



Behavioral economics and the nature of neoclassical paradigm

Lorenzo Esposito¹ · Giuseppe Mastromatteo²

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Abstract

Psychological observations are by now well integrated into economics, especially in the theory of finance, as can also be seen in the Nobel Prize awarded to Thaler. On the contrary, Simon's attempt to reforge economic theory on the paradigm of bounded rationality failed. Starting from the birth of the neoclassical paradigm, we'll describe the attempt to give it psychological foundations with a direct measurement of utility, then the axiomatic turn of the paradigm and its first anomalies. We'll then sum up the debate on rationality, taking place in the group of economists led by Simon, which brought to the rational expectations hypothesis. Finally, we'll discuss the development of behavioral economics and its progressive acceptance in economic theory. This historical reconstruction allows us to understand the actual hard core of the neoclassical paradigm and the growing need of the paradigm for practical flexibility that determines how to choose arguments, methods and evidence that can be useful to its development, including psychological ones.

Keywords Simon · Bounded rationality · Behavioral economics · Rational expectations · Expected utility theory

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✉ Lorenzo Esposito
lorenzo.esposito@unicatt.it

¹ Bank of Italy, and Economic Policy Department, Università Cattolica del Sacro Cuore, Milan, Italy

² Economic Policy Department, Università Cattolica del Sacro Cuore, Milan, Italy

1 Introduction: Psychological biases as imperfections of last resort

In the last decades we have seen a flourishing of psychological explanations of economic facts, although the import of psychological explanation into economics is very old. In fact, “Interest in psychological aspects of choice was evident over two centuries ago in the work of Adam Smith” (Earl, 2005), and this influence was also at the origin of the creation of the neoclassical paradigm, while the last wave of import was connected to the financial collapse of 2008 and the need to delve into its determinants.

Kuhn and Lakatos have underlined that the core principles of a theory are not really subjected to empirical tests. However, it is not easy to identify what Lakatos called the “hard core” of a research program (or a paradigm in Kuhn’s definition, Kuhn 1962), and different authors have proposed different hard cores.

In this work we’ll analyze a number of theoretical turns of the neoclassical paradigm, showing how psychological import has been accepted insomuch as it was deemed useful to strengthen it. Of course, this mechanism is very common: normal science, the core of scientific development, is based on the fact that scientists are eager to select what is useful for the progress of the paradigm. However, differences can arise on the nature of the paradigm’s anomalies: the deepening of some of them can enrich the paradigm, an activity that Kuhn assimilated to puzzle solving, while others can undermine it; during a scientific dispute, detecting what anomaly can be used to improve the paradigm is indeed the best way to understand the hard core of the paradigm. A scientific community part of the same paradigm could disagree on these issues, and the good and the bad anomalies vis à vis the development of the paradigm will be clear only post factum, this implying the marginalization of the theories connected to the latter. We use Simon’s bounded rationality (BR) as an example of this process because it underlines that the acceptance or dismissal of an anomaly is not connected to its content per se but to its professional consequences, enlightening what is most important in a paradigm: its existence as the basis of a profession.

In other words, our main point, as far as the development of the paradigm is concerned, is that the possibility of anomalies and, consequently, of new theories to be accepted as part of the paradigm does not reside mainly in how much they differ from the dominant version of the paradigm: heretical interpretations that solve an anomaly are welcome. What is not acceptable, regardless of the differences in the assumptions or conclusions of the theories from the mainstream paradigm, is a theory that proposes the *abolition* of a separate paradigm for that science: no scientist would accept a theory that produces the end of their profession. This is what condemned Simon to isolation in economics. Behavioral economists proposed a different version of the paradigm and, as such, they were accepted as economists although criticized by rival theoretical strands.

The bulk of modern economics is a collection of models and theories that are different varieties of the neoclassical paradigm, the only ones that represent the modern market economy, albeit in a peculiar way. In fact, the mainstream economic paradigm has been built on a double standard. On the one hand, theoretical core assumptions, basically the same since the works of Arrow and Debreu, exclude crises, financial bubbles, social inequality and other sad occurrences. On the other, most neoclassical economists know that these assumptions are very restrictive and such facts are

common; so, to square the circle, they introduce *imperfections*. These things happen because the economy has imperfections, such as minimum wage, progressive taxation, financial regulation and all the constraints that do not allow markets to reach the best outcome, operating freely.

This set up preserves the general *laissez faire* orientation of the paradigm without precluding any concrete measure to tackle real problems, while, on the theoretical side, explaining the same real problems using imperfections, a behavior in line with Kuhn's description of how a scientific paradigm develops. However, the 2008 crisis was so strong, forcing retreats on so many fronts, for instance in financial deregulation and fiscal policies, that to save the paradigm an entire array of new imperfections was needed. The importance of financial issues made behavioral economics (BE) the most promising candidate to the role. Psychological explanations were not new: when the neoclassical paradigm was created, it was based on the idea that utility could be interpreted, and hence measured, using psychology. When this project failed, economists retrenched towards formalization using the "as if" epistemological stance that, in finance, merged with the expected utility theory (EUT). Many scholars criticized the axiomatic turn; they lacked, however, a thorough alternative to the neoclassical paradigm, with a few exceptions.

In particular, Simon proposed to fit economic theory into a unified theory of decisions. He was not suggesting BR as a way to improve the paradigm but to substitute the latter with it. For years Simon clashed with mainstream economists until when, recognizing his total isolation, he decided to concentrate on psychology and artificial intelligence. On its part, the neoclassical paradigm was strengthened using Muth's rational expectations, a proposal created specifically to counter Simon's ideas. After a couple of decades, a new wave of psychological hints flowed into economics with the theories of Kahneman and Tversky. Their success has grown over the years and, after 2008, they have become a vital part of the imperfectionist world.

The paper is structured as follows. We'll start by discussing the utilitarianist root of the neoclassical paradigm and the illusion of the founders in utility measurability. Then we'll explain why the delusion of cardinal utility brought about the axiomatic turn of the paradigm and with which results. We'll describe the challenge that Simon posed to the paradigm and how even Simon's collaborators repulsed it, determining his growing isolation until his decision to concentrate on artificial intelligence and cognitive psychology. After that, we'll highlight the role of Kahneman and Tversky, who accepted most of the tenets of the paradigm (individualism, consumerism, hedonism), downplaying the differences between BE and mainstream economics. We'll then discuss the main critiques to BE and why they were not successful. Finally, we'll trace what the parallel trajectory of the first and the second wave of psychological economics tells us about the neoclassical paradigm.

2 Is there a hard core in economics?

Both Kuhn's concept of paradigm and Lakatos' concept of research program are widely used by historians of science and epistemologists (we use them interchangeably). Despite a vast debate on their nature, meaning and precise definition, we think

they are sufficiently clear in their analysis of science development. They state that scientists carry out their research adhering to a paradigm, because theories, procedures, and empirical analyses wouldn't even be conceived without referring to a theoretical framework as a paradigm. There are two main aspects of these concepts. First of all, a paradigm (or a research program) is characterized by a *hard core*, a series of assumptions that characterize its long-term nature and that interact with empirical research inasmuch as it is beneficial to the hard core itself. To this end, Lakatos makes a distinction between “negative heuristic of the programme [that] forbids us to direct the modus tollens at this ‘hard core’ ” (Lakatos 1978; p. 48). Secondly, a positive heuristic that deals with the resolution of the anomalies. In general, “The quicker a research program is able to treat the emerging anomalies, the more it is regarded as a progressive research program. By contrast, a research program where the protective belt accumulates more anomalies than it solves is a degenerative one” (Truc 2018; p. 33). As can be seen, the conventional aspect of science in terms of its *content* allows the paradigm to develop along a framework (“normal science”) until every progressive content can be extracted from it in terms of theories and predictions. However, the paradigm also has a conventional aspect in terms of *researchers’ behavior*. As Kuhn noted: “scientists... were taught standard ways to solve selected problems” (Kuhn 1977; p. XIX). In essence, a paradigm is for Kuhn a scientific community (ivi pp. 10–11).

In this sense, the fact that Kuhn’s analysis of scientific development is based on the history of science and not on normative grounds as in Popper is not what makes it different; many historical analyses of scientific theories exist. The point is that the paradigm has a structure or, to be more precise, *is* a structure, a set of rules, routines, behaviors, not only theories and models. This is why Kuhn’s *magnus opus* was called the *structure* of scientific revolutions. When young researchers enter a paradigm, they are taught not only a science but a way of life: “According to Kuhn, knowledge and competence in a mature science are transmitted in the course of a dogmatic and highly structured training, which inculcates an intense commitment to existing modes of perception, beliefs, paradigms or problem-solutions, and procedures” (Barnes 1982; p. 10). The life of a paradigm is complex and often only settled by the generational turnover of scientists, because it entails not only a comparison of axioms or empirical results, but the meaning of a given science, what is even admissible as data or scientific practice (Coats 1969). The episode of Cardinal Bellarmino, incidentally one of the most prominent intellectuals of his time (Pani 2021) who refused to look through Galilei’s telescope is an example of this struggle: Bellarmino refused the very idea that it was possible to do science with a telescope. Scientists of a different paradigm represent a distinct scientific community, and they live in different worlds in the Gestaltic conceptualization that Kuhn gave to the scientific *Weltanschauung* (Hoyningen-Huene 1993). This role is both necessary, because scientific research cannot develop if scientists are not taught what science is, and dangerous because “the paradigm can insulate the community from socially important problems if they cannot be stated within the conceptual framework the paradigm provides” (Peabody 1971).

