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by

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I. Introduction

Twentieth century demand theory is an outgrowth of the revision of the utilitarian program undertaken by Jevons (1879) in the so-called marginalist revolution. In the original, Benthamite version, the utilitarian program was based on a naturalistic, hedonic theory of behavior. Utility was conceived of as a sensory experience of pleasures and avoidance of pains and, thus, as an 'objective', measurable notion (Bentham 1948). In Jevons' interpretation the concept of utility lost these 'objective' sensory connotations. In the further development, cardinal notions of subjective utility were substituted for ever more abstract, ordinal index number interpretations. The hedonic underpinnings of utility were gradually abandoned. The focus narrowed down to the analytical problem of properly representing the theory by a utility function and indifference curves. Since these were considered to be non-observables, the positivist spirit of the time suggested expressing the theory in terms of observable variables. Demand theory – or the "pure theory of consumer's behavior" (Samuelson 1947, 90-1) – that dealt with quantities demanded, prices, and incomes only, was expected to provide the solution.

By the mid 20th century, the development had arrived at a point where Samuelson (ibid.) could speak of the "hollowness" of utility theory. He called for its replacement by an axiomatic preference theory. With the use of a preference revelation procedure, Samuelson (1948) hoped to elicit all the information required for the theoretical underpinnings of demand from observing the agents' choices in response to systematically varied prices and income. Today, axiomatic preference theory dominates utilitarian thinking, or what is left of it. In almost every graduate textbook of microeconomics, axiomatic preference theory is presented as the foundation of consumption and demand. The rigor of this approach is unsurpassed. However, it comes at a price.

The "shift in emphasis away from the physiological and psychological hedonistic, introspective aspects of utility" (Samuelson 1947, 90-1) resulted in the neglect of sensory experience as a cause of

behavior. As a consequence, the explanatory basis of utilitarianism narrowed down. What motivates economic action or, for that matter, why people order their preferences in the observed way, is left unexplained. The theory reduces to hypotheses about how a given amount of money is allocated among goods in relation to their prices. It says neither what it is that people wish to consume and therefore demand, nor why they do so. No explanations are offered as to how and why earlier consumption experiences affect demand at later stages. No reasons are given for why variations in income affect the demand for different goods and services quite differently. Important problems of modern economies, like the role of demand for innovations and economic growth, can hardly be addressed on such a basis.

In view of such deficits it may be questioned whether the "purging out of objectionable, and sometimes unnecessary, connotations ... of the Bentham .. variety" (as Samuelson ibid. put it with obvious approval) has been a productive research strategy. Lacking an alternative, the potential of the naturalistic impetus of the original utilitarian program may be worthwhile reconsidering. First steps in that direction are indeed under way (Kahneman, Wakker, and Sarin 1997; Kahneman, Diener and Schwarz 1999; Frey and Stutzer 2002). Today, a naturalistic approach does not necessarily have to lead back to Bentham. There are also non-utilitarian roots of naturalistic thought about consumption behavior which deserve attention, e.g., the theories of wants or needs.

The present paper is devoted to a brief reconstruction of how the naturalistic connotations of sensory utilitarianism disappeared from economic theorizing and how, more recently, attempts at gaining back some of their advantages have slowly taken shape. The paper proceeds as follows. Section II briefly summarizes the – naturalistic – claims of early sensory utilitarianism and contrasts them with the anti-naturalistic modifications which Jevons introduced in his endeavor to propagate marginalist calculus in economics. Section III highlights the 20th century transformation of utility theory into a positivist, axiomatic theory of revealed preferences. As will be shown, this development completed the narrowing down of the explanatory agenda of the utilitarian program. Section IV discusses some post WWII

ramifications which partly revoke the revision of the utilitarian program going back to Jevons. They can be put in perspective, it is argued in Section V, with the empirical potential of non-utilitarian theories of wants. With few notable exceptions, this potential was neglected during the heyday of demand theory. Section VI offers some conclusions.

II. Early Sensory Utilitarianism and its Dismantling

In 1789 Bentham published his *Principles of Morals and Legislation* (Bentham 1948). With its blending of a positive theory of action and a normative theory of justice it became the authoritative statement of the early utilitarian program. "Utility" – a term which Bentham had taken over from Hume – is used synonymously with "happiness", pointing to the hedonic underpinnings of Bentham's interpretation: "what happiness consists of we have already seen: enjoyment of pleasures, security from pains" (ibid., 70). Human action follows intentions, he argued, and intentions orient towards the action's consequences which, in turn, are assessed by the pleasures and pains the action elicits. Bentham conceived of pleasures and pains as quantities which are measurable in separate dimensions. With remarkable psychological intuition he claimed that the quantities depend on the intensity, duration, (un-) certainty, propinquity, fecundity, and purity with which pleasures and pains are sensed (ibid., 30). For each of these "circumstances" the time dimension matters in an essential way. He went on by enumerating no less than fourteen different sorts of pleasures and twelve different sorts of pains (ibid., 33-34, subdivided further in chap. V). Each of them can be sensed differently, he argued, depending on yet another, long list of circumstances which he extensively commented on (ibid., chap. VI).

