Araştırma Makalesi

The Human Conception of Neuroeconomics: *Homo-Neurobiologicus*[*]

Hüsnü BİLİR[1]

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Abstract: One of the fundamental assumptions of neoclassical economics is the concept of the *homo-æconomicus*. This model assumes that individuals are rational, pursue personal interests, and aim to maximize their utility or profits based on choices determined by external factors. Neuroeconomics, however, challenges this idealized human model and focuses on understanding how people actually behave in the real world. By examining human decision-making processes and behaviors through laboratory studies and field analysis, neuroeconomics seeks to understand the neurobiological processes behind economic decisions. This approach suggests that people make decisions not only based on external factors or rationality but also influenced by emotions, thoughts, and their neurobiological structures. In this context, neuroeconomics points to a completely different nature of humans, contrary to the *homo-æconomicus* model: This human model, whose behavior is influenced by its social and economic nature and its neurobiology, is termed as *homo-neurobiologicus*. In this a person's economic decisions are largely determined by their neurobiological structure. The purpose of this study is to examine the *homo-neurobiologicus* which is the human understanding of neuroeconomics, and to highlight the differences and similarities between it and *homo-æconomicus*.

Keywords: Neuroeconomics, *Homo-Neurobiologicus*, Neoclassical Economics, *Homo-æconomicus*.
JelCodes: B13, B31, B59.

Nöroiktisadın İnsan Anlayışı: Homo-Neurobiologicus

Öz: Neoklasik iktisadın temel varsayımlarından birisi *homo-æconomicus*tur. Rasyonel olduğu, kişisel-çıkarı peşinde koştuğu ve faydasını/kârını maksimize etmeye çalıştığı varsayılan *homo-æconomicus* dışsal olarak veri olan ve belirlenen tercihler temelinde bir seçim durumuyla karşı karşıyadır. Nöroiktisat ise bu idealize edilmiş insan modeline karşı çıkmakta ve insanların gerçek hayatta nasıl davrandıklarını anlamaya odaklanmaktadır. Laboratuvar çalışmaları ve saha analizleri aracılığıyla insanların karar alma süreçlerini ve davranışlarını inceleyerek, ekonomik kararlarının arkasındaki nörobiyolojik süreçleri anlamaya çalışmaktadır. Bu yaklaşım, insanların sadece dışsal faktörler veya rasyonalite üzerinden değil, aynı zamanda duygular, düşünceler ve nörobiyolojik yapıları üzerinden de kararlar aldığını öne sürmektedir. Bu çerçevede nöroiktisat, *homo-æconomicus* modelinden tamamen farklı bir insan doğasına işaret etmektedir: Davranışı, toplumsal ve iktisadi doğasının ve nörobiyolojik yapısının bir sonucu olan bu insan modeli *homo-neurobiologicus* olarak adlandırılmaktadır. Bu modelde, insanın iktisadi kararlarını büyük ölçüde nörobiyolojik yapısı belirlemektedir. Bu çalışmanın amacı nöroiktisadın insan anlayışı olan *homo-neurobiologicus*u incelemek ve *homo-æconomicus* ile arasındaki farklara ve benzerliklere işaret etmektir.

Anahtar Kelimeler: Nöroiktisat, *Homo-Neurobiologicus*, Neoklasik İktisat, *Homo-æconomicus*.
Jel Kodları: B13, B31, B59.

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1. Introduction

The dominant understanding of the discipline of economics, neoclassical economics, is built upon certain assumptions. One of these fundamental assumptions is methodological individualism. Methodological individualism, briefly, emphasizes the importance of individuals and their purposive behavior. In other words, according to methodological individualism, since everything is composed of individuals or aggregates of individuals, analysis should begin with the examination of individuals (Bunge, 2000). Thus, in neoclassical economics, the individual is not only the most common unit but also the fundamental unit and starting point of analysis. The individual actor carries more significance than structural factors, and institutional factors are either treated as external variables that cannot be explained within the model or as outcomes of individual action (Fine and Milonakis, 2014, p. 281).

