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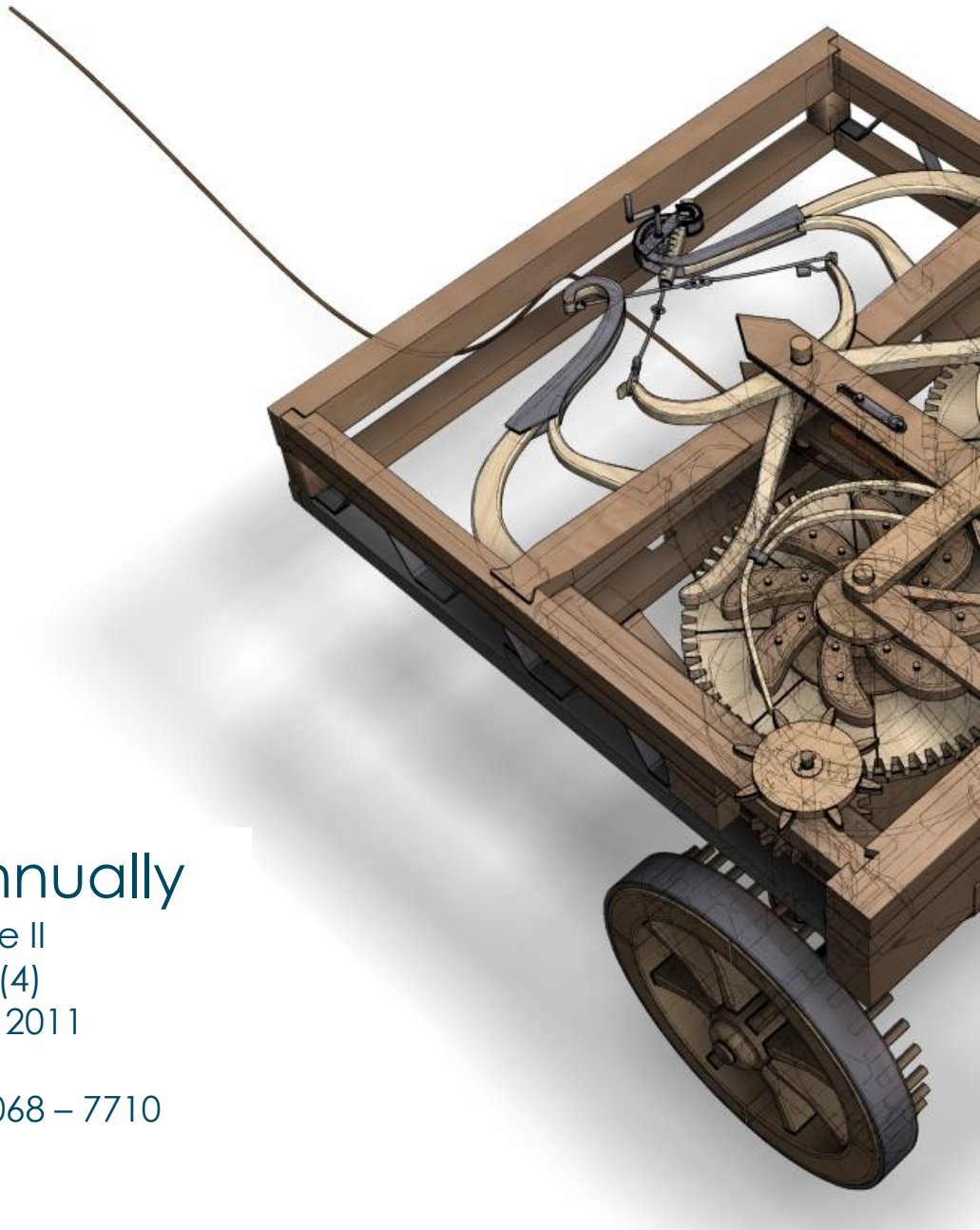

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# *Contents:*

1 **Some Convergence Results on Dynamic Factor Models** ... 120
**Maddalena Cavicchioli**
University of Venice, **Italy**

2 **Italy after the Crisis: a Case of Recoveryless Credit Growth** ... 132
**Antonio Forte**
Centro Europa Ricerche, **Italy**

3 **Expectations Impact on the Effectiveness of the Inflation-Real Activity Trade-Off** ... 141
**Gbaguidi S. David**
Université des Antilles et de la Guyane (CREDDI-LEAD), **France**
Université de la Méditerranée II (GREQAM), **France**

4 **Rationality and Choices in Economics: Behavioral and Evolutionary Approaches** ... 181
**Mario Graziano**
Università di Messina, **Italy**
Dipartimento di Scienze Cognitive, della Formazione e degli Studi Culturali
**Daniele Schilirò**
University of Messina, **Italy**
DESMaS "V.Pareto"

5 **A Mathematical Model for a Company's Advertising Strategy** ...195
**Laura Ungureanu**
Spiru Haret University, **Romania**

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# RATIONALITY AND CHOICES IN ECONOMICS: BEHAVIORAL AND EVOLUTIONARY APPROACHES

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**Abstract**:

*The paper critically discusses the issue of rationality and choices in economics in both the behavioural and evolutionary approaches. Our study aims, on the one hand, to highlight the scientific contributions of psychology in economics, since psychology, and with it the theoretical approach of the behavioral economics, has made more complex and problematic the analysis of economic choices, showing the limits of rationality. On the other hand, the work offers a reinterpretation of the theory of Alfred Marshall in a biological-evolutionary perspective. The reinterpretation of Marshall's theory in a evolutionary perspective aims to show that, historically, economics has not been a discipline aligned in a homogenous way to a single and undifferentiated thought, locked into the idea of perfect rationality, but, on the opposite, is a discipline that has enriched itself and continually is enriching by contributions and significant contaminations with other research fields.*

**Keywords:** rationality, choice, behavioral economics, evolutionary theories, biology

**JEL Classification**: B13, B52, D01, D03, D81, D90.

## 1. Introduction

This paper critically discusses the issue of rationality and choices in economics by examining both the behavioral and evolutionary approaches.

Economics has pointed out, with Leon Walras and Vilfredo Pareto, its independence from the other disciplines following a deductive-nomological approach and treating the non-economic behavior as "irrational". This has led to exclude all links or contamination of economics with disciplines such as philosophy, psychology and biology. Not by chance that Lionel Robbins expressed a concept of choice entirely contained in the economic dimension. He claimed in his book *Essay on the Nature and Significance of Economic Science* in 1932 that economic theory is a deductive science, by which can be calculated the behavior of individuals, if are known the purposes, the means available and the preferences. Robbins then postulates the concept of choice in economics as a result of a coherent and logical reasoning, which implies and emphasizes the role of rationality.