From today's point of view, Bentham's elaborate categorization appears a mixed bag of notions with widely differing connotations. Besides the hedonic (innate) elements, learnt responses play a role in his scheme, as does cognitively reflected decision behavior (e.g. in assessing certainty, propinquity,

or fecundity for pleasurable or painful experiences). Nonetheless, the basic concept is a very modern one (cf. Rozin 1999). The utility which an action, e.g. the consumption of a commodity, entails is identified with a sensory experience that is, in principle, observable. Furthermore, Bentham accounts for the fact that this experience may have several sources, i.e. that sensory stimuli of different quality may be sensed simultaneously. The contribution which different sensory experiences make to overall utility are, in principle, substitutable for each other. They can be imagined to enter aggregate utility with (possibly changing) relative weights. With respect to the actual measuring of utility (or quantities of pleasures and pains) Bentham held, however, a naive view. He claimed that the corresponding values can intuitively be grasped and can be added up and balanced – pleasures with positive values, pains with negative ones (ibid. chap. IV).[1] Though this is a naive interpretation, measuring of pleasures and pains as such is not entirely inept an idea. Pleasures and pains are, after all, sensory perceptions, and in different contexts, e.g. that of the Weber-Fechner law, measuring sensory perceptions is a standard practice.[2]

Less than a hundred years after Bentham, the interpretation of utilitarianism changed dramatically with Jevons' *Theory of Political Economy* (Jevons 1879, first edition 1871). The revision

[1] As is well-known, Bentham and the early utilitarians therefore even believed that the quantities of pleasures and pains which somebody experiences in a certain situation can be measured in money equivalents. With such an 'objective', pecuniary measuring rod the possibility of inter-personal utility comparisons and balances would be feasible (albeit not necessarily on the basis of treating all individuals and their money equivalents equally). Bentham (1948) wanted to rest his normative, moral justification of institutions like penal law or constitutions on calculating and balancing the values of pleasures and pains of all individuals affected. If the balance appeared positive, he assessed an institution or action as being morally right. Where the balance had its greatest positive value, he considered this the morally best solution – his "greatest happiness principle".

[2] The empirical measures developed for that context were therefore sometimes also suggested, but never seriously tried, as a way to proceed in utility measurement, cf. Stigler (1950, part II).

initiated by Jevons has shaped the core assumptions of both utility and demand theory to the present day. On the surface, Jevons adopted Bentham's pleasure-and-pain rhetoric. However, he was not interested in empirical *hypotheses* about how sensory experience drives action. His concern was rather the *calculus* of pleasures and pains, a formal scheme of argumentation inspired by an analogy which he himself dubbed "the mechanics of utility and self-interest" (ibid., 23).[3]

Unlike for an empirical theory, for a "calculus of pleasure and pain" Bentham's detailed, naturalistic understanding of pleasures, pains, sensory differences, and circumstances was too complex and therefore a hindrance. Jevons faced the need to revise the utilitarian approach so that the original variety and complexity could be reduced. Of the modifications he introduced, three have had a particular influence on the further theory development – albeit, as Warke (2000) has convincingly argued, a problematic one.

(i) Where Bentham saw utility as being derived from actions (probably using commodities as in consumption activities), Jevons (1879, 40-42, 47-48) attributed utility directly to commodities.

(ii) While Bentham kept separate not only the dimensions of pleasure and pain but also several

[3] In classical mechanics – the then prevailing ideal of scientific analysis – hypotheses like the law of least effort are expressed in single functional relationships which can be subjected to differential calculus under the constraint of conservation principles. Jevons' idea was to create an analytical framework which "...consists in applying the differential calculus to the familiar notions of wealth, utility, value, demand, supply, capital, interest labor, and all the other quantitative notions belonging to the daily operations of industry. As the complete theory of almost every other science involves the use of that calculus, so we cannot have a true theory of Economics without its aid." (ibid., 4-5). For a more extensive discussion cf. Georgescu-Roegen (1971, 318-19), Mirowksi (1988, chap. 1), Grattan-Guinness (2002), White (2004).

different kinds of pleasures and pains, Jevons lumped them all together into just one compound "feeling" (ibid., 30-39).

(iii) Jevons interpreted that "feeling" and, hence, "utility" as entirely subjective and not measurable. Interpersonal comparisons of any kind were thus ruled out (ibid.,15-17).

The problems with these modifications are several. Familiar as modification (i) – the attribution of utility to commodities – appears today, it had an important consequence. While actions like, e.g., consumption naturally relate to a time scale, commodities do not. To substitute commodities for actions therefore allows the time dimension in the analysis of utility to be skipped (cf. Steedman 2001, chap. 2) – a prerequisite for static theorizing.[4]

Modification (ii) – Jevons' reduction of utility to just one compound variable "feeling" – causes problems whenever the consumption of some commodity actually involves a simultaneous sensory experience of several distinct pleasures or sources of utility. Consider, for example, a fountain-pen. This

[4] Jevons defined the "quantity of feeling" as intensity × duration of the feeling. Duration is interpreted as a unit time interval during which intensity is assumed constant, i.e. as a scaling variable. As such it can readily be transformed. It is indeed replaced later by the shares of a commodity quantity as a scaling variable (ibid., 49-53). With this variable substitution Jevons seems to have hoped to motivate his version of the 'law' of decreasing marginal utility – the backbone of his "principle of indifference" and marginalist calculus, cf. Warke (2000). In his version, marginal utility decreases with the increment of the *quantity* consumed (independent of a time dimension) rather than with time increments as in Gossen's original version of the law, cf. Steedman (2001, chap. 1). Note that Gossen's interpretation, in contrast to that of Jevons, corresponds with the empirically well confirmed observation in sensory psychology: the intensity of a feeling decreases with the increment of time during which the stimulus causing the feeling is extended (Helson 1964).

is a commodity whose services can be enjoyed in the act of writing, drawing, signing and, as such, it may be considered a substitute for pencils, ball-pens, fiber-pens, and even simple steel-pens and pen-holders. At the same time, fountain-pens may be enjoyed as collectibles. They may have an aesthetic design and expensive attributes. (There are models on the market which have gold pens and a body made of horn.) Or fountain pens may be appreciated as 'accessoires' expressing personal taste, or even as status symbols. This means that fountain-pens may simultaneously be substitutes for a whole set of entirely different commodities. For one and the same commodity "fountain pen" several marginal rates of substitution may therefore actually be relevant. Unless the individuals attach invariable, subjective weights to the various dimensions in which utility is assessed, the "principle of indifference" is an under-determined concept.

