AKSOE 8: Economic Models and Evolutionary Game Theory

Time: Tuesday 10:15–12:15 Location: EW 203

AKSOE 8.1 Tue 10:15 EW 203

Socioeconomic Networks with Long-Range Interactions — Rui Carvalho[1] and •Giulia Iori[2] — [1]Centre for Advanced Spatial Analysis, 1-19 Torrington Place, University College London, WC1E 6BT United Kingdom — [2]Department of Economics, School of Social Science City University, Northampton Square, London EC1V 0HB United Kingdom

In well networked communities, information is often shared informally among an individual's direct and indirect acquaintances. Here we study a modified version of a model previously proposed by Jackson and Wolinsky to account for communicating information and allocating goods in socioeconomic networks. The model defines a utility function of node i which is a weighted sum of contributions from all nodes accessible from i. First, we show that scale-free networks are more efficient than Poisson networks for the range of average degree typically found in real world networks. We then study an evolving network mechanism where new nodes attach to existing ones preferentially by utility. We find the presence of three regimes: scale-free (rich-get-richer), fit-get-rich, and Poisson degree distribution. The fit-get-rich regime is characterized by a decrease in average path length.

AKSOE 8.2 Tue 10:45 EW 203

Cooperation in Prisoner's Dilemma with Dynamical Connection Weights — •Platkowski Tadeusz and Mogielski Krzysztof — Department of Mathematics, Informatics and Mechanics, University of Warsaw

We propose a model of continuous population of agents which, at any instant of time, are randomly matched to play the 2-person Prisoner's Dilemma game. The payoff from each encounter depends on the payoff matrix and on the weights of connections between different types of players. In our model the weights are dynamical variables. Their evolution depends on the difference of the agent's payoff from the considered type of encounters and his average payoff. Time evolution of the frequency of cooperators in the population is governed by the replicator equation. Both symmetric and asymmetric weights between cooperators and defectors are considered. Solutions of the resulting systems of differential equations are discussed. Structure of equilibrium states of the systems is investigated. In particular we prove existence of equilibrium states with partial cooperation.

AKSOE 8.3 Tue 11:15 EW 203

Impact of Topology on the Dynamical Organization of Cooperation — Andreas Pusch, •Sebastian Weber, and Markus Porto — Institut für Festkörrperphysik, Technische Universität Darmstadt, Germany

The way cooperation organizes dynamically strongly depends on the topology of the underlying interaction network. We study this dependence using heterogeneous scale-free networks with different levels of (a) degree-degree correlations and (b) enhanced clustering [1], where the number of neighbors of connected nodes are correlated and the number of closed triangles are enhanced, respectively. Using these networks, we analyze the evolutionary replicator dynamics of the prisoner's dilemma, a two-player game with two strategies, defection and cooperation, whose payoff matrix favors defection. Both topological features significantly change the dynamics with respect to the one observed for fully randomized scale-free networks and can strongly facilitate cooperation even for a large benefit in defection and should hence be considered as important factors in the evolution of cooperation.

[1] A. Pusch, S. Weber, and M. Porto, submitted

AKSOE 8.4 Tue 11:45 EW 203

Differentialformen der Ökonophysik — •Jürgen Mimkes — Department Physik, Uni Paderborn

Ökonomisches Wachstum führt auf nicht totale Differential- formen, deren Integral vom Weg abhängt. Diese Differentiale beschreiben Einkommen und Gewinne, die sich nur "ex post", nach Kenntnis des Integral- oder Produktionsweges berechnen lassen. Neoklassiche Theorien lassen sich nur auf Null- Wachtum anwenden. Nicht totale Differentiale lassen sich durch einen integrierenden Faktor Lambda in ein totales Differential dF umwandeln. F heisst in der Ökonomie Produktionsfunktion und in der Physik Entropie. Der Wirtschaftskreislauf läßt sich als Carnot Prozess auffassen, der immer auf zwei Niveaus Lambda führt, warm und kalt, Kapital und Arbeit, Investor und Sparer, reich und arm. Der Carnot Prozess führt in der Produktion zur Reduktion der Entropie (Ordnen der Bauelemte des Produktes) und auf dem Rückweg zur Entropieproduktion (Umwelt- und Klimaschäden). Im Handel führt er zum Kaufen (sammeln) bei niedrigem Preis und zum verkaufen (verteilen) bei hohem Preis. Im Bankwesen führt er zur Risiko Verringerung für Sparer und zu erhöhtem Risiko bei Investoren. Im Finanzwesen ist die Entropie die Produktionsfunktion jedes Portfolios. Ökonophysik umfasst Produktion, Handel, Banken und Finanzwesen.