

Witt, Ulrich

Working Paper

Evolutionary economics and psychology

Papers on Economics and Evolution, No. 0613

Provided in Cooperation with:

Max Planck Institute of Economics

Suggested Citation: Witt, Ulrich (2006) : Evolutionary economics and psychology, Papers on Economics and Evolution, No. 0613, Max Planck Institute of Economics, Jena

This Version is available at:

<https://hdl.handle.net/10419/31828>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

PAPERS on Economics & Evolution



MAX-PLANCK-GESELLSCHAFT

0613

Evolutionary Economics and Psychology

by

Ulrich Witt

The *Papers on Economics and Evolution* are edited by the
Evolutionary Economics Group, MPI Jena. For editorial correspondence,
please contact: evopapers@econ.mpg.de

ISSN 1430-4716

© by the author

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

Evolutionary Economics and Psychology*

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

September 2006

Abstract

Evolutionary economics is a paradigm for explaining the transformation of the economy. To achieve its goal, it needs being founded on a proper theory of economic behavior. The paper discusses these foundations. It is argued that the historical malleability of economic behavior is based on the interactions between innate behavior dispositions and adaptation mechanisms on the one hand and the limited, and always selective, cognitive and observational learning that contributes to an ever more extended and differentiated action knowledge. The implications of this interpretation are outlined in an exemplary fashion for the case of the evolution and growth of consumption.

* Entry prepared for Alan Lewis (ed.), The Cambridge Handbook of Psychology and Economic Behaviour, forthcoming, Cambridge University Press. This article is taken from the author's original manuscript and has not been reviewed or edited. The definitive published version of this extract may be found in the complete Cambridge Handbook of Psychology and Economic Behaviour, forthcoming.

I. Introduction

Evolutionary economics focuses on the transformation of the economy over time and the consequences this has for the current conditions of production and consumption. The sources of the transformation process are human learning, problem solving, and the accumulation of knowledge and capital. The diversity of individual efforts and capabilities with respect to both learning and innovation results at any time in the generation and diffusion of a variety of innovative technologies, institutions, and commercial activities that compete with each other. The competition between them, and the economic and social adaptations triggered by that competition, fuel the process of transformation from within the economy (cf. Nelson 1995, Foster and Metcalfe 2001, Fagerberg 2003, Witt 2007 for recent surveys).

The concept of evolution thus has a meaning in evolutionary economics that differs from the one in evolutionary psychology. In the latter, ‘evolution’ – in the sense of the Darwinian theory (cf. Mayr 1991, Chap. 4) – is part of the explanans. It provides the meta-hypothesis on the basis of which capabilities and constraints of the human brain – and the corresponding features of the cognition and choice – are reconstructed as, it is assumed, natural selection has created them at times when early humans were under fierce selection pressure (cf. Lea, this volume). In evolutionary economics, in contrast, ‘evolution’ is a synonym for the economic transformation process and, hence, part of the explanandum. However, because of the causal reduction of endogenous economic change to human learning, creativity, and innovative action, there is a basis and a need for engaging in a dialogue with psychological theories on these dynamic aspects of human behavior.

In order to explain the economic transformation process and the results it is generating, it is necessary, thus, to go beyond static decision making theories. These are theories of choice that take alternatives as given. In some cases, as in evolutionary psychology, they focus on how framing effects bias the perception of the alternatives and how choices follow simple decision heuristics (cf. Gigerenzer and Goldstein 1996). In evolutionary economics, in contrast, the role of choice

alternatives that newly emerge is crucial (cf. Witt 2003). Accordingly, the focus is on what motivations drive learning and innovativeness from which the newly perceived options arise. How are new insights and actions created, and what behavioral adaptations do they trigger? Obviously, these questions transcend a mode of reasoning often to be found in contemporary economic theorizing which is preoccupied with the characteristics and implications of equilibrium states of the economy. In that mode of reasoning the complexities of human behavior and its adaptive potential are not considered. The present reflections on the adaptations in economic behavior and their driving forces may therefore be seen as an attempt to broaden the foundation of the theory of economic behavior more generally.

The argumentation in this entry proceeds as follows. Adaptations in human behavior can be distinguished by the different time scales at which they occur. In rough approximation, three levels can be identified. One level is that of the genes that code certain forms of behavior. Another level is that of innate, non-cognitive learning mechanisms that govern instrumental conditioning and conditioned reinforcement. Last, but not least, there is the level of cognitive reflection, insight, and observational learning. As argued in Section II, adaptations at the genetic level – for which the Darwinian theory of evolution would be relevant – need many generations to appear. Given that, in the economic domain, the bulk of change occurs within single generations, the pace of that kind of behavioral adaptation seems too slow to matter for economic evolution. Moreover, systematic behavior adaptations of the kind explained by sociobiology only occur under sufficient natural selection pressure – an assumption that is controversial as far as modern humans are concerned. The facts notwithstanding, it will be argued that, for similar reasons as in evolutionary psychology, the Darwinian theory of evolution in general, and sociobiology in particular, can be considered relevant meta-hypotheses for evolutionary economics too.

In elaborating this argument, Section III explores the influence of the innate, non-cognitive learning mechanisms on behavior adaptations as they occur in the course of the economic transformation process. To account for these influences within the utilitarian model of economic

behavior, a connection to the concepts of utility functions and their logical equivalent, individual preference orderings, needs to be made. These concepts, central to microeconomic theorizing, play no similar role in psychology. In economics the questions of what generates utility and how are left open. Or, for that matter, what becomes the object of preference orders and why? However, as will be explained, it is precisely in answering these questions that the influences of innate dispositions and non-cognitive learning mechanisms are relevant. Section IV turns to the cognitive influences on economic behavior and the systematic changes they are responsible for in interaction with the non-cognitive learning processes. In a short digression it will also be discussed here what motivations drive innovativeness from which new choice alternatives emerge. Section V elaborates in an exemplary fashion on the implications of the theory presented in the previous sections for explaining the economic transformation process. The example chosen is the apparently incessant historical growth and structural change of consumption. Section VI briefly concludes.