Finally, with respect to modification (iii), it may be acknowledged that Jevons' adoption of a subjectivist view in utility theory was not unmotivated. It opposed the naive inter-personal comparing and balancing of pleasures and pains and, thus, the 'objective' moral judgement à la Bentham's greatest happiness principle (Jevons 1879, 25-29).[5] However, to exclude interpersonal utility balances is one thing. To deny pleasures and pains the status of sensory perception which can, at least partially, be made 'objective' (ibid., 15) is another thing. Jevons' subjectivist credo was interpreted – if not meant by the author – as rejecting both things at the same time, with the consequence that the concept of utility became disconnected from its naturalistic background.

With a concept of utility disconnected from a naturalistic basis, a utilitarian position has difficulties in supporting more detailed notions about causal structures in human behavior. For the same reason it becomes difficult, if not impossible, to reconcile utilitarian theory with other theories, e.g.

[5] It may also have been directed against 'objective' Ricardian "value in use" concepts and the labor theory of value as Stigler (1950, Part I) has claimed.

those on human wants or needs, and psychological theories more generally, which also cover demand and consumption behavior. This problem appears already in Jevons. He refers to wants as an explanatory arguments, in fact, even to a veritable "law of human wants" without noticing the remarkable contrast to his own, subjective theory of utility.[6] In fact, in a later section where Jevons comes back to the "law of wants" (ibid., 56-62), it turns out that "wants" actually have no place in his theoretical grid. The only aspect he is interested in is the diminishing marginal utility in the pursuit of each of the unexplained, allegedly hierarchical wants.

Jevons' simplifying modifications (i) - (iii) have indeed been convenient for the further development of the kind of calculus he was motivated by. Perhaps because of this fact they are still in place in most of the theoretical work to the present day. However, as was pointed out, they constrain both the heuristic basis and the explanatory potential of the theory. The convenient simplifications prevent a richer (and, of course, more complex) structure of the theory. They also impede the integration of rich empirical materials from neighboring disciplines like psychology. Turning one's back on Bentham's more complex utilitarian position therefore incurred a high cost on economic theorizing. However, it took almost the entire 20th century to find this out. In the meantime, research efforts went

[6] Citing Senior and Banfield, he states that 'law' as follows. "The necessaries of life are so few and simple, that a man is soon satisfied in regard to these, and desires to extend his range of enjoyment. His first object is to vary his food; but there soon arises the desire of variety and elegance in dress; and to this succeeds the desire to build, to ornament, and to furnish -- tastes which, where they exist, are absolutely insatiable ... An examination of the nature and intensity of man's wants shows that ... the satisfaction of every lower want in the scale creates a desire of a higher character. If the higher desire existed previous to the satisfaction of the primary want, it becomes more intense when the latter is removed. The removal of a primary want commonly awakens the sense of more than one secondary privation..." (ibid., 43-44 and 46).

in the direction of purifying what had been created by the marginalist revolution and turning it into an abstract theory of demand.

III. Progression in Mathematical Thought and Positivist Minimalism

A person's motives and desires and her thought belong to the sphere of the human mind. These inner states of a person cannot be observed in the same way as the physical activities of the body. This fact is at the bottom of the long debate on the mind-body problem in philosophy. Subjectivism in economics may be seen as a response to that debate. Although the lack of direct observation of inner states poses a problem for empirically meaningful theorizing about motives, desires, and thought, it does not generally preclude it. Hypotheses about the people's inner states can be tested indirectly by what they predict will follow for the people's behavior (which is observable). However, hypotheses about motives and the objects of desires or, for that matter, about what preferences people have, can rarely be found in contemporary economic theory. Little, if any, effort is made to explain what it is that people demand and why.

The reason is not that economists have become a breed of radical subjectivists who claim that the subjective sphere is inaccessible to scientific analysis in principle. The reason, it may be argued, rather lies in a preference increasingly revealed within the discipline. The mathematical details of abstract calculus of utility were preferred over the complexities of empirical conjectures about human behavior competing with psychological approaches.[7] The trend had been set by Jevons and Walras, where Walras was the first to explicitly include demand theory. The trend became manifest with writers like Edgeworth, Fisher, and Pareto who wrestled with the problem of finding a representation of utility

[7] For a broader assessment of the role of mathematics cf. Mirowski (1991).

theory (or what calculus had left over of it) in terms of a proper utility *function.*

With the transition from cardinal to ordinal notions of utility the ground was prepared for further "progression in mathematical thought" (Samuelson 1947, 92): the logical reduction of utility theory to a theory of subjective preference orderings from the 1930s onwards. The few empirical hypotheses which subjective utility theory entails (decreasing marginal rates of substitution; the law of indifference implying a downward sloping demand curve) had to be derived from the shape of the utility function. Yet, what the utility functions which people were supposed to have really looked like was unknown. Hence it was not known whether the well-behaved functional forms that had been discussed were empirically relevant. One way to proceed was to try to deduce theoretical implications that would be compatible with – or rationalize – demand curve features as these were expected to be observable in markets. This way was suggested by Hicks and Allen (1934).[8]