Although Kuhn, Lakatos, and most of the other epistemologists focused their analyses on natural sciences, there have been quite a few attempts to apply the idea

of a paradigm to economics. Hence, we can ask: what are its hard core and its negative heuristics? There have been some attempts to define these issues. For instance, Weintraub (1985) condensed the hard core in 6 propositions (to give an idea, one is: “agents independently optimize subject to constraints”). Hoover (1991) proposed a hard core based on 5 assumptions with both traditional features (such as individualism) and relatively new ones (as rational expectations). It was proposed that “The only general methodological principle governing economics... is methodological individualism” (Hausman 1994; p. 211). The same Hausman proposed the idea that the agents’ rationality is key, and set forth 6 assumptions to grasp the neoclassical hard core (Hausman 1992; pp. 87–88), all converging towards the idea that the issue of rationality is what identifies economics, its “distinct domain” (ivi p. 91). In a thorough analysis of what an economic paradigm is, Remenyi (1979) finds 8 hard core propositions (dealing with rationality, self-interest and equilibrium) and 17 heuristics to begin with. From a radical perspective, Zweig (1971) noted that: “The two most central and distinctive elements of the bourgeois paradigm of capitalist economies are harmony and equilibrium”.

The difficulty of defining the neoclassical paradigm lies also in the fact that the same theoretical assumptions yield different policy outcomes and, conversely, the same policy outcomes are connected to different assumptions. For instance, the general economic equilibrium (GEE) framework has been used to back up laissez faire (as with the welfare economics theorems) or socialist planning (Barone, Lange, etc.). On the other hand, free trade as a policy conducive to economic growth has been defended by as different thinkers as Ricardo, Marx, and Hayek. We have seen cases where economists changed one or two assumptions of the hard core without any intention of ditching the neoclassical paradigm. Sometimes compatibility is debated. In particular, how much of Keynes’ *General Theory* is neoclassical has been ferociously debated since it came out. Coats (1969) stated that “it is now clear that the Keynesian paradigm was not ‘incompatible’ with its predecessor”, many would disagree. For instance, Blaug noted that the Keynesian hard core was new for economics, and that “There is hardly any doubt, therefore, that Keynesian economics marked the appearance of a new scientific research program in the history of economics” (Blaug 1976; p. 162).

To deepen the discussion of different variants of the neoclassical paradigm we can hypothesize the existence of a *theoretical triad*: utilitarianism, individualism, rationality. An economic theory can renounce one of them and still be in the neoclassical paradigm if it retains the other two. This is the flexible hard core of modern economics.

3 Utilitarianism and the illusion of utility measurability

Building on utilitarianist ideas, especially on Bentham, the neoclassical founders based their paradigm on the triad concentrated in the concept of *homo economicus*. To give a solid foundation to the paradigm, grounded on the individual consumer, the early neoclassical economists had to prove that utility could be measured. Without comparing individual utility there was no theory of prices, hence a unit of measure

for utility became the modern Holy Grail. Ironically, if we think about later developments in economic thought, the neoclassical founders hoped to find the solution in the psyche. For example, Edgeworth was convinced that utility was directly measurable thanks to the developments in physio-psychology, envisaging the construction of a “hedonimeter” (Colander 2005). To the critiques of the idea of utility measurement, the first neoclassicals replied that the theory was new and it would gradually overcome its own inconsistencies; they actually multiplied. Others were disillusioned. Jevons wrote: “[never was] an attempt made to compare the amount of feeling in one mind with that in another. I see no means by which such comparison can be accomplished... Every mind is thus inscrutable to every other mind” (Jevons 1871 [1911], p. 14).

It is impossible to be clearer and this conclusion explains the subsequent turn towards ordinal utility. Even at the time, many economists considered cardinal utility to be a dead end but, lacking anything better, they continued to rely on psychological considerations as a ground for their cardinal reasoning. In overcoming cardinalism, Pareto made a very interesting observation on the possibility of utility measurement. He asked: how can we aggregate the utility of a sheep and a wolf? (Pareto 1906, pp. 62–63). In a nutshell, the first wave of psychological import was meant to help make individual utilities comparable, yet it did not work. Cardinal utilities also present another drawback. They allow comparisons connected to welfare policies: “Opponents of egalitarian income redistribution also attacked the use of cardinal utility theories to make judgements about the welfare effects of economic policies” (Udehn 2001). Not only did Bentham and Jevons propose different kinds of utilitarianism, they also had different views on individualism: “The utilitarian economists were individualists, but they were also radicals and social reformers” (ibidem). This idea of utility could justify even radical policies of wealth redistribution, something the neoclassical founders were totally opposed to.

The difficulties to develop a theory based on individual cardinal utilities convinced Pareto and others to separate economics from psychology to create a general theory of rational action without psychological foundations (Camerer 2006). They succeeded: the neoclassical program after Pareto “took a distinct turn as Hicks and Allen, Samuelson, and Savage, made use of Pareto’s arguments against using anything from psychology” (Berg and Gigerenzer 2010). So, “While the cardinal and hedonistic views of the early marginalists like Walras, Jevons, and Menger were related to psychology, the following generation of marginalists proved more wary... This led Fisher, Pareto, and Slutsky to favor an ‘escape’ from psychology... that was eventually followed by the ordinalist revolution. This escape found its peak in Samuelson’s revealed preference theory which definitely drove psychology out of economics” (Truc 2018; p. 14). Utility functions also had technical issues highlighted by Volterra, Georgescu-Roegen and others which forced the functions to have more and more specific forms (Bianchi 1986; pp. 195–196). The impossibility to ground utility in empirical aspects pushed neoclassical economists towards the axiomatic approach, excluding connections with psychology, so that Hicks and Samuelson “effectively completed the divorce of economics from psychology” (Coats 1988; p. 213).

From the point of view of the scientific method, the turn was helped by two methodological developments. The first was instrumentalism: a variant of logical positiv-

ism based on the idea that the objective content of a theory is irrelevant. Friedman was among the first and most consistent economists to endorse this framework, while, at the beginning, Samuelson, Baumol and others were against but, lacking alternatives, they accepted Friedman's position (Moscati 2018; ch. 10). The second aspect was Hilbert's program aimed at a complete axiomatization of mathematics. For instance, in 1936 Alt proposed the first representation theorem for preferences using Hilbert's approach. Objections based on implausibility were ignored, as often happens with Kuhnian anomalies, and results like the Arrow-Debreu general equilibrium analysis and the axioms of revealed preferences became cornerstones of economic science. From then on, the axiomatic approach has become the foundation of economic theory in terms of individual utility and welfare economics with no need for a direct measurement of utility that was simply revealed through actual choices, a retrenchment towards a more empirically testable and mathematically suitable idea (Wong 2006; pp. 1 and following). From psychology neoclassical economists switched to mathematics to strengthen the paradigm.

Axiomatization took two different roads. A first path was the search for the conditions to find a general economic equilibrium (GEE), a way to transform the invisible hand metaphor into a formal model (the Walras-Arrow-Debreu path), a "crucial contribution to the coherence of economic theory" (Loasby 1991; p. 9). The second path was the analysis of probabilistic situations. In this process of formalization, economists rediscovered the concept of expected utility. The idea was that, when individuals are confronted with different possibilities (as in lotteries and gambles), they will rationally figure out their expected utility from playing and they will maximize the expected result. It was a rediscovery because the idea of expected utility is very old, being attributed to Nicholas Bernoulli (Stigler 1950) who, in 1738, also proposed decreasing marginal utility to solve the famous St Petersburg paradox (Kühlberger and Schulte-Mecklenbeck 2018). The fact that the modern continuation of this paradigm is called "game theory" shows that Bernoulli and the others did a great job.

The turn had profound methodological consequences. As Blaug (2003) pointed out: "The metamorphosis of economics in the late 1940s and 1950s is aptly called a "formalist revolution" because it was marked, not just by a preference, but by an absolute preference for the form of an economic argument over its content. This frequently, but not necessarily, implied reliance on mathematical modeling because its ultimate objective was to emulate the notorious turn-of-the-century Hilbert program in mathematics by achieving the complete axiomatization of economic theories". Given that "The Formalist Revolution made the existence and determinacy of equilibrium the be all and end all of economic analysis" (ibidem), we can state that the general equilibrium hypotheses became the hard core of the paradigm. It is important to observe that this methodological turn was based on procedures more than on political outcomes. In fact, GEE could be used to put forward also the case for planning and socialism. It has been noted that "Lange's *On the Economic Theory of Socialism* (1936–7) was probably more influential in teaching a whole generation the meaning of GE theory" (Blaug 1994; p. 127).

The axiological turn produced important theoretical results (the modern theory of consumption, the demonstration of a general economic equilibrium, etc.) but these results came with drawbacks. First, Gödel's incompleteness theorems showed that

the axiomatic approach in general had fatal weaknesses¹. Secondly, to obtain basically the same policy suggestions that we find in the works of Ricardo or Mill, economists were forced to introduce a whole series of strong assumptions, and over the years, GEE has needed more and more implausible hypotheses, a regressive research program in Lakatos' terms. A third and more important issue is that, notwithstanding all these assumptions, the switch from utility to preferences left the same insurmountable obstacle: economists were still unable to get aggregate preferences and hence to retain individualism. This is true for GEE models, but it is also true for the game theory that, while the profession was moving away from cardinal utility, seemed to square the circle. In fact, the efforts of Morgenstern and von Neumann to build a general theory of rational behavior appeared as a third way between ordinalism and cardinalism. However, authors honestly acknowledged that even their theory was unable to reach comparability among individual preferences: "We have not obtained any basis for a comparison, quantitatively or qualitatively, of the utilities of different individuals" (Von Neumann and Morgenstern 1944, p. 19). Like the other scholars, they relied on the development of the paradigm for a solution. Unfortunately, for these hopes, some years later the axiological turn suffered an internal defeat: Arrow's theorem demonstrated that social welfare analysis is impossible because political preferences, like economic preferences, cannot be aggregated. Economists attempted to bypass Arrow's theorem, to no avail (Harsanyi 1955). The impossibility theorem confirmed the results of the utility theory since the founding of the neoclassical paradigm: utility is individual and no aggregate behavior can be rigorously derived from it.

