if” they maximize is not good enough. First, it is – to put it mildly – very unlikely that the thesis of “as if” maximization would with some plausibility apply universally. Second, even if all individual behavior could be described “as if” it were maximizing this would not amount to a causal explanation. As far as causality is concerned the very

⁶ Of course, one might remark here that Gary Becker’s approach is different in this regard. Is he not a critic of “ad hocery”? Indeed he insists that in the last resort human motives have to be treated as invariant between situations. In the last resort there is one human nature that is inter-individually invariant. To explain differences in overt behavior economists have to rely on observable external constraints. The internal technology of producing the ultimate satisfactions of basic needs differs but not the needs and ultimate motives as such.

Without going into the details of the Beckerian methodology let us acknowledge that it tries to cope with some of the more obvious criticisms of the neo-classical approach to human behavior in a quite ingenious way. However, it still insists on the “maximization subject to constraints” paradigm. It rescues mathematical elegance and unity of mathematical method at the price of substantial unifying theories. In particular, Beckerian differences in human capital, in the technology of creating ultimate satisfactions seem quite arbitrary ways to “explain” differences in choice making behavior.

concept of "as if" explicitly acknowledges that we encounter here an explanandum (a – very astonishing – phenomenon to be explained) rather than an explanans (an explaining set of hypotheses and conditions for their application). The fact that behavior can be described as if it were maximizing is what it is, a different description but not a causal explanation in terms of some behavioral law or other. For it is obviously true that conscious and intentional maximization of a given objective function is not at root of human choice making and thus cannot be the true causal law inducing behavior to be as if maximizing. Third, human behavior is sometimes so-well adapted to circumstances that an omniscient maximizer could not do better. Yet, again, the well-adapted behavior is definitely not the result of conscious maximization. It is in all likelihood the outgrowth of other processes that somehow led to the observable optimal result. Merely to identify overt behavior as optimally adapted – or at least as stable in the sense of, say evolutionary stability – does not provide an explanation. Optimality as well as stability rather require an explanation in terms other than optimization (the origin of predictable behavior is discussed from a more or less neo-classical perspective in several studies as for example (Heiner, R. 1983)).

In sum, wherever results corresponding to the predictions of full rationality should be observed – and we are very reluctant to concede that they are ever observed – an explanation in behavioral laws of boundedly rational behavior is required. Rather than feeling reassured in our economic views of the world we should ask: Why is it so that the anomaly of seeming full rationality is observed? What are the circumstances that led to such a phenomenon under general behavioral laws? If optimality in the sense of “as if” rationality is widespread how can we explain this extraordinary and astonishing fact? What are the general behavioral laws and causal mechanisms that can explain such (and other) behavioral observations?

We will not be in a position to offer fully convincing answers to these questions. Turning to the task of outlining what can and (to our opinion) should perhaps be done let us start with a more specific brief look at the traditional theories of

perfect rationality that were involved in making stronger claims to generality and then gradually bring in a more realistic perspective on choice making.

3. (Commonly known) Perfect Rationality and its difficulties

Let $I := \{1, 2, \dots, n\}$, $n \geq 1$, be the set of players and let Γ denote the class of all games G in a domain with

$$G = (S_1, S_2, \dots, S_n; u_1, u_2, \dots, u_n);$$

where for all $i \in I$ the

$S_i \neq \emptyset$ are finite strategy sets,

$S := \prod_{i=1}^n S_i$ is the set of all strategy profiles $s = (s_1, s_2, \dots, s_n)$

u_i are mappings $u_i: S \rightarrow \mathbf{R}$, $u_i(s) \in \mathbf{R}$, which represent the individuals' preferences by a conventional cardinal utility measure.

If $n=1$ optimality of choice behavior requires that the single actor, 1, must choose $s^* \in S$ such that $u = u_1$ is maximized over S ; i.e.

$$s^* \in \operatorname{argmax} \{ u(s) : s \in S \}.$$

In cases with $n \geq 2$ it is not clear what optimal behavior in the sense of maximizing u_i requires of each actor from $i \in I = \{1, 2, \dots, n\}$. If the behavior of all others is known to i and fixed then, i needs to maximize against $s_{-i} := (s_1, s_2, s_{i-1}, s_{i+1}, \dots, s_n)$ such that an optimal result is reached. The information condition that the actions of all others are fixed and known can conceivably be fulfilled only for one individual. In all other cases the question of how to deal with situations in which the actions of other actors are not known (either not fixed yet or unknown for other reasons) emerges at least for some actors. This raises the question which criteria of optimal behavior could be applied by those individuals.

Though there is no commonly accepted answer to this question most economists would tend to require as a minimum that choices be in equilibrium (but even this is contested, see for instance (Sugden, Robert 1991)). A strategy vector $s^* \in S$ is in equilibrium (see (Cournot, Auguste 1838), (Nash, John F. 1951)) if

$$\forall i \in I: s^*_i \in \operatorname{argmax} \{ u_i (s_i, s^*_{-i}) : s_i \in S_i \}.$$

As stated, not all individuals can be informed about all choices as *fixed* or *made* by all other individuals. In that sense ignorance as to some of the choices of others necessarily (in a logical sense of necessity) applies when the other $n-1$ of the choosers make their choices. For instance, in a two person sequential game one actor must move first and thus without knowing the choice of the other actor. He can have views on which actions the other actor will take but he cannot know in advance the other choice as made. Obviously in sequential games with $n > 2$ the same line of argument applies with at least as much and possibly even more force while in simultaneous move games, to which we confine attention for the time being, all n choice-makers must fix their choices without knowing the choices of others. So in making these choices none can maximize against the *known* choices as made by others.

Even in very idealized circumstances in which the game is not only known to all players but common knowledge among them – i. e. they know that all know that all know ... that all know the game – players cannot maximize in any simple sense that would correspond to the case $n=1$. As a consequence of this, though in equilibrium each player maximizes against the choices of each other individual, it is not clear how even fully rational individuals would get to the equilibrium by their actual choices (for more extensive "reflections on equilibrium" see Berninghaus, Güth and Kliemt 2003, in this volume).

To put it slightly otherwise: What kind of play could we recommend to players who intend to act as rational utility maximizers in such situations? For example, consider a standard battle of the sexes game:

	2	s_2^1	s_2^2
1			
	s_1^1	\$10, \$20	0, 0
	s_1^2	0, 0	\$20, \$10

Figure 1

An omniscient outside observer might conceivably be able to predict the choices of all individuals and to provide for each of them the correct information on what the others will do. But even for an omniscient observer this task is not an easy one because as an outside observer she must take into account how individuals will respond to the information she provides. For instance if she sends the signal that player 1 will choose s_1^1 to player 2 she has to anticipate how player 2 will respond to that information and to feed that anticipation back to player 1. This will lead to valid predictions only if player 1 will not alter his plans upon receiving the information about player 2 ...

If we assume that players respond rationally to the known choices of others according to the maximization paradigm of a single actor – the case $n=1$ – then s_1^1 must already be the optimal response to the optimal response of player 2 and so on indefinitely. Thus the omniscient outside observer should predict that player 2 chooses s_2^1 contingent on the information that the choice of player 1 will be s_1^1 . Only in that case the dictates of isolated actor rationality under full information about all other pay-off relevant parameters and predictions of interaction decisions can be consistent.

Now, an omniscient outside observer bringing about the “right” choices of all actors by signals (see on related issues (Aumann, Robert 1990; Aumann, Robert and Adam Brandenburger 1995), (Brandenburger, Adam and Eddie Dekel 1987) is even more of a fiction than the assumption of common knowledge of the game and of full rationality of the individual players. Human beings interact

without any external omniscient source of information. Theories of how to play must substitute the information process of the outside observer.

More specifically, individual players who are fully rational in the sense of individual maximization of utility would follow a theory to co-ordinate their behavior if certain requirements are fulfilled. First, besides common knowledge of the (rules of the) game there must be common knowledge of the theory that guides the within rule choices in the game. Otherwise individuals would have to take into account that other individuals might follow theories other than they suspect while the other individuals would have to take into account these suspicions and so on...Second, under common knowledge of the game and of the theory of rational play no individual must have an incentive to deviate from the precepts of the commonly known theory if all others follow the theory. And finally the theory must give definite advice to each and every player such that an equilibrium will be selected (see for the most refined such approach (Harsanyi, John C. and Reinhard Selten 1988)).

These are the minimum ideal conditions that must be fulfilled if an equilibrium is not only to exist but also to be predicted as the outcome of rational play. The corresponding equilibrium play can be derived as the outcome of the deliberate rational choices of players in one-off interactions only if we as well as the players have a theory of what the players think, what they think what others think ..., and what their cognitive processes are. Rational choice theory assumes that players use the same commonly known theory. This requirement of theories of perfectly as opposed to theories of boundedly rational behavior is extremely demanding.

To illustrate, let us pursue the battle of the sexes game somewhat further. For instance, in an experiment with monetary payoffs two individuals could be brought into a room in which the matrix of the game is presented to them. They are jointly present, too, and know that they are, when a theory of rational play that suggests that the players play (s_1^1, s_2^1) is laid out to both players. Then they are brought into separate rooms to actually play the game without further communication. In this situation it is safe to assume that the matrix of figure 1

along with the theory of rational play is common knowledge among the players. Due to its explicit introduction the theory of rational play figures so prominently that no deviations from the theory's descriptions should be expected. Coordination on (s_1^1, s_2^1) can be predicted according to the instructions of the players. A rational choice explanation of equilibrium play is presumably very close to the truth since the theory underlying the choices is commonly known. We could indeed say that they choose on behalf of their knowledge of the theory and their knowledge of the fact that the other knows the theory and will in all likelihood choose accordingly.

Once we leave the simplest cases behind severe problems emerge. For instance, the theory of rational play in this game is still dependent on the presence of a third person. It was specifically tailored to the situation at hand by the instructor. Without such an individual the theory would have to specify something as weird as the prescription that each player in battle of the sexes games should choose the strategy *numbered* as strategy 1.

More generally speaking, there are cases in which rational choice explanations in the narrow sense of that term could conceivably apply even in strategic contexts involving multiple equilibria. This holds good for specific situations with contingent commonly known signals (which also could be features of prominence). It is, however, absolutely implausible that a theory of equilibrium selection would be "absorbed" such that its presence in the mental processes of the actors could explain behavior. To assume that knowledge of the theory of equilibrium selection as a matter of fact characterizes the rational actor and explains her choices is absurd.

But even less demanding rationality assumptions may be quite absurd. In particular the seemingly innocuous premise of the utility representation of preferences, that players can and do know their own preferences as well as those of others, is not harmless. Even in the simplest extreme case in which the number of decision makers is $n=1$ it is rather problematic to treat preferences as "given". Assume that the stakes are very high. Say a pedestrian decision maker after winning in a state lottery plans to invest into a portfolio the sum of \$

1.000.000. To invest a million is a nice prospect for the individual but does she know her preference ranking among all portfolios? How can she – or we – assign a utility to such yet unknown preferences? Even if the investor would focus merely on a subset of some few “prominent” portfolios she would have to “construe” her preferences first. She would start to compare alternatives along several dimensions of evaluation and structure that process by specific rules of thumb like “a third in bricks, a third in bonds, a third in stocks”. If she is clever she might also say that she wants to have independent risks and therefore invest internationally etc. But at the same time she may – and will in all likelihood – fall prey to familiarity and other biases (for a survey of experiments where complexity renders optimality extremely unlikely, see Anderhub and Güth, 1999).

More generally speaking we all act frequently the “fast and frugal way” (see (Gigerenzer, Gerhard 1996; 1997; Gigerenzer, Gerd, Jean Czerlinski, and Laura Martignon 1998)). We are facing constraints inducing boundedly rational decisionmaking throughout. These constraints are even more marked in strategic interaction than in single actor contexts. But as the example of the investor shows, even in non-strategic contexts models of bounded rather than perfect rationality must be used to approach the reality of choice making in the real world of homo sapiens as opposed to the economic world of homo oeconomicus.

Nevertheless, most economists, although being aware of the preceding line of argument, stick to the model of utility maximization. That they do so, and engage the task of finding “neo-classical repairs” is in itself a remarkable fact that should not be dismissed lightly. So let us turn to some of the more recent efforts to rescue the traditional maximization paradigm.

4. Some neo-classical repairs and their difficulties

4.1. Homo oeconomicus as exception

If ever there might be a universal behavioral model then it will in all likelihood frame human behavior as both drawn by the future and driven by the past (see programmatically, if still to some extent in the spirit of neo-classical repairs (Güth, Werner and Hartmut Kliemt 1998) and on other methodological aspects of evolutionary economics (Nelson, R. R. and S. G. Winter 1982) and (Witt, Ulrich 1987)). Expectations of the effects of individual acts that are taken strictly separately as well as rules comprising a class of actions inform our choice making. Human behavior is, in short, boundedly rational. It is rational in the shadow of the future and bounded by the shadow of the past. Homo sapiens is not a straightforward maximizer but torn between the extremes of strategic calculation and blind rule following. But he can and does seize certain opportunities.

Routines as for instance in planning the amount of goods to be kept in stock typically develop in a process of trial and error through time. Routines may indeed be selected and thereby form the basis for evolutionary and some learning theoretic modeling in economics. But it is also clear that the exceptional management efforts or forward-looking strategic choice making do matter. They play a role in processes like introducing new products, entering a new market, reacting to exogenous shocks in a market and, very importantly, in reforming the routines of a company (constitutional economic choice making in the sense of (Buchanan, James M. 1999)) ranging from outsourcing, over vertical integration decisions, to acquiring, founding or selling other firms.

