

ECON 1465 - Market Design: Theory and Applications
Brown University
Fall 2011

Lecture: Wednesday 3-5:20pm in Wilson Hall 103

Conference: Tuesday 7-7:50pm in J. Walter Wilson Building 301

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Instructor: Itay Fainmesser (email: Itay_Fainmesser@Brown.edu)

Office: Robinson 303D

Office hours: Wednesday 8-10am

Teaching Assistant: Tianran Dai (email: Tianran_Dai@brown.edu)

Office hours: Monday 9-11am

Course description

This course studies the design of organized markets, focusing on efficient organization and the incentives created by market rules. The analysis relies on a mix of documenting the rules of real-world markets, game theoretic analysis, empirical analysis, and experimental work.

Applications include:

- Online auction markets - e.g. eBay, Amazon
- Ad auctions - e.g. Google
- Matching markets
 - Matching students to schools
 - Matching workers to job: medical residents to hospitals, lawyers to clerkship positions
 - Matching kidney donors to recipients
 - Online dating

Prerequisites

ECON 1110 (Intermediate Microeconomics) or ECON 1130 (Intermediate Microeconomics, Mathematical), MATH 0090 or equivalent.

While not a prerequisite, a strong background in Game Theory is a plus.

Readings

A good introduction to Market Design can be found in the following papers:

- Roth, Alvin E. "What have we learned from market design?" Hahn Lecture, *Economic Journal*, 118 (March), 2008, 285-310. (You can see the lecture live here: <http://www.bu.edu/buniverse/view/?v=grOprKV>)
- Roth, Alvin E. "The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics," *Econometrica*, 70, 4, July 2002, 1341-1378. ((Or see Hal Varian's much briefer [NY Times column](#) on this paper.)
- Paul Milgrom, "[Auctions and Bidding: A Primer](#)", *Journal of Economic Perspectives*, 3, Summer 1989, 3-22.

There are two reference books that are recommended and include much of the theoretical material covered in class (and a lot more):

- Al Roth and Merilda Sotomayor, *Two-Sided Matching*, Cambridge University Press, 1990.
- Paul Klemperer, *Auctions: Theory and Practice*, Princeton University Press, 2004. (available online at: <http://www.gqq10.dial.pipex.com/>)

The schedule below includes a long list of relevant readings. Items marked with * will be discussed in class and are required readings. The schedule is tentative and will be modified throughout the semester based on students' interests and logistical constraints.

There are also a few blogs on market design that some of you may find extremely interesting and can provide you with ample ideas for great term papers. Two that come to mind are:

- Al Roth's blog on Market Design (a must-read for any Market Designer): <http://marketdesigner.blogspot.com/>
- Noam Nisan's Algorithmic Game Theory – Economics Blog (especially interesting for Math-ECON, Applied Math-ECON, and CS-ECON concentrators): <http://agtblog.wordpress.com/>

Problem sets

2 problem sets will be assigned. Groups of students may collaborate on the assignments, but each student must write up his/her own assignment individually. Assignments must be handed in at the beginning of class on the date they are due. Late assignments will not be accepted.

Problem sets are designed as learning experience. A great emphasis should be put on working through each problem.

Problem sets will be graded based on the amount of work that appears to have been invested in reaching a solution. A complete and correct solution that includes all of the steps in solving a problem will achieve the maximum score. A solution that includes most of the steps yet reaches a wrong conclusion, or a solution that includes coherent steps,

even if wrong, will achieve many of the points. A correct solution which does not go through the necessary steps will not always achieve the maximal score.

Referee report

Each student is required to write a 2-3 page referee report for an academic paper. A paper for the report will be assigned by the instructor. Referee reports should be typed in font size 12 with line spacing of 1.5 and at least one inch margins on all sides. Referee reports should be submitted electronically. The deadline for submitting the referee report is at the beginning of class on **October 12**. Late submissions will not be accepted.

In-class presentation and final paper

Each student (possibly in pairs) is required to submit a final paper that reviews existing literature on a topic in market design by **December 14**. Late submission will be considered only based on a written letter from Dean David Targan.

While topics will be approved on an individual basis, there are three types of papers that are recommended:

- A review of a question that is discussed in the academic literature on market design. The review should be detailed and show complete understanding of the model, or econometrics used in at least one paper that was published in an economic journal, or was written by a serious economist (consult with me on the paper when in doubt).
- A review of a real-world market, with focus on the markets rules, strengths and weaknesses of the existing design, and relevant academic literature. This is a challenging format for a paper and you should approve with me the exact focus of your paper prior to your presentation in class.
- A research proposal that is related to Market Design. This format is the most difficult to accomplish. You are required to approve with me the exact focus and outline of the proposal before your presentation in class (this is recommended **ONLY** for students that plan to follow up with an honors thesis and have at least one more year of undergraduate studies after the end of the semester in which they take the course).

The paper is limited to no more than 15 pages. Grading of longer papers will be done based on the first 15 pages.