Before turning to the critics of the axiomatization of the utility theory, it is interesting to observe that the turn was only gradually established in economists' minds. Although they accepted the methodological idea of building economics with no regard for psychological reality – to concentrate on logical consistency – they were not "axiom native", so to speak; therefore in their works, they retained this legacy in terms of practical observations: "the 'literary' tradition in economics before 1930 – due to Smith, Keynes, Marshall, Fisher and others – is full of psychological insights which came to be neglected as the core ideas were mathematized" (Camerer 1999). This was true until the 1950s. For instance, the same Friedman and Savage, among the main supporters of the EUT in the 1950s, described the "young men adventurous disposition" and "their absurd presumption in their own good fortune" (what BE now calls overconfidence) as well as general "ignorance of the odds" (Friedman and Savage 1948). Harsanyi commented on "gamblers' notorious irrationality", noting that they "overrate their chance of winning" (Harsanyi 1953). Two years later he highlighted "consumers' notorious 'irrationality'", proposing to deepen psychological laws. Even Markowitz, the creator of the modern axiomatic theory of financial portfolios, observed many facts that now we would call biases, for instance: "A person who lost extremely heavily (to the left of the first inflection point) would wish to continue the game (somewhat in desperation)" (Markowitz 1952). For these

¹ Von Neumann was aware of the devastating consequences of Gödel's results since day one, as he was present when Gödel first announced them publicly (Formica 2013).

economists it was still difficult to separate economic modelling from psychological observations, notwithstanding their devotion to formalism.

It is important to point out that, at the time, the main disputes among economists were about economic policies, and more generally pragmatic issues, while the discussions on the tenets of the utility theory were followed by few specialists. The fact that no social theoretical concepts, like a social utility function or an aggregate production function, were conceivable outside the narrow boundaries of the paradigm's assumptions should have worried economists; yet, it did not. The bulk of the profession was trying to make sense of Keynes' ideas within the mainstream framework, and the "as if" methodology helped to maintain a bridge between these two branches (normative and positive economics) without putting into question the hard core of the paradigm.

4 From EUT to Simon

The axiomatic turn was meant to overcome the impossibility (and dangerousness) of comparing individual utilities. Without a unit of measurement, it was also difficult to test the theory empirically, although it was attempted. After all, if the tests proved the EUT to be right, analytical difficulties could be ignored. The most famous of these tests was a mental experiment proposed at the Paris conference in 1952, where Allais showed the inconsistency of the EUT using Savage himself. Allais proved that, presented with identical situations in different experiments, people made choices inconsistent with the EUT. Other experiments confirmed these results (Moscati 2018; ch. 10). In terms of theoretical consistency, the Allais experiments would have struck the EUT dead. This did not happen also because the proposals made by Allais and others to replace the EUT were vague and not operational. As Guala (2000) noted: "in such a methodological-falsificationist vein... Allais produced a series of counterexamples without a superseding theory, and therefore his refutations could not be taken seriously".

The bulk of the profession kept the "as if" solution. So, criticizing Marshall, who proposed the idea that, under risk, agents do not maximize profits, Friedman and Savage (1948) observed: "individuals behave as if they calculated and compared expected utility and as if they knew the odds". This methodological stance reduced the weight of empirical proofs giving even more importance to the axiomatic trend. However, in those years, there were experiments that confirmed the EUT, albeit in a very narrow sense. First of all, these experiments were about lotteries, not ordinary economic problems. Secondly, they tested the theory using monetary measures, as in Bentham's tradition, thus excluding a direct analysis of utility. Moreover, from the experiments there emerged that, using different measurement methods - for instance the certainty equivalence method versus the probability equivalence method - results were different and incompatible (24 different methods in all were counted: Moscati 2018; p. 265), showing the extreme precariousness of the theory. All in all, the 1950s and 1960s experiments were not helpful for the EUT, in particular for the transitivity and the independence assumptions, strengthening the axiomatic turn against empirical issues. At the end of the 1960s the situation was the following: the EUT had been used to create modern financial theory (the mean-variance model, the capital asset

pricing model, etc.) with only a loose connection with the GEE and marginalizing any empirical anomaly.

The Second World War, however, required economics to deal with compelling issues, and distinctively to deepen the knowledge of how complex organizations work. Facing a life and death situation, the government and the military asked **economists** to solve problems, not only to create models. In the US, the tasks and resources provided by the Pentagon forged economics as a modern scientific profession (Bollard 2019). In this environment, many theories of mainstream economics were subject to strong criticism, including the theory of the firm. In a sense, a neoclassical theory of the firm was not even there (Loasby 1967); the only thing economists knew was that firms maximized profits, but how was hard to tell. The process of industrial concentration was stirring a debate on imperfect competition (yet another kind of imperfection) and a discussion on the institutional and historical elements of competition. Simon's research studies were part of this pragmatic trend against the "as if" methodology and ordinary individualism (Brette, Lazaric, and Vieira da Silva 2017).

As for Simon himself, it is noteworthy to point out that when he started his career, the mainstream psychological theory was behaviorism, as derived from the studies of Watson first and then Skinner, who, in order to overcome the vagueness of intuitionism, and borrowing from the methods of Pavlov, had begun to shift their investigation from what human beings think they are doing, to what they actually do. In particular, they were interested in learning processes. The brain is a black box – in the definition of Skinner – that it is useless to analyze. It is better to understand how animals concretely behave and learn. This seemed appealing for the economic theory of choice: "Once we portray choices as resulting from the application of experimentally defined standards of adequacy and procedures for resolving trade-offs, it appears that we can discuss behavior without making any reference to either the concept of utility maximisation or the plethora of theories of motivation that have been proposed in psychology" (Earl 1990). Shortly after the war (1947), Simon published a book based on his PhD dissertation (for a general recount of the events see Augier 2001 and Augier and March 2001), *Administrative Behavior: a Study of Decision-Making Processes in Administrative Organization*. The title of the volume makes clear that he was trying to delve into the functioning of organizations, how firms and institutions actually make decisions, how they identify and reach their goals, deepening how human behavior takes form in organizations (Egidi 2017). This was not a psychological discussion on firms (Foss 2001), nor was it a formal microeconomic model. In his book, Simon was creating a unified decision theory starting from how people behave in organizations. In doing so, he was proposing to reshape the social sciences as a genuinely descriptive discipline with a clear empirical basis (Viale 2007), as Skinner had done with pigeons and rats: not as if, but as it is (Cyert and Simon 1983). The neoclassical paradigm was ineffective. For instance, he called the neoclassical firm a "pitifully skeletonized abstraction" (Simon 1947; p. 20). As a consequence of this new conceptual framework, he proposed to renounce the distinctive aspects of economics: economic problems had to become a category among many of the decisions that human beings make in an organization (or even alone). In this context, he set forth the idea of bounded rationality not mainly to explain how human brain works, but rather as the outcome of real decision making in a complex organization. Every

organized structure (brains, computers, and firms) has limits, for instance computational limits, biases, and so on; in the case of human organizations (and paradigms), procedures, routines, conventions are created to reach the assigned tasks; in the case of individuals, they use heuristics. Simon's all-out attack on the mainstream idea of rationality forced economists to deepen its nature, but the fact that he started from rationality in organizations brought many heterodox economists to ignore his ideas too (Loasby 1971). The role of organizations was paramount because the limits of rationality are not connected to the internal consistency of behavior but to a more general "ecological" outcome that can change the consequences of boundedness (Berg 2014).

Simon had the possibility of developing these ideas heading the Department of Industrial Management of the Graduate School of Industrial Administration at Carnegie Mellon, where he gathered a group of talented scholars to develop his ideas on decision theory and rationality. To no avail, however. The economists of the faculty were not convinced, and they resented being left behind vis à vis other important US universities. In practice they were not at the frontier of the development of the paradigm. Simon observed: "I heckled the GSIA economists about their ridiculous assumptions of human omniscience, and they increasingly viewed me as the main obstacle to building 'real' economics in the school" (Simon 1996; p. 165). Simon's proposal to euthanize the neoclassical paradigm was rapidly overwhelmed. From the second half of the 1950s, he started to concentrate on artificial intelligence, as the natural one was not fit for his ideas. By the early 1960s, the GSIA "came to be dominated by research on sophisticated mathematical techniques in operations research and economics and by neo-classical economic theory" (ivi p. 184). To make things worse, not only did psychological critiques to economic rationality remain unanswered, but economists used *homo economicus* to explain the entire humankind existence assuming that: "the economic approach is... applicable to all human behavior" (Becker 1976; p. 8).

5 Rationality and economics

The dispute between Simon and the neoclassical economists focused on the nature of rationality, because "Economic theory, since it has been systematic, has been based on some notion of rationality" (Arrow 1986). Its role is particularly clear as far as prices are concerned. The essence of capitalism is that the price system works, i.e. it allows profit maximization, giving the right signals to producers and investors. This is true in GEE and also in the finance theory. For instance, Thaler (2016) noted that efficient prices are the most important ingredient of the efficient market hypothesis. However, we can have a situation, as with the prisoner's dilemma, where rational agents end up with a disastrous outcome. On the other hand, we can have theories where individual rationality is not needed. The Austrian school and its modern derivation, experimental economics (EE), followed this second idea: individual rationality is irrelevant vis à vis the markets' ability to aggregate dispersed information in an efficient result, thus rational order can arise without rational human beings. In

this context, economics does not need *homo economicus* to reach laissez faire policy prescriptions (Berg 2003).

Where is Simon placed in this context? Like the EUT scholars, Simon was creating a decision-making theory but in a different theoretical framework: organizations instead of individuals, cognitive psychology instead of *homo economicus*, empirical tests instead of axioms (Earl 1990). For Simon, managers and human beings in general try to find a solution that they consider “good enough”, or *satisficing*, for the situation (Simon 1955). What is important is not maximizing behavior to find the best outcome no one knows, but the practical rational procedures of organizations. The fact that Simon recognized “the implications of the extreme disparity between the complexity of the universe and the capacity of the individual human brain” (Witt and Chai 2018; p. 74) could make his ideas close to Hayek’s on the limitations of human cognition, albeit with different policy consequences.

