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Economic Behavior –
Evolutionary vs. Behavioral Perspectives

by

Ulrich Witt

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Max Planck Institute of Economics
Evolutionary Economics Group
Kahlaische Str. 10
07745 Jena, Germany
Fax: ++49-3641-686868

Economic Behavior – Evolutionary vs. Behavioral Perspectives

Ulrich Witt
Max Planck Institute of Economics
Jena, Germany
ulrich.witt@econ.mpg.de

abstract

An evolutionary perspective on economic behavior has to account for the influences that the human genetic endowment has on the choices the agents make. Likely to have been fixed in times of fierce selection pressure, this endowment is presumably adapted to the living conditions of early humans. If at all, behavioral economics accounts for its influences on economic decision making in a way similar to the approach taken by evolutionary psychology, i.e. by focusing on decision heuristics and their tensions with modern rationality standards. In an evolutionary perspective, that focus needs to be extended so as to also embrace the motivational underpinnings of economic behavior. In the language of economics this means to inquire into the agents' preferences and to explain how they relate to the human genetic endowment and how they change over time. The paper discusses several implications of such an extension.

key words: behavioral economics, evolutionary economics, Darwinism, decision heuristics, preferences, development, growth, welfare

JEL code: A12, B25, B52, D01, D03, D63, O10

1. Introduction

Towards the end of the 19th century the Darwinian revolution gained momentum in the sciences. It is an irony of history that at the same time in economics a "marginalist (or subjectivist) revolution" took place that aimed exactly in the opposite direction. Darwin's theory of the evolution of life and the descent of the species by means of natural selection amounted to nothing less than a challenge to the then dominating Newtonian world view. In contrast, proponents of the "revolution" in economics like Walras, Edgeworth, Pareto, and, in particular, Jevons (see Maas 2005) wished to turn economics into a social physics inspired by the ideal of Newtonian classical mechanics. With his attempt to set up a "mechanics of utility and self-interest" Jevons (1897, 23) triggered a development in economic theorizing that increasingly neglected the motivational aspects of economic behavior that had in the tradition of sensory utilitarianism been explained by identifying utility with the enjoyment of pleasures and avoidance of pains. Utility was declared an inscrutably subjective magnitude and the "felicitous calculus" of subjective utility maximization was conceptualized analogously to the dissipation (minimization) of potential energy in physics (see Georgescu-Roegen 1971, Mirowski 1989).

It took economic theorizing almost a century to step back from the radically subjective interpretation and to raise questions about the adequacy of the utility maximization calculus as the valid theory of economic behavior. Initiated by the writings of the Carnegie School (March and Simon 1958, March 1978), the idea of bounded rationality was introduced and was later extended into a behavioral theory particularly about decision anomalies and biases in intuitive beliefs and choices (Hogarth 1994, Kahneman 2003, Sent 2004). The development of behavioral economics gained momentum over the past years (see, e.g., Camerer, Loewenstein and Rabin 2003) and was backed by a broad introduction of experiments into economics. It is not clear, though, to what extent the relevance of Darwinian thought for understanding economic behavior is acknowledged in these developments (see Robson 2001). Not unlike in evolutionary psychology, Darwinian theory can be used to reconstruct the human genetic endowment that was fixed at times when early man was under fierce selection pressure. As all human behavior, the economic choices people make are likely to be subject to influences from this endowment. The question is how far these influences reach, where they are most notable, and in which way tracing these influences helps to better understand certain features of economic behavior.

In evolutionary psychology the focus is mainly on capabilities and constraints of the human brain as, it is argued, natural selection has created them (cf. Barkow, Cosmides and Tooby 1992). They correspond to certain features of human cognition and choice, explaining in part the pervasiveness of decision heuristics, biases, and framing effects that fall short of the fiction of olympic rationality (see Gigerenzer and Goldstein 1996). Regarding the development of the economy as a whole a different, and probably more momentous, issue relates to what it is that the agents choose. What motivates their behavior, where do these motivations come from, and how do they develop over time? These motivational questions differ from the ones that behavioral economics pursues with its choice-theoretic focus. In any case, it is necessary, however, first to identify what influences of the human genetic endowment on economic behavior there are and to assess various contingencies they seem to be subject to.

Accordingly, the plan for present paper is as follows. Section 2 briefly discusses the approach that behavioral economics takes in this respect. As will turn out, the focus is here mainly on decision making heuristics which can be claimed to follow from the evolved architecture of the human mind. They imply the well known tensions between actual decision making and the normative standards of rational decisions. In an evolutionary perspective, it will be argued in Section 3, that approach needs to be extended so as to also embrace the motivational underpinnings of economic behavior . In the language of economics this means to inquire into the agents' preferences and to explain where they come from and how they change over time. As a consequence of such an extension, some important new questions turn up on the agenda. Among them is the question of insatiability of human preferences as a feature of economic behavior and probably even part of the human genetic endowment and its effect on the development of the economy that will be discussed in Section 4. Section 5 concludes with an outlook on possible normative implications of the suggested evolutionary perspective on economic behavior.

