

The Two Blades of Occam's Razor in Economics: Logical and Heuristic

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This paper is part of the general debate on the need to rethink economics as a human discipline using a heuristic to describe its object, on the need to explicitly reject the positivistic approach in neoclassical economics, and on the urgency to adopt a different methodology, grounded on a realistic set of initial assumptions able to cope with the complexity of the decision making process. The aim of this paper is to show the use of Occam's razor in the economic debate around realism in economic modelling. Occam's razor can be intended as a principle of logic that emphasizes simplicity, or as a heuristic tool that emphasizes parsimony. Neoclassical economists such as Samuelson have explicitly used Occam's razor as a logical principle to highlight the strict logic and simplicity of neoclassical economics; neoclassical models, however, are based on unrealistic assumptions. Some approaches of heterodox economics, *au contraire*, have used Occam's razor as a powerful heuristic tool to emphasize parsimony, building up models grounded on realistic initial assumptions and able to embed complexity into the general explanation of economic behavior, like in Simon's bounded rationality (1955; 1957) and Hayek's notion of human rationality (1948; 1952; 1974) and cultural and social evolution (1967; 1978).

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Introduction

Occam's razor was formulated during the Middle Ages by *Doctor Invincibilis*, alias William of Occam (circa 1290-1349). Occam's razor states that of two competing theories, the simpler and more parsimonious is preferred. It derives from a more general application of Occam's philosophical outlook (according to which any knowledge is supposed to be grounded *only* on experience), and on a complete rejection of any traditional aspect of Aristotelian metaphysics (upon which traditional Scholastics had been developed). Simplicity (*entia non sunt multiplicanda praeter necessitate*, which means 'entities are not

to be multiplied beyond necessity’) and parsimony (*frustra fit per plura quod potest fieri per pauciora*, which means ‘in vain is that explained by many things which can be explained by fewer things’) are the two blades of Occam’s razor.

Although simplicity and parsimony are related, they are not the same: simplicity is related to the capacity of a model to describe a complex phenomenon in a “sophisticatedly simple way” (Zellner 2001, 242); parsimony is “a proper subset of simplicity” and it involves a paucity of factors (Jensen 2001, 283). Hence, Occam’s razor can be defined as follows: “the widely held principle of science that the simplest (often shortest) explanation that is adequate in number and type of assumptions (simplicity) and in technique (elegance) to explain the observed facts is the criterion by which to prefer explanations” (Reid 1987, 551n).

Because Occam’s razor advocates simplicity and parsimony, it influenced many philosophers and has been considered the most suitable tool to explain and predict phenomena not only in physics¹ but also in other fields, including economics. Hicks (1938) first introduced Occam’s razor into economics, in terms of parsimony, to exclude the measurability of consumer utility (Pfouts 2002). Samuelson (1947) and Friedman (1953) gave precedence to simplicity in their economic modelling.

In a recent debate among philosophers of science, Occam’s razor has been classified into three not mutually exclusive categories: an ontological razor (it is rational to believe the simpler theory), an epistemic razor (it is rational to adopt the simpler theory), and a methodological razor (it is rational to adopt the simpler theory because that is what the

¹ Leibnitz and Newton used Occam’s razor to drop any metaphysical residual from science. During the last century, Mach’s principle of ‘the economy of science’ unified the methodology of Occam’s razor along with the idea of an economy of nature, according to which nature is an organized and frugal system (Mach [1883] 1960). Mach’s formulation reinforced the pure theoretical principle of simplicity with the more operative principle of parsimony, according to the Occam’s razor tradition. During the 1920s, the revival of Occam’s razor had particularly taken place in European continental philosophy, especially in Schlick’s circle (Vienna) as well as in Reichenbach’s group (Berlin).

