Fulin Guo

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Education

University of Cambridge   *October 2021 - June 2025 (Expected)*
PhD in Economics

University of Cambridge   *September 2020 - July 2021*
MPhil in Economic Research (with Distinction)

University of Chicago   *August 2018 - June 2020*
MA in Computational Social Science (GPA: 3.925/4)

Huazhong University of Science and Technology (HUST)   *September 2014 - June 2018*
BA in Economics (GPA: 3.90/4)

References

Professor Sanjeev Goyal   **Professor Syngjoo Choi**   **Professor Matthew Elliott**
Faculty of Economics   Department of Economics   Faculty of Economics
University of Cambridge   Seoul National University   University of Cambridge
sg472@cam.ac.uk   syngjooc@snu.ac.kr   mle30@cam.ac.uk

Research Interests

Microeconomics, Networks, Behavioral and Experimental Economics, AI in Economics

Working Papers

Behavioral attenuation in networks (Fulin Guo, Syngjoo Choi, Sanjeev Goyal, and Frédéric Moisan) [**Job Market Paper**]

- Social networks shape individual behavior and public policy increasingly leverages networks to enhance effectiveness. It is therefore important to understand how individuals behave in network interactions. This paper uses lab experiments to examine behavior in games on networks involving strategic substitutes and strategic complements. Theory suggests that an individual's choice is proportional to their (Bonacich) centrality. Our experiments, however, find that while choices increase with centrality, the relationship is weaker than predicted. The total action levels individuals choose and the total payoff they achieve are higher than the Nash outcomes in some cases while lower in others. We find that these results can be coherently explained by individuals' behavioral attenuation: they have incomplete adjustments to the strategic differences across network positions, exhibiting a bias toward generally high-payoff choices in complex networks—even when these choices are not optimal for their specific network positions.

GPT in game theory experiments *arXiv preprint arXiv:2305.05516*, 2023

- This paper explores the use of Generative Pre-trained Transformers (GPT) in strategic game experiments, specifically in the finitely repeated play of the ultimatum game and of the prisoner's dilemma. I designed prompts and architectures to enable GPT to understand the game rules and to generate both its choices and the reasoning behind decisions. The key findings show that GPT exhibits behaviors similar to those of humans in important aspects, such as making positive offers and rejecting unfair ones in the ultimatum game, along with conditional cooperation strategy in the prisoner's dilemma. The study explores how prompting GPT with traits of fairness concern or selfishness influences its decisions. Notably, the "fair" GPT in the ultimatum game tends to make higher offers and reject offers more frequently compared to the "selfish" GPT. In the prisoner's

dilemma, the "fair" GPT has a significantly higher cooperation rate than the "selfish" GPT. The reasoning statements produced by GPT during gameplay uncover the underlying logic of certain intriguing patterns observed in the games. They also reveal that GPT's high cooperation tendency in the prisoner's dilemma is sometimes driven by errors in reasoning. Overall, this research shows the potential of GPT as a valuable tool in social science research, especially in experimental studies and social simulations.

Experimental evidence on group size effects in network formation games (with Syngjoo Choi, Sanjeev Goyal, and Frédéric Moisan), **Reject and Resubmit at American Economic Review**

- This paper presents experimental evidence on games where individuals can unilaterally decide on their links with each other. Linking decisions give rise to directed graphs. We consider two classes of situations: one, benefits flow along the direction of the network paths (one-way flow), and two, when the benefits flow on network paths without regard to the direction of links (two-way flow). Our experiments reveal that in the one-way flow model subjects create sparse networks whose distance grows and efficiency falls as group size increases; by contrast, in the two-way flow model subjects create sparse and small world networks whose efficiency remains high in both small and large groups. We show that a bounded rational model that combines myopic best response with targeting a most connected individual provides a coherent account of our experimental data.

Experience-weighted attraction learning in network coordination games

- This paper studies the action dynamics of network coordination games with bounded-rational agents. I apply the experience-weighted attraction (EWA) model to the analysis as the EWA model has several free parameters that can capture different aspects of agents' behavioral features. I show that the set of possible long-term action patterns can be largely different when the behavioral parameters vary, ranging from a unique possibility in which all agents favor the risk-dominant option to some set of outcomes richer than the collection of Nash equilibria. Monotonicity and non-monotonicity in the relationship between the number of possible long-term action profiles and the behavioral parameters are analyzed. I also study the question of influential agents in terms of whose initial preferences are important to the actions of the whole network. I find that the importance of agents can be represented by the left eigenvector of a Jacobian matrix which incorporates both the properties of the network structure and individual behavioral traits.