2. Innate Constraints on Behavior and the Agenda of Behavioral Economics

There is no doubt that important parts of the behavioral repertoire of animals are innate, i.e. develop as an expression of their genes. Cases in point are elementary behavior dispositions and adaptation patterns like instrumental conditioning and conditioned reinforcement (Dugatkin 2003, Chap. 4). With their direct or indirect effect on reproductive success, innate dispositions and adaptation patterns are likely to have been shaped by natural selection in a way that enhances individual fitness of the organisms carrying the corresponding "behavior genes". In sociobiology, this hypothesis is extended to animal behavior in social interactions (Trivers 1985). Prominent examples are rearing offspring, the joint hunting of prey, food sharing, support of mating and breeding activities of other animals, and – most puzzling – "altruistic" forms of behavior, e.g. in self-sacrifices that increase the survival chances of others. Whether these and other social forms of behavior need to be explained in terms the concept of "inclusive fitness" (rather than individual genetic fitness, see Hamilton 1964) or whether they support group selection theory (see Sober and Wilson 1998) is still under scrutiny.

Certain basic behavioral dispositions and adaptation patterns seem to be innate also in humans. The question of whether the sociobiological approach can be extended to explaining human social behavior is, however, highly controversial (cf. Caplan 1978). Particularly in the context of early (and of still living, primitive) human societies, the problems of coordination of joint activities, mutual support, reciprocity, and "altruism" seem to present themselves somewhat similarly as in higher animal societies. Competition for the scarce resources food, habitat space, access to mating partners, etc. is a basic condition of life, here and there. Yet, even in primitive societies this does not imply that human social behavior is limited to genetically coded forms. There are culturally conditioned and cognitively created forms of behavior which may in some stages of human history co-evolve with the genes (Boyd and Richerson 1985). Culturally acquired problem solutions and a growing problem solving knowledge certainly provide the key for understanding why contemporary human societies are capable of mastering their environment so successfully that the selection pressure on their social and economic behavior has decreased dramatically. [1]

[1] Evidence for a decreasing selection pressure is provided by the fading correlation between the amount of resources commanded on the one hand and reproductive success on the

As a consequence, selection pressure no longer wipes out an increasing variety of idiosyncratic human behaviors with little or no adaptive value in terms of reproductive success. The question then is how the increasing variety of idiosyncratic behaviors comes about, and what determines which behavior is likely to be observable under what conditions. For an answer it is necessary to distinguish more thoroughly between various strata of human behavior, from the basic, instinctive responses via innate, non-cognitive learning mechanisms further on to cognitively reflected, insightful, intentional choices. It will be claimed that observable behavior at all these strata is "produced" – to use an economic metaphor – by a hard-wired physiological and mental apparatus that has emerged from natural selection. The constraints are still binding for the human behavioral repertoire, but their impact is not equally direct at the different strata of behavior.

Among the various strata of human behavior, conscious deliberation and decision making is likely to be the one that, in terms of phylogenetic time scales, evolved rather lately. Evolution has endowed humans with a unique intelligence. Nonetheless, this capacity is not independent from genetic influences as evolutionary psychology sets out to show (Buss 2003). In fact, the constraints implied by the mental "apparatus" that has emerged from natural selection are well known to economists as limitations in memory, information processing, and judgment – exactly the issues central to behavioral economics. [2] The background here are the features of the human cognitive system.

In human perception a limited number of sensory stimuli can spontaneously be processed in parallel and be recognized (see Anderson 2000, chap. 3, 6 and 7 for the following). Even though the brain commands a number of parallel processing systems for the various sensory perceptions, the motor system, and cognition, in each of them attention must be allocated to competing processing demands when, as usual, stimuli are offered in abundance to the sensory system. For the cognitive capacity this implies a bottleneck: of the information coming in at any given point in time, spontaneous selective attention processes must filter out a subset of information to be processed further. What pieces of incoming information grab attention depends on their frequency and relative strength [3] and on whether they contain cognitive cues for which there exists an associative basis with knowledge already existing in memory so that a meaning can be attributed.

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other. As Maddison (2001, Chap. 1) shows in a cross country comparison, the more per capita income in real terms increased from 1820 to 1998, the more both birth rates and population growth went down. In pre-industrial societies, in contrast, there was still evidence for a positive correlation, see Chagnon and Irons (1979) for a historical study.

[2] These limitations were center stage already in the early bounded rationality debate (Simon 1978).

[3] Both are defined in terms of adaptation levels dependent on the previously experienced stimuli Helson (1964). Thus within normal intensity limits it is not the absolute strength of the stimulus which is decisive for perception, but rather a sufficiently strong change in the stimulus. The adaptive value of such a selective information processing seems to lie in the fact that, with the brain's limited information processing capacity, information overflow could paralyze action. Selective attentiveness to the stimulus discrepancies is an effective means of concentrating attention to the cases of environmental changes, but otherwise keeping the apperceptive capacity free for other purposes.

Information reflecting newly arising problems which cannot adequately be associated with problem solutions previously stored in memory therefore require considerable cognitive effort in the form of information search and inference by structuring perceived alternatives in expected action-consequence relationships. These cognitive activities draw on a rather limited capacity for immediate information processing (sometimes called the working memory). More elaborate decision trees or chains of inference can therefore only imperfectly by kept represented by immediate information processing. For this reason, the cognitive organization of such a search results in rules of thumb and other decision heuristics. As a consequence, the performance in problem situations not sufficiently subjected to experience or deliberate training can be rather poor and fall short of the normative standards of rational decision making.