The preceding view would render homo oeconomicus and rational choice analyses exceptional. It would give up any claim to universal applicability of the homo oeconomicus model. The theory would be rescued for a special class of decisions. Man acts according to routines and the like, *unless* something as for instance the failure to fulfill aspiration levels triggers an exceptional response in form of rational forward looking behavior that seeks to find out and seizes opportunities. – A somewhat more general way to accomplish the same emerges if we rely on the conventional distinction between low and high costs.

4.2. Low and high costs in a maximization framework

Since humans can seize opportunities the economists' special focus on opportunistic, in particular monetary motivation may have some merit. It is intuitively plausible, that the size of opportunity costs will influence behavior (see on some high stakes experiments (Harrison, Glenn W. 1989), (Slonim, Robert and Alvin E Roth 1998)). Moreover, the higher the pecuniary rewards the stronger the tendency towards opportunity taking or case-by-case maximizing behavior should be.⁷ Therefore economists might want to endorse the standard view of ethical theory that human behavior is different if stakes are low than if they are high and may legitimately be expected to be so (see on this see (Brennan, H. Geoffrey and James M. Buchanan 1984; Brennan, H. Geoffrey and Loren Lomasky 1984), (Heyd, David 1982), (Selten, Reinhard 1986), (Urmson, J. O. 1958), see also (Kliemt, Hartmut 1986)). The economists could stipulate that their theory applies chiefly to high cost situations. Actors will start to maximize only when it really matters or if that effort really pays.

Economists should be warned, however, that with these modifications rational choice modeling has ceased to be a universal theory. Even if individuals start to maximize deliberately whenever it really matters this does not imply that only these situations matter. Quite to the contrary, much of social structure in fact does depend on the systematic exploitation of cost asymmetries and the human proclivity to show norm-guided behavior in low cost situations. Therefore a large and essential realm of human behavior – typically norm guided behavior in

⁷ The remaining ambiguity of the motivational structure could be controlled to a certain extent by systematic variations of the size of monetary rewards either with the same individuals on different rounds of experimentation (within subjects design) or with different subjects who engage the same task with different monetary incentives (between subjects-design). For instance, if we would double the monetary rewards, then obviously x units in the first will be $2x$ in the next treatment. The “elasticity” of behavior in response to such variations would give us some clue as to the degree to which the monetary motive does in fact dominate. Regrettably the latter procedure is seldom applied.

low cost situations – must be explained according to principles other than opportunistically rational choice.⁸

Nevertheless, according to the rules of the art of economic experimentation dominance of the monetary as opposed to other motives should be aimed at (see (Friedman, James and Shyam Sunder 1994)). Experimental economists try to structure situations such that the number of instances in which certain forms of behavior are shown would increase monotonically with the size of the expected monetary reward and that the monetary reward is directly and prominently linked to the choice making in the experiment.

By such measures experimentalists try to induce the classical behavior of rational economic man who is interested exclusively in monetary gain. But regardless of their efforts they almost never succeeded in this completely. Always motives other than direct monetary gain influence human choice making. There can be no doubt that for most people most of the time earning money is by far not the most important motive (Sheldon et al., 2001) and neither on the individual nor on the national level the primary source of subjective well-being (Kirkcaldy, Furnham & Martin, 1998). In addition, for most people making money is not an end in itself, but a means for satisfying other motives (Srivastava, Locke & Bartol, 2001).

Of course, what people say in these matters may not be reliable. We may suspect that individuals if being asked how important various motives or values are to them in their lives answer in part according to social norms and therefore misrepresent the significance of socially less valued desires (e. g. for power or money). It is the merit of experiments in which monetary gains are at stake that individuals cannot say whatever they want without putting their monetary self-interest at risk. In particular high stakes experiments show that non-pecuniary and non-selfish motives must be present and quite strong (see also for evidence

⁸ Just imagine as a most typical example a judge who can create high costs for others without incurring such.

from the field, Frank (1988)). The conventional rejoinder of the adherents of the homo oeconomicus model that in typical experiments not much is at stake and therefore homo oeconomicus just does not care to raise his head has no force here. The argument from low opportunity costs that would not trigger case-by-case maximization does not apply.

Still the neo-classical theorist will not give in here. He will discount maximization of a monetary objective as old fashioned and insist on utility maximization. And can indeed add with some plausibility that opportunity-taking behavior need not be restricted to an improvement of the situation as evaluated in terms of pecuniary rewards only. All sorts of values may play a role in individual evaluations and therefore opportunism should be framed as to allow for opportunity-seeking according to complex preferences or, for that matter, utility representations thereof. Even though the pitfalls of that kind of move have been pointed out again and again, the argument is still around and we therefore need to deal with it briefly if very reluctantly before we can move on.

4.3. Utility maximization and all that

According to the modern notion of utility an alternative a is not preferred over an alternative b because a has higher utility than b . Quite to the contrary, a higher utility to a than to b is assigned just to *represent* the higher ranking of a . However, this higher ranking depends on values and motives other than utility. The utility function is not among the reasons for a value ranking, it represents the outcome of such reasoning and evaluation.

If we can describe behavior *as if* it were the outcome of a conscious maximization effort of a more complicated utility maximand then this raises more questions than it answers. It is an explanandum not an explanation since the fact that predictions derived from the maximization assumption cohere with the data is no explanation. Behavior needs to be explained in motivational categories other than maximization.

Utility is only “representative utility” that stenographically represents preferences. It is a descriptive term, not an explanatory theoretical construct. Therefore maximization must describe a process that is driven by motives other than maximizing the utility function. In view of this it is an astonishing fact if behavior does indeed coincide with the maximization of a utility function. Only if monetary rewards are dominating evaluations and reasoning the mystery vanishes to some extent. In that case attitudes to risk may still pose interesting questions in the ordering of alternatives but the focus on monetary rewards that dominate in the framing of the decision situation renders it plausible that the individual indeed is behaving in a maximizing manner.

However, if besides the selfish income-motive other, rather complicated motives like for instance so-called "inequality aversion" come into play it is less plausible that measures referring to the satisfaction/dissatisfaction of those motives are also “minimized or maximized”. Who in the world would be consciously maximizing or minimizing such a possibly complicated measure? More importantly, could it ever be plausible that anybody would be consciously maximizing a weighted sum of say monetary income and some measure of inequality? To say here that individuals do not maximize such measures per se but only the utility derived from them is a “petitio principii” since utility is only representing preferences and thus the outcome of a ranking process that – by assumption – in itself cannot be based on the maximization of a weighted sum.⁹

Going back to the behavioral axioms is no solution either but merely postpones the problem. Accepting that preferences can be represented by a utility index whenever certain axioms are fulfilled we must again wonder how it may be that

⁹ Methodologically, the neo-classic perspective is strictly behavioristic, i. e., only objectively observable behavior and operationally defined explanatory constructs like utility (in neo-classic definition) are admitted. Most objections of this paper against the utility maximization principle draw on mental processes (cognitions, motives, emotions) that lay outside of the realm of behaviorism.

those axioms should ever be fulfilled by choice behavior that in itself is not motivated by maximizing a numerical function. Economists cannot have it both ways on the one hand insist that utility is merely representative of preferences and avoid the question of how the mysterious fact of behavior that looks as if it were driven by utility maximization can be explained.

Psychological theories that try to measure utility as an independent quality are much more respectable as explanatory devices even if they should rely on such old fashioned methods as introspection. However, it still needs to be shown that there is some quality like pleasure and the avoidance of pain that would indeed be consciously maximized by human individuals and as reason for action explain what humans do. We do not reject such a hedonistic approach completely but we think that a classical hedonistic calculus of conscious maximization of pleasure like the maximization of monetary gain is not a true explanation of human behavior. The conventional defense of unconscious maximization by individuals who behave merely as if maximizing is no way out either.

4.4. Hyper-rational behavior of the simple-minded

Peyton Young in his basic text on institutional evolution very nicely presents his reasons for favoring the “evolutionary alternative”:

“In neoclassical economic theory – especially game theory – agents are assumed to be hyper-rational. They know the utility functions of other agents (or the probability that other agents have these utility functions), they are fully aware of the process they are embedded in, they make optimum long-run plans based on the assumption that everyone else makes optimum long-run plans, and so forth. This is a rather extravagant and implausible model of human behavior, especially in the complex, dynamic environments that economic agents typically face. Moreover it represents a peculiar aberration from traditional ways of thinking in economics. One of the central

messages of the pure theory of exchange, for example, is the ability of prices and markets to coordinate economic activity *without* assuming that agents are anything more than naïve optimizers acting on limited information.” ((Young, H. Peyton 1998), p. 5).

Though we agree with Young in what he says we also insist that “the ability of prices and markets to coordinate economic activity *without* assuming that agents are anything more than naïve optimizers acting on limited information” cannot be used to defend rational choice modeling. It is not true that the rational choice approach has explanatory power because it would “predict” equilibrium results of markets. The standard arguments of economists who invoke “trial and error” and experiences across diverse games are often interesting (see as an example (Roth, A.E. and J. Erev 1995)).¹⁰ Likewise the classical argument as in particular presented by Armen Alchian (see (Alchian, Armen A. 1950)) that even individuals without any ability to make forward looking choices (e. g. via operant conditioning in psychological terms or as “zero intelligence traders” in the sense of (Gode, Dhamanjay K. and Shyam Sunder 1993)) would reach equilibrium results on markets with appropriate competitive conditions does not support the behavioral model underlying neo-classical economics. In the present context such arguments are entirely irrelevant. They basically reject the rational choice approach by introducing substitutes that explain why results may look “as if” brought about by rational choice. Rather than presenting the explanation of observed equilibrium behavior in terms of rational choice they “reduce” it to an explanation in terms other than rational choice, namely adaptive ones.

The question of how and through which motives preferences that can be represented as if amounting to the maximization of an objective function could indeed emerge has no easy answer unless a simple-minded dominance of the monetary income motive can be assumed. Since the experiments of economists as well as everyday experience show that such simple-mindedness is

¹⁰ In psychological terms, this would be operant conditioning that (in principle) functions without rational judgment and even without conscious awareness.

exceptional, the neo-classical framework runs into serious difficulties. Let us look more closely at some before we turn to some tentative ways to deal with them more adequately.

5. Paradigms of experimental economics

Even though much of experimental economics is still pursued within the traditional neo-classical framework its most basic results are not well in line with the behavioral model of homo oeconomicus. Experimentalists with a background in economics did not, however, strive to drive home this point. They were in general very reluctant to abandon the maximization framework completely and rather tried to integrate experimental results into the established corpus of neo-classical economic theories by incorporating them into utility functions.

5.1. Beyond repair?

A particularly instructive recent example from that “neo-classical repair shop” is Gary Bolton’s and Axel Ockenfels’ theory of equity, reciprocity and competition, ERC ((Bolton, Gary and Axel Ockenfels 2000)). ERC shows in an exemplary manner how to deal with experimental results. It tries to account for a wide class of experimental game theoretic observations within a modified neo-classical „maximization of utility“ approach.

To accomplish this the basic utility functions of individuals are calibrated on the results of dictator and ultimatum games and then, with these functions in hand, experimental outcomes of other game experiments are explained. In principle, fixing certain functions for a class of observations and then using these estimates to account for a broader class of results is a methodologically legitimate strategy. In a behavioristic approach broadly the same is done by first observing which consequences of a certain behavior induce that behavior to be shown more frequently and then, second, to rely on these reinforcers for changing

behavior in other, more or less different situations. It is in line with good scientific practice that the implied empirical claim is based on the invariance of the relationship in different contexts – including not only those in which the parameters are fixed. Moreover, if the theory that human behavior is driven by some process of conscious maximization were a successful one then we would have good reason to start with this hypothesis and reach progress by more detailed specification of its contents.

However, since we do not accept the background thesis that neo-classical economics was basically an explanatory success we are not committed to piecemeal repairs of the neo-classical approach at all. Quite to the contrary, we shall subsequently argue that reward allocation, dictator and ultimatum games suggest that more radical moves towards theories of bounded rationality are necessary if real progress is to be made at least eventually.¹¹ Our point is not that empirical estimations of utility functions representing human motivations are methodologically mistaken across the board. It is rather that explaining behavior as maximization of any such function will always end up in an "as if" argument; i. e. the individuals act as if maximizing that function while that does not in any way represent the motivation present in their cognitive processes. Regardless of how well the predictions derived from such models fit the observational data, there is no reason to assume that they capture the true motivational roots of behavior and of how mental models relate to action. To start with maximization of some entity and then, after observing that this cannot account for observations, enter another factor to derive a more complicated maximization etc. while not questioning maximization as such seems one sided at best and dogmatic at worst.

¹¹ see Rubinstein, Ariel. 1998. *Modeling Bounded Rationality*. Cambridge, MA: Cambridge University Press. He claims to model bounded rationality but he is clearly still very close to the more traditional economic approach.

5.2. Reward allocation games

A simple class of experiments originally introduced by social psychologists as “reward allocation games” (see for instance, (Shapiro, E.G. 1975) or (Mikula, Gerold 1973) and (Homans, 1961) for an early discussion of the distributive justice concept) illustrates that straightforward maximization of monetary rewards can hardly be typical human behavior.¹² As performed by social psychologists the experiments normally adopt the following form:

- two subjects X and Y must jointly perform some work;
- as a result of their joint effort they jointly earn some monetary reward or “pie”, $p > 0$,
- they are informed that actor X contributed a fraction $c \in (0, 1)$ of the total effort of “1 unit” that the two invested in joint production,
- individual X allocates shares of the pie p by “dictating” that individual X receives x while individual Y receives $y = p - x$; where $x, y \geq 0$,
- the two individuals do not meet after the game and are aware that there will be no subsequent interaction.