A different stance was taken by Samuelson (1938). His idea was to devise a theory based only on the observable variables prices, quantities, and income and a postulate of consistency of behavior (the "weak axiom of revealed preference"). The revealed preference theory, as he called it, should allow to derive all properties of demand functions known to be implied by well-behaved utility functions without actually requiring the utility concept. As later shown by Houthakker (1950), revealed preference theory is indeed observationally equivalent to ordinal utility theory, if the consumer's preferences are transitive (i.e. the "strong axiom of revealed preference" is valid). The advantage of Samuelson's theory is that it implied an empirical preference revelation method (Samuelson 1947, 1948), Houthakker's result meant that with that method a way was found to reconstruct the shape of a person's indifference curves – the

[8] Cf. Fernandez-Grela (2005); like other approaches to ordinal utility theory, it faced the problems of integrability and substitutability vs. complementarity discussed in Hands (2005) and Lefant (2005) respectively.

core concept of ordinal utility theory – from observations of the purchasing decisions of that person under a controlled variation of relative prices and total expenditure.[9]

However, Samuelson's approach turned out not to be as logically conclusive as claimed (cf. Georgescu-Roegen 1954b, Wong 1978, Chap. 4 and 5). Its Achilles heal is the consistency condition – whether in the weak or the strong versions of the axiom of revealed preference. Whether or not this precondition of the theory is satisfied cannot be determined independently of the observations necessary to derive the individual indifference curves as an implication of the theory. For this indeterminacy – which made Sen (1973) wonder whether revealed preference theory represents more than an "elaborate pun" – the originally fostered expectation of testing the theory by market data was never met. However, attempts were made to examine it in experiments. Yet, even the experimental results were rather inconclusive (see, e.g. Koo 1963, MacCrimmon and Toda (1969), and Koo and Hasenkamp 1972), and interest in conducting such experiments faded.

The inconclusiveness of the results is not surprising. Even if the postulate of consistency of behavior were to hold, there are several other idealizing assumptions which are difficult to meet in experiments. Two of them are well known from the previous section. One is the abstraction from the time dimension implied by Jevons' modification (i). The other is the abstraction from the plurality of the

[9] The intention "to develop the theory of consumer's behavior freed from any vestigial traces of the utility concept" (Samuelson 1947, 71), the observational language chosen for his theory, and the minimalist design of the revelation procedure – all these features point to a positivist attitude (cf. Wong 1978, Chap. 5). At that time, such an attitude was widely adopted with respect to the mind-body-problem in behaviorism and the philosophy of sciences, cf. Mirowski (2005). Positivism rejected 'metaphysical speculations' about unobservable inner states of persons and wanted to reduce scientific theorizing exclusively to what is directly observable in behavior.

source of utility (Jevons' modification (ii)). Consider the time dimension problem first. In an experimental setting the preference revelation procedure means varying over and again the relative prices of the commodities available for purchase and the money amount that can be spent. The reactions of the test person(s) to these variations are recorded. Even with only two commodities the procedure is cumbersome and time-consuming.[10] In such a situation it cannot per se be excluded that the test persons' preferences change. However, the basically static framework of revealed preference theory implicitly suggests invariable preferences (a criticism already raised by Robinson 1962, p.50). For hypotheses about changes in preferences – which could be included in preference revelation experiments – one has to theorize in one way or other about the test persons' unobservable inner states. This is, of course, exactly what the positivist theory of revealed preference wanted to get rid of.[11]

The second idealizing assumption – abstracting from the plurality of possible sources of utility – causes problems as follows. In the definition of a partial preference ordering, the notion of indifference plays a crucial role. A test person may be said to be indifferent with respect to two alternative commodity bundles $\{x_1, y_1\}$ and $\{x_2, y_2\}$, if (s)he is as much inclined to choose $\{x_1, y_1\}$ as (s)he is inclined to choose $\{x_2, y_2\}$. Let x denote the quantity of fountain-pens and y that of wrist watches. As

[10] For instance, MacCrimmon and Toda (1969) required their test persons to choose repetitively among different combinations of ball-pens and small amounts of money at varying prices of the ball-pens.

[11] A starting point could, e.g., be the possibly changing (intrinsic) motivation of test persons in the experiment or possible preference adjustments in response to experimental experience. As Kahneman, Wakker and Sarin (1997) have shown, the connection between experienced and/or remembered utility on the one hand and predicted utility and actual choices on the other implies several degrees of freedom. The observations in a revealed preference experiment may therefore not necessarily, and certainly not exclusively, reflect the current state of the preferences of the test persons, but they may also reflect the idiosyncratic conditions of their sensory information processing activities.

has been explained above, a person may derive utility from a fountain-pen for several, simultaneously effective reasons, i.e. from different source. The same can be argued to hold for a wristwatch. If the utility obtained from the different sources is measured in different dimensions, then the preferences for both commodities have to be rated in several dimensions.

Let the sources or dimensions of utility derived from fountain-pens and wristwatches be distinguished as above. Consider the 'tool dimension', i.e. the fountain-pen as a writing facility, the wristwatch as a chronometer. Assume that having several fountain-pens for writing – with different breadths of the pen, filled with different colors of ink etc. – is rated more useful then having several wristwatches to determine the time of the day. The marginal rate of substitution of fountain-pens for watches (itself strange enough a concept) may then be relatively slowly decreasing with a change in the endowment of the two. It is not difficult to imagine, in contrast, that in the 'collectibles dimension', the 'status symbol dimension', and perhaps also the 'accessoire dimension' the relative ratings and the relative change of the marginal rate of substitution may vary just the other way round. Hence, in this example, no less than four, potentially different, indifference curves may result for the four dimensions.

