

Introduction to the Special Issue

This Special Issue published in the Journal of Economic Interaction and Coordination includes a selection of refereed research papers presented at the 18th Annual Conference on Economic Science with Heterogeneous Interacting Agents (WEHIA 2013), which was held at Reykjavik University, Iceland, on June 20-22, 2013.

The WEHIA Conferences initiated in the late 90s in Ancona, Italy, with the aim to promote the exchange of concepts and techniques among a growing number of scholars from different fields (such as economics, social sciences, physics, and computer science) that were studying economic problems by using innovative and multidisciplinary approaches, including computer simulation. The concepts of economic agents' heterogeneity and interaction as well as dynamics and disequilibrium have always played a key role in the community.

The research community has grown considerably since those initial years. The research scope, initially mainly focused on financial issues, has become wider and included different macro- and micro-economics domains. Increasing interests and attention from both the wide research community of economists, still sticking to the equilibrium and representative agent paradigms, and by popular media, have been gained in recent years, in particular in the aftermath of the so-called Great Recession of the late 2000s and early 2010s.

The Great Recession has not only been an economic and financial crisis of historical proportion but has also caused a crisis of confidence in the science of economics and, in particular, in standard macro-economic modeling. The crisis has indeed highlighted the inadequateness of standard models, which proved unable not only to foresee the crisis but also to consider the importance of the interplay among the financial, the credit and the real sectors of the economy. The crisis has highlighted the need for new models that take into account booms and busts in asset- and credit markets as well as the balance-sheet interlinkages in credit exposures and shock transmission processes at the systemic level.

The collapse of the Icelandic banking system in the aftermath of the Lehman Brothers triggering event in September 2008 and the following severe economic recession of the Icelandic economy were an epitome of the Great Recession. In this perspective, the organization of WEHIA 2013 in Reykjavik, the capital of the country that was the first casualty, assumed a symbolic meaning. Indeed, the agent-based modelling approach pursued by the WEHIA research community has indicated the way to provide a valuable and reliable support for designing appropriate economic policies able to prevent future economic crises of the same proportion of the Great Recession. Agent-based modelling helps to understand the linkages among credit, finance and real economic activity and their role not just as propagators of exogenous shocks but as the main source of endogenous asset bubbles, financial instability and endogenous business cycles.

This special issue includes eight contributions pursuing this innovative modelling approach; they cover different areas of research in economics, from finance and start-up financing, to game theory and macroeconomics. The field where we have the most contributions is finance, which has been the main application domain of the agent-based modelling approach since its

inception in the 90s. In particular, the special issue includes three contributions addressing financial issues by both modelling and empirical analysis techniques.

Biondi and Righi, building upon a previous model, provide further insights on the informational efficiency of financial markets, by showing how it depends also on the regulatory regimes for fundamental information provision. In particular, the authors show that mark-to-market accounting generates higher linear correlation between market prices and fundamental signals, but involves higher market instability and volatility than historical cost accounting. Bookstaber et al. develop an order-book model characterized by heterogeneity in trader decision cycles, where long-term fundamental investors have a slower decision cycle than high frequency and statistical arbitrage traders. They show that this disparity in the reaction speed may even widen during liquidity shocks, when high-frequency traders are forced to close rapidly their asset positions while fundamental investors, which could provide the necessary liquidity, may refrain to enter the market because of the need to reformulate their investment plan. These different reaction speeds cause an amplification of liquidity shocks and may even lead to a market collapse. Raddant and Wagner present an empirical study of the covariance matrix of asset price returns of stocks which have been part of the Standard & Poor's 500 index from 1987 until 2011. By using the random matrix theory technique, common in physical sciences, they find that the eigenvector belonging to the leading eigenvalue (the market) exhibits a sort of phase transition in 2005, when the market changes from an ordered state, where the IT sector plays the dominant role, to a disordered one, where investments and trading volume become much more scattered over all segments.

Furthermore, we have two contributions that provide novel perspectives in the macroeconomic domain; they deserve a special attention considering the crisis of confidence in mainstream macroeconomic models which followed the Great Recession. Golo et al. build upon Minsky's financial instability hypothesis and on a previous agent-based model by Solomon and Golo which is characterized by a top-down feedback loop of the interest rate on the status of individual firms, a bottom-up influence of the individual states of companies on the interest rate and by a peer-to-peer interaction related to the change of status of a company to changes in the status of its trade partners. In particular, they present empirical evidence supporting the relevance of the Solomon and Golo model by fitting historical interest rate data in order to predict the number of distressed firms and then comparing model's prediction with the data taken from a large panel of Italian firms. Ferri et al. present an equation-based dynamic model characterized by endogenous fluctuations generated by endogenous markups, variable capacity utilization, and credit constraints, within Minsky's financial instability hypothesis. They also enrich the model by introducing heterogeneous expectations of demand on the supply side, showing how a larger gap in the expected rate of growth between agents can increase the standard deviation of endogenous fluctuations.

The special issue includes also three additional contributions.

The paper by Anna Klabunde deals with the important issue of start-up financing and the trust relation between the entrepreneur and investors. In particular, the author develops an agent-based model where trust, which is the pre-condition for investment, grows (decreases) when the investor is satisfied (disappointed) based on the comparison of his return with that of other

investors. The author finds that investors that cooperatively share their returns succeed collectively in sorting out entrepreneurs with a long row of negative productivity shocks, but that it is optimal for an individual investor to deviate from this strategy, to be less easily disappointed, but to decrease trust in larger steps. However, if all investors behave according to this latter strategy, too many unproductive firms remain in the market and the average investor's return is lower than in the collective optimum.

Yu et al. study the role of punishment in the promotion of cooperation by means of an evolutionary agent-based model of a society characterized by social norms. Agents choose their strategies to maximize their individual benefits given the current social norm, which is a globally and evolving shared rule used to update their reputation based on what they did and to whom. Contrary to other studies limited to equilibrium solutions, the authors find that in their evolutionary framework costly punishment does contribute to the evolution toward cooperation and that the convergence to a stable cooperative society is faster if the punishment action is encouraged by the social norm.

Furthermore, the paper by Ted Theodosopoulos presents a new type of spin market model, populated by hierarchical agents, represented as configurations of sites and arcs in an evolving network. In particular, the author defines a stochastic process on meta-individual agents that he represents as spin configurations of sites and arcs in a network that evolves as a result of their interactions, thus extending earlier work on spin market models and opinion formation models to the case of a network that evolves simultaneously and reciprocally with the agents' actions.

In conclusion, the variety and quality of the contributions in this special issue demonstrate the fruitfulness, innovation and development taking place within the area of the WEHIA conferences. New understandings, methods and models will add to the existing expertise, and eventually have a positive impact on the economy and the society as a whole.

Finally, we would like to thank the reviewers of this special issue for their valuable comments and support, as well as all the participants at the WEHIA 2013 Conference held in Reykjavik.

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