II. Setting the Frame: the Role of the Human Genetic Endowment

When economic evolution is identified with the ongoing transformation processes of the economy, what relevance does the Darwinian theory of evolution then have for evolutionary economics? Opinions on this point are split. If a Darwinian world view is accepted as a unifying frame for scientific inquiry (see Wilson 1998), a straightforward answer would be to interpret the Darwinian theory as a meta-hypothesis from which the initial conditions and some of the underlying constraints of the historical process of economic change in the long run can be derived. Influenced by the Darwinian revolution of his time, this position had already been suggested by Veblen (1898) – who also introduced the label ‘evolutionary’ economics. But his position was not pursued further in the school he founded (cf. Hodgson 2004). The discussion on the relevance of the Darwinian worldview for evolutionary economics and on what it implies, has therefore only recently reappeared on the

agenda of evolutionary economics.¹

Another way of making use of Darwinian thought in evolutionary economics is a purely heuristic one. Negating the idea of a common ontology of the sciences, this approach borrows key notions and models from evolutionary biology to conveniently conceptualize the economic evolutionary process on the basis of analogy constructions. Analogy constructions to natural selection and recourse to models of population dynamics are characteristic, in particular, of the neo-Schumpeterian branch of evolutionary economics initiated by the work by Nelson and Winter (1982).

² Yet, population thinking and analogy constructions can be more of a hindrance than help when it comes to explaining the causal role that behavior adaptations play in economic change. Nelson and Winter (1982, Chap. 5) assume that, because of their bounded rationality, economic agents operate on the basis of behavioral routines. When different agents follow different routines this usually means that a variety of more or less successful behaviors emerge. Analogously to the principle of natural selection, selection forces implied by market competition are argued to erode that variety and, thus, to produce adaptations in average behavior. Hence, what is considered to improve average performance is not individual behavior adaption, e.g. through learning and problem solving, and the corresponding motivations, but the changing relative frequencies in a population of behavioral routines that are themselves unchanging.

In order to be able to account for the impact of individual behavior adaptations on the economic transformation process – the focal point of the present entry – the neo-Schumpeterian approach will therefore not be adopted here. The Darwinian theory will not be used as a source for constructing analogies but as a meta-theory that, though not directly relevant for the economic

¹ See Witt (1996), Vromen (2001), Hodgson (2002), Witt (2003, Chap. 1), cf. also the special issue of the *Journal of Evolutionary Economics*, Vol. 16, No. 5, 2006 on “Evolutionary Concepts in Economics and Biology”.

² Cf. Metcalfe (1998), Fagerberg (2003), Nelson and Winter (2002). In his seminal works on the self-transformation of the economy Schumpeter (1934) had avoided the term ‘evolution’. He considered it a Darwinian concept and, as such, irrelevant for the social sciences. He also opposed the use of biological analogies.

transformation process, can shed light on the behavioral foundations of this process. Not unlike in evolutionary psychology, it can be used to reconstruct the genetic influences on behavior, deriving from times when early humans were under fierce selection pressure. The consequences of these influences can be put in perspective with culturally acquired forms of economic behavior.

As far as animals are concerned, there is little doubt that important parts of their behavioral repertoire 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 the animals' behavior in social interactions (Wilson 1975). Prominent examples are rearing offspring, the joint stalking 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. These and other social forms of behavior are explicable in terms of the theory of natural selection by substituting the concept of “inclusive fitness” (Hamilton 1964) for the concept of individual genetic fitness.³

Some 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,

³ Inclusive fitness means to account for the genetic commonalities between kin in calculating the fitness value of a particular genetically coded social behavior. Behaving altruistically may lower the chances of reproducing their own genes. On the other hand, depending on the degree of relationship, the reproductive disadvantage may be over-compensated by increased reproduction chances of the same genes in kin who benefit from the social behavior.

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 intelligently created forms of behavior. They are the major reason why many primitive – but even more so the economically highly developed modern – societies are capable of mastering their environment so successfully that the selection pressure on their social and economic behavior has decreased dramatically.

Evidence for this finding is provided by the fading correlation between the amount of resources commanded on the one hand and reproductive success on the other. While the amount of scarce resources an animal can command is positively correlated with its reproductive success, in the developed, human societies average real income increases and population growth are negatively correlated.⁴ The fact that such inconsequential reproductive behavior is not wiped out indicates that pressure from natural selection does not suffice anymore to cut back on an increasing variety of idiosyncratic 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 actually displayed.

As will be explained in the next sections, besides the impact of cognitive reasoning and beliefs, some elementary, innate, behavioral dispositions and adaptation mechanisms do have an influence here, albeit an indirect one. (And, precisely because natural selection is no longer a source of rapid systematic change in the human species, these elementary, innate features are likely to be basically the same as those shaped under selection pressure in the earlier phases of human phylogeny.) The indirect influence affects, it will be argued, the individuals' utility or preferences and the way in which they change over time.

⁴ Cf. Maddison (2001, Chap. 1) who shows in a cross country comparison that 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 is evidence for a positive correlation, cf., e.g., Chagnon and Irons (1979).

