Evolution and Economic Complexity, edited by J. Stanley Metcalfe and John Foster. Cheltenham, UK: Edward Elgar. 2004. Cloth, ISBN 1843765268, $100.00. 227 pages.

The book, edited by Metcalfe and Foster, focuses on the connection between economic evolution and economic complexity. It includes an overview essay written by the editors and nine papers that were presented during the second Brisbane Club workshop in Manchester, UK in July 5-7, 2002.

An article by Kurt Dopfer from University of St. Gallen in Switzerland and Jason Potts from University of Queensland in Australia explain a conceptual framework of micro-meso-macro analysis. Within their framework, organizations and economies are represented as systems of agents and rules. During the evolutionary process, rules store knowledge and are created, maintained, and dropped by agents. The meso part of the analysis studies rule emergence and rule evolution. The evolutionary path of rules, called the meso trajectory, gives rise to the simultaneous micro and macro paths. Hence, the meso analysis is the foundation of micro and macro analysis. Complexity is the result of many possible rule arrangements within a system.

Paul Ormerod and Bridget Rosewell from Volterra Consulting, UK argue that the appropriate criteria for assessing any model of a social system are the plausibility of its behavioral rules, the purpose of the model, and its predictive power. They present an agent-based model of US business cycles. The model demonstrates that the variability in activities of the firms can cause business fluctuations. The authors also briefly describe an agent-based model of competition. Ormerod and Rosewell emphatically communicate their frustration with the lukewarm reception their models received from economists. I wonder if the poor reception can be explained, at least partially, by the authors' strong opinions about the state of economic modeling and the lack of acknowledgement of the extensive literature on business cycles, the behavioral theory of the firm and agent-based modeling.

Division of labor and outsourcing are tools that organizations use to enhance their capabilities, asserts Paolo Ramazzotti of the University of Macerata, Italy. He maintains that division of labor, firm capabilities, firm boundaries, strategic objectives, and learning form a feedback loop: management determines goals (such as cost-cutting or quality enhancement) and designs the division of labor to accommodate those goals. The division of labor determines the firm's capabilities, which in turn reinforces the original goals of management. Sometimes, management deliberately uses the division of labor to control knowledge available to workers. Among the negative effects he notes that specialization by firms may preclude learning.

Peter Hall from the University of New South Wales in Australia reviews the effect of tacit knowledge on the dynamic capabilities of a firm. He notes that evolutionary theory recognizes knowledge as an important factor for determining strategic positioning of a firm. However, codification of knowledge is costly, and therefore some knowledge is purposefully left in the domain of tacit knowledge. The author concludes that there is insufficient empirical research on the role of tacit knowledge.

Within the framework developed by Peter Allen from Cranfield University in UK, a system is formalized as an evolving structure comprised of linked agents. Evolution is seen as a series of "invasions of the system by new elements." The system forms experimental linkages to the invaders, but retains only links that contribute to the "synergy" of the activities of the entire system. Eventually, the system converges to a "structural attractor," which is a system with a fixed number of agents and fixed linkages between them. Allen emphasizes that the ability to explore new agents and linkages is essential for the emergence of better-fit systems. The theory illustrates that since the emergence of a given structural attractor is path dependent, "there are many possible pathways into the future." The theory is being applied to study the evolution of automobile manufacturing.

Esben Sloth Andersen from IKE Group and Aalborg University in Denmark explains three models of economic growth in terms of the concept of "population thinking" and Price's equation from evolutionary biology. In the simplest model, heterogeneous firms produce one good and compete for labor. Random shocks to productivity affect the market positioning of firms. Firms in the second model divide their labor between production and knowledge creation. Knowledge creation, which is approximated with a Poisson distribution, improves production. Regardless of the initial setup, simulations of the second model always result in the emergence of a monopoly. The author calls this effect the "monopoly paradox of the evolutionary modeling." The third model, still under development at the time of the writing, will allow specialization by firms and will, the author predicts, resolve the monopoly paradox.

Francisco Louca of University of Lisbon in Portugal argues that the treatment of error in biology as an integral part of the evolutionary process is superior to the current view of error in economics. Economists, he laments, see an error either as a measurement error, a shock, or a perturbation from a steady state. He notes that an extensive and prolonged debate within economics did not get rid of many inconsistencies in the interpretation of error in economic models.

Uwe Cantner and Jens Kruger of Friedrich-Schiller University in Germany report on an empirical study that compared performance mobility and market share mobility of large German firms during the period of 1981-1993. The authors used two approaches to measure mobility: Salter curves, which display heterogeneity among the firms, and the transition matrix of a Markov chain. Each approach led them to conclude that performance mobility as measured by productivity is significantly greater than market share mobility as measured by output shares.

Andreas Pyka, Bernd Ebersberger, and Horst Hanusch from University of Augsburg in Germany present an outline of an agent-based model of an energy sector. In their view, neoclassical economic models are inadequate for capturing the multidimensional complexity of the sector. Their model, once implemented, will consist of artificial energy producers, energy consumers, policy makers and regulatory agencies. They will use

genetic algorithms to approximate the decision making by agents. Models will be used to study recent developments in the German energy system.

Overall, I recommend “Evolution and Economic Complexity” for academics and advanced students interested in evolutionary research, complexity, or agent-based modeling.

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