

# The interpretation and role of utility from early economic views to behavioral economics

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**ABSTRACT:** This study examines the historical development of the concept of utility from early 18<sup>th</sup>-century economic views to behavioral economics. It critically evaluates and analyzes how the interpretation and role of utility has changed with the development of economics—from the normative foundations of utilitarianism, through the theory of marginal utility and the model of rational choice, to the formalized framework of expected utility maximization. The study pays particular attention to how behavioral economics has challenged the assumptions of neoclassical economics regarding rationality and expected utility. Finally it also discusses, how empirical research findings on decisions and behaviors in real-world settings have contributed to the enrichment of the concept of utility and utility functions.

**KEYWORDS:** utility, utility function, history of theory, economic thinking

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## Introduction

Utility is one of the most decisive, yet most controversial basic concepts in economics, which is an essential factor in understanding, studying, and analyzing economic decisions and their outcomes. Utility theory originally bases its explanation of individual behavior on the premise that individuals are able to consistently rank their choices based on their own preferences. They attach imaginary utility values to different alternatives during decision-making, which also their decisions influence

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subsequent. Utility indicates satisfaction, and individuals strive to maximize it (Keller, 2015).

With the changing economic approach, methodology, and view of humanity over time, the concept of utility has also undergone a transformation. This study traces the changes in the interpretation and role of utility, marginal utility, and the utility function from early economic views to the perspective of behavioral economics. First, after a multi-faceted review of its definitions, the study focuses on the 18th-century views that laid the foundations for the concept of utility, followed by a review of utilitarianism, and the theory and its critique of marginal utility. From the beginning of the 20th century, the theory of rational choice and the approach of maximizing expected utility dominated economic thinking for a long time. However, with the emergence of behavioral economics, these approaches have been increasingly criticized; based on this new approach and the integration of empirical studies, the concept of utility has gained a new interpretation. Different forms of utility were defined, and the utility function was supplemented with behavioral components. Finally, we will discuss the possibilities for measuring utility according to the behavioral economics approach.

## Interpretations of utility

Neoclassical economics developed at the end of the 19th century as an economic theory of rational choice and maximization. Originally, neoclassical economics was based on utilitarian psychology. It was assumed that there was a one-dimensional, interpersonal, comparable measure of mental states (pleasure), and it was also hypothesized that rational individual choice meant maximizing this measure. In the 20th century, economists rejected utilitarian assumptions, but retained most of the theoretical structure that was originally derived from assumptions. This changed the foundations of the theory, but the basic structure was retained. Postulates and preferences became the new foundations or were about choices, rationality was constructed not as instrumental rationality but as the consistency of preferences or choices (Bruni, 2010).

Neoclassical economics defines rationality as utility-maximizing behavior and sets up some external constraints. According to the fundamentals of microeconomics, utility is a hypothetical measure of consumer satisfaction that does not require happiness or satisfaction to be described as mental states, if they can be described or measured at all. In economics, utility is an almost intangible category. In microeconomics, utility is treated as a theoretical and unrealistic construct, commonly expressed as an indifference curve. This represents combinations of goods that an individual (or society) requires to maintain a given level of satisfaction. However, indifference curves, which require a precise definition of satisfaction, only superficially solve the fundamentally difficult problem of measuring utility (even to a limited extent) (Keller, 2015).

Neoclassical economics assumes that decision-makers can calculate which alternative will result in the greatest utility based on their knowledge of the utility of given products, services, alternatives, and outcomes. In behavioral economics,

however, bounded rationality forms the basis of the choice model, which takes into account both the limits of knowledge and cognitive capacity. Bounded rationality thus becomes a central concept in behavioral economics. This also applies to the ways in which the current decision-making process can be influenced (Keller, 2015).

In his early work, Pareto (1893: 307) analyzed the relationship between the law of market demand and utility as follows

*“One sees now that instead of being able to use the indicated properties of the final degree of utility to demonstrate what laws demand and supply must obey, it is necessary to follow the opposite path, and use the knowledge of such laws one may obtain from experience to derive the properties of the final degree of utility. One cannot rigorously demonstrate the law of demand, but rather, from the directly observable fact that demand diminishes with the increase of price we deduce the consequence that the final degrees of utility may each be considered – as far as this phenomenon is concerned – as approximately dependent only on the quantity of the commodity to which it is related.”*

According to Veblen (1909), if we place the concept of utility at the center of neoclassical economic analysis, other important factors such as property, money, and institutions are lost. As a result, behavior human

*“conceived of and interpreted as a rational response to the exigencies of the situation in which mankind is placed; as regards economic conduct it is such a rational and unprejudiced response to the stimulus of anticipated pleasure and pain – being, typically and in the main, a response to the promptings of anticipated pleasure, for the hedonists of the nineteenth century and of the marginal-utility school are in the main of an optimistic temper.”* (Veblen, 1909: 623).

According to Wieser (1884), use value must be distinguished from exchange value: use value is not specific but subjective, while exchange value is not general but objective. In his view the value of a commodity is actually determined by its usefulness

*“For most goods a distinction must be made between the magnitude of their value [ihres Wertes] and the magnitude of their use [ihres Nutzens]. Only for those goods that are actually employed to bring about the marginal use-performance will the good's own use be the source of its value and will there be agreement between the two judgments. For any other good a different use, which must nevertheless be a use characteristic of that sort of good, will be the basis for the estimate of its value, which accordingly will differ from the estimate of the use-effect it actually brings about; for such a good, the actual use is higher than the dependent use and therefore higher than its value.”* (Wieser, 1884: 128).

Viner (1925) sees that when applying the law of diminishing utility, the concept of marginal utility was merely a tool for introducing and causal background for the negative slope of the demand curve, as well as for market equilibrium, its explanation in terms of the current conventional representation, and the justification for the steep downward and rightward slope of market demand. Viner (1925) also points out that utility analysis made a positive contribution to the existing knowledge in the field of value economics. This was the first satisfactory explanation for the disparity between use value and exchange value, which was so mysterious to

classical economists. At the same time a, it provided hypothesis – in harmony with what we call human nature – and satisfactorily explained the negative slope of the demand curve, which was unique in this field at the time. It sheds some light on the causes and types of interrelationships between the prices of different goods. Although only partially, bridges the gap between the economic theory of price or exchange value and the general theory of value of philosophers and psychologists. These contributions may be equally important in terms of the individual definition of concepts, individual interest, or judgment.

McCulloch (1977) argues that the starting point for conclusions about the subjective importance of goods is the subjective ranking of all needs, which arranges them according to how important they are to the individual. Given, this scale and, it can be determined which needs depend on the possession of a given good, and based on this, which the importance of the product can be described depends on its position on the scale of needs.

According to Eabrasu (2011), an individual's preference scale is based on specific units of consumed goods. These observations show that the usefulness (value) of a given good would increase if one unit were removed. Marginalism, however, only explains why one thing is more or less useful (valuable), but it does not answer the question of what usefulness (value) means. Does not specify which criteria should be used to rank the usefulness (value) of goods. The formula for the praxeological criterion of real action facilitates the solution of this task. If we assume that individuals reveal their preference scale through their actions, then we implicitly validate the subjective concept of value.

Marshall (1890) defined the law of negatively sloped demand functions, which is only a consequence of decreasing marginal utility if the utility function is additive.

*“There is then one law and only one law which is common to all demand schedules, ... that the greater the amount to be sold the smaller will be the price at which it will find purchasers.” (ibid. 159–160).*

Encyclopedias and dictionaries on utility:

Encyclopedia Britannica (2008) defines utility as follows:

*“satisfaction or benefit that a consumer derives from buying a commodity or service.”*

The Collins Dictionary of Economics (1988: 534) defines utility as follows

*“the satisfaction or pleasure that an individual derives from the consumption of good or service”*

According to the Penguin Dictionary of Economics (1992: 437), utility is:

*“the pleasure or satisfaction derived by an individual from being in particular situation of from consuming goods or services.”*

According to Investopedia (2008), utility:

*“an economic term referring to the total satisfaction received from consuming a good or service.”*

*“The law of diminishing marginal utility states that, as the amount of good consumed increases, the marginal utility of that good tends to decline.” (Samuelson-Nordhaus, 2010: 84-85).*

## The history of the role of utility in microeconomics, from utilitarianism to the theory of marginal utility

Before the development of classical economics, in the mid-18th century, Daniel Bernoulli (1738/1954) defined utility as a marginally decreasing function of wealth, where wealth is the sum of an individual's total property and monetary income capacity. The utility derived from a given monetary gain will decrease as initial wealth increases. Bernoulli made utility, rather than monetary wealth, the criterion for decision-making, which marked the beginning of the development of expected utility theory<sup>3</sup>. An important element of his theory is the individual factor associated with risky money, which explains individuals' attitudes toward risk. This theory leaves no room for other factors, such as psychological ones, especially those related to risky situations, which could be added to the utility of money to explain risk-taking behavior. The latter aspect of his theory is evident from the way he takes into account an individual's attitude to risk. Risk attitudes are not specific, but can be seen as a simple psychological trait of the individual and are entirely determined by the individual's attitude to risk-free money.