Were monetary rewards the dominant motive of individuals, the outcome should be $(x^* = p, y^* = 0)$. However this is rarely the outcome of such experiments. Typically participants act justly as described in book five of Aristotle's *Nicomachean Ethics* and allocate in proportion to the contribution c (see for a standard modern philosophical account stressing “proportionality” as basic criterion of (distributive) justice (Frankena, William K. 1966)); i.e. X chooses $(x = cp, y = (1 - c)p)$. If the work effort is rather trivial then, since p more or less

¹² A variant of such games became more widely known as “dictator games” among economists.

drops down as manna from heaven, we may also find the allocation $(\frac{P}{2}, \frac{P}{2})$ as the most frequently chosen alternative.¹³

If the monetary payoffs present in the situation are salient and dominant such that experimental subjects, c.p., prefer higher to lower payoffs homo oeconomicus behavior should be expected at least approximately. The situation is sufficiently simple to expect that. Nevertheless this kind of behavior is in fact rarely observed. Therefore the rational choice approach seems clearly falsified.

Still, all theories with empirical content – among them the most useful ones – are running into trouble somewhere. They all are falsified in some sense of that term but that does not imply that the falsified theory is to be given up immediately. In the case of hitherto successful theories the wise practical strategy suggests to modify those theories such as to account for the falsifying evidence rather than to abandon the successful theory completely.¹⁴ Along these lines the neo-classical economist will typically argue that neo-classical economics was in fact successful. Therefore, he will say, economic theory should not be given up lightly in view of such evidence as resulting from reward allocation experiments. And, since maximization is part of the theory's core,

¹³ Letting manna drop from heaven is, as may be noted in passing, the way economists normally frame their somewhat bowdlerized version of the reward allocation problem in which the phases of earning claims by some work is left out (see for exceptions Gantner, Güth and Königstein. 2001. Equitable choices in bargaining games with joint production. *Journal of Economic Behavior and Organization*, vol. 46(2), pp. 209-225. Königstein, Manfred. 2000. *Equity, Efficiency and Evolutionary Stability in Bargaining Games with Joint Production*. Berlin Heidelberg New York: Springer.).

¹⁴ Meaningful falsificationism is based on the norm that our theories should be *formulated* such that they are most easily falsifiable. Observing this norm implies that counter evidence is as readily at hand as possible if there is such. The methodological advice of meaningful falsificationism is completely different from the non-sensical advice to give up theories instantaneously once counter evidence is found.

some additions to the assumption of monetary motivation should be made such as to protect the core of the theory in view of the observational evidence.

For the sake of illustration let us look here merely at the minimum such modification. Let us consider one other factor with an application to one other type of social interaction slightly more complicated than the reward allocation game. In doing so we consider as additional factor that of so-called “inequality aversion” (see (Fehr, Ernst and Klaus Schmidt 1999)) and as additional interaction situation the “ultimatum game” (see on this conceptually (Güth, Werner 1976) and experimentally (Güth, Werner, Rolf Schmittberger, and Bernd Schwarze 1982)). – Let us first sketch the game and then discuss how inequality aversion may “explain” observed results.

5.3. The ultimatum game and additional motives

There is a pie p to be allocated to two players X , Y . One, X , is in the role of the “proposer” while the other, Y , adopts the role of the “responder”.

- First X can “propose” some allocation (x, y) of p , $x, y \geq 0$ and $x+y=p$,
- The responder Y can accept the proposal (x, y) or reject it.
- If the responder rejects the proposal both players receive nothing or $(0, 0)$
- If the responder accepts the proposal the pie will be allocated according to the proposal such as to yield (x, y)
- The players do not – and do not expect to – meet each other after the experiment.¹⁵

¹⁵ The ultimatum game has also been used under conditions in which subjects knew that it was played “double blind” meaning that they knew that even the experimenter would be

If the ultimatum game is analyzed in terms of maximizing monetary rewards as the only motive then the recipient should accept all proposals $y > 0$ (and be indifferent as towards acceptance or rejection of the proposal $y = 0$). The proposer should anticipate this if „rationality is common knowledge“ and propose the minimum monetary unit such that $y > 0$. Again, observations tell a different story:

- Responders Y frequently reject offers y from the range $0 \leq y \leq p/3$
- Proposers X in general offer $y > p/3$, mostly an equal split $y = p/2$ of the pie which nearly all responders accept.

These observations¹⁶ are clearly not in line with the classical motivational assumptions of rational economic behavior. At least the responder behavior cannot coincide with the model.¹⁷ Moreover, proposers' theories about human motivation must be such that they predict non-opportunistic rejections, i. e., rejections that forego the opportunity of monetary gains, on the side of

ignorant of the identity of the players see Hoffman, McCabe and Smith, 1996 [Bolton and Zwick, 1995 #1102]).

¹⁶ The recent results of a newspaper experiment with more than 1000 participants can be studied in Güth, Werner, Carsten Schmidt, and Matthias Sutter. 2002. "Bargaining Outside The Lab - A Newspaper Experiment Of a Three Person Ultimatum Game." *Max Planck Institute for Research into Economic Systems: Jena. Discussion Paper Series: Jena.*

Güth, Werner, Carsten Schmidt, and Matthias Sutter. 2003. "Fairness in the Mail and Opportunism in the Internet - A Newspaper Experiment on Ultimatum Bargaining." *German Economic Review*, 4:2, pp. 243-265, while older evidence is discussed in Roth, Alvin E. 1995. "Bargaining Experiments," in *The Handbook of Experimental Economics*. John H. Kagel and Alvin E Roth eds. Princeton: Princeton University Press, pp. 253-348.

¹⁷ If proposers would foresee that responders do not seize all opportunities to acquire additional monetary rewards but rather reject certain offers they could make positive proposals without contradicting the homo oeconomicus model as based exclusively on monetary motivation.

responders or, if not so, the proposers must be (in an altruistic mood) intrinsically motivated not to allocate rewards (too) unevenly.¹⁸

One way of dealing with the observations in a rational choice framework relies on the aforementioned motive of “inequality aversion”. Forming utility functions $u_x(x, |x-y|)$, $u_y(y, |x-y|)$ increasing in the first and decreasing in the second argument¹⁹ has the clear advantage that it applies to actors in both roles. It explains behavior in reward allocation and ultimatum games (and beyond) by “inequality aversion”.²⁰ Both selfish and other regarding motivations are included in a systematic way specifying their relative weight. Finally the qualitative results derived are quite well in line with observational data.

In the preceding regards the argument from inequality aversion seems to be impervious to the most obvious methodological criticisms. It is clearly not pure "ad hocery". If inequality aversion were consistently observed in a variety of situations, it would be justified to see in it an operationalization of a theoretical construct that might be called a motive. Of course, this is only a first step in theory building (from acts to dispositions). Next we might want to learn more about the origins of such a disposition (nature [genetically determined] vs.

¹⁸ In a fuller account the comparison between dictator and ultimatum games on the one hand and reward allocation games and ultimatum games with a preceding joint effort as in the reward allocation case would be appropriate.

¹⁹ Such effects need not be continuous, though. Neo-classical repairs should also allow for lumpiness, see for instance Elias L.Khalil. 2002. “Honesty in One-Shot Game.” *Behavioral Research Council: Great Barrington. Working Paper.*

²⁰ Avoidance vs. approach orientation is an important distinction in psychological motivation research; see, Higgins, E. T., 1996. Ideals, oughts, and regulatory focus: Affect and motivation from distinct pains and pleasures. In P. M. Gollwitzer & J. A. Bargh (Edts.). *The psychology of action. Linking cognition and motivation to behavior* (pp. 91-114). New York: Guilford Press. Since the theory under discussion here is based on inequality aversion we will for the time being go along with that.

nurture [learned in the process of socialization]) or about the characteristics of situations that activate such a motive or about the subjective experience (thoughts and feelings) that are connected with etc. In particular, one would like to know which internal and external conditions elicit efforts towards equality and avoidance of inequality, two motivational orientations that are accompanied by different emotions and different effects on social relationships.

Independent evidence for the presence of the motive of inequality aversion is necessary also because there are many other competing motivational hypotheses that all could explain the emergence of the observed results. For instance, the proclivity of the responder to reject offers that are “too low” could quite naturally be explained in the traditional way by the presence of retributive emotions (see again Brandstätter & Güth, 2002). We have some evidence in day-to-day experience that such emotions do play a role in motivating human behavior. But they do not explain the observations in full. In an ultimatum game, retributive emotions directly apply to the motivation of the responder, whereas the behavior of the first-moving player is indirectly influenced by anticipating the partner’s emotions. In the reward allocation game retributive emotions towards somebody who has contributed to a joint product could conceivably be operative as well and explain at least in part the proposer’s allocation. However, retributive emotions would explain the observations in dictator games as typically used in experimental economics only with some additional assumptions about stimulus generalization which would mean that responses originally conditioned to ultimatum like interaction situations is transferred to dictator situations.²¹

²¹ The desire not to disappoint others could be useful in that regard (Geanakoplos, J., D. Pearce and E. Stacchetti. 1989. “Psychological Games and Sequential Rationality,” *Games on Economic Behavior*, 1, pp. 60-79, Rabin, M. 1993. "Incorporating Fairness into Game Theory and Economics." *American Economic Review*, 83, pp. 1281-302, Falk, A. and Fischbacher, U. 1998. “A Theory on Reciprocity.” Working Paper No. 6, University of Zurich, Dufwenberg, M. and Kirchsteiger, G. 2000. “Reciprocity and wage undercutting.” *European Economic*

There is probably no uniform individual behavior of a proposer in an ultimatum game even in those cases where several individuals consistently tend to offer equitable amounts. Person *A* may wish not to disappoint the recipient, *B* may feel obliged to stick to the equity norm, *C* (not trusting the anonymity promise) may want to impress as just person, etc. This is, of course, a problem of any explanation of overt individual behavior. One cannot get rid of it by aggregation, because averaging usually does not result in a proposition of general psychology (a proposition that should be true for every individual), but rather in a proposition of what may be called ‘averaging psychology’.

The observational regularities of averaging psychology are mere illusions of general "laws". "General psychology" based on averaging does not deliver nomological explanations based on valid laws on the micro level.²² Neglecting and/or not understanding heterogeneity can therefore be disastrous if the circumstances (the environmental conditions) of people's behavior change and individuals or different categories of individuals react differently to those changes. To give one example: We know that some people abide by law because they are conscientious citizens (acting on behalf of internalized social norms), others because they want to maintain their reputation as honorable citizens, still others because they do not want to incur the risk of legal punishment. If we cannot tell the categories from each other and how many individuals belong to each of the different categories of "overtly" law-abiding citizens we cannot predict what happens in case of a policy change. Whether citizens will instantaneously abandon their former legal law abiding practice if sanctions are removed or whether there will be considerable inertia before compliance may eventually be eroded, if at all, depends on the specific motives of individuals.

Review, 44, pp. 1069-78) since it would explain first-mover behavior in the dictator game as well.

²² Nevertheless, propositions on average experience and behavior can be very useful in predicting future average experience and behavior – even if we forget about the heterogeneity underlying the averages.

The extent to which either effect is to be expected can only be estimated in view of some estimate of the heterogeneity in the population.

After all that has been said so far there is no good reason to assume that models based on some notion of full rationality or on standard maximization will lead to adequate explanations in terms of the true causal laws operative in social reality. Let us therefore turn to an account of behavior in dictator and ultimatum games in categories of bounded rationality.

6. Bounded rationality in dictator and ultimatum games

Modern economists tend to refer to themselves as methodological individualists. However, strangely enough, in economics individuals show up only as represented by the stenographic device of utility functions. Rejecting the axioms that guarantee the existence of the utility function we eliminate the individual as perceived by neo-classical economic theory from the picture entirely. No wonder that a kind of “horror vacui” (the fear of the void or the vacuum) takes hold of many economists if utility maximization is taken away.

Adherents of theories of boundedly rational behavior may smile at the ill fate of the adherents of standard rational choice modeling. But they need to put something in place of the rejected “explanations”. Theories of general psychology would form an obvious candidate. If there were well corroborated and universal such theories economics could immediately be reduced to psychology. But it seems quite obvious that there is no general psychological theory of which economic psychology would be a straightforward specification. Therefore adherents of the classical approach can claim with some initial plausibility that one should not abandon neo-classical economics unless there is something to be put into its place. Moreover, they can quite plausibly argue, too, that in digging a tunnel it is a good idea to start from both sides; i.e. not only to work from general psychology towards economic psychology but also from economics towards more realistic models of “boundedly rational behavior”.

However, not too much has been accomplished yet in the field of theories of bounded rationality. Since there is no unified, general theory of boundedly rational behavior and space is limited we will focus in our discussion of reward allocation (dictator) and ultimatum games on the fairly standard and prominent category of satisficing rather than optimizing behavior (see (Simon, Herbert A. 1957) (Simon, Herbert A. 1985)).

According to the assumption of satisficing, humans do not go for the best but rather for results that satisfy their aspiration levels. This approach is rooted in ideas originally developed by Kurt Lewin and his associates in the early 1930s (Hoppe, 1930) and thereby in general psychology rather than neo-classical economics. Examples from business interactions serve as the most prominent and widely accepted illustrations of satisficing behavior. For instance, aspirations of, say a car manufacturer may be, “to stay in business”, “avoid losses”, “avoid cutting back the work force in any dramatic manner”, “keep share prices from falling”, “try to be ahead of the average performance”, “try to be the best in terms of profit” etc. The manufacturer tries to see that the aspirations are met. He is not restlessly striving to find the best alternative (neither is he directly “jumping” to the best alternative all the time since information processing is neither costless nor perfect).

