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Introduction

The subject of this book is the "nudge." If we want to discuss the procedure of a nudge, then we are talking about nudging. The concept of the nudge is relatively new (see Thaler and Sunstein, 2008), although it finds application in various areas of social life. The key to the concept is the idea that the appropriate nudge can influence a person's behavior by encouraging them to re-evaluate their priorities in a way that they voluntarily change their behavior, thereby bringing them personal and social benefits. One of the most important areas of modern society where nudging finds use is healthcare.

This publication examines nudging in relation to selected health policy issues such as preventing obesity, malnutrition, and type 2 diabetes. These diseases are obvious, complex social problems that affect the health of the entire population, public expenditures on health care (see e.g., Maaytová, 2012; Maaytová, Gajdošová, and Láchová, 2018; Medveď, Nemec, and Vitek, 2005; Mertl, 2015), and the cost-effectiveness of such expenditures (Vrabková and Vaňková, 2015; Mertl, 2016). They can also affect the government's tax structure (Klazar, 2010; Mertl, 2012; Mertl, 2013).

These health issues have multiple impacts. Take the case of obesity, which poses a serious challenge to public health policy. Reducing obesity levels in population can certainly be affected by nudges. Obesity can lead to a number of serious and potentially life-threatening conditions, such as type 2 diabetes, high blood pressure, coronary heart disease, various cancers, and strokes. Obesity can also affect a person's quality of life and lead to social and psychological problems such as social ex-

clusion, isolation, depression, and low self-esteem.[1] A rational person is able to acknowledge the benefits of adhering to the principles of a healthy lifestyle and the consequences of violating them. However, the puzzling question arises as to why the incidence of civilization diseases in the Czech Republic, including type 2 diabetes mellitus, is growing. Why do we see a discrepancy between the ontological side of the problem (real human behavior) and the behavior of the theoretical *Homo economicus* axiom, when we expect people to act purely rationally based on *Homo economicus* rationality.

From the perspective of the *Homo economicus* axiom, which dominates mainstream economics, it seems self-contradictory that people generally know that obesity is detrimental to them, and yet in reality they do not behave as the economic behavior theory based on the *Homo economicus* axiom predicts. Speaking philosophically and methodologically, the relationship between substance and phenomenon lies behind this discrepancy. As it turns out the economic model of individual's rational based on the *Homo economicus* axiom fails to properly explain the discrepancy between reality and expected outcomes. With this in mind, we have set the following objectives:

Examine the ontological and epistemological foundations of human behavior based on the notion of *Homo economicus*.

1 As numerous publications show (See e.g., Rybka, 2007; Svačina, 2010), obesity is one of the factors leading to the development of type 2 diabetes. Almost a tenth of the Czech population (more than 900,000 inhabitants) suffers from diabetes mellitus. The vast majority of cases are type 2, an incurable, lifelong, metabolic disease. In patients with type 1 diabetes, insulin is absent. Not only diabetes harms the individual, but also the society as a whole. According to expert studies, the disease shortens life expectancy by 30 to 50% depending on the type (Rybka, 2007). The risk of developing type 2 diabetes is more than 50% for children of a type 2 diabetic and nearly 100% if both parents have type 2 diabetes. At the same time, it is alarming that every year about 60,000 people in the Czech Republic are diagnosed with diabetes, and about 22,000 patients a year die of this disease. (See EUROZPRÁVY, 2020: Kolik bude za deset let v ČR diabetiků? Asociace prozradila víc. [How many diabetics will there be in the Czech Republic in ten years? The association revealed more.] Source: https://eurozpravy.cz/domaci/zivot/kolik-bude-za-deset-let-v-cr-diabetiku-asociace-prozradila-vic.fe05294c/ (downloaded on March 2, 2021). The rate of adult obesity in the Czech Republic is one of the highest in the EU and has increased by more than 30% over the last 15 years. About 20% of Czech adults are obese; well above the EU average of 15%. (See https://ec.europa.eu/health/sites/health/files/state/docs/2019_chp_cs_czech.pdf). Only about 61% of Czech adults engage in at least light physical activity each week, less than the EU average (72%). The rate of overweight and obesity in children is increasing. About 17.5% of 15-year-olds are overweight or obese (see https://ec.europa.eu/health/sites/health/files/state/docs/2019_chp_cs_czech.pdf). The government could improve this situation with an appropriate "nudging" policy.

Explore the theoretical and methodological basis of the nudge and define nudging in terms of contemporary scientific discourse.

Define the nudging tools in the paradigm of prospect theory using content analysis of the literature and examine their use in health policy setting, with an emphasis on diabetology. In doing so, conduct a systematic review of the literature on nudging as it relates to healthy eating.

With these objectives in mind, we pose three research questions:

Research Question 1: What are the epistemological foundations of the concept of human behavior based on the notion of the *Homo economicus* axiom and what are the theoretical and empirical foundations of nudging?