III. Explaining Motivation: Utility, Preferences, and Their Inherent Dynamics

A person's motivation to act and the reflections about possible actions belong to the inner sphere of that person which cannot be observed in the same way as the action actually taken. This simple fact is the crux of a long philosophical debate. Its repercussions have triggered different responses in economic and psychological theorizing. Starting from Bentham's (1789) sensory utilitarianism – guided by a good psychological intuition but a naive attitude towards measurement – economics has over the past two centuries turned first to a theory of subjective utility (lacking any idea of measurability) and then to subjective preference theory. Initially motivated by the desire to give utility theory a proper mathematical expression (Warke 2000), the conversion into preference theory followed a different path. Strikingly similar to the positivist attitude underlying behaviorism in psychology, the goal was to eliminate all speculations about unobservable inner states of a person from the foundations of microeconomics (cf. Samuelson 1947, Chap. I and V).

The few empirical implications of subjective utility theory all rest on the – unknown – shape of a person's utility function (usually defined over quantities of n commodities, x_1, x_2, \dots, x_n). However, if certain conditions are satisfied, such a utility function is logically equivalent to an ordering over alternative bundles of the n commodities. For any two bundles $\mathbf{x} = x_1, x_2, \dots, x_n$ and $\mathbf{y} = y_1, y_2, \dots, y_n$ such an ordering implies that either “ \mathbf{x} is preferred to \mathbf{y} ” or “ \mathbf{y} is preferred to \mathbf{x} ” or “ \mathbf{x} and \mathbf{y} are equally preferred”(indifference). Which of these preferences a person has was, under controlled conditions, expected to be observable by the quantities a person chooses when prices vary (provided the person acts consistently – a version of the rationality assumption whose validity cannot simultaneously be observed). However, such “revealed preference” experiments were rarely carried out. The theory was factually used as a platform to logically deduce ‘operational’ hypotheses about demand behavior, formulated exclusively in terms of observable prices and quantities. As a consequence, individual utility functions and preference orderings now populate economic textbooks, yet with reference to their subjective nature it is left unexplained what the arguments in the functions stand for, or what it is that people have preferences for.

Psychological theorizing took a different route. The concepts of utility and preferences can hardly be found in the psychological literature. However, with respect to the observability problem, radical behaviorism had a similar positivist stance – with one major difference. While revealed preferences theory was oriented towards deriving abstract logical inferences about demand functions, behavioral psychology focused on explaining observable behavior itself – human and non-human. With a minimalist theory, in hundreds of experiments a narrowly limited number of primary reinforcers were identified – findings that invited reflections about the underlying motivation to act. These reinforcers are shared, with some variance, by all humans and by many other species (Herrnstein 1990). This fact and the physiological mechanisms underlying reinforcement that were later discovered in molecular biology point to a genetic basis. By understanding the physiological foundations, the short-term dynamics of deprivation and satiation and their motivational potential can easily be explained. The behaviorists' genuinely dynamic approach to motivation was complemented by the theory of conditioned reinforcement. That theory postulates a primitive, innate mechanism by which associations are learned between stimuli and by which secondary reinforcers emerge on the basis of conditioning learning.

In economics, Bentham's hedonic interpretation of utility as a sensory perception which is observable and even measurable has recently been rehabilitated (cf. Kahneman, Wakker and Sarin 1997). However, his question of what generates utility and, thus, motivates people to act still needs to be revived. It is particularly important for evolutionary economics, because without being able to explain what motivates a person to act it is impossible, *a fortiori*, to explain how that motivation changes in the short run, and how it can possibly evolve in systematic ways in the longer run. Contrary to what many economists hold, the subjectivity of individual utility and preferences does not prevent being specific about their causes and contingencies. In fact, the just mentioned findings in behavioral psychology are directly relevant here. The innate motivational dispositions and the adaptation mechanism expressed respectively in primary reinforcing events and processes of instrumental conditioning and conditioned reinforcement suggest the following hypothesis: A person derives utility from actions depending on (or prefers them according to) their current potential to

induce a rewarding sensory experience either by reducing deprivation with respect to primary reinforcers directly or through conditioned secondary reinforcers.⁵

Thus, at least some of the arguments of a person's utility function (if defined over actions rather than commodities) can be connected with the sensory experiences of reinforcers. First, there are experiences with the limited number of innate primary reinforcers shared, with the usual genetic variance, by all humans. Among them are the removal or reduction of aversive stimuli like pain, fear, etc.. Furthermore, in numerous experiments the removal or reduction of deprivation from, among others, air, aqueous solutions, sleeping, food, body heat, sensory arousal of certain kind and strength, social status recognition, sex, care, and affection have been identified as primary reinforcing instances.⁶ Following the argument above, actions – usually involving goods and services that are purchased in the markets – that are capable of removing or reducing deprivation in these dimensions thus are what generates utility (or, for that matter, are the objects of preference orderings). Correspondingly, the short run dynamics of the probabilities for certain actions being chosen reflect the variations in the relative degree of deprivation felt in the respective dimensions.

Based on such innate primary reinforcers, a potentially very long chain of secondary reinforcers emerges over the history of conditioned reinforcement a person goes through. The arguments of the individual utility function therefore represent, second, the varying structure of individually acquired secondary reinforcers. Unlike the widely shared primary reinforcers, this structure is of highly idiosyncratic nature, except perhaps for some cultural commonalities in similarly socialized groups. Given their idiosyncrasy and enormous variety there would be little sense in trying to produce a list of secondary reinforcers. (It is mainly because of these features that it can rightly be claimed that no two individual utility functions or preferences are alike.) Furthermore, unlike the

⁵ As the biologists Pulliam and Dunford (1980, 11-44) have shown, this hypothesis can also be given an interpretation in terms of sensory experiences that are based on hard-wired (genetically coded) neurological processes in higher organisms.

⁶ Cf. Millenson (1967, p. 368). The survival value of the primary reinforcers is obvious.

primary reinforcers allowing for individual malleability in behavior only through instrumental conditioning, the emergence of a structure of individual secondary reinforcers implies a rich dynamic potential for utility functions and preferences to evolve both over individual life times and cultural epochs.