To refer to satisficing rather than to the single-minded desire to “maximize” utility has a realistic ring to it. However, from a theoretical point of view it does not say much unless we can specify to some extent how certain motives and aspirations related to these motives will be operative in a boundedly rational manner. As an example for a bounded rationality approach we look at the framing of situations (see, of course, (Kahneman, Daniel and Amos Tversky 1984) that plays a crucial role in triggering certain responses as cognitive and motivational processes.

6.1. The framing of reward allocation and dictator games

Rules (of thumb) that guide individuals in their boundedly rational choice making specify conditions under which the rules apply. Whether behavior x or x' is adequate depends on how the action situation is perceived which in turn is a combined effect of (somehow) objective characteristics of the situation and the perceivers' dispositions.²³

If we tell people that “lying” is the “right” thing to do in a game allegedly because the task is to tell an untrue story then most of them will lie even though they resent lying otherwise. If we put somebody in a contest of winning as great a share of a pie p as possible then she will act accordingly. She acts selfishly because she feels entitled to or because she thinks that this is the expected behavior, even if she is not a selfish person. Likewise, if a certain situation is characterized as an occasion to show fairness then the actor may perceive it in a completely different frame and again act accordingly because she thinks that this is appropriate, and not because she is naturally completely fair.²⁴

²³ In psychology, measuring or classifying situations is much less developed than measuring or classifying persons. Situations can be characterized by the aggregate (average) of the individual ratings. Averaging across individuals and neglecting individual differences for characterizing situations is acceptable (as last resort) if there is no objective way of classifying situations (for example according to physical intensity [brightness or loudness] in psychophysics, informational complexity [number of elements and relations between the elements] in varying the difficulty of verbal, numerical, or pictorial cognitive tasks in experiments on learning or in aptitude testing etc.).

²⁴ A more general concept than ‘framing’ is Lewin’s ‘Aufforderungscharakter der Situation’ (demand characteristic) and related concepts like ‘affordances’ (Gibson, J. J. [1979]. The ecological approach to visual perception. Boston: Houghton Mifflin); Greeno, J. G. [1994]. Gibson’s affordances. *Psychological Review*, 101, 336-342 or ‘behavior setting’ (Barker, R. G. [1968], Ecological psychology. Stanford: Stanford University Press). With respect to any class of behavior one has to ask how strongly the situation enables or stimulates the respective

More formally:

Let G be a class of situations which are to be classified as action situations. For the sake of simplicity and in order to keep things parallel with the discussion of preferences based on self- and other-regarding motives – like monetary gain and inequality aversion in the distribution of such gains – let us assume that situations may be perceived merely in two ways by actors i from a set of actors $I := \{1, 2, \dots, N\}$:

$\emptyset \neq G_i^n \subset G$; non-ethical (opportunistic) behavior appropriate;

$\emptyset \neq G_i^e \subset G$; ethical (non-opportunistic) behavior appropriate;

$\emptyset \neq G_i^u := G - \{G_i^n \cup G_i^e\}$; no standard of behavior directly applies.

By implication $G_i^n \cup G_i^e \neq G$. Let us assume that $G_i^n \cap G_i^e = \emptyset$.²⁵ For any situation $g \in G$ we have $g \in G_i^n$, $g \in G_i^e$, or $g \in G_i^u$. In the first case rules or norms of appropriate pursuit of self-interest will apply as dominant considerations, in the second case ethical rules, like rules of fairness, retribution, beneficence etc. will dominate or at least guide the deliberation process, while in the third case additional deliberations that in turn take into account different considerations must be performed. To illustrate this process briefly let us look more specifically at the three active decision making roles in the dictator and the ultimatum game:

(D) dictator X in a reward allocation game with contribution $c \in (0, 1)$;

(P) proposer in an ultimatum game;

behavior. Thus, one has to measure the demand characteristics of the (experimental) situation as well as the personality characteristics of the participants relevant in the specific situation.

²⁵ The possibility that two standards, either coherent or conflicting, of which one is ethical and one non-ethical apply is excluded here at least initially.

(R) responder in an ultimatum game.

6.1.1. Some boundedly rational deliberations in role (D)

If an individual finds herself in role (D) in a dictator or reward allocation game g she must classify the situation as to whether it is of type G_i^n , G_i^e or G_i^u . If the situation is framed as a reward allocation game r with “earned entitlements” that amount to c individuals almost never classify their task as $r \in G_i^n$. From $r \notin G_i^n$ it does not necessarily follow that $r \in G_i^e$ applies. But in the reward allocation experiments of psychologists almost all subjects $i \in I$ were choosing allocations $(p/2, p/2)$ or $(cp, (1-c)p)$ and thus according to an “ethical” rule of “equal” or “proportional” shares (see again (Shapiro, E.G. 1975) and (Mikula, Gerold 1973)).

The entitlement to the reward seems to trigger a classification according to $r \in G_i^e$.²⁶ In the dictator games d without entitlement (see (Hoffman, Elizabeth, and Matthew L. Spitzer 1985)) in which experimental economists let the pie drop like manna from heaven individuals seemed less sure about the framing of the situation. There were individuals who obviously were going for $d \in G_i^e$ while others indeed chose allocations according to $d \in G_i^n$. Yet there were also individuals who were uncertain which rules and standards would apply to the

²⁶ An analogous reason may perhaps form part of the explanation for the prevalence of producer as opposed to consumer interests. Producers feel entitled to the rewards of their work. Others in turn think that they indeed have a legitimate claim. Therefore all are willing to vote in favor of policies serving producer interests. Within the standard neo-classical framework we could merely point out factors like information and organization costs leaving open many crucial questions. But if we take framing into account things seem less mysterious.

problem, $d \in G_i^u$. It seems that many individuals when undecided are inclined to go along with whatever they believe is dominant in the group they identify with. Also some who are undecided themselves might nevertheless think that most others would not be uncertain and perceive the situation either as $d \in G_i^e$ or $d \in G_i^n$. However, it is much more plausible that in some kind of “false consensus” uncertain individuals would take their own uncertainty as indicating that others feel likewise (see on false consensus effects Engelmann and Strobel 2000; Gilovitch, 1990). Unable to proceed either according to $d \in G_i^e$ or $d \in G_i^n$ such individuals might try to go for some kind of “convex-combination” or compromise between decision rules. If inner conflict prevails it becomes to a certain extent unpredictable how individuals shall decide. This all being said, it should be noted that, more often than not $d \in G_i^e$ seemed to emerge and the ethical component or frame of decision making did play a role in the deliberations of real decision-makers (see [Bolton, 1995 #1102], Güth and Huck, 1997, Brandstätter and Güth, 1992). Even though less dominant than before allocations (p/2, p/2) formed modal behavior.

The preceding is supported by some experimental evidence. But we readily concede that there is no powerful theory of boundedly rational behavior here.²⁷ Somewhat more general elements show up in the stress that is laid on classification and framing (aspects of human behavior well known and well studied in cognitive psychology) as preceding choice making. It should be noted well, too, that human choice making is modeled as “rule-bound” rather than proceeding case by case. Being rule-bound does not imply, though, that all individuals are bound by the same rules. There may be basic heterogeneity at the more extreme ends of the behavioral spectrum and even those who compromise

²⁷ To argue in common sense categories may be deemed appropriate in view of the fact that we are, after all, dealing with cognitive processes to which individuals bring nothing but their common sense.

between opposing rules may have gotten to their compromise due to their failure to find an appropriate rule and not because of their desire to balance ethical and non-ethical values neo-classically at the margin.

6.1.2. Some boundedly rational deliberations in the responder role (R)

In ultimatum games u the participants must classify the situation also as to whether $u \in G_i^u$, $u \in G_i^e$ or $u \in G_i^n$ applies. Now the proposer X and the responder Y both play an active role as choice-makers.

Starting with the responder it should be noted first that – at least in those cases in which the experiment does not employ the strategy method – the responder knows not only u but also that X offered y in u to her. Let us refer to the information that an offer of y was made in an ultimatum game u by $u(y)$. Then $u(p/2)$ should be sufficient to trigger a positive response from the responder. For $u(p/2) \notin G_i^n$ this is obviously what opportunism (or, perhaps, rather non-ethical rules of behavior) would suggest to the responder. After all, getting something is better than getting nothing and here it is even half the pie. For $u(p/2) \in G_i^e$ the ethical reasoning about fair divisions will lead to the acceptance of the offer $y=p/2$, too. In cases with $0 < y \neq p/2$ the moral response of rejection might be forthcoming. Interestingly enough, in the aforementioned newspaper experiment (see (Güth, Werner, Carsten Schmidt, and Matthias Sutter 2002; Güth, Werner, Carsten Schmidt, and Matthias Sutter 2003)) one could observe that not only in cases $y < p/2$ rejection occurred but also in cases $y > p/2$ if less frequently. Along with a quite distinct tendency to accept very low offers to an extent that goes beyond most other ultimatum game experiments (about a third of the participants accepted in their strategies offers as low as a 10% share of the pie) this is quite remarkable.

Speculating about the reasons for such remarkable results of the newspaper experiment we should like to point out the following: In the experiment the strategy method was employed; i.e. individuals had to specify for each offer in a

discrete space of possible offers whether they would accept or reject the offer. This induced obviously a tendency of participants to distance themselves from direct emotions (assisted by complete anonymity of participants, wide social and local distance, wide gap in time, and the strategy method rendering the proposals hypothetical to some extent).²⁸ Looking for rules in a sober-minded unemotional way may have furthered *both*, the tendency to go for the “right solution” and therefore, if perceived in the ethical framework, to insist on $y=p/2$ and, if perceived in the non-ethical framework, a tendency to reason opportunistically rational and thus to accept all offers. Since individuals can do both, act opportunistically and rule bound, such heterogeneity as observed is not surprising²⁹

6.1.3. Some boundedly rational deliberations in role (P)

An individual X in the proposer role (P) in an ultimatum game is confronted not only with the task of classifying for himself the game u as $u \in G_X^u$, $u \in G_X^e$ or $u \in G_X^n$, but also with the task of anticipating how the responder (R) will classify the situation. Will Y perceive the situation as $u \in G_Y^u$, $u \in G_Y^e$ or $u \in G_Y^n$?

The second part of the proposer’s task could be fulfilled in different ways. The proposer could conceivably try to represent the behavior of the second-moving responder “as if” it were perfectly rational. As a first-mover he would employ the short hand of the utility function to describe her behavior in the second-mover role. Assuming that the first-mover is aware of the theories of inequality

²⁸ Such *post-hoc* explanations could have been tested if measures of how the participants experienced the game situation had been used.

²⁹ Since framing and perception of situations is such a delicate matter, influenced by minor details of the perceived situation and the perceiving subject heterogeneity is to be expected (see Güth, Huck and Müller 2001).

aversion he may speculate that his partner is subject to that aversion and may ascribe to her a utility function giving weight to both, selfish opportunism and unselfish fairness. However, it does not seem very likely that a human decision maker who himself is clearly boundedly rational and perceives himself as being so would in fact rely on the theoretical construct of a utility representation to capture his anticipations of the behavior of another individual. Being aware of the boundedly rational character of his own decision-making he will speculate that the second-mover's decision-making is of the same kind.

If X tries to anticipate the reasoning of Y he must decide on whether $u \in G_Y^u$, $u \in G_Y^e$ or $u \in G_Y^n$ applies. If he knew a bit about experimental results he would also know that at least outside of newspaper experiments it is quite unlikely that $u \in G_Y^n$ prevails. His responder will not accept any $y > 0$ that he might offer. After a very low $y \ll p/2$ the second-mover will tend to classify according to $u(y \ll p/2) \in G_Y^e$. In all likelihood the ethical rule will suggest rejection very strongly and distinctly. In such a case a proposer who himself classifies u according to $u \in G_X^n$ has good reason to propose what seems appropriate according to a situational perception $u \in G_X^e$ speculating introspectively that the latter emulates G_Y^e .

But, of course, it is in general exceedingly unlikely that subjects in experiments would know the results of previous studies of the ultimatum game when playing the game themselves. Only in the long run, propagating the results of research may conceivably influence people's expectations and possibly invalidate their previous theories. Theory absorption of which traditional game theory assumes that it has run its course completely will occur among boundedly rational decision makers only in a very rudimentary fashion. Proposers will form their own view of the boundedly rational theorizing of the responder according to some rather primitive theory of how responders reason and respond. In fact individuals in the proposer role may skip reasoning about the reasoning of

reponders altogether by simply classifying the situation as $u \in G_X^e$ and use some rule of thumb specifying what is the appropriate offer in a situation as u . The most likely case here is that individuals will endorse normative theories that would suggest to offer $y=p/2$ in such cases. At least modal behavior would coincide with this view of the matter.

But what about those who come to the conclusion that an offer of $y < p/2$ is appropriate? Let us initially assume for the sake of specificity that X offers $y=p/3$. It seems likely that such a proposer X is looking at the situation as $u \in G_X^n$ or, possibly, $u \in G_X^u$ and would speculate that his co-player is subject to both motives the ethical one to reject unfair offers supported by retributive emotions – otherwise the proposer should offer $y=0$ – and the non-ethical temptation to take what is on offer. A clever X will consider other possibilities than $y=p/3$. He will, perhaps, apply some non-Bayesian reasoning to determine a range of offers $[y^*, p/2]$ which will in all likelihood be accepted and a range of offers $[0, \underline{y}]$ that he expects to be rejected. Clearly $p/2 \geq y^* \geq \underline{y} \geq 0$ must hold good. The way boundedly rational individuals typically seek for sufficient (satisficing) alternatives makes it most likely that X will neglect offers both from $[0, \underline{y}]$ and from $[\underline{y}, y^*]$ and focus on y^* if his perception of the situation is $u \in G_X^n$.