Already the early experiments on behavioral decision theory have pointed to the fact that, because of the narrow information processing constraints, decision heuristics frequently proceed in several steps and result in inconsistencies the more so, the more complex the problem or the greater the time pressure to decide. [4] The interpretation of what needs to be decided and the evaluation of alternatives is frequently influenced by "framing effects" (Tversky and Kahneman 1981). This means that actions and their consequences are assessed differently if presented in different contexts or in different order. [5] Similar constraints of the mental apparatus can be noted in the case of chance events and judgments under uncertainty. Compared with rationally constructed concepts of probability and statistical inference, particularly Bayesian probability estimates, the intuitive assessment of such situations is usually biased if not altogether deficient. [6]

In a seminal paper, Tversky and Kahneman (1974) listed three examples of biased or deficient, intuitive judgmental heuristics related to probabilities: "judgement by representativeness" (observations are judged less by their objective statistical trustworthiness than according to whether the information which they provide appears representative for the beliefs an observer already holds); "judgement by availability" (the frequency or probability of events is judged according to how well they can be imagined or how easily one can remember similar or identical results – implying among other effects that less well-known risks or chances are systematically undervalued); "anchoring and adjustment" (the estimation

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[4] See Slovic, Fischhoff and Lichtenstein (1977). An example is the "elimination by aspect" heuristic (Tversky 1972) often observable when decisions have to be taken on alternatives with many characteristics, like in the case of purchasing a home in which price, furnishings, site, age, resale value, etc. all play a role. People then tend to compare only subsets of alternatives by trying to sort them according to whether or not they possess highly valued characteristics. Whenever the valuation is not perfectly transitive, the heuristic results in decision inconsistencies.

[5] A special case is assessment not by absolute criteria, but relative ones. This is a frequently observed phenomenon also underlying Kahneman and Tversky's (1979) prospect theory where it is paired with an value function which assesses estimates profits and losses asymmetrically. Further examples of relative assessment in economic context can be found in Thaler (1980).

[6] In an evolutionary perspective this should not be much surprising as the rational concepts have only been developed over the last 350 years, see Hacking (1975).

of relative frequencies starts from a rough first approximation – the anchor – and is then adjusted by more detailed considerations typically resulting in a final estimate systematically biased towards the first approximation. [7]

Unlike in evolutionary psychology, in behavioral economics the observed regularities and limitations of the human cognitive apparatus are not explicitly traced back to, and explained by, the way in which they have emerged from natural selection as part of the human genetic endowment (see Cosmides and Tooby 1996). Nonetheless, they are essential for recognizing how actual decision making behavior systematically deviates from the normative standard of rationality cherished as model of economic behavior by modern economic theory. But the way in which decision are made is only one determinant of human economic behavior. The probably even more consequential question which, with few exceptions (e.g. Kahneman, Wakker, and Sarin 1997), has so far been neglected in behavioral economics is what the choices are and for what reasons they are chosen, be it in a fully rational mode or not. This is the question of what motivates economic behavior or, in economic terminology, the question of preferences. Dispelled from the agenda by the 19th century subjectivist revolution in economics, the motivation-theoretic question still is a step child of economic analysis also in behavioral economics. [8] But, as will be argued in the next section, it is precisely by acknowledging the influences of the human genetic endowment on economic behavior that much progress can be made with this question.

3. The Neglected Motivational Underpinnings of Economic Behavior

One of the major trends in establishing microeconomic theory in the 20th century has been the progressive elimination of the motivational aspects of economic behavior. Where the Benthamite sensory utilitarianism had been based on an elaborate hedonistic theory of action motivation, hypotheses on the specific reasons or causes that induce economic agents to take actions have now disappeared. (As is well known, Bentham had equated utility with the enjoyment of pleasures and the avoidance of pains and had explained in great detail what pleasures and pains motivate people to act.) While in the behavioral and human sciences research on the motivational underpinnings of behavior was deepened and increasingly merged with a focus on the genetic, evolutionary roots of action motivation, economists worked on the "purging out of objectionable, and sometimes unnecessary, connotations ... of the Bentham .. variety" (as Samuelson 1947, 90 put it approvingly). After decades of debates first

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[7] These judgment biases have been observed in experiments with psychologists, passioned Las Vegas casino patrons, and stock market traders alike, indicating that even "experts" are not necessarily able to overcome the constraints of intuition. They also show "over-confidence", i.e. unjustified trust in their ability to estimate subjective probabilities see Slovic, Fischhoff, and Lichtenstein 1977). For the conditions under which decisions had to be made by the early humans it can be conjectured that the immediacy of intuitive judgments were more important for survival than the distortions caused by that kind of judgments. In view of the momentous consequences that single decisions can have, given the technological possibilities of modern industrial societies, these deficiencies can however result in dramatic failure.

[8] An exception is the special case of risk preferences which, under certain conditions have been shown not to be perfectly consistent and immutable (Grether and Plott 1979).

on the measurement and proper functional representation of utility, the concept of utility itself was replaced by a theory of preference orders. The loss of explanatory power regarding economic behavior that results from eliminating all motivational considerations is obvious. A preference revealed by choosing alternative x over alternative y is equivalent to saying that the decision maker's utility of x is larger than the utility of y. But the simple question for what reasons this should be so is given no answer (for early criticisms raised against this research strategy see Georgescu-Roegen 1954a and Sen 1973).