A recourse to elementary innate behavior dispositions and adaptation mechanisms has been suggested here to provide a behavioral foundation for the concepts of utility, preferences, and their inherent dynamics. This suggestion is not meant to imply that the discussion should be confined to the behavioral level. In the economic context, important motivational influences on human behavior, particularly on intentional choices, are likely to emanate also from the cognitive level. These influences are to be discussed next.

IV. Acknowledging the Role of Cognition: Attention and Unfolding Action Knowledge

Evolution has endowed humans with an exceptional intelligence. Reflection, intuitive insight, intentionality, and logical inference – unique capacities of our cognitive system – play a constitutive role for many economic actions. This means that, in addition to the elementary, innate behavior dispositions and adaptation mechanisms, a set of further causal factors has to be accounted for. The corresponding hypotheses on cognitive influences have to be merged in a more comprehensive theory of economic behavior and its dynamics.

Subjective perception and interpretation can intervene in stimulus-response reaction patterns. Depending on how perceptions are associated with intentions and other existing memory content to form a more or less reflected action plan, reaction patterns can systematically change. Intentional behavior is selectively controlled for goal achievement, and goals may be adjusted as a result of observing the behavior of others. Success or failure in goal achievement can be reflected in terms of subjective cause-and-effect relationships and, by inference, expectations and/or aspirations can be

revised. In any case, in addition to learning in the sense of instrumental conditioning and conditioned reinforcement, cognitive learning through insight and observation of others comes into play in a way that moderates the individual dependence on innate behavior dispositions and adaptation mechanisms (Bandura 1986).

As attribution theory has shown, the intervening cognitive activities are not only rather complex but also somewhat arbitrary with respect to their outcome (cf. van Raaij 1985). However, whether intervening cognitive activities occur, and which ones these are, hinges on the information input. What information is perceived and processed through personal experience or by observation of, and/or communication with, others is contingent, in turn, on certain constraints in human information processing and, thus, knowledge acquisition. These constraints are also part of the human biological inheritance. Since it may be easier to derive hypotheses on the effects of cognitive intervention on economic behavior from constraints on the information input than from the complex internal cognitive processes, these constraints deserve a closer inspection.

In human perception a limited number of sensory stimuli, such as visual and acoustic signals, can spontaneously be processed in parallel into respective stores and be recognized.⁷ Unless attention is quickly paid to any such message it will, however be lost from memory. If, as often, stimuli are offered in abundance to the sensory system, attention must selectively be allocated to competing processing demands. This means that, in the brains processing capacity there is a bottleneck. Of the information coming in at any given point in time, spontaneous selective attention processes must filter out that information that will be processed further in the working memory. There the selected information is maintained by rehearsal, but the amount of information that can be rehearsed at one point in time is also narrowly limited.

What pieces of incoming information grab attention depends on both their physically based

⁷ Cf., e.g., Anderson (2000, chap. 3, 6 and 7) for the following.

attributes ⁸ and their meaning-based attributes. Meaning is identified through tracing information from long term memory (the other source of information entering the working memory). In long term memory, knowledge is stored that has previously been accumulated. In order for elements of long term memory to be made available, they have to be activated selectively through cognitive cues contained in messages. Only messages containing cues for which there is an associative basis in long term memory can have a meaningful interpretation and, by means of this, attract attention. Since only what is gaining attention has a chance of being rehearsed in memory and, thus, of being added to an individual's knowledge, the change of individual knowledge hinges on the already acquired knowledge.

The meaning associated with a particular piece of information often has affective connotations of liking or disliking. The latter reflect previous rewarding or aversive experiences ultimately based on reinforcing instances as discussed in the previous section. In the terminology chosen here, the affective connotations therefore relate to a person's preferences or utility function. More specifically, this means that the more a person has developed a preference (or an aversion) for a particular item or event, the more affective weight is attributed to its meaning. Accordingly, it is more likely that attention is allocated to incoming information relating to that item or event. Concomitantly, there is also an effect on individual knowledge: if information related to a particular item or event attracts more attention, then that information also tends to be more frequently attended and rehearsed in thinking and, hence, to be better cognitively represented in action knowledge in the long term memory. Thus, two mutually reinforcing effects interact. One effect is the affection-driven impact of the current preferences on the selective allocation of attention and the incremental change of knowledge. The other effect is that of selective attention and gradually changing knowledge on the formation of individual preferences. The more something is valued, the more it is also able to attract attention, to be rehearsed, and to be retrieved in long term memory. Conversely, what is more often

⁸ Sensory arousal elicited by a stimulus in general depends on two attributes of the stimulus: frequency and relative strength (Helson 1964). Applied to the present context of allocating attention to the information carried by a sensory stimulus these two factors may be identified with the frequency of exposure to that particular information and the intensity with which the stimulus is felt.

and persistently recognized as a positive stimulus, or as being related to one, tends, in turn, to be preferred increasingly (provided that a positively conditioning setting is maintained).

The flip side of the coin in this process with self-augmenting features is the relative neglect of, and the rising ignorance with respect to, other information. The capacity of the working memory required to lay out traces to what has earlier been stored in long term memory is narrowly confined. For this reason, traces that allow to retrieve a particular piece of information can only be established and maintained at the expense of memory traces to other pieces of information. Therefore, the frequency of practicing particular memory traces and the affective value of the stored information are once more decisive factors – this time, however, with regard to the probability and intensity of recalling information. To put it differently: the less frequently and the less intensively an information has been recalled in the past the more likely it is lost from long term memory, i.e. from current knowledge.