Moscato (2023) points out that Bernoulli assumes a concave utility function, i.e., the marginal utility of money is decreasing, so every individual is risk-averse, or rejects an actuarially fair game. In Bernoulli's theory, individuals are risk-averse because the marginal utility of money is decreasing. When Cramer (1728) and Bernoulli introduced diminishing marginal utility, it was used to express the gambling paradox rather than to represent the value paradox. Later, Bernoulli's concept of satisfaction (*emolumentum*) and Cramer's category of moral value were considered equivalent to utility.

The source of utility theory was utilitarianism. The doctrine of utilitarianism in the late 18th and early 19th centuries regarded the maximization of utility as a moral criterion, and Jeremy Bentham (1789/1948) and John Stuart Mill (1843), leading utilitarians, also treated it as the most important goal of humanity. According to Jeremy Bentham (1789/1948) and John Stuart Mill (1843), society must attempt to maximize the total utility of individuals by aiming for "the greatest happiness for the greatest number."

Bentham defines utility as a property of an object or action that either causes pleasure or reduces pain. The origin of this theory is hedonism, which refers to the expression of pleasure. His theory was based on the general human desire to seek out things that cause pleasure or comfort and to avoid or reject things that cause pain or discomfort. Based on this fact, hedonism means that pleasure is good, so the fundamental goal of life is to do things that increase our pleasure. This usefulness

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3 Daniel Bernoulli (1738/1954) suggested replacing monetary goods with benefits (Latin: *emolumentum*) that could be derived from money. Thus, the fair price of the game became the benefit that could be obtained from playing it. In the English translation (1954), the Latin term for "benefit" was changed to "usefulness," and "*emolumentum*" was modified to moral expectation.

refers to any object's property that tends to cause benefit, pleasure, good, or happiness for the individual, while avoiding trouble, pain, evil, or unhappiness .

According to Stigler (1950), Bentham placed the principle of utility at the forefront of the discussion (in a much broader sense than consumption is considered in economics), and proposed measuring the amount of pleasure and pain, which has dimensions four: intensity, duration, certainty, and proximity.

Armesilla (2013) believes that Bentham and Mill, as representatives of classical utilitarianism, held a philosophical position and sought to avoid pain while seeking pleasure for the majority of people, linked to the degree to which pleasure increases individual happiness and, therefore, the good . Initially, utilitarians considered utility to be synonymous with usefulness. As moral philosophers, Bentham and Mill linked this to the creation of pleasure and the avoidance of pain. Based on this philosophy, utility was defined as the "feeling" of pleasure and pain, and further defined as the "quantity of sensation."

Bruni's (2010) critique clearly outlines the place of utility theory based on utilitarian philosophy. He criticized utilitarian thinkers' assumption that there was a one-dimensional, interpersonal, and comparable measure (pleasure) of mental states. Rational individual choice means maximizing this measure. Although the fact that this measure has never been found has caused some confusion: it is unclear why we hope to find this measure (p. 103).

In the last third of the 19th century, there was a significant change in the microeconomic treatment of utility that played a critical role in this so-called value paradox, the essence of which was expressed by Adam Smith (1776) as follows.

*"The things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had for it."* (Smith, 1776: 28).

The unveiling of the value paradox and the disregard of subjective value created a theoretical void, which was filled by the theory of marginal utility. William Stanley Jevons (1871), Carl Menger (1871), and Leon Walras (1874) rejected the labor theory of value proposed by classical economists, emphasizing the role of individual preferences in determining value. Referred to this step as a marginal revolution, which consisted of the subjective determination of the value of a good (i.e., depending on the judgment of one individual to another, and not on its objective determination), i.e., depending on the amount of labor required to produce the good, which is independent of the observer and always the same.

Stigler (1950) evaluated Jevons' theory of marginal utility from several angles. He started from the premise that the founders of this theory accepted utility as a fact derived from common experience, in accordance with everyday self-observation, and that Jevons was the most explicit in this regard.

*"The science of Economics, however, is in some degree peculiar, owing to the fact... that its ultimate laws are known to us immediately by intuition, or, at any rate,*

*they are furnished to us ready made by other mental or physical sciences. ...The theory here given may be described as the mechanics of utility and self-interest. Oversights may have been committed in tracing out its details, but in its main features this theory must be the true one. Its method is as sure and demonstrative as that of kinematics or statics, nay, almost as self-evident as are the elements of Euclidean theory” (Jevons, 1871: 12).*

In connection with the development of the theory of marginal utility, Jevons’s relationship to utilitarianism and the measurability of utility was an equally important issue. Stigler believed that Jevons’s concept of utility was rooted in the utilitarian tradition of Bentham and Mill, but he differed from his classical predecessors in emphasizing that value depends entirely on utility, especially finite utility, on which economics is based. Jevons later described this by saying that in the equilibrium exchange model, value ratios are proportional not only to the ultimate degree of utility, but also to production costs.

Crimmins (2021) also draws attention to the link between marginal utility theory and utilitarianism when he states that the idea of diminishing marginal utility is already implicit in Bentham’s concept of utility. Crimmins writes about this as follows.

*“Bentham occasionally suggested that pains and pleasures might be evaluated in relation to income or wealth, but he was aware of the limitations of this approach. While we might plausibly assume that, of two individuals with unequal fortunes, the richer of the two would be the happier, it does not follow that adding increments to that person’s wealth will continue to make him happier in the same proportion. It is in the nature of the case that the amount of increase in happiness will not be as great as the increase in wealth; the addition of equal increments of money will eventually bring successively less of an increase in happiness.” (Crimmins, op. cit.).*

Elahi and Reardon (2022) takes a different view, suggesting that Jevons rejected a critical aspect of Bentham’s principle of utility when he developed his theory of marginal utility. According to Elahi and Reardon (2022), modern proponents of consumer theory deny the critical difference between Bentham and the neoclassical marginalists when examining the origins of utility theory in economics. Jevons’s relevant passage helps to resolve this controversial issue.

*“The theory which follows is entirely based on a calculus of pleasure and pain; and the object of Economy is to maximise happiness by purchasing pleasure, as it were, at the lowest cost of pain [emphasis added]. The language employed may be open to misapprehension, and it may seem as if pleasures and pains of a gross kind were treated as the all-sufficient motives to guide the mind of man. I have no hesitation in accepting the Utilitarian theory of morals which does uphold the effect upon the happiness of mankind as the criterion of what is right and wrong. But I have never felt that there is anything in that theory to prevent our putting the widest and highest interpretation upon the terms used.” (Jevons, 1871: 27).*

Elahi and Reardon (2022) also emphasizes that the nature of utility examined by Bentham differs from that discussed by Jevons. Based on general terms, the utility discussed by neoclassical marginalists differs from that examined by moral philosophers. Bentham and others’ concept of utility is narrower in scope, applying

only to those elements of products and services that satisfy basic needs, which means that the vast majority of products used by modern consumers do not fall within the scope of this theory. In the case of luxury goods, for example, pain and pleasure are only of psychological significance. Jevons denied the possibility of accurately measuring utility, but in this regard, Stigler draws attention to an important circumstance. Let us first consider Jevons' original opinion.

*"There is no unit of labour, or suffering, or enjoyment. I have granted that we can hardly form the conception of a unit of pleasure or pain, so that the numerical expression of quantities of feeling seems to be out of the question."* (Jevons, 1871: 7; 12).

According to Stigler, Jevons was uncertain about the measurability of utility and considered its measurability at the time to be doubtful in the first edition of his work (1871), but in the second edition (1879), the following passage was no longer included.

*"I confess that it seems to me difficult even to imagine how such estimation [of utility] and summations can be made with any approach to accuracy. Greatly though I admire the clear and precise notions of Bentham. I know not where his numerical data are to be found."* (Jevons, 1871: 14).

Menger represented marginal utilities with numerical values and applied an equation to marginal utilities as a criterion for the optimal allocation of goods in various applications (Menger, 1871: 98). His concept of utility was certainly and intentionally neutral, but he did not attach any ethical connotations to it. This concept of subjective value was emphatically based on the evaluation of different products, and he derived his own conclusions from the idea that value depends on the significance that individuals attribute to different goods. Stigler points out that Menger's qualitative approach to utility stands in sharp contrast to the quantitative interpretations of other contemporary thinkers of the marginal revolution, such as Jevons and Walras. For example, Walras, based on a quantitative interpretation of value, argues that utility can be weighted.