Research in psychology, instead, has systematically depth the study of topics such as human judgment and behavior (also economic behavior) of individuals, challenging the traditional concept of perfect rationality of economic science. In addition, psychological research in economics, known as cognitive-behavioral approach and the biological and evolutionary line of research have highlighted some shortcomings and inconsistencies of economic science, showing, as in the case of behavioral economics, a systematic discrepancy between economic theory and reality. This implies the inability of economics and its theoretical system known as the theory of rational choice to explain and describe the complexity of reality.

This contribution argues the issue of choice and rationality in economics looking at different approaches with respect to the traditional analysis. Our investigation aims, on the one hand, to highlight the scientific contributions of psychology in economics, since psychology, and with it the theoretical approach of the behavioral economics, has made more complex and problematic the analysis of economic choices, showing the limits of rationality. On the other hand, the work offers a reinterpretation

of the theory of Alfred Marshall in a biological-evolutionary perspective. His theory showed the dynamics and the evolution of the economic system. In Marshall's works, there is the clear belief that economic and biological phenomena share a large number of similarities concerning the organic and complex nature, but also the involvement in a constantly changing world. The reinterpretation of Marshall's theory in a evolutionary perspective aims to show that, historically, economics has not been a discipline aligned in a homogenous way to a single and undifferentiated thought, locked into the idea of perfect rationality, but, on the opposite, is a discipline that has enriched itself and continually is enriching by contributions and significant contaminations with other research fields.

## 2. Choice and rationality, between economics and psychology *

### 2.1. Expected utility and choices under uncertainty

Neoclassical economics, by adopting a system known as the "Theory of rational choice", has described the decision as a rational process conducted by a single cognitive process. In such a process it is assumed that each individual has stable and consistent preferences and make decisions based on the principle of maximization of the subjective expected utility. So given a set of options and beliefs expressed in probabilistic terms, it is assumed that the individual maximizes the expected value of a utility function U (x). This means that - according to the Theory of rational choice - an agent is rational if it maximizes the value of his expected utility function, where this function exists if are met the three axioms (*transitivity, continuity, independence*) on which are based the preferences. To maximize his expected utility function, the individual uses probability estimates and utility values as elements of the calculation, assessing the probabilities and significant utilities on the basis of his personal opinion but also using all relevant information available. In practice, this process is based on the assumption that the utility of an individual under conditions of uncertainty can be calculated as a weighted average of the utilities in each possible state, adopting as weights the probability of occurrence of each alternative. In this complex theoretical model the actions of individuals are the result of a choice and the rationality of actions is, therefore, the manifestation of the criterion of rationality of the agents.

The complexity of the system of choice under uncertainty manifests itself in the fact that one must take into account several conditions of rationality, such as the existence of a regular system of preferences on the consequences; the rationality of expectations about the consequences of actions; the rationality of the function that determines the system of preference on the actions relative to the expectations about the consequences of actions (Schilirò, 2011).

The expected utility theory has been generally accepted as a normative model of rational choice, by defining what decisions are rational. In fact, if an individual does not maximize his expected utility is intended to violate in his choices some precise axiomatic principles, which are also rationally binding. This theory has also been applied as a descriptive model of economic behavior (Friedman, Savage, 1948; Arrow, 1971) so as to constitute an important reference model in economics. However, the expected utility theory has proved unable to adequately describe the behavior of individuals, as Maurice Allais has been shown in Paris in 1952 with his experiment on gambling, which he published in Econometrica in 1953 and known as the "Allais' Paradox" [25]. The purpose of Allais was to show that the axiomatic method of subjective expected utility theory, proposed by von Neumann and Morgenstern in their book *Theory of Games and Economic Behavior* (1944), did not constitute a proper descriptive theory of choices under uncertainty, since he had met in several experiments the violation of the axiom of *independence*. Individuals, in fact, behaved in an ambiguous way in the choice between almost

*Paragraph 2. is written by Daniele Schilirò

[25] In 1952 in Paris, Allais presented his famous "Paradox" to an audience composed of the best economists of his generation: among others, Kenneth Arrow, Paul Samuelson, Milton Friedman, Jacob Marschak, Oskar Morgenstern and Leonard Savage. The results of laboratory experiments conducted by Allais showed that people chose inconsistently and preferred solutions that do not maximize expected utility, thus demonstrating that the axiomatic definition of rationality did not allow describing and even predicting the economic decisions.

certain events and probable events. Allais then expressed the need to change the formal criteria of the theory.

## 2.2. Rationality and economic choices in the behavioral approach

The "Allais Paradox" is a first important critique of the theory of expected utility because it highlights how individuals are "inconsistent" in their choices, as they are driven by motivations that the Theory of rational choice does not explain and cannot justify, due to its axiomatic definition of rationality. Another "Paradox" is the one developed by Ellsberg (1961), who demonstrated experimentally another type of inconsistency in preferences, showing that individuals prefer to bet on a lottery with known probabilities of winning rather than on a lottery with ambiguous results. Individuals therefore show an aversion to ambiguity. This aversion to uncertainty (ambiguity) is subjective but completely ignored in the model of expected utility from a descriptive point of view, while it is not considered eligible from a normative point of view.

But the most interesting critical contributions to the axiomatic approach of the Theory of rational choice theory come from the cognitive-behavioral theoretical strand that has emerged in the seventies. The results of research in cognitive psychology reveal different distortions (biases) in decision making under uncertainty that the economic theory of rational choice did not consider at all. These results highlight especially a number of anomalies in conceptualizing a model where individuals maximize their utility function, which, by hypothesis, is perceived as conistent, accurate and also stable over time. It follows that they often make systematic errors in predicting their future experience of results and, therefore, fail to maximize their utility (Kahneman, Thaler, 2006). This occurs because individuals face in their acting real difficulty in assessing their preferences. Therefore, they prefer the pursuit of instant gratification, which, however, are often inconsistent with their long-term preferences (Rabin, 1998).

