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Fields of Concentration:

Microeconomic Theory
Game Theory
Political Economy

Desired Teaching:

Microeconomics
Game Theory
Industrial Organization
Political Economy

Comprehensive Examinations Completed:

2005 (oral): Microeconomic Theory and Political Economy
2004 (written): Microeconomic Theory *(with distinction)* and Macroeconomic Theory

Dissertation Title: *Essays on Sequential Auctions and Dynamic Mechanism Design*

Committee:

Professor Dirk Bergemann (chair)
Professor Johannes Hörner
Professor Benjamin Polak
Professor Larry Samuelson

Expected Completion Date: May 2009

Degrees:

Ph.D., Economics, Yale University, expected May 2009
M.Phil., Economics, Yale University, December 2006
M.A., Economics, Yale University, May 2005
B.A., Economics and Mathematics *(with honors),* New York University, May 2003
(magna cum laude)

Fellowships, Honors and Awards:

Robert M. Leylan Fellowship in the Social Sciences, Yale University, 2008-2009
John F. Enders Fellowship, Yale University (Declined), 2008
Carl Arvid Anderson Prize Fellowship, Cowles Foundation, Yale University, 2007-2008
National Science Foundation Graduate Research Fellowship, 2003-2005, 2006-2007
Jacob K. Javits Fellowship (Declined), 2003
Cowles Foundation Graduate Student Fellowship, Yale University, 2003-2007
Yale University Graduate Fellowship, 2003-2008
Phi Beta Kappa, New York University, 2002
Presidential Honors Scholar, New York University, 1999-2003
National Merit Scholar, New York University, 1999-2000

Teaching Experience:

Instructor:
Game Theory, Yale University, Summer 2007

Teaching Assistant:
Department of Economics Math Camp, Yale University, Summer 2005, 2006, 2008
Mathematical Game Theory, Yale University, Spring 2007
Introductory Microeconomics, Yale University, Spring 2006
Game Theory, Yale University, Fall 2005

Research Experience:

Research Assistant for Professor Philip Haile, Yale University, Summer 2008
Research Assistant for Professor Rohini Pande, Yale University, Fall 2005
Research Assistant for Professor Andrew Schotter, New York University, Summer 2002

Papers:

"Auctions with Dynamic Populations: Efficiency and Revenue Maximization," (Job Market Paper), 2008

"Information Revelation in Sequential Ascending Auctions," 2008
Extended abstract published in *Proceedings of the 2008 ACM Conference on Electronic Commerce (EC'08),* Chicago, July 2008

"Stochastic Equivalence in Sequential Auctions with New Buyers," 2008

"Learning in Hidden Markov Models with Bounded Memory" (with Daniel Monte), in progress

Presentations:

Canadian Economic Theory Conference, Vancouver, May 2008
North American Summer Meeting of the Econometric Society, Pittsburgh, June 2008
ACM Conference on Electronic Commerce (EC'08), Chicago, July 2008
World Congress of the Game Theory Society (Games 2008), Evanston, July 2008
Congress of the European Economic Association, Milan, August 2008
European Meeting of the Econometric Society, Milan, August 2008

Referee Activity:

Econometrica, Games and Economic Behavior, Nonlinear Dynamics

References:

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Dissertation Abstract:

My research analyzes bidding behavior in dynamic auction markets and explores the implications of dynamic buyer populations for the optimal design of institutions and mechanisms. Auctions have gained widespread acceptance by individuals and businesses alike as an integral part of modern economic interaction. Individuals purchase everything from collectibles to electronics from online auction sites such as eBay, while firms have increasingly turned to using auctions for supply-chain sourcing. Even advertisements, such as those found on Google or Yahoo! for keyword search terms, are now sold via auctions.

A key feature common to these markets is their dynamic nature. In contrast to, for example, FCC spectrum auctions, the auctions that form a part of these economic interactions occur with great regularity, one after the other. Moreover, these interactions seldom involve exactly the same set of buyers in repeated competition. Rather, buyers arrive to the market at different times, and participate in several auctions before their eventual departure.