Considering the results of Brandstätter and Güth (2002), we might say that whether participants perceive the game as $u \in G_X^u$, $u \in G_X^e$ or $u \in G_X^n$, or, respectively, as $u \in G_Y^u$, $u \in G_Y^e$ or $u \in G_Y^n$, is not only a question of the situational cues, but also one of personal dispositions. This suggests that it should be possible to establish the ‘behavioral signatures’ (Mischel & Shoda, 1998) of the players by observing their behavior in a series of games of different structure and to relate these behavioral signatures to basic personality dimensions. But we cannot pursue this issue any further here and are content to let it rest with that.

6.2. Marginal adjustments and the formation of aspiration levels

6.2.1. Marginal adjustment and its limits

In our discussion of the deliberation process in roles (D), (R), (P) we made the assumption $G_i^n \cap G_i^e = \emptyset$. From an intuitive point of view this assumption may seem quite strong. It seems that many of our decision problems arise from intra-personal conflict. We may be torn between factors as for instance the temptation to break a rule or norm and the requirements imposed by that standard of behavior. This is a very common experience and we all must find ways to deal with such conflicts somehow (cf. Feger, 1978). A rational way of doing so clearly emerges if we start to weigh opportunity costs and adjust them at the margin such as to find an optimal compromise. We try to adjust our behavior such that conflicting considerations contribute equally at the margin to our overall well-being.

This approach is appealing from a rational choice point of view. But are such dictates of rationality in any way realistic models of mental processes? Do humans ever consciously adjust at the margin?

Even what may look “as if” it were the outcome of multi-factorial marginal adjustment and global utility maximization is at root in all likelihood a different animal. It is rule bounded or rule guided choice-making and consequentialist utility maximization only exceptionally. To some extent we follow one rule and then to some extent another one. We switch categorically rather than adjust at the margin. Putting such behavior through the neo-classical repair shop to have utility maximization written all over it does not make too much sense. Maybe that some modified utility function “explains” the data but in the end it is behavior that we want to explain not the data. To accomplish this we better go for the mental processes that bring about the results observed as data. Only if we capture them do we have explanations based on the true causal mechanisms rather than “as if-explanations” in terms of utility maximizing behavior. This is not to say, though, that predictions of what might or will happen could not be based on as if analyses based on utility maximizing behavior. But that is a

legitimate prediction only if we can explain the success of the predictor by a deeper understanding of why it works. Otherwise we were relying on mere prophecy.

Clearly the mental processes responsible for individual behavior seem a far cry from marginal adjustment. Therefore we should explore alternatives to the neo-classical assumptions of utility maximization more systematically.

6.2.2. On the formation of aspiration levels

In view of multiple aspirations individuals are moving on a kind of (multi-dimensional) “grid” (Selten, 1998). If their aspirations are not met even after an extended effort modification of the levels will be pending. This modification will often follow some lexicographic pattern.³⁰ If human subjects have aspiration levels along several dimensions they do not adjust changes along several dimensions simultaneously at the margin but satisfy first one of the levels – typically the one that they deem most important –, then the next etc.

How aspirations are generated is a difficult question. For the sake of specificity let us again take a look at the simple ultimatum game. In such a setting according to a first plausible hypothesis a re-acting individual or responder will not aspire to get more than $p/2$. From the results of many experiments we know that offers of $p/2$ will practically always be accepted and practically never be transcended by the actor (the strategy method in the newspaper experiment provided some data for that eventuality, too, though). There will presumably be types of individuals who in the responder role will reject any offer $y < p/2$. Their aspiration level is $y^* = p/2$. Others will tend to accept some offer $y < p/2$. Of

³⁰ Lexicographic modes of thinking are discussed in the case studies in Ahlert, Marlies and Hartmut Kliemt eds. 2001. *Making Choices in Organ Allocation*. Stuttgart: Lucius und Lucius.

special interest is the aspiration level y^* such that they will not accept any y with $y < y^* < p/2$.

It is quite impossible to say something about the absolute height of individual aspiration levels in general. There is also heterogeneity in any population of individuals in that regard. Different individuals will be endowed with different aspirations y^* that must be satisfied should they not become inclined in the responder role to reject the offer of the proposer. Given y^* the following classification of response behavior to offers y emerges:

- $y = p/2$ acceptance will come forward;
- $y^* \leq y < p/2$ acceptance will come forward if grudgingly;
- $y < y^* < p/2$ rejection response will be triggered since the aspiration level is not satisfied.

Forming aspirations in the role of the proposer is somewhat more complicated. Being confronted with such a decision task as playing the ultimatum game in the proposer role individuals might be reasoning along the following lines (see Güth, 2001) which we present in “query and answer”-mode to give just one example of a conceivable cognitive process of deliberation:

1. Q What am I trying to achieve?
A To get a large x is desirable but my proposal must be accepted.
2. Q Is there a conflict between my desire for x and the acceptance by Y and when does it emerge?
A $y < p/2$ may upset the responder while $x \leq p/2$ will bring me on the safe side as far as this is concerned while $x = p/2$ will also satisfy my own desire for self-esteem.
3. Q If I go for $x > p/2$ where is the critical threshold which will trigger Y 's retributive response?

A There is no definite answer to that query. Either the risk must be taken or not. But a kind of prominent fraction like $y^*=p/3$ is the most likely rejection threshold and the corresponding rejection rule guiding Y's behavior is "reject if $x/y > 2$ ".

4. Q What should I do in the light of the foregoing?

A Either offer $y=p/2$ or take the risk and offer $y=p/3$.

The preceding reasoning is not very complicated. We do not have much more to offer in its favor than its plausibility. But we readily admit that the reasoning could be otherwise as well. In particular it could have stopped earlier in the process. An individual searching for a plausible demand that might end her own uncertainty about what her own aspirations should be, could for instance stop after step 2.³¹ She might say after the answer to the query in 2 that the alternative $p/2$ has much in its favor and should therefore be chosen. For rather small p it may appear not worthwhile to go into such a matter too deeply. So somebody who is economizing on decision effort might be content after step 2. Somebody else might of course go on and on a deeper level come to the same conclusion. For instance someone might reason that if p seems small to the responder he may become more inclined to reject the offer since the opportunity costs of expressing retributive emotions are low.³² Again the same result may be reached from going down the list to 4.

What this all shows is, of course, that our theories of cognitive processes leading to the formation of aspiration levels even in such simple cases as ultimatum games is rather underdeveloped (for a review see Keller, 1996). We readily

³¹ Quite often, the equitable offer $y = p/2$ will be chosen at step 1 without any further deliberation that comes into play only if the proposer is tempted to take advantage of the partner's weakness.

³² The relation to the distinction between low and high cost situations as discussed above is obvious.

admit that. At the same time we think that experimentation in economics should aim at and can contribute to such a theory. Rather than repairing a neo-classical maximization approach which quite clearly is not present in the cognitive processes underlying choice making we should try to lift the veil of “utility maximization” and try to form a model of the individual as a choice maker.

Starting with examples like the ultimatum game may be good policy since it keeps things reasonably simple initially. Complications emerge if we try to generalize. For instance, ultimatum games are sometimes also discussed under the heading of “ultimatum bargaining games”. Posting an ultimatum is just the limiting case of bargaining. If we would allow for several rounds of offering and responding between two actors X and Y a real negotiation process about the distribution of the pie p could unfold. What both actors demand in this process may not be their true aspiration level. Fixing an initial demand d_{i0} of actor $i=X, Y$ may rather be the result of some kind of strategic act in which both are “testing the water”. The sum of the initial demands d_{i0} will therefore typically exceed p ; i.e. $p < d_{X0} + d_{Y0}$. A theory of aspiration level adaptation will involve steps of lowering the initially incompatible demands. One meaningful hypothesis here might be that individuals tend to reduce demands by stepping down one aspiration level at a time. Simultaneous or alternating concessions proceeding to the next lower aspiration level may then lead to an aspiration balancing equilibrium which is reached after an equal number of concessions on both sides (see (Ahlert 2003), (Brandstätter and Hoggatt 1982), (Pruitt and Carnevale 1993), (Tietz, Reinhard and Hans-Juergen Weber 1972)).

6.3. Avenues of research on boundedly rational reasoning

If we want to know more about boundedly rational behavior it will be necessary to learn more about actual reasoning processes of human individuals. Of course, we are entering here the turf of cognitive psychology. Being well aware of our own deficiencies as well as of the immature state of the field of cognitive sciences (see for instance Estes 1994) we shall confine ourselves to a speculative discussion of the basic examples of reward allocation and ultimatum games.

6.3.1. Thinking aloud

Thinking aloud procedures are fairly well-established in psychology (Johnson, 1993). They are a way to get some handles on actual human reasoning processes by letting the reasoners “think loud”. For the sake of specificity imagine that a reward allocation game including the problem of fixing an allocation is played under the “think aloud” regime. Individuals in the role of the “dictator” are asked to report what ever comes to their mind. Whatever they say is recorded, transcribed, analyzed and then classified in broader categories according to content.

The difficulties that such studies encounter are obvious. The introspection-biases created in reporting itself. The validity and reliability problems of content analyses are not only well known from other branches of social and psychological theory as for instance media research but cannot be neglected in thinking aloud procedures as well. Still, there are at least some remedies for the deficiencies. For instance the technique of letting at least two experts look through the protocols independently and to let them classify reasons according to pre-specified catch-words or phrases is not without merit. If for instance the dictator in a reward allocation game would say things like “one has to be fair”, “why not take what I can”, “Y should not go without anything but I deserve more”.

Such think aloud studies can clearly assist us in the formation of theories (Corbin & Strauss, 1990). It would, however, be unwise to hope for the inductive emergence of a general theory by simple repetitions of think aloud studies. It may be reasonable though to expect that conducting some “think aloud” studies can provide a good initial grasp of the several factors involved. If that is so then in a next step theory formation should ensue. Moreover, introspectively created “common sense” theories as the speculative arguments that we proposed in 6.1.1. may be “tested”: Did we capture typical lines of argument? Are the kinds of argument consistently repeated in think aloud

studies by a certain percentage or perhaps even a majority of participants of such studies etc.?

6.3.2. Artificial agents

To provoke specific reactions in a controlled way artificial agents may be used. For instance, imagine again a reward allocation game r . If the individual X in the dictator role would be asked by an artificial agent (typically a computer program) assuming the role of a partner, interviewer, adviser, consultant etc. whether she thinks that fairness is important in that situation this might give us some clue on how she sees the situation. However, whether she classifies the situation as $r \in G_X^e$ or not may be affected by the question (Schwarz, 1999). The same would apply if we asked individuals specifically about asymmetries in situational control or power before making their choices. Again the research intervention will affect the situation and how it is perceived by those who participate in the experiment.

More generally, the kind of questions asked and the sequence in which they are asked during rather than after an experiment are non-neutral with respect to outcomes. The use of artificial agents is in all likelihood not neutral with respect to results but it can create valuable information in a controlled way. After all, the artificial agent other than a human agent will always respond in exactly the same manner to identical inputs. Technically speaking its reactions are a function of the responses of participants in an experiment. The next question asked by the program is triggered by the response of the natural or personal agent. The artificial interviewer might even get more sincere answers if anonymity is secured than a human interviewer. It seems that the potential of research based on artificial agents has not yet been fully understood nor has it in any depth been explored up to now. In particular if it is used in re-runs of former experiments it might create some useful insights. We come back to that suggestion in the next

section in which personal actors are teamed with another personal actor rather than an agent.³³

6.3.3. Teams as unitary decision-makers

Economists are used to treat groups of individuals as so-called corporate actors or unitary decision-makers even though they are well aware that in any literal sense only individuals can decide and act. For instance if a team of three individuals would have to decide collectively on the choice of a program to be watched by them on their TV-set they might do so by relying on simple majority vote. We would routinely describe that as a "collective choice". But, of course, literally speaking there is no collective choice. No collectivity literally makes the choice of the TV program and for that matter no individual. The individuals can only choose to vote for or against a proposed program. Their options are – in the simplest case – “yes” or “no” but not the choice of the program as such. That choice emerges from the several acts of assent or rejection chosen by the individuals.³⁴

Individual decision-making seems to emerge from individual processes of weighing pros and cons, too. Individual choice as emergent rather than "made" seems to be mirrored by team processes. This suggests that in order to gain insights into deliberation processes of individuals teams of individuals might be paired to play simple games (see for instance Henning-Schmidt, 1999). Recording discussions among the team members by video and audio devices and analyzing that information might reveal some of the reasoning processes. Teams that have to make the decisions jointly must reach some form of consensus. In

³³ Baurmann and Mans, 1984, used artificial intelligence programming in lisp to create "query agents" in a similar vein.

³⁴ This argument has been made by Buchanan over and over again see for instance vol. 1 of the collected works [Brennan, 1999 #754].

particular, if the team is brought into a co-operative mood such that internal strategies like “holding out” or “bullying” would not appeal to the team members, there is some hope that something can be learnt from the argument in the team for individual deliberations as well (for an overview of group decision making see Brandstätter & Brodbeck, in press).

A design according to which individuals exchange messages over a keyboard in a more formalized manner might work here, too. In the near future speech recognition might reach a state in which spoken messages could automatically be transformed into written ones providing some additional control over the sequence of information exchange and the group dynamics. Controlling for more implicit aspects like the tone of the voices etc. may offer additional insights (see DePaulo & Friedman, 1998, for psychological research on nonverbal communication). Such methods do not enable the researcher to “look into individuals’ heads” but they do bring us somewhat closer to making explicit some interesting processes of deliberation that otherwise remain implicit. On the other hand it may well be that true deliberation processes are not explicit and to force individuals to make them explicit may in itself strongly bias them.