world is like) (Riesch 2010). In this paper I will argue that Occam's razor in economics has been adopted as both an epistemic tool and a methodological principle. As an epistemic tool (more precisely, as a logical principle that gives precedence to simplicity), Occam's razor has been used in neoclassical economics and econometrics. In the former, we see Occam's razor in Samuelson's revealed preference theory, Friedman's concept of positive economics, and Becker's model of the consumer (Wong 2006). In econometrics, Keuzenkamp and McAleer (1995) explicitly used Occam's razor to develop simple models; those models, however, are not parsimonious, because parsimony implies an insufficient number of parameters. In using Occam's razor as a pure logical tool, one that gives simplicity to a model, neoclassical economics commits a fault: it neglects the fact that in the human sciences a trade-off between simplicity and realism exists, and this trade-off cannot be confused with the degree of abstraction that characterizes the object of any natural science, like physics, because human behavior cannot be confused with the behavior of, say, atoms.

As a methodological principle (more precisely, as a heuristic reasoning that puts more emphasis on parsimony), Occam's razor has been used by heterodox economists as a heuristic rule of thumb. Examples are Simon's bounded rationality and Hayek's approach to complex phenomena. In using Occam's razor as a heuristic tool, heterodox economics leverages an advantage: it permits a more realistic description of individual behavior (under whatever constraint) because it implies the adoption of a rule of thumb (based on a realistic scenario in which individuals are not fully rational maximizers). The advantages of using Occam's razor as a heuristic rule of thumb is to allow economists to develop their theories in a way that does justice to, rather than assumes away, the complexity of their subject matter as in the case of Simon's bounded rationality and Hayek's theory of the social world and complex phenomena.

1. Neoclassical Economics' adoption of Occam's Razor Logical Blade.

Neoclassical economics, which became the mainstream within the discipline in the mid-1950s (Colander 2000; Dequech 2007), had intended Occam razor's as a pure logical principle. The success (to become mainstream) of a paradigm (neoclassical economics) has many reasons. It has been often remarked how neoclassical economics had formally reached a cognitive status as

well as a scientific respectability due to the general agreement around neoclassical results, focused on general economic equilibrium and rational choice theory (Weintraub 2007). Both general economic equilibrium and rational choice theory adopt a set of initial methodological assumptions that are ‘occamite’, when Occam’s razor is intended in a pure logical sense. The assumptions are the simplest possible (an economic agent is able to rank her preferences, which are transitive, complete, and technically convex) and suggest a unique way of reasoning (given a budget constraint, a utility function is expected to be maximized in order to achieve optima).

Occam’s razor logical blade is fashionable for neoclassical economics because it becomes the essential route towards elucidating a simpler and clearer description of individual and social dynamics in order to explain economic phenomena. Furthermore, Occam’s razor logical blade matches the urgency to express models² as well as initial assumptions in mathematical terms. The advantage of using a formal language is twofold: it avoids any possible linguistic misunderstanding, and it makes explanations as simple as they can be.

The immediate example of the application of such a scheme within the natural sciences is physics. In fact, neoclassical economists have modeled the discipline after *physics* in order to become a *positive* science. The process of modeling economics as physics started with the rise of marginalism (at the end of the nineteenth century) and continued until the final systematization of general economic equilibrium (in the 1930s through the 1950s), ultimately becoming the dominant style of neoclassical economics within the mainstream (Weintraub 1985; Mirowski 1989, 2002; Lawson 2013). According to Mirowski (1989), it was Fisher who first tried to apply physics to economics, without understanding the differences between their domains, and, according to Boumans (1993), it was Tinbergen who introduced the concept of ‘formal analogies’ between physics and economics without drawing any substantial analogy between their domains³.

² Given the ambiguity of the term ‘model’, I will be following Mäki’s definition of models as representations of some target or as surrogate systems (Mäki, 2009a).

³ Even though the introduction of models in economics has reduced the naturalism of the discipline (Sugden 2000; Morgan 2012; Mäki 2013), philosophers such as Cartwright

Why do physicists and neoclassical economists consider simplicity (the logic blade of Occam's razor) the best way to describe a theory? The answer seems immediately apparent: as previously claimed, in a simpler framework, mistakes are reduced. Although both physicists and neoclassical economists are aware that to make Occam's razor operational non-arbitrarily can be difficult, they accept Occam's razor as a logical principle because it makes easier to match theoretical knowledge with actual behavior (as in Mach's economic principle of the economy of science)⁴.

