International Journal of Human Sciences Research

ISSN 2764-0558 vol. 5, n. 13, 2025

ARTICLE 3

Acceptance date: 24/12/2025

CRITIQUE OF THE NEOCLASSICAL CONCEPT OF UTILITY FROM THE PERSPECTIVE OF ECONOMIC NEUROSCIENCE

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ABSTRACT: Unlike the rational and normative approach of microeconomic theory, neuroscience takes a descriptive and positive approach, studying how decisions are made at the brain level. This approach allows for the development of more realistic models that incorporate the complexity of human decision-making processes. The analytical objective of this work is to contrast the neoclassical concept of utility from a neuroeconomic point of view, that is, it seeks to place utility within the research perspective offered by neuroscience to demonstrate that human behavior goes beyond consumer maximization.

KEYWORDS: utility, neoclassical, economic agents, preferences, neuroscience.

Introduction

A person who eats a fish fillet obtains a degree of utility from consuming it, but that utility cannot be measured in the same way as the caloric content of the food. This is because utility is a subjective concept that depends on preferences, motivations, and contextual factors. The satisfaction someone experiences when consuming a good varies according to their needs and can hardly be expressed in absolute terms.

The subjectivity of utility has to do with the lack of uniqueness. Nicholson (2005) mentions that, when assigning values, it is also impossible to estimate the degree of satisfaction provided by the consumption of a good. For example, two people, Daniela and Isabela, share the same fish fillet with the same nutritional values. Assuming that Daniela indicates that eating the fillet provides her with a utility of 10 and Isabela states that it provides her with a utility of 5, how can we determine who values the fish fillet more, if each of them may be using different scales?

It is possible that the utility each person derives from eating the steak is different. On the one hand, Daniela loves seafood, so her experience is pleasant and her valuation is very high. On the other hand, Isabela is not a fan of fish and prefers to eat meat, so her rating is low. This situation shows that the utility obtained from consumption cannot be measured objectively, as it depends on different individual circumstances and perceptions (Nicholson, 2005).

Microeconomics studies the behavior of individual economic units: families, businesses, workers, any agent involved in the functioning of the economy. It assumes that agents are rational and seek to maximize their utility under a constraint (Pindyck and Rubinfeld, 2011). This notion is based on the fact that individuals have defined and ordered preferences, asserting that people choose the best option available to them. However, the reality is different: people are subject to multiple biases that can affect their decision-making processes. These biases can manifest themselves in various ways, such as emotions, social trends, or fashion, and in turn lead to situations that deviate from neoclassical principles. For example, emotional biases such as risk aversion can lead to irrational decisions that do not maximize well-being, revealing that the representative agent model has limitations (Sarmiento *et al.*, 2017).

The latest technological advances in neuroscience have driven the growth of new approaches and areas of research ranging from the study of neurons to social behavior. By studying brain activity and emotional influence on economic decisions, neuroscience challenges the premise of rationality in neoclassical theory. It seeks to understand how neural stimuli impact

choice processes, showing that economic decisions are not the result of rationality but are influenced by cognitive processes. Techniques such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and magnetoencephalography (MEG) have made it possible to observe areas of the brain that are activated during the decision-making process. This allows us to identify the neural networks and cognitive mechanisms involved, as well as factors inherent to human beings in their assessment of the options available to them (Armony et al., 2012; Ramos-Argüelles et al., 2009; Maestú, C. et al., 1999).

This paper seeks to critique the neoclassical approach to utility from a neuroscience perspective. Mullainathan and Thaler (2000) point out that people face cognitive limitations inherent to human beings and that considering other components such as psychology reveals how individuals process the information available to them when choosing one of their options. Therefore, the research is divided into four sections, including this introduction. The second section addresses a theoretical framework in which different critiques of the neoclassical concept of utility are contrasted from different theoretical approaches, but not before showing the evolution of the concept of utility within conventional microeconomics. The third section presents how neuroscience challenges the premise of rationality in decision-making by showing the relationship between psychological, social, and cultural factors. Preferences are not defined; they are presented as dynamic patterns that are influenced by emotions, tastes, and cognitive biases that modify the assessment of utility, making it more complex than the neoclassical version. Finally, in the fourth part, the conclusions are presented.