*"We need only suppose that utility is measurable and we are at once able to give an exact, mathematical account of the influence utility exerts, along with the quantity initially owned, on demand curves and hence on prices."* (Walras, translated from French by Jaffé, 1977: 300).

Following the same line of thought, Jevons (1871: 53; 54) writes that the value of different goods can be measured based on the degree of utility perceived by consumers. Following Jevons' opinion, many economists maintained that utility must be cardinal, i.e., measurable. The ordinal version was formulated by Menger within the Austrian school tradition, while cardinal utility is rooted in the neoclassical tradition and is based on Jevons' work. Despite the difference between the two, both thinkers consider utility to be an external property of goods (or an internal property of human existence). According to the two thinkers and the tradition, a product is not useful in itself, but only in relation to human needs. Menger's opinion confirms this assumption.

*"...in the first place, utility, though a quality of things, is no inherent quality. It is better described as a circumstance of things arising out of their relation to man's requirements"* (Menger, 1871: 110).

He further states that value

*“nothing inherent in goods, no property of them.” (ibid.).*

This idea confirms economists’ belief that, despite their differences, the two thinkers have the same concept of utility.

Stigler argues that Jevons, Menger, and Walras, in establishing the theory of utility, derived the utility of goods solely from their quantity. According to this, if income increases, the marginal utility of all goods (and income) must decrease, but based on this theory, the marginal utility of a good can only decrease with an increase in quantity. Based on this, considers the law of diminishing marginal utility to be explainable. Direct consequence of marginal utility is that if we have a larger quantity of a good, then the dependent needs will be lower on the scale, and therefore the marginal utility of a single (additional) unit will be lower. The significance of marginal applications decreases as the available quantity increases.

In the last third of the 19<sup>th</sup> century, economics was attempted to be built on a priori psychological laws derived from self-observation. Psychological self-observation appeared to provide precisely defined laws governing individual behavior (such as the pursuit of wealth). In his work, Edgeworth (1881) attempted to base economics on the latest findings in psychophysics. Fechner (1860) believed in the measurability of mental phenomena. Fechner advocated the empirical possibility of perception, and his work on the subject was a direct precursor to the marginalist revolution. Wundt (1874) classified perceptions based on the intensity, duration, and modality of sensations. These ideas became known during the marginalist revolution. Wundt subsequently formulated a three-dimensional system of sensations (joy – joylessness – tension, versus relaxation – excitement – depression), but he found no followers among economists, who based their own theories on one-dimensional utility (pleasure – pain). For Edgeworth (1881), Fechner–Weber’s law was the basis for measuring stimulation and utility, but this endeavor did not resonate with economists<sup>4</sup>. Instead, he presented an indifference curve and derived its properties from the theory of marginal utility. In addition, he wrote down the function of total utility, which he assumed to be a differentiable function of quantified products and services.

## Criticism of marginal utility – the first transformation in utility theory

At the beginning of the 20th century, economists rejected utilitarian assumptions. Bruni (2010) states that microeconomic thinkers in the field retained most of the theoretical structure that was originally derived from the assumptions: the foundations of the theory changed, but the superstructure remained. The new foundations became postulates and preferences, or they were about rational choice,

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4 Viner (1958: 183) claimed that Edgeworth’s reference was “the only quotation” he had encountered in the contemporary literature on the Fechner-Weber law (marginal utility theory).

with rationality constructed as the consistency of preferences or choices, as opposed to the earlier pursuit of pleasure.

One of the targets of theoretical skepticism was hedonism. Downey (1910) started from the premise that people did not usually express themselves in terms of anticipated feelings. These feelings are probably not conceivable in advance, so they cannot be anticipated, and therefore the anticipated feeling cannot serve as a motive. Based on this, the theory of hedonism – as a psychological concept – cannot serve as a secure foundation for economic analysis. Contrary to the assumption of anticipated feelings, people do not directly strive for pleasure and happiness, but act to achieve definite, concrete, realistic, and realizable goals.

According to Fetter (1915), the point of transformation is “satisfaction,” so satisfaction stands in opposition to hedonism. This is reflected in the following quote.

*“The [rationally conceived] purpose of industry is to gratify wants. The substitution of goods in men’s thought is the shifting of the choice from a good that does not give the highest gratification economically possible at the time to another good that does.” (ibid.).*

Downey (1910) concluded that the theory of marginal utility cannot be addressed with the help of psychology because it is fundamentally hedonistic, while human consciousness is unnaturally and persistently non-hedonistic. Hedonism is criticized by in relation to utility because of theoretical approach that human behavior is guided by rational calculation of self-interest based on the concepts of pleasure and pain.

According to Downey, deliberation and rational choice play a minor role in individuals’ decisions. Habit and calculation are what guide most of individuals’ actions. Such calculation and choice can only take place on the basis of habit and within its limits. The mindset, which is what matters in most cases of choice formation, is not the result of prescriptions, but of conventions that are uncritically accepted on the basis of belonging to a given group. These are conventions that go far beyond the rational evaluation of individuals and determine the “relative usefulness of consumer goods.”

At the heart of Veblen’s (1898) criticism is the realization that the theory of marginal utility provides an insufficient explanation for the motivation underlying human behavior, which in this case is also the basis of an individual’s economic behavior. The reason for this criticism is that individual behavior could be described in hedonistic terms in the following form.

*“The hedonistic conception of man is that of a lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area, but leave him intact. (Veblen, 1898: 389).*

According to Veblen (1909), marginal utility is part of classical economics. Both the classical school in general and the marginal utility school of thought moved away from the traditional psychology of the early 19th-century hedonists, which had previously been accepted as self-evident. The hedonistic dogma, supplemented by related psychological motives, can be understood as a rational response to the situational constraints in which human existence is embedded (Veblen, 1909: 623).

Downey (1910) offered a characteristic critique of the theory of marginal utility at the beginning of the 20th century. If economics deals primarily with the fact of choice between goods or between courses of action, then all discussion of “satisfaction,” “psychological income,” or “utilities balancing” can be removed from economics, and furthermore, marginal utility becomes meaningless. If the choice is actually made between goods and not between the “utilities” represented by the goods, then why do we talk about utility at all? If we allow economic choice to be made more often on the basis of habit, advice, and other influences than on the basis of a rational weighing of alternative satisfactions, then the analysis of the marginal utility of products loses all meaning. The failure to recognize hedonism deprives the theory of marginal utility of its entire content and can be presented as the application of a theory distilled from specific individual cases. For the hedonistic individual, comparing the utility possibilities of different goods at different times or for different individuals poses an insurmountable difficulty. Criticism and dissatisfaction with utility theory culminated in Downey’s (1910: 268) opinion.

A hundred years later, Keller (2015) offers a comprehensive and detailed critique of the theory of utility, which is considered the cornerstone of microeconomics. He views utility as an abstract but unscientific concept, which cannot be precisely defined and adequately measured. Since utility is unique to each individual, it cannot be used to construct a universal theory that would be applicable to different individuals in different situations. Given that utility is a vague and unmeasurable phenomenon, it makes no sense to talk about maximizing it.<sup>5</sup>

When cardinal utility is applied, differences in utility are treated as significant in ethical or behavioral terms. On the other hand, ordinal utility only captures relative rankings, but does not reflect the strength of preferences. Keller considers the main problem to be that the utility functions of the two variants arbitrarily (arbitrarily and not on a scientific basis) assign numerical values to the individuals in the choice set. These numbers represent utilities, which are hypothetical but misleading units of utility. Marginal utility should be removed from economics as the only rational solution, as it has caused great and unnecessary confusion in microeconomics.

A specific chapter in the literature on marginal utility is Max Weber’s (1908) essay. In it, he argued that marginal utility theory and economic theory in general have nothing to do with psychological principles, including the Weber–Fechner law’s<sup>6</sup>

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5 Keller (2015) goes even further in his criticism, arguing that the theory of utility contradicts both logical and empirical evidence. In his view, the category of utility has only remained in microeconomics because of conservatism, which is in fact a distortion of the ideology and work ethic of theoretical economists. Black (1991: 777) goes even further when he writes that Jevons, Menger, and Walras introduced a non-scientific, irrational, and harmful idea into economics for purely ideological reasons in the form of the so-called diminishing marginal utility.