Assume further that, in comparing the bundles $\{x_1, y_1\}$ and $\{x_2, y_2\}$, a test person is able to attribute subjective weights to the four dimensions showing her indifference between these bundles. Now enter yet another bundle $\{x_3, y_3\}$ in the experiment and assume the test person reveals indifference between all three bundles. This outcome could as much be due to the size of the marginal substitution rates in the four dimensions as it could result from a re-scaling of the weights between the dimension by the test person. In fact, changes in weights between dimensions do not appear unlikely.[12] But the weights

[12] Given the enormous complexity of the task of merging indifference curves over several dimensions, changes in weighing the dimensions may result from framing and anchoring effects well-known from behavioral decision theory (Kahneman 2003) – or simply from inconsistency.

may also vary over time, e.g., under the influence of satiation phenomena. Or a re-scaling may even reflect a systematic response to relative price changes which may affect, e.g., the attractiveness of an item as status symbol relative to its 'tool value'. All these effects can occur simultaneously and would be confounded with each other in the preference revelation procedure, rendering the observations inconclusive. A remedy for this problem could only be expected from a reconstruction of the sensory experiences of the different pleasures and pains. As in the case of the time dimension problem, this means, however, that hypotheses about the test persons' inner states have to be developed – exactly what Samuelson's minimalist revealed preference theory claimed to be able to do without.

While the theory of revealed preference did not gain much momentum as an empirical program, it did have an impact at the analytical level. It prepared the ground for proving that ordinal utility functions can be logically deduced from a (partial) preference ordering that satisfies certain axioms. These were the axioms of reflexivity, completeness, and transitivity. The desired shape of the utility function and unique solutions in comparative statics analysis of budget changes also required the more technical assumptions or axioms of continuity, convexity, and non-satiation of preferences. However, the theoretical achievements notwithstanding, the empirical content of the theory remains controversial, given that all the axioms are highly idealized assumptions (Kreuzenkamp and Barten 1995). If the brand of utilitarianism brought about by progression in mathematical thought and positivist minimalism is meant to be an account of actually observed choice behavior at all, its empirical status is an unresolved issue (Deaton and Muellbauer 1980, Chap. 3).

IV. Ramifications vs. Revocations

Research following the version of the utilitarian program established with Jevons' modifications has attracted an enormous amount of intellectual resources. In most of the 20th century it has been considered

prestigious cutting edge research. Nonetheless, the value added which all these efforts have contributed to the explanatory power of economics is somewhat disappointing. Since the 1950s several efforts have therefore been made in the domain of demand and consumption to broaden the theory, to abandon some idealizations, and thus to improve its empirical content. However, hardly any of them actually challenged the course set by Jevons and his successors in principle.

With early contributions on linear expenditure systems (cf. Stone 1954) and distributed lags ("habit formation") in consumption time series (Houthakker and Taylor 1966) a huge literature emerged which dealt with demand and consumption at a statistical level. Initially, this literature took a "pragmatic approach" (Brown and Deaton 1972, 1151) which was only loosely informed by the theory of demand. Based on household statistics, refined regression techniques were developed and applied to economic variables chosen more or less eclectically. Later, attempts at deriving constraints for empirical estimations from demand theory were undertaken. They resulted, among other things, in the sophisticated consumer price index models (Deaton and Muellbauer 1980). These contributions built on various types of "well-behaved" individual utility functions and derived the properties of the demand systems by a constrained utility maximization calculus with additional side conditions. However, the statistical tests of the properties of the individual demand systems were carried out with aggregate data. Because several degrees of freedom emerge by going from individual to aggregate data, a conclusive empirical test of the underlying utility theory was not feasible in this way. The usefulness of the elaborate maximization apparatus has therefore never been demonstrated, and it is doubtful whether it is necessary for the empirical insights which this literature has generated. Nonetheless, the literature on demand systems still sticks to an imaginary individual utility maximization calculus.

At the theoretical level, a prominent example of an extension is Kelvin Lancaster's (1966, 1971) "characteristics approach" to consumption theory. He assumes that it is not goods per se that give utility to the consumers but rather their "characteristics" or intrinsic quality features. Thus, the assumed ordinal

utility function u = u (**z**) has standard properties except that, as arguments of the function, the quantities of goods are replaced by the vector **z** representing the quantity of characteristics which the goods possess. Goods usually have more than one characteristic and many of the characteristics may be shared by more than one good. The relationship between the goods and their characteristics is determined by the present state of the consumption technology. The latter is assumed to be 'objectively' known to all consumers and to inform the way in which they make use of the goods in their consumption activities. A wrist watch, to use that example again, may thus be thought of as possessing characteristics in the form of its color, its form and size, the number and specification of mechanical complications, the quality and weight of the various materials of which it is manufactured, the number of exemplars that have been sold, and so on. Under the simplifying assumption that only one good is involved in each consumption activity (like the wrist watch in measuring the time), the consumption technology can be described as a linear transformation of the commodity space into the characteristics space.[13]

Lancaster's contribution has the merit of drawing attention to the largely neglected, but economically significant, quality dimension of goods and services (cf. Wadman 2000, Chap. 6). However, as an otherwise unchanged extension of modern utility theory it shares all of Jevons' simplifying assumptions. It firmly rests on a homogeneous utility measure. Hence, the substitution of the arguments notwithstanding, Lancaster's utility function does not account for the concern of sensory utilitarianism with different sources or dimensions of utility.[14] Nor does it change the attribution of

[13] If, in addition, only two goods x and y and two characteristics z_i, i = 1,2 are assumed, the utility function reduces to u = u (a_{1x} x + a_{1y} y, a_{2x} x + a_{2y} y), where a_{ix} and a_{iy} represent the quantities of the i-th characteristic possessed by one unit of the corresponding good.