It seems an interesting step to apply the research strategies – that are known among psychologists and other researchers anyway – to some of the research in experimental economics.³⁵ Repeating some of the experimental games relying on teams rather than persons as players may on the one hand control for biases and on the other hand produce new insights. Since the game experiments have been conducted before by individuals there exists some prior knowledge of individual play or some benchmark already. If the distribution and patterns of results of team play are broadly the same as of individual play one can be fairly sure that team- and explicitness-biases are not too strong. Since there are prior hypotheses on how the results in the experimental games came about as well, we can create new insights by testing these hypotheses in light of the new evidence. Letting teams of players play the same games as personal players did before we

³⁵ For a related very stimulating approach see Hutchins "cognition in the wild"

may obviously hope to learn something about the truth of the hypotheses that were formed about the reasoning of persons. There will be evidence about what individual team members regard as relevant considerations for the team. If personal player behavior roughly coincides with what the teams do it seems fairly clear that the reasoning in teams indicates something about considerations of personal players. Moreover, since many of our decisions and for that matter many of those most important in business life are in fact made in inter-personal (discussion) processes such ways of experimenting may not seem too strange to participants. We may therefore generally hope that the techniques of research may not bias results too much.

As stated already, there is nothing new or innovative about the preceding suggestions. Psychologists have been thinking along these lines for a long time. Often they found these kinds of research too clumsy or too unreliable to make them worthwhile. But to use them in the context of prior research of experimental economics may change this assessment to a considerable extent. It seems a quite promising research program to repeat economic experiments performed before with personal players with teams of players who must explicitly reason about their decisions in some formalized format.

More specifically, think of teaming up pairs of individuals in an ultimatum game. They now earn the same payoffs jointly that personal players earned before. To control for the effect of splitting the pie by four rather than two the monetary pie of p might be transformed into a $2p$ or perhaps $(2+\varepsilon)p$, $1>\varepsilon>0$. An even "within-team" split of payoffs should be imposed by the experimenter. The players could be kept incommunicado except for a communication channel that allows for the exchange of messages over the computer key-board. The individuals forming the team in the proposer role might even get some advice concerning the structure and direction of their opinion formation and likewise the individuals forming the team at the receiving end. Different designs or treatments are conceivable here – including the use of artificial agents. Except for such variations the rules should be the same as in a former ultimatum experiment.

Recording what individuals say etc. and analyzing it we may hope to gain some insights on what is in fact driving their decisions. It seems quite likely for instance that one can learn something about whether or not such a motive as “inequality aversion” was in fact present. Intentions in the proposer role might become more transparent. In the responder role we may hope to find out more about motives as well. Was an aversion against inequality driving subjects or were retributive emotions inducing individuals to reject offers? In the future, even advanced techniques like brain imaging may provide additional insights (Posner & DiGirolamo, 2000, Smith et al #####). But we will refrain from speculating on this promising field any further here and rather turn to the other side of the street, the apparently or truly irrational.

7. Bounded rationality and irrationality

It is an interesting question to what extent theories of boundedly rational behavior are to be classified as belonging to the field of rational-choice modelling rather than to empirical psychology pure and simple. Simon's (1957, 1985) concept of "bounded rationality" still concentrates on rationality, on cognitions and the limitations of human cognitive processes. The focus is on conscious mental representations of an individual's world, taking conscious emotional experience only marginally into account, and putting subconscious or unconscious mental processes completely aside. This is not surprising since Simon was addressing primarily an economic audience. But two or three decades ago, emotions were even in psychology a neglected topic of research. Though meanwhile quite some work has been done on emotions (see for instance in psychology Oatley, 1992, in economics Frank 1988 and in philosophy Lahno 2002) up to the present day unconscious mental processes are not a serious concern. This holds good also for psychology – at least as a field of

research and teaching at universities³⁶. But if we intend to understand human choice making in full we have to take into account the influence of the emotions and of the unconscious. We have to deal with a) the intrusion of unconscious mental processes into human reasoning, and b) conscious emotional experience interfering with rational thinking.

With respect to unconscious and possibly irrational influences on choice-making it seems useful to go back to the writings of Sigmund Freud (though we could have gone back to classical antiquity and the philosophical discussion of so-called "weakness of the will" as well, see for instance from a philosophical point of view Spitzley 1992, 1999 and from a more economic, Marxist point of view Elster 1979). As to the Marxist perspective of the influence of economic conditions on human behavior Freud states in his *New introductory lectures on psycho-analysis* : "The strength of Marxism clearly lies, not in its view of history or the prophecies of the future that are based on it, but in its sagacious indication of the decisive influence which the economic circumstances of men have upon their intellectual, ethical and artistic attitudes... But it cannot be assumed that economic motives are the only ones that determine the behaviour of human beings in society ... It is altogether incomprehensible how psychological factors can be overlooked where what is in question are the reactions of living human beings; for not only were these reactions concerned in establishing the economic conditions, but even under the domination of those conditions men can only bring their original instinctual impulses into play – their self-preservative instinct, their drive towards obtaining pleasure and avoiding unpleasure" (35th lecture; pp. 220-221).

³⁶ Quite recently, but obviously not in a psychoanalytic perspective, unconscious cognitive processes attracted some interest in experimental psychology (e. g., Draine and Greenwald, 1998). That Freud's theories are still relevant for today's psychological research is stressed by Westen (1998).

Even if Freud's criticism should miss the thrust of Marxist thinking, it is right on target with respect to the rationalist approach both of the neo-classical *homo oeconomicus* and the model of *bounded rationality*. Sigmund Freud tells us that the most potent forces activating and directing our behaviour are irrational, unconscious in origin, experienced as polarity of love and hatred, barely controlled by rational processes. What, if people often unconsciously undermine and destroy what they consciously are striving for? Then, even the hedonistic pleasure principle, the postulate that humans in all their dealings try to enhance pleasure and to reduce pain, would become at least problematic. "There are people in whose lives the same reactions are perpetually being repeated uncorrected, to their own detriment, or others who seem to be pursued by a relentless fate, though closer investigation teaches us that they are unwittingly bringing this fate on themselves" (32nd lecture, p. 133). These reactions are, however, not restricted to the sub-population of neurotic individuals. What neurotics manifest in extremes, according to Freud is effective in some way or other in every person. More generally Freud posits: "Our hypothesis is that there are two essentially different classes of instincts: the sexual instincts, understood in the widest sense – Eros, if you prefer that name – and the aggressive instincts, whose aim is destruction." (32nd lecture; pp. 128-129).

This destruction can turn itself against the outer world, but also against the ego as (mostly) unconscious self-punishment. Evidently, such an understanding of human nature implies serious doubts not only about full-fledged, but also about bounded rationality of human behavior. Looking at the many past and present conflicts between nations, political movements, ethnic groups, religious affiliations, and personal relationships that so often end in terrible catastrophes for all parties involved, one may reluctantly sympathize with Freud's rather pessimistic view (for a psychoanalytic view at economic processes see also Wolozin, 2002).³⁷

³⁷ It should not be neglected, though, that there are analyses of such processes that point out the rational or strategic role of the seemingly irrational.

As to the second question (conscious emotional experience interfering with reasoning) that can be answered more easily by experimental research than hypotheses derived from psychoanalytic theory, we have first to remember that the concept of utility itself, although neo-classical economic theory in its focus on overt (consistent) preferences avoids any reference to mental processes, in a broader psychological perspective implies an emotional response of feeling well or badly in view of the expected or actually encountered outcome of a person's decisions. An emotion is a spontaneous and immediate feedback following upon successes and failures in pursuing one's goals (for a review of theoretical constructs of unconscious and conscious component processes of emotions, of phenomenological descriptions [first-order emotional experience and second-order reflexive awareness; self- versus world focus; evaluation versus action], and of cultural as well individual differences see Lambie & Marcel, 2002). "An unpleasant feeling tells one to stop what one is doing. A pleasant feeling signals that one should carry on" (Overskeid, 2000). In this respect, emotions are an essential source of preferences and they are constituent components of experiencing a situation as a problem, i. e., as a state one wants to change for the better, in particular when a routine procedure of adjustment is missing. In a psychological perspective, we could not speak of utility as experienced or anticipated feelings of pleasure (according to its classical interpretation) at all, if there were no emotions for or against possible or actual consequences of our actions.

Epstein and his associates (Epstein, 1990; Epstein et al., 1992; Pacini & Epstein, 1999) state that humans develop views of their world and their selves, their personal relationships with the world around them, through two different, though related systems, the experiential system (*ES*) and the rational system (*RS*). In the process of evolution of the species as in individual development the *ES* precedes the *RS*. But it retains a great deal of influence on adult life (see Table 1 from Epstein et al., 1992, for a comparison of properties of *ES* and *RS*). In the *ES*, that operates primarily on a pre-conscious level, events encountered by the person elicit, as a consequence of previous conditioning, emotions that were experienced in the past, particularly in the early childhood and these

positive or negative emotions are connected with impulsive approach or avoidance behavior, respectively. Thus, a person may be inclined to experience his or her environment in general or specific situations as dangerous and hostile, even if she knows that her worries are unfounded and that a more distant and objective judgment finding the situation as actually harmless or even benevolent might be right. The *ES* is assumed to be functional in a majority of situations as well as in a majority of people. There are, however, some situations to which *ES* responds ineffectively and misleadingly and there are some people who very often are misguided by their *ES*. It happens that the *RS* operating on a conscious level according to logical rules, contradicts the *ES* without being able to take the lead in decision-making and action.

Table 1
Comparison of the Experiential and Rational Systems

Experiential system	Rational system
Holistic	Analytic
Emotional: pleasure-pain oriented (what feels good)	Logical: reason oriented (what is sensible)
Associationistic connections	Cause-and-effect connections
More outcome oriented	More process oriented
Behavior mediated by "vibes" from past experiences	Behavior mediated by conscious appraisal of events
Encodes reality in concrete images, metaphors, and narratives	Encodes reality in abstract symbols: words and numbers
More rapid processing: oriented toward immediate action	Slower processing: oriented toward delayed action
Slower to change: changes with repetitive or intense experience	Changes more rapidly: changes with speed of thought
More crudely differentiated: broad generalization gradient, categorical thinking	More highly differentiated, dimensional thinking
More crudely integrated: dissociative, organized into emotional complexes (cognitive-affective modules)	More highly integrated
Experienced passively and preconsciously: we are seized by our emotions	Experienced actively and consciously: we are in control of our thoughts
Self-evidently valid: "experiencing is believing"	Requires justification via logic and evidence

From Epstein et al. (1992).

Epstein's theory reminds us of phenomenologically derived structures of cognitive and affective human experience (e. g. Lersch, 1970). Obviously, there are also some parallels with the distinction of unconscious and conscious mental processes and their conflicts in psychoanalytic theory. Although Epstein (1990) briefly mentions a third system called 'associationistic' that functions without conscious awareness and is viewed as similar to the unconscious system of Freud, the experiential system, too, is characterized in a way that seems to be influenced by psychoanalytic theory (for unconscious versus conscious

components of emotions, varying levels of awareness or attention, and related empirical evidence see also Lambie & Marcel, 2002).

There is a lot of research showing how emotions influence not only the evaluation of activities and of possible outcomes of those activities, but also cognitions (mental representations) of alternatives in decision-making. An example of research on how emotions influence cognitions is the categorization of objects (things, events or situations) according to their emotional quality (Niedenthal, Halberstadt & Innes-Ker, 1999; Innes-Ker & Niedenthal, 2002). The contributions to this line of research assume (and provide empirical evidence) that objects are not only and very often not primarily categorized according to their objective characteristics, but according to the kind of emotions associated with them. (For instance a reward allocation experiment may unconsciously remind a participant of a family situation (e. g., mother distributing a cake) and not of a business interaction (e. g., selling a used car to a stranger)).

As to the influence of moods on decision-making, people in a good mood are less inclined to check possible solutions and their shortcomings carefully than people in a neutral or bad mood, particularly if making a correct decision is not very important. Depending on a person's optimism or pessimism (Marshall et al., 1992) recollections and expectations coming into mind may be positively or negatively biased (for a review of the function of emotions in decision-making see Overskeid, 2000).

If they like what they find reasonable, feeling and thinking are congruent, whether the cognitions are correct or mistaken. Quite often, however, people are torn between reason and passion. They may feel attracted to a goal and – considering their opportunities and abilities – have good reasons to approach it, but they are either irresistibly afraid of doing what they perceive as necessary and good for them, or they are pushed by a strange desire (barely understood and not approved by themselves) into a direction that they clearly recognize as dangerous and damaging over the long haul. Drug addiction (Wills, Sandy & Yaeger, 2001) or entrapment in a course of action that obviously leads into a

disaster (Brockner & Rubin, 1985) are examples along with other intra-personal conflicts that are knowingly solved in a selfdestructive way. Whenever a person finds it necessary and reasonable to act in a certain way while she is yearning and heading for a different or even opposite direction, well knowing that regret will come up soon, one could still say that a person chooses what is most attractive to her in the moment. However, in all accounts of rationality that do not subscribe to the view that for rational behavior only "present motives" matter it would be strange to call such a behavior rational or even boundedly rational.

