Spring 2009
Columbia University

Economics G6600

Market Design

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Market Design is an emerging field in economics that attempts to devise a practical scheme for allocating scarce resources to individuals who value them. Its applications involve many important real-life problems ranging from allocation of public land, mineral rights, radio spectrum licenses, procurement contracts, carbon emission rights, school choice, placement of advertising in Internet search engines, to the design of TARP (troubled assets relief program). Mechanism design, auction, and matching theories underpin the field as a general methodological framework. The course shall provide a guide through these theories and discusses a few applications, along the way.

- **General Information:**

  Class Hours: Tuesday, 11:00A-12:50P

  Location: 253 Engineering Terrace (hopefully moved)

  Contact Information: (E-mail) yeonkooche@gmail.com

- **Grading:**

  1. Occasional Problem Sets
  2. Research Proposal with Preliminary Results

- **Text Books**

  Milgrom, P., *Putting Auction Theory to Work,* Cambridge University Press, 2004.

  Roth, A., and Sotomayor, M., *Two-sided Matching: A Study in Game-theoretic Modeling and Analysis*, Econometric Society Monographs.

  Krishna, *Auction Theory*, Academic Press, 2002.

Course Outline

Part I: Mechanism and Auction Design

1. General Overview, and Math Preliminaries

- Roth, A.E., 2002, "The Economist as Engineer: Game Theory, Experimental Economics and Computation as Tools of Design Economics," *Econometrica*, 70, 4, July 2002, 1341-1378.
- Chapter 23 of A. Mas-Colell, M.D. Whinston, and J.R. Green, *Microeconomic Theory*, Oxford University Press, 1995.
- Milgrom, P., and Shannon C., 1994, "Monotone Comparative Statics," *Econometrica*, 62: 157-180.

2. Optimal Auction Design in IPV auctions, Scoring Rule Auctions

- Milgrom, P., and Segal, I., 2000, "Envelope Theorems for Arbitrary Choice Sets," *Econometrica*, 70, 583-601
- Myerson, R., 1981, "Optimal Auction Design," *Mathematics of Operations Research*, 6, 58-73.
- Che, Y.-K., 1993, "Design Competition through Multidimensional Auctions," *Rand Journal of Economics*, 24, 668-80.

3. Correlated Types, Interdependent Values, and Winners' Curse

- Crémer, J., and Richard M., 1985, "Optimal Selling Strategies under Uncertainty for a Discriminating Monopolist when Demands are Interdependent," *Econometrica*, 53, 345-362.
- Crémer, J., and Richard M., 1988, "Full Extraction of the Surplus in Bayesian and Dominant Strategy Auctions," *Econometrica*, 56, 1247-1257.
- Milgrom, P., and Weber, R., 1982, "A Theory of Auctions and Competitive Bidding," *Econometrica*, 50, 1089-1122.
- Dasgupta, P., and Maskin, 2000,"Efficient Auctions," Quarterly Journal of Economics, 115, 341-388.

4. Multiunit Auctions and Package Auctions

- Milgrom, P., 2000, "Putting Auction Theory to Work: Simultaneous Ascending Auction," *Journal of Political Economy*, April.
- Ausubel, L. and Milgrom, P., 2002, "Ascending Auctions with Package Bidding," *Frontiers of Theoretical Economics*, 1(1), August 2002: Article 1.
- Ausubel, L., 2004, "An Efficient Ascending-Bid Auction for Multiple Objects," *American Economic Review*, 94, 1452-1475.
- Binmore, K. and Klemperer, 2002, "The Biggest Auction Ever: the Sale of British 3G Telecom Licenses," *Economic Journal*, 112, C74-C96.
- Bulow, J., Levin, J., and Milgrom P., 2008, "Winning Play in Spectrum Auctions," mimeo.

5. Assignment Mechanisms, Internet Keyword Advertising Auctions

- Edelman, B., Ostrovsky, M. and Schwarz, M. (2007), "Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars Worth of Keywords," forthcoming, *American Economic Review.*
- Edelman, B. and Ostrovsky, M., "Strategic Bidder Behavior in Sponsored Search Auctions," Decision Support Systems, v. 43(1), February 2007, pp. 192-198.
- Varian, H. (2007), "Position Auctions," forthcoming, *International Journal of Industrial Organization.*
- Borgers, T., Cox, I., Pesendorfer, M., and Petricek, V. (2007), "Equilibrium Bids in Sponsored Search Auctions: Theory and Evidence," mimeo., University of Michigan.

6. Contingent Payment, Security Auctions, and TARP

- DeMarzo, P., Kremer, I. and Skrzypacz, A., 2005, "Bidding with Securities–Auctions and Security Design," *American Economic Review*, 95, 936-959.
- Che, Y.-K., and Kim, J., 2008, "Bidding with Securities: Comment," mimeo.
- Ausubel, L., and Cramton, P., 2008, "A Troubled Asset Reverse Auctions," mimeo.
- Klemperer, P., 2008, "A New Auction for Substitutes: Central Bank Reverse Auctions, the U.S. TARP, and Variable Product-Mix Auctions," mimeo.

Part II: Matching Theory

7. One-Sided Matching

- Zhou, L., 1990, "On a Conjecture by Gale About One-Sided Matching Problems," *Journal of Economic Theory*, 52, 123-135.
- Abdulkadiroglu, A., and Sonmez, T., 1998, "Random Serial Dictatorship and the Core from Random Endowments in House Allocation Problems," *Econometrica*, 66, 689-701
- Roth, A.E. 1982, "Incentive Compatibility in a Market with Indivisible Goods," *Economics Letters*, 9, pp127-132.
- Hylland, A. and Zeckhauser, R., 1979, "The Efficient Allocation of Individuals to Positions," *Journal of Political Economy*, 87, 293-314.
- Bogomolnaia, A. and Moulin, H., 2001, "A New Solution to the Random Assignment Problem," *Journal of Economic Theory*, 100, 295-328.
- Che, Y.-K., and Kojima, F., 2009, "Asymptotic Equivalence of Probabilistic Serial and Random Serial Mechanisms," mimeo.
- Budish, E., Che, Y.-K., Kojima, F., and Milgrom, P., 2009, "Implementing Random Assignments: A Generalization of Birkhoff-von Neumann Theorem," mimeo.

8. Two-Sided Matching: One-to-one Matching ("Marriage Problem")

- Gale, D. and Shapley, L., 1962, "College Admissions and the Stability of Marriage," *American Mathematical Monthly*, 69, pp9-15.
- Roth and Sotomayor, Chapters 2-4.

9. Two-Sided Matching: Many-to-one Matchings ("College Admissions Problem")

- Roth and Sotomayor, Chapter 5

10. Two-Sided Matching: Unified Approach in Matchings

- Roth and Sotomayor, Chapter 5
- Kelso, A.S., and Crawford, V., 1982, Job Matching, Coalition Formation, and Gross Substitutes", *Econometrica*, 50, 1483-1504.
- Hatfield, J., and Milgrom, P. (2005), "Matching with Contracts," The American Economic Review, Volume 95, Number 4, September 2005, pp. 913-935(23)

11. School Choice Application

- Abdulkadiroglu, A., and Sonmez, T., 2003 "School Choice: A Mechanism Design Approach", *American Economic Review*, 93-3: 729-747.
- Abdulkadiroğlu, A., Pathak, P., Roth, E., and Sönmez, T., 2005, "The Boston Public School Match," *American Economic Review*, 95, 368-371.
- Abdulkadiroglu, A., Che, Y.-K., and Yasuda, Y., 2008, "Expanding Choice to School Choice." mimeo.