[14] As mentioned before, a homogeneous utility measure can only be assumed, if the consumers attach, in a consistent way, subjective weights to the different dimensions from which they derive utility in their sensory experience. Coefficients which are supposed to reflect 'objective' technological features

utility to commodities. Despite its reference to activity analysis utility is ultimately – after some transformations via the characteristics – not attributed to activities.

A prominent example where at least one of Jevons' restrictive modifications of the utilitarian program is revoked is Becker's (1965) theory of the allocation of time and his household production theory (Michael and Becker 1973). As in the simplified version of Lancaster's model, Becker assumes that the household obtains utility from "productive activities" in which purchased market goods and services are an input. Unlike in Lancaster, the household's time is also considered an input to the productive activities. This means that, contrary to Jevons' modification (i), utility is attributed to activities. The activities on which Becker focuses are represented in an otherwise standard utility function by their consequences (called somewhat misleadingly "household commodities" and their services). Since the way in which household time and purchased goods and services are combined is again considered a matter of an 'objective' household production technology, the utility function is assumed to be maximized subject to given prices and marginal productivities of the inputs, an income constraint, and a time constraint.[15]

(such as a_{ix} and a_{iy}) cannot represent such weights. They can, however, be taken to represent the relationships between the 'objective' characteristics of goods and the different dimensions of sensory experience, as the case of the wrist watch may exemplify. Some of the characteristics of wrist watches appear to be relevant to only one of the possible dimensions (above alluded to as the functional dimension, the collectibles dimension, the 'accessoires' dimension, the status dimension, etc.), some to several or even all dimensions. Conversely, for each single dimension, several of the characteristics seem to be relevant simultaneously. Interestingly, in discussing the empirical relevance of characteristics for consumer choices, Lancaster (1971, 146-147) leaves his purely formal set-up and takes recourse to psychological conjectures in the form of the theory of want satisfaction.

[15] As Steedman (2001, chap 2) has shown, the importance of time as an ultimate constraint and the marginal conditions for maximizing utility over alternative uses of scarce time were clearly formulated

The immediate consequence of this extension is the resurfacing of the time dimension as a crucial aspect of economic behavior in general and consumption in particular. Indeed, alternative uses of time – i.e. decisions between alternative household activities of different quality which cannot be conducted at the same time – are the very point of Becker's theory and its applications. It is not the place here to discuss these applications which revolve around the comparative statics of the households' time allocation, consumption behavior, labor supply, specialization patterns among household members, fertility decisions etc. under changing relative prices and productivities of the inputs to the household production processes. The wide range of phenomena addressed shows that Becker's approach develops a remarkable heuristic potential when compared to what is feasible on the basis of the standard utility maximization approach. Nonetheless, the theory and its applications are still subject to the criticism leveled above against Jevons' modifications (ii) and (iii), as these are kept in place despite the reference which Michael and Becker (1973) make to Bentham.

A recent contribution in which two of Jevons' modifications are revoked at the same time is Kahneman, Wakker, and Sarin (1997). The authors suggest turning back to Bentham and restoring some of the more complex naturalistic positions of the early utilitarian program. (At the same time they implicitly de-emphasize the relevance of marginal calculus.) Contra modification (i) Kahneman et al. return to the notion of hedonic experience connected to the outcome of actions. Contra modification (iii) they claim that the hedonic experience is a sensory perception which, despite its subjective nature, can be observed and measured. On this basis, the authors introduce several useful distinctions. They identify the immediate hedonic experience of outcomes with the notion of "instant utility" which corresponds to Bentham's variable "intensity". Since there is usually a stream of immediate experiences over time, Bentham's variable "duration" of a sensory perception is a straightforward aspect to consider. However,

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by Gossen as early as 1854. Steedman (ibid., chap. 5) also makes clear that economizing on time cannot be framed other than as a problem of choice between actions differing in their time intensity.

this variable turns out to imply an unexpected complexity. The duration of sensory perceptions is assessed in retrospect. For the subjective record of a stream of immediate experiences (possibly varying in intensity) therefore only what is remembered counts. This leads to the notion of "remembered utility". Kahneman et al. provide evidence that remembered utility is affected only by the intensity of pleasures or pains during the whole stream of immediate experiences – more precisely by an average of the intensity at the peak of that stream and near the end of it. Remembered utility is not affected by the duration of the sensory experience. The authors also discuss how, on the basis of their immediate hedonic experience, people make predictions ("predicted utility") and how remembered and predicted utility affect decisions ("decision utility"). They argue that biases in both predicted and remembered utility systematically bias decision utility and thus decision making.[16]

The examples discussed by Kahneman et al. do not yet meet the level of complexity of demand and consumption behavior. However, there should be no obstacle, in principle, to applying their conceptual set-up in these fields. A major result that can be expected from such an application is that

[16] An important part of the authors' project of restoring sensory utilitarianism is the comparison of the just mentioned descriptive concepts of utility with corresponding normative concepts (cf. also Kahneman 1994). The assessment of a whole sequence or stream of sensory perceptions is a case in point. As an alternative to leaving the assessment to the intuitive working of our memory leading to "remembered utility", an attempt can be made to derive a "total utility" according to a normative or rational rule from the temporal profile of instant utility. The normative concept of total utility would then basically be determined by the integral of the value of instant utility over time which deviates from remembered utility. This means that people do not intuitively follow the normative rule. Two interesting questions thus arise. Do people try to maximize utility in their decision making and, if so, on the basis of what concept of utility? Would it be desirable to take measures that try to induce people to make use of total utility where they tend to rely on remembered utility?

biases in (remembered) consumption experience translate into biases in future consumption decision. People allocate their money among goods and services in a way that probably deviates from what would maximize the stream of instant utility they could obtain with the expenditure. This would be a particularly interesting result, if there are factors influencing the consumers' selective memory of sensory experiences that can be manipulated by the producers, e.g., through advertising or the arrangement of the characteristics of the goods and services.