Students should submit a 1-2 pages topic proposal by **October 26**. A proposal includes a description of the topic and planned layout of the paper, as well as a succinct description of the work already done.

Proposals and final papers should be typed in font size 12 with line spacing of 1.5 and at least one inch margins on all sides. Proposals and final papers should be submitted electronically.

Each student (possibly in pairs) is required to prepare a 20-30 minutes presentation motivating and previewing their final paper. Presentation times will be assigned individually at the discretion of the instructor in any class between **November 16** and **December 7**. The date assigned is not negotiable, and changes will be considered only based on a written letter from Dean David Targan.

Grading

Your course grade will be based on problem sets, in-class presentation, final paper, and class participation.

Problem sets:	10%
Referee report:	20%
In-class presentation and Final paper:	60%
Class participation	10%

Corrected assignments will be available in the class mailbox (in the basement of Robinson hall) at most six days after the deadline or the date of the assignment. Students then have at most *eight* days to introduce a complaint regarding a grade (that means exactly two weeks after the deadline or the date of the assignment). Requests must be placed in my mailbox in Robinson hall (room 103). I expect them to be specific and motivated. This means that you must include a copy of the submitted assignment, and an explanation as to why the question(s) need(s) to be regarded. If I find the request motivated, then I will re-grade these question(s) myself (which may possibly result in a lower grade if I find it justified).

Laptops and cell phones policy

Laptops and cell phones should be turned off and put away during class and section.

Office Hours

Office hours are a great learning opportunity. Please come to my and the teaching assistant's office hours with questions on the material covered in class, comments on the course, and in order to discuss ideas for your final paper. Please also come to my office hours if you want to talk about anything in Economics.

Please do not use either my or the teaching assistant's office hours to talk about grades.

Schedule (tentative)

September 7: No class - Opening Convocation

September 14: Introduction and Matching Theory

- Roth, Alvin E. "The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics," *Econometrica*, 70, 4, July 2002, 1341-1378.
- Roth, Alvin E. "What have we learned from market design?" Hahn Lecture, *Economic Journal*, 118 (March), 2008, 285-310.
- Gale, David and Lloyd Shapley [1962], "College Admissions and the Stability of Marriage," *American Mathematical Monthly*, 69, 9-15.
- * Roth, A.E. and M. Sotomayor *Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis*, Econometric Society Monograph Series, Cambridge University Press, 1990. (Chapters 2.1-4.3)
- Paul Klemperer, *Auctions: Theory and Practice*, Princeton University Press, 2004. (Chapter 1 section 1)

September 21: Matching Theory II and NRMP design (problem set #1 assigned)

- Roth, A.E., "The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory," *Journal of Political Economy*, 92, 1984, 991-1016.
- * Roth, A.E. and M. Sotomayor *Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis*, Econometric Society Monograph Series, Cambridge University Press, 1990. (Chapter 5)

September 28: Congestion in Matching Markets: the Market for Clinical Psychologists, college admission, AEA signaling, online dating (problem set #1 due, referee report assigned)

- * Roth, A.E. and X. Xing "[Turnaround Time and Bottlenecks in Market Clearing: Decentralized Matching in the Market for Clinical Psychologists](#)," *Journal of Political Economy*, 105, April 1997, 284-329.
- Coles, Peter, Alexey Kushnir and Muriel Niederle, "[Preference Signaling in Matching Markets](#)", working paper, 2010.
- Lee, Soohyung, and Muriel Niederle, "Propose with a Rose? Signaling in Internet Dating Markets," working paper, December 2009.
- Avery, Christopher, Andrew Fairbanks and Richard Zeckhauser, *The Early Admissions Game: Joining the Elite*, Harvard University Press, Cambridge, MA 2003.
- Avery, Christopher and Jonathan Levin, "Early Admissions at Selective Colleges," Forthcoming, *American Economic Review*.

- * Peter Coles, John Cawley, Phillip B. Levine, Muriel Niederle, Alvin E. Roth, and John J. Siegfried , " [The Job Market for New Economists: A Market Design Perspective](#) ," revised April 6, 2010, forthcoming in Journal of Economic Perspectives, Fall 2010.

October 5: Unraveling, decentralized matching, and social networks: college football, the market for gastroenterologists, the market for judicial clerks.

