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Adolfo García de la Sienra. 2019. *A Structuralist Theory of Economics*. London/New York: Routledge (INEM Advances in Economic Methodology)

Adolfo García de la Sienra is one of the most prominent philosophers of economics in the Spanish-speaking world. He has held a meeting of the International Network for Economic Method in Xalapa and actively participates in the Sociedad Iberoamericana de Metodología Económica. Thanks to García de la Sienra, the structuralist approach to economics is now mature, with a full-fledged analysis of some of the most significant varieties of economic theorizing in the 20th century. This analysis is now thoroughly presented in *A Structuralist Theory of Economics*, where we also find García de la Sienra's own take on the structuralist programme, connecting it with its Suppesian roots.

The first half of the book is an introduction to the pillars of the structuralist approach. In Chapter 1 we find the Suppes *informal structural* view, articulated on set-theoretical predicates and data structures, in which the key epistemic notion is the observational adequation between the two. Chapter 2 presents the concept of structure, drawing on the seminal work of Sneed and his school, on the one hand, and Da Costa and Chuaqui, on the other. Structures are informally defined as “a list of sets together with relations built over such sets” (p. 30). García de la Sienra then formalizes this intuition using *types*, to classify power sets, and a modified version of the Ackermann-Müller theory of classes. He is then ready to define set-theoretical predicates rich enough to capture the complexity of actual scientific theories. This is illustrated, in Chapter 3, with an analysis of classical particle mechanics, followed by a short but effective introduction to the key elements in the Sneedian structuralist view of theories (*theory core*, *theory element*, and *theory nets*).

García de la Sienra closes the first half of the book with two additional chapters on idealization and concretization (ch. 4) and measurement (ch. 5). In the former, García de la Sienra answers some regular objections against the ability of the structuralist view to grasp empirical phenomena. For García de la Sienra, scientific theories reach this grasp through the interplay of four items: there are, on the one hand, set-theoretical structures (intended applications, models of data) representing reality, but there are also, on the other hand, *model systems* (conjunctions of predicates expressing idealizations, in the sense of Mäki and Portides) and the *real concrete systems* that the former represent. This same dialectic between set-theoretical structures and its empirical targets reappears in chapter 5 with the distinction between *metrization* and measurement. For García de la Sienra, *metrization* occurs when an empirical property is proven measurable, according to a given unit of measurement. The representational theory of measurement establishes the set-theoretical conditions under which such property is metrizable, independently of how it is actually measured.

This fifth chapter starts the transition from general philosophy of science to the philosophy of economics. In order to illustrate how metrization is achieved independently of the representational theory of measurement, García de la Sienra briefly discusses two clas-

sical 20th century controversies: the measurement of demand functions and the measurement theory debate. Chapter 6 establishes the target of any economic theory, the general concept of an economy, a structure covering four basic activities: production, distribution, exchange and consumption.

Chapter 7 covers preferences and utility where we find one of the author's main conceptual achievements. For a structuralist, a preference relation may be idealized, but it is nonetheless empirical, and its content should be represented by a (theoretical) utility function. The problem is that in standard microeconomic theory, utility functions are continuously differentiable, a pre-requirement for the topological analysis of economic equilibrium. But what would be the empirical counterpart of differentiability in a preference relation? García de la Sienna suggests that differentiability captures a way in which the agent's tastes are stable in the vicinity of any consumption menu. Capturing this apparently simple intuition requires a long mathematical digression showing the correspondence between algebraic and geometric difference structures, and then between the latter and preference structures. Against instrumentalist or positivist interpretations of utility theory, where its mathematical apparatus would not require any empirical justification provided it delivered empirically successful predictions, García de la Sienna vindicates a realist account in which every empirically meaningful element of a preference relation would be represented by the corresponding utility function.

No less original is the analysis of game theory in chapter 8. Focusing on dynamic games, García de la Sienna provides an axiomatic formulation from which the *theory-element* of neoclassical economics will emerge as a *specialization*. Its empirical content is captured as follows. On the one hand, García de la Sienna shows that behavioural strategies "determine a probability measure over the space of all possible histories of the game", making some trajectories more probable than others -those that maximize the expected utility of the agent. The empirical behaviour of economic agents generates a histogram over the same space. According to the author, the fundamental law of game theory states that such empirical distribution must approximate the probability measure -i.e., agents behave strategically and the empirical distribution approximates an equilibrium of the game.

In chapter 9 García de la Sienna solves the main conceptual problems that have ravaged the labor theory of value. He provides a general definition of abstract labor and a representational measurement of the same. He then shows that a uniform profit induces abstract labor, and finally he proves that a given determination of abstract labor induces a system of prices which is unique up to similarity transformations. In chapter 10, the author recasts classical economics fusing the labor theory of value with "neoclassical" economics, proving the existence of an equilibrium in which the prices are induced by labor value, they clear the markets, and all the agents maximize utility.

In chapter 11, he reconstructs, in the same vein, with Sraffa's *Production of Commodities by Means of Commodities*. And to close the book, and his sweeping survey of economics, García de la Sienna tackles econometrics building up on Aris Spanos' analysis of the connection between probability theory and *data generation processes* via *model specification*. And then the book ends up abruptly, without a conclusions chapter.

As the reader may have already guessed, this is quite an impressive monograph for many different reasons. First, breadth and scope: *A structuralist theory of economics* is both a primer in some central themes in philosophy of science plus a broad introduction to economic theories, covering on equal grounds neoclassical and Marxist approaches. Although

this is an exercise in formal philosophy of science, García de la Sienna makes the philosophical message clear at every step and, as conveyed —I hope— in the summary above, there are plenty of insightful intuitions. There are also some perplexities, let me just comment on a salient one.

Like many others, I have the impression that structuralist approach is perhaps too powerful, since it can reconstruct formally almost every articulated doctrine with a minimal amount of empirical content. Treating neoclassical and Marxist approaches on equal grounds shows, in my view, this sheer excess of power. Most practitioners and methodologists of economics would see these two approaches in open contradiction: García de la Sienna shows, with his reconstruction, that this is clearly not the case. Except that his reconstruction becomes something more than meta-theory: García del Sienna is actively picking up those threads in economics that will fit better with the structuralist template. This may be a legitimate strategy. After all, Suppes and his school tried to capture the distinguishing traits of the most successful scientific theories. If economics wants to achieve the same success, we should better focus on the structures it shares with other scientific disciplines.

Here comes the second perplexity: García de la Sienna's analysis stops every time at the same point: the identification of the empirical claim of the theories reconstructed. He says very little about the truth of these empirical claims, despite decades of debate on whether economics succeeds at grasping the truth about the phenomena under analysis. But the reason for this, as he told me personally, is that whether a theory is successful in some applications is an entirely empirical matter. I hope the discussion of this empirical matter will provide a good enough reason for García de la Sienna to keep writing on economics.

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