The implications of these specificities of the human information processing system for economic behavior in general and the transformation processes going on in the economy in particular will be highlighted in the next section. Before, however, a brief digression into a problem may be in order that is of great importance for the explanatory program of evolutionary economics. The problem – also arising at the cognitive level – is how to explain individual innovativeness, i.e. the creation of new choice alternatives and the motivation to do so. Two different questions are involved: first, how is novelty produced, and second, why. Regarding the first question, the key seems to be the brains's continually ongoing recombination activities of already known cognitive components (Koestler 1964, Campbell 1987). For the processes involved in both the recombination and the attribution of meaning, individual creative skills certainly play a crucial role (Sternberg 1988). How these processes work is, however, still little understood. Moreover, the inquiry into these issues is complicated by intricate epistemological problems. One hypothesis that has been suggested is that the meaning of newly produced recombinations is identified through switches in the underlying interpretative *Gestalt*

patterns.⁹

The second question – why, and under what conditions, a person is motivated to search for novelty – is epistemologically less problematic and therefore easier to answer. Since neither the outcome of the search endeavor nor the time and effort it will need are known in advance, the search cannot be motivated by the expectation of specific outcomes (as implicitly assumed in optimal search models in economics). Search for novelty is motivated in a different way. In fact, there seem to be different forms of motivation corresponding with different forms of searching.

One form is covered by the “satisficing” hypothesis (Siegel 1957, March and Simon 1958, pp. 47-52). According to this hypothesis, the search motivation is dissatisfaction with the status quo. A person experiences a situation that falls short of the current aspiration level of that person, i.e. the level that reflects a balance of the person’s earlier successes and failures. Imagine, to give an example, a producer who has a competitor. If the competitor comes up with an innovative move that causes the producer’s revenues to fall whatever feasible reaction she can choose, then such a situation is likely to violate the person’s current aspiration level. According to the satisficing hypothesis a motivation to search for not yet known, better alternatives is triggered, notwithstanding the fact that it is unknown whether the search will indeed lead to better alternatives. The search motivation sooner or later vanishes, however, as search goes on without generating better options. The person’s aspiration level gradually declines and when it eventually converges to the best option presently known the motivation to search vanishes.

A different motivation to search for novelty, and another form of searching, is highlighted by the taste-for-novelty hypothesis. This hypothesis assumes that humans find the experience of certain kinds of novelty a rewarding experience and deprivation from such sensory arousal an aversive

⁹ See Schlicht (1997); these patterns represent highly idiosyncratic, subjective mental states depending on individual experience and current knowledge. For a reconstruction of the brains’s recombinatory activity as an act of “conceptual blending” see Fauconnier and Turner (2002).

experience (Scitovsky 1976). Hence, the more boring a life becomes, i.e. the more deprivation rises in this dimension, the stronger the motivation to either consume (try) new source of sensory arousal, if available, or to actively search for, and generate the experience of, novelty. Obviously, the two motivational hypotheses refer to different causal contexts and search contexts so that they may be considered complementary hypotheses. The satisficing hypothesis suggests that search for novelty is typically motivated by, and more frequently triggered in, situations of challenge or crisis (where these may be anticipated crises). The taste-for-novelty hypothesis predicts a short-term fluctuation of the search motivation between deprivation and satiation so that, on average, novelty is sought with a, perhaps rather low but constant, basic rate.

V. Pulling Things Together: The Example of Consumption Evolving

Because of space constraints what follows from the evolutionary approach to economic behavior laid out in the previous sections can only be discussed here in an exemplary fashion. The case to be chosen is that of the growth and structural change of consumption in the developed countries over the past century, i.e. the explanation of what goes on at the demand side of the economy in the historical transformation process. The underlying facts are as follows: per capita income has risen three to six times in the different countries in real terms (Maddison 2001, Chap. 1). Consumer spending has grown by a similar magnitude (Lebergott 1993). The enormous expansion of consumer spending was not equally distributed over all consumption categories. To the contrary, over the hundred years there were massive changes in the compositions of goods and services consumed. As empirical research over the past decades has consistently shown, income elasticities of the demand for the different goods and services not only differ but also change over time, resulting in an unequal growth of consumption expenditures across different consumption categories.¹⁰ Moreover, within each of the

¹⁰ See Stone (1954), Houthakker and Taylor (1966), Deaton and Muellbauer (1980), Lebergott (1993). Let I and x denote income and the amount spent on a consumption good respectively. Assuming that a differentiable function $x = x(I)$ exists, the definition of the income elasticity of demand η for that goods is $\eta = (dx/dI) / (x/I)$. The good is said to be income-inferior if $\eta < 1$ (income-

consumption categories the quality of existing goods and services has constantly been varied and differentiated. An increasing variety of new goods and services has been introduced to the markets.

How can all these observations be explained? How can consumer spending grow so dramatically with rising income without reaching a level of satiation? What role do satiation phenomena play at least in some consumption categories (as they may indeed be conjectured to express themselves in the differing income elasticities)? It is sometimes argued that vicarious entrepreneurs at the supply side of the markets have found ways to offer new or better products appealing to consumer preferences for which there have previously been no suitable offers. Hence the continuously upheld motivation among the consumers to expand expenditures. However, this argument is difficult to accept or refute as long as it is left unspecified what preferences consumers actually have. The discussion in the previous sections provides a basis for making progress.¹¹

To recapitulate, some sources of utility – and the corresponding motivation to act – have been identified above with the removal or reduction of deprivation in physiologically determined activities like breathing air, drinking aqueous solutions, eating food, or pain relief. The motivation to consume the corresponding items air, water, food, medicine is easy to understand. It is ‘consumption’ in the literal sense of eating up. A significant feature of that kind of consumption is that it is subject to temporary physical satiation that constrains the amount consumed per unit of time. The motivation for additional consumption vanishes as the satiation level is approached, but it reemerges as the organism’s metabolism gradually uses up what was consumed. As real income increases, consumption can sooner or later be expanded to the average satiation level. Unless people expand their consumption beyond that level (‘consumption’ in the sense of purchasing items without ‘consuming’ them in the literal sense anymore), the absolute per capita consumption of these inputs

superior if $\eta > 1$). This means that, with a marginal increase in disposable income, the percentage change in spending on that good is smaller (larger) than the percentage change of income.