The analogy between physics and neoclassical economics is fundamental in the history of the discipline: in Samuelson's *Foundations*, this analogy has been modeled on the assumption that both physical and economic phenomena can be described and explained in the same terms. Both are in fact based on the existence of *operationally meaningful* theorems as well as on 'the existence of a general theory which underlies the particular theories and unifies them with respect to those central features' (Samuelson 1947, 3). By a *meaningful theorem*, Samuelson means "simply a hypothesis about empirical data which could conceivably be refuted, if only under ideal conditions' (Samuelson 1947, 4), and by 'operational' he means a theorem that can be empirically tested. According to Samuelson, 'meaningful theorems exist in economics and they proceed from two hypotheses: any equilibrium is a result of a process of maximization (minimization), and the stability of equilibrium' (Samuelson 1947, 5)⁵.

(1999) defined economics' attitude to consider itself as a natural science, by following an 'imperialistic tendency', bound to fall into the trap of methodological fundamentalism.

⁴ The use of Occam's razor purely as a logical tool causes many other problems: for instance, which is the best way to measure simplicity, or how simplicity and empirical models are reciprocally related (Zellner et al. 2001).

⁵ In his epistemic position, Samuelson was influenced by Bridgman's operationalism in physics and by early logical positivism: 'his view of scientific theories [was] *descriptivist*: scientific theories merely describe the empirical evidence and do not go beyond the evidence to *explain* any deeper, underlying, or hidden causes of the phenomena' (Hands, 2001, 63).

Along with Samuelson's modeling economics as a physical science, there is Friedman's modeling economics as a positive science. Friedman defined positive economics as 'an objective science, in the same sense as any of the physical sciences' (Friedman 1953, 4)⁶; and behind Samuelson's and Friedman's neoclassical economics there is the emergence of rational choice theory, i.e., the transformation of individuals into economic agents whose behavior can be reduced to uniformity, just as can the behavior of physical atoms.

This process is made possible by the introduction of an axiomatic system to describe human preferences and human utility in order to explain individual decision making (including any decision making under uncertainty) as cohesive. In fact, from a methodological point of view, Samuelson approaches Friedman in considering the instrumental role of theory in maximizing behavior in building up economic models of equilibrium. Samuelson wrote:

In cases where the equilibrium values of our variable can be regarded as the solutions of an *extremum* (maximum or minimum) problem, it is often possible regardless of the number of variables involved to determine unambiguously the qualitative behavior of our solution values in respect to changes of parameters (...). It is possible to derive operationally meaningful restrictive hypotheses in consumers'

⁶ Friedman's positive economics is the opposite of normative economics, and it implies the independence of economics from any particular ethical position or normative judgment (Friedman 1953, 4). Along with the development of this process, ethics was discarded from economics, as it was supposed to be alienated from any other social science (Sen 1987; Putnam 2002). For a recent debate on the relationship between ethics and economics, see De Martino and McCloskey et al. (2016). Nevertheless, many scholars consider fictitious the distinction between positive and normative economics: 'a modernist chimera founded on the rigid dogmas of positivism, the total structure of neoclassical economics is normative in nature on account of the special role it ascribes to the postulate of rationality and the fact that the theorist must necessarily invoke non-cognitive mental notions which he or she must interpret in subjectivist and evaluative terms' (Keita 1997, 82).

behavior so as to maximize an ordinal preference scale of quantities of consumption goods and services (Samuelson 1947, 21-22).

The microeconomic process of maximizing expected utility functions combines individual dynamics with the static stability of the final equilibrium in the economic system, as happens in physics. This interpretation describes the logic mechanism of the economic system as if it determined the logic of the economic maximizing agent (Davis 2003).