Behavioral economics is then really a return to reality from an untenable position that the rational optimizing model is the only framework for economics (Shiller, 2005). Thus, behavioral economics, through his experiments, tries to account for constant deviations that individuals make in real life with respect to the theory of choice in its standard version, at the same time postulating a system of heuristic evaluation. Kahneman and Tversky were the promoters and the protagonists of the cognitive-behavioral turn. In one of their contributions Tversky and Kahneman (1974) documented that individuals made systematic deviations from perfect rationality when they express a judgement under uncertainty. Tversky e Kahneman provide a theoretical explanation about the observed deviations from perfect rationality, noting that people rely on «heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations» (1974, p.1124). Tversky e Kahneman, therefore, do not abandon the assumption that individuals are intelligent and intentional in making decisions, but they assume just systematic and specific distortions that move away the individuals' judgements from perfect rationality.

Rabin (1998, pp. 24-32) mentions among the various distortions highlighted by Tversky and Kahneman, and other scholars – e.g., Gilovich, Vallone and Tversky (1985), Bruner and Potter (1964), Keren (1987) and others, who contributed to this line of researches in behavioral economics: the "law of small numbers", or the tendency of individuals to overestimate by a rather small sample the similarities with the entire population from which the sample came from, and the "confirmatory bias". This stems from the fact (as documented by the results of research in cognitive psychology) that people tend to incorrectly read the evidence of the data, so as to constitute further evidence in support of their hypothesis, which explains the occurrence of "confirmatory bias".

Other violations of the expected utility paradigm that have a psychological motivation and which are important in the choice of a financial nature are risk aversion and, above all, loss aversion (Kahneman and Tversky, 1984). For most individuals, in fact, the motivation to avoid a loss is greater than the motivation to make a profit. This general psychological principle, which is connected to a kind of survival instinct, means that the same decision may give rise to opposite choices depending on whether the results are presented to the subject as losses rather than such as loss of earnings. This

type of evidence has led Kahneman and Tversky (1979, 1984), but also Thaler (1980) to develop the "prospect theory" as part of their cognitive-behavioral approach. This theory starts from the observation that the probability distributions perceived by individuals, who make decisions under uncertainty, are not invariant with respect to environmental contexts. Hence one of the cardinal principles of behavioral economics is framing, that is, human actions are heavily influenced by frames of reference. The institutional structure that individuals have is the basic framework for all of their economic decisions[26]. Kahneman e Tversky have shown, for example, that many of the risks of little importance are given disproportionate weight, but also that the losses and future earnings are not treated symmetrically. The uncertain gains and losses are evaluated in this case in relation to the wealth possessed by the individual (endowment effect)[27]. The expected utility of the subjects is not calculated according to the monetary values that make the probability distribution, but rather on the deviation of these values from the *status quo*, which corresponds to the wealth of the individual. In this way, at different levels of wealth can match order of preference on the same pair, contradictory to each other, and this behavior is attributed to the perceptual processes that process information about uncertain events. Kahneman and Tversky attribute this behavior to the perceptual processes that process information about uncertain events taking as reference the situation to which the individual has been previously adapted. The authors link the description and understanding of economic decision to the analysis of the functioning of mental processes, thus emphasizing the psychological motivations of this perceptual distorsion. Kahneman and Tversky have, thus, questioned the assumptions of rationality of neoclassical economics. In fact, most of the economic analysis assumes perfect rationality in agents' decisions, but also the rationality of the judgments and predictions on which those decisions are based.

The approach of behavioral economics goes therefore beyond the rationality postulated by the neoclassical economics and formalized in the Theory of rational choice; it does indeed point to a different concept of rationality: i.e. that of bounded rationality. This concept, introduced by Herbert Simon (1955, 1956, 1978)[28] indicates that rational choice that takes into account the cognitive limits of the agents.

According to Simon, even though individuals try to make decisions as rationally as possible, they can not be entirely rational due to some factors or limits such as: the complexity of the problems, the availability of incomplete information, the limited ability of agents to process information, the limited time available to them, the conflicting preferences of decision makers with respect to objectives. Simon's approach based on bounded rationality has focused primarily on so-called process of finding a satisfactory level ("satisficing search and process") through which individuals, because of limitations in cognitive processes, unlike the process of maximizing, seek solutions to achieve a sufficiently good level of aspiration that they have set. This mechanism, validated by a large amount of empirical results, leads individuals, in the case where it is difficult for them to find "good enough" solutions to set an aspiration level, to diminish and/or increase the search activity. This rationality of the process of looking for alternatives, according to Simon (1987), is more procedural than substantive, rationality is in fact a feature / quality of the research process - as is highlighted by Novarese, Castellani, Di Giovinazzo (2009) - and is a psychological form of rationality, as opposed to economic rationality. So in the Simon's vision, bounded rationality is more related to the procedural level of decision making. Bounded rationality is consequently a complex mechanism, which takes into account many aspects of the mental process of the human person: both aspects of the research activity and/or ongoing adjustment of the level of aspiration and of post-decision assessment. Both these phases of decision-making are closely linked to personal experience and to the ability to "frame" a situation, putting it in relation to previous similar situations through a kind of analogical reasoning.

[26] Shiller (2005) argues that behavioral economics yielded important institutional innovation and in any case maintained an environment friendly to institutional innovation.
[27] Kahneman, Knetsch, Thaler (1990).
[28] See also Cyert, Simon, Trow, (1956), Simon (2000).

Simon's ideas on bounded rationality mean that, as regards the decision analysis, the focus shifts - as stated by Egidi (2005)[29] – from decision to the representation of the alternatives, thus paving the way for an extremely wide range of empirical studies on the building of strategies, problem-solving and learning.

Kahneman and Tversky are broadly in agreement with Simon in arguing that the analysis of cognitive process should be put at the center of the investigation of economic behavior, though without calling into question the normative force of rational choice. Their theory does not seek to falsify the expected utility theory as a normative theory, but will demonstrate its inadequacy at empirical level and, consequently, the poor predictive ability of economic theory on which it rests. Kahneman and Tversky distinguish two stages in the process of choice under uncertainty: first, the mental representation of events, second, the phase of evaluation (Tversky, Kahneman, 1986). In particular, the mental representation of events constitutes, in their view, the key element of the decision. The attitude to risk varies according to the different individuals, depending on the frame within which lies the choice (Kahneman and Tversky, 1979). It follows that the frame, or the context of choice, *coeteris paribus*, helps to determine a different behavior. In conclusion, Tversky and Kahneman, with their theory, certainly did not want to support the thesis of human irrationality, but they indicated the way to build models or "maps" of bounded rationality (Kahneman, 2002), thereby following an approach not much far from Simon's.

