

APPLIED MATHEMATICS COLLOQUIUM

Date: Wednesday, December 3, 2014

Time: 2:30 – 3:30 p.m.

Location: Middlesex College Room 204

Academic wages, singularities, phase transitions and pyramid schemes

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Abstract:

In this lecture we introduce a mathematical model which couples the education and labor markets, in which steady-state competitive equilibria turn out to be characterized as the solutions to an infinite-dimensional linear program and its dual. In joint work with Erlinger, Shi, Siow, and Wolthoff, we use ideas from optimal transport to analyze this program, and discover the formation of a pyramid-like structure with the potential to produce a phase transition separating singular from non-singular wage gradients.

Wages are determined by supply and demand. In a steady-state economy, individuals will choose a profession, such as worker, manager, or teacher, depending on their skills and market conditions. But these skills are determined in part by the education market. Some individuals participate in the education market twice, eventually marketing as teachers the skills they acquired as students. When the heterogeneity amongst student skills is large, so that it can be modeled as a continuum, this feedback mechanism has the potential to produce larger and larger wages for the few most highly skilled individuals at the top of the market. We analyze this phenomena using the aforementioned model. We show that a competitive equilibrium exists, and it displays a phase transition from bounded to unbounded wage gradients, depending on whether or not the impact of each teacher increases or decreases as we pass through successive generations of their students. We specify criteria under which this equilibrium will be unique, and under which the educational matching will be positive assortative. The latter turns out to depend on convexity of the equilibrium wages as a function of ability, suitably parameterized.