In 2000 Simon returned on the issue: “Today, in consequence of these developments, we do not live in a market economy, but in an organization economy, or at most, in an organization/market economy, with a predominance of organizational over market activity”. He started with social sciences and management issues, but then he moved through other disciplines focusing on the problem of a search for “a science of man” based on “his dual nature as a social and a rational animal” as he wrote (Sent 1997). In the creation of this new theory, Simon borrowed from logic, linguistics, the theory of information and other disciplines to produce the ideas that started artificial intelligence theories, the cognitive revolution in psychology, and helped the creation of cybernetics. Just to make an example, in 1956 Simon was thrilled to communicate to a surprised Bertrand Russell that his team had created a software able to recreate the mathematical theorems of *Principia Mathematica* (Simon 1996; p. 225). If algorithms were able to substitute the deductive logic of geniuses like Russell and Whitehead, to understand and describe economic choices would have been much easier. BR could unify branches of knowledge as different as management and computer science, artificial intelligence and economics. With these ideas, Simon refuted the triad in its entirety: rationality is bounded, individualism is subdued to organizations, and maximization of utility is substituted by satisficing behavior, thus economics should cease to exist independently to become an application of this new science of decisions.

The point was not the “computational failures of the mind with respect to the canons of economic rationality... [but that] rationality is bounded by the interactions between the mind and the environment” (Viale 2018). Given that humans think according to the BR theory, *homo economicus* is a mistake not only as a representation of how investors or consumers decide, but as a claim to maintain a separate science. Simon proposed openly to abolish economics: “One can conceive of at least two alternative scenarios for the continuation into the future of this gradual change in the program of economics. One involves the direct ‘psychologizing’ of economics, the explicit adoption of the program of economic behavioralism. The second scenario pictures economists as borrowing the notions of optimal search and computational efficiency from operations research and statistical decision theory, and introducing a wider and wider range of computational considerations into the models of rationality” (Simon 1976; p. 147). The two scenarios were presented as incompatible.

Given the amassing of empirical anomalies against mainstream economics and the strength of the proposed alternative, Simon believed that it was only a matter of years before economics would become part of the new unified decision theory. His attitude would be branded as overconfidence by a modern behavioral economist, especially when he confronted the most prominent EUT supporters (Mirowski 2001; p. 454). Buoyant in his alternative, he dared to attack Friedman himself, noting that his methodological work (*Essays in Positive Economics*) “will amaze anyone brought up in the empirical tradition of psychology and sociology, although it has apparently excited little adverse comment among economists” (Simon 1959). Individualism would be substituted by the analysis of organizations (Simon 1955), a dynamic that seemed to mimic what was really happening in modern economies. Maximization would be substituted with satisficing behavior. He proposed “the dismissal of the main methodological tenets of mainstream economics, such as positivism, deductivism, static equilibrium analysis, and optimizing models of economic agency” (Nagatsu 2015). In different texts, his ideas on how much psychology could be introduced into mainstream economics could vary, but the general point was that abstract assumptions should be confined to a backseat.

Simon’s gauntlet was not picked up directly, because GEE scholars were discussing the theoretical assumptions of the paradigm away from the clamor of the battle, and practical defenders of the EUT, like Friedman, having reluctantly accepted that Markowitz’s model was economics, were engaged in a struggle against the neo-Keynesians on the future of the neoclassical synthesis. Economists continued to build the paradigm on axioms within the *homo economicus* framework irrespectively for its empirical weaknesses, showing its nature as the hard core of the paradigm.

Particularly clear was the cleavage with mainstream economists in the explanation of firms’ behavior. Simon stated that this behavior is based on information available, including that on what other firms are doing. It is often useless to try to have better information that maybe does not even exist. Normally a good strategy is enough, especially when all the other firms are doing just that. He observed later on: “Human rational behavior... is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor” (Simon 1990); firms’ behavior is not an issue of optimization but of adaptation, i.e. finding the satisficing methods allowing the organization to survive. Rationality, in Simon’s analysis, is bounded mainly by how competition and uncertainty mold organizations. Since real behaviors do not tend to optimize, market economies are not efficient in the neoclassical sense (Spada 2010), and a science based on individual maximizing behavior does not produce interesting results.

Predictably, the replies to Simon went in the direction of interpreting these problems as anomalies using the “imperfect world argument”: investors can be a bit irrational, markets do have some imperfections and incompleteness, and policymakers must act to reduce the outcomes of these imperfections (Radner 1997); yet an imperfection “does not, in itself, require any departure from maximizing behavior” (Sen 2002; p. 38). While Simon proposed to dispose of individual rationality and methodological individualism altogether, the counterargument was: we must create more advanced models able to incorporate these anomalies to save most of the triad.

6 From insult to injury: the rise of rational expectations

The group that Simon assembled at GSIA encompassed a number of gifted economists, many of whom became famous on their own merits, like Modigliani and Muth. Ironically, the modern version of *homo economicus*, which conquered the whole of the profession, came exactly from here. In fact, John Muth proposed the rational expectation hypothesis (REH) as an extreme case in the discussion about rationality: what happens if people's ideas on how economy works represent how economy works? When Muth presented rational expectations in 1961, he "explicitly labeled his theory a reply to [Simon's] doctrine of bounded rationality" (Simon 1996; p. 311) using the "as if" method. Simon observed that Muth's proposal went unnoticed for a decade, before two young collaborators at GSIA, Lucas and Sargent, "brought the theory of rational expectations into national and international prominence" (cit. in Sent 1997). The success of the REH has different motivations, but, as Egidi (2014) pointed out, it "most importantly excluded definitely psychology from economic modelling", thus vindicating the axiomatic turn of the previous generations of neo-classical economists. This is why: "Although Muth's contribution was originally intended for some specific and somewhat narrow circumstances, Lucas extended it by assuming it to be a necessary consistency condition in macroeconomic models, and the sheer theoretical power of the Muth-Lucas construct came to be seen as a revolution" (Visco and Zevi 2020). For his part, Simon branded the REH a brilliant counterfactual simplification of rational behavior, but things developed differently: "What to most in the Holt-Modigliani-Muth-Simon research team was an approximating, satisficing simplification, served for Muth as a major line of defense for perfect rationality" (Sent 2018). The success of the REH in micro-founding economic models was complete, and Simon's alternative no longer faced a "gradual escalation" but an "open and declared" war. Given that, on the contrary, in psychology and computer sciences, his ideas were doing well, the rational choice was to change profession: "Disillusioned, Simon left the Graduate School of Industrial Administration at Carnegie Mellon University in the 1970s for the psychology department at the same institution, noting: "My economist friends have long since given up on me, consigning me to psychology or some other distant wasteland"." (Sent 2004). While the original plan was to push economists to change profession, Simon was forced to change profession himself. He noted: "It is not without irony that bounded rationality and rational expectations...although entirely antithetical to each other, were engendered in and flourished in the same small business school at almost the same time" (Simon 1996; p. 291).

Although Simon insisted that the REH lacked empirical support, its supporters were not pretending? to depict the reality, as economic models were not considered relevant for their empirical virtues. As Lucas and Sargent (1979) noted: "the general hypothesis that a collection of time series describes an economy in competitive equilibrium is *without content*". This is interesting because it shows that, although the REH was associated with laissez faire policies against the old Keynesian recipes, it could be employed in a variety of models, also including more interventionist policies. In other words, the REH was kept in the paradigm as a tool able to develop it technically, not for its policy conclusions. In fact, the development of the REH was

concentrated on the creation of econometric methods. This is why among the most quoted economics articles since the 1970s, the only article on GEE is at the 53rd place, while 3 out of the first 5 are on econometric tools (Kim et al. 2006).

7 The return of the repressed: the rise of behavioral economics

GEE cum REH has ruled macroeconomics since the 1970s; there was, however, a breach: finance. Lucas and his co-thinkers were not interested in finance because they thought, rightly so in the context of GEE, that money and finance were of no interest to economics at large. After all, “standard ‘neoclassical’ economic theory assumes that the financial system is rather like lubricating oil in an engine – it enables the engine to work smoothly, but has no driving effect” (Keen 2011; p. 14). Moreover, Markowitz, Fama and others had created a theory of finance similar to REH macroeconomics, but a separated realm with different research interests and based on the EUT. More importantly, not only did the theory of finance analyze financial markets but it contributed to creating them. For instance: “In 1973, the year of the publication of the landmark papers on option theory, the world’s first modern options market opened: the Chicago Board Options Exchange” (MacKenzie 2006; p. 6). Therefore, even if not important for pure economics, the theory of finance was important to financial intermediaries inasmuch as it was good for their profits. Also thanks to technological advancements, the theory of finance helped the growth of financial revenues, and this was by far more important than its empirical weaknesses, especially because financial products, like options, were reshaped to fit the theory of modern finance models like the famous Black-Scholes-Merton formula.

Due to its practical, profit-making role, the mainstream theory of finance seemed unassailable, yet it was not. As seen, many anomalies in the EUT paradigm were known already in the 1950s, and even before then, but the paradigm simply added new assumptions to overcome them. Simon analyzed whether experiments were able to corroborate the EUT, and the result was interesting: it was so for experiments about lotteries and gambles, but “When these experiments are extended to more “realistic” choices – choices that are more obviously relevant to real-life situations – difficulties multiply. In the few extensions that have been made, it is not at all clear that the subjects behave in accordance with the utility axioms” (Simon 1959). Only if finance were conceived as a choice between lotteries mainstream finance theory made sense. This explains why not only mainstream finance theory but also the BE critical alternative itself are mostly based on gambles.

