Title

Optimal nonlinear pricing in social networks under asymmetric network information

Abstract

We study the optimal nonlinear pricing of products and services in social networks, where customers are strategic and their consumption exhibits local externality. The stochastic network formation process generates both network uncertainty and information asymmetry: customers know about their local network characteristics but the selling firm only has knowledge of global network. The firm may adopt nonlinear pricing to serve customers with heterogeneous and unobservable network positions. The firm's profit maximization resembles a principal-agent problem, complicated with the externalities in agents' payoffs.

We develop a novel solution approach using calculus of variations to tackle this non-standard principal-agent problem. We show that the optimal pricing scheme involves either a quantity premium or quantity discount, which is in strict contrast with the linear pricing case. Applying our results to the random graph (a special case of the social network model we use), we find that the pricing scheme should not discriminate by network positions; consequently, the firm can offer a simple uniform price.

Keywords: stochastic network formation, local network effects, game theory, information asymmetry, nonlinear pricing.

Joint work with Yang Zhang (Tsinghua University)