¹¹ For a more detailed discussion see Witt (2001).

per unit of time should therefore be expected to face an upper bound.¹² Yet, this is not what can be observed.

Food is an obvious example and its various forms are therefore preferred candidates for demonstrating statistically that there are income-inferior goods (cf. Lebergott 1993, Part II). However, the food industry have been battling with the satiation problem for decades and there have been ways of circumventing it so far. Household expenditure surveys show that per capita consumption even of many income-inferior goods is continuing to grow in absolute terms. The reason seems to be, first, that with rising income the kind and quality of the diet changes in the direction of more complex and more expensive ingredients with more refined sensory quality. Second, producers have developed new products by which the sensory perception of a rewarding consumption experience can be enjoyed without rapidly approaching physiological satiation. A prominent case are food stuffs made with artificial sweeteners which allow increased intake, and thus the expenditures, to a much higher level than the satiation level for similar products made with 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-calorie substitutes for traditional flavoring ingredients with higher caloric content.

For consumption items other than those directly eaten up, the explanation of the change in consumer behavior is more involved. For example, consumption items such as beds or air conditioning facilities serve as means or ‘tools’ in relation to physiologically determined needs such as getting sleep or maintaining body temperature. A television set, to give another example, is one tool among many other options that serve the rewarding experience of a pleasant sensory arousal through entertainment. (In itself, a television set is fairly useless, if it cannot be turned on to emit the

¹² The ambiguity of the term ‘consumption’ reflects the etymology of a word that has been used for an increasingly broader set of phenomena after the organization of the economy evolved from the subsistence economy of self-supporting households to an increasingly differentiated division of labor. The extensive market exchange activities related to the latter imply purchasing acts of the households now usually associated with the term consumption (‘consumption expenditures’).

entertaining services in the form of a flow of visual and acoustic information.) Being deprived in the dimension of, say sleep, body heat, or sensory arousal can thus motivate the expenditure on a consumption item able to provide the proper service like beds, clothes, air conditioning, television sets etc.

The significant feature here is that not the ‘tools’ purchased, but the services they provide contribute to removing or reducing deprivation. This means that a temporary satiation level (defined per unit of time) that stifles the motivation to consume can be reached with respect to the *services*. In using them one may feel warm enough, may have had enough sleep, or enough entertainment. But the motivation to utilize the services of the ‘tools’ one possesses and the motivation to purchase the ‘tools’ in the first place are distinct features. The latter motivation depends on how the instrumental relationship of the tools and their services (means and ends) is perceived and is not necessarily affected by satiation in the services. Other reasons than the relative degree of deprivation in their services may influence the motivation to purchase tools. These reasons are likely to emerge from cognitive reflections (e.g., concerning securing a redundant supply, multiple availability for different purposes or at different places etc.) and subsequent conditioned reinforcement building up secondary reinforcing instances.

People usually reflect and learn about how to instrumentalize consumption items with tool function – most of them belonging to the category of durables (appliances, equipments, etc.) – before a purchasing decision is made. Often rather elaborate knowledge about the consumption technology is necessary and needs to be built up. This knowledge is not only obtained through personal experimentation, but also through communication and observation and imitation of other consumers. Not least, knowledge of the consumption technology is offered by the producers of consumption items – an important function of their advertising. Given the selective nature of individual information processing discussed in the previous section, attention processes tend to shift from information less frequently and less intensely recognized towards information recognized more often and more intensely. At the same time, the perception and, in the longer run, consumption knowledge of items

which continue to attract attention tend to become more detailed (refinement effect). By repeated experience a conditioned reinforcement is likely to build up that creates secondary reinforcement instances. Individual preferences extend to ever more details and attributes – attracting more attention into the same direction.

Because of the limitations of the individual information processing capacity, the already mentioned consequence of this process is specialization in consumption. One person may develop into a true motor sport fan following up, with an increasing preference and growing expertise, the most recent technical achievements of the motor car industry. Another person may develop into a similarly attentive opera fan with highly differentiated perception of, and preferences for, the qualitative differences in the music performance. Some people may develop into knowledgeable motor sport and opera fans simultaneously, but nobody can be a fan with differentiated perceptions of, and preferences for, everything. The upshot of specialization and the simultaneous refinement of perception, knowledge, and preferences is that additional reasons can arise for a consumer to purchase, several times over, consumption items with tool functions. These reasons may override the fact that the items provide one and the same service (or very similar ones) and that, with respect to that service, the satiation level is close to being reached or is already reached. (The extreme case is that of collectibles.)

If there is a satiation level with regard to the services in some deprivation dimension, and if multiple purchases of the same ‘tool’ or similar ones exceed the number technically necessary to furnish the satiation level in the services, this simply results in a decreasing average rate of using the services provided by each single tool. For example, since only one pair of shoes (a ‘tool’ providing pain protection and body warmth as ‘services’) can be worn at the same time, purchasing several pairs of shoes means that on average each single pair of shoes is used less intensely. However, although this may induce some dissonant feeling, seeing things being utilized less intensely is likely not to curb the motivation to consume (purchase) as much as the physiological experience of satiation would do.