Empirical weaknesses in the EUT created a space for BE that succeeded in proposing alternatives with clever choices. First of all, BE introduced ideas from cognitivism to be added to the neoclassical paradigm, instead of substituting it; moreover, Kahneman and Tversky did not attack the GEE core nor its policy consequences, but a specific aspect of the paradigm: the financial applications of the theory of rational choice. They approached the limits of *homo economicus* in a very specific way. Their works on decision making did not touch the main economic issues of the time (stagflation, unemployment, public deficit, and so on), because it was difficult to directly connect these macroeconomic issues to psychological biases. The EUT was

based on lotteries, and they confined themselves to lotteries, deepening the principles governing gambles. In a letter to a colleague in 1975, Tversky wrote: “we believe for the first time that we understand the basic principles governing choices between gambles” (Heukelom 2014a; p. 119). They were aware of the distance between the neo-classical paradigm and their own psychological ideas: “One day in the early 1970s, Amos handed me a mimeographed essay.... I can still recite its first sentence: “The agent of economic theory is rational, selfish, and his tastes do not change.” *I was astonished*. My economist colleagues worked in the building next door, but I had not appreciated the profound difference between our intellectual worlds. To a psychologist, it is self-evident that people are neither fully rational nor completely selfish, and that their tastes are anything but stable” (Kahneman 2011; p. 261, our emphasis). Wisely, he kept astonishment to himself while detecting an open field to intervene, a typical Kuhnian anomaly: the decisions based on the EUT.

The starting point was a factual critique to a specific point: “systematic violations of the axioms of rationality in choices between gambles” (ivi p. 263), i.e. gambles not economic decisions in general. The proposal was to amend this part of the paradigm. Thirty years after the events, Kahneman pointed out: “I realized only recently how fortunate we were not to have aimed deliberately at the large target we happened to hit. If we had intended the article as a challenge to the rational model, we would have written it differently, and the challenge would have been less effective” (Kahneman 2003). To prevent a pre-emptive rejection by economists, the founders of BE “carefully avoided the term *rational* and used *reasonable* instead... The use of *rational* would certainly have induced some economists to think that these two psychologists had the same research program as Simon, who had won the Nobel memorial prize in economics the year before. From the start, prospect theory was carefully constructed to be able to broaden the scope to economists especially” (Heukelom 2014a; p. 120). A powerful idea was to start from the descriptive/normative cleavage accepted by economists to state that, on the normative side, BE agreed with economists, but the latter were mistaken in sticking to the same theory in the realm of descriptive science.

Pragmatism paid off. First, Kahneman and Tversky identified an important but dispensable aspect of the paradigm; secondly, they published on *Econometrica*, even if their works did not deal with econometrics, because the journal had published articles on the theory of choice; thirdly, they used a language familiar to economists: a formalized model. Kahneman (2003) acknowledged that these choices were crucial: “the impact of prospect theory depended crucially on the medium, as well as the message. Prospect theory was a formal mathematical theory, and its formal nature was the key to the impact it had in economics”. The overall message was: we are here to strengthen the neoclassical paradigm not to bury it. Behavioral explanations can be considered “optional” as Kahneman wrote, but this is economics nonetheless. Their “rhetoric was specifically designed to convince readers of *Econometrica*, including economists” (Heukelom 2012). They were proposing an amendment to the Markowitz theory: “Following Markowitz..., outcomes are expressed in prospect theory as positive or negative deviations (gains or losses) from a neutral reference outcome.... Unlike Markowitz, however, we propose that the value function is commonly S shaped, concave above the reference point, and convex below it” (Tversky and Kahneman 1986). As noted, the normative side of the rational choice theory was

left untouched, whereas they questioned the descriptive side of the theory pointing at the many anomalies it was amassing. They knew that their idea of rationality was distant from the neoclassical models, but they put it as an empirical issue: observations tended to favor their version on the traditional one. Others were more explicit; in particular Rabin and Thaler stated that “it is time for economists to recognize that expected utility is an ex-hypothesis” (Rabin and Thaler 2001); needless to say, many economists “saw this flippant statement as little short of blasphemy” as Kahneman noted (Kahneman 2011; p. 278). The strategy of frontal collision would have doomed these theories to the same fate of BR. Kahneman and Tversky prevented it.

Once paradigm improvement, not its demise, was set as the goal, behavioral economists were entitled to present anomaly after anomaly, and cognitive biases of investors became dozens. In particular, two interesting points emerged. Preferences are not independent due to the role of reference points, and loss and gains are not symmetrical. These anomalies added to the disproof of the transitivity assumption already proposed by Allais and others, but in a more structured theoretical framework, and they were presented as compatible with the general paradigm also because they were confined to financial models. The discussion on REH macroeconomics was not on the agenda. In this way, psychological economy resurrected as “friendly criticism of economics that economists could grasp” (Truc 2018; p. 105).

8 From foe to friend

In the 1980s, Miller and the other prominent finance economists dismissed behavioral finance as useless. In those years, as Truc (2021) pointed out: “most of Kahneman, Tversky, Slovic, and Lichtenstein’s articles were still published in psychology journals. However, during this time period, these researchers increased the number of articles they published in economics and helped to bring their psychological program into economics”. A decade later, BE as the cure for EUT anomalies was spreading: “What psychologists Daniel Kahneman and Amos Tversky brought to economics in the 1980s was the idea that imperfections in the market may, in addition, be caused by fallible human behavior” (Heukelom 2014a; p. 1). It worked. In 1999 Shleifer was awarded the John Bates Clark medal by the American Economic Association, Rabin in 2001. In the same year, Akerlof won the Nobel Prize, and the subsequent year it was Kahneman’s turn. Gradually BE became part of major economics conferences, graduate programs and prominent journals. From the point of view of content, BE was no less distant than BR from mainstream economics. The point was the attitude towards the paradigm. Simon thought that the normative-descriptive schism demonstrated the cul de sac economics was in. There was nothing to save in economics. “Kahneman and Tversky were much less hostile. In fact, they were in favor of current practice in economics... and they only meant to suggest that a few adjustments be made to improve it” (Heukelom 2014a; p. 127). BE had to be seen “as supplementing, rather than overturning, traditional economic analysis and policy methods” (Loewenstein and Chater 2017). Rabin went so far as to say: “[Behavioral economics] is not only built on the premise that economic *methods* are great, but also that most mainstream economic *assumptions* are great”, and he explicitly proposed BE

not as a scientific revolution but as a cure for anomalies: “It is not good science to declare we *shouldn't* mess incrementally with a paradigm, nor to insist that incremental critiques and improvements ought to be ignored until we replace the current paradigm in one fell swoop. As we find pieces of the classical model that are wrong, then insofar as we can recognize how to replace them, we ought to replace them” (Rabin 2002). This was a strategy akin to the development of neoclassical synthesis using the *General Theory*, and the article explicitly calls for a synthesis between BE and mainstream economics: in “the mid-1960s, Chicago economist Milton Friedman coined the phrase ‘We’re all Keynesians now’. Half a century later, we might say instead: ‘We’re all behavioral economists now’”. This has become the standard interpretation of BE by economists: “several economists have argued that behavioral factors can be incorporated into standard theory” (Angner 2019), this thanks to behavioral economists that made great efforts to maintain a continuity with neoclassical economics downplaying differences. The new role of BE was consciously pursued in search of relevance. Thaler is quoted as saying “I have encouraged the young guys to play by the rules, because otherwise they will be ignored” (Truc 2018; p. 104), this being the very definition of normal science. In their theoretical assumptions, Kahneman and Tversky connected prospect theory to the neoclassical utilitarianism in its more psychophysical version, skirting very closely to the ideas of Jevons and Edgeworth (Heukelom 2012). At the same time, BE also “maintained a mathematical structure that is familiar to economists, so as to allow them to successfully influence economics” (Truc 2018; p. 215). The triad was safe.

BE was accepted: “as a renewal of economics. But to avoid being dismissed as a outside of economics or as an ‘heterodoxy’, it needs to establish some form of continuity with what the economic profession is used to” (ivi p. 5). Acceptance went so far that some economists criticized BE as being too similar to mainstream neoclassical economics. For instance: “[Kahneman and Tversky accepted] the basic framework of ‘rationality’ as defined by Von Neumann and Morgenstern. They did not, in other words, set out to create a new framework for economics but rather to extend the existing one as necessary. Kahneman and Tversky created a combination of neoclassical economics and cognitive psychology, and their approach has remained the approach of all researchers in the field” (Jeffrey and Putman 2013). On the other hand, behavioral economists had a more confrontational approach. For instance, in the 1980s Thaler explicitly used Kuhn’s idea of a scientific revolution, but this was when behavioral economists had to be both accepted and kept distinct from ordinary economists. At any rate, the more BE ideas circulated among economists, the more the same Thaler changed focus and stated: “The rise of behavioral economics is sometimes characterized as a kind of paradigm-shifting revolution within economics, but I think that is a misreading of the history of economic thought. It would be more accurate to say that the methodology of behavioral economics returns economic thinking to the way it began, with Adam Smith, and continued through the time of Irving Fisher and John Maynard Keynes in the 1930s” (Thaler 2016). Not a revolution then, but a restoration. After all, in 1987 Thaler himself had started the ‘anomalies’ column in *the Journal of Economic Perspectives*, in which “he explicitly used Kuhn to present some BE experiments as ‘anomalies’ to the dominant economic ‘paradigm’” (Truc 2018; p. 56). The new role of BE is clearly established in recent economic literature.

As Heukelom (2014b) pointed out: “behavioral economics is the new mainstream micro and can now stand on its feet without the help of neighboring disciplines”. A separate discipline within the neoclassical paradigm.