The most significant complement to methodological individualism has been the assumption of "rationality"; hence, rationality is another fundamental assumption of neoclassical economics (Hodgson, 1988, p. 74). According to neoclassical economists' understanding of rationality, a person is rational to the extent that their choices are consistent with each other. In other words, in neoclassical economics, individuals are rational to the extent that they efficiently use their means to achieve their ends; hence, instrumental rationality is at play. In this context, instrumental rationality, which is based on the fundamental concept of causal connection or means-end relationship, is the most effective way to achieve goals (Bilir, 2017, p. 27).

Therefore, the result of considering methodological individualism and rationality together in neoclassical economics is that all individuals generally maximize something called utility: "(Neoclassical) economics' first principle is that every agent acts only in self-interest" (Edgeworth, 1881, p. 16). Thus, each individual actor pursues self-interest and seeks to maximize expected utility. In this regard, analysis based on individuals striving for utility/profit maximization under perfect information has become one of the fundamental assumptions of neoclassical economics: *homo-æconomicus*.

The purpose of this study is to examine the homo-æconomicus, which is the fundamental assumption of neoclassical economics, in terms of its general characteristics, and to investigate the *homo-neurobiologicus* proposed by neuroeconomics as a critique to this understanding of human behavior. In this context, similarities and differences between these approaches of human behavior will be emphasized.

2. The Basic Features of Homo-æconomicus

Although the attribution of the term homo-æconomicus is a subject of debate in economic literature, its roots can be traced back to Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations (1776)*. However, the concept was first analytically examined by John Stuart Mill in his work *On the Definition of Political Economy; and on the Method of Investigation Proper to it (1836)* and reached its final and complete form in *Principles of Political Economy (1848)*. Additionally, it can be observed that this concept was used as a symbol of Enlightenment philosophy in the writings of other Enlightenment philosophers and economists of the eighteenth century (O'Boyle, 2007, p. 322).

The abstract economic human concept of neoclassical economics is based on Benthamite hedonism, utilitarianism, and the concept of rationality, drawing from Bentham's ideas that "society is a fiction" and "there is no 'social' perspective other than the individual's self-interest" (Hosseini, 1990). Therefore, it is a reductionist attempt to achieve an idealized creature defined only by economic motives -an atomistic billiard ball, a decision-making machine- where economic forces operate and remain fully rational, achieved by eliminating many ethical, religious, altruistic, etc., motives of real human beings.

In this context, the social universe consists of autonomous individuals making independent decisions, each operating in complete isolation (Solo, 1975). Just as in

Newtonian mechanics, the atomized entities of neoclassical economics are entirely independent and respond predictably to forces that affect them without granting any freedom of movement.

Therefore, homo-æconomicus is an economic actor whose basic function as both a consumer and a producer is decision-making (Elahi, 2015, p. 31). Assumed to be rational, pursuing self-interest, and attempting to maximize utility/profit, homo-æconomicus is faced with a choice situation based on externally given and determined preferences. These preferences apply to the goods and services produced, consumed, and exchanged. In this choice process, homo-æconomicus seeks self-interest and is concerned only with individual (or slightly broader household) goods, labor, and leisure; thus, homo-æconomicus is outcome-oriented and considers social interactions only to the extent that they affect their final consumption and welfare. Additionally, homo-æconomicus has time preference, allowing for the distribution of consumption over time in a way that reflects their own welfare and that of future generations (Gintis, 2000).

However, it should be emphasized that in the world where homo-æconomicus makes decisions based on fixed preferences, time and space are merely conceptual categories. Therefore, there is no change in this world, and uncertainty and risk are not present; this allows for decisions based on new information to be instantaneous and costless. In other words, primarily, the assumption of complete and certain knowledge and foresight is made, and hence there is no uncertainty; therefore, once individuals' preference structures are completed, choices are continuous, transitive, and convex (Alter, 1982).

As Nelson (1995) also pointed out, this abstract economic individual has no childhood or old age, is not dependent on anyone, has no responsibility towards anyone other than themselves, is not influenced by their environment; rather, the environment is merely a passive matter in which it exhibits its rationality. The economic individual interacts with society without being influenced by it, and this interaction occurs through the ideal market, where the only form of communication is through prices. Therefore, as emphasized by İnsel (2012, p. 122), when the economic individual exchanges value for the commodity, they are essentially consuming their social relationship, and the sociality of both parties engaged in the exchange thus ceases to exist. Their re-engagement, or the creation of sociality between them, is left to the coincidence of their interests; in other words, the reproduction of social relationships becomes incidental for the economic realm.