2. Neoclassical Economics' rejections of Occam's Razor Heuristic Blade

As seen in the previous section, adopting Occam's razor as a purely logical tool that gives precedence to simplicity allows neoclassical economists to model economics as a physical and positive science. In order to make this theoretical operation possible, some fundamentals (listed below) have been accepted by neoclassical economists, and they form the pillars of neoclassical economics:

- a. An axiomatic set of prerequisites (the proprieties of individual preferences)⁷;
- b. A specific role for causality (economic relations usually depend on personal expectations)⁸;
- c. Formal models that are considered able to describe the real world (general economic equilibrium model took a bourbakian approach)⁹;
- d. The use of microeconomics to explain aggregate phenomena intended as a method of making aggregations assuming that the actions of individuals are the outcomes of optimizing decision-making processes, and that equilibrium is the final outcome¹⁰.

⁷ Rational choice theory is grounded on the axioms of consumer preference that has been modeled with the aim of using a mathematical interpretation of utility functions, of portraying rational behavior as optimal, and of deriving proper demand curves.

⁸ Rational choice theory models individual expectations, which may be adaptive and rational, in a way that implies a direct and simple behavior: the economizing behavior of maximization.

⁹ Although at a certain point, neoclassical economists rejected the use of physics to explain formal models, like general economic equilibrium, in favor of the pure bourbakian mathematics (Giocoli 2003), as in the case of Debreu (Weintraub 2002).

These fundamentals, however, show that neoclassical economics rests on hypotheses and assumptions that are not just simple (in terms of Occam's razor) but oversimplified and inconsistent with reality¹¹. Furthermore, their simplicity becomes apparent and is misleading (this would be that case according to which Occam's razor slows rather than speeds economic knowledge (Reid 1987)) for the following reasons:

- a. Economic agents, as well as social aggregates, do not follow linear paths of behavior: hence, the completeness, symmetry, reflexivity, and transitivity (axioms) of preferences can be violated, as has been demonstrated in different ways (Allais 1953; Kahneman and Tversky 1981);
- b. The theory of expectations can be a guideline for economists (Lucas and Sargent 1981), but it does not guarantee a correct and robust economic forecast (Davidson 1982);
- c. The lack of realism in neoclassical economics is one of its main faults that reduce the complexity of *explananda* and the possibility of moving closer to a proper explanation (Hodgson 2004);
- d. The passage from the description of individual economic behavior to a description of complex social groups is fallacious because it is based on the idea that complex systems are simply the sum of their single components (individuals), which is not valid (Albin and Foley 1998; Israel 2005).

The *lack of realism* in its initial assumptions and the *reduction of complexity* in describing decision making process are two interconnected aspects of neoclassical economics and thus have to be analyzed as related, in order to understand how they make neoclassical economics problematic in terms of a proper description of economic behavior.

¹⁰ Macroeconomics is reduced to microeconomic analysis: macroeconomic phenomena can be explained by deriving them from microeconomics parameters, such as individual preferences and expectations. For a critical view on this methodological reductionism see Hoover (2001; 2010) and King (2012).

¹¹ For some scholars, this is enough to consider it as a form of powerful rhetorical discourse (Nelson 2001; Mitchell 2016), and for some scholars of other disciplines as a pseudo-science (Patterson and Fosse 2015).

To be concerned about the realism of a theory implies a concern about the degree to which models are consistent with reality, as well as between theoretical assumptions and empirical models (based entirely on data). The collection of data is the very first methodological issue in constructing any empirical model: relevant data serve to test or calibrate models (Knuutila 2009; Morgan 2001). These models are able to make assumptions testable, problem solving and prediction being the two main aims of science. Scientists and scholars of social disciplines are ‘empirical modelers ... making logical inferences based on data, to understand what is going on and what will happen’ (Thompson 2011, 1). The lack of realism, which remains the main fault of neoclassical economics from a methodological point of view¹², became explicit in Friedman’s 1953 definition of positive economics, where the truth of an assumption does not matter because what really matters is the concordance between a theory’s predictions and observed phenomena¹³. In fact, Friedman said, a discourse on ‘unrealism’ is pointless, and theory can only yield predictions that are good approximations; furthermore, assumptions cannot test an economic theory, because they are ambiguous, and a criticism based on the discrepancy between assumptions and the real world is rooted in ‘the confusion between descriptive accuracy and analytical relevance’ (Friedman 1953, 33). Friedman’s conclusion is his well-known *as-if* principle: ‘it is frequently convenient to present such a hypothesis by stating that the phenomena it is desired to predict behave in the world of observation *as if* they occurred in a hypothetical and highly simplified world containing only the forces that the hypothesis asserts to be important’ (Friedman 1953, 40)¹⁴.