There is, however, another perspective, different from behavioral economics: the experimental economics. This latter approach justifies, by means of laboratory experiments, its capacity of analysis and verification of theories. For instance, in the event you want to test the empirical plausibility of an economic theory, the experimental analysis may be useful to check its generality; the laboratory represents, in fact, a special case in which a theory, that claims to be general, must find a positive response. The experimental evidence may also provides useful suggestions to the refinement of a theory, showing, in front of the empirical evidence produced in the laboratory, where it will highlight its greatest weaknesses. This theoretical strand of experimental economics identified weaknesses and strengths in the approach of behavioral economics. Vernon Smith (2000) – the most influential exponent of experimental economics – critiques several aspects of the theory of Kahneman e Tversky, but he shares with them some conceptualizations, he also considers Herbert Simon as one of the major economists for his theory and his experimental method. With regard to neoclassical theory, Smith (1982, 2000) recognizes in it some elements of great explanatory power, but also significant weaknesses. He argues that neoclassical economics in its standard formulation is a good first approximation to understand and predict the behavior of markets[30], but this theory - according to Smith - is incomplete, especially in the definition of the convergence processes over time.

The economic literature, which documents paradoxes and inconsistencies of rationality is rich and certainly goes beyond the above mentioned contributions from Kahenamann and Tversky, Thaler and other protagonists of the behavioral approach. An important issue about this concerns intertemporal choice, namely a choice between options the consequences of which occur at different points in time. It is good to mention in this regard the empirical paradoxes that document the failure of the traditional discounted utility model. As is well known, in the literature the dominant normative model is the model of Samuelson (1937), in which the utility of the various alternatives over time, measured at the time the investment decision is taken, is the weighted sum of the values of utility of all the alternatives, discounted as a function of time in which they arise. According to this model, the behavior of an investor is rational in dynamic terms when he realizes his investment plan consistenly as formulated in the present.

The discounted utility model provides a way to evaluate the intertemporal choice. First, there is the stationarity of preferences, whose main implication is that if A is preferred to B at time *t*, it will be preferred at any other time in the future. Secondly, the main component of the model is a function of

[29]Egidi, *Prefazione* in Motterlini, Guala (2005, p.XV).

[30] Experimental economics is concerned with markets and institutions rather than individuals.

discount that is used to calculate the present value of future utility. In many applications of the model are being used exponential discount functions. These functions generally have an exponential discount rate that is constant through time and equal for all goods. The exponential discount functions also have the convenient property of not generating inversions of preference. Strotz (1956)[31] was the first economist to formalize a theory of commitment and to demonstrate that the mechanisms of commitment may be important determinants of economic performance. He has shown that when the discount functions of individuals are not of exponential type, individuals prefer to limit their future choices. The mechanism of commitment is usually undertaken by individuals-decision makers when their preferences are dynamically inconsistent.

Within the cognitive social psychology and behavioral economics, the research on intertemporal choice (Ainslie, 1991, Akerlof, 1991; Thaler, 1981) has produced abundant evidence of the pervasive devaluation of the future by the economic agents. These empirical studies have led to affirm that the discount functions are usually hyperbolic (Mazur, 1987, 1988). The hyperbolic discount functions are characterized by a relatively high discount rate on the short horizons and a relatively low discount rate on the long periods of time. This complex structure of discount rates creates a conflict between today's preferences and preferences to be held in the future. In addition to the hyperbolic functions, appeared in the literature other discount models that contain functions that try to explain this "bias towards the present" in the evaluation of monetary sums. These models make use of the quasi-hyperbolic discount function (Laibson, 1997). The empirical evidence is therefore generally inconsistent with the property of a constant discount rate as postulated in discounted utility model.Thus, these different discount structures are relevant in that they may play a role not only in economic decisions, but also in the generation of self-control problems.In conclusion, the models that are following the cognitive-behavioral approach represent, according to some scholars, a collection of tools and/or ideas rather than a unified theory, so this approach is not yet a theoretical paradigm independent and structured (Motterlini, Guala, 2005, p. 26). The fact remains that the “psycho-economic” models, if formally founded and empirically tractable, may contribute to the development of a more general theory of rationality based on cognitive-behavioral bases. The behavioral economics with its research program and its models seeks to balance the relationship between theory and evidence, using a broader but, at the same time, less rigid concept of rationality, where the psychological dimension of individuals is not excluded in the economic choices.

## 3. Evolutionism and biology in economic models**

### 3.1 Economics and biology in the theories of Alfred Marshall

One of the major merits of behavioral economics has been to show experimentally that, in everyday life, there are numerous possibilities that arise when we make an important decision; thus, the consequences of these choices are not clearly predictable or known *a priori.* In this complex and uncertain environment, our choices have consequences which can be more or less favorable over time. Experiencing the different consequences permits the knowledge of various options and allows to elaborate a preference for some of them. If we then verify the consequences associated with each choice, our uncertainty decreases and, therefore, decisions will be driven, according to our inclinations, whether or not to run risks. As a consequence, we can speak of the decision-making as an adaptive process that manifests itself in fundamental steps that an individual adopts in relation to a complex and dynamic environment. It allows us to control and direct the choices to the options that are more profitable. A '"right" decision-making allows us to learn of new situations, to move forward taking into account the errors and also to modify the actions that have proven inappropriate. On the opposite, when behaviors are no longer suitable, that is, when the choices of individuals have systematically unfavorable consequences for themselves and for their group, than the decision is called "inappropriate" (or pathological). The most complicated aspect of decision-making is that not only the choices are at stake, but rather the values that we assign to them. The preference for an action over another depends,

[31] For a survey: Shane, Loewnstein, O'Donoghue, (2002).

in fact, by the way our brain interfaces with the internal and external world. It is these same mechanisms that constrain our choices, anchoring them to our biological needs. The ability to assign a value to the different options of choice is becoming more sophisticated over time, because it represents a valid strategy for solving problems that affect our survival and also for a requirement of flexibility in dealing with the uncertainties of the surrounding environment (Montague, 2008). The living beings also tend to develop increasingly complex structures, accumulating changes due to various adjustments or reorganizing their previous configurations. In this sense, the standard economic models have had the great limitation of not taking into account that the phenomena and processes of change must be historicized and thus can not be caged into rigid and outdated mathematical models.

