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Progress in Artificial Economics

Computational and Agent-Based Models

 Springer

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Preface

This volume collects the contributions presented at the sixth event in the annual Artificial Economics conference. (For more information on former conferences, see <http://www.artificial-economics.org/>.) We received 48 submissions and based our acceptance decisions on a total of 137 referee's reports, leading to an average number of reports close to three per paper. We had to make difficult choices and we regret having been unable to include more papers.

Upon reaching a sixth anniversary, one should be able to answer a simple and basic question such as "What is Artificial Economics?" When working on this book, the editors came back to this question many times and had lively discussions leading to the conclusion that a proper answer requires a fair amount of care and ingenuity. Clearly, Artificial Economics lives in a neighborhood of Computational Economics. One of the editors likes to say that Computational Economics is an excellent first-order approximation to Artificial Economics. But what about the second order? Moreover, and more importantly, a commonly accepted definition of Computational Economics has still to come and, hence, this looks like a slippery avenue. Another editor suggests that the blend between Economics and Computer Science plays an important role in the definition of Artificial Economics scope and goals. Somehow, the A in Artificial rhymes well with the initials of algorithms and (economic) activities.

Artificial Economics is based on the consistent use of agent-based models and computational techniques. Virtually all contributions in this volume are interesting variations on one facet or another of these foundations. The richness and diversity underlying these models is now widely accepted as a useful companion for better understanding the experimental and theoretical results close to the heart of our scientific interests. Yet, we believe that this is not the whole story.

We would like to spell out the principle that what lies behind Artificial Economics are networks. (If you hear some background mumbling at this stage, this is a symptom of a healthy debate.) We can see at least three of these:

1. Artificial Economics connects disciplines like Economics, Management Science, and Computer Science. . . with a *fil rouge* emphasizing the role of agents, heterogeneity and evolution.
2. Artificial Economics links economic problems and approaches coming from different research areas, united by the need or opportunity to use simulations, numerical methods, and more generally heuristics in a broad sense;
3. Artificial Economics is made by a wide-casting network of scholars willing to recombine problems, ideas and solutions in innovative ways that draw inspiration from the areas mentioned above.

Ultimately, networks afford the multiplicity, diversity and resilience that are needed to explain our world and advance research. But the proof of the cake is in the pudding. Let us introduce the heterogenous papers appearing in this volume, conveniently (albeit somewhat arbitrarily) arranged in seven categories.

Markets and trading. Veryzhenko, Brandouy, and Mathieu tackle the question of how much sophistication is required from artificial traders to replicate well-known stylized facts in a realistic market microstructure. Hauser and Kaempff consider a market where agents are heterogeneously informed and introduce a new trading strategy that is shown to protect most of them from being exploited. Kodia, Ben Said, and Ghedira open a new front in the agent-based modeling of stylized facts for asset markets by explicitly considering behavior and cognitive attitudes.

Auctions. Brigui-Chtioui and Pinson propose a new bidding algorithm for the multicriteria English reverse auction protocol. Mochon, Saez, Gomez-Barroso, and Isasi present a simulator for the combinatorial first-price sealed-bid auction and test it over two environments inspired by current spectrum auctions. Posada and Hernández offer an agent-based perspective on recent experimental results about the performance of the continuous double auction in the presence of transaction costs.

Networks. Anand, Gai, and Marsili develop a simple model of how trust can break down in financial systems drawing on insights from the literature on coordination games and networks. Blasco and Pin study the adoption of a new technology as an instance of social learning, comparing the long-run efficiency of a network against the benchmark case of isolated agents. Taghawi-Nejad relies on a network of agents to illustrate how shocks due to the introduction of a new technology may lead to business cycles.

Management. Wall guides us into the analysis of how imperfect information affects performance under different organizational structures. Chie and Chen study different layers of the effects of social interactions on product innovation in a duopolistic dynamics. Lacagnina and Provenzano consider a multi-agent supply chain and exhibit situations of self-organized criticality that may create large fluctuations in the sector productions.

Industry Sectors. Mc Breen, Goffette-Nagot, and Jensen apply an agent-based model to provide a detailed study of the housing market that tracks the consequences of imperfect information. Schütte develops a model of product market

competition and validates it using empirical data from the pharmaceutical industry in Germany. Osinga, Kramer, Hofstede, Roozmand, and Beulens investigate a complex market with many agents that is directly inspired by the Chinese pork sector.

Macroeconomics. Romanov, Yakovlev, and Lelchuk study the long-run distribution of wealth in a model with many classes of agents. Teglio, Raberto, and Cincotti report on the relationships between the availability of credit money and the variability of output and prices within the EURACE model. Hemmati, Nili, and Sadati analyze a linear-quadratic repeated inflation-unemployment game in an environment populated by heterogeneous agents who use reinforcement learning to evaluate the governmental target.

Demography and culture. Giulioni and Bucciarelli apply an agent-based model to investigate the evolution of fertility and income in the process of economic development. Ruiz, Botti, Giret, Julian, Alvarado, Perez, and Rodriguez consider the effects of the labour market and of the financial sector on migration in a multi-agent simulation. Burgers, Hofstede, Jonker, and Verwaart offer a rich simulation of the impact of several cultural variables on trade.

As usual, the Conference was also enriched by two invited speakers whose (unofficial) job description is to alert us to new developments. Frank Westerhoff (University of Bamberg) gave us a wide introduction to his recent work on the use of models with heterogeneous agents to probe the various effects of regulatory measures. Thomas Bäck (University of Leiden) shared with us his deep knowledge of the foundations and applications of evolutionary and bio-inspired algorithms that are becoming increasingly important for Artificial Economics and several other research areas.

To wrap things up, we would like to share that during the last hectic week when this volume was getting the final editing touches the editors were in France, Spain and Italy, respectively. Each of these three countries has played an important role in the development of the Artificial Economics series since its beginnings and, not coincidentally, this proves once again the importance of networking.

Venice,
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*Marco LiCalzi
Lucia Milone
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