Introducing a discount factor giving more weight to an instantaneous pleasure than to pleasure in the future (see Wills, Sandy & Yaeger, 2001, for time perspective in drug addiction and more generally in connection with economic reasoning Ainslee) would not necessarily rescue the traditional model of behavior, if people are convinced that sustained happiness is what they want, but that they are unable to act according to their insights. People differ consistently (across time) in delay-of-gratification measures ([Shoda, Mischel, & Peake, 1990](#)), indicating their ability, to abstain from a present satisfaction in exchange for a larger or more durable future satisfaction. Nevertheless, those who can not resist the temptation of immediate pleasure might well be aware of the conflict. By the same token they might know that they will regret their impulsive action without being able to act reasonably. Evidently, such behavior (wanting to behave reasonably, but unable to do so) would not fit a model of bounded rationality. As Latin wisdom had it: *Video meliora, proboque, deteriora sequor.*³⁸

8. Conclusion homo sapiens, boundedly rational and expecting man

As remarked before human behavior is always both drawn by the future and pushed from the past. Humans can in exceptional instances act in a purely

³⁸ I see the better and I do approve of it yet I will do the worse.

opportunistic manner. But more often they act in a way that fails to exploit the full potential of opportunities. Their cognitive capacities as well as their ethical will are both imposing constraints on them. They are cognitively or normatively bounded in their ability to engage in opportunity taking behavior. Still, sometimes they can in fact overcome both types of boundedness. Consulting experts and engaging in an exceptional effort of situational analysis may be helpful in overcoming cognitive routines. Likewise, those who intend to abandon old habits and the allegiance to some ethical norm of conduct may do so as well in some special effort or by simply giving in to a temptation.

Research on bounded rationality must take into account the fact that human behavior cannot be adequately understood unless *both* future directedness and adaptation to past experience are taken into account. To find the fundamental mechanisms of human coordination we must in particular look at situations that are repeated under several influences including frequent external shocks of minor and sometimes major proportions.³⁹ Even though we would reject the typical neo-classical focus on optimization as brought about by selective adaptation in repetitive situations we do not deny that repetition, learning and adaptation in gradual processes of trial and error are of the essence of the economic process and therefore must be studied in detail.

One can respond to this insight by turning to “robust learning” experiments (see Güth 2002). In these experiments participants play a variety of structurally related games to find out some general features of learning processes that are robust in the sense of being identical across games, showing up again and again when playing sequences of games and reappear when the games are played in alternating order. To illustrate, let us again for the sake of specificity look at ultimatum games *u* and dictator games *d* (or, for that matter, reward allocation games *r*). A robust learning experiment would for example engage participants in the

³⁹ This general experience is expressed in the extended citation from Peyton Young’s theory of institutional evolution above.

(1) repeated play of games of the form d (or r) with changing participants
after announcing the change

(2) repeated play of games of the form u with changing participants

possibly repeating two sequences (1)-(2) over and over again.

Adaptive learning is observable in the repetitions of the same game. If after the announcement of change and switching to the other game drastic changes of behavior occur, this will indicate the presence of forward looking rational strategic choices. For instance if after a series of u-games and the announcement of the switch to the series of d-games behavior changes very distinctively then this may suggest that strategic opportunism was influential in determining the behavior in the games of the type u. But even this evidence for opportunistic case-by-case maximization is not too strong. After all, the observed switch could still be a switch between two rules, one deemed appropriate for one class of games and one for the other class. The choice maker then is not maximizing but rather switching between rules typically to meet certain aspirations connected to former experience of applying those rules.

The problem that comes to the fore here again is simply that the case-by-case maximization assumption of the standard perfect rationality model of neo-classical economics is so far off the mark that it becomes hard to find real world examples for it. It would be much better if economists would cease to acclaim those most who manage to “explain” everything in terms of “rational choice”. What can be won by economic story telling of that kind?

On the other hand the deficiencies of the bounded rationality approach, its lack of specificity, sometimes even its lack of empirical content and certainly of general applicability are obvious. But let us not forget that utility maximization though its mathematical precision is nurturing all sorts of illusions is no better in those regards. Worse, it is quite certainly a dead-end of research since it does not support efforts to form realistic models of decision processes. The bounded rationality approach is at least a step towards modeling real decision processes

of individuals. Since it does not insist that everything be cast into the maximization under constraints mold it can be more open with respect to all sorts of theorizing.

We are very much aware that such remarks as our preceding programmatic proposals are mere gestures. A new synthesis of several strands of research on human decision making is needed if real progress is to be made. Branches of psychology as cognitive and social psychology are part of or can at least be utilized in the move towards theories of boundedly rational behavior (reaching from (Festinger, L. 1957) to (Gigerenzer, Gerhard 1996;1997); see also (Evans, 2002)). Cognitive science in the broader sense of that term as inspired by Herbert Simon himself and then pushed on in several directions bears promise, too (see for some non-standard contributions opening new perspectives of research (Clark, Andy 1997;Hutchins, Edwin 1995)(Wilson, R. A. and Keil, F. C. (Eds.) 2001)).

We dare to suggest that the future lies in designing new experiments and field studies that may shed some light on human mental processes and may heuristically inspire the formation of new theories. It seems striking how complex the discussion of even such simple game structures as reward allocation, dictator and ultimatum games can get. Complexity is not a good but rather a bad thing for boundedly rational theoreticians like us. But if it unfolds from going over every nook and cranny of such simple structures as we studied we may speculate that we perhaps might be on the right track towards the exemplary understanding of the delicate relationship between such factors like cognitive limitations, norm orientation and opportunism in human behavior. Doing so we will get closer to homo sapiens rather than homo oeconomicus or a model of man that allows the complexities of human behavior to emerge from realistic assumptions about boundedly rational behavior.

References

Marlies Ahlert 2003. An Axiomatic Approach to Bounded Rationality in Negotiations - Agreements by Aspiration Balancing. Discussion Paper Martin Luther University Halle-Wittenberg.

Ahlert, Marlies and Hartmut Kliemt eds. 2001. *Making Choices in Organ Allocation*. Stuttgart: Lucius und Lucius.

Ainslee, G. (1992). *Picoeconomics*. Cambridge, Cambridge University Press.

Albert, Hans. 1964. "Probleme der Theoriebildung," in *Theorie und Realität*. Hans Albert ed. Tübingen: Mohr.

Albert, Hans. 1967. *Marktsoziologie und Entscheidungslogik*. Neuwied/Berlin.: Luchterhand.

Alchian, Armen A. 1950. "Uncertainty, Evolution, and Economic Theory." *Journal of Political Economy*, Vol. 58, pp. 211 ff.

Anderhub, Vital and Werner Güth. 1999. "On intertemporal allocation behavior - A selective survey of saving experiments." *ifo-Studien*, 3, pp. 303-333.

Aumann, Robert. 1990. "Nash Equilibria are not Self-Enforcing," in *Economic Decision Making: Games, Econometrics and Optimisation*. J. J. Gabszewicz, J.-F. Richard and L. A. Wolsey eds. Amsterdam: Elsevier Science Publishers.

Aumann, Robert and Adam Brandenburger. 1995. "Epistemic Conditions for Nash Equilibrium." *Econometrica*, Vol. 63:5, pp. 1161-80.

Baurmann, Michael and Dieter Mans. 1984. "Künstliche Intelligenz in den Sozialwissenschaften." *Analyse & Kritik*, 2.

Becker, Gary. 1976. *The Economic Approach to Human Behavior*. Chicago und London: University of Chicago Press.

Berninghaus, Siegfried, Werner Güth and Hartmut Kliemt. 2003. "Reflections on Equilibrium." *in this volume*.

Bolton, Gary E. and Axel Ockenfels. 2000. "ERC: A Theory of Equity, Reciprocity and Competition." *American Economic Review*, 90, pp. 166-93.

Bolton, Gary E. and Rami Zwick. 1995. "Anonymity versus Punishment in Ultimatum Bargaining." *Games and Economic Behavior*, v. 10, p. 95-121.

Brandenburger, Adam and Eddie Dekel. 1987. "Rationalizability and Correlated Equilibria." *Econometrica*, 55:6, pp. 1391-402.

Brandstätter, H. & Brodbeck, F. (in press). Problemlösen und Entscheiden in Gruppen. In H. Schuler (Ed.). *Enzyklopädie der Psychologie.D III, Band 3. Organisationspsychologie* (2nd ed.). Göttingen: Hogrefe.

Brandstätter, H. & Güth, W. 2002. Personality in dictator and ultimatum games. *Central European Journal of Operations Research*, 10, 191-215.

Brandstätter H. & Hoggatt, A. C. (1982). The influence of social emotions on bargaining outcomes in a bilateral monopoly game. In H. Brandstätter, J. H. Davis & G. Stocker-Kreichgauer (Eds.), *Group Decision Making* (pp. 284-294). London: Academic Press.

Brennan, H. Geoffrey and James M. Buchanan. 1984. "Voter Choice: Evaluating Political Alternatives." *American Behavioral Scientist*, 28:No. 2, November/December, pp. 185-201.

Brennan, H. Geoffrey and Loren Lomasky. 1984. "Inefficient Unanimity." *Journal of Applied Philosophy*, 1,1, pp. 151-63.

Brockner, J. & Rubin, J. Z. (1985). *Entrapment in escalating conflicts: A social psychological analysis*. New York: Springer.

Buchanan, James M. 1999. *The Logical Foundations of Constitutional Liberty*. Indianapolis: Liberty Fund.

Buchanan, James M. and Gordon Tullock. 1962. *The Calculus of Consent*. Ann Arbor: University of Michigan Press.

Cattell, Raymond B. 1965. *The scientific analysis of personality*. Baltimore: Pinquin Books.

Clark, Andy. 1997. *Being There. Putting Brain, Body, and World Together Again*. Cambridge: MIT Press.

Corbin, J. & Strauss, A. (1990). Grounded theory research: Procedures, canons and evaluative criteria. *Zeitschrift für Soziologie*, 19, 418-427.

Cournot, Auguste. 1838. *Recherches sur les principes mathématiques de la théorie des richesses*. Paris: L. Hachette.

Dacey, Raymond. 1976. "Theory Absorption and the Testability of Economic Theory." *Zeitschrift für Nationalökonomie*, 36:3-4, pp. 247-67.

Dacey, Raymond. 1981. "Some Implications of 'Theory Absorption' for Economic Theory and the Economics of Information," in *Philosophy in Economics*. Joseph C. Pitt ed. Dordrecht: D. Reidel, pp. 111-36.

DePaulo, Bella M. & Friedman, Howard S. (1998). Nonverbal communication. In D. T. Gilbert, S. T. Fiske & G. Lindzey (Eds.). *The handbook of social psychology (4th ed., vol. 2, pp. 3-40)*. Boston, MA: McGraw-Hill.

Draine, S. C. & Greenwald, A. G. (1998). Replicable unconscious semantic priming. *Journal of Experimental Psychology: General*, 127, 286-303.

Elster, J. (1979). *Ulysses and the Sirens*. Cambridge, Cambridge University Press.

Engelmann, Dirk and Martin Strobel. 2000. "The False Consensus Effect Disappears if Representative Information and Monetary Incentives Are Given." *Experimental Economics*, 3(3), pp. 241-260.

- Epstein, S. (1990). Cognitive-experiential self-theory. In L. A. Pervin (ed.), *Handbook of personality. Theory and research* (pp. 165 – 192). New York: The Guilford Press.
- Epstein, S., Lipson, A., Holstein, C. & Huh, E. (1992). Irrational reactions to negative outcomes. Evidence for two conceptual systems. *Journal of Personality and Social Psychology*, 62, 328-339.
- Estes, W. K. 1994. *Classification and cognition*. New York: Oxford University Press.
- Evans, Jonathan St. B. T. 2002. Logic and human reasoning: An assessment of the deduction paradigm. *Psychological Bulletin*, 128, 978-996.
- Feger, Huber. 1978. *Konflikterleben und Konfliktverhalten*. Bern: Huber.
- Fehr, Ernst and Klaus Schmidt. 1999. "A Theory of Fairness, Competition, and Cooperation." *Quarterly Journal of Economics*, 114, pp. 817-68.
- Festinger, L. 1957. *Theory of Cognitive Dissonance*. Evanston (Ill.): Roar.
- Frank, R. 1988. *The Passions within Reason: Prisoner's Dilemmas and the Strategic Role of the Emotions*. New York: W. W. Norton.
- Frankena, William K. 1966. *Some Beliefs about Justice*. Lawrence. Kansas: The University of Kansas.
- Freud, S. (1933/1989). *New introductory lectures on psycho-analysis*. Translated and edited by James Strachey. New York: Norton.
- Friedman, James and Shyam Sunder. 1994. *Experimental Methods. A Primer for Economists*. Cambridge: Cambridge University Press.
- Frohn, Joachim, Werner Güth, Hartmut Kliemt, and Reinhard Selten eds. 2001. *Making Choices I & II*. München: Accedo.

Gantner, Anita, Manfred Königstein and Werner Güth. 2001. "Equitable choices in bargaining games with joint production." *Journal of Economic Behavior and Organization*, vol. 46(2), pp. 209-225.

Gigerenzer, Gerd, Jean Czerlinski, and Laura Martignon. 1998. "How Good Are Fast and Frugal Heuristics?," in *Decision Research from Bayesian Approaches to Normative Systems: Reflections on the Contribution of Ward Edwards*. James Shanteau, Barbara Mellers and David Schum eds. Dordrecht: Kluwer, pp. 1-23.

Gigerenzer, Gerhard. 1996. "Reasoning the Fast and Frugal Way." *Psychological Review*, 103, pp. 650-69.

Gigerenzer, Gerhard. 1997. "Bounded Rationality: Models of Bounded Rationality." *Swiss Journal of Economics and Statistics*, 133, pp. 201-18.

Gilovich, Cornell. 1990. Differential Construal and the False Consensus Effect *Journal of Personality and Social Psychology*, 59, 623-634.