From happiness to the concept of utility: a critique of the traditional concept of utility

Prior to the 19th century, numerous economists were already investigating the concept of happiness. Happiness seems to be a topic unrelated to economics, but it suggests that it is at the heart of this field. The term happiness comes from the Latin *felicitas* or *felitates*, which in turn derives from *felix*, meaning fertile, fruitful, or productive. Happiness is conceived as an emotion that admits pleasure or satisfaction. Finding happiness is a matter for each individual, as what brings joy and well-being to one person may or may not produce the same feelings in another. Therefore, this meaning is subjective (De los Ríos, 2019).

Classical economists were among the first authors interested in addressing human happiness (Rojas, 2009). An approach to this assertion can be found in Smith's *theory of moral sentiments* (1759); in his contribution, he mentions that no matter how selfish human beings may appear, there are elements in their nature that make them interested in the fate of others, as they derive pleasure from witnessing it. Happiness boils down to people's peace of mind and stability. On the one hand, stability is the desired state not only in systems but also for achieving happiness. On the other hand, peace of mind is a principle for achieving pleasure. Agony and pain are not feelings that last over time; individuals become accustomed to unpleasant situations and eventually regain their peace of mind (Smith, 2014).

The notion of happiness as the purpose of being, proposed by Smith and other authors, laid the foundations for Bentham (1789) to develop his theory of utilitaria-

nism. Hence, in economic thought, happiness was replaced by the concept of utility (De los Ríos, 2019). Bentham argues that the right actions are those that tend to generate the greatest amount of happiness for the greatest number of people (Baquero, 2017). Therefore, the morality of an action is judged by its tendency to promote happiness. He appealed to a hedonistic view of happiness, understanding it as the sum of pleasures and the absence of pain. The closer one is to pleasure, then the methods selected to achieve happiness are correct (Murillo, 2022).

Mill (1863), in his work *Utilitarianism*, maintained the premise that utility is identified as happiness, but broadened its definition to include aspects such as personal fulfillment, virtue, and human dignity. He indicates that morality should be judged solely by its utility. People are capable of sacrificing their own good for the good of others. This sacrifice is only desirable if it increases social happiness. Utilitarianism promotes happiness and is the sole objective of human actions (Stuart, 1980). Unlike Bentham, who viewed pleasures as proportional, Mill justified the existence of higher and lower pleasures, understanding that some pleasures are more desirable than others (Genovés, 2004).

It is recognized that Bentham contributed a cardinal measure of utility that enabled interpersonal comparisons. This measure sought to quantify the utility created by an action. However, his position was questioned and replaced by an ordinal conception, highlighting two instruments: indifference curves and the utility function (Andrade, 2010). Utility cannot be measured cardinally; it is only possible to establish an ordinal ranking of preferences. This transition from cardinal to ordinal represented a shift towards subjectivism, moving away from the interpretation of utility as quantifiable happiness (Mayorga, 2010).

Pareto (1929) was interested in the concept of utility and its measurement. In fact, he was one of those who criticized the notion of utility in its cardinal form, suggesting that it is a valuation that depends on each agent. In his approach, utility is related to the observable choices of economic agents, without attempting to measure levels of satisfaction. According to Carreras (1992), Pareto coined the term "ofelimidad." This word expresses a relationship of convenience, allowing one thing to satisfy a need that the economy takes care of. Although Pareto did not use the term directly, it is related to the idea of ordinal utility and revealed preferences (Reyes and Oslund, 2014; Carreras, 1992).

With the theory of revealed preferences, utility was linked to choices and the psychological judgments incorporated into Bentham's perspective were rejected (De los Ríos, 2019). This new approach, reestablished by Samuelson (1947), proposes that consumers can infer a consumption pattern from their behavior in the market (Tenorio-Vilaña and Mideros-Mora, 2022). This theory is supposed to empirically show agents' purchasing decisions, that is, their actual preferences. Individuals have different consumption baskets at their disposal and face different sets of prices and budget constraints (Villacís, 2021).

Even with the transformation that the notion of utility has undergone within microeconomic theory itself, criticism of this conceptualization persists. The microeconomic approach tends to address economic phenomena by focusing on individual

behavior, neglecting social, institutional, political, and cultural factors that affect decision-making. Furthermore, it concentrates on simplifying assumptions that do not adequately reflect the complexity of the real world, much less consider the cognitive limitations inherent in human beings (Arias *et* al., 2013). Thus, the assessments that other authors make of the neoclassical concept of utility stem from the general criticisms made of microeconomics.