Research Question 2: What are the differences in the paradigm explaining human behavior of classical economic theory and prospect theory?

Research question 3: What health policy tools can be used for food nudging and how is nudging reflected in contemporary scientific discourse? What do the research conclusions mean for public health policy?

Apart from general scientific methods we used content analysis of the scientific discourse focused on the nudge found in the literature and a specification method for defining the elements of nudging in healthcare (specifically, in diabetology). The result is a systematic review of the literature, contained in the third and fourth chapters of this book.

The main contribution of this book is that it provides an analytical-systematic view of the current state of scientific discourse on the nudge published in scientific journals indexed in the Web of Science and Scopus databases. It clarifies and compares the theoretical and methodological basis of two basic concepts that are used to explain human behavior, namely the concept of *Homo economicus* and the prospect theory of the nudge. From a comparison of the two theories, we formulated conclusions that provide stimuli for further scientific research. The book also has practical benefits: it will provide help in the public policy formulation process (especially health policy) because it analyzes the effectiveness of various tools (nudges) in the field of health care. Based on analysis of individual nudges, it makes general observations and provides recommendations for public policy.

1. Human Behavior in the Traditional Paradigm

1.1 Defining "Human Behavior"

Human behavior is a social phenomenon. We understand human beings as actors responding to stimuli in their social and other environments. In general, their actions can be both intentional (i.e., targeted) and can be unintended (unplanned). We see that these are two different methodological approaches. In our publication, we will present the concept of human behavior based on behavioral economics, and we will consider the impact of Kahneman's concepts of "fast" and "slow" thinking (Kahneman, 2011) on Thaler's and Sunstein's concept of the nudge (Thaler and Sunstein, 2008). We are of the opinion that human actions can be both intentional and unintentional (instinctively conditioned). However, human behavior, as a whole, is a mix of actions (intended and unintended) that manifesting themselves as a reaction to external stimuli and serve as feedback to the stimulus source.

From an ontological point of view, human behavior is a complex phenomenon. The complexity is reflected in the diversity of the approaches of individual scientific disciplines to its study. Scientific disciplines—such as cybernetics, psychology, and economics—offer various perspectives. From the cybernetics point of view, human behavior is feedback on certain stimuli in the environment (Wiener, Ashby). From a psychological-behavioralist point of view, human behavior is operantly conditioned (Skinner), that is, actions and reactions are conditioned by exposure to environmental stimuli. However, neither psychology nor economics completely agree on the basis of human behavior. Freud's deep psychology offers yet another completely different psychological view of human behavior. For an overview of these different psychological views, see, for example, Hunt (2007).

The economic theory of human behavior is crucial for our research because the concept of nudging originates in economic science influenced by experimental psychology. Ludwig von Mises's voluminous book, *Human Action* (Mises, 1998), which deals specifically with human behavior, is of a great importance to the economic conception of human behavior. Mises created the praxeological theory of human behavior. He relied on the tradition of classical rationalism based on the work of René Descartes. Classical rationalism is characteristic of mainstream economic theory, where the key axiom is that human beings are in reality a species of *Homo economicus*: rational beings who pursue their own interests (Mises, 1998). Mises believed that economics deals with purely rational actors and that human behavior is necessarily rational.

Mises insists that human action involves making a choice and that the choice is a rational one at heart. According to Mises, human behavior "comes from the same source as human thought," and can be described using praxeology. To him, the theories of praxeological reasoning are not only perfect and irrefutable but are in fact mathematical. They predict the reality of action as it appears in life and history with the full rigor of their apodictic (self-evident) certainty and irrefutability. Praxeology offers accurate and precise knowledge of real things. The starting point of praxeology is not the choice of axioms and the decision about methods of procedure, but rather reflection about the essence of action.

Mises criticized the naturalistic view of human behavior. His view is a critique of the naturalistic behavioral traditions of Wundt and Skinner, as recorded in the history of psychology (see, for example, Hunt, 2007). Mises is critical of naturalism and of authors who are eager to construct an epistemological system of the sciences of human action according to the pattern of the natural sciences. He vehemently rejects this approach, known as "social physics" (Neurath).

Mises considers the science of human behavior to be aprioristic (based on self-evident principles) and not empirical. His beliefs are based on Kant's aprioristic concepts, judgments that cannot be verified in any way. The subject of praxeology is therefore the study of human behavior as such. Praxeology provides us with formal knowledge of human behavior. The statements and conclusions of praxeology cannot be verified or refuted. Mises concludes that no experiments can be performed in the field of human behavior. His conclusion that praxeology is impossible to verify has been criticized by positivists. Karl Popper disputed that its tenets are impossible to refute.