Gode, Dhamanjay K. and Shyam Sunder. 1993. "Allocative Efficiency of Markets With Zero Intelligence Traders: Markets as a Partial Substitute for Individual Rationality." *Journal of Political Economy*, 101, pp. 119-37.

Greenwald, A. G. (1992). New look 3: Unconscious cognition reclaimed. *American Psychologist*, 47, 766-779.

Güth, Werner. 1976. "Towards a More General Analysis of von Stackelberg-Situations." *Zeitschrift für die gesamte Staatswissenschaft*, pp. 592-608.

Güth, Werner. 2002. "How do decisions emerge? Generating ultimatum proposals." *Advances in Behavioral Economics - Essays in Honor of Horst Todt* (Hrsg.: Friedel Bolle und Michael Carlberg), Physica-Verlag Heidelberg, pp. 11-24.

Güth, Werner. 2002. "Robust Learning Experiments." *Experimental Economics: Financial Markets, Auctions, and Decision Making, Interviews and Contributions from the 20th Arne Ryde Symposium*, F. Andersson and H. Holm, Lund University (eds.), Kluwer Academic Publishers, pp. 159-184.

Güth, Werner and Steffen Huck. 1997. "From ultimatum bargaining to dictatorship - An experimental study of four games varying in veto power." *Metroeconomica*, 48/3, pp. 262-279.

Güth, Werner, Steffen Huck and Wieland Müller. 2001. "The Relevance of Equal Splits in Ultimatum Games." *Games and Economic Behavior*, 37, pp. 161-169.

Güth, Werner and Hartmut Kliemt. 1998. "Towards a Fully Indirect Evolutionary Approach." *Rationality and Society*, 10:3, pp. 377-99.

Güth, Werner and Hartmut Kliemt. 2000. "From full to bounded rationality. The limits of unlimited rationality." Center for Interdisciplinary Research (ZiF): Bielefeld.

Güth, Werner, Hartmut Kliemt, and Axel Ockenfels. 2002. "Retributive Responses." *Journal of Conflict Resolution*, forthcoming.

Güth, Werner, Rolf Schmittberger, and Bernd Schwarze. 1982. "An Experimental Analysis of Ultimatum Bargaining." *Journal of Economic Behavior and Organization*, 3, pp. 367-88.

Hamburger, Henry. 1979. *Games as Models of Social Phenomena*. San Francisco: W. H. Freeman and Company.

Harrison, Glenn W. 1989. "Theory and Misbehavior of First-Price Auctions." *American Economic Review*, 79, pp. 749-62.

Harsanyi, John C. and Reinhard Selten. 1988. *A General Theory of Equilibrium Selection in Games*. Cambridge, Mass.: MIT Press.

Heiner, R. 1983. "The Origin of Predictable Behavior." *American Economic Review*, 73/4, pp. 560 ff.

Henning Schmidt, Heike. 1999. "Bargaining in a Video Experiment - Determinants of Boundedly Rational Behavior." *Lecture Notes in Economics*

and Mathematical Systems, vol. 467, Springer-Verlag Berlin-Heidelberg-New York.

Heyd, David. 1982. *Supererogation. Its Status in Ethical Theory*. Cambridge et al.: Cambridge University Press.

Hoffman, Elizabeth, Kevin McCabe and Vernon Smith. 1996. "Anonymity in Dictator Experiments."

Hoffman, Elizabeth, and Matthew L. Spitzer. 1985. "Entitlements, Rights, and Fairness: An Experimental Examination of Subjects' Concepts of Distributive Justice." *Journal of Legal Studies*, 14:2 (June), pp. 259-97.

Holland, J. L. 1996. *Making vocational choices. A theory of vocational personalities and work environments* (3rd edition). Odessa, FL: Psychological Assessment Resources.

Homans, George, C. 1961. *Social behavior. Its elementary forms*. New York: Harcourt Brace Jovanovich.

Hoppe, F. 1930. Erfolg und Misserfolg. *Psychologische Forschung*, 14, 1-62.

Hume, David, 1739/1978, *A Treatise of Human Nature*: Oxford, Clarendon.

Hutchins, Edwin. 1995. *Cognition in the Wild*. Cambridge: MIT Press.

Innes-Ker, Å. & Niedenthal, P. M. (2002). Emotion concepts and emotional states in social judgment and categorization. *Journal of Personality and Social Psychology*, 83, 84-816.

Johnson, M. M. 1993. Thinking about strategies during, before, and after making a decision. *Psychology & Aging*, 8, 231-241.

Kagel, John H. and Alvin E. Roth eds. 1995. *The Handbook of Experimental Economics*. Princeton: Princeton University Press.

Kahneman, Daniel and Amos Tversky. 1984. "Choices, Values and Frames." *American Psychologist*, 39:April, pp. 341-50.

Keller, J. A. 1996. **Anspruchsniveau**. In J. Kuhl & H. Heckhausen (Eds.). *Motivation, Volition und Handlung*. Enzyklopädie der Psychologie, C, IV, Band 4. Göttingen: Hogrefe.

Kirkcaldy, B. D., Furnham, A. & Martin, T. (1998). National Differences in Personality, Socio-Economic, and Work-Related Attitudinal Variables. *European Psychologist*, 3, 255-262.

Kliemt, H. 1986. "The Veil of Insignificance." *European Journal of Political Economy*, 2/3, pp. 333-344.

Königstein, Manfred. 2000. *Equity, Efficiency and Evolutionary Stability in Bargaining Games with Joint Production*. Berlin Heidelberg New York: Springer.

Lahno, B. (2002). *Der Begriff des Vertrauens*. Paderborn, Mentis.

Lambie, J. A. & Marcel, A. J. (2002). Consciousness and the varieties of emotion experience. A theoretical framework. *Psychological Review*, 109, 219-259.

Lersch, Ph. (1970). *Aufbau der Person* (11. Aufl.) [The structure of the person, 11th ed.]. München: Barth.

Luce, D. and H. Raiffa. 1957. *Games and Decisions. Introduction and Critical Survey*. New York et al.: John Wiley.

Mackie, John L. 1985. *Morality and the Retributive Emotions*.

Maital, S. and S. L. Maital. 1984. *Economic Games People Play*. New York: Basic Books.

Marshall, Grant N.; Wortman, Camille B.; Kusulas, Jeffrey W.; Hervig, Linda K.; Vickers, Ross R. (1992). Distinguishing optimism from pessimism: Relations to fundamental dimensions of mood and personality. *Journal of Personality & Social Psychology*, 62, 1067-1074.

McKenzie, Richard B. and Gordon Tullock. 1975. *The New World of Economics: Explorations into the Human Experience*. Homewood, IL. Richard D. Irwin, Inc.

Meckling, W. 1976. "Values and the Choice of the Model of the Individual in the Social Sciences." *Schweizerische Zeitschrift für Volkswirtschaft und Statistik*, 112/4, pp. 545 ff.

Mikula, Gerold. 1973. "Gewinnaufteilungsverhalten in Dyaden bei variiertem Leistungsverhältnis." *Zeitschrift für Sozialpsychologie*, 3, pp. 126-33.

Milgrom, Paul and John Roberts. 1993. *Economics, Organization and Management*. Englewood Cliffs: Prentice Hall.

Mischel, Walter and Yuichi Shoda. 1998. "Reconciling processing dynamics and personality dispositions." *Annual Review of Psychology*, 49, 229-258.

Morgenstern, Oskar. 1972. "Descriptive, Predictive and Normative Theory." *Kyklos*, 25, pp. 699-714.

Morgenstern, Oskar and Gerhard Schwödiauer. 1976. "Competition and Collusion in Bilateral Markets." *Zeitschrift für Nationalökonomie*, 36:3-4, pp. 217-45.

Nash, John F. 1951. "Noncooperative Games." *Annals of Mathematics*, 54, pp. 289-95.

Nelson, R. R. and S. G. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Niedenthal, P. M. & Halberstadt, J. B. & Innes-Ker, Å. H. 1999. "Emotional response categorization." *Psychological Review*, 106, 337-361.

Oatley, K. (1992). *Best laid schemes. The psychology of emotions*. New York: Oxford University Press⁴⁰.

Overskeid, G. 2000. "The slave of the passions. Experiencing problems and selecting solutions." *Review of General Psychology*, 4, 284-309.

Pacini, R. & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, 76, 972-987.

Posner, Michael I. & DiGirolamo, Gregory J. 2000. Cognitive neuroscience: Origins and promise. *Psychological Bulletin*, 126, 873-889.

Pruitt, D. G. & Carnevale, P. J. (1993). *Negotiation in social conflict*. Buckingham: Open University Press.

Rabin, Matthew. 1993. "Incorporating Fairness Into Game Theory and Economics." *American Economic Review*, 83, pp. 1281-302.

Roth, A.E. and J. Erev. 1995. "Learning in extensive form games: experimental data and simple dynamic models." *Games and Economic Behavior*, 8:1, pp. 164-212.

Roth, Alvin E. 1995. "Bargaining Experiments," in *The Handbook of Experimental Economics*. John H. Kagel and Alvin E Roth eds. Princeton: Princeton University Press, pp. 253-348.

Rubinstein, Ariel. 1998. *Modeling Bounded Rationality*. Cambridge. MA: Cambridge University Press.

Schwartz, Hugh, 2002. Herbert Simon and behavioral economics. *Journal of Socioeconomics*, 31, 181-189.

Schwarz, Norbert. 1999. Self-reports: How the questions shape the answers. *American Psychologist*, 54, 93-105.

Selten, Reinhard. 1986. "Institutional Utilitarianism," in *Guidance, Control, and Evaluation in the Public Sector*. Franz-Xaver Kaufmann ed. Berlin und New York: de Gruyter, pp. 251 ff.

Selten, Reinhard ed. 1991a. *Game Equilibrium Models I - Evolution and Game Dynamics*. Berlin / Heidelberg / New York / London / Paris etc.: Springer Verlag.

Selten, Reinhard ed. 1991b. *Game Equilibrium Models II - Methods, Morals, and Markets*: Springer Verlag.

Selten, Reinhard ed. 1991c. *Game Equilibrium Models III - Strategic Bargaining*. Berlin / Heidelberg / London etc.: Springer-Verlag.

Selten, Reinhard ed. 1991d. *Game Equilibrium Models IV - Social and Political Interaction*. Berlin / Heidelberg / New York etc.: Springer-Verlag.

Selten, Reinhard. 1998. "Aspiration Adaptation Theory." *Journal of Mathematical Psychology*, 42, pp. 191-214.

Shapiro, E.G. 1975. "Effects of future interaction on reward allocation in dyads: equity or equality." *Journal of Personality and Social Psychology*, 32, pp. 873-80.

Sheldon, K. M., Elliot, A. J., Kim, Y & Kasser, T. 2001. *Journal of Personality and Social Psychology*. 80, 325-339.

Shoda, Y., Mischel, W. & Peake, P. K. 1990. "Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification." *Developmental Psychology*, 26, 978-986.

Simon, Herbert A. 1957. *Models of Man*. New York: John Wiley and Sons.

- Simon, Herbert A. 1985. *Models of Bounded Rationality (1&2)*. Cambridge, MA: MIT-Press.
- Simon, Herbert A. 1990. Invariants of human behavior. *Annual Review of Psychology*, 41, 1-19.
- Slonim, Robert and Alvin E Roth. 1998. "Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic." *Econometrica*, 66, pp. 569-96.
- Spitzley, Th. 1992. *Handeln wider besseres Wissen. Eine Diskussion klassischer Positionen*, de Gruyter, Berlin/New York.
- Spitzley, Th. 1999. "Willensschwäche", in: *Enzyklopädie Philosophie*, Bd. 2, hrsg. von H. J. Sandkühler, Meiner, Hamburg, S.1758f.
- Srivastava, A., Locke, E. A. & Bartol, K. M. 2001. "Money and subjective well-being. It's not the money, it's the motives." *Journal of Personality and Social Psychology*, 80, 959-971.
- Sugden, Robert. 1991. "Rational Choice: A Survey of Contributions from Economics and Philosophy." *The Economic Journal*, 101:July, pp. 751-85.
- Thompson, Earl and Roger Faith. 1981. "A Pure Theory of Strategic Behavior and Social Institutions." *American Economic Review*, 71, pp. 366 ff.
- Tietz, Reinhard and Hans-Juergen Weber. 1972. "On the Nature of the Bargaining Process in the KRESKO-Game," in *Beiträge zur Experimentellen Wirtschaftsforschung*. Heinz Sauermann ed. Tübingen: Mohr, pp. 305-34.
- Urmson, J. O. 1958. "Saints and Heroes," in *Essays in Moral Philosophy*. I Melden ed. Seattle/London: University of Washington Press, pp. 198 ff.
- Westen, D. 1998. "The scientific legacy of Sigmund Freud. Toward a psychodynamically informed psychological science." *Psychological Bulletin*, 124,333 -371.

Wills, T. A., Sandy, J. M. & Yaeger, A. M. 2001. "Time perspective and early-onset substance use: A model based on stress-coping theory." *Psychology of Addictive Behaviors*, 15, 118-125.

Wilson, R. A. & Keil, F. C. 2001. *The MIT Encyclopedia of the Cognitive Sciences*. Boston,MA: MIT Press.

Witt, Ulrich. 1987. *Individualistische Grundlagen der evolutorischen Ökonomik*. Tübingen: Mohr.

Wolozin, H. 2002. "The individual in economic analysis: toward psychology of economic behavior." *Journal of Socio-Economics*, 31, 4557.

Young, H. Peyton. 1998. *Individual Strategy and Social Structure. An Evolutionary Theory of Institutions*. Princeton: Princeton University Press.