SOE 3: Economic Models I

Time: Monday 10:30–11:30 Location: MA 001

SOE 3.1 Mon 10:30 MA 001

Bilateral trade agreements and the interconnectedness of global trade — Jullian Maluck[1,2], Nicole Glanemann[1,3], and •Reik V. Donner[1] — [1]PIK Potsdam, Germany — [2]HU Berlin, Germany — [3]WHU - Otto Beisheim School of Management, Vallendar, Germany

Over the last decades, bilateral trade agreements (BTAs) have increased considerably in number and economic relevance. Notably, such agreements substantially affect global trade, since the reorganization of flows of goods and services has prominent impacts on the contracting countries' economic sectors, but also on other parties that are (directly or indirectly) engaged in trade with these countries. Here, we empirically study the effect of BTAs on the input-output linkages between the contractual parties' national economic sectors by measuring their Trade Interconnectedness (TI), which describes the relative importance of direct and indirect production linkages between the two countries. By analyzing its time evolution for each pair of trade agreement partners, we demonstrate that while most BTAs are succeeded by an increase in TI between the contractors, there are some notable exceptions. In particular, comparing the trade profiles of China and the United States (US), we find indications that both countries have been pursuing fundamentally different objectives and strategies related to the negotiation of BTAs.

SOE 3.2 Mon 10:45 MA 001

Stability analysis of a time-homogeneous system of money and antimoney in an agent-based random economy — •Julian Stein and Dieter Braun — Systems Biophysics LMU

One source of financial instability might be the creation of money [1] also leading to non-local transfers of wealth (Cantillon effect) and a loss of economic memory [2]. Motivated by an analogy to particle physics, time-homogeneity can be imposed on monetary systems to solve the associated problems. As a result, full reserve banking is implemented by a two-currency system of non-bank (money) and bank assets (antimoney) [3]. Payments are either made by passing on money or receiving antimoney at respective price levels. Liquidity is provided by the simultaneous transfer of money and antimoney from seller to buyer at a negotiated liquidity price. Thus interest rates and credit are implemented by a varying price for liquidity. We aim to study the problem of credit crunches in such systems. An agent-based random economy is set-up, in which households and firms apply stochastic trading strategies to exchange goods via a limit order book mechanism.

The comparison of the prevailing monetary system with the money-antimoney system shows that symmetric price equilibria can be reached by imposing a limit on the agents antimoney holdings. Quantity theory is satisfied. Crash and boom scenarios show a quantitative and qualitative similar behavior for the different monetary systems, indicating the overall functionality of the money-antimoney system.

[1] Am Econ Rev 102 (2012) [2] New J Phys 16, 033024 (2014), [3] Physica A 290, 491 (2001)

SOE 3.3 Mon 11:00 MA 001

Repeated gambles with uncertain parameters — •Mark Kirstein[1], Alexander Adamou[2], and Ole Peters[2,3] — [1]Economics Department, TU Dresden — [2]London Mathematical Laboratory — [3]Santa Fe Institute

Gambles repeated multiplicatively create non-ergodic changes in the gambler's wealth. The growth-optimal bet fraction maximises the time-average growth rate of his wealth or, equivalently, expected changes in his logarithmic utility. Standard treatments use models in which the gambler knows with certainty the parameters (i.e. the payoffs and probabilities) of the gamble. Here we confront the theoretically appealing results of such analyses with reality outside the model world. A realistic environment is one about which the gambler has some ignorance, manifested as uncertainty in his estimate of the gamble parameters. We build a simple model of this uncertainty, in addition to the more familiar uncertainty in the gamble's outcome. We find that a gambler maximising the time-average growth rate of his wealth under such conditions would bet a lower fraction of his wealth than anticipated by an observer making a conventional analysis, which assumes the gamble parameters are known. Indeed, it would look to this observer as if a gambler were weighing probabilities non-linearly, a psychological bias identified by behavioural economists as inconsistent with all models of rationality. Our approach, conversely, explains the gambler's behaviour as consistent with a straightforward optimisation strategy through time that accounts for his ignorance about the environment, for which no psychological assumptions are needed.

SOE 3.4 Mon 11:15 MA 001

The winner takes it all. But who wins and how? — •Chengyuan Han[1,2,3], Malte Schröder[4], and Dirk Witthaut[1,3] — [1]Forschungszentrum Jülich, Institute for Energy and Climate Research - Systems Analysis and Technology Evaluation (IEK-STE), 52428 Jülich, Germany — [2]Department of Physics and Astronomy, Rheinische Friedrich-Wilhelms Universität Bonn, 53115 Bonn, Germany — [3]Institute for Theoretical Physics, University of Cologne, 50937 Köln, Germany — [4]Network Dynamics, Max Planck Institute for Dynamics and Self-Organization (MPIDS), 37077 Göttingen, Germany

In economies of scale, specific production costs decrease as the production increases. This leads to a centralization of production when transaction costs are negligible: The winner takes it all. But who wins this competition and how? We study a mathematical model of trade, which each node in a network individually tries to minimize the costs, including production and transaction costs, to satisfying a fixed demand. This optimization problem can be simplified to a local percolation model, and admitting an efficient solution. We show that centralization process can be discontinuous and study which node becomes the central producer. Surprisingly, the model reveals that closeness centrality is not always a good indicator to the final supplier of the network. In geographically embedded networks, nodes with the low degree and betweenness centrality are more likely to win. We also introduced the idea of Entropy to maximize the diversity of the purchase.