A century after the publication of The Theory of Moral Sentiments, Veblen (1899) stated that income level is an important component in increasing happiness. He argued that pleasure increases when more of the same good is consumed, but this is temporary, as humans become accustomed to it and return to normal. He therefore criticizes the hedonistic approach of neoclassical utility, as it reduces human behavior to the pursuit of pleasure. In turn, he shows that individuals are influenced by social, cultural, and institutional factors that are more complex than the simple maximization of utility (Veblen, 2014). According to Veblen, modern societies consume not only to satisfy a need, but also in pursuit of social status and prestige. In this way, he introduced the idea of conspicuous consumption (Alegría and Sánchez, 2017).

Rawls (1971) defines utility as the satisfaction of a desire (Martín, 2010). He argues that a theory, however persuasive it may be, must be rejected if it is not verifiable; acceptance of an erroneous theory implies the absence of a better one. The author's purpose is to question utilitarianism, believing that the traditional concept of utility does not take into account the problems of distribution and justice. Rawls rejected the utilitarian principle of maximizing utility, as it leads to sacrificing the rights and freedoms of some in order to maximize the total utility of society (Caballero, 2006).

For his part, Sen (1979) proposes a capabilities approach that assesses well-being in terms of the real opportunities people have to achieve their desired standard of living. Individuals' happiness depends on what life can offer them. Using an example of distributing a cake to a group of people, Sen mentions that individuals obtain greater well-being when their share of the cake is larger, but at the same time, this utility decreases as they obtain more cake (Sen, 1979; Aránzazu, 1999). Therefore, he mentions that utilitarianism focuses on maximizing utility without paying attention to how it is distributed among society.

Along the same lines, Simon (1955), Kahneman (1979), Tversky (1979), and Thaler (1980) are authors who incorporate psychological traits into their critique of microeconomics. However, they do not seek to break with the contributions of neoclassical theory, but rather to give it reality. Therefore, they abandon the maximizing nature of economic agents. Kahneman and Tversky discovered that the assumption of rationality is affected by cognitive biases, so they both proposed an alternative model to utility theory, namely prospect theory. In it, they demonstrated that people do not comply with the axioms of expected utility theory when making decisions under risk, showing biases such as loss aversion (Kahneman, 1979; Arias, 2016).

Simon's (1955) ideas on bounded rationality and satisfaction, as well as Thaler's (1980) findings on behavioral biases, serve as a basis for questioning the utility maximization assumptions of microeconomic theory. The truth is that these authors did

not publish an article directly focused on the concept of utility. Simon, in his theory of bounded rationality, reveals that the alternatives available to consumers are examined sequentially when making decisions. Human beings face cognitive constraints, as they are not capable of processing all the information available to them. Likewise, for Simon, aspiration levels represent a satisfactory option. People do not pay attention to optimal solutions, but rather focus on finding solutions that are good enough given their time and resource constraints. In fact, Thaler agrees with this idea. Thaler states that preferences are constructed at the moment of decision-making, so agents do not have well-defined preferences. He reiterates that cognitive biases make it impossible to maximize a utility function as assumed by neoclassical theory. (Simon, 1955, 1959; Thaler, 1980; Arias, 2016).

Beyond neoclassical utility

The first assumption considered in microeconomic theory is that economic agents are rational. This assumption indicates that people make rational decisions in order to maximize their utility. Under this conception, the presence of a utility function suggests that individuals have a mechanism that links their objectives to maximizing behavior, where each person orders their alternatives according to their revealed preference. Preferences are subjective valuations that consumers assign to different consumption baskets, which requires that these preferences be complete, reflective, and transitive (Nicholson, 2005; Arias, 2013).

The completeness of preferences implies that an individual possesses all available information about two situations, inferring whether one of these two is preferable or indifferent; it shows that the agent is capable of choosing what they want. The reflexivity of their consumption choices means that each basket is as good as itself, so there will be no failure in their choice. Meanwhile, transitivity expresses that the agent is consistent with their choices; if a choice is their preferred one, it will be transitive over any other (Nicholson, 2005; Pindyck and Rubinfeld, 2011). What is interesting about preferences derives from the behavior of agents in response to changes in prices and income, since, given a series of possibilities, they will choose the one that provides them with the greatest utility (De la Peña, 2015).

The above axioms demonstrate that preferences can be categorized from most desirable to least desirable. Therefore, it quantifies ordinal values in the concept of utility. Mathematically, utility maximization is achieved when the marginal rate of substitution (MRS) is equal to the price ratio of two goods. That is, the slope of the indifference curve intersects with that of the budget line (Nicholson, 2005; Arias, 2013).