¹² Robert Lucas, for example, claimed that the insistence of realism damages the scientific aspects of economics (Lucas 1981).

¹³ Friedman’s essays, and particular Chapter I on methodology, have been called ‘the most cited, the most influential, the most controversial piece[s] of methodological writing in twentieth century economics’ (Mäki 2009c, xvii), and ‘a marketing masterpiece’ (Caldwell 1982, 173).

¹⁴ Blaug’s well-known battle for a realistic methodology of economics (1992), based on a falsificationist critique of both mainstream and heterodox economics (it was Hutchison (1938) who introduced Popper’s falsification principle (Popper [1935] 1959) into

Although recently Friedman's anti-realism has been reconsidered (Hoover 2009; Mäki 2009)¹⁵, his methodology has been overtly criticized since its publication (Hausman 1992b, Gul and Pesendorfer 2008; Gilboa 2009; Mäki 2011). Ernst Nagel's critique of Friedman's methodology is based on the fact that Friedman failed to distinguish among three kinds of 'unrealism': the lack of an 'exhaustive' description; the possible accordance between an unrealistic assumption and a correct theory; and the instrumental use of unrealistic assumptions when they reveal discrepancies (hidden variable theory) between pure theory and described phenomena (Nagel 1963)¹⁶.

The critique of Friedman's methodology—the so-called Friedman's *as-if*, or Friedman's twist, as Samuelson stigmatized it—'has paved the way for an internal debate in economics around the falsifiability of a theory, and the possibility to develop a theory of empirical contest as well as to provide testable axioms for describing individual behavior' (Chambers, Enchenique and Shmaya 2014). In Samuelson's words, 'F-twist is

economics, as an attack on Mises' apriorism (Hands 2001)), led him to a normative approach mainly as a result of 'meta-theoretical claims about economics often descriptively unrealistic' (Mäki 2013a, 89). For an extensive consideration of the problem of demarcation in economics, see Latsis at al. (1976) and Mäki (2008). For a historical reconstruction of the legacy of Friedman's principle within economics, see Mäki (2009b), and Mayer (2009).

¹⁵ For a more complex and recent analysis of Friedman's *as-if* principle, see Mäki at al. (2009).

¹⁶ A discourse about the realism of initial assumptions in economics, and more generally within the social sciences, should take account of the distinction between abstraction (the process of focusing on a particular aspect of a phenomenon to build up a model able to explain it) and idealization (the tendency to isolate an economic phenomenon as if it worked without any external interference). They are independent methods of reasoning. In the process of idealization, a distinction between internal validity (the correct use of data) and external validity (the actual degree of generalizability) should be made in order to test a model (Rol 2008). According to Runde (1997), neoclassical economics adopts idealizations to facilitate the application of a deductive method.

fundamentally wrong, in thinking that unrealism in the sense of factual inaccuracy even to a tolerable degree of approximation is anything but a demerit for a theory or hypothesis (or set of hypotheses)' (Samuelson 1966, 1774). Samuelson's position against Friedman's methodological approach has been criticized by Machlup, who, referring to Samuelson's '*operationally meaningful* theorems' (mentioned before), claimed that the best results of Samuelson, as a theorist, are deduced from unrealistic assumptions: 'Samuelson produces his best work when he deduces from unrealistic assumptions general theoretical propositions' (Machlup 1964, 735).

