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**Placement Directors:** Professor Ufuk Akcigit, [uakcigit@uchicago.edu](mailto:uakcigit@uchicago.edu), (773) 702 0433

**Graduate Student Coordinator:** Robert Herbst, [rherbst@uchicago.edu](mailto:rherbst@uchicago.edu), (773) 834 1972

**EDUCATION**

**The University of Chicago**, 2014-2021 (expected)

**Ph.D.** Candidates in Economics

Thesis Title: *A Markov Model of Network Formation: Production Network Perspective*

Specialization: Econometrics, Finance, Network games and estimations, Macroeconomics

Expected Completion Date: June 2021

Committee:

Professor Stephane Bonhomme (Chair)  
University of Chicago  
Email: [sbonhomme@uchicago.edu](mailto:sbonhomme@uchicago.edu)  
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Professor Rodrigo Adao (Co-Chair)  
University of Chicago Booth School of Business  
Email: [rodrigo.adao@chicagobooth.edu](mailto:rodrigo.adao@chicagobooth.edu)  
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**Boston University**, 2012-2014

Master of Arts, in Economics (with Distinction)

**Cambridge University**, 2006-2009

Bachelor of Arts, in Economics

**JOB MARKET PAPER**

*“A Markov Model of Network Formation: A Production Network Perspective”*

This paper develops a tractable model of dynamic network formation with heterogeneous forward-looking agents. The model bridges the gap between recent Macroeconomic models with exogenous production network and static econometric models of networks formation games. I model network formation as sequence of Bayesian incomplete information games in which the dynamic state dependencies of agents' strategies are Markov. This feature of aggregate state dependence allows me to investigate the role of network externality through a global interaction channel. I characterize the Bayesian Markov Perfect symmetric equilibrium by a set of fixed-point

equations in conditional choice probabilities. I motivate this approach by developing a second stage general equilibrium model of production networks in an open economy. This second stage model provides the payoff structure for the network formation and relevant Markov sufficient statistics. I propose a simple two step maximum likelihood estimator and develop its asymptotic properties for a single large network. I apply this model to US input-output data. In counterfactual experiments, I find that network externality is quantitatively important for endogenous network formation. Furthermore, negative network externality provides alternative explanation for network persistence. In an extension, I show how endogenous entry and exit of nodes can be jointly formulated with endogenous network formation.

## **WORKING PAPER**

### *“Asset Pricing under Heterogeneous Expectation and Uncertainty”*

This paper investigates the asset pricing implications of heterogeneous risk-neutral investors who are concerned with model misspecification. Building upon the formulation in Harrison and Kreps (1978), investors differ in their probability models of the economy's underlying processes. They have the same information set and agree to disagree with each other. This paper proposes a tractable robust decision problem with potential analytical applications, as demonstrated in a modified Gordon model and other examples. Investors must balance between his model and the worst-case model when investing. This paper contributes to the literature in the following ways. First, the short sell constraint present in the literature is relaxed, leading to a less inflated theory of asset speculation. We show that short selling does not eliminate the speculative bubble. Second, the pricing kernel is shown to be a weighted average of the likelihood ratio between different model to a benchmark model. The model explains the excess return from risky assets by the uncertainty they present. Investors profit from speculating against the market, which aggregates all investors' valuation of the asset. Thus, a large risk premium to a particular investor can be re-interpreted as a large presence of investors who have different views on the asset. Third, Bayesian learning can eliminate bubble in the long run while different priors drive speculation in the short run. Finally, the relative measure of heterogeneous investors directly impacts the equilibrium price and speculative value of the asset, as demonstrated in a numerical example.

### *“Valuating Blockchain Currencies using Markov Network Formation”*

This paper develops a new framework for evaluating decentralized digital currencies and blockchain based digital economies using dynamic network formation model developed in Xiao (2020). By jointly formulating the entry and exit problem of nodes, peer to peer network formation, and the economic transactions on the blockchain, I extract the value of the blockchain as the aggregate of network sufficient statistic component of individual value functions. Specifically, the relevant network sufficient statistic component turns out to be the condition out-degree distribution of the network and the size of the network. This insight suggests a reduced form estimation using parametric models of the conditional out-degree distribution of the network. I apply this method to the public blockchain data on Bitcoin and study its relevance in explaining the relative price movements of Bitcoin. Furthermore, I develop a model of adoption in the market of multiple competing blockchain currencies based on valuation functions of each blockchain. I find that uncertainty of future economy payoff plays an important role in the adoption of blockchain currencies.

## RESEARCH EXPERIENCE

- 2013                      Research Assistant. (Professor Jianjun Miao, Boston University) Developed and verified solutions for textbook *Economic Dynamics in Discrete Time*.
- 2016-2017              Research Assistant. (Professor Larry Schmidt, the University of Chicago) Developed auxiliary particle filter algorithm for estimating latent permanent component of income process. Developed various stochastic optimization routines such as simulated annealing and metropolis-hasting. Wrote and updated technical documents of different methodologies. Coded parallelized optimization routine for structural estimation using simulated method of moments.

## TEACHING EXPERIENCE

- 2016 Spring            **Econ 20200 Intermediate Macro**, Teaching Assistant  
Lecturer: Professor Melissa Tartari  
Graded exams and problem sets; instructed weekly TA sessions; held weekly office hours
- 2017 Spring            **Econ 20900 Honors Econometrics**, Teaching Assistant  
Lecturer: Kyle Kost, PhD  
Graded exams and problem sets; instructed weekly TA sessions; held weekly office hours
- 2017 Fall                **Econ 21020 Econometrics**, Lecturer  
Designed teaching materials: slides, notes, problem sets, solutions, exams; held weekly office hours; calculated course grades.

## HONORS AND FELLOWSHIP

- 2014                      Prize for Academic Excellence, Boston University
- 2015-2016              Sherwin Rosen Fellowship, the University of Chicago
- 2016-2018              Department of Economics Doctoral Fellowship, the University of Chicago

## QUANTITATIVE COURSES

Real Analysis (Graduate), Stochastic Calculus and Brownian Motion (Graduate), Chaotic Dynamical System (Graduate)

## COMPUTER SKILLS

Proficient: R, MATLAB, Latex, Excel

Experienced: Python, C, Stata, Mathematica

**LANGUAGE**

English (Fluent), Mandarin (Native), Cantonese (Fluent), Japanese (Intermediate), Latin (Work in progress)

**MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS**

American Economic Association

Omicron Delta Epsilon

**OTHER EXPERIENCES**

2008-2009          President of Cambridge University's largest Chinese student society (CUCCS)