6 According to Max Weber, Brentano is wrong in stating that the fundamental law of psychophysics is the basis of the theory of marginal utility, and that the latter is accordingly the application of the former (Max Weber, *op. cit.* 25).

theory of marginal utility is far from being a special case of the application of the Weber–Fechner law or any fundamental psychological law.

Stigler (1950) expressed his agreement with Weber’s view, as it demonstrated that economists could safely ignore the Weber–Fechner law. Zafrowski (2001) highlights Weber’s belief that the theory of marginal utility stands on its own and is independent of any psychological principles. At the same time, Weber’s essay reveals that the theory of marginal utility is not independent of all external influences ’s essay contains a latent thesis that the theory of utility, and likewise rational economic behavior, is limited by certain social, historical, and cultural conditions, conditions that Weber associates with modern capitalist society. In his essay, he implicitly gives an example of such a proposition with the following statement:

*“heuristic significance of marginal utility theory rests on this cultural-historical fact [capitalism], but not on its supposed foundation in the Weber-Fechner [psychological] law.” (ibid. 33).*

Weber’s economic behavior is not an individual characteristic rooted in psychology or biology, but rather a social-institutional characteristic based on specific cultural-historical facts. In other words, economic rationality is a matter of external “reality”, as Max Weber (1908: 31) calls it: “social environment”. He adds that

*“marginal utility theory, and, more broadly, any subjective theory of value are not psychologically, but ... ‘pragmatically founded, that is, on the use of the categories ‘ends’ and ‘means’ (ibid. 33).*

Armesilla (2013) points out that, according to Max Weber, the theory of expected utility is not merely an economic theory. The supporters of the theory of expected utility are primarily philosophers, since, similar to the labor theory of value, it is a philosophical theory, but with a diametrically opposite meaning. Labor theory of value has a materialist slant, while marginal utility has an idealist conception.

## The development of rational choice theory in microeconomics

The profound transformation of utility began with the criticism of traditional hedonistic utilitarianism and marginal utility theory at the end of the 19th century and the beginning of the 20th century. Within this framework, the principle of the pursuit of pleasure was replaced by postulates and preferences. From the beginning of the 20th century, decision-theory thinkers rejected hedonistic utilitarian conditions, and strong doubts arose regarding the concept of marginal utility. Moscati (2023) emphasizes that Pareto (1906) sought to remove metaphysical utility from economics. He was interested in how the assumption of indifference curves could be justified when individuals had to move toward empirical facts. Pareto warned that if this problem could not be solved, the accusation would be made that assumptions about economic behavior had to be invoked that depended on metaphysical arguments about the intrinsic properties of utility. Pareto (1900) believed that indifference curve analysis was a safer basis, since the psychological analysis used is theoretically unsound, always requiring self-observation. Signed

with the hedonistic-marginalist line and pursued two new goals: one was to replace cardinal utility with ordinal utility, and the other was to base the preference index on the simple fact of choice. Pareto (1906) took as his basis a series of indifference curves, which represented preferences for combinations of goods. Pareto (1893) accepted Edgeworth's (1881) concept: indifference curve analysis represents a method that does not quantify utility, based on the convexity of indifference curves. According to this, this analysis replaces the earlier marginal utility analysis. The latter was considered outdated in terms of content and became unnecessary from an observational point of view.

The development of rational choice theory began with the work of Pareto (1906). Hicks and Allen (1934) confirmed Pareto's view that measuring utility had become unnecessary. According to them, some of the key concepts used by Pareto, such as the principle of diminishing marginal utility, are inconsistent with the lack of measurability of utility and therefore need to be eliminated. They eliminated not only diminishing marginal utility, but also utility itself, and attempted to construct a theory of demand based solely on observable choice behavior and captured by indifference curves. The cornerstone of their demand analysis was the marginal rate of substitution, which they understood as a quantitative and observable entity independent of utility. They offer the following explanation for their solution, which is based on product combinations and replaces marginal utility:

*"The theory of value does not need any precise definition of marginal utility. What it does need is only this: that when an individual's system of wants is given... we should know his marginal rate of substitution of any good Y for any other X is defined as the quantity of good Y which would just compensate him for the loss of a marginal unit of X."* (Hicks and Allen, 1934: 1c 55).

Others replaced Pareto's basic concept of marginal utility with the marginal rate of substitution, which does not require marginal utility at all<sup>7</sup>. Hicks (1946) says that if we reject cardinal utility and purge it from our analysis, then

*"all concepts which are tainted by quantitative utility, ... the first victim must be marginal utility itself. If total utility is arbitrary so is marginal utility... The second victim (a more serious one this time) must be the principle of Diminishing Marginal Utility. If marginal utility has no exact sense, diminishing marginal utility can have no exact sense either."* (Hicks, 1946: 19-20).

The quote highlights the ordinal shift that took place in the first decades of the 20<sup>th</sup> century in relation to the treatment of utility. The works of Pareto (1906), Hicks and Allen (1934), Allen (1938), and Samuelson (1938) played a major role in supporting ordinalism.

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7 Lemieux (2022) traces the theoretical basis of neoclassical economics back to Robbins' opinion: "The interpersonal comparison of utility ... is known to be a scientific impossibility in economics. ... According to Robbins (1932), interpersonally comparing utility cannot be used to justify income distribution. ... Modern economic theory does not require the assumption of diminishing marginal utility of income or consumption, but only assumes a diminishing rate of substitution between goods."

As Moscati (2023) pointed out, for ordinalists, preferences have three advantages over the category of utility: First, they provide a suitable definition for identifying utility: they satisfy needs, fulfill desires, and evoke selfishness or selflessness. For ordinalists, preference ordering can express any type of taste: material or spiritual, selfish or altruistic or even masochistic, healthy or unhealthy, moral or immoral. Second, ordinalists argue that only final preferences are relevant in economic analysis<sup>8</sup>, while the complex psychological processes that generate them are irrelevant to economists. Thirdly, for ordinalists, the advantage of preferences over utility is that, although the concept of preference remains mental and thus directly observable, it is directly linked to observable choice behavior, unlike the concept of utility. While the link between utility and choice is indirect in the sense that it goes through a process of utility maximization, the link between preferences and choice is direct.

Moscati points out that in the wake of the ordinalist revolution initiated by Pareto, thinkers concerned with utility – largely under the influence of neopositivist philosophy – moved away from cardinalism and chose the ordinal approach to utility. The theory based on the ordinal utility index involves the rejection of earlier concepts of utility theory that are incapable of positive transformation. Such was the principle of diminishing marginal utility, as well as the substitution of goods based on how a change in the marginal utility of one good modifies the quantity of another good.

Bernardelli (1938) sought deeper reasons for the doubt as to whether the concept of marginal utility provides an adequate basis for economic theory. Previous interpretation of this in economics is incompatible with the fact that utility is in fact an intense psychological quantity that cannot be subjected to any form of measurement. s theory of valuation must be constructed in such a way that there is no doubt about the fundamental unmeasurability of total and marginal utility. It must also be made clear that one or both of these concepts cannot be incorporated into a restructured framework. From this, it can be concluded that these concepts must be rejected as “meaningless” and unscientific. Despite doubts, utility does not necessarily have to be rejected, as the obstacles to its application arose within the concept itself. The source of the problems may have been Pareto’s utility index theory, namely the postulate of index invariance.

The theory of marginal utility attempts to explain economic choices by summing up an individual’s marginal utilities. The relevant motives or impulses determine the reasons for an individual’s decisions based on economic impulses. Based on this, Bernardelli comes to the following conclusion: if we remove the concept of marginal utility from economics, it would no longer be possible to explain choice behavior. Individuals would limit themselves to merely registering and classifying the results of their choices, observing their market behavior. Bernardelli started from the tacit assumption that marginal utility is to total utility as differentiation is

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8 Samuelson (1937; 1938) formulated his own “stated preference theorem” as part of the ordinalist revolution.

to integration. The basis for this is that the integral function is intended to represent total utility, while marginal utility can be expressed by differentials. When marginal utility is treated as the differential of total utility, it is endowed with properties that it clearly does not possess. The mathematical reason is that differentials cannot be transformed in the same way as their integral functions, which are based on the fact that the integral form can be defined as the limit of the sum of the differentials. If we therefore apply the same rule to marginal utilities, this also implies that total utility is the sum of marginal utilities. At the same time, total and marginal utility are intensive quantities. However, it is impossible to sum intensities in any algebraic sense. The paradox between the mathematical legitimacy of marginal utility and the immeasurability of utility (total and marginal) can only be resolved by stipulating that total utility is not identical to the integral of marginal utilities.