However, we think that both mainstream economics and Mises's conception of human behavior have similar ontological and epistemological starting points: Cartesian rationalism and Cartesian epistemology.

1.2 Human Behavior from the Perspective of the *Homo economicus* Axiom, Cartesian rationalism, and Epistemology

When mainstream economics was taking shape, its leading figures decided to model economics after physics—in particular, Newtonian physics. Newtonian physics explains the mechanical behavior of macroscopic bodies moving at speeds close to zero, speeds that are negligible compared to the speed of light. Metaphorically speaking, the ontological object in Newtonian physics is the world that we encounter as people on day-to-day basis.

From an epistemological point of view, Newtonian physics is based on classical rationalism, i.e., the Cartesian type of rationalism, established by René Descartes in *Rules for the Direction of the Mind*. Cartesian rationalism is based on the idea that firm conclusions can be drawn using logic, working from explicitly defined premises. Using Descartes' method we can build an axiom-based deductive theory. An axiom is an a priori valid thesis and does not need to be proved. Axioms must be internally indisputable and independent. That means that in a given system there cannot be axioms contradicting each other and that it cannot be possible to derive an axiom from another axiom or axioms. From the point of view of scientific laws, axioms can be considered laws that are not otherwise derived in the logical system. However, it is possible to derive theorems from axioms. Theorems are laws that are derived within a system. A theory created this way is an axiomatic theory, a formal theory requiring a formal proof in order to demonstrate its validity. This method and its procedures are characteristic of mathematical theories (see Hilbert's calculus).

The principles of axiomatic-deductive theory are applicable in many scientific disciplines. One of the axioms of classical economics is the idea that humans are *Homo economicus*, meaning that a human actor is a perfectly rational individual possessing perfect knowledge, making rational decisions with the intent to maximize personal gains, and minimizing losses (costs). In mainstream economics, the axiom of *Homo economicus* is the starting point for explaining human behavior. In the logic of Car-

tesian rationalism, human action is purely rational activity. Assuming human beings are *Homo economicus*, it is possible to explain an actor's action rationally. In reality, however, the assumption of rationality leads to trouble. If we were to agree with the Cartesian way of thinking, rational action requires perfect knowledge of all relevant facts. That would be only possible with knowing all the given circumstances of initial premises apply, for so long as those conditions remain unchanged. That is impossible in reality for two reasons: ontological and epistemological.

From an ontological point of view, the vast majority of systems, including human society (and therefore the economy), are dynamic systems. Dynamic systems are characterized by the following ontological features: instability, imbalance, irreversibility, and nonlinearity of developmental trajectories. Dynamic systems change over time and tend to be unstable. Examples of dynamic systems are economic cycles and the unpredictable (or difficult to predict) behavior of financial markets, as well as the spread of pandemic diseases.

From an epistemological point of view, the behavior of complex systems cannot be explained using Cartesian epistemology. Only those who believe in the omnipotence of the Enlightenment would think that dynamic systems can be as reliably managed as deterministic systems and that epistemology is fundamentally wrong. To understand the behavior of dynamic systems, it is necessary to turn away from Cartesian epistemology and move on to non-Cartesian epistemology. The Newtonian paradigm, based on mechanical determinism, breaks down the boundaries of mechanics. It cannot be used to study dynamic social systems without the risk of oversimplification. Newton's paradigm presupposes that the world (and society as a subsystem of it) is by nature a system that naturally oscillates around a state of equilibrium. This idea echoes in mainstream economics with Adam Smith's "invisible hand." Walras's idea of general equilibrium was also inspired by Newtonian mechanics and the idea of "systemic equilibrium."

One characteristic of non-dynamic systems is that we can rationally predict their state at any time. This is because coincidences do not significantly interfere with the causal chain in such a system. Changes in a non-dynamic system can be reliably predicted because predictions are based on deterministic (strictly given) causality. The explanatory paradigm of non-dynamic systems considers nonlinearity and instability to be randomly distributed phenomena. They are the result of noise and transients. Malfunctions in the functioning of a non-dynamic system are considered natural, occurring in the long-term, otherwise essentially bal-

anced evolutionary development. For example, the economic theory of business cycles relies on the idea that periodic changes in variables lead to a change in the cycles of the economic system. A chaos is a random phenomenon, because it is a failure without a cause in the particular system. The malfunctions are therefore the result of dysfunction at the epistemological level, such as improper regulation.

The primary causes of instability in dynamic systems are not found at the epistemological level, but in the very nature of these systems. If we do not realize this, we will fall victim to the illusion that this instability can be prevented by simply correcting or improving regulations, enhancing information flows, and eliminating the effects of chance occurrences. However, coincidence and its effect on the stability of dynamic systems cannot be eradicated. We can only acknowledge that even a slight coincidence (e.g., the butterfly effect, Lorenz) can destabilize the system and lead to its bifurcation (i.e., splitting and disintegrating). With respect to dynamic systems, a mechanical-deterministic worldview must be replaced by a different theory, the evolutionism, which can explain the influence of a chance on developments.