Although Kahneman, Wakker, and Sarin's (1997) contribution is probably the most explicit attempt in recent times to get off the trend set in utilitarianism by Jevons, it still does not revoke all of Jevons' modifications. Despite the newly introduced differentiations with respect to the temporal dimension of hedonic experiences, the notion of a homogenous utility measure (modification (ii)) is still maintained. The multiplicity of sources or dimensions of utility is not considered. In order to account for the true complexity of human motivation and desires and their influence on demand and consumption it would be desirable to also relax that simplifying assumption. As will be argued in the next section, support for such a move may come from the long-standing theories of wants and needs which originated, of course, from non-utilitarian thought. Far from forming a coherent set of ideas, these theories are open to reinterpretation by, or recombination with elements of, the utilitarian tradition.

V. Back to the Theory of Wants?

The concept of wants or needs (used interchangeably here) as motivators of human action goes back at least to Plato. From the outset, it has been associated with the idea of a hierarchical order of wants. This non-utilitarian approach also played a role in the marginalist revolution where it was advocated by

Menger (1950, first edition 1871, chap. 1).[17] He submitted that there is a demand for goods, because people have wants (or needs) and have learnt that they can be satisfied by these goods. There is hardly any case, Menger observed, where one want can be served by only one good, or where a complex of goods serves one, and only one, want (ibid. 129). He also elaborated on the hierarchy of wants or, as Georgescu-Roegen (1954a) has called it, the "principle of the subordination of wants".[18] The principle can be interpreted to imply that, if another want always appears after the next lower has been satiated, an individual's total demand or consumption will never be satiated. Indeed, Menger considered human wants to have a potential to develop beyond all bounds (ibid., 82-83).

All these conjectures are far from being empirically refuted. Nonetheless, all of them have disappeared from the economists' discourse on demand and consumption. This was different until after WWII. Writers dealing with consumption theory like Duesenberry (1949, Chap. 1), Georgescu-Roegen (1954a), Abbott (1955, Chap. 4), and Ironmonger (1972) still based their arguments on elaborate notions of wants and physical needs. In doing so they tried in some cases to combine or reinterpret the theory of wants with utilitarian terminology. An example is Georgescu-Roegen's (1954a) splendid comparison between axiomatic preference theory and the older literature on wants – a remarkable antidote to the positivist fashion of his time.

Georgescu-Roegen avoids a precise definition of wants. But the way he uses the concept and,

[17] As Mirowski (1989, chap. 5) has stated, the marginalist revolution is therefore no monolithic movement propagating physicalists ideals and calculus à la Jevons and Walras. Menger explicitly denied calculus a constructive role and, remarkably enough, called his own exposition a "demonstration of a difficult and previously unexplored field of psychology" (Menger 1950, 128). For an interpretation of Menger's wants-based theory of subjective value and its methodological background cf. Alter (1990).

[18] Cf. Menger (1950, 131). As explained in Section II, this principle was also endorsed by Jevons – who called it the "law of human wants" – although it was inconsistent with his own approach.

in particular, attributes indifference curves to wants makes it plain that an action that serves the satisfaction of a specific want is considered equivalent to an action that generates a specific utility. This means that a want or need is assumed to correspond to exactly one source or dimension of utility. Since the consumers have a large, probably infinite, number of wants, there are as many different sources or dimensions of specific utility as there are wants. With his "principle of the irreducibility of wants" Georgescu-Roegen insists that the multiplicity of wants (or sources of utility) cannot be lumped into just one catch-all want. However, precisely this has been done, he notes, "in a veiled passage" by "the founders of marginal utility theory" with their concept of utility representing "the unique want into which all wants can be merged" (ibid. p.515). Obviously, Jevons' modification (ii) is attacked here, and the vehicle used to revoke it is the theory of wants.

In Georgescu-Roegen's interpretation of wants, their hierarchical order is a central argument. He claims that the choice of actions is directed towards satisfying wants in a decreasing order of importance. Want satisfaction can usually be achieved by actions involving a set of alternative commodities. Moreover, each of the commodities may be involved in satisfying yet other wants, i.e. provide utility in yet other dimensions. Water can, to take Menger's example, be used to satisfy the want to drink, but also wants which Georgescu-Roegen refers to by the actions of "cooking", "washing", "laundering", "watering the grass". The order of importance of these wants is supposed to be drinking, cooking, washing, laundering, watering the grass. More specifically, the next lower want is assumed to manifest itself only after satiation has been reached at the level of the higher one. Yet, it is not clear how precisely the "satiation" level is determined here.

Georgescu-Roegen's approach was later taken up by Ironmonger (1972) whose motivation is, however, slightly different. Interested in consumer innovations he recognizes that "without some distinction between various types of wants, there is no place for considering a change in the quality of a commodity or the introduction of a new commodity to the market" (ibid., 13). Like Georgescu-Roegen,

Ironmonger acknowledges a multiplicity of wants which "...are assumed to be so ordered that at a given income and prices the consumer will satiate as many wants as possible, going down the order of priority from the most important to the least" (ibid., 23). Yet, unlike Georgescu-Roegen, he explicitly presumes that the number of units of satisfaction of all these different wants can be merged to give a homogeneous utility measure. [19] The measure induces a preference order over wants (rather than commodities). More precisely, Ironmonger argues that because of the hierarchical order and the satiability of wants, the preference order is lexicographic. He goes on, on this basis, to determine optimal budgets by means of linear programming and to analyze, in the usual fashion, the comparative statics of choice and the effects of quality differentiation and new commodities.

Both Georgescu-Roegen and Ironmonger thus demonstrate that the analytical tools of modern utility theory can be used for representing several aspects and implications of the theory of wants. Conversely, they show that the theory of wants can be an inspiration for discussing what a utilitarian calculus could look like when Jevons' simplifying modifications (i) and (ii) are revoked. Indeed, if one accepts Ironmonger's way of homogenizing the various wants, the only major formal difference to standard utility calculus reduces to the assumption of a lexicographic preference order over wants which may, but does not have to, translate into lexicographic preferences between commodities. However, Ironmonger's lexicographic interpretation is not the only possible, and probably not the most adequate, one to account for the fact that different wants have different priorities for the agents. As mentioned above, the subjective importance or priority which the different wants (or sources of utility) have for the

[19] As in Lancaster (1966), commodities thus affect the consumer's utility indirectly in a way that is mediated by consumption technology. In Lancaster's case, the goods' technical characteristics enter the individual utility functions directly. In Ironmonger (1972, Chap. 2) the goods' technical features generate, when consumed, a certain number of units of satisfaction of a want. Only the latter enter the individual utility functions.

agents at a given point in time can be expressed by subjective weights. If these weights are attributed in a consistent way, they can be normalized so that they always sum up to one. Except in the limiting case, where, at successive points in time, always only one want has relative weight one and all others weight zero, these weights do not express a lexicographic preference between the wants.

Can the distribution of subjective weights over wants (or sources of utility) be determined more precisely? More particularly, are there any inter-personal similarities in these distributions – expressing, perhaps, something like human universals – which would qualify Jevons' verdict against measurability and inter-personal comparisons (modification (iii))? An answer to these questions seems to require a better knowledge of what human wants (or the sources of utility) are. When, in the history of economic theory, the notion of wants was used, the authors – Menger, Georgescu-Roegen, and Ironmonger being no exception – have usually referred to examples chosen ad hoc. A systematic analysis of wants and the relations between them is lacking, and it is presumably feasible only on the basis of an explication of wants in naturalistic terms.[20]

[20] As has been argued in (Witt 2001), a naturalistic explication can start from the fact that certain human wants are innate. Innate wants make themselves felt in a state of deprivation or pain. The corresponding aversive sensory perception motivates action to satisfy the want, i.e. to diminish or remove deprivation (which induces a rewarding sensory perception). In the present context, the action triggered is a consumption activity. Both pleasant and unpleasant sensory perceptions associated with an innate want diminish if a level of satiation (or absence of deprivation) of the want is reached. The subjective weights attributed to innate wants by an individual at a given point in time can therefore be conjectured to vary with the wants' relative degree of deprivation. In this interpretation, innate wants are thus associated with classical reinforcers (cf., e.g., the list in Millenson 1967, p. 368) and other rewarding brain stimulation (Shizgal 1999), including acquired or learnt wants. The latter emerge from an elementary, innate learning mechanism by which organisms learn to associate originally neutral

Regardless of how the weights are attributed at a given point in time, the analysis is enormously complicated if there are substitutes for satisfying a particular want and complementarities between goods satisfying different wants (as claimed by Menger). This is not surprising. Many additional factors affecting demand have to be accounted for: the consumption technology relating goods to want satisfaction, the current distribution of subjective weights between wants and their changes, the relations between the various substitution rates, the price ratios, and, not least, income. The long-winded elaborations on the implications of the comparatively simple case of lexicographic preferences between wants in Georgescu-Roegen (1954a) and Ironmonger (1972) give an idea of what is to be expected, if consumption decisions would have to be reconstructed in the usual textbook style. Georgescu-Roegen suspected that the principle of indifference – established by the marginalist revolution qua its simplifications – may no longer be assured its central status. Yet – again unsurprisingly – this may not be all that has to be sacrificed. An abstraction strategy conveniently adapted to Jevons' strongly idealizing modifications (i) - (iii) can hardly be expected to work well also under more complex conditions. A major task of a revived sensory utilitarianism will therefore be to find ways of reducing the complexity by developing other abstraction strategies, better suited to the new circumstances. It would not be surprising if this also means readjusting the questions and problems which the theory of demand and consumption should be concerned with.

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stimuli with concurrent pleasant (or aversive) ones. The satisfaction of acquired wants is a conditioned rewarding experience. However, the strength of an acquired want fades, if the association on which it is based is not at least occasionally corroborated. Since the associations are contingent on the people's differing learning histories, a huge inter-personal variety of idiosyncratic acquired wants is likely to result. The category of acquired wants and their emergence thus explain in naturalistic terms what Menger and other proponents of the theory of wants have simply assumed: the principle of the growth of wants.

VI. Conclusions

The naturalistic connotations of sensory utilitarianism disappeared from economic theorizing during the marginalist revolution basically as a consequence of three major modifications which Jevons introduced to ease the exposition of his "mechanics of utility and self interest". The 20th century transformation of utility theory into an axiomatic preferences theory greatly enhanced the mathematical exposition of the version of utilitarianism that remained after Jevons' cuts had been made. However, as has been argued, its remaining empirical content can be considered satisfactory only from the point of view of a positivist minimalism à la Samuelson (1948). The empirical and theoretical ramifications and the partial revoking of Jevons' modifications in the literature on demand and consumption since then, can be read as sign of discontent with the state of the theory. Only few attempts have, however, so far been made to return to a research program of sensory utilitarianism. As pointed out, if seriously pursued, a naturalistic re-interpretation of utility, demand, and consumption would be likely to require significant adjustments of the present agenda of demand theory.

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