Another, but related, cause for expanding consumption irrespective of satiation levels being reached can occur when a consumption good is capable of removing or reducing deprivation in several dimensions simultaneously. Such ‘combination goods’ are often deliberately created by product differentiation and product innovations. If, with rising income, consumption of these goods is growing, satiation levels are usually not reached in all dimensions at the same time. In that case, a sufficient motivation to further expand consumption of the good or service may be upheld in those dimensions not yet satiated. For obtaining additional satisfaction from such ‘combination goods’ in some dimensions, consumption in other dimensions is extended beyond the satiation level. The possibility to create new combinations is strongly supported by the refinement effect just mentioned.

The questions addressed in this section are why and in what way consumer spending has been expanding tremendously in real terms with rising income over the past century and how the unequal growth of consumption expenditures across different consumption categories (the differences in the income elasticities of the goods and services) can be explained. For the consumption categories discussed so far the answers were based on the assumption that the growth of income and consumption would in principle make a reduction or removal of average deprivation feasible. In some consumption categories, however, the satiation level may not, or not easily, be reached by increasing expenditures.

Consider, e.g., the primary reinforcing instance of social status recognition. Consumption items with tool function whose services are 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 (cf. Hirsch 1978) - an unstable condition like in a weapon’s race.

Another case in which satiation is difficult to attain and consumption can therefore expand without reducing deprivation significantly is the primary reinforcing instance of sensory arousal. As argued by Scitovsky (1976), the reason is again an instability in 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.

VI. Conclusions

Human economic activity and the human economy have changed dramatically over time. Evolutionary economics has been proposed as a paradigm for analyzing the historical process of change. However, evolutionary economics, as much as economics more generally, requires a foundation in the form of a concise theory of economic behavior. Both the historical changes in economic behavior and the behavioral dispositions on the basis of which they could develop can probably be rationalized, but not be explained, by the static (and latently normative) theory of constrained maximization. In this entry the foundations of an evolutionary approach to economic behavior have been laid out. It has been argued that the historical malleability of economic behavior is based on the interactions between elementary, innate behavior dispositions and adaptation mechanisms on the one hand and the limited, and always selective, cognitive and observational learning that contributes to an ever more extended and differentiated action knowledge. The implications of this interpretation have briefly been outlined in an exemplary fashion for the explanation of the evolution and growth of consumption.

The fact that, as a characteristic of the evolutionary economic transformation process,

consumption is continually growing has been argued to have several causes. As a consequence of “nature’s parsimony” (as Ricardo put it), i.e. of a minimal real per capita income, humans have throughout their history been confronted by a situation of deprivation with respect to many of their needs. Simply as a reaction to that situation of deprivation, consumption expenditures could therefore be expected to rise from their extremely low value, when per capita income in the developed countries started to rise in the early 20th century. However, as turned out, a more detailed investigation of this reaction begs the question of what precisely causes deprivation and whether and when, with further rising income, satiation can remove that consumption motivation.

The hypotheses suggested in this entry to answer the question, have emphasized the genetically fixed, physiological and psychological dimensions of deprivation in which a reduction of deprivation is a rewarding experience. In some of these dimensions it may, for different reasons, be difficult to reach satiation even at very high levels of income. As two examples social or status recognition, sensory and cognitive arousal have been mentioned. In these few dimensions the simple logic of increasing consumption to reduce deprivation seems to induce a long lasting, if not unbounded, growth of demand and, hence, a rising share of these consumption categories in overall consumption expenditures. Even though this is a selective effect, it does contribute to consumption further expanding even in the richest countries.

Beyond the motivational mechanism of deprivation and satiation other parts of the human biological inheritance have been claimed to also play a crucial role for economic behavior and its impact on the economic transformation process. These parts are conditioned learning and the intelligent recognition of means-ends or tool-service relationships from which additional motives to expand consumption emerge. As a result of contingent reinforcement, preferences for goods and service can develop where there have been no such preferences before. With disposable income rising, consumers literally learn to appreciate previously unknown consumption opportunities, to develop refined tastes, and to ‘specialize’ in certain consumption activities.

Furthermore, it has been contended that with rising income the opportunities for purchasing consumption goods with ‘tool’ functions increase, provided the consumers command the corresponding consumption knowledge. The information from which this knowledge arises is not least furnished by commercial advertisements, and its impact is often reinforced by socially contingent opinion formation processes and agenda setting effects. These are the sources that provide all sorts of plausible reasons for why ‘tools’ should be purchased. At the level of cognitively motivated consumption expenditures they may induce expenses, even when satiation with respect to some of the service dimensions of the tools is already reached. The consequence is a decreasing average rate of using the services of the tools. A special case of this phenomenon is that of “combination goods” nowadays representing a substantial share of the consumer goods.

References

- Anderson, J.R. 2000. *Cognitive Psychology and its Implications*. 5.ed., New York: Worth.
- Bandura, A. 1986. *Social Foundations of Thought and Action - A Social Cognitive Theory*. Englewood Cliffs: Prentice-Hall.
- Bentham, J. 1789. *An Introduction to the Principles of Morals and Legislation*. London: T.Payne.
- Campbell, D.T. 1987. ‘Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes’, in Radnitzky, G. and Bartley III, W.W. (eds.) *Evolutionary Epistemology, Theory of Rationality, and the Sociology of Knowledge*, La Salle: Open Court, pp. 91-114.
- Caplan, A.L. (ed.) 1978. *The Sociobiology Debate*. New York: Harper.
- Chagnon, N.A. and Irons, W. (eds.) 1979. *Evolutionary Biology and Human Social Behavior – An Anthropological Perspective*. North Scituate: Duxbury Press.