We do not mean to reject the idea of *Homo economicus* in the economic and social sciences in its entirety. We should only keep in mind that the models and theories based on this axiom have limitations and are built on particular assumptions. One of the key assumptions, in addition to the a priori rationality of behavior, is that economic actors have perfect information (Meričková Mikušová, Jakuš Muthová, 2019). The difficulty with this assumption was noticed by Herbert Simon, who formulated the concept of bounded rationality. He noticed that the theory of humans as *Homo economicus* is unrealistic. Cartesian rationalism cannot fully explain human behavior and its consequences. Essentially, the Cartesian type of rationality can be used successfully in cases where the premises and conditions remain unchanged (Ochrana, 1998); sufficient in the context of Newtonian physics and Euclidean geometry, but it no longer in the context of Einsteinian physics and Riemannian geometry. Likewise, it can be said that the Cartesian type of rationality can support economic theories based on *Homo economicus*, but it cannot account for "non-rational" factors affecting human actions. The response to this insufficiency was the emergence of behavioral economics and the concept of the nudge.

2. Nudges and Nudging

2.1 Behavioral Economics and Prospect Theory: The Theoretical and Methodological Bases of the Concept of the Nudge

Paradigms are crucial in science (Kuhn, 1970). According to Kuhn, a paradigm is a generally accepted result of scientific research, which in a given community of experts at a given time represents both a model of a problem and a model for its solution. A paradigm is thus a way of solving a given scientific problem. According to Kuhn, a scientific revolution entails a paradigm shift. The initiation of a scientific revolution occurs when an anomaly emerges (Kuhn, 1970), that is, when a new phenomenon cannot be explained using the current paradigm. Such an anomaly was recorded by Preston and Baratta (1948) during their experiments with the behavior of people at auctions under conditions of uncertainty. They concluded from their experiments that people overestimate low probabilities and underestimate high probabilities. This led them to doubt whether the existence of *Homo economicus* was axiomatic. A new explanatory paradigm began to emerge, currently known as behavioral economics. If neoclassical economics based its theories on the assumption of "pure" rationality, behavioral economics takes into account other psychological factors that influence human behavior. Human behavior began to be perceived as a series of complex choices (Baláž, 2014) that are accompanied by risk and uncertainty (Baláž, 2009). With his concept of bounded rationality, Simon (1947) pointed out the need for a new non-economic approach to the choices an actor makes.

The pioneering papers that brought this new paradigm to economic science were the publications by Daniel Kahneman and Amos Tversky

(Kahneman and Tversky, 1979, 1984; Tversky and Kahneman, 1974, 1992) and their collaborators (Fox, Kochler, Riepe, Slovic, and others). Their experiments with decision-making under conditions of uncertainty and with choices between the present and the future have shown that the behavior of *Homo economicus* is not purely rational. Their psychology experiments aiming to examine people's behavior led them to create the "prospect theory" (Kahneman and Tversky, 1979).

Based on their experiments, Kahneman and Tversky concluded that people value a positive benefit differently in monetary terms than they do a deprivation of the same benefit. This is in stark contrast to the axiom of *Homo economicus*, to which Neumann and von Morgenstern's theories of the behavior of a rational actor should apply (Neumann and von Morgenstern, 1944).

Kahneman and Tversky research subjects were introduced to games with either a positive or a negative prospect of success. They found that their subjects' preferences in games where the prospect was negative were mirroring their preferences in those with positive prospectuses. Changing the sign of the prospectus significantly changed the order of the subjects' preferences when making decisions. Kahneman and Tversky (1979) proved this by dividing the answers by the positive and negative prospectuses. They called their subjects' change in risk preference a "reflection effect."

To provide an example of their methodology: When a win was in principle possible, but unlikely, people chose to play a game with a potentially larger prize. If the same game were offered, but with negative prospects of winning, their preferences were the mirror image of their preferences in games with positive prospects. This outcome was inconsistent with the assumption that the subjects would choose rationally, as dictated by the *Homo economicus* axiom. Thus, prospect theory was a way to deal with the discovery of a "Kuhn anomaly," a violation of paradigm-induced expectations, during scientific research. Prospect theory does not entirely dismiss the idea of *Homo economicus*, but it does cast doubt upon its absolute validity. The fact that we can reach different conclusions by applying different theories to an economic phenomenon reflects the new spirit of science as defined by Bachelard (1999). The new scientific picture of the world is based on a neorealistic way of thinking. The absolutes of science are replaced by relative, probabilistic statements. Absolute theorems are no longer universally valid. A new scientific truth is born, a truth reflected in relative statements. Classical rationality falls apart and new rationality arises, its content being an epistemological rev-