Unlike Friedman, Samuelson claimed that the realism of assumptions matters and introduced the so-called Samuelson's razor valid for both physics and economics (Samuelson 1966). In Samuelson's reply to Machlup, he reminded the latter that his doctrine of revealed preference is grounded in realism, and he explicitly mentioned Occam's razor as a 'primarily aesthetic' tool to criticize unrealistic assumptions in science; Samuelson used Occam's razor's logical blade to justify his position: 'Occam's razor has cut away every zipper, collar, shirt, and fig leaf' (Samuelson 1964, 738). It has done so, even though, in the social sciences, parsimony is much more proper than simplicity for explaining the complexity of phenomena under scrutiny.

A possible explanation for Samuelson's use of Occam's razor purely as a logical tool can be found in the fact that, as Hands clarifies, he (along with Friedman and Hutchison) was influenced by positivist ideas:

[Friedman's] purposes of positive (as opposed to normative) economics, *the truth of the assumptions of a theory do not matter at all*, [because] the only thing that matters in deciding among various economic theories is which one is most successful in making empirical *predictions*. The Theory that makes the most accurate predictions in the relevant domain is the best theory, and if it employs "unrealistic" assumptions this should not in any way detract from its success as a positive scientific theory. (...) [In] Samuelson's methodological position, scientific theories *merely describe* the empirical evidence and do not go beyond the evidence to *explain* any deeper, underlying, or hidden causes of the phenomena. On this view, science can indeed provide explanations, but such explanations are independent of the cognitive content

of the scientific theories involved (...) such descriptivism was representative of early (but not later) logical positivism (Hands 2001, 54- 63).

They were still embedded in the cultural framework of economic positivism, i.e., the application of positivist methodology to economics (Wilber and Wisman 1975), and the promotion of neoclassical economics as the only scientific approach to explain individual and social behavior in economic model building (Boland 2003). Although ‘economic positivism’ has different nuances, and can be very confusing, the idea of ‘positive economics is mostly a matter of rhetoric’ (Boland 1997, 117), and Occam’s razor’s power of rhetoric is highly enlightening.

Let us now turn to the other aspect of economics with which the lack of realism is connected: the reduction of complexity. In neoclassical economics, the reduction of complexity started with the introduction of *homo oeconomicus*, a rational maximizer of a utility function. This process led to rational choice theory, focused on the methodological assumption that individuals are rational economic agents able to rank their preferences and, given a budget constraint, choose the optimal solution. The story of rational choice theory began with Pareto’s concept of revealed preferences, later developed by Samuelson’s revealed preference axioms (Mas-Colell 1978), and it finally ended up with Becker’s economic approach to human behavior as the combination of ‘maximizing behavior, market equilibrium, and stable preferences’ (Becker 1976, 7). Rational choice theory was dominant in the discipline from the 1950s, with Friedman-Samuelson’s systematization, up to the 1990s, when some alternative theories were advanced without successfully replacing it (Moscati 2016).

Rational choice theory uses an ‘oversimplified pattern of human behavior [that] ignores the irreducibility of wants (...) the background for unpredictable results is reduced to probability’ (Georgescu-Roegen 1954, 531). Rosenberg has defined the neoclassical reduction of complexity in describing economic behavior as a ‘formalized folk psychology’ based on subjectivism and preferences, which fails to define the real causes of individual behavior (Rosenberg 1992). Under strict rationality, the complex problems associated with the acquisition of human knowledge (which is determinant in the decision

making process) are reduced and oversimplified in the automatism of human behavior (reduced to maximization of an expected utility function).

Summing up, neoclassical economics, grounded on ‘operationally meaningful hypotheses’ (*à la* Samuelson), on the notion of positive economics (*à la* Friedman), and on economic agents depicted as fully rational Bayesian maximizers of subjective utility, does not explain the *complexity* of human actions in a *realistic* way. In Buchanan’s words:

The *subjective* elements of our discipline are defined precisely within the boundaries between the positive, predictive science of the orthodox model on the one hand and the speculative thinking of moral philosophy on the other. (...) For our purpose, I define *moral philosophy* as discourse that embodies an explicit denial of the relevance of scientific explanation (...) The recognition of the domain of an operationally meaningful economic theory does not carry with it any implication concerning the practical usefulness of this theory in making predictions in the real world’ (Buchanan 1982, 8-16).

