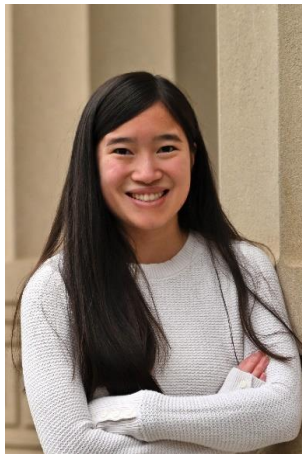




## DISSERTATION DEFENSE



### Katherine Mayo

#### A Strategic Agent-Based Analysis of Economic and Technological Changes in Financial Networks

Wednesday, May 15, 2024

2:00pm – 4:00pm

3725 BBB

Hybrid – [Zoom](#)

**ABSTRACT:** Economic events and advancements in technology have drastically transformed the financial system over the past 20 years. This includes the implementation of new policies post-2008 financial crisis, as well as new methods for customers to engage with the system from cryptocurrency to faster processing payment types. This system is a complex network, vital for connecting customers and financial institutions for monetary transactions. Thus, it is important to carefully consider how changes may impact and transform the system. This dissertation applies a computational approach to study strategic decisions that arise from economic and technological changes in financial networks. I introduce the extended financial credit network model capable of expressing diverse financial scenarios and enabling the creation of agent-based models. To study the strategic decisions of agents within the model, I apply methods from empirical game-theoretic analysis to identify equilibrium behavior.

I apply these methods to four case studies in financial networks. First, I analyze portfolio compression, a method for eliminating cycles of debt. I find that the strategic compression decision is best made using simple, local information available to banks. I note the importance of the recovery rate of insolvent banks in the perceived affect of cycles on systemic risk. Second, I investigate the use of fraud detection by banks when invoking the detector may be costly. I observe the strategic behavior of banks is subject to the relative, not specific, abilities of fraud detectors. Those with strong detectors are better able to adjust their behavior when costs rise due to the existence of weaker banks in the system. The third study addresses bank allowance of real-time payments by customers at risk of overdrafts. My analysis shows banks allow most, though not all, customers to send real-time payments. I discover this strategic choice is not the socially optimal one. Lastly, I study banks' strategic mitigation of fraud risk in real-time payments. I find banks value the ability to control customer access to these payments, though balance such constraints with the use of fraud detection. I observe these strategic measures limit the negative effects from fraud with minimal disruption to customers.

**CHAIR:** Prof. Michael Wellman