Only recently attempts have been made in behavioral economics to revive the motivational underpinnings of sensory utilitarianism (Kahneman, Wakker, and Sarin 1997) by putting back in place hedonistic motives for taking action: enjoyment of pleasure and avoidance of pains. However, a revival of hedonistic, utilitarian hypotheses is not the only possible way to reconstruct the motivation-theoretic foundations of a behavioral approach to economics. Both pleasures and pains are themselves explicable in terms of physiological or psychological processes that trigger such feelings and induce the agents to act (Rozin 1999). These physiological and psychological processes belong to the domain of theories of needs and drives as motivators/inhibitors of action. [9] In terms of these theories it can be argued that, if a need is deprived, the (temporary) reduction or removal of deprivation can be classified as a pleasurable experience. Conversely, rising deprivation of a need can be expected to cause increasingly painful feelings. In order to explain what it is that motivates action it is necessary, however, to be more specific as to what the relevant needs are. Unlike in earlier attempts to deal with needs in economics, this specification will be derived here from a strictly behavioral approach. [10]

Let a certain action reduce or eliminate deprivation in a certain need. If this event increases the rate with which that action is chosen in the future, the satisfaction of the need is connected with (unconditioned) reinforcement. The notion of needs will be restricted here to precisely those for which this connection holds ("basic needs"). Need satisfaction can then be identified with "primary reinforcers" in the theory of instrumental or operant conditioning (Herrnstein 1990, Staddon and Cerutti 2003). Obviously, only a limited number of physiological and psychological needs qualify for this category, among them the needs for air, water, sleep, food, body heat, shelter, pain relief, physical activity, sex, affection, social recognition and status, sensory arousal, cognitive consistency, achievement (Millenson 1967, 386). Given their obvious reproductive value in times of fierce selection pressure, these basic needs can be argued to be innate and, indeed, they are commonly shared by humans (with the usual genetic variance).

The behavioral reduction of the need-theoretic explanation for why an agent should be motivated to choose an alternative (or order several alternatives in a certain sequence) has certain advantages. Within the framework of (sensory) utilitarianism, the explanation of the

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[9] Need-theoretic reasoning has a tradition reaching back to Aristotle. Several economists have used it in the past for explaining the motivation underlying economic behavior, among them Duesenberry (1949), Georgescu-Roegen (1954b), and Ironmonger (1972).

[10] See Witt (2001) for details. At any point in time a need is more or less deprived if it is not completely satisfied or satiated. The present approach also deviates from Maslow's (1987) influential hypothesis of a hierarchy of needs which, however, could not be empirically confirmed, see Wahba and Bridwell (2002).

motivation ot act is cast in terms of a balance of pleasures and pains associated with the alternative(s). Simplifying somewhat, pleasures and pains are assumed to be homogenized into a single hedonic currency – the utility index – taken to express the relative strength of the action motivation (see Shizgal 1999). Thus, a higher value of the hedonic currency suffices as a proximate cause for the motivation underlying an observed choice of an action. What determines the pleasure and pain feelings from which utility is derived does not have to be, and usually is not, specified.

The suggested need-theoretic explanation, by contrast, provides an ultimate cause for the motivation underlying the choice of an action. It does so by identifying how the action reduces deprivation with respect to some specific need(s) – related above to primary reinforcers – and, thus, triggers a pleasurable experience (generates utility). Moreover, besides giving deeper reasons for how utility is generated, the present interpretation also suggests important dynamic extensions of the motivational underpinnings of behavioral economics. These dynamic extension are an implication of reinforcement theory claiming that (non-genetic) behavior adaptation is governed by two different kinds of innate dynamics: that of instrumental conditioning on the one side and that of conditioned reinforcement or conditioning learning on the other (see Leslie 1996).

The adaptation dynamics implied by instrumental conditioning ("reinforcement learning") basically converge to the "matching law" (Herrnstein 1997), an empirical generalization derived from hundreds of experiments in the behavioral sciences testing behavior that is not, or only marginally, cognitively reflected and controlled. If there are several actions feasible that serve one and the same need, an organism learns by instrumental conditioning how to adjust the relative frequency of alternative actions to the relative size of the rewards corresponding obtained by the actions. [11] If F_i is the relative frequency of action i = 1,..., n, $\sum_i F_i = 1$, and R_i the reward obtained, the matching law postulates the simple relationship $F_i = R_i / \sum_i R_i$.

However, there are significant differences between the standard laboratory experiments and real life. First, while in an experiment both the rate of reinforcement and the level of deprivation are experimental control parameters, in economic reality they represent trend variables that are correlated with the growth trend in disposable per capita income. Second, while experiments are usually conducted with one reinforcer only – usually some form of food – behavior outside the laboratory is subject to all, more or less, deprived needs at the same time. This is a more complicated case. As a consequence, at any point in time the relative strength of the motivation to act to reduce deprivation of any particular need depends on its degree of deprivation *relative* to the degree of deprivation of all other needs.

To put it differently, by reinforcement learning the agents adjust over their conditioning history on the one hand to the reward structure of each single need. On the other hand, they learn to adjust to the relative ease with which reinforcement can be obtained in their environment across their needs. Relatively strongly positively reinforced needs (i.e. needs

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[11] In the need-theoretic interpretation, actions and rewards are related by their capacity to effect a reduction in the deprivation of a basic need like, e.g., the one for food, or more specifically calorie, intake. Adaptations under reinforcement learning are also influenced by the immediacy and contingency of the reward, two variables not to be discussed here; see Leslie (1996) for details.

that can relatively easier be satisfied with feasible actions) are more frequently pursued, less strongly or even negatively reinforced needs less so. People thus develop an individual approach as to where they seek more or less intensely the rewarding experience of need satisfaction and how – some become gluttons, some party lions, some sex obsessed, some workaholics, and so on, and many a little bit of everything. In the utilitarian language the emergence of such individualized patterns is part of the formation of individual preferences (a process that may be strongly supported by cognitively controlled self-efficacy, see below.)

