Economics 899 – Recent Advances in Economics
“Markets and Mechanisms”

INSTRUCTORS
First half of semester:  
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Second half of semester:  
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FORMAL DETAILS
Canvas URL: https://canvas.wisc.edu/courses/78400

Instructional Mode: face-to-face

Course meetings:
Jan 24 – Mar 7: Mondays and some Wednesdays, 4-6 p.m., 4308 Social Sciences
Mar 13 – May 4: Tuesdays and Thursdays, 1-2:15 p.m., 4308 Social Sciences

Credits: 1-3  
(The course will meet an average of 150 minutes per week over the semester, and students will spend significant additional time preparing for class meetings and on assignments. The course therefore meets the traditional Carnegie definition for three credits. With permission, students may take only the first half of the course, or only the second half of the course, for 1 credit.)

COURSE DESCRIPTION
Econ 899 official description: “Selections from all fields of economic research. Content changes each semester. May be repeated.”

Dan’s half of the course will begin with the standard model of an auction for a single, indivisible object, and establish some classic results in mechanism design: the revelation principle, revenue equivalence, and the seller-optimal auction. We’ll then extend the model in several directions. First, we’ll consider a wider range of problems we can use the same tools to address, such as a simple model of internet ad auctions. Second, we’ll extend the single-good auction model to account for a greater range of strategic behavior, such as endogenous entry, information acquisition, and investment. Third, we’ll look at several different definitions of “robustness”, and what it means to do mechanism design in a more “robust” way, possibly including the “differential privacy” approach introduced in computer science. We’ll discuss the theory behind several empirical approaches used in auction studies. Finally, we’ll examine other models used for different types of markets: two-sided matching markets, multi-unit auctions, and all-pay “contests” where players compete for prizes by exerting effort.
Marzena’s half will consist of two modules:

**Decentralized markets:** Classical equilibrium theory is based on two assumptions: (1) markets are competitive, i.e., all traders are negligible in the market; and (2) markets are centralized, i.e., a single market clearing applies to all traders’ demands and supplies for all assets. Modern financial and goods markets are neither competitive nor centralized. There is a growing literature on decentralized markets, which has been particularly active in the past decade. We will learn how to model centralized and decentralized markets -- competitive and noncompetitive, static and dynamic -- in a systematic and flexible way. We will discuss how market noncompetitiveness and decentralization affect agents’ behavior, equilibrium and welfare. What are decentralized market phenomena that have no centralized market counterparts? We will look into the new possibilities that market design offers when trading is decentralized and ask whether decentralized markets can be more efficient than centralized markets. We will discuss the insights from the literature as well as what we have yet to understand. We will introduce the relevant modeling techniques in the context of applications in microeconomics, industrial organization, and macroeconomics.

**Games among groups of agents:** Game theory has implicitly focused on interactions in which either all players interact directly or all interactions are bilateral, as is the case in networks and matching models. In many economic applications, the relevant unit of analysis is a group. Examples include financial markets (traders participate in multiple exchanges), international trade (countries sign multilateral agreements), and political economy. How do interactions among groups differ from games played by individuals? How does the fact that a player interacts with others as a member of a group rather than an individual affect his behavior? We will learn techniques for modeling market and nonmarket interactions among groups.

**Official Prerequisites:** graduate or professional standing.

**Recommended preparation:** graduate-level training in microeconomic theory.

**LEARNING OUTCOMES**

After taking this class, students should be able to:

- Read, understand, present, and credibly critique cutting-edge research on markets and mechanism design
- Formulate a model of a complex real-world institution or interaction
- Propose fruitful directions for future research

**GRADING**

Grades will be based on an average of independent assessments for the two instructors’ halves of the course. The evaluation of Dan’s half is described more below, under “expectations.”
OUTLINE OF FIRST HALF OF COURSE

The first half of the course will focus on a mix of “classic” foundational results in mechanism design and auction theory, and some very recent advances. We will meet nine times, for between ninety minutes and two hours each meeting; most meetings will be on Monday afternoons (4-6 p.m.), but we will meet Wednesdays as well early in the semester. After a long break, we will reconvene and meet about three more times late in the semester for student presentations.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Wed 1/24</td>
<td>Introduction: Bayes Nash equilibrium, and the basic auction setup</td>
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<tr>
<td>Mon 1/29</td>
<td>Mechanism design and optimal auctions 1: the revelation principle, posing the optimal auction problem, dominant strategy vs Bayesian implementation, and mechanism design in other “single-parameter” environments</td>
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<td>Wed 1/31</td>
<td>Mechanism design and optimal auctions 2: solving the optimal auction problem, and some bonus results: why participation matters “more than anything else”, using mechanism design to compare asymmetric first-price and English auctions, and a simple “pretty good” rule for choosing a monopoly price with very little data</td>
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<tr>
<td>Mon 2/5</td>
<td>Enlarging the game: technical extensions (correlation, risk aversion, common values), and choices made before an auction (entry and bidder investment) and a cool result that unifies several of these ideas</td>
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<tr>
<td>Wed 2/7</td>
<td>“Robustness I”, or why don’t we see a world full of optimal mechanisms: what if you can’t use all mechanisms, don’t know the environment, worry about “bad” equilibria, or know the “payoff” environment but not the information structure</td>
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<tr>
<td>Mon 2/12</td>
<td>“Robustness II”: robustness to resale; robustness to collusion; obvious strategyproofness and the link to sellers with limited commitment power</td>
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<td>Mon 2/19</td>
<td>How a theorist thinks about auction empirics: identification strategies for first-price and English auctions under various assumptions</td>
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<td>Mon 2/26</td>
<td>Two-sided matching markets</td>
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<td>Mon 3/5</td>
<td>Differential privacy, and application to many-to-one matching</td>
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<td>Mon 4/16</td>
<td>Student presentations</td>
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<td>Mon 4/23</td>
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<td>Mon 4/30</td>
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EXPECTATIONS