3. Advantages of Occam’s Razor Heuristic Blade in Heterodox Economics

The common intent of many so-called heterodox approaches to economics is to work toward a major revision of neoclassical methodological assumptions and to open up alternative theoretical perspectives able to consider, in a more realistic way, the interconnection between individual dynamics and social phenomena. Recently, some heterodox economists used heuristics to make a serious attempt to separate themselves from the neoclassical model of economic rationality: unlike neoclassical economics, they adopt Occam’s razor as a heuristic rule of thumb and accuse neoclassical economists of applying a mathematical-deductive method to a series of inappropriate (unrealistic) conditions as they are described using individual preference axioms in a static context. In such a context, heterodox approaches consider the lack of realism in neoclassical economics as the most severe limitation within the discipline, and they introduce alternative models, such as rhetoric, persuasion, metaphors, and heuristics (McCloskey 1983; Lawson 1997; Mäki 1998, 2012; Hausman 1998; Gigerenzer 2008; Gigerenzer and Todd 1999; Keen 2001; Lewis et al. 2004; Lavoie 2014).

In the previous section we have just considered some faults of neoclassical economics with regard to Occam's razor logical blade. But what about the advantages of using Occam's razor heuristic blade in economics? Advantages are mainly focused in the possibility to build up a coherent and realistic theory of human behavior and economic dynamics in social terms. As Simon recalled:

Occam's razor has a double edge. Succinctness of statement is not the only measure of a theory's simplicity. Occam understood his rule as recommending theories that make no more assumptions than necessary to account for the phenomena. A theory of profit or utility maximization can be stated more briefly than a satisficing theory, but the former makes much stronger assumptions than the latter about the human cognitive system. Hence in the case before us, the two edges of the razor cut in opposite way (Simon 1992, 345-346).

To describe economic behavior in the most realistic and coherent way, Occam's razor has to be adopted as a heuristic rule of thumb (Lauth 1997; Burgess 1998), which gives precedence to parsimony rather than to simplicity. This will allow economists to better explain the complexity of the object of economics (individual and social dynamics within a specific context) and to reach a more realistic *explanation* (the causal inference and the connected relations between means and ends in individual and social dynamics) of its own *explanandum* (the object of economics). In fact, the object of economics (individual decision making and social dynamics) is complex, and individual decision making as well as social dynamics do not, I argue, necessary follow the strict regularities imposed by neoclassical economics.

Against neoclassical economics, which reduces the complexity of its *explanandum* (economic behavior) and loses realism as well as degrees of explanation, Hayek retains the complexity of the *explanandum* and stresses the importance of reducing any lack of realism. The following passage, quoted from Hayek, illustrates this point:

[Model building] brings out an important feature which all explanations possess but to very different degrees. (...) To the physicist the value of a model (especially of a mathematical model represented by a set of equations) normally consists in the fact that he can ascertain and insert the relevant variables and thus derive the quantitative

values of the events to be predicted or explained. Yet in [social sciences] similar models are regularly used although the values of the variables cannot in fact be ascertained. (...) The service of a theory [within the realm of social sciences] would perhaps be better described by the term *orientation* than by speaking of prediction. Although such a theory does not tell us precisely what to expect, it will still make the world around us a more familiar world in which we can move with greater confidence (Hayek 1967, 18).

Occam's razor, intended as a heuristic tool, provides at least two advantages: it makes possible realistic models describing human behavior as well as social phenomena; and it provides an easy procedure for problem solving, based on practical experience, that does not guarantee an optimal but a satisfactory solution in an uncertain context¹⁷. An important turning point in establishing the advantages of Occam's razor as a heuristic device capable of providing a realistic description of economic behavior as well as economic phenomena was Simon's model of bounded rationality, based on the satisficing principle rather than maximizing behavior (Simon 1955; 1957).

