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Markets come to bits: Evolution, computation and markomata in economic science

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Abstract

Based upon my previous historical work, I attempt to isolate and identify what appears to be a profound shift in the conception of the economy in recent economic research, focusing on five areas: mechanism design, zero-intelligence agents, 'market microstructure', engineering economics and artificial intelligence. The shift identified concerns treating markets as diverse algorithms, and will have profound effects upon the conceptual frames used to address the economy. Rather than deal in vague imponderables, in the paper we proceed to sketch the emergent outlines of the implicit alternative program of an evolutionary computational economics constructed from the theory of automata which situates the problematic existence of diverse market species at the very center of the research agenda, and not, as happens all too frequently, to relegate it to the margins of modern economic thought. The laws that are sought under the new paradigm are laws of the markets, *not* laws of human nature.

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1. The emergence of Markets theory

I have argued in Mirowski (2002) that the trajectory of the orthodoxy began the 20th century primarily as the oft-acknowledged theory of static allocation, patterned upon classical mechanics, but that during World War II its path got deflected by events and personalities (too numerous to recount here) towards an altogether different conception of its core doctrine, one that might be

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summarized as recasting the economic agent as an information processor. It goes without saying that the wartime development of the computer and its subsequent diffusion into nearly every sphere of intellectual discourse had quite a bit to do with what has been the most significant reorientation of the economics discipline in the last century, one that has nowhere near yet exhausted its promise. Nevertheless, it is the premise of the present paper that the sciences never rest content; that further developments in the computational and biological sciences are portending another deflection of the central tendency of microeconomics, which, if successful, will transmute once more the very quiddity of economics. Because we are living in the early stages of the emergence of the new tradition, this paper cannot be constructed in an historical idiom, as was my earlier book. Rather, it is an attempt to describe the stark outlines of the new analytic vision, point out some ways in which it has become manifest in the last few decades, and suggest some incipient lines of development.

In a crude and inadequate manner of speaking, the shift which I think I detect in modern microeconomics is one which is becoming less and less interested in the 'correct' specification of the economic agent and her cognitive capacities, and is increasingly concerned with the formal specification of markets as evolving computational algorithms. The reader may be tempted to reject this distinction out of hand: at minimum, the neoclassical tradition has always taken the nature of markets as the central province of economics, has it not? Yet that notion would be premature, as some high-profile economists have noted:

> "It is a peculiar fact that the literature on economics... contains so little discussion of the central institution that underlies neoclassical economics—the market" (North, 1977, p. 710). "Although economists claim to study the market in modern economic theory the market itself has even a more shadowy role than the firm" (Coase, 1988, p. 7). Arrow and Hahn's *General Competitive Analysis* asserts in passing that it takes the "existence of markets... for granted." (Arrow and Hahn, 1971, p. 348)

In fact, a judicious and unbiased overview of the history of the first century of neoclassical economics would confirm that it had been much more fascinated with the status and nature of *agents* than with the structure and composition of markets. Most of the time, the concept of the market was treated as a general synonym for the phenomenon of exchange itself, and hence rendered effectively redundant (Rosenbaum, 2000). Even in the few instances when key thinkers in the tradition felt they should discuss the actual sequence of bids and asks in their models of trade – say, for instance, Walras with his *tâtonnement* and his *bons*, or Edgeworth with his recontracting process – what jumps out at the economic historian is the extent to which the sequence of activities posited therein had little or no relationship to the operation of any actual contemporary market.[1] Mid-20th century attempts to develop accounts of price dynamics were, if anything, even further removed from the increasingly sophisticated diversity of market formats and structures and the actual sequence of what markets accomplish.[2] Whilst there would be many ways to account for this incongruous turn of events, the condition we shall opt to stress here was the strong dependence of the neoclassical tradition upon *physics* to provide the respected paradigm of scientific explanation. Not only had energy physics provided the original agent formalism of optimization over a

[1] A symptom of the general oblivion to market structures is the urban myth about Walras being inspired by the Paris Bourse. A good historian such as Walker (2001) makes short work of this fairy tale. The only claim that a real-world market anywhere near approximated the actual sequence of events in Walras' tâtonnement of which I am aware is a description of the operation of the post-war London bullion price-fixing ring. See Jarecki (1976).

[2] The essential disconnect between theories of market dynamics and any empirical sensibility with regard to process is revealed by the historical discussions in Weintraub (1991) and Schinkel (2001).