9 Simon’s mission impossible

In the 1950s, Simon had thought that BR could substitute *homo economicus*, but it was never the case. First of all, it was impossible ideologically. Historical research studies have documented that the Cold War “turned university authorities and academics into FBI informants. In economics, any dissent from neoclassical theory would be identified as politically subversive, leading to purges of non- neoclassical and Marxist economists and to the marginalization of heterodox or critical traditions” (Tzotzes and Milonakis 2021). Even the term “social science” was considered too close to “socialism”, and was substituted by “behavioral science” (Pooley and Solovey 2010). During the conflict, defending the neoclassical paradigm was less important than winning the war, but afterwards the situation totally changed. Attacking the neoclassical paradigm was tantamount to be a KGB informant. On the contrary, BE had always had a strong support from the RAND Corporation and other think tanks close to the establishment, like the Sloan Foundation and the Russell Sage Foundation; moreover, after the fall of the Berlin Wall, criticizing the neoclassical paradigm was no more a politically decisive issue (Maital 2004). The choice was to deal with the anomalies of the neoclassical paradigm using the imperfectionist approach: every anomaly an imperfection. This allowed the paradigm to defend its hard core while at the same time maintaining its pragmatic stance in policymaking.

As if the world was still in the 1940s, Simon continued to underline the deficiencies of the neoclassical paradigm. In 1986 he noted: “Neoclassical theory, without strong auxiliary assumptions, is helpless” and: “Contemporary neoclassical economics provides no theoretical basis for specifying the shape and content of the utility function, and this gap is very inadequately filled by empirical research using econometric techniques” (Simon 1986). In 2000 he wrote again: “With the discovery of voluminous discordant empirical evidence, maximizing expected utility is rapidly disappearing as the core of the theory of human rationality, and a theory of bounded rationality, embracing both the processes and products of choice, is replacing it” and also “The number of defectors has clearly not yet reached a majority of the profession, but if we add serious doubters to defectors the numbers increase greatly”. This last observation is important because it suggests that he was still thinking that the anomalies of the neoclassical paradigm were so deep that a new paradigm was needed. In 1979, Simon had noted that in the late 1950s “it would not have been unreasonable to predict that theories of bounded rationality would soon find a large place in the mainstream of economic thought”, yet what happened was that anomalies were considered imperfections to be cured using ancillary hypotheses, including those coming from BE.

After decades, although lacking the optimism of the 1950s, he was still at war with economics. He observed that neoclassical rationality remained useless to understand how people make decisions (Simon 1976). He even spoke of an “Econometric Mafia”

that had mathematized the whole of profession, observing that “The neoclassicists clearly had won the day” (Simon 1996; p. 357). Even in his Nobel lecture he attacked Friedman’s “wildly inaccurate descriptive representation of reality”, and he tried to connect his challenge to mainstream economics to the new one quoting Kahneman and Tversky and their “most dramatic and convincing empirical refutations of the theory” (Simon 1979). It is interesting to observe that Simon framed this situation using the Kuhn-Lakatos epistemological stance: “Once a theory is well entrenched, it will survive many assaults of empirical evidence that purports to refute it unless an alternative theory, consistent with the evidence, stands ready to replace it. Such conservative protectiveness of established beliefs is, indeed, not unreasonable” (Simon 1979).

While Simon was still fighting this unwinnable conflict, ending as a psychologist interested in decision theory, Kahneman and Tversky were doing somewhat the opposite. They started as psychologists and were progressively accepted in economics, as we can see from the gradual repositioning of their publications from psychological to economic journals (Heukelom 2007). In their journey towards acceptance, they were not interested in being considered Simon’s successors, nor had they to oedipally kill their intellectual father, as Muth did; it was sufficient to ignore him. For instance, in the 1979 article that introduced prospect theory, the most famous article on psychology and economics of all time, they quoted Allais as well as Markowitz, Friedman, Savage, Von Neumann and Morgenstern but not Simon.

This stance is confirmed in the work derived from the lecture given for the Nobel Prize in 2002, an event that in itself was the proof of the successful repositioning. The work is called *Maps of bounded rationality*, but BR is nowhere to be seen and Simon is quoted for his contribution to “features of the cognitive system”, i.e. as a psychologist not as an economist². As Gigerenzer concluded: “Since there are no citations at all to Simon in the early influential papers of Kahneman and Tversky...this mentioning was probably more an acknowledgement to a distinguished figure than an intellectual debt” (Gigerenzer 2004; p. 396). Kahneman invoked Simon “to construct authority for the behavioral economic program, while at the same time interpreting the concept of bounded rationality in such a way that it would become fully compatible with his and Tversky’s approach and that of the behavioral economists” (Heukelom 2014a; p. 183). This different approach meant that Simon’s original effort to abolish neoclassical economics had failed, but it opened the way for psychological ideas into economics. However, Simon’s ideas were not rescued by the growing success of BE, because BR remained outside the paradigm. In fact, the Nobel Prize was awarded to Simon “for his pioneering research into the decision-making process within economic organizations” (Petracca 2021), detaching him from neoclassical economics, and not a single example from Simon’s contributions to ordinary economic problems is cited (the Royal Swedish Academy of Science only cites “decision-making situations” in general, RSAS 1978). In more recent works, Simon proposed an interpretation of BR similar to what Thaler had done for BE, presenting it not as a revolution but as a

² It is interesting to point out that in the actual lecture the role of Simon is even less markedly acknowledged, e.g. he is cited twice (in the published article he is mentioned 19 times) and the sentence we quoted is not present.

return to “the practical reasoning that Adam Smith and his contemporaries observed in economic actors” (Simon 2000). To no avail: if economists wanted some help from psychology, BE was already there.

10 Timeo danaos et biases ferentes: How BE succeeded against its critics

In the *Aeneid*, the high priest Laocoon tried to caution the Trojans about the gift from the Greek army (the famous wooden horse) but the gods killed him. The opposition to BE was smashed not by the Olympian gods but by the needs of the neoclassical paradigm. Besides the already mentioned motivations, in the 1980s and especially in the 1990s BE started to emerge as an alternative to the EUT thanks to two main drivers. From the point of view of scientific acceptance, this was allowed because BE reduced financial analysis to gambles, resulting perfectly aligned to ordinary financial models. The second driver was the fact that, from the 1990s, financial crises started to punctuate world economy: the collapse of the European Monetary System in Europe, Mexico, Asian Tigers, Brazil, Russia, the LTCM demise, a couple of years later the dot-com bubble etc., recurrent financial crises, and the scant interest that new macroeconomics gave to financial issues helped to make psychological explanations more and more accepted. They helped financial economics to survive. Mainstream financial economists were so interested that even Markowitz contributed (Das et al. 2010) integrating mental accounting in his portfolio theory; moreover, since the 1990s a Behavioral Capital Asset Pricing Theory had been developing (Shefrin and Statman 1994). Given that agents’ rationality is incomplete, so market perfection is incomplete. This solution allowed having the rational cake and eating it too. The paradigm foundations, including laissez faire conclusions, were safe, while markets imperfections, cognitive biases included, permitted dealing with real situations, for instance a financial collapse. In this sense, BE became one of the many attempts to overcome the GEE-EUT’s empirical weaknesses using imperfections, as with information asymmetries (as in Grossman and Stiglitz 1976) or “noise traders” (DeLong et al. 1987). However, for all this caution, there were still many economists that did not like BE.

Interestingly, defenders of the paradigm against BE used psychological arguments too. A first line of defense consisted in using BR in the neoclassical paradigm: “Since rational expectations are attained in the limit in many models of learning, the approach suggests that rationality may emerge asymptotically from boundedly rational behavior” (Honkapohja 1995). In particular, Sargent “sought to restore the balance by picturing agents, economists and econometricians alike as being boundedly rational but converging to rational expectations” (Sent 2018). This not only showed the difficulties encountered by REH models, but also the importance gained by psychological ideas as a way to overcome these difficulties. Sargent, one of the founders of REH macroeconomics, proposed using BR as a “convergence to rational expectations through learning” (Sent 1999).

Simon was glad to point out that, in this way, REH supporters were retreating “to more realistic schemes of ‘adaptive expectations’ in which actors gradually learn

about their environments from the unfolding of events around them” (Simon 1969; p. 39), but the retreat was not enough because the analysis cannot be limited to outcomes, as in the “as if” methodology: “Bounded rationality insists that processes matter, that successful science must properly link the process of making individual decisions to organizational processes responsible for collective choices” (Jones 2002). Without an explanation of how the true model is learnt by economic agents, it is not possible to speak unconditionally of a rational equilibrium (Salehnejad 2007; p. 72).

Sargent was not alone among mainstream economists. In fact, there were many economic models based on BR, but were not works that Simon would have endorsed. In effect, he explicitly rejected this use of his ideas. For instance, Simon read a preliminary version of the fundamental book by Rubinstein on the issue, and, as the author reported, he wholly disagreed with it for the total lack of empirical support of the models presented (Rubinstein 1998, pp. 187–188). All in all, BE was a better compromise: it allowed for the explanation of investors’ behavior at odd with the neoclassical paradigm without renouncing the paradigm itself. BE increased the resistance of the paradigm to theoretical as well as empirical assaults making it more flexible.

This helps to explain why an apparently orthodox strand that used experiments too, empirical economics (EE), did not gain much traction. The idea was to bypass the discussion on agents’ rationality to find “rationality at the market level” as Becker (1962) had already noted. The axiomatization of individual rationality was proved a dead end; moreover, GEE was not the same to *laissez faire* policies, because Barone, Lange and others have shown that it could justify even a centrally planned economy. If information is there, it can be used by private agents just like by the Gosplan. While GEE needed a number of heroic assumptions, EE only needed the rule of law, because without enforcement of property right there is no viable market economy. Smith (1991) brought this idea to its acme and made experiments to this end, showing that even a monkey can achieve optimal equilibrium results (Conlisk 1996). EE reaches *laissez faire* conclusions apparently without theoretical assumptions, and even renouncing utilitarianism (Smith 2015), thus overcoming the “as if” methodology. In this way Vernon Smith seemed to give a victorious turn to the old Austrian school battle against GEE and Walras. Now, it is important to point out that although sometimes Vernon Smith and Kahneman are presented as somewhat similar (for instance, Charness and Halladay 2017) and they won the Nobel prize together, the fact itself that they both use experiments does not make them similar, although, for EE supporters, it increases “consistency between the observations and the models” (Wade Hands 2015).

