DIFFERENCES AND SIMILARITIES IN EVOLUTIONARY ECONOMICS

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The emergence of the so-called "microelectronic paradigm", around the decades of 1960 and 1970, radically altered the dynamics and workings of industrial economies. The development of new informational and precision technologies gave birth to new industrial sectors based on advanced and costly technological research. This new environment, which presented very high speeds of update and change, set in motion a new logic of research-based industrial development that provoked and intensified a set of economic phenomena that were not frequently observed in economies and which current economic theory was either not capable of handling comfortably, like the existence of increasing returns to scale, or not capable of adequately considering, such as the phenomenon of innovation.

Faced with these limitations, during the 70's and the 80's a group of researchers tried to develop alternative methods to satisfactorily address these new phenomena with theories that looked to capture and express the constant innovation aspect of this new economic paradigm, and the consequences of this aspect on the long-term trajectory of specific industries and the economy as a whole. To accomplish that, these theories aim to interpret the economy as an open system in constant change under certain restrictions. Due to this characteristic, which recovers the work of another group of economists active during the beginning of the twentieth century, those theories started to be grouped under the term "evolutionary". Generally, those works tried to address this aspect of economies either by exploring new possibilities under the prevailing research programme or by giving up this framework entirely in favor of a new structure.

To adequately describe the processes of evolutionary change economies go through, the evolutionary research programme rejects some fundamental aspects of the neoclassical theory, or "mainstream" theory as described by Nelson and Winter (1982). Among these aspects, one can cite the focus of the mainstream branch in describing equilibrium states versus the evolutionary programme's objective of describing the dynamic of economic variables over time, or the usage of single representative agents endowed with objective rationality (Dosi and Nelson, 1994) in neoclassical theory versus heterogeneous agents with subjective and bounded rationality. Saviotti and Metcalfe comment on the characteristics of the orthodox view:

> Central here is the orthodox concern with equilibrium states rather than processes of change, together with the overwhelming reliance on the representative agent (firm or household) as the vehicle through which orthodox theory is articulated. By these two devices the essential variety and openness which drives evolutionary change is ruled out of consideration. (METCALFE, SAVIOTTI, 1991, p. 2).

It is important to note that despite this rejection being relatively prevalent among work considered evolutionary, is is not strictly indispensable. Different works show different levels of rejection or tolerance of those principles.

According to Dosi and Nelson (1994),

one of the defining elements of neoclassical theory is the explanation of the behavior of an economic system as the result of the individual action of a number of rational agents, that act to maximize their utility, given a set of restrictions they are subject to. Note that for the actors to be able to truly maximize their utility, they must perfectly understand the meaning of the information they have access to and the full consequences of their possible actions, to the extent they are logically predictable. Thus, they demonstrate an objective rationality: their actions truly are the best possible, given the available information. This is in contrast to a subjective rationality, where agents make the decisions that seem most sensible to them. It is worth noting that the concept of objective rationality does not imply that agents cannot make mistakes or be unsuccessful in their choices, but that this will only happen because of lack of information or "bad luck". Obviously, this demands arbitrarily large information processing and interpretation capabilities, which is somewhat unreasonable. To be fair, however, most of the economists in the mainstream branch of economics do not actually consider agents to have such processing capabilities, but defend that agents act as if it were true (Cavalieri, 2009, p. 13), since any suboptimal behavior would be excluded from the system through market selection. There is a series of obstacles to such an interpretation, however: it is hard to argue that competitive pressures play this role in all situations, and even then such a dynamic would guarantee only a local optimum point for the system. Interpreting this is a problem for a theory that cannot deal comfortably with multiple equilibria.

Another possibly more significant problem of neoclassical theory for evolutionary economists since it is related to many methodological and practical aspects important to evolutionary economics' main topics is it's focus on equilibrium analysis. In an economic system with a number of agents, each agent makes a decision considering the decisions of other agents, creating a stable equilibrium. The analysis carried by neoclassical theory then aims to identify these equilibria and describe their behavior when faced with some external perturbation. The first problem presented by such an analysis is the inability to determine the dynamics of economic variables: simple equilibrium analyses do not tell very much about the behavior of the system when out of equilibrium, and this behavior is at the center of many phenomena that evolutionary economics aim to explain, such as the transformation of productive capacities due to economic growth or technological progress. Another problem that a neoclassical analysis strategy may encounter is the existence of multiple equilibria: in its text-book formulation, neoclassical theory will be unable to determine in which equilibrium the system will find itself if that is the case. This situation is common in cases of technological progress or industrial configuration, in which feedback effects in the system can make it so initial random events determine the final state of the system. Furthermore, neoclassical theory does not consider in any specificity the motivations behind the actions of agents or any kind of cultural or social limitation over their field of possibilities.