In this context of reform of contemporary economic theory, the discipline that has had the merit of capturing the evolution of economic realities is biology (Hodgson, 1993). However, as Theodosius Dobzhansky (1973) had already realized, you can not grasp something important in biology without the idea of Darwinian evolution by natural selection. It is the latter, in fact, to have offered to biological data a very powerful overall consistency from the explanatory standpoint and, in some cases, also from the predictive point of view, bringing together the great amount of experimental data within a single theoretical framework by which we can interpret the multiformity of living being and his many transformations (Pievani, 2005). However, before the theory of evolution and economics could establish a fruitful interdisciplinary dialogue, there was the need that both reached a certain level of maturity. This dialogue was possible given certain assumptions that the two sciences share, i.e.: 1. Rarity. The economic/biological individual search limited resources. 2. Competition. The individuals are competing for the achievement of the limited resources. 3. Maximisation. The individual is represented as the one that maximizes a value (utility / attitude) in the attainment of resources. 4. Joint Emergency. The processes (market / evolution) are not directed by the agents, but derive from the competitive interaction between them. Although several authors have referred to the economy as a biological system, Alfred Marshall is the economist who looks at an advanced use of the evolutionary paradigm. In fact, he provides in his work, *Principles of Economics*[32], the argument in favor of "organic economy", based on the assumption that the economic and biological phenomena share a large number of affinities, from the complex and organic nature to the involvement in a changing world, to the qualititive and quantitative influences that imply that future events do not ever reproduce the same conditions.

Apart from the *Principles,* also the later work of Marshall, i.e. *Industry and Trade* (1919), is crossed by a chronic dissatisfaction that is revealed every time he found not so much the logical inconsistency of the successful economic analytical tools, but rather their lack of immediate applicability to practical situations. The originality of his idea of economic dynamics, or rather of economic evolution, derived from a biological model that has been shelved for a long time until many areas of knowledge have been permeated by evolutionary theories. In economics, however, the term 'evolution' (or evolutionism) is used in different and sometimes opposite ways. There is indeed a sense of usage of the term 'evolution' that does not go beyond an explanation in analogical terms. In this case the use of biological terms is simply to criticize or justify the standard economic theories or notions as, for example, the equilibrium of the markets. Another point of view could be to take rather seriously the evolutionary paradigm, specify its characteristics, and then to reason in terms of reproduction and selection. To construct a satisfying theory of economic evolution is not enough then, to look for similarities with the notions of natural selection, change, unit of selection, but it should be necessary to supplement, beyond the simple conceptual marks, what brings together the economic approach with the evolutionary one. In fact, because the principle of natural selection, applied to the evolution of the patterns of social and industrial organization, is theoretically relevant, it requires, in origin, an integration and understanding of Darwinian evolutionism as part of its global issue. Alfred Marshall has worked following this perspective, that is, questioning about the way that

** Paragraph 3. is written by Mario Graziano.

[32] First Edition 1890.

Darwinian evolution could be used for the study of economic phenomena. The peculiarity of Alfred Marshall is, in fact, that of being one of the first economists to have explicitly claimed the use of a double approach, static and dynamic, for the study of economic phenomena. Both approaches are structured around systems of reference, based on analogy, of different nature, which are respectively the physical model and the biological model. Marshall argues that there is a relative strong analogy between the first stages of an economic reasoning and the static step in the physical sense. Then he asks if there is a step so profitable in the last stages of an economic reasoning and the dynamic methods, and his answer is negative. He, in fact, thinks that in advanced stages of reasoning, biological analogies are more appropriate than physical ones. (Marshall**,** 1961). In his argument, the two reference systems, based on analogy, (i.e., the physical and biological) do not underlie the same kind of theoretical reasoning. According to Marshall, in fact, the formal analogies set in physics or mathematics have the advantage of providing static solutions, in terms of equilibrium, with an emphasis on some economic aspects. In this case, a formal correspondence is established between two fields of knowledge (physics and economics) in which their contribution to the economic analysis is exhausted in providing a series of arguments that do not lead to useful conclusions. In contrast, Marshallian biological analogies establish a substantial correspondence between a field of knowledge and another, through a coherent network of similar relationships between objects and properties of both domains. Differently from the formal analogy, which is an integral part of the logical construction of a theory, the place of predilection of the substantial analogy is therefore that where you work in the selection of pre-theoretical assumptions. According to this perspective, the substantial analogies are often used to compensate for the limitations of an emerging science through the use of scientific paradigms of another science which is more consolidated or 'classical'. In the case of Marshall this may seem paradoxical given that biology as a discipline was born in the nineteenth century (with Lamarck), while economics goes back much further. Actually, Marshall uses biological analogies to treat, according to a different point of view, the already old question of economic dynamics. However, the real question is whether the use of biological analogies is able to overcome the simple imitation or may become a useful learning tool for the conceptualization stage of a new knowledge. Our analysis aims to demonstrate how Marshall sees the study of economic life in the Darwinian evolutionary spectrum, thus identifying the economic forces as living and moving forces, dropped in a changing world.

In the era of Marshall, most of the theoretical constructs developed by the fathers of the equilibrium theory was based on an abstract notion of time borrowed from rational mechanics. For example, in the case of Walras, the mathematical conditions on which it was based its concept of equilibrium canceled out any time horizon. As highlighted by Claude Ménard (1979): «the action and the consequences are mixed, the dimensions are perfectly continuous; [...] we are in a timeless world and without costs». From a technical point of view, «the image of time is copied on the kinematics of the machines without frictions [...] and the global time is constituted only by juxtaposed moments (of stops over time)» (Menard, 1979, p.3). Thus, being the time materialized in the form of a continuous and uniform usage, the economist could afford to make abstraction of this variable in the determination of economic laws.

By considering, instead, the notion of time as one of the most burdensome of any construction of economic models, Marshall's analysis differs from timeless economic analysis. In the Darwinian version of evolution, the time is inseparable from the origin of the living world and its evolution and it is also associated with a certain idea of continuity, instability and contingency. According to Bergson, the time of evolution is «a real-time envisioned as a stream, or in other words, as the mobility itself of the being» and it is opposed to the abstract time «time that intervenes in our speculations on artificial systems, that die and reborn forever» (Bergson, 1996, p.336). Similarly, Alfred Marshall defined economic progress as the organic growth, which is limited, restricted and sometimes opposed by a host of factors that affect each other and whose effect varies depending on the state of growth already achieved by each of them (Marshall, 1961). His equilibrium analysis has different basis and detaches itself from that of other equilibrium theorists (like Walras or Jevons) mainly because he included in his

model the appearance of the time period. The choice of the period, in fact, determines the point of view of the observer, and, therefore, the theoretical explanation. The two crucial Marshallian periods, the short-term and long-term, define deeply different modes of regulation. In the long term, for example, the determination of regulatory mechanisms calls upon temporal specificities of the market, since the behaviors depend on the duration considered. So, while for Walras, the “real” market plays rather the role of a logical construction, the equilibrium markets in the marshallian tradition are *in time*. For Claude Ménard, the fact that the very foundations of Marshallian equilibrium are different with respect to marginalist economists allows us to glimpse already a turn toward biological analogies: «the problems raised by the integration of decentralized markets and active units led him to seek on the side of the living beings most suitable models to the expression of the economic processes» (Ménard, 1979, p.51).