Beyond all variance caused by such individual (but usually culturally contingent) specializations there is, however, one general tendency in the mean behavior triggered whenever the overall means for satisfying needs grow with rising income. This tendency results from the fact that basic needs differ with respect to their deprivation-satiation patterns in a way that is similar across all humans. For some basic needs, deprivation can, in principle, be reduced temporarily to zero. Examples of needs that can be satiated quite easily are the needs for food and something to drink. But there are also basic needs where, for different reasons, it is difficult, if not impossible, to reduce average deprivation to zero. Typically, these are needs whose satiation level is defined in relative terms like the need for arousal (i.e. sensory or cognitive stimulation) or for social recognition.

The adaptation dynamics implied by conditioned reinforcement or conditioning learning are quite different. They result from the fact that an organism tends to learn to associate stimuli that trigger an action leading to reward (a pleasurable experience) and neutral stimuli (triggering neither a pleasurable nor an aversive experience), if these two kinds of stimuli coincide repeatedly. Once such an association is established, the originally neutral action triggers a rewarding experience qua the learnt association. A conditioned (secondary or acquired) reinforcer is established. [12] This effect works even if the previously coinciding primary reinforcement is dropped, but the strength of a conditioned reinforcer fades away, if the association is not at least occasionally corroborated. One can speak here of the emergence of "acquired wants" whose satisfaction triggers pleasurable feelings. In the utilitarian language the acquisition of such learnt wants is a different part of the formation and change of the preferences specific to an individual agent.

Unlike the widely inter-personally shared basic needs, the emerging structure of acquired wants is of highly idiosyncratic nature. It would make little sense, therefore, to produce a list of learnt reinforcers comparable to that of the limited number of innate ones. Together with the individual specialization patterns resulting from the adaptations under instrumental conditioning in terms of where to seek more or less intensely for need satisfaction, the structure of acquired wants explains a good deal of the observable inter-individual variance in human preferences (a variance usually taken as support for preference

[12] An example of such an association learning may be helpful. Imagine taking repeatedly a good meal when hungry in a special environment characterized by particular aesthetic aspects like scenic architecture, furniture, tableware, table music etc. Assume that such a special environment is initially a neutral experience. If so, the association that is learnt between good eating and the aesthetic features then has the effect that experiencing the aesthetics of scenic architecture, furniture, tableware, table music etc. tends to become a rewarding experience in its own right – a conditioned reinforcer. Accordingly, such aesthetics can be expected to become a motivating force shifting the frequency of actions in that direction, even if no longer coinciding with eating activities.

subjectivism). However, the particular cultural environment in which conditioning takes place and influences the associations that the agents happen to learn can induce a certain cultural bias in the individually acquired wants. For this reason, agents in similarly socialized groups or similar cultural environments may show less variety in their acquired wants than agents from different backgrounds.

The motivational underpinnings of economic behavior and its changes over time are, of course, not confined to the non-cognitive level. In the economic domain, cognitive deliberation often intervenes more or less intensely into the motivational structures shaped by instrumental conditioning and conditioning learning. Hence, a theory of motivation would be incomplete without hypotheses that account for these cognitive influences. By cognitive construction of means-ends relationships actions are assessed with respect to their instrumental value for attaining need satisfaction – with all the decision making biases discussed in the previous section. Regarding the present motivation-theoretic context the consequence of cognitive intervention is that it can selectively change observable behavior as compared to what reinforcement contingencies would predict. The perception of instrumental relationships can consciously be manipulated and the reinforcement (the actual satisfaction of some need) thus be postponed as an instance of self-efficacy (Bandura 1986). Furthermore, cognitive activity can induce own motivational forces as, for example, the consistency of self-image (Dunning 2007) and a pervasive need for high self-esteem (Gollwitzer and Kirchhof 1998).

It is important to note, though, that, due to the already discussed limitations of the human information processing capacity and the selectivity of attention processes, cognitive interventions are highly selective. This fact has implications also at the motivational level because it results in a dynamic interaction of cognitive and motivational processes. As was mentioned in the previous section, except in cases of alarming signals, scarce attentional capacity is only attracted to incoming information that contains cues for which there is an associative basis in long term memory (so that meaning can be attributed to that information). This means that at any point in time the incremental change of individual action knowledge through newly processed information ultimately hinges on already existing knowledge that can be activated in long term memory. However, the cognitive cues and the associated memory content differ in how much attention they are able to attract, depending on the affective value of the particular meaning that is associated. The affective value, in turn, reflects the strength of previous rewarding (pleasurable) or aversive (painful) experiences that are memorized in association with the information.

If individual preferences also reflect the affective value of action information, it follows that the new knowledge an individual acquires is not only contingent on her already existing knowledge. It also hinges on the current state of her preferences that influence the selective allocation of attention. This means that the interactions between the current state of the individuals' knowledge and the current state of their preferences feed back on the further shaping of both their perceptions and preferences. Extending the attention given to an action possibility at the expense of others allows to recognize details in that possibility which otherwise are likely to have gone unnoticed (refinement effect in perceptions and preferences). Put differently, with more refined perceptions of action possibilities further specialization in reinforcement sampling under instrumental conditioning becomes feasible.