To resolve the problems and insufficiencies presented by neoclassical theory, the set of theories denominated evolutionary utilize some form of analogy with biological evolutionary theory. Witt apud Cavalieri (2009) lists four ways this analogy can be made: in a reductionist sense, strictly as a metaphorical analogy, in the logic of "universal darwinism", and the way proposed by Witt himself. The reductionist view states that economic phenomena are the result of human behavior selected by processes of biological evolution, and thus "admite-se que os fenômenos econômicos podem ser explicados como resultado dos comportamentos mais aptos aos mecanismos de seleção natural" (CAVALIERI, 2009, p. 15). The idea of the biological evolutionary process as an analogy for the economic process, "segundo WITT (2004, p. 127), é a mais popular entre os teóricos da economia evolucionária", and was advanced by the pioneering work by Nelson and Winter:

> Our use of the term 'evolutionary theory' to describe our alternative to orthodoxy also requires some discussion. It is above all a signal that we have borrowed basic ideas from biology, thus exercising an option to which economists are entitled in perpetuity by virtue of the stimulus our predecessor Malthus provided to Darwin's thinking.
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> (NELSON, WINTER, 1982, p. 9)

Nelson e Winter use many concepts from biology, particularly the structure of mutation, transmission and selection of characteristics, as explanatory analogies for their own theory, a position adopted by many subsequent works. But those analogies were limited to explanation, not necessarily keeping any relation with the specific workings of the economy. Nelson and Winter write later on:

> We emphatically disavow any intention to pursue biological analogies for their own sake, or even for the sake of progress toward an abstract, higher-level evolutionary theory that would incorporate a range of existing theories. We are pleased to exploit any idea from biology that seems helpful in the understanding of economic problems, but we are equally prepared to pass over anything that seems awkward, or to modify accepted biological theories radically in the interest of getting better economic theory (witness our espousal of Lamarckianism). (NELSON, WINTER, 1982, p. 11)

The third possibility, of "universal darwinism", is based on the previous one, but doesn't consider biological evolution mechanisms merely as an useful analogy for economic phenomena, but as having a closer relationship at a higher level. Geoffrey Hodgson, one of the leading defenders of this view, writes:

> It is possible that some of the reaction against 'biological analogies' is grounded on a mistaken view that theories operate on one level only. The concern is that the invocation of such analogies necessarily means a slavish copying of every detail of biological evolution. On the contrary, Darwinian evolution shares common ground with economics at a much higher level of abstraction, as a result of the fact that both biology and the social sciences address complex, open, evolving systems.
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> (HODGSON, 2002, p. 273)

Thus, the fundamental darwinist structure of variation, inheritance and selection would be shared by any science that studies complex and open systems, such as social sciences, economics included. The analogy is not merely explanatory, but also ontological. Finally, there is the view of Witt himself, that also is based on the second view introduced by Nelson and Winter, but considers that the darwinist theory cornerstones of variation, inheritance and selection are not the most adequate to represent economic processes, proposing instead fundamentals specific to human cultures.

The effects of these principles in economic models produce behaviors quite different from what is expected in a "mainstream" model, and demand different forms of analysis. Differently from neoclassical models, which behave like systems closed to exchanges of energy with their environment and show stable equilibria where the organization of the system is the lowest possible (i.e. the entropy of the system is at its maximum), evolutionary models are more similar to open systems, where there is energy and information exchange with its environment. This similarity is due to a set of characteristics that are present in this type of system and also in the economic phenomena that evolutionary theories seek to describe. A particularly interesting example is the fact that instead of settling in the state with the largest possible level of entropy, open systems can have crescent levels of organization over time, depending on the interactions with the environment that occur. Metcalfe and Saviotti write:

> As several scholars have emphasised, economic systems are open systems and exchange matter, information and energy with their environments[...]. Therefore, they must follow the laws of behaviour of open systems. On the other hand one of the most important features of economic systems, which they share with biological systems, is the increasingly greater order, complexity and variety of institutions, products and technologies to which economic development has given rise. Naturally, this increasing order would not be explicable if economic systems were closed to flows of energy and matter. (METCALFE, SAVIOTTI, 1991, p. 14-15)

Another interesting phenomenon is that of path-dependence, that is, the property that the state of the system in a given point in time influences its possible states in the future. This is associated to the concept of irreversibility of the system, which states that the alteration of one of the variables of the system causes changes that cannot be reversed afterwards with another alteration of the same variable by the same amount but with an inverted signal. This characteristic allows the system to go through a process of "evolution", here defined as a qualitative change in the structure of the system, as it distances itself away from a closed equilibrium, which happens when the system approaches a "bifurcation", a point where the system becomes unstable and in which small alterations in any of its variables determine what structure it will have from there on.

> When the 'distance' from equilibrium, as measured by some control parameter, is sufficiently large the system begins to behave in a completely different way. First, it can undergo a series of transitions to an ever greater number of states, each characterized by a high degree of order and a different structure. This can be represented in a 'bifurcation' diagram. By contrast with equilibrium systems, in the neighbourhood of a transition point (a branching point in the bifurcation diagram) the behaviour of the system becomes indeterminate and it is not possible to predict which branch of the bifurcation diagram is going to be followed. Random fluctuations are extremely important in determining the outcome of the process.
> (METCALFE, SAVIOTTI, 1991, p. 15)

The mentioned characteristics of opposition to the current "mainstream" tradition, presence of evolutionary, usually darwinist elements and behavior best described by models based on open systems are present in evolutionary theory as a whole. However, the form and intensity with which each element appears varies greatly across the field, depending on the objectives of the researcher and their position on the academic debate. An interesting exercise then might be observing the differences between the theories of different authors.

Sugestões de Leitura

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