The role of individual and environmental factors in intergenerational transmission

- This paper investigates intergenerational income transmission by analyzing how children's incomes are influenced by a broad set of individual characteristics and environmental factors. Using data from the National Longitudinal Surveys (NLS), I use machine learning techniques—including lasso regressions, principal component regressions, and decision trees—to capture complex, nonlinear relationships among these variables. The main findings are: (1) although environmental factors can explain intergenerational income correlations nearly as effectively as individual characteristics, their impact becomes insignificant once individual traits are accounted for, suggesting that environmental factors may influence child income indirectly through the development of individual abilities; (2) parental income and environmental factors have greater importance in influencing whether an individual reaches higher income percentiles compared to lower ones, indicating that attaining top income brackets may require advantages beyond acquiring individual abilities as compared to reaching a decent income level; and (3) in the decision tree analyses, mathematical score is usually the most influential predictor of future income, while the behavior problems index is a key secondary factor among children with high math scores.

Work in Progress

Large language models for simulating and understanding human behavior in economic experiments

- This paper explores the use of large language models (LLMs) as a tool for simulating human decision-making in classic economic experiments, with the aim of understanding human behavioral traits. By allowing decision rules to be expressed in natural language, LLMs provide a flexible framework for modeling and simulating choices under various decision-making regularities. I apply this methodology in two experimental contexts: reporting the certain equivalent (CE) for lotteries and making choices in matrix games. First, without predefined decision rules, GPT's behavior shows systematic patterns of deviations from human choices. For example, different from humans, GPT almost never exhibits risk-loving behavior in lotteries. Additionally, GPT shows a greater tendency to use the maxmax or level-1 rule in matrix games compared to humans. The study then demonstrates that GPT can follow specific decision rules and behavioral traits assigned to it. Through an iterative process between defining decision rules and running simulations, decision rules that align more closely with observed human data provide insights into human behavioral traits, such as probability weighting in lotteries and a preference for high symmetric joint payoffs in matrix games. This research highlights the potential of LLMs in behavioral analysis in experimental economics, complementing traditional mathematical modeling approaches.

Teaching

Teaching Assistant (MPhil - R100 Microeconomics)   September 2022 - June 2023
Employer: Professor Matthew Elliott, Faculty of Economics   University of Cambridge

- Taught R100 microeconomics classes to over 100 students in the MPhil in Economic Research and MPhil in Finance and Economics programs at the University of Cambridge

Publication

Impact of community opening based on road splicing, *Chinese Journal of Engineering Mathematics* (in Chinese), Vol. 33, Supp.1, December 2016, P110-122 (with Yunwen He and Yong Zhang)

Employment

Research Assistant   April 2022 - December 2022
Employer: Professor Sanjeev Goyal, Faculty of Economics   University of Cambridge

- Provided research assistance for multiple projects; developed solutions for the exercises in the book "*Networks: An Economics Approach. MIT Press (2023)*"

Research Assistant   April 2019 - December 2019
Employer: Dr Richard Evans   University of Chicago

- Conducted data analysis for the research on downward risk in labor income: age, gender, education, crime, and inequality

Academic Service

Referee for Management Science

Presentations

EEA-ESEM Congress in Barcelona, Spain	08/2023
World Meeting of the Economic Science Association in Lyon, France	06/2023
Asia-Pacific Economic Science Association Conference in Seoul, South Korea	05/2023
Theory Workshop, Faculty of Economics, University of Cambridge	02/2022, 11/2022, 04/2024

Awards and Scholarships

Faculty Trust Funding, University of Cambridge	07/2024
Cambridge Trust & Janeway Institute Scholarship (full scholarship), University of Cambridge	07/2021
Two-Thirds Tuition Award, University of Chicago	07/2019
Social Sciences Scholarship of Half Tuition, University of Chicago	04/2018
National First Prize and Outstanding Paper Prize (winning rate: 16/31199), China Undergraduate Mathematical Contest in Modeling	12/2016

Extracurricular Activity

EnterpriseTECH Student at Cambridge Judge Entrepreneurship Centre
January 2024 - March 2024
EnterpriseTECH is a programme focusing on the potential commercialisation of early-stage technologies. It teaches entrepreneurial skills to students and researchers from all backgrounds across the University of Cambridge and other institutions.

Skills

Technical Skills: Python, LaTeX, Github

Languages: English (fluent), Chinese (native)