4. Economic Behavior and the Insatiability Conjecture

As turned out in the previous section, the motivational side of human behavior can be discussed from a utilitarian, a need-theoretic, and a reinforcement-theoretic point of view. All the three approaches have been shown to correspond with one another in several respects. If, as suggested, innate needs and acquired wants are identified with primary and secondary reinforcers respectively, this has the advantage, however, that one can be more specific with respect to what it is that motivates behavior, or what generates utility, and in which way. On this basis one can go beyond the current debate in behavioral economics focusing mainly on cognitive aspects of decision making. To demonstrate the relevance of the suggested extension (and to add a more evolutionary flavor), a question will now be addressed that seems important for understanding economic development and growth. This is the question of whether humans, by their nature, are insatiable – as is often implicitly assumed in utility theory. If not only characteristic features of human cognition seem to be remnants of a genetic adaptation to the living conditions of early human phylogeny, but also essential parts of what motivates economic behavior, to what ends will modern humans with their power to manipulate the environment according to their preferences, be drawn by the motivational structures they have inherited?

Because of space constraints the question will be explored here for consumption activities and their motivational underpinnings which can be conjectured to drive much of economic development and growth from the demand side. In an evolutionary perspective one of the outstanding changes of human life is the historically unprecedented increase in income and wealth in the developed countries and many of the developing ones. It is a consequence of improved technological knowledge and the capital deepening of the production processes and has made possible an increase of per capita income by the factor three to six in the different countries in real terms over just one century (Maddison 2001, Chap. 1). Consumer spending has closely followed this development and has grown by similar magnitudes (cf., e.g., Lebergott 1993), seemingly supporting the belief that humans (or their preferences) are simply insatiable. However, the drastic expansion of consumer spending was not equally distributed over all consumption categories. Some of them indeed seem to converge to a state reflecting something close to satiation, while in other categories there is no sign of retardation in the growth of consumer expenditures. Satiation in consumer behavior thus seems to be a more complex phenomenon which is difficult to analyze as long as it is left unspecified what preferences (i.e. motivations to buy) consumers actually have. The hypotheses discussed in the previous section allow to be more specific.

In the easiest case, a motivation to act results where an innate need like drinking, eating is deprived. Food and drinks are consumption items of a special kind: they are "consumed" in the literal sense of being eating up. A characteristic of that kind of consumption are its homoeostatic features. Except in cases of mistaken physiological controls, the motivation for additional consumption vanishes as the satiation level (a certain quantity per unit of time) is approached. Consumption beyond the satiation level normally does not create additional satisfaction – it usually induces increasing aversion. As real per capita income rises, an increasing ability to spend on such items would, in principle, allow to sooner or later reach the level of satiation so that expenditures should stagnate. Yet, even in the richest countries purchases of food are still expanding in absolute terms (even though the budget shares are declining, see e.g. the data for the U.S. in Lebergott 1993, Part II). One reason may be an increase in waste (purchasing more than is consumed in the literal sense). But this is not the

whole explanation. By changing the composition of the diet to include more expensive ingredients, expenditure per calorie can be rising faster than the constrained amount of calories that can be consumed (Manig and Moneta 2009).

The key to this development can be found in the product innovations and product differentiations of the food industry which is battling with satiation tendencies since decades and has invented ways of circumventing it so far. Products innovations have targeted on creating a larger variety of food with new and more complex taste, using all sorts of ingredients from "cuisines" all over the world which are often scarce and/or require long-haul transport that makes them expensive. Other innovation strategies focused on how the rewarding sensory perception of taste can be enjoyed without rapidly approaching physiological satiation. A prominent case are food stuffs made with artificial sweeteners which allow to increase their physical intake – and thus the expenditures – to a much higher level than the satiation level for similar products made with calorie-rich sugar (see Ruprecht 2005). A typical example is the introduction of Diet Coke. A similar role is played by spices and, more recently, artificial aromas which can be used as low-calory substitutes for traditional flavoring ingredients with higher caloric content.

The consequences of rising income for consumer expenditures on items other than those directly eaten up are more complicated. The motivation to act is related here to other innate needs (primary reinforcers) though in a more complex way. The motivation to maintain body temperature is one example (with homeostatic features), arousal of the senses or the cognitive system a different one (lacking such features). The difference to the former cases is that there are no consumption items that could be eaten up to reduce deprivation in these needs. The items one can think of as being relevant here – clothes or heating facilities in the one case and, say, electronic entertainment facilities like a television set in the other case – are not literally consumed themselves. Instead, these items function as means or "tools" which deliver "services", and it is their services, not the items themselves, that reduce deprivation. A television set, for example, would be fairly useless, if it could not be turned on to emit the entertaining services in the form of a flow of visual and acoustic stimuli.

Thus, the motivation to purchase tools and the motivation to use their services are two different things. Accordingly, satiation occurs, if at all, in the amount of the *services* consumed per unit of time. (In consuming the services of clothes or heating facilities, for instance, one may eventually feel warm enough.) Regarding the number of tools purchased there is no direct, sensory experience of satiation – the satiation level needs to be derived by cognitive reflection on the efficiency of the "production" of services by means of the tools. At this point, additional cognitive motives can come into play which uphold a motivation to purchase tools beyond the number necessary for reaching the satiation level in terms of the services. The instrumental relationship between the tools and their services can, e.g., be extended by cognitively constructed reasons like safety, convenience, or redundancy consideration (a multiple availability for different purposes or at different places). An important innovation strategy of the producers focuses on the disintegration of functions a product serves into several specialized tools, etc., in the hope that this motivates consumers to make multiple purchases.