The problem of measuring psychological magnitude and its impact on microeconomics has always been a mystery in economics. Pareto's introduction of the index invariance postulate led many to conclude that the concept of marginal utility could not be part of economic theory. Pareto and his followers blamed the marginal utility method instead of recognizing that the root of the problem was that the index invariance postulate was not consistent with marginal utility. Nevertheless, total and marginal utility were treated together as if the consistency condition held.

The lack of integrability between Pareto's index invariance postulate and marginal utility was a critical point in the economic applicability of utility theory and the rejection of marginal utility by the Pareto school until the mid-20th century. Even the most influential thinkers had differing opinions. For example, Pareto and his followers sought to dethrone utility. Irving Fisher (1903) did not recognize the integrability problem, Hicks (1946) denied the non-integrability of marginal utility, while Allen (1932) accepted it. Samuelson's (1950) writing played a major role in resolving these doubts. He had already expressed his opinion at the end of the 1930s with the introduction of the key concept of "stated preferences." In his work, set out to find the roots of the non-integrability of marginal utility using an ordinal basis. Started from the premise that individuals are able to formulate preferences in relation to so-called "small changes," but are unable to make consistent choices regarding situations that will arise much later. We cannot make accurate predictions for cases where individuals will become very rich or very poor. The only realistic approach is to distinguish between short-term and long-term preferences, or between *ex ante* behavior and *ex post* behavior. Samuelson concluded that comparative statics cannot help in assessing index invariance, and even when following the optimal order of consumption, the possibility of integrability may not exist. Postulate of Pareto index invariance is unacceptable, i.e., preferences may change over time, and it would not be appropriate to eliminate utility from welfare economics.

The rejection of utilitarianism and the criticism of marginal utility theory in the first half of the 20th century underwent a process of transformation that directly affected the economic position of utility theory. Efforts were aimed at eliminating metaphysical utility from economics. The "soul" of utility theory is the law of diminishing marginal utility (Viner, 1925), according to which any individual who acquires or consumes

successive units of a product without a significant time lag, derives less “utility or pleasure,” or “satisfaction or fulfillment, or benefit, or capacity for the fulfillment of desires” from each subsequent unit than from the previous unit.

Tried to resolve the rigid rejection of the principle of utility – marginal utility – diminishing marginal utility with the following consideration. A likely substitute for the “marginal utility concept” of utility thinkers may be marginal desire, which can serve equally well as the only logical solution to the concept, expressing with greater precision the subjective relationships between the small final increments of different products. If we substitute marginal desire for marginal utility, this can be expressed as follows: the market price of a series of products (if they can be purchased in small units) measures the relative marginal desires of all buyers with respect to the product they are currently purchasing.

Jevons (1871: 25), one of the pioneers of marginalism, started from the premise that value depends entirely on utility, but this makes it clear what gives things their value. The explanation that things are only useful (valuable) in relation to individuals cannot be considered satisfactory. The problem with this explanation, as Eabrasu (2011) points out in his study, is that it answers the alternative question, namely to whom things are useful (valuable), instead of giving us a direct answer to the question of what utility (value) is. Since any thing can be potentially useful, how can we know whether a given good is useful (valuable) to us at any given time?

Marginalism differentiates goods, showing that individuals do not consume water or diamonds, but rather specific units of them. These specific units create an individual’s preference scale. These observations show that the usefulness (value) of a given product would increase if we took away one unit. However, marginalism only explains why something is more or less useful, but it does not answer the question of “what is usefulness (value)”. In other words, marginalism does not tell us what criteria to use to rank the value of product combinations. This explains why marginal utility may have been suitable for the purpose of demand analysis, but at the same time, thinkers sought a solution for finding an adequate ranking criterion for the purpose of rational choice. A new transformation of utility theory created this framework in the mid-20<sup>th</sup> century.

## **Maximizing expected utility as a criterion for rational choice**

Pareto, and the ordinalists considered the newly established preferences to be consistent with common sense and moderation (despite their vague content). In the context of the ordinalist turn that peaked in the 1930s, most ordinalists rejected the assumption that preferences induce cardinal utility. At that time, Hicks’ opinion had a great influence. He concluded that individuals tend to evaluate based on uncertain payout distributions rather than on payouts themselves. This foreshadowed the perspective of expected utility calculation (Hicks, 1946). On the other hand, it indicated that similar to the thesis of diminishing marginal utility, the theory of expected utility is not compatible with the ordinal concept of utility, because if

the utility function represents individual preferences for outcomes, then it applies individually to any increasing transformation, and the course of action is linked to the highest utility, which may be undefined.

By the end of the 1930s, with the ordinal turn, the abandonment of cardinalism, and the criticism of utility and diminishing marginal utility, rational choice had been left in a vacuum. In this situation, a significant change occurred when, in contrast to traditional utility-maximizing theory, von Neumann and Morgenstern's consideration that indifference curves allow for risk-free choice without utility being precisely measurable on some scale emerged as a challenge. In the 1940s, von Neumann and Morgenstern rejected the psychophysical basis of utility and similarly rejected Daniel Bernoulli's views. The latter attempts to explain how individuals evaluate (or should evaluate) risky options as a function of other factors and, importantly, how individuals evaluate risk-free money as a result. In contrast, von Neumann and Morgenstern regard the preferences of decision-makers as given and are not interested in explaining them. Their epoch-making work (1944) brought about a turning point in decision theory with the assumption that, through theoretical simplification, utility was considered equivalent to the amount of money that was the subject of the decision. The actors in their model maximize money or monetary equivalents, but this money is referred to as utility.

The authors treated preference as an economic concept, the nature and properties of which must be precisely defined using axioms. There are five axioms – completeness, transitivity, continuity, reduction, and independence – and each has a purely ordinal nature in the sense that it only shows the ranking of variants. Von Neumann and Morgenstern's work advanced the axiomatic version of preference-based expected utility. It has been shown that if the decision maker's preferences – when choosing between risky alternatives – satisfy certain axioms, and only then, the individual will prefer the risky alternative associated with the highest mathematical expectation of the cardinal utility function. As in Daniel Bernoulli's expected utility, in von Neumann and Morgenstern's expected utility, the decision maker is interested in achieving a higher level of wealth, which is his original wealth plus the monetary gain or minus the monetary loss associated with the outcome of the game.

Von Neumann and Morgenstern (1944) axioms of theory refer to individuals' preferences regarding risky alternatives and include the existence of a utility function that is continuous, time-invariant, and a real-valued ordinal utility function for ranking product combinations.

In the case of certainty, the exact values of the utility function are not important, and a monotonically increasing transformation of the utility function preserves the ranking of consumption combinations, i.e., the transformed version presents the same preferences as the utility function. In the case of uncertainty, the basis for choice is the probability distribution of state-dependent financial payments. In addition to the six axioms, there is a cardinal, continuous, time-invariant, real-valued von Neumann-Morgenstern-type money happiness (utility) function. When applying expected utility theory – in the case of uncertain payments – ranking is performed using an index that contains, in the form of a linear combination, the

sum of the state-specific payments of the preference order and the series of state probabilities associated with them. The relevant axioms include the existence of a cardinal utility function, i.e., a function that is uniquely amenable to a linearly increasing transformation. von Neumann-Morgenstern called this specific form of utility “numerical” rather than cardinal utility.

Thus, in the 1940s, a new transformation of utility theory took place, and the resulting rise of expected utility maximization theory was linked to the scientific rehabilitation of the cardinal utility concept of, following a period when (1930s) thinkers concerned with utility supported a strictly ordinal approach to utility analysis. This specific type of utility became a fundamental tool in economics from the mid-20th century onwards. In von Neumann and Morgenstern’s version of expected utility maximization, the specificity lies not in its axiomatic nature, but in the fact that the axioms are preferences rather than utility functions.

Risk and uncertainty are of central importance in contemporary economics. This was the main reason for the great influence of quantified models of utility maximization on researchers. Quantified models provide a simple approach to analyzing risky decisions by linking diminishing marginal utility to risk aversion.

In the theory of expected utility maximization, von Neumann-Morgenstern proved that any normal preference relation – for a finite set of states – can be written as expected utility, which thus became von Neumann-Morgenstern utility. This was a huge turning point after the ordinal revolution of the 1920s and 1930s. revived utility cardinalization, which had been rejected for a long time. A particular inconsistency arose in economics when the philosophy and practical solution of the von Neumann-Morgenstern expected utility maximization model was accepted by the leading thinkers in economics after a long period of rejection. The essence of this is that preferences can be considered intrinsically ordinal, which is contrary to the probability-based cardinalization of the von Neumann-Morgenstern axiom system. This leads to the denial of the principle of intrinsically ordinal marginal utility becoming questionable.