Marshall shows us how the whole organization is characterized by its transitory form, so that compromises any pretense of the economist to identify universal laws similar to those of physics. As an example, Marshall presents the principle of division of labor. This principle, at the time of Adam Smith, was identified as a "routine" that favored, due to standardization, the quality of the products. Later gradually it took the form of mechanization, a process by which man is gradually replaced by the machine. Marshall has shown that, regardless of its form, the principle of division of labor must its preservation at a proper adjustment to the purpose for which it is applied. Adam Smith had already explained the advantages of this method but, as Marshall points out, has always avoided making it a universal law that would guarantee the prosperity and welfare of the people as they did instead, according to Marshall, Smith's disciples. This form of industrial organization that simply meets the needs of its time, owes its success to temporary adavantages that outweigh the drawbacks (especially on social matters). The economic model of Marshall, by contrast, is inseparable from the social reality and, therefore, must first increase its knowledge with respect to the reality itself and, then, concentrate on the effects that is could have on the practical life.

The problem of Marshall is therefore to find a classification system that allows the economist, using a small number of terms of common use, to express a large number of subtle distinctions. The main difficulty will be to express all this in a language intelligible to the general public even by structuring a system of definition universally valid. The solution proposed by Marshall, is of utmost importance for the goal we have set ourselves, since it makes direct reference to Charles Darwin and his classification system. We quote a key sentence, in which Marshall, after adhering to the idea of Mill to develop a scientific classification for economic objects, precises exactly the nature of this undertaking: «We come up often against this difficulty: that the most important proposals in a phase of economic development may be among the least important for another. On the subject, economists have much to learn from recent experiences of biology and the depth discussion of the question that Darwin did, which throws a vivid light on the difficulties that present themselves to us. Darwin shows that the characters that determine the practical life of every living being in the economy of nature are not, normally, those elements that throw more light on his origin, but the ones that throw less. [...].

Similarly, for an economic institution, those peculiarities that contribute the most to make it work that should actually do, are probably, for this reason, even of recent date» (Marshall, 1961, II, I, IV). Applied to the economic object, this means that the real "affinity" (Darwin's definition) or the fundamental properties of a particular notion are those that determine its adaptation to the means, but those that are «the hereditary result of the community of descendents» (Darwin, 1967). Marshall wants to prove that the (current) social organization is the product of a slow development of many generations who owe their basic properties, not so much to those that allow it to adapt to their purposes, but to others, which were conveyed as a sort of common code, through the various forms that the same properties have taken over time. Such is the influence of heredity for Marshall that works both for living beings and for business organizations. He wants to show how most of the distinctions that are expressed in economic terms are based on differences of degree and not of nature.

### 3.2 Economic progress and natural evolution

Ever since the publication of Darwin's theory, there has been a misunderstanding that originates in the identification that was made between evolutionary tendencies and progress. This is partly explained by the influence of the writings of Herbert Spencer, philosopher, contemporary of Darwin, who, trying to unify under one principle: the law of evolution, the phenomena described by the natural and human sciences, it has distorted the original Darwinian sense. The law of evolution, according to Spencer, expresses a tendency inherent to the increasing complexity of the organization of living beings, which is always achieved in the sense of progress. None of this was ever said by Darwin, who, however, has contributed in some way, to ensure that this misunderstanding lasted, replacing, albeit with some reluctance, in the sixth edition of "The Origin of Species," the notion of natural selection with that of "survival of the most suitable", borrowed from Spencer. Some have interpreted this new formula as the quintessential example of the viable competition: the victory of the strong over the weak. In Darwin's key idea, however, natural selection has as its ultimate goal the ever increasing improvement, an improvement which inevitably leads to a gradual progress in the organizations and in most living beings. As Telmo Pievani explains: «It is important to remember, however, that Darwin was never tired to distance his theory firmly away from any social and political implications: the struggle for survival, for him, was a complex scenario of interrelations between organisms in of an ecosystem and had nothing to do with the metaphor of the survival of the more suitable that will suffer pernicious applications in the social and racial sphere» (Pievani, 2005, p. 8). But then, «what is called progress or adaptation is merely the necessary result of this game of interactions that inevitably take place between the system and its surroundings» (Jacob, 1980, p. 194). The idea of evolutionary progress, therefore, does not imply that of an internal principle of improvement. If many have misunderstood the mechanism of natural selection, it is also because they had not integrated the pattern that underlies it. Natural selection is not deterministic, it must be interpreted as a statistical concept: «to have a superior genotype does not guarantee the survival and abundant reproduction: this only gives a higher probability» (Mayr, 1982, p.653).

In the chapter of the *Principles* dedicated to the analysis of social and industrial organizations, Marshall gives the feeling of having perfectly integrated this dissociation between progress and development that exists in the theory of Darwinian evolution. He writes: «Every economic strength will constantly change its action under the influence of other forces acting around it incessantly. The changes that occur in the volume of production, in its methods and its cost of production will affect each other, without stopping» (Marshall, 1961, II, I, V). This definition incorporates, therefore, in any construction of economic models, two of the main philosophical parameters of Darwinian view of evolution: first, the integration of a historic time for the study of economic evolution that forces the scholars to take into account the irreversibility of phenomena; secondly, the economic evolution does not presuppose the idea of a linearity of change oriented towards the perfectibility. Evolution and progress are two separable notions. This separation explains how the different forms of social or industrial organizations are subjected to a process of natural selection in economic terms that, in a competitive world, gradually eliminate those organizations which do not have a proper adjustment to their means and simultaneously promote the formation of new organizational forms. Moreover in his view, the economic mechanism of natural selection, as the biological mechanism, is understood probabilistically. It can always practice outside influences preventing the emergence of a form of organization, which *a priori* would be in perfect adequacy with a given means and mutually, it can happen that the struggle for survival is not able to give birth to organisms which would however very advantageous for their purpose. In the business world, the need for a new industrial layout is certainly not enough to cause the supply. Finally, Marshall retains the uncertain and external aspect of the mechanism of natural selection. Progress in the division of labor, as a special form of organization, is mainly due to factors external to firms, as «the extension of markets, the increased demand for large quantities of goods of the same kind» (Marshall, 1961, IV, IX, III). He then proposes a use of the

Darwinian principle of divergence. Such a principle is derived from the physiological division of labor of Milne-Edwards, which provides to the evolution a preferred direction.