According to Simon, "human beings have reasons for what they do, but they seldom maximize utility, (...) given the complexities and uncertainties of the choice situations they face" (Simon 2001, 57). This is an explicit and direct application of the heuristic blade of Occam's razor, focused especially on parsimony. If we intend satisficing as a humanly rational strategy, it appears simpler and more frugal than maximizing because in this scenario, individuals are following the rule of thumb in a dynamic context; while in the neoclassical scenario individuals are optimizers in a static and non-realistic context of

¹⁷ As Karl Menger, the mathematician son of Carl the economist, had claimed about the use of Occam's razor in social science modelling: "*It is vain to try to do with less what requires more.* This more general formulation of the counterpart of Occam's law, besides denouncing ontological gaps, may also be construed as a semantic maxim opposing equivocations. (...) Under certain circumstances, the methodological tool that is needed is not a razor but a prism resolving conceptual medleys into the spectra of their meanings or, if one wishes to remain in the tonsorial domain of the razor, a comb disentangling and straightening out the various threads of thought" (Menger 1961, 332).

perfect knowledge and complete information. To seek optima is not a reasonable strategy, because finding optima requires unrealistic assumptions in formal modeling.

In this context, Gigerenzer's notion of a 'fast and frugal' heuristic is the best example of an 'occamite' approach to explaining the decision making process (Gigerenzer and Selten 2001). This kind of heuristic is fast because it requires only a short time to solve a problem, and it is frugal because it solves a problem with the information actually available (Gigerenzer 2008). In terms of Occam's razor, neoclassical economics, based on rational assumptions, makes the building of economics as a science more complicated, rather than simpler, and more inaccurate rather than more correct. In Hayek's words: 'this is a consequence of the fundamental difficulty of any complete explanation of highly complex phenomena and not merely of an insufficient development of economic theory' (Hayek 1967, 259).

Conclusions

In one regard, Occam's razor is the more sophisticated and elegant version of what is usually considered common sense (Fenk 2010). At an initial glance, Occam advocates simplicity in order to reduce the risk of mistakes. The main source of errors in science, either natural or social, is the lack of sufficient data or an inability to replicate an experiment or observation. The presumption that an increase in the number of hypotheses will increase the chances of formulating a wrong theory is misleading. In addition, this is not what Occam's razor advocates: when applied to the social sciences, economics in particular, Occam's razor has a powerful heuristic effect: it does not reduce the complexity of an *explanandum*, but it is able to cope with it in better terms, in terms of parsimony. The main fault of neoclassical economics is with its initial assumptions, which are oversimplified and unrealistic, either in terms of individual behavior or in terms of social institutions. Neoclassical economists try to reduce the complexity of individual and social dynamics rather than to describe them in realistic terms. Rational choice theory, based on the general validity of the expected utility function, and general economic equilibrium are representations of individuals and society somehow disconnected with the real world. In Simon's terms, the epistemology of neoclassical economics is inconsistent with our

knowledge of actual human choice behavior; in Hayek's terms, it is an abuse of reason; in Occam's time, it would have been regarded as a form of essentialism.

There are many alternatives to neoclassical economics. Besides many differences among heterodox economic approaches, their main concern is to build up an economic discipline able to define economic agents and institutions in a way that makes adherence to reality more effective and to include complexity. The heuristic blade of Occam's razor goes in that direction: knowledge consists of cumulative perceptions collected through experience and is designed to facilitate decision making by individuals and society. Economics has to be regarded as a human discipline, able to conveniently describe human dynamics and to find some general regularities among them, without presuming to reach an authentic scientific status as well as a real dominant position – the 'economic imperialism' of neoclassical economics (Laezar 2000) - among the so-called social sciences. This process will open up a more pluralistic view within economics. Neoclassical economists should bear in mind the well-known quotation from William Blake's *Proverbs of Hell*—'Truth can never be told so as to be understood, and not to be believed'—as a warning when dealing with the moral sciences (Ramsey 1931 as quoted in Georgescu-Roegen 1954).

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