Indeed, BE and EE are very different theories and rest on totally different methodological premises. First of all, BE is made of a series of theories that go beyond economics that experiments serve to confirm, “while experimental economics is a tool” (*ibidem*) that serves to corroborate a policy conclusion that was much older, thus EE results are empirical in nature. Secondly, experiments were not able to show how individuals could overcome the effects of the biases analyzed by BE. For instance, Thaler observed that markets cannot write off the consequences of the endowment effect: the distribution of utility among agents is not independent from initial endow-

ments (Heuvelom 2007). Moreover, experimental economics makes two peculiar assumptions. First of all, it assumes that agents rapidly learn from their mistakes and correct them. The same Thaler recounts how this has been falsified in numerous experiments where, even when the correct solution has been repeatedly explained to them, individuals still persist in making the wrong decision because even “when subjects are made aware of biases connected to their choices, they only minimally adjust their behavior” (Egidi 2012). The second assumption is that there is always time to learn. It is like to state that animals always have the time to evolve, while the vast majority of the species is extinct exactly because this is not the case; therefore, we must reduce economic analysis to the situations that can be repeated many times in the same environment (Smith 1991). Another problem is that experimentalism does not deal with *homo economicus* with his individual rationality (Knez, Smith and William 1985); in fact, it does not always deal with *homo* at all: the characteristics of the individuals are so irrelevant that even monkeys produce efficient markets. In other words, this is not a micro-founded approach, on the contrary its results hold because individuals are not accounted for; yet, modern economics is supposed to be micro-founded. A fourth problem is that those tests are only used for a single market at a time, i.e. this is a partial equilibrium environment, and the idea that this automatically brings general equilibrium results was proved inconsequential decades ago. What experimental economics can achieve, then, is that on a specific market, equilibrium is attained even by irrational agents. Finally, experiments are only useful on double auction frameworks: a situation with fixed prices, as in supermarkets, is impossible to test (Mirowski 2001; pp. 545 and following). If BE uses gambles as an economic problem metaphor, EE (and Vernon Smith in particular) uses auctions, but the markets’ interactions are by far more complex. As Rabin (2002) noted: “It was jarring for me as I came of graduate school (at MIT) twelve years ago and started following experimental economics to see the very narrow notion of economic institutions (typically, highly anonymous double auctions) studied by the experimental economists. This focus on perfect competition, right or wrong, simply didn’t match the focus of research and teaching at MIT and much of the rest of economics”.

In reality, the reason why BE succeeded while EE was kept at the margin of the paradigm can be found, once again, in Kuhn’s model of science development. EE marginalized anomalies. Smith noted: “the focus on what are called “anomalies,” beginning in the 1970s, converted the emerging discovery enterprise into a deliberate search for contradictions between reports of behavior and standard decision theory” (Smith 2007; p. 149). However, anomalies are what keep the paradigm going. What would be the point of doing research if a paradigm had no anomalies? What new knowledge does a purely confirmative study give to the scientific community? In this way, EE introduced rigidity into the paradigm: it is such an extreme version of neoclassical economics that it ties policymakers’ hands. It prescribes *laissez faire* by default but, once again, reality is by far more complex, especially in the age of recurrent financial crises.

On the other hand, BE was attacked by psychologists who considered it still too close to the neoclassical paradigm. In particular, this came from the scholars of “fast and frugal” heuristics (for a general introduction: Gigerenzer et al. 2011). Like BE, these scholars criticize the full rationality of *homo economicus* but they criticize BE

too, considered too keen on maximization, while real heuristics are simple rules of thumb used to make a decision (Brandstätter et al. 2006). So, for instance, while BE, like the EUT, needs probabilities to assess behavior, these heuristics use simpler rules. The same Kahneman observed “theories in behavioral economics have generally retained the basic architecture of the rational model, adding assumptions about cognitive limitations” (Kahneman 2003). In practice they attacked BE because it is still too based on normative prescription as the neoclassical theory: “It is striking that the behavioral economists who successfully sold psychology to neoclassical economists are among the most hardened and staunch defenders of the normative status of the neoclassical model. Whereas neoclassical economists frequently interpret their models as essentialized approximations, from which deviations are expected to average out in the aggregate, many behavioral economists use the rationality standard of neoclassical economics more literally and rigidly than their neoclassical colleagues” (Berg and Gigerenzer 2010). This means that BE is forced to use “even more heroic assumptions about decision processes” than mainstream economics (Ibidem). For the same reasons, also Simon was attacked. Gigerenzer observed that BR “although bounded, is still a kind of rationality. Consequently, it still makes normative claims – how one ought to reason, what one ought to do – only within its bounds” (Grüne-Yanoff et al. 2014). In this sense, for Gigerenzer, Simon and BE were similar because they were both simply trying to dismantle “the unrealistic assumptions of rational choice theory” (Petraцца 2021), while Simon considered these heuristics as a different definition of satisficing procedures.

At any rate, even if Gigerenzer and others criticized BE for being too close to neoclassical rationality, on the practical side they expressed opposite critiques: BE was too harsh in assessing market results. So, they stated that there is no proof that biased behaviors yield less profits: for instance, they find that “none of the simple rules used in financial asset markets is truly superior to the others” (Gigerenzer and Selten 2001; p. 87). Thus, a rule is valid as a matter of convention, not of maximization. More generally fast and frugal heuristics emphasize the role of social norms (Boyd and Richerson 2001), for instance in consumption (Hayakawa and Venieris 1977), but all these ideas were used to defend the original neoclassical paradigm, thus precluding the cure of its anomalies. It is also interesting to observe that these scholars, as Kahneman and Tversky, were interested in economics as an application of a more general analysis of decision making. For instance, in the book on bounded rationality edited by Gigerenzer and Selten, only one out of forty articles deals with economic problems. Not surprisingly, this article deals with finance (asset allocation); even examples of utilization of heuristics in macroeconomics deal with finance (in particular, financial bubbles, for instance combining behavioral analysis and Minsky, as in Earl et al. (2007), or assuming two types of agents with different heuristics and cognitive limitations, in De Grauwe 2012).

To sum up the three possible alternatives, bounded rationality REH models are among many models that assume imperfections, but they can be considered part of the general class of psychology-based imperfections models that BE has allowed to flourish. EE cannot discuss general equilibrium models and is too rigid as far as policymaking is concerned, reducing the ability of the paradigm to deal with crises. Finally, fast and frugal heuristics models do not propose any cure for the anomalies

nor endorse any specific policy to overcome practical problems, although Gigerenzer and other scholars would argue that these are not anomalies at all. All in all, BE remains the most promising way to develop the neoclassical paradigm against its main contenders.

11 The life of behavioral economics after the 2008 crisis

Broadly speaking, BE results could be disruptive for the *homo economicus* paradigm. For instance, cognitive biases severely damage consumer sovereignty, but without a theory of rational consumers the neoclassical paradigm is strongly undermined. More generally, BE can be used to show that laissez faire policies are mistaken (Camerer 1997; Yellen 2007). This could be repulsive to outright laissez faire supporters like the Austrian school or EE, but the average neoclassical economist is flexible as far as market imperfections are concerned, and the BE stance on market efficiency can be reconciled with almost any policy.

Moreover, BE shares many assumptions with the neoclassical paradigm. For instance, prospect theory and other BE ideas are individual in nature: cognitive limitations are referred to individuals, not to the markets, just as in the *homo economicus* framework: “Behavioral economics has pointed out—and empirically substantiated—numerous irrationalities, but although there are a few important exceptions, almost all of what has been shown has referred to the actions of individuals” (Schwartz 2019). The issue is not only theoretical: from this individualistic stance follow individual solutions, and these assumptions “have guided many (though by no means all) behavioral scientists to frame policy problems in individual, not systemic, terms” (Chater and Loewenstein 2022). This concentrates the focus of economic policies on the micro-level. For instance, to ensure a sustainable economy, individual behaviors are targeted so that: “Corporations with an interest in maintaining the status quo put out PR messages that the solution to a problem they are associated with lies with individual responsibility, and that people need to be helped to exercise that responsibility more effectively” but these interventions at the micro-level “show at best modest, and often null, effects, and are sometimes even counterproductive” (ibidem).

Another issue where BE is aligned with neoclassical methodology is that it deals with static explanations. Market imperfections are caused by cognitive biases that do not have cycles or trends (this is also an observation made by Berg and Gigerenzer 2007; to propose less regulation). This rules out a discussion on economic and social dynamics, like wealth concentration or financialization. Financial crises are not connected to deregulation or giant banks but to our brains. The fact that in some epochs financial crises are frequent, and in others are not, does not seem relevant, a stance that is once again aligned with the neoclassical explanations of crises.

A third issue of BE alignment can be introduced by the following quotation: “Consider the following list of economic activities: deciding how much milk to buy at the grocery store, choosing a sweater, buying a car, buying a home, selecting a career, choosing a spouse, saving for retirement” (Thaler 2016): what do they have in common? They are individual consumption choices (with one exception that can be easily reduced to consumption). The neoclassical paradigm deals with individual consum-

ers or investors. Profit maximization, the firm's behavior, that was at the core of the classical school, is discussed inasmuch as consumers must have an income to buy something.