As pointed out by Jean Mathiot, this principle «is the conquest of new ecological suitable places that opens up cumulatively to new opportunities of benefits for innovative organisms. One advantage in an organism creates the ecological conditions of its amplification, correlatively to an increase divergence with respect to the initial conditions of existence of the group from which it is derived, this divergence will open up new possibilities of existence and reproduction» (Mathiot, 1998, p. 2). This principle, applied to the economy, explains the progressive disappearance of some firms in the same market that does not have a quite differentiated structure.

Marshall, raising the question of the various forms of organization, places his reasoning in a context in which the variability is the true norm. He does not start from an arbitrary definition of industrial enterprise to reject afterwards all the forms that deviate. On the contrary, he defines an enterprise through its life cycle as every kind of tree has its normal life in the same way the length of time during which an enterprise of any type is likely to retain its full strength is limited by the laws of nature combined with the circumstances of place and time, with the features and the degree of development of the industrial sector to which it belongs (Marshall, 1961). These laws of nature act on the company by limiting the length of life such that, after a period in which the firm will realize, if it is well suited, economies of scale, it will lose part of its strength, its flexibility and power of progress in the fight against its leading competitors.

The idea of a struggle for survival is, however, an old idea, the use of which dates back to the seventeenth and eighteenth centuries. But then it was considered a benign formula, which allowed the necessary corrections to equilibrium of the nature (as for example in Line, Cuvier, etc.). Instead, the Darwinian theory of struggle for existence calls into question the idea of a harmonious constancy of the world. Since Darwin, the adaptation of organisms must be seen as a dynamic process, and not as a *static status* over time, the organisms are devoted to extinction, unless there is a continuous change to perpetuate itself in a constantly changing physical and biotic environment. Returning to the economic context, the Darwinian principle of struggle for existence must express the similar idea of a competition between various agents and organizations for the existing resources. Marshall applies this idea in *Industry and Trade* to competition between the different organizational forms of the same branch of industry. In particular, as Keynes, which was a Marshall's pupil, said: «The volume as a whole also serves to illustrate what Marshall was always concerned to emphasise, namely the tran-sitory and changing character of the forms of business organisa-tion and of the shapes in which economic activities embody themselves. He calls particular attention to the precarious and impermanent nature of the foundations on which England's industrial leadership had been built up» (Keynes, 1924, p.370).

Specifically, Marshall gives top priority to the advantage that large companies have, which have evolved methods of mechanization, that allow them to take advantage of external economies, related to the overall development of the industry, and of internal economies at the same time, which are linked to their resources.

## 4. Conclusion

This work, critically arguing the issue of rationality and choices in both the behavioral and evolutionary approaches, has tried to highlight the limits of the theory of rational choice of neoclassical economics. This theory, over the years, aimed at increasing its mathematical precision trying to gain the same level of prestige of the physical sciences in the Victorian era. If its methodological framework has been able to hold, though with some difficulty, on the legal front, so it was not at descriptive and predictive level, since manifestly far from reality as the empirical evidence and expriments of cognitive-behavioral economics have demonstrated more in detail from the seventies onwards. So to the conception of *homo economicus*, perfectly rational, that has a complete knowledge, is replaced that of a different king of individual endowed with a bounded rationality. According to behavioral economics, in fact, people in everyday life rarely apply expensive choice

procedures that lead to the selection of the option capable of maximizing their expected utility; they, instead, use much simpler procedures that do not provide the best choice, but that lead to results at least "satisfying". A similar argument in terms of critique of the neoclassical economic theory in the tradition of Walras and Pareto can be done by following the evolutionary-biological approach. The extension of Darwin's theory to economics (as well as other branches of knowledge) is based on the ability to identify a substrate that, although it is not genetic, it is capable to replicate itself, passing on to descendants parts of their own characteristics, and admitting also a variety of possible outcomes for the evolutionary process. The models and theories by Marshall, discussed in this paper, carried away a vision of the economy in dynamic-evolutionary terms different from standard traditional economics, which is formally abstract, where words such as law, normal, trend, average, strength, cause, do not express what really happens, but what might happen on the basis of certain assumptions that are never exactly realized. The true novelty from Marshall was to have exceeded this limit, through a double identification of biological and economic laws, on the one hand, and the economic object and the living matter, on the other.

## References


[1] Ainslie, G. 1991. Intertemporal choice. Derivation of "rational" economic behavior from hyperbolic discount curves, American Economic Review 81(2), pp. 334-340.

[2] Akerlof, G. A. 1991. Procrastination and obedience, American Economic Review, 81(2), pp. 1-19.

[3] Allais, M. 1953. Le comportement de l'homme rationnel devant le risque: critique des postulats et axiomes de l'école américaine, *Econometrica*, 21, pp. 503-546.

[4] Arrow, K. J. 1971. *Essay in the theory of risk-bearing*, Amsterdam, North Holland Pub. Co.

[5] Bergson, H. 1996. *L'évolution créatrice*, Paris, PUF.

[6] Bruner, J. S., Potter, M.C. 1964. Interference in visual recognition, *Science*, 144, pp. 424-425, April.

[7] Cournot, A. 1838. *Recherches sur les principes mathematiques de la theorie des richesses*, Paris, L.Hachette.

[8] Cyert, R. M., Simon, H. A., Trow, D.B. 1956. Observation of a business decision, *Journal of Business*, 29 (4): 237-48.

[9] Darwin, C. 1967. *L'origine della specie*, Torino, Bollati Boringhieri.

[10] Dobzhansky, T. 1973. Nothing in biology makes sense except in the light of evolution. In The *American Biology Teacher*, 35, pp. 125-129.

[11] Ellsberg, D. 1961. Risk, ambiguity, and the Savage axioms, *Quarterly Journal of Economics*, 75 (4), pp. 643–669.

[12] Friedman, M., Savage, L. 1948. Utility analysis of choices involving risk, *Journal of Political Economy*, 56 (4), pp. 279-304.