In short, in such a world, homo-æconomicus, who makes decisions and choices to maximize their utility, is an independent (atomist), selfish, rational individual who calculates benefits and costs at the margin (Eren, 2011, p. 17; Frantz, 2005, p. 1). This understanding of the individual in neoclassical economics has been subject to intense criticism in the literature (for example, see Veblen, 1899; Hayek, 1937, 1945; Davidson, 1994; Arestis, 1996). One of these criticisms has been directed by neuroeconomics.

3. A New Human Conception: *Homo-Neurobioligucus*

The debates have intensified within the discipline of economics regarding the limitations and shortcomings of economic models based on homo-æconomicus in the 1970's (for example, see Kahneman and Tversky, 1974, 1979; Sen, 1977; Simon, 1978). During this period, economists began conducting experiments and surveys and using computer simulations to uncover how people actually behave and the consequences of real human behavior (Pressman, 2006). Neuroeconomics emerged as one of the research fields resulting from these discussions and criticisms.

It can be described as an interdisciplinary field that transcends the boundaries of economics, psychology, and neuroscience (Rustichini, 2009c). Within this framework, economists and psychologists provide rich conceptual tools for understanding and modeling behavior, while neurologists provide tools to explain the functioning of mechanisms (Glimcher and Rustichini, 2004). Thus, neuroeconomics provides a unified

framework for measuring neuro-psychological activity during the decision-making process, thereby offering a window into human nature (Zak, 2004).

According to Glimcher (2011), the goal of neuroeconomics is to create a unified and integrated theory that combines economic, psychological, and neurological analyses of the decision-making mechanism, and in this regard, "because" models depict the neuroeconomic approach. "Because" theories, or "hard" theories, aim to reveal the origins of behavior, so they not only predict behavior but also describe the logical processes that underlie this behavior, coming quite close to the physical and mental processes that generate it. Therefore, Glimcher (2011) suggests that rather than theories based on "as if" assumptions, a clear mechanism theory, or "because" theory, should be constructed, which can be tested simultaneously with neural, psychological, and economic analyses.

People behave in ways that are far removed from the homo-æconomicus conception of neoclassical economics for neuroeconomists. As Lee (2006) pointed out, real-life decision-making involves routines that approximate optimality, guided by emotions, based on experience, taking into account the decisions of others, and attempting to predict the consequences of alternative actions. In this context, neuroeconomics points to a completely different human nature compared to the homo-æconomicus model: behavior, with its social and economic nature, is described by this model as homo-neurobiologicus (neurobiological human), a result of neurobiology. In this model, a person's thoughts and emotions, decision-making and action-taking, buying and selling, in short, their economic life, are largely determined by their neurobiological structure.

For neuroeconomists, the human brain is the natural center of individual decision-making, and they argue that examining the neural system behind individual decisions will allow for the creation of a correct and original decision mechanism, leading to behavior being predicted accurately and precisely. Contrary to what neoclassical economics claims, according to neuroeconomists, humans do not make decisions solely on a conscious or rational basis. In addition to conscious thought, emotions, intuitions, instincts, habits, and the subconscious play a significant role in decision-making, and neuroeconomic research and experiments reveal which brain regions are activated by these factors during decision-making by imaging the brain.

Studies in neuroeconomics highlight the significant role of the brain's cognitive regions in economic choices involving cost-benefit considerations. However, these decisions are primarily made by older brain regions that mediate emotions, motivation, and interest. Thus, humans are far from being rational actors; on the other hand, they are not systematically irrational either. This is because the brain's resources are limited, and default pathways in the brain lead decisions to be different from similar decisions made previously, manifesting as choice heuristics used during decision-making. Humans may deviate from these shortcuts, but only when the expected reward is sufficiently high. In this context, energy constraints in the brain during the decision-making process result in limited rational choices (Zak and Kugler, 2011).