A fourth line of similitude is the all-round pervasiveness of the rationality interpretation. In the neoclassical paradigm, *homo economicus* is always a rational maximizer, and this means that the neoclassical approach can be used everywhere. The apotheosis of this line of research is Becker's *The Economic Approach to Human Behavior* that proposed to extend the *homo economicus* model to every human behavior. Moreover, neoclassical models do not need everybody to be rational. As the same Becker argued: "It doesn't matter if 90% of people can't do the complex analysis required to calculate probabilities. The 10% of people who can, will end up in the jobs where it's required" (cit. in Etzioni 2011). The EE line is even more extreme: you don't need a single rational agent to have an efficient market. In a sort of Dante's *contrapasso* to Becker's project, Kahneman and Tversky argued that all human behaviors could be understood under a unified theory, yet this was not the *homo economicus* paradigm but psychological heuristics. Symmetrically to the Hayekian monkeys of the EE models, Thaler (2016) noted that "even the best chess players in the world do not maximize", and thus neoclassical rationality does not exist and must be substituted by heuristics. All in all, having considered BE and neoclassical paradigm similitudes, we can agree that "The normative model of behavioural economics is neoclassical rationality" (Viale 2018). Despite the fact that for BE critics this is a reason of concern, this is also why BE succeeded where Simon failed. All in all, the neoclassical triad was kept safe: BE proposed quasi-rational individual maximizer economic agents with cognitive biases.

Given the importance of BE as a cure to the paradigm anomalies, behavioral economists could aspire to a bigger scientific recognition, although Kahneman remained prudent. For instance, he observed: "you are unlikely to find [BE] terms in the index of an introductory text in economics. I am sometimes pained by this omission, but in fact it is quite reasonable, because of the central role of rationality in basic economic theory... This assumption is truly necessary, and it would be undermined by introducing the Humans of prospect theory..." (Kahneman 2011; p. 278), adding that reality would be "confusing, and perhaps demoralizing". In other words, it is right to distort reality to protect students from a gloomy truth. This can explain why Simon observed that these students are afflicted by "deep cynicism about their own research and about what they are being taught and asked to believe" (cit. in Conlisk 2004; p. 194). Once again, the issue was to add psychological explanation to mainstream economics: "We think it is simply unwise, and inefficient, to do economics without paying some attention to good psychology" (Camerer and Loewenstein 2004). To use the title of a famous book by Thaler, the goal was to create a *Quasi Rational Economics*, and it worked well especially vis à vis Simon's *hubris*: "The changing status of 'behavioural economics' in the past two decades provides a telling case study of what can be achieved by careful positioning and brand management and of the opportunities that can be lost if these issues are mishandled. At first sight, it may appear that... 'new behavioural economics' has been accepted purely because it does not violate the hard core of the mainstream research program, unlike the earlier approach for which Herbert Simon was awarded the 1978 Alfred Nobel Memorial Prize in Economic Sci-

ence” (Earl and Peng 2012). It would be inaccurate to state that Simon did not have success. He did, but not as an economist.

On the contrary, BE prudence was rewarded. The 2008 crisis was not only important in practice, being the most severe financial collapse since the 1930s, but also in the theoretical field. It caught the economists unprepared: “The economics profession was taken by surprise by the severity of the recent crisis and by the speed with which it spread throughout the world” (Martin and Ventura 2011). The surprise was so overwhelming to suggest renouncing prediction altogether, as Fama himself stated: “Economics is not very good at explaining swings in economic activity” (Cassidy 2010), thus implicitly rejecting the “as if” method that had ruled economics since the 1940s. The impasse was tackled using psychological ideas. Theoretical works that explored financial markets using BE hints multiplied (for instance, Gennaioli and Shleifer 2018), and the wide utilization of nudging in fields like consumer protection shows that BE also succeeded in modelling practical policies (OECD-IOSCO 2018). After two decades since Kahneman was awarded the Nobel Prize, BE is now the most promising imperfectionist version of the neoclassical paradigm, “improving neoclassical economics on its own term” (Lanteri and Carabelli 2008).

12 Conclusions. The best cure for anomalies

Non virtute hostium, sed amicorum perfidia decidi - Cornelius Nepos.

The difficulty lies, not in the new ideas, but in escaping from the old ones – J. M. Keynes.

Neoclassical economics is based on theories about individuals that, left to themselves, trade goods maximizing utility for themselves and overall. The development of the paradigm has followed two paths: the clarification of the formal conditions of this process (the general equilibrium), and what happens when the markets do not comply with these conditions because of imperfections (included psychological ones). The GEE cum imperfections is a formidable paradigm as it can reject any empirical attack. For instance, the 2008 global financial crisis was a severe blow to mainstream economics, but the surprise ended rapidly and the blow was felt especially on the media. Deep inside the profession, it only meant that new imperfections had to be introduced to improve the performance of the economic models. Therefore, when the crisis erupted, after a rapid homage to Keynes or Minsky, the profession concentrated on the analysis of imperfections (like financial frictions or cognitive biases). On a more theoretical plan, the GEE paradigm has not changed much in the last decades, nor it is likely to develop too soon. In this sense, it is the most entrenched possible hard core but at the same time not interesting enough for an economist to delve into. The debate is on practical issues. Economic anomalies, like non-competitive markets, or negative externalities are well known and widely debated.

BE suggested a new source of imperfections: our brain. This source is particularly effective to protect the neoclassical paradigm because it dismisses discussions on specific features of modern capitalism: if bubbles depend on biases (for instance

overconfidence), what is the point in analyzing issues such as financialization, income inequality, financial deregulation? BE-linked anomalies are psychological, thus defying any economic attack on the neoclassical paradigm. Higher taxes on rich people can address inequality but not cognitive biases, stricter rules can reduce banks' leverage but not overconfidence, and so on. Although BE was gaining ground long before the crisis, the latter changed the scenario: "The financial crisis of 2007 and 2008 strongly challenged the belief that expectations are rational and markets are efficient. With reality so jarringly incompatible with standard neoclassical models, behavioral economics gained in stature while the awarding of the 2017 Nobel Prize to Richard Thaler gave a strong signal that behavioral economics is accepted by the mainstream of the profession" (Tzotzes and Milonakis 2021). This acceptance was well deserved because BE ascribed financial crises to marketing tricks linked to cognitive biases, for instance the "teaser rates" of the subprime mortgages (Thaler 2016).

While preventing any deep attack to the paradigm, BE is also able to address its crises, whereas variants of the neoclassical paradigm that exclude them do not allow the theory to deal with them. For instance, according to the founders of new classical macroeconomics: "Macroeconomics in this original sense has succeeded... Its central problem of depression prevention has been solved" (Lucas 2003). Strict obedience to these conclusions would have imposed *laissez faire* recipes in 2008, with catastrophic results. As Summers observed: "the principle of building macroeconomics on microeconomic foundations, as applied by economists, contributed next to nothing to predicting, explaining or resolving the Great Recession" (Summers 2018). Summers himself proposed a solution: irrational investors, a typical tenet of BE. Moreover, a paradigm with no anomalies is not attractive to researchers. As Nickles (2018) noted analyzing the role of Simon: "Godlike epistemological models are exactly the wrong starting point for epistemology, for an omniscient being, already knowing everything, cannot genuinely inquire, cannot learn".

A paradigm needs anomalies to be interesting for scientists and to retain its flexibility especially in uncertain times. Kuhn observed that the emergence of new theories is often preceded by a period of strong professional insecurity "generated by the persistent failure of the puzzles of normal science to come out as they should. Failure of existing rules is the prelude to a search for new ones" (Kuhn 1977; p. 92). BE gave the neoclassical paradigm the new rules it needed, although the process was not smooth because, as seen, many economists were, and still are, opposed to the BE solutions to neoclassical anomalies. However, this is not worrying for the paradigm: strong disagreements are acceptable, especially if they allow puzzle solving and anomalies discovery, the core of the activity of scientists. Controversies on variants of the paradigm can be tough and enduring, but Kahneman and Tversky were careful not to irritate the economists by waving the red flag of the failure of *homo economicus*, while explaining the need, for the neoclassical paradigm, of a cognitive help that can also imply a more active policy. They were distant in the contents but friendly in the approach. For instance, Kahneman attacked *laissez faire* conclusions: "Although Humans are not irrational, they often need help to make more accurate judgments and better decisions, and in some cases policies and institutions can provide that help" (Kahneman 2011; p. 402). The message is clear: we can retain the foundations of the neoclassical paradigm also during financial crises using more active policies.

BE assumes that the neoclassical paradigm can be amended and developed, therefore economics *as a science* can continue to exist. BE could have been a scientific revolution, but failed to become so because its techniques have been incorporated in the normal sciences practiced by neoclassical economists (Berg 2003).

To conclude, BE success ultimately shows what the hard core of the neoclassical paradigm consists of: a triad based on individualism, rationality and utilitarianism. They are needed, yet not necessarily together. Their alternate absence gives way to the prevailing kind of pluralism of modern economics: a variety of imperfections inside the neoclassical universe. Thus, the neoclassical paradigm and BE “are not competitors in the intellectual market place but complementary suppliers” (Nightingale 1994). By focusing on explaining anomalies using a bounded range of minor alterations to the neoclassical triad’s preferred modes of analysis, BE has allowed a limited form of pluralism that maintains most of the hard core as defined by the triad. This enrichment has served as a successful adaptive device enabling economics to survive the many empirical challenges we mentioned. In contrast, the radical methodological revisions proposed by Simon’s BR research program proved too extreme. The different attitude of Kahneman-Tversky and Simon towards the neoclassical paradigm, more than the content of their theories, explains why prospect theory is normally taught in theory of finance lessons today while bounded rationality is not.

Appendix – a summary table

In the paper we have discussed the neoclassical paradigm vis à vis different alternatives. In the following table we sum up their characteristics to help highlight the main aspects we discussed. In particular, we synthesize their attitude towards the triad we mentioned and their ensuing stance towards policymaking.

	Neoclassical paradigm	Bounded rationality	Behavioral economics	Experimental economics	Fast and frugal heuristics
<i>Utilitarianism</i>	Core aspect	Partial	Partial	Irrelevant	Irrelevant
<i>Individualism</i>	Full	Partial	Partial	irrelevant	Partial
<i>Rationality</i>	Full	Limited	Limited	Full	Limited
<i>Active policies</i>	Only with imperfections	Sometimes	Helpful	Normally irrelevant (rule of law)	Normally unhelpful
<i>Financial crises</i>	Impossible	Possible	Frequent	Impossible	Unlikely

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