- Deaton, A. and Muellbauer, J. 1980. *Economics and Consumer Behavior*. Cambridge: Cambridge University Press.
- Dugatkin, L.A. 2003. *Principles of Animal Behavior*. New York: Norton & Company.
- Fagerberg, J. 2003. 'Schumpeter and the Revival of Evolutionary Economics', *Journal of Evolutionary Economics* 13: 125-159.
- Fauconnier, G. and Turner, M. 2002. *The Way We Think – Conceptual Blending and the Mind's Hidden Complexities*, New York: Basic Books.
- Foster, J. and Metcalfe, J.S. 2001. 'Modern Evolutionary Perspectives: An Overview', in Foster, J. and Metcalfe, J.S. (eds.), *Frontiers of Evolutionary Economics*. Cheltenham: Edward Elgar, pp. 1- 16.
- Gigerenzer, G. and Goldstein D.G. 1996. 'Reasoning the Fast and Frugal Way: Models of Bounded Rationality', *Psychological Review* 103: 650-669.
- Hamilton, W.D. 1964. 'The Genetical Evolution of Social Behavior I', *Journal of Theoretical Biology* 7: 1-16.
- Helson, H. 1964. *Adaptation Level Theory*. New York: Harper & Row.
- Herrnstein, R.J. 1990. 'Behavior, Reinforcement, and Utility', *Psychological Sciences* 4: 217-221.
- Hirsch, F. 1978. *Social Limits to Growth*. Cambridge, MA: Harvard University Press.
- Hodgson, G. M. 2002. 'Darwinism in Economics: From Analogy to Ontology', *Journal of Evolutionary Economics* 12: 259-281.
- Hodgson, G. M. 2004. *The Evolution of Institutional Economics*. London: Routledge.
- Houthakker, H.S. and Taylor, L.D. 1966. *Consumer Demand in the United States 1929 – 1970*. Cambridge, Mass.: Harvard University Press.

- Kahneman, D., Wakker, P.P, and Sarin, R. 1997. 'Back to Bentham? Explorations of Experienced Utility', *Quarterly Journal of Economics* 112: 375-405.
- Koestler, A. 1964. *The Act of Creation*. London: Penguin Books.
- Lea, S.E.G. 2007. 'Evolutionary Psychology and Economic Psychology', this volume.
- Lebergott, S. 1993. *Pursuing Happiness - American Consumers in the Twentieth Century*. Princeton: Princeton University Press.
- Maddison, A. 2001. *The World Economy: A Millenium Perspective*. Paris: OECD.
- March, J.G. and Simon, H.A. 1958. *Organizations*, New York: Wiley.
- Mayr, E. 1991. *One Long Argument*. Cambridge, MA: Harvard University Press.
- Metcalf, J.S. 1998. *Evolutionary Economics and Creative Destruction*. London: Routledge.
- Millenson, J.R. 1967. *Principles of Behavioral Analysis*. New York: Macmillan.
- Nelson, R.R. 1995. 'Recent Evolutionary Theorizing about Economic Change', *Journal of Economic Literature* 33: 48-90.
- Nelson, R.R. and Winter, S.G. 1982. *An Evolutionary Theory of Economic Change* Cambridge: Harvard University Press.
- Nelson, R.R. und Winter, S.G. 2002. 'Evolutionary Theorizing in Economics', *Journal of Economic Perspectives* 16: 23-46.
- Pulliam, H.R. and Dunford, C. 1980. *Programmed to Learn: An Essay on the Evolution of Culture*. New York: Columbia University Press.
- Raaij, W.F. van 1985. 'Attribution of Causality to Economic Actions and Events', *Kyklos* 38: 3-19.

- Ruprecht, W. 2005. 'The Historical Development of the Consumption of Sweeteners – A Learning Approach', *Journal of Evolutionary Economics* 15: 247-272.
- Samuelson, P.A. 1947. *Foundations of Economic Analysis*. Cambridge, Mass.: Harvard University Press.
- Schlicht, E. 1997. 'Patterned Variation - The Role of Psychological Dispositions in Social and Institutional Evolution', *Journal of Institutional and Theoretical Economics* 153: 722-736.
- Schumpeter, J.A. 1934. *Theory of Economic Development*. Cambridge: Harvard University Press.
- Scitovsky, T. 1976. *The Joyless Economy*. Oxford: Oxford University Press.
- Siegel, S. 1957. 'Level of Aspiration and Decision Making', *Psychological Review* 64: 253-262.
- Sternberg, R.J. 1988. *The Nature of Creativity*. Cambridge: Cambridge University Press.
- Stone, J.R.N. 1954. *Measurement of Consumer Expenditures and Behavior in the United Kingdom*. Vol. I, Cambridge: Cambridge University Press.
- Veblen, T. 1898. 'Why Is Economics Not an Evolutionary Science?', *Quarterly Journal of Economics* 12: 373-397.
- Vromen, J.J. 2001. 'The Human Agent in Evolutionary Economics', in: Laurent, J. and Nightingale, J. (eds.), *Darwinism and Evolutionary Economics*. Cheltenham: Edward Elgar, pp. 184-208.
- Warke, T. 2000. 'Mathematical Fitness in the Evolution of the Utility Concept from Bentham to Jevons to Marshall', *Journal of History of Economic Thought* 22: 3-23.
- Wilson, E.O. 1975. *Sociobiology - The New Synthesis*. Cambridge, MA: Belknap Press.
- Wilson, E.O. 1998. *Consilience - The Unity of Knowledge*, New York: Knopf.
- Witt, U. 1996. 'A Darwinian Revolution in Economics?', *Journal of Institutional and Theoretical Economics* 152: 707-715.

Witt, U. 2001. 'Learning to Consume - A Theory of Wants and the Growth of Demand', *Journal of Evolutionary Economics* 11: 23-36.

Witt, U. 2003. *The Evolving Economy*. Cheltenham: Edward Elgar.

Witt, U. 2007. 'Evolutionary Economics', in: Durlauf, S. N. and Blume, L. E. (eds.), *The New Palgrave Dictionary of Economics*. New York: Palgrave Macmillan, forthcoming.