Now, the problem with neoclassical rationality is that it conceives of human beings as inherently selfish entities, making it difficult for them to understand concepts such as sympathy, morality, and justice (Arias, 2013). However, to assert the existence of rational individuals with complete information is to ignore human nature, which incorporates emotions into all aspects of life. Research in neuroscience indicates that, contrary to what conventional microeconomics suggests, emotions greatly influence the decision-making process (Pinto, 2022).

The analysis of human behavior has become increasingly important in explaining the decision-making process. Just as science innovates, humans evolve along with their purchasing decisions, tastes, and

preferences; nothing remains constant. This reflects the dynamism of human behavior, which in turn is affected by cultural, social, and economic factors. Decisions are made daily, from what will be done that day to the consideration of every aspect of life. However, emotions are always at play, showing that individuals tend to be more passionate than rational (Salazar, 2011; Sánchez *et* al., 2020).

Lack of willpower shows a lack of rationality and denotes a desire to satisfy needs immediately. Simon (1947) argues that people's rationality depends on the information available, cognitive constraints, and the time they take to make a choice, in: (Pinto, 2022; Arias, 2016; Sánchez et al., 2020). However, individuals are always exposed to advertising and exogenous factors that make them want access to things they would not otherwise need. It is understood that constant exposure to marketing and social pressure can distort people's priorities and lead them to act against their own well-being. There are unconscious emotional factors that, no matter how much one wants to, cannot be controlled. This explains why people sometimes prefer a pizza from a certain franchise, despite its price. This connection evokes feelings that can influence future decision-making. In other words, sensations and stimuli are activated when consuming a good that reinforces preferences, causing people to choose a specific product, beyond their logical and economic considerations (Salazar, 2011; Pinto, 2022).

Neuroimaging techniques such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and magnetoencephalography (MEG) have revolutionized our understanding of the decision-making process by allowing researchers to directly observe brain activity.

On the one hand, fMRI measures changes in cerebral blood flow, allowing researchers to map the regions of the brain that are activated during specific tasks. Studies using this technique reveal that areas such as the prefrontal cortex, particularly the ventromedial and dorsolateral regions, play a key role in risk assessment and the integration of emotional and cognitive information during decision-making (Armony *et* al., 2012; Sarmiento *et al.*, 2017).

On the other hand, EEG and MEG directly measure the electrical activity and magnetic fields generated by neurons, respectively. These techniques allow tracking of neural activation patterns in milliseconds. Both approaches have shown that decision--making involves complex interactions between multiple brain regions, including the prefrontal cortex, parietal cortex, and subcortical structures such as the amygdala and nucleus accumbens (Ramos-Argüelles *et al.*, 2009; Maestú, C. *et al.*, 1999; Sarmiento *et al.*, 2017).

Using these techniques, it has been observed how emotions and cognitive biases participate in brain activity. For example, activity in the amygdala, a key region for emotional processing, is related to the processing of decisions biased by fear or anxiety (Sarmiento *et al.*, 2017). This highlights how emotional state and cognitive biases can affect decision-making.

Conclusions

Microeconomic theory is recognized as having been valuable in the development of new knowledge. It has also enabled the study of economic phenomena from a simple perspective, with the simplification and consideration of postulates such as the ra-

tionality of agents and perfect information. However, it lacks realism by not taking into account the complexities of agents' behavior. People do not always act rationally and lack several postulates dictated by neoclassical theory, such as the search for an optimum.

People lack information, are susceptible to their emotions and their environment, make judgments, and tend to make mistakes. Research in neuroscience reveals that agents' decisions are not governed solely by the pursuit of utility. Rather, such choices are conditioned by contextual factors such as those mentioned above. By understanding the brain processes involved in decision-making, neuroeconomics enables the development of more accurate models that reveal the behavior of agents.

Although the neuroscientific approach to economics is still under development and faces methodological challenges in the analysis of choice, it has gained relevance in recent years. It therefore emerges as a superior proposal to microeconomic theory, which, as it advances, generates a better understanding of the neural and cognitive mechanisms underlying decision-making.

Finally, the pending agenda for this work is to conduct a more exhaustive theoretical analysis of the critiques of the concept of utility. The work only expresses ideas from what different authors stated in their contributions. Therefore, there may be little understanding of them, or they may not fully express the author's notion. Similarly, the field of neuroscience is constantly evolving in economics, so an expansion of what is written in this essay would not be out of place. In addition, there are elements that were not addressed in the work, such as neuromarketing and neuroanatomy, to name a few, which influence people's decision-making processes to a greater or lesser extent.

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