[13] Gilovich, T., Vallone, R., Tversky, A. 1985. The hot hand in basketball: on the misperception of random sequences, *Cognitive Psychology*, 17 (3), pp. 295 - 314, July.

[14] Hogdson, T. 1993. Economics and evolution, bringing life back into economics, Cambridge, Polity Press.

[15] Jacob, F. 1980. La logique du vivant, une histoire de l'hérédité, Paris, Gallimard.

[16] Kahneman, D. 2002. Maps of bounded rationality: a perspective on intuitive judgment and choice, *Nobel Lecture*, Princeton.

[17] Kahneman, D., Thaler, R.H. 2006. Anomalies: utility maximization and experienced utility, *Journal of Economic Perspectives,* 20 (1), pp. 221 - 234.

[18] Kahneman, D., Tversky, A. 1979. Prospect theory. An analysis of decision under risk, *Econometrica*, 47 (2), pp. 263 - 292.

[19] Kahneman, D., Tversky, A. 1984. Choices, values and frames, *American Psychologist*, 39, pp. 341 - 350.

[20] Kahneman, D., Knetsch, J. L., Thaler R. H. 1990. Experimental tests oft he endowment effect and the Coase theorem, *Journal of Political Economy*, 98 (6), pp. 1325 - 1348.

[21] Keynes, J. M. 1924. Alfred Marshall, 1842-1924, *Economic Journal*, 34, pp. 311- 372, September.

[22] Keren, G. 1987. Facing uncertainty in the game of bridge: a calibration study, *Organizational behaviour and human decision processes*, 39 (1), pp. 98-114, February.

[23] Laibson, D. 1997. Golden eggs and hyperbolic discounting, *Quarterly Journal of Economics,* 112(2), pp. 443 - 477.

[24] Marshall, A. 1919. *Industry and Trade,* London, Macmillan & Co.

[25] Marshall, A. 1961, 1890 (1st edition). *Principles of Economics*, London, Macmillan.

[26] Marshall, A. 1991. Analogies mécaniques et biologiques en économie (1898), *Revue Française d'Economie*, 6 (1), pp. 103-113.

[27] Mathiot, J. 1998. Evolution, sélection, information. La question de la convergence, *Philosophiques*, Département de philosophie de l'UQAM.

[28] Mayr E. 1982. *Storia del pensiero biologico. Diversità, evoluzione, eredità*. Torino, Bollati Boringhieri, *in Italian*

[29] Mazur, J. E. 1987. An adjusting procedure for studying delayed reinforcement. In *Quantitative analyses of behavior: V. The effect of delay and of intervening events on reinforcement value.*

[29] M. L. Commons, J. E. Mazur, J. A. Nevin and H. Rachlin, eds., Hillsdale, NJ: Lawrence Erlbaum, pp. 55 – 73.

[30] Mazur, J. E. 1988. Estimation of indifference points with an adjusting delay procedure. *Journal of the Experimental Analysis of Behavior*, 49 (1), pp. 37– 47.

[31] Ménard, C.L. 1979. Equilibre, déséquilibre, temps : un peu d'histoire, Economie Appliquée, 32 (2-3), pp. 229 - 251.

[32] Montague, R. 2008. Perchè l'hai fatto? Come prendiamo le nostre decisioni, Milano, Raffello Cortina.

[33] Motterlini, M., Guala, F., Eds. 2005. *Economia cognitiva e sperimentale*, Milano, Egea.

[34] Novarese, M., Castellani, M., Di Giovinazzo, V. 2009. Procedural rationality and happiness, *MPRA Paper*, n.18290, October.

[35] Pievani, T. 2005. *Introduzione alla filosofia della biologia*, Bari, Laterza.

[36] Rabin, M. 1998. Psychology and economics, *Journal of Economic Literature*, 36 (1), pp. 11- 46.

[37] Robbins, L.C. 1932. 1935 (2nd edition). *An essay on the nature and significance of economic science*, London, Macmillan.

[38] Samuelson, P. 1937. A note on measurement of utility*, Review of Economic Studies*, 4, pp. 155 – 161.

[39] Schilirò, D. 2011. *Decisioni e razionalità in economia,* MPRA Paper *n.29477. March.*

[40] Schumpeter, J. A. 1954. *History of economic analysis*, New York, Oxford University Press.

[41] Shane, F., Loewnstein, G., O'Donoghue, T. 2002. Time discounting and time preference. A critical review, *Journal of Economic Literature,* XL (2), pp. 351 - 401.

[42] Shiller, R.J. 2005. Behavioral economics and instituional innovation, *Cowles Foundation Discussion Paper* no. 1499.

[43] Simon, H. A. 1955. A behavioral model of rational choice, *Quarterly Journal of Economics,* 69 (1), pp. 99 - 118.

[44] Simon, H. A. 1956. Rational choice and the structure of the environment, *Psychological Review*, 63 (2), March, pp. 129 - 138.

[45] Simon, H. A. 1978. Rational decision-making in business organizations. *Nobel Memorial Lecture, 8 December 1978, Economic Sciences*, pp. 343-371.

[46] Simon, H. A. 1987. Rationality in psychology and economics, in *Rational choice*, R.M. Hogarth, Reder, R.W., eds., Chicago, University of Chicago Press, pp. 25 - 40.

[47] Simon, H. A. 2000. Bounded rationality in social science: today and tomorrow. *Mind & Society*, 1, pp. 25 - 39.

[48] Smith, V. L. 1982. *Microeconomic system as an experimental science*, *American Economic Review*, 72, pp. 923 - 955.

[49] Smith, V. L. 2000. *Bargaining and market behavior: essays in experimental economics*, Cambridge, Cambridge University Press.

[50] Strotz, R. H. 1955-1956. Myopia and inconsistency in dynamic utility maximization. *Review of Economic Studies*, 23 (3), pp. 165 - 180.

[51] Thaler, R. H. 1980. Towards a positive theory of consumer choice. *Journal of Economic Behavior and Organization*, 1, pp. 39-60.

[52] Thaler, R. H. 1981. Some Empirical Evidence on Dynamic Inconsistency," *Economic Letters*, 8, pp. 201-207.

[53] Tversky, A., Kahneman, D. 1974. Judgment under uncertainty: heuristics and biases, *Science*, 185, pp. 1124-31, September.

[54] Tversky, A., Kahneman D. 1986. Rational choice and the framing of decisions, *Journal of Business*, 59 (4) Part 2, pp. S251-S278.

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