Consider, to exemplify this, the case of foot ware. One pair of shoes (a "tool" providing pain protection and body warmth as "services") would, in principle, be sufficient – and, in fact, for most of man's cultural history has been sufficient – to reach the satiation level with respect

to the services. With the introduction of functionally differentiated shoes for representation, for working, for casual home use, for athletic use, tennis, hiking, and, of course, fashion-based status-signaling, the shoe industry has provided sufficiently convincing reasons to extend the purchases of foot ware. Since only one pair of shoes can be worn at the same time, purchasing several pairs of shoes means that the average rate of using the services of each single pair is decreasing. The example points to a more general phenomenon: With the consumers' rising disposable income there are growing chances – and incentives – for the producers to induce multiple purchases beyond what is necessary to reach the satiation level with regard to the tools' services by means of marketing strategies that appeal to additional, persuasive, cognitive motives.

Multiple purchases of what has been called "tools" here indeed seem to contribute significantly to the impression of insatiability of consumer demand. Another, but related, effect contributing to this impression is the consequence of the fact that one and the same consumption good is often capable of removing or reducing deprivation not only with respect to one need but with respect to several of them simultaneously. Let us call this a "combination good". Typically, the different needs to which a combination good appeals reach a level of satiation at different amounts of consumption of these goods or their services. With rising income, an increase in consumption of these goods thus reaches the satiation level of one need after the other, retaining a (successively reduced) motivation to further expand consumption until the satiation level of the least easily satiated need is eventually reached. Hence, in order to obtain additional satisfaction for not yet satiated needs, consumption is extended beyond the satiation level of some of the involved needs.

Combination goods can be deliberately created by the producers through innovations and product differentiation. Their acceptance is often supported by an increasing awareness of the consumers of more differentiated consumption opportunities under the above mentioned refinement effect in perceptions and preferences. Indeed, producers facing an increasingly saturated market for their products have strong incentives for trying to add features to their products that appeal to additional needs that are less easily satiable than the ones their products originally serve. Product differentiation strategies aiming in this direction are, for instance, the adding of symbols that can be used to signal status or a particular group identity like in apparel, foot ware, bags, etc. (see Witt 2010) or the adding of entertainment features as it is attempted in many food products.

Indeed, the fact that the limited number of innate needs differ significantly with respect to their satiability – not least because of the presence or absence of homoeostatic features – is an important qualifications of any undifferentiated insatiability hypothesis (in addition to the points just made). The reasons for what appears to amount to factual insatiability may differ. Consider, e.g., the need for social status recognition mentioned above. Consumption items able to signal the desired status by distinguishing oneself from others may remove or reduce deprivation in this dimension. Yet, with rising average income, lower income groups may be able to also acquire such consumption items. As a consequence, the status-distinguishing character of the corresponding consumption items is lost and deprivation in this dimension returns. To continue to be able to signal the desired social status differences by one's own consumption, other, and usually more expensive, goods need to be consumed. A level of satiation can, if at all, only be upheld by continuously rising the expenditures on status goods an unstable condition like in a weapon's race (Hirsch 1978, Frank 1999) .

A further case in which satiation is difficult to attain and consumption can therefore expand without reducing average deprivation significantly is the primary reinforcing instance of sensory arousal. As argued by Scitovsky (1981), the reason is again an instability in the deprivation-satiation mechanism, albeit one that is caused in a different way. This time it arises from a kind of sensory stupefaction effect that calls for ever stronger stimuli to reduce deprivation. With growing consumption the satiation level is continually rising here. The instability can be conjectured to be visible in modern consumption patterns in the expenditures on entertainment, tourism, and the media that have been growing much faster with rising income than average consumption expenditures and are likely to continue to do so.

In any case, if some needs are more difficult to satiate than others, then the consumers' expenditures will shift with rising income in the direction of goods that serve the less easily satiable ones as it has been, and will continue to be, recognized by the differences in the income elasticities of the expenditure categories empirically recorded by consumer surveys. But, as has been pointed out, the dramatically growing expansion of consumption has several independent causes – it is not a simple story of insatiable human desires. The relative importance of the causes may vary over time and may be an additional reason for the qualitative changes in the composition of consumption. The behavioral and cognitive dispositions and processes that have been argued to underlie the observed development seem to be robust features of human behavior. What remains unpredictable is, of course, the innovativeness of the industries in trying to avoid the effects of satiation on demand.

5. Conclusions: Does It Make a Difference?

In this paper it has been claimed that, for a comprehensive evolutionary perspective on economic behavior, the reflections on the characteristics and limitations of human decision making that are center stage in evolutionary psychology and behavioral economics need to be extended by a thorough reconstruction of the motivational underpinnings of human behavior. The hypotheses presented with regard to the latter have been related to the old question of whether economic behavior, particularly consumption behavior, is insatiable – a question that, from an evolutionary point of view, seems to be highly relevant for understanding and evaluating economic development and growth. To demonstrate the relevance, a short outlook on possible normative implications may conclude this paper.