Therefore, it could be said that humans do not make rational decisions because emotions and intuitions intervene in conscious thought processes according to neuroeconomists. Neurobiological constraints also hinder humans from making rational decisions; neuroeconomists describe the brain as a structure with limited resources. They argue that the brain compares the energy expended during decision-making with the utility gained from the decision, and decisions with higher utility are made within this cost-benefit framework. Thus, for a decision to be made -whether rational or not- it must also pass the cost-benefit test. Consequently, decisions are limited by the biological constraints of the human brain. Therefore, rather than being perfectly rational or irrational, the human brain is "rationally rational," and the model of rational rationality predicts that "good enough" will prevail throughout the decision-making process. Simon refers to this as "satisficing." According to Simon (1986, pp. 209-210), a judgment of whether a certain behavior is "rational" or "logical" can only be reached by considering the behavior within the context of a set of precursors or "data." These data include numerical

tools accessible to determine the situation in which the behavior occurs, the goal reached, and how to achieve the goals. In this regard, while (neoclassical) economics treats human behavior as rational, psychology deals with both the rational and irrational aspects of behavior.

Unless the expected benefit or cost is very high, rational rationality uses memory of similar situations to serve as beliefs to guide decisions. Belief-based decisions do not utilize all cognitive resources to analyze accessible options (Sapra and Zak, 2010). In other words, the phenomenon where individuals use their limited cognitive resources only when the expected reward offsets the cognitive cost of the decision-making process is called "rational rationality" (Vercoe and Zak, 2010).

On the other hand, according to Glimcher (2009), psychological and neurological research shows that the motivation and drive to take action are not always associated with hedonistic outcomes, contrary to what neoclassical economists assume. For example, Camerer and Fehr (2006), who examine under what circumstances social behavior dominates homo-æconomicus, argue that strategic incentives play a crucial role. They suggest that a minority of selfish individuals could lead to a "noncooperative" outcome if their behavior incentivizes imitation by the majority of altruistic individuals. Conversely, if the behavior of the altruistic minority incentivizes cooperation from the selfish majority, it could lead to a "cooperative" outcome. In social choices, brain activity measured while participants make strategic choices shows that cooperation is encoded in the same way as basic rewards like food.

Additionally, these factors can also prevent individuals from solely acting on self-interest and can lead to altruistic and pro-social behaviors. Therefore, the understanding of individuals solely driven by self-interest and striving to maximize their utility, as assumed by neoclassical economics, falls short; in the light of neuroeconomic research, this ideal understanding of homo-æconomicus is replaced by homo-neurobiologicus. The decision-making, behavior, and actions of this neuroeconomic individual are analyzed on a neurobiological basis, through the brain and neural systems. Moreover, neuroeconomists, who claim to provide new insights into the decision-making process or choice behavior of humans -on a neurological and neurobiological basis- through brain imaging techniques and controlled experiments, also argue that a more holistic understanding of how humans make choices will enable them to make better decisions.

4. Criticisms of Neuroeconomics to the Human Conception of Neoclassical Economics

The field of neuroeconomic research provides a more detailed analysis of how the elements of an individual -brain regions, cognitive control, and neural circuits- interact and communicate to determine individual behavior, as opposed to the single-minded, profit-maximizing individual construct of homo-æconomicus favored by neoclassical economics. Does this critique of the homo-æconomicus understanding of neoclassical economics, in favor of homo-neurobiologicus, point towards a more realistic and social analysis for economics? To answer this question, we need to examine the criticisms of neuroeconomics.

The "individual" model of neoclassical economics, homo-æconomicus, acts in the market through the price mechanism, with the sole aim of maximizing utility, and this individual behaves rationally. According to neuroeconomists, however, this approach is flawed; humans do not make rational decisions, and the primary reason for humans not making rational decisions is that they have cognitive constraints. Therefore, rationality must be limited in the sense that decisions are made within the biological constraints of the human brain. According to this approach, the cost of fully evaluating each option outweighs the benefit; that is, because the human brain does not have the cognitive capacity to evaluate all options, humans do not make rational decisions. However, contrary to what the neuroeconomic approach suggests, a human is more than the sum of their neurons (Ross, 2007). As Sacks (1997, p. 51) pointed out, humans are not just brains

or memories; they also have emotions, willpower, sensitivities, and conscience. Each individual has a different mental world, inner journeys, and unique characteristics. At this point, neuroeconomics, which claims to "observe" and "measure" factors such as emotions and thoughts, also emphasizes that another reason for individuals not making rational decisions is that humans do not make decisions based solely on conscious thought. According to this view, emotions, intuition, and instincts also intervene in the decision-making process, leading individuals to "deviate" from rational choice. Thus, when an individual makes a decision based on emotions, intuition, or against their self-interest and in favor of altruism or society, this decision is labeled "irrational." However, even here, the concept of rationality is analyzed only within the context of means-end rationality, without considering its social and cultural context, and decisions that do not lead to outcomes aligned with self-interest are not considered rational (Bilir, 2017, pp. 173-174).