## Utility in behavioral economics

Behavioral economics, in its quest to realistically describe the decisions and behavior of individuals as economic actors, has dispelled the assumptions of neoclassical economics regarding rationality and the concept of homo economicus. It has identified a number of factors influencing economic decisions and behavior that neoclassical economics did not take into account, and has pointed out that individuals often simplify their decisions. Researchers in the field have also confirmed that individuals are not always able or do not always seek to maximize their utility. All this has contributed to the perspective of behavioral economics that individuals do not make decisions based on expected utility. The interpretation of utility has thus changed with the advancement of behavioral economics research. On the one hand, this is due to empirical research results that describe decisions

and behaviors that occur in real-world circumstances. On the other hand, it is due to the fact that factors influencing decisions and behavior (e.g., social influences, present bias) have also been incorporated into utility functions, which neoclassical economics ignored. Thirdly, behavioral economics distinguishes between several types of utility, depending on which aspect of the decision or behavior is the focus.

The rest of this paper presents the concept of utility from the perspective of behavioral economics. First, we will discuss the non-traditional interpretation of utility and the addition of behavioral components to the utility function. Next, we will review the different forms of utility defined and applied by behavioral economics. Finally, we will discuss the possibilities for measuring utility from the perspective of behavioral economics.

### Interpretations of utility in behavioral economics

Starting in the 1950s, with the development of “old” behavioral economics, empirical studies began to spread, which also touched on utility theory. Initially, the validity of expected utility theory was tested, which was increasingly questioned based on the results obtained, and later it was pointed out that in reality, individuals’ decisions do not correspond to expected utility theory (Moskati, 2020). While the traditional economic approach was based on the close link between rationality and utility, and started from the alternatives available to the decision-maker, the known consequences, and a given utility function, “old” behavioral economics focused on accurately describing behavior and examined the consequences of its actual deviations from neoclassical assumptions, basing the form and content of the utility function on empirical evidence (Sent, 2004).

According to the empirically based view of Herbert Simon (1986), a leading representative of “old” behavioral economics, economic behavior cannot be explained and predicted based on the theory of rationality and assumptions about utility maximization. Behind this is the realization that individuals often have to solve complex decision-making problems for which their cognitive abilities are insufficient (Simon, 1955; 1957b). Thus, decision-makers are characterized by bounded rationality, with the result that they are unable to optimize and utility maximization is not achieved. According to Simon (1957a; 1982; 1997), in reality, individuals consider the options available to them, the consequences of which they generally do not know precisely, and as soon as they find one that reaches or exceeds a minimum acceptable threshold they have set in advance, the choice is made. This decision is therefore a satisfactory (satisficing) decision for the individual, rather than one that maximizes utility.

Later, Tversky and Kahneman (1974) – whose empirical research findings had a significant impact – confirmed that individuals do not make decisions based on the rational choice axioms of expected utility theory when faced with uncertainty. They also found that individuals do not always strive to maximize utility (Tversky and Kahneman, 1992). Kahneman and Tversky (1979) developed prospect theory as a critique of expected utility theory, based on their experimental research findings, and

its emergence is considered to mark the beginning of “new” behavioral economics. Prospect theory is similar to expected utility theory in that it interprets decision-making in risky situations as a choice between outcomes. One key difference between the two theories is that expected utility theory takes a normative approach, i.e., it determines how to choose between alternatives in the face of risk, while prospect theory is descriptive in nature and shows how individuals actually make decisions in the face of risk. Another relevant difference between the two theories is that while expected utility theory uses a utility function, prospect theory uses a value function, which expresses the psychological aspects of decisions more consistently and strongly. The value function reflects the psychological value of the perceived gain or loss of the decision outcome relative to a reference point. The reference point is related to the framing of the decision problem, and the framing effect influences the choice (Thaler, 1985). The reference point divides the S-shaped value function into two parts; however, the gain and loss sections are not symmetrical. This can be attributed to the fact that perceived losses elicit a stronger psychological reaction than perceived gains of the same absolute value. The loss section of the value function, located to the left of the reference point, is convex, reflecting the tendency of individuals to take risks in order to avoid losses. The gain section of the value function, located to the right, is concave, indicating risk aversion. Finally, the loss part of the value function is steeper than the gain part, indicating that loss causes more pain than the pleasure of an equal gain (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991).

Kahneman and Tversky’s (1979) prospect theory has become widely known and recognized, and has been applied to the study of numerous economic topics and issues. Nevertheless, one relevant element of the theory, the use of the value function, has not become widespread. The utility function has remained the dominant factor in interpreting the evaluation, satisfaction, and pleasure of decision-making individuals. The perspective of behavioral economics and the expansion of its research results have led researchers to supplement the utility function

- ▶ on the one hand, with factors that influence individuals’ choices and utility in reality but were ignored by neoclassical economics,
- ▶ on the other hand, in many cases, and increasingly in a dynamic approach, especially with the recognition of the frequency and significance of intertemporal decisions.

One of the key drivers behind the addition of various components to the consumer utility function is the rejection of the traditional economic assumption that decision-makers pursue their own interests and that other economic actors have no influence on their choices, as well as the recognition and confirmation that in reality, individuals’ decisions and behavior are influenced by others, and that their social environment also plays a role. Based on this, altruism – as the prevalence of pro-social decisions and behavior – appears in the utility function (Hori, 2009; Simon, 2016), the description and application of which may be relevant in contexts where taking into account, supporting, and promoting the interests and well-being

of others is as important or even more important than the decision-maker's own interests or happiness. In situations where reciprocity and cooperation between individuals have an impact, reciprocity is incorporated into the utility function (Falk and Fischbacher, 2006; Malmendier, te Velde and Weber, 2014). The influence of the narrower or broader social environment and direct or indirect interaction with others thus manifests itself in various ways and from various perspectives in relation to the utility of the individual.

In the literature, the most attention has been paid to the fact that it is not only the absolute level of consumption that determines the level of utility – as stated in neoclassical economics – but also relative consumption, i.e., what and how much an individual consumes in relation to others and how they relate to this. This is also related to the fact that in many decision-making situations, or in the case of consumption of goods, individuals make choices that take into account the decisions and behavior of individuals in their reference groups, as well as the characteristics or quantity of the goods they use or own. They do this (consciously or unconsciously) mostly in order to maintain or improve their relative position; relative consumption is therefore also linked to competition between actors. The comparison of an individual's consumption of goods with that of others and the influence of the social environment and reference groups have been incorporated into the utility function in many ways. Duesenberry (1949) was the first to supplement the utility function – from a cardinal perspective, using a ratio-based approach – with the consumption levels of others, to which individual weights are also attached. Frank (1985) specifically included the level of consumption of positional and non-positional goods in his utility function, and, in a novel approach, also included the individual's rank in terms of the level of consumption of positional goods, thus applying an ordinal approach to comparison with others. With the expansion of behavioral economics research and a deeper understanding of the relationship between relative consumption and utility, researchers have attempted to incorporate more and more factors into utility functions, which have also become increasingly sophisticated. For example, Congleton's (1989) function includes the effect of the average degree of striving for status within the reference group, while in Akerlof's (1997) model, unlike Duesenberry's (1949), individuals do not make individual comparisons, but compare their own choices to the average of others' choices. Absolute and relative consumption are expressed as a multiplicative relationship in the utility function described by Andersson (2008), where the individual compares their level of consumption to the average absolute consumption level of their reference group, and where the extent to which the relative increase in consumption resulting from the last unit of money spent contributes to the change in utility also plays a role. In addition to factors directly related to consumption, Brekke, Howarth and Nyborg's (2003) model also includes labor productivity, time spent working, and leisure time, i.e., it links the individual's different economic roles as a worker and consumer. Higher productivity and longer working hours can lead to higher consumption levels and, consequently, higher utility levels, but longer working hours also mean less leisure time, which results in a

decrease in utility. Antinyan, Horváth and Jia (2020) use networks to model how the utility individuals derive from the consumption of positioning goods is influenced by the consumption decisions of actors directly related to them; the function also includes a component that expresses how sensitive the individual is to rivalry. Kovács (2020) attempts to incorporate relative consumption into a utility function from a dynamic perspective, as it has significant intertemporal effects due to the never-ending nature of rivalry. Among other things, the model takes into account that individuals who intend to maintain or improve their relative consumption in the future need to estimate the future absolute consumption level of those in their reference group, which is usually uncertain. It also points out that a higher absolute consumption level does not necessarily lead to a higher utility level.

The further development of the utility function in a dynamic approach by behavioral economics researchers can be attributed to several reasons. Among these, the recognition of the anomalies of the discounted utility model, the identification of the intertemporal aspects of many economic decisions and behaviors, and the fact that the decision errors and biases identified often affect multiple periods are decisive. Behavioral economics studies have also shown – contrary to neoclassical economic assumptions – that individuals' preferences are not stable over time and that they have inconsistent preferences over time, as DellaVigna (2009) provides a consistent overview. All of this affects the description of the utility function.