Ever since Bentham's inception of utilitarianism, economists have been inspired by the twin idea of explaining economic behavior and assessing its moral legitimacy – even though the latter today occurs only in the very abstract disguise of welfare theory. Under the preference subjectivism usually adopted in welfare economics one does not need to know much about individual preferences, i.e. the underlying motivations to act, as long as economic activities are chosen voluntarily under freedom of contract (and in the absence of externalities that cannot be resolved through private negotiations). Under such conditions, the quasi-normative judgment is that actions and transactions reflect what is feasible and satisfies the preferences of the involved agents and, in this sense, is "good". Yet, this argument is based on the assumption of given, unchanging preferences. This is a strong and, in the light of the motivation-theoretic considerations in the previous section, counter-factual assumption.[13]

[13] For a similar criticism see Gowdy and Mayumi (2001). The assumption is sometimes replaced by assuming that individuals have different utility functions or different states of

Once the black box of subjective preferences is opened, and it turns out that they are not only partly inconsistent and malleable, but also strongly dependent on innate needs, culturally acquired wants, and cognitively constructed motives, many questions arise: At what stage of preference learning should the state of preferences be taken as measuring rod to assess whether there are any welfare gains? Given that, with rising wealth, some of the innate needs can be satiated more easily than others, do such differences in satiability matter for welfare assessments? Furthermore, given that with rising wealth more opportunities for developing further refinements in acquired wants and cognitively constructed motives arise and motivate further increases in spending, does the self-perpetuating motivational spiral that seems to emerge here render welfare altogether inapt as a measure of human progress?

No doubt, the last century's dramatic growth of income and wealth in the developed and many of the developing countries has improved life tremendously over what were the harsh living conditions over most of human history. The multiplication of per capita disposable income has enabled not only the upper strata of society but also the masses to conduct what by historical standards indisputably is a "better life". In the light of the motivational hypotheses suggested in this paper it seems, however, that a judgment like this cannot be made independent of the level of income already reached. Once disposable income allows to remove deprivation in the pressing human needs, other motivational mechanisms take over in guiding economic behavior, particularly consumption behavior. What consumers then enjoy as pleasures, to use te utilitarian diction, are often learnt pleasures. And where the pleasures would, in principle, seem satiable with the income level reached, cognitive motives may be learnt to enjoy ways of further income spending that avoid satiation. But as with all learning there is a peculiar asymmetry. Had there been no continued income increases, no opportunities to experience all the new consumption possibilities would have occurred and no learning to appreciate them. People would not known what ways of obtaining pleasant sensory perceptions they forego. Once all the experience have been made, though, foregoing all the learnt pleasures, e.g. because of a sustained decline in disposable income, would be felt as harsh privation.

This is an abstract argument. Nonetheless, one may be concerned about its implications. They seem to entail a rather relativistic assessment of the "good" in the notion of a "good life". Even worse, the particular conditions on the basis of which further improvements in the "goodness" by further income increases have to be assessed may sometimes appear rather odd to our moral intuitions. One may thus ask, whether additional income spent on needs that are basically satiated is equally morally legitimate as were or are additional expenditure on highly deprived needs. Is additional income spending to obtain rewarding experiences from acquired wants (conditioned reinforcers) equally morally legitimate as additional spending to obtain reinforcement from reducing deprivation in innate needs? How should refinements of the cognitive and the sensory perceptions be assessed that

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preferences at different points in time, and that they can either evaluate their different preference orderings at different points in time on some common basis. (This may, for instance, be a meta-preference, i.e. an order over the preferences at different points in time, see, e.g., Sen 1977 and Elster 1982). Or it is assumed that the ongoing preference change meets special criteria (so that an improvement in terms of one preference order is not made a deterioration from the point of view of the subsequently valid preference order – a kind of transitivity condition for successive preference orders, see von Weizsäcker 2005). Both assumptions are still quite artificial, formal constructs.

are learnt once income rises, given that they are little valued as long as they are not yet learnt, but their privation is felt as a loss after learning?

The moral question become really pressing when there are significant technological externalities arising from high income spending habits, like the depletion of non-renewable resources or the green house effect and/or dramatic inter-personal differences in disposable income. To put it in a provocative way, how is the interest of affluent consumers in hunting for the last frenzies (which their high income has allowed them to learn to appreciate) or in keeping ahead in status seeking by resource-intensive consumption to be morally assessed against the interest of other people in saving them from starving hunger or living in a degraded environment? It is quite likely that our moral feeling tells us that there is a problem here (perhaps because the feeling of empathy and justice is a part of our inherited sociality, see Binmore 2006, Tomasello 2009). It is not surprising then that income redistribution is frequently considered morally legitimate, or that the idea of enabling low-income countries to catch up by development policies is propagated. However, precisely because there is no absolute standard for defining what a "good life" means as long as there are further income increases, the legitimation of both income redistribution and development policies may be more problematic than it appears on first sight.

If the positive insights that can be derived from the evolutionary foundations of economic behavior are taken seriously, it may instead be asked whether the way in which income is spent rather than the size of income is what intuitively appears to cause moral concerns. If it is true that large parts of income spending are culturally learnt forms of behavior providing forms of pleasure that one would not have missed, hadn't they been learnt, moral feelings may suggest that an unboundedly growing income is no necessary condition for a "good life" and the implicit equation of income increases with "better life" problematic. When putting oneself in the shoes of people starving from hunger and of people living in a seriously degraded environment may feel inclined to reflect about the ethical argument that allows us to contribute to a balance in how we spend our income and how much further income increases are indeed valued. As man is a social animal, after all, the social discourse about what the right balance would probably help to stimulate a broad cognitive awareness of the moral connotations the highly developed countries face with the way how they spend their income.

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