

## SOE 9: Economic Models

Time: Tuesday 9:30–11:30

Location: H17

SOE 9.1 Tue 9:30 H17

**How exclusive competition promotes discrimination** — ●GORM GRUNER JENSEN and STEFAN BORNHOLDT — Institut für Theoretische Physik, Universität Bremen

Some game theoretical models have been proposed to illustrate how social discrimination could be the consequence of different groups getting stuck in different Nash equilibria due to self-perpetuating collective reputation [1,2]. While these models show that multiple equilibria are possible, they don't describe any interactions between the reputations of different groups, and it is therefore left as an open question how their historic events lead to different equilibria in the first place. Here we explore a variation of the theory of collective reputation, in which agents are not evaluated on whether their reputation is good, but rather whether it is better than that of their peers. The introduction of this element of exclusive competition is inspired by recent results from evolutionary game theory suggesting that discrimination is more likely to emerge through spontaneous symmetry-breaking in highly competitive environments [3].

[1] J. Tirole, *The Review of Economic Studies* **63**, 1 (1996). URL <https://doi.org/10.2307/2298112>

[2] J. Levin, *The B.E. Journal of Theoretical Economics* **9** (2009), <https://doi.org/10.2202/1935-1704.1548>

[3] G.G. Jensen, S. Bornholdt, *Social evolution of structural discrimination*, arXiv:1703.06311

SOE 9.2 Tue 10:00 H17

**Poverty Dynamics** — ●AMIT CHATTOPADHYAY<sup>1</sup>, IAIN RICE<sup>2</sup>, and T KRISHNA KUMAR<sup>3</sup> — <sup>1</sup>Aston University, Mathematics, Birmingham, B4 7ET, UK — <sup>2</sup>Arden University, Coventry, CV3 3RD, UK — <sup>3</sup>Rockville-Analytics, Rockville, MD 20850, USA

Economic inequality has been conventionally measured against a unique poverty line; those below this line are deemed poor and those above it, not so! Economists are well aware of the pitfall of such a strict line of demarcation, all based on an exogenous number that may be misleading as well. Departing from such a subjective inequality measure, here we have modeled the largest available dataset (India) using advanced machine learning architecture, over all three expenditure modes (basic food, other food and non-food) that are mutually connected, to avail information on multivariate income distribution functions (PDFs). Independent agent-based stochastic models of trade were then used to validate these PDFs, where trade in assets was only allowed between agents with incomes exceeding a self-consistent mean income over the dynamically evolving trade market, thereby substituting an exogenous poverty line with a data-objectified economic threshold. Together with recent publications (EPL 91, 58003; PRE95, 023109), we have established an alternative probabilistic measure of inequality that is free of personal bias.

SOE 9.3 Tue 10:30 H17

**Stability of a time-homogeneous system of money and anti-**

**money and multi-flavor moneys** — ●JULIAN STEIN and DIETER BRAUN — Systems Biophysics LMU Munich

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 show that the system exhibits behavior similar to the prevailing monetary system for good and credit shocks in an agent-based model economy with constraints on individual debt levels.

To set up a monetary system in which a credit lender is liable for his/her granted credits, we extend the the money-antimoney system to a flavor-money and antimoney system. In this system, every acting subject is endowed with the same amount of unique money and antimoney. We argue that this system might show increased robustness under hazardous agent behavior and test its stability.

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

SOE 9.4 Tue 11:00 H17

**Human Nature synchronizes and limits the Industrial Society per Capita** — ●HANS DANIELMEYER and THOMAS MARTINETZ — INB Uni Lübeck, Germany

During the Cold War's longest peace on G8 level soil the world's average existential conditions improved by an order of magnitude. Yet the lower half owns generally nothing above debt, and 93% of all assets are owned by the top 10%. This inequity caused the electorate's current anger at democracy. Nevertheless, we predict a possibly peaceful future for China, the USA, Russia, Germany, Japan, and the UK. Their original innovation was strong enough for pushing the male and female maturation programs along their inherited dynamic limits (*Springer Link* Jan. 19, 2018 or [inb.uni-luebeck.de](http://inb.uni-luebeck.de)). This indestructible and socially uniting master plan replaced implicitly Adam Smith's accumulation of destructible wealth as socially dividing goal. Four new variables and their directly measured inherited time constants are all but immune even to world wars: annual working and spare time, the best outputs per capita above all disasters, the associated G7 life style's life expectancy, the human generation gap, and a human adaption time of 62 years that links two generations. The natural theory is analytically exact, needs no extrapolation, and is as self-consistent as human maturation.

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