In neoclassical economics, Samuelson's (1937) discounted utility model is widely accepted and used to describe and analyze intertemporal decisions. However, behavioral economics research has revealed a number of anomalies in the description and analysis of individuals' actual decisions and behavior. One of the most important is that the discount rate cannot be considered constant in reality. Not only is it difficult to define clearly, but it can also vary depending on the decision-making domain (Frederick, Loewenstein and O'Donoghue, 2002) and framing (Matousek, Havranek and Irsova, 2022). Furthermore, the difference between objective time and subjective time perception also contributes to the formation of the discount rate (Bradford, Dolan and Galizzi, 2019). According to Thaler (1981), individuals discount gains more heavily than losses, as losses have a stronger emotional impact based on prospect theory (Kahneman and Tversky, 1979). As a result, the utility function is more sensitive to losses than to gains (Loewenstein and Prelec, 1992). The degree of discounting also depends on the size of the outcome: smaller outcomes are discounted more heavily (Hardisty, Appelt and Weber, 2013), which means that the utility function is more flexible for outcomes with a higher absolute value (Loewenstein and Prelec, 1992). According to the traditional model, the degree of discounting does not change when the time interval is divided into parts (Dhami, 2016), but in reality it increases with shorter periods – this is subadditive discounting (Read, 2001). Finally, another relevant anomaly is the violation of independence; the Samuelson model is challenged by the fact that, in reality, consumption at different points in time is not independent of each other and the distribution of future payments and utilities is not indifferent to the decision-maker (Frederick, Loewenstein and O'Donoghue, 2002). Consumption at earlier points in time and the utility derived from it influence later

consumption decisions and the utility derived from them. Consumption planned for future points in time influences present choices.

In behavioral economics, the description of utility functions from a dynamic perspective and their application to analysis has become relevant and widespread due to the role and significance of many economic decisions and behaviors spanning multiple time periods, as well as the errors and distortions associated with intertemporal decisions. Individuals often have time-inconsistent preferences, a typical form of which is present-biased preferences. When these preferences prevail, individuals place relatively greater weight on the present than on any later point in time; consequently, they prefer consumption close to the present and short-term gains over later consumption and long-term benefits (O'Donoghue and Rabin, 1999). Present bias was first introduced into the utility function by Phelps and Pollak (1968), but it was Laibson's (1997) hyperbolically discounted utility function that later became widely used to describe and analyze the utility flow of individuals with present-biased preferences and to explore the related economic consequences. In reality, individuals' preferences are not stable over time, and they are unable to accurately predict how they will change in the future. This can lead to the projection bias identified by Loewenstein, O'Donoghue and Rabin (2003), whereby individuals tend to believe that their future preferences will be very similar to their current preferences when making decisions about the future (e.g., present decisions about future consumption or travel). As a consequence of this decision error, the estimated and realized utility differ from each other. In the model of Loewenstein, O'Donoghue and Rabin (2003), a key component is the "state" expressing preferences and tastes at a given point in time, which determines utility.

### Categories of utility functions in behavioral economics

Behavioral economics has identified several types of utility by moving away from the concept of perfect rationality and identifying the factors that influence real-life decisions and behaviors, as well as analyzing their consequences. The emergence of different concepts of utility has also been influenced by the fact that utility can be viewed and examined from multiple perspectives and in multiple contexts. However, different interpretations of utility have not become widespread in the literature; the focus is primarily on experienced utility, and social utility plays an even more significant role.

The concept of experienced utility dates back to Bentham (1789/1948), who equates utility with happiness and distinguishes it from choice. He considers it a kind of hedonic experience that derives from an activity, such as the consumption of goods, and is therefore not directly provided by an object. This type of utility can be produced simultaneously by several different pleasures derived from the activity. Bentham (1789/1948) considers utility to be a sensory perception that can be observed and measured. For a long time, this line of thought did not receive much attention, and in fact, it was only in the "new" behavioral economics that it received significant attention again. This is mainly due to the fact that experienced utility

was not consistent with the neoclassical economic approach. Instead, it focused on decision utility, i.e., the utility associated with choosing between alternatives, as it rejected the subjectivity of experience and based its thinking on the objectivity of explicit, clearly definable, and identifiable choices. Furthermore, if economic actors are assumed to be rational and to maximize utility, then there is no need to question whether they consider their choices and their outcomes to be good and thus enjoy the consumption of the goods they have chosen. In maintaining the assumptions of rationality in traditional economic thinking, there was no need to distinguish between decision utility and experienced utility. Decision utility refers to an individual's choices, the thoughts and attitudes that influence their actions, and is linked to rational preferences; it is also an *ex ante* concept. Experienced utility, on the other hand, is the hedonic experience resulting from choices; it is an *ex post* concept (Kahneman and Sugden, 2005).

Distinguishing between experienced utility and decision utility is also important because the two do not always coincide. This means that decision-makers do not necessarily choose the alternative that offers them the highest utility (Kahneman, Wakker and Sarin, 1997). Furthermore, people do not always know what they will like, and they often make systematic errors in predicting future experiences of outcomes, and thus fail to maximize experienced utility. This is relevant because it is often necessary to make decisions whose outcomes will only be experienced at a future point in time, and the utility of those outcomes must be predicted; this is not easy to do, and in most cases it is not even possible to do so accurately. Prediction is particularly difficult when there is a large time gap between the decision and the outcome, when the circumstances of the decision and the outcome are different, and when the emotional and motivational factors are different at the two points in time (Kahneman and Thaler, 2006).

There are strong and weak versions of the theory of experienced utility. The strong version is close to Bentham's (1789/1948) view; it is defined by the categorization of pleasure and pain, focusing on their magnitude. Reed (2007) summarizes the main points of the strong theory of experienced utility as follows:

1. there is experienced utility at every moment – this can be pleasure or pain;
2. this utility has a measure, and a neutral point separates the desirable from the undesirable, as well as pleasure from pain;
3. this utility expresses whether the experience is good or not;
4. the total utility for a period of time is given by the sum of the immediate utilities;
5. the optimal decision allows for the maximization of experienced utility;
6. immediate usefulness can also be measured.

Measuring utility requires the identification of a true zero point, which represents a neutral state between good and bad. The zero point can be defined in two ways: 1. where the experience is neither pleasant nor unpleasant, 2. where it separates the “stop” and “go” signals for the decision maker. Kahneman, Wakker and Sarin (1997) clearly distinguish their view from the strong version; they apply a hedonic

interpretation of utility. An individual's independent value judgment indicates the utility experienced, which actually reflects the evaluation of the outcome. The intensity and duration of pleasure and pain are decisive. Experienced utility can be measured directly and immediately; it consists of immediate utilities, which are influenced by perceptions, feelings, thoughts, and imagination (Godovykh and Tasci, 2020). Thus, it does not depend solely on the intrinsic quality of goods, but also on prior expectations, situational factors, and unexpected circumstances (Figini, Leoni and Vici, 2024).

While experienced utility is based on momentary experiences, remembered utility derives from the recall of memories (Morewedge, 2015). Remembered utility is a retrospective assessment of the pleasure or pain associated with past decision outcomes. At the same time, it also has an adaptive function, as it determines whether a situation experienced in the past should now be avoided or approached again (Kahneman, Wakker and Sarin, 1997).

Kahneman, Wakker, and Sarin (1997) point out that remembered utility can be measured based on past experiences, with individuals retrospectively estimating the duration of hedonic experiences. However, when evaluating a stream of immediate experiences of varying intensity, only those that the individual remembers are taken into account. Since individuals do not remember every momentary experience, the series of remembered experiences does not correspond to the entire flow of experiences. The remembered utility actually reflects the average intensity of pleasures or pains at the peak and near the end of the entire flow of experiences; this also suggests that remembered utility is not influenced by the duration of sensory experience. According to Kahneman (2000), retrospective evaluation may be subject to bias.

Another concept of utility relevant to the time dimension is anticipatory/anticipation utility. Anticipatory utility reflects how an individual perceives the future utility of an activity or event (Wilkinson and Klaes, 2012). It expresses a range of positive and negative feelings arising from thinking about future experiences, which allows individuals to experience the emotional effects of future activities or events before they actually occur (Loewenstein and Elster, 1992). Ariely (2008) uses empirical examples to show that the utility derived from activities or consumption is based on individuals' expectations. Barigozzi and Levaggi (2010) confirm that anticipatory utility depends on the accuracy of information, but the relationship is not monotonic.