- * Kagel, John H. and A.E. Roth, "[The dynamics of reorganization in matching markets: A laboratory experiment motivated by a natural experiment](#)," Quarterly Journal of Economics, February, 2000, 201-235.
- Roth, A.E. "[A Natural Experiment in the Organization of Entry Level Labor Markets: Regional Markets for New Physicians and Surgeons in the U.K.](#)," American Economic Review, vol. 81, June 1991, 415-440.
- * Roth, A.E. and X. Xing "[Jumping the Gun: Imperfections and Institutions Related to the Timing of Market Transactions](#)," American Economic Review, 84, September, 1994, 992-1044.
- Avery, Christopher, Christine Jolls, Richard A. Posner, and Alvin E. Roth (2001), "[The Market for Federal Judicial Law Clerks](#)," University of Chicago Law Review, 68(3), Summer, 793-902.
- * Niederle, Muriel and Alvin E. Roth, "[Unraveling reduces mobility in a labor market: Gastroenterology with and without a centralized match](#)," Journal of Political Economy, 1. 111, no. 6, December 2003, 1342- 1352.
- McKinney, C. Nicholas, Muriel Niederle, and Alvin E. Roth, (2003) "[The collapse of a medical labor clearinghouse \(and why such failures are rare\)](#)," American Economic Review.
- Niederle, Muriel, and Alvin E. Roth, "[The Gastroenterology Fellowship Market: Should there be a Match?](#)," American Economic Review Papers & Proceedings.
- Frechette, Guillaume, Alvin E. Roth, and Utku Unver, "[Unraveling Yields Inefficient Matchings: Evidence from Post-Season College Football Bowls](#)," Rand Journal of Economics, 38, 4, Winter 2007, 967-982.
- Fainmesser, Itay, (2010) "[Social Networks and Unraveling in Labor Markets](#)," working paper.
- [Niederle, Muriel](#), and Alvin E. Roth, "[Market Culture: How Rules Governing Exploding Offers Affect Market Performance](#)," *American Economic Journal: Microeconomics*, 1, 2, August 2009, 199-219.
- Mongell, S. and Roth, A.E., "[Sorority Rush as a Two-Sided Matching Mechanism](#)," *American Economic Review*, vol. 81, June 1991, 441-464

October 12: Auction Theory and online applications: eBay vs. Amazon (referee report due, problem set #2 assigned)

- * Paul Klemperer, Auctions: Theory and Practice, Princeton University Press, 2004. (Ch. 1 section 1 - 6)
- * Roth, Alvin E. and Axel Ockenfels, "[Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the](#)

- [Internet](#)," *American Economic Review*, 92 (4), September 2002, 1093-1103.
(Press coverage: See [Hal Varian's NY Times column](#) on this work, a [piece in SIAM news](#), a brief account from [HBS Working knowledge](#), and articles in [USA Today](#) and [New Scientist](#)). The data from that study are posted [here](#).
- * Ariely, Dan, Axel Ockenfels, and Alvin E. Roth, "[An Experimental Analysis of Ending Rules in Internet Auctions](#)," *Rand Journal of Economics*, 36, 4, Winter 2005, 891-908.
 - Ockenfels, Axel and Alvin E. Roth, "[Late and Multiple Bidding in Second-Price Internet Auctions: Theory and Evidence Concerning Different Rules for Ending an Auction](#)," *Games and Economic Behavior*, 55, 2006, 297-320
 - Axel Ockenfels and Alvin E. Roth, "[The Timing of Bids in Internet Auctions: Market Design, Bidder Behavior, and Artificial Agents](#)," *AI Magazine*, Fall 2002, 79-88.
 - Gary Bolton, Ben Greiner, and [Axel Ockenfels](#), "Engineering Trust - Reciprocity in the Production of Reputation Information" [[Download](#)]
 - Athey, Susan, and Jonathan Levin, "[Information and Competition in U.S. Forest Service Timber Auctions](#)." *Journal of Political Economy*, 109 (2), April 2001.
 - Decarolis, Francesco, and Timothy Conley, "Collusion in Average Bid Auctions". Working paper.

October 19: **Online auctions (eBay, Amazon, Google ad auctions), and introduction to combinatorial auctions with application to spectrum auctions (problem set #2 due)**

- Varian, Hal, "Position Auctions," (2006), mimeo (download here: [\[PDF\]](#))
- * Edelman, Benjamin, Ostrovsky, Michael, and Schwartz, Michael, "[Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars Worth of Keywords](#)", *American Economic Review*, forthcoming, March 2007.
- Athey Susan, and Glenn Ellison (2007) "[Position Auctions with Consumer Search](#)" working paper.
- * Ausubel, Lawrence M. and Paul Milgrom (2002), "Ascending Auctions with Package Bidding," *Frontiers of Theoretical Economics*, 1: 1-45, (www.bepress.com/bejte/frontiers/vol1/iss1/art1).

Peter Cramton, Yoav Shoham, and Richard Steinberg "Introduction to Combinatorial Auctions" (<http://www.cramton.umd.edu/papers2000-2004/cramton-shoham-steinberg-introduction-to-combinatorial-auctions.pdf>)

October 26: TBA (**term paper proposals due**)

November 2: Guest speaker -- Clayton Featherstone

November 9: Guest speaker -- Francesco Decarolis

November 16: **TBD (half of the class will be students' presentations)**

November 23 – no class, Thanksgiving

November 30: **Students' Presentations**

December 7: **Students' Presentations + discussion: what have we learned from market design?**

December 14th: **No class – deadline for submission of the term paper**