Preparation for Class

As you’ll see from the reading list below, many days will cover ideas from three or more papers. I do not expect you to read the papers on the reading list before the lecture. What I do expect, however, is for some subset of you to “go deeper” into these topics after a given lecture. Hopefully, two or three times over the course of the semester, each of you will get excited about something I discuss in class, and be motivated to dig deeper – to read the paper or papers carefully after the lecture, and come to the following class with questions or ideas you want to discuss. My hope is that, after the first couple of lectures, a typical day might involve 20-30 minutes of talking about the ideas from the previous day, and what a few of you found when you investigated further, before we then move on to that day’s new material.

“Referee Report” and Presentation

The main “deliverable” for the class will be a written report on one or more paper, along with a short (roughly 30 minute) presentation. You can think of this as a referee report – a chance to read one paper, or a couple of related papers, carefully and respond to it/them – evaluating what the author or author does, and how it contributes to the literature. (This will likely require you to look at several of the papers cited, to understand what was already known prior to this paper, and therefore what this paper contributed to our understanding – whether it was a new modeling framework/paradigm, a new technique, or a new result.) Hopefully, you will also have ideas for how to possibly extend this line of research – what questions were left open, and how you might proceed further. (This does not simply mean “solve the same model but with one technical tweak” – I mean how one might extend the line of research to get genuinely new insights.)

You are welcome to do this project on your own, or in a group of two, if two of you get excited about the same idea. (The standard for a two-person group will be higher than for a solo project, of course, but I encourage you to work together – I think it will be very helpful to have someone to work with!) Along with a written paper, each person or group will give a 30-minute presentation at the end of the semester. This is obviously not enough time to get into every technical detail of the paper, but should focus on the big ideas – what question the paper or papers take on, what it/they contributes to our understanding, and where you would want to go from there.

I’ll ask that you let me know early what paper/papers you plan to present, so we don’t end up with five presentations on the same topic. It can really be any topic that’s reasonably related to markets and mechanisms – it doesn’t have to be one we touched on in class, and I encourage you to go in whatever direction you find most interesting. The last few pages of this syllabus are a bunch of topics/papers that might offer a starting point.
READINGS
(I’ll put all these papers on Canvas before the semester starts)

Wed Jan 24 – review
nothing

Mon Jan 29 and Wed Jan 31 – mechanism design and optimal auctions


Extension of mechanism design to other “single-parameter” environments (multiple goods, public goods, internet ad auctions) – covered well in Roughgarden (2016), *Twenty Lectures on Algorithmic Game Theory*, ch. 2-3

Dominant vs Bayesian implementation: Mookherjee and Reichelstein (1992), Dominant strategy implementation of Bayesian incentive compatible allocation rules, *JET* 56

Other cool results using the “marginal revenue” result:

- Bulow and Klemperer (1996), Auctions Versus Negotiations, *AER* 86.1
- Maskin and Riley (2000), Asymmetric Auctions, *REStud* 67

Mon Feb 5 – enlarging the model

Correlated values: Cremer and McLean (1988), Full Extraction of the Surplus in Bayesian and Dominant Strategy Auctions, *ECMA* 56

Common values and information aggregation: Pesendorfer and Swinkels (1997), The Loser’s Curse and Information Aggregation in Common Value Auctions, *ECMA* 65

Milgrom and Weber (1982), A Theory of Auctions and Competitive Bidding, *ECMA* 50


Choices made before the auction:

- Levin and Smith (1994), Equilibrium in Auctions with Entry, *AER* 84.3
- Bergemann and Valimaki (2002), Information Acquisition and Efficient Mechanism Design, *ECMA* 70.3
- Arozamena and Cantillon (2004), Investment Incentives in Procurement Auctions, *REStud* 71.1
Wed Feb 7 – robustness I

Ollár and Penta (2017), Full Implementation and Belief Restrictions, *AER* 107.8
Bergemann and Morris (2005), Robust Mechanism Design, *ECMA* 73.6
Bergemann, Brooks and Morris (2017), First Price Auctions with General Information Structures: Implications for Bidding and Revenue, *ECMA* 85.1

Mon Feb 12 – robustness II: resale, collusion, partial seller commitment

Zheng (2002), Optimal Auction with Resale, *ECMA* 70
Carroll and Segal (2017), Robustly Optimal Auctions with Unknown Resale Opportunities, working paper
Che and Kim (2006), Robustly Collusion-Proof Implementation, *ECMA* 74.4

Mon Feb 19 – empirics

Guerre, Perrigne and Vuong (2000), Optimal Nonparametric Estimation of First-Price Auctions, *ECMA* 68.3
Aradillas-López, Gandhi and Quint (2013), Identification and Inference in Ascending Auctions with Correlated Private Values, *ECMA* 81.2
Athey and Haile (2007), Nonparametric Approaches to Auctions, in *Handbook of Econometrics* Vol 6A (J. Heckman and E. Leamer, eds.)
Haile and Tamer (2003), Inference with an Incomplete Model of English Auctions, *JPE* 111.1
Syrgkanis, Tamer and Ziani (2018), Inference on Auctions with Weak Assumptions on Information, working paper
Mon Feb 26 