In summary, neuroeconomists criticize the exclusion of unobservable and unmeasurable phenomena in neoclassical economics, but at the same time, they seek to expand the scope of neoclassical economics by observing and measuring mental phenomena such as emotions and thoughts, which are considered unobservable or unmeasurable within the context of neoclassical economics, in laboratory settings. Thus, neuroeconomics does not reject rational choice theory; instead, by observing variables considered inherently unobservable in rational choice theory, neuroeconomics seeks to explore the potential for expanding the scope of rational choice theory (Bilir, 2017, pp. 169-171).

Homo-neurobiologicus represents an individual whose emotions, thoughts, decisions, and actions are determined by their cognitive capacity and neurobiological structure. Therefore, neuroeconomics constructs its critique of homo-æconomicus based on an individual analyzed in a laboratory setting, even down to the individual's brain, neural structure, and cognitive capacity, and suggests that even a person's emotions and thoughts are determined by their neurobiological structure. In this context, as emphasized by Elster (2008), individual preferences and plans are fundamentally social. Firstly, humans live in a complex society built on cooperation; economic relations are based on numerous collaborations (Rankin, 2011). According to Granovetter (1992), economic action is embedded in a network of social relations; economic action pursues both economic and non-economic goals, and economic institutions are socially constructed. However, as Ormerod (1994) points out, individual behavior does not occur in isolation; instead, the behaviors of other individuals affect individual behavior. This mutual relationship continues, and human behavior is too complex to be understood from a mechanical perspective.

Indeed, humans exist within a social context, and this social aspect of individuals reflects on the outcomes of their behavior. Society changes, and since preferences are socially influenced and affect the general values of society, individuals must somehow take this into account when making decisions. In this framework, individual behavior can be influenced by cultural factors, prevailing moral standards, social traditions or duties, habits, and herd behavior, among other things. Because individuals both exist within and are shaped by society, there is no clear distinction between an individual's personal world and the social world; these two are deeply intertwined in every aspect and meaning. The reason why individuals have certain types of behavior based on various attitudes, thoughts, beliefs, and knowledge about the world is that they experience social processes embedded in their culture, which they have been part of since the beginning of their lives. Therefore, mental processes do not constitute the source and cause of human behavior in the world; rather, the source and cause of what emerges in the human mind are the behaviors in this world (Bilir, 2017, pp. 183-184).

In short, no objective knowledge of human nature can reduce humans to a function of neural events; these events occur as a mutual part of our culture, life processes, and mental life. As a natural consequence of being a social being, the human brain is also a social organ; therefore, the human brain cannot be conceived outside of socialization and

culture. It can be said that every human brain is unique and shaped and transformed by social and cultural factors. Since the brain, which has the potential to establish connections with each other's cells in infinite combinations, comes into the world with an unlimited detailed organizational pattern, its intricate organization is shaped (literally) by the environment it finds itself in (Bilir, 2017, p. 186). Therefore, "the brain is, above all, a 'moldable' structure, sensitive to environmental factors" (Camerer, 2007). Park and Zak (2007) also emphasize that the environment, life history, genes, and even matters such as whether a person has eaten meat recently all affect brain function.

Additionally, we cannot claim that the criticisms raised by neuroeconomists are original, as these criticisms have been expressed in the history of economic thought before neuroeconomics emerged. The idea that emotions and intuitions play a role in human behavior and that the human brain operates according to a dual system was not first articulated by neuroeconomics. Throughout the history of economic thought, starting with pioneers of neoclassical economics like Léon Walras and Alfred Marshall, thinkers such as Carl Menger, Thorstein B. Veblen, Friedrich August von Hayek, and Paul Davidson, as well as various economic schools, have emphasized the role of emotions and intuitions in human decisions and questioned whether humans can behave rationally[1]. For example, according to Marshall (1890), the decision-making process of humans is not solely based on conscious thought; habits, senses, intuitions, sympathy, and empathy also influence choice behavior.