This dissertation investigates the implications of these market dynamics. In particular, the first chapter (my job market paper) considers the question of designing mechanisms for the optimal allocation of goods in an environment where the presence of buyers and objects is governed by a stochastic process. I characterize incentive compatible allocation rules and extend the revenue equivalence results of static mechanism design to this setting. I study both efficient and revenue maximizing direct mechanisms, and show that the sequential ascending (English) auction serves as a natural indirect mechanism that yields equivalent outcomes. In the second chapter, I examine the revelation of private information by buyers in sequential ascending auctions. I explore the manner in which this information is incorporated into bidding behavior, taking into account the possibility of additional buyers arriving in future periods. The third and final chapter considers the effects of random arrivals of buyers to an auction market for stochastically equivalent objects. I show that these arrivals affect bidding behavior, and hence equilibrium prices, by altering the outside options of buyers already present on the market. I then study the impact of evolving market dynamics on the optimal bidding of buyers.

I. Auctions with Dynamic Populations: Efficiency and Revenue Maximization (Job Market Paper)

I examine an environment where goods and privately informed buyers arrive stochastically to a market. A mechanism designer in this setting is thus faced with a sequential allocation problem. The incentives for information revelation must account for the intertemporal nature of this problem. While much of the dynamic mechanism design literature studies a fixed set of buyers whose type may change over time, I consider a setting where the number and set of buyers may change over time but types are fixed.

I characterize the set of incentive compatible allocation rules and provide a generalized revenue equivalence result. In contrast to a static setting where incentive compatibility implies that higher-valued buyers have a greater likelihood of receiving an object, in my dynamic setting, incentive compatibility implies that higher-valued buyers have a greater likelihood of receiving an object sooner.

I also characterize the set of efficient allocation rules. I show that a dynamic Vickrey-Clarke-Groves mechanism is efficient and dominant strategy incentive compatible. I then move on to examine optimal (revenue-maximizing) mechanisms. I prove that, analogous to static settings, the revenue maximizing direct mechanism is a pivot mechanism with a reserve price.

Finally, I consider sequential ascending auctions in this setting, both with and without a reserve price. I use the structure of the efficient and optimal policies to construct equilibrium bidding strategies. These equilibria are outcome equivalent to those of the corresponding direct mechanisms. Thus, I show that the sequential ascending auction is a natural institution for achieving either efficient or optimal outcomes.

II. Information Revelation in Sequential Ascending Auctions

I examine a model in which buyers with single-unit demand are faced with an infinite sequence of auctions. In each period, a new buyer probabilistically arrives to the market, and is endowed with a constant private value. I demonstrate, by way of a simple example, that the second-price auction does not provide the appropriate incentives for information revelation in this sequential setting, and is therefore inefficient.

I then show that the mechanism in which each object is sold via an ascending auction has an efficient Markov perfect Bayesian equilibrium that is *ex post* optimal for all buyers in each period, given their expectations about the future. This is surprising, as in static private value environments, the ascending auction and the second-price auction are essentially equivalent.

In equilibrium, buyers fully reveal their private information in every period. Despite this, equilibrium bidding behavior is memoryless: buyers condition their bids only on information revealed in the current auction, and not on any information revealed in previous periods. This lack of memory is crucial, as it allows buyers to behave symmetrically, despite the informational asymmetry arising from the arrival of uninformed buyers. This provides the appropriate incentives for these new buyers to also reveal their private information.

III. Stochastic Equivalence in Sequential Auctions with New Buyers

I analyze a dynamic market in which buyers compete in a sequence of auctions. New buyers and objects may arrive at random times. Unlike Chapter 2, however, buyers' private values are not persistent. Instead, buyers draw new values in every period; equivalently, objects are heterogeneous but are drawn from the same distribution.

I consider the use of the second-price auction for selling these objects. In equilibrium, buyers do not bid their true value. Instead, they shade their bids down by their continuation value, which is the option value of participating in future auctions. I show that this option value depends not only on the number of buyers currently present on the market, but also on anticipated market dynamics. I also generalize my results to the setting in which values correspond to a "buyer's market" or a "seller's market" and market conditions evolve from one to the other.