Bodner and Prelec (2002) interpret diagnostic utility as an estimate of an individual's propensity to make a choice. Furthermore, they consider it to be something that individuals experience as an unintended by-product of choice, which does not consciously influence the decision. This also means that it is not only the experienced utility of the consumed good that must be considered, but also the utility that its consumption entails. For example, as a result of weak will or strong will, as is extremely important in the case of alcohol consumption. The negative diagnostic utility of an activity may exceed the expected positive experienced utility associated with the consumed good, in which case the individual refrains from consumption. This is particularly important in relation to goods that can cause addiction and

individuals with addictive behavior (Wilkinson and Klaes, 2012). Wang, Menon and Ranaweera (2018) use diagnostic utility in a different interpretation and context from the former. They consider the opinions and evaluations of previous consumers to be diagnostic utility, as they can be useful information for potential future consumers to weigh the suitability of a good in relation to their needs.

The concept of transaction utility was introduced by Thaler (1985) and is discussed in conjunction with acquisition utility. Transaction utility is determined by the difference between the reference price, i.e., the price the consumer expects to pay for the good, and the actual price paid, which is therefore consistent with the perceived value of the purchase. Acquisition utility, on the other hand, expresses the value of the purchased good in relation to the price, which is in fact the consumer surplus. According to Thaler (1985), transaction utility has two relevant implications. One is that people are often persuaded to make purchases where transaction utility exceeds acquisition utility. The other is the opposite situation, where people give up goods that are attractive to them in terms of purchase utility, but reject them because of the large perceived loss of transaction disutility. According to the research results of Urbany et al. (1997), purchase utility can be a determining factor in purchase intention, but transaction utility has less influence on the decision in the case of uncertain quality, becoming a significant influencing factor only in the case of more certain quality. Hou, Hsueh and Zhang (2021) point out in their mental accounting approach study that digital payments increase transaction utility. This is mainly due to the fact that digital payments are less painful and more pleasant and comfortable for individuals than paying with cash or bank cards, and also involve lower transaction costs.

Frey Benz, and Stutzer (2004) introduce the concept of procedural utility into the literature. The concept of procedural utility is based on the recognition that people are not only interested in outcomes, but also in the processes that lead to them and the circumstances under which they are achieved. Furthermore, people typically have preferences about how they want to achieve the outcome. Procedural utility therefore gives importance to the conditions behind the outcomes. Overall, this means that the focus is on the pleasure and discomfort of the processes rather than on the outcome-oriented approach.

According to Frey Benz, and Stutzer (2004), there are three key elements to procedural utility. One is that this type of utility also expresses well-being – processes contribute to an individual's well-being, regardless of the outcome. Another is that it emphasizes the role of the processes behind the outcome. The third is the self-awareness of individuals – processes provide feedback to individuals. The three authors also argue that processes and outcomes are not independent of each other; when analyzing decision-making mechanisms, it is advisable to evaluate procedures as well as results. They conclude that there is a trade-off between processes and outcomes, but this is not a simple conversion, because the usefulness of the process and the outcome cannot be perfectly separated. If the outcome is unfavorable, the quality of the process becomes more important; if, on the other hand, the outcome is pleasing, the underlying process loses its significance. According to Frey and Stutzer (2005), procedural utility can be measured directly by determining subjective well-being.

Wilkinson and Klaes (2012) also mention residual utility, which expresses the joy or pain experienced by an individual after an event or activity because different utilities are connected or separated from each other. For example, after returning to work following a vacation, an individual may experience feelings that are contrary to those experienced during their time off, but later, when telling their friends about their vacation, they may have positive feelings again. These episodes of contrasting emotions are repeated after the original event or activity to which they are linked.

In many economic and social contexts and decision-making situations, people do not only consider their own interests, but also take others into account. This has led to the emergence of the concept of social utility (Camerer, 1999; Fehr and Schmidt, 1999), which does not exclusively involve self-interested behavior. It can be applied to the analysis of decision-making situations where an individual's choice has an impact on others. Thus, it can be used to analyze behavior patterns such as reciprocity, cooperation, or rivalry.

### Methods of measuring utility

With the progress of studies related to utility by behavioral economics researchers and the widespread application of various utility functions, the need to measure utility has become increasingly apparent. This is largely due to the fact that behavioral economics focuses not on hypothetical decisions and behaviors, but on those that actually occur in reality and their consequences, and that, in contrast to neoclassical economics, empirical studies play a decisive role in this field, with their results being organically incorporated into theory development. They are primarily concerned with the possibility of measuring experienced utility; on the one hand, because this is the most widespread concept of utility, and on the other hand, because it is the form of utility that best reflects real-time, lived experiences.

Kahneman and Sugden (2005) argue that experienced utility is measurable. One possible indirect measure of experienced utility is anticipatory utility, which represents an individual's ex ante beliefs about the hedonic value of their future experiences; however, this is influenced by how accurately the individual can predict their emotions. Another method is the measurement of satisfaction, which is often used in happiness research; this is based on a retrospective assessment of experienced utility, which the authors argue is not a reliable method of measurement. As a third alternative, they propose a more realistic method of measurement based on people's momentary experiences and happiness.

Godovykh and Tasci (2020) recommend measuring experienced utility instead of basing satisfaction on retrospective evaluation due to its numerous limitations and distortions, citing several advantages of this method. Measuring experienced utility using different techniques makes it possible to eliminate memory-related errors, capture a wide range of positive and negative emotions triggered by goods, and distinguish between different factors of experienced utility and their effects.

Data collection is a critical element of measuring perceived usefulness. Kleine, Peschke and Wagner (2024) consider real-time surveys conducted under natural

conditions to be the most direct method of measurement. There are also methods that involve a certain degree of time lag in data collection, but these have the disadvantage of inaccuracy in the assessment of past experiences and emotions, which is largely due to imperfect memory. One such method is the day reconstruction method (DRM) developed by Kahneman et al. (2004a). However, if the focus is on a specific event or activity, the event recall method (ERM) can be effective, as it has the advantage of concentrating on a specific activity and does not overload the individuals involved in the study with recalling memories and providing data and information (Kahneman et al., 2004b). Two indicators are widely used to estimate the value of perceived usefulness. One is net affect, developed by Kahneman et al. (2004b), which is the difference between the average of three positive and five negative emotions experienced by individuals; based on this, individuals can also be compared. The other indicator, following Bentham (1789/1948), is based on the utility derived from the flow of pain and pleasure, which Kahneman et al. (2004b) call the u-index, defined as the product of net affect and the duration of the activity.

There are several happiness studies that use experienced utility as the basis for empirical analyses (Akay, Bargain and Jara, 2023; Kleine, Peschke and Wagner, 2024). For example, the Satisfaction with Life Scale (SWLS) measures life satisfaction using five statements on a 7-point Likert scale, based on cognitive value judgments (Diener et al., 1985). Among international happiness studies, the World Happiness Report (2025) is a key reference; it assesses life satisfaction by considering six areas, using multiple factors and sophisticated methodology.

## Concluding remarks

The concept of utility is crucial in economics; on the one hand, it is related to the evaluation of an individual's choices in decision-making, and on the other hand, to the degree of satisfaction resulting from the outcome of the decision. Understanding and studying it is essential for analyzing individuals' economic decisions and behavior. Utility is not an exact concept, but rather an abstract one; thus, its interpretation and role have undergone significant changes with the development of economics.

As early as the 18th century, before the development of classical economics, the first attempts to grasp utility appeared, which considered it to be one of the determining factors in individual decisions. Subsequently, based on the philosophical roots of utilitarianism, the maximization of utility became the primary goal of decision-makers. In the second half of the 19th century, with the recognition of the role and significance of marginal utility, particularly in the works of Jevons, Menger, and Walras, the concept of subjective utility came to the fore, enabling the mathematical modeling of consumer decisions. From the beginning of the 20th century, decision theory thinkers rejected hedonistic utilitarian conditions, and theories related to marginal utility were also strongly criticized. Based on this approach, neoclassical economics, assuming rational choice and the maximisation of expected utility,

placed the theory of preferences and utility functions on an axiomatic basis, which determined economic thinking for a long time.

From the second half of the 20th century onwards, the neoclassical economic interpretation of utility came under increasing criticism, particularly with regard to its normative and predictive power. With the emergence of behavioral economics, the concept of utility gained a new interpretation that takes into account people's cognitive limitations, decision biases and errors, and the context of decision-making situations. The behavioral approach uses empirical methods to examine how decisions made in reality differ from theoretical models. This has also meant that utility is no longer a decisive concept only at the theoretical level, but its understanding and measurement have also become relevant from a practical and empirical point of view. ■

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