Moreover, the idea that humans do not always make decisions through lengthy deliberation has been emphasized in psychology literature as well. For instance, according to Freudian theory, humans are not the masters of their own minds; the consciousness they perceive as themselves is actually under the strong influence of the unconscious, which controls much of the mind beyond their awareness, and sometimes consciousness is the slave of the unconscious. Similarly, according to Libet (1993), a cerebral activity lasting 0.5 seconds must occur before a conscious experience; thus, the world is perceived with a delay. This indicates that mental processes pass through the unconscious before becoming conscious.

Furthermore, it can be argued that behavioral economics, much like neuroeconomics, systematically presents these elements and provides findings on brain function through observations and experiments. For example, studies in behavioral economics have advanced the idea that the human brain operates according to a dual system and that emotions, intuitions, instincts, and feelings influence human decisions, often overriding rational decision-making. Therefore, it can be said that the findings and claims of neuroeconomics on this matter are already present in the economics literature.

Another point that needs to be addressed regarding neuroeconomic research is the extent to which the results obtained from experiments and studies reflect the economic decisions of individuals in their daily lives. As Levitt and List (2008) pointed out, experiments conducted in the laboratory are not the same as real market conditions, and individuals may behave differently depending on whether they are part of an experiment or real actors. On the other hand, as emphasized by Kahneman (2015, pp. 261-262), unnoticed stimuli in their environment have significant effects on people's thoughts and actions, and these effects fluctuate moment by moment; since people do not have direct knowledge of what is happening in their minds, they can never perceive that they make different judgments or decisions when conditions change slightly. Therefore, assuming that an individual who makes choices in a laboratory experiment, being aware that they are participating in an experiment isolated from environmental conditions that affect their mind/brain, would make the same choice in society, where they live and where their choices, behaviors, and actions are filtered and conditioned through certain rules, norms, and patterns, would be an oversimplification.

[1] In this context, the critiques directed at the assumption of rationality in neoclassical economics by various schools of economics see. Menger, 1871; Veblen, 1899; Hayek, 1937, 1945; Schutz, 1943; Davidson, 1994; Arestis, 1996.

5. Conclusion

In conclusion, neuroeconomics has reached quite exciting and enlightening results regarding the decision-making process of humans through experiments and observations. Therefore, more studies need to be conducted in the field of neuroeconomics, which has not been sufficiently researched in Turkey. However, it's safe to say that neuroeconomics is one of the representatives of neoclassical economics in the history of economic thought. Because firstly, in both approaches, there is a tendency to focus on economic "decision units" by disregarding social, cultural, and historical factors, or by excluding factors like ethnicity, race, gender, and identity. These economic units -such as the *homo-æconomicus* model in neoclassical economics and the *homo-neurobiologicus* model in neuroeconomics- who operate under certain models are analyzed based on their decisions, behaviors, choices, and preferences. In this context, while neuroeconomics claims to critique the homo-æconomicus model of neoclassical economics, it operates under the assumption that decisions are made based on neurobiological structures, without considering the social, cultural, historical, and environmental factors that shape these structures.

Secondly, criticisms of the neoclassical economic model's fundamental elements -such as rationality and self-interest assumptions- in neuroeconomics also remain limited. Because in the examination of rationality and self-interest, neuroeconomics also conducts an individual-based analysis, often focusing specifically on the person's brain and neural structure. Based on the assumptions that humans are rational and that their sole aim is to pursue personal gain, decisions that do not achieve this goal are considered "irrational." According to neuroeconomists, the reasons why people may fail to make rational decisions include cognitive constraints and the influence of factors such as emotions, intuition, and instincts on the decision-making process.

In this context, neuroeconomics is the re-expression and reinforcement of criticisms previously voiced in the history of economic thought with new methods and techniques. In this regard, as noted by Boettke et al. (2008), what has changed over the past two centuries is not the meaning and principles of economics but the application of economic principles. However, it should be noted that, like the homo-æconomicus approach, neuroeconomics' homo-neurobiologicus proposal is not sufficiently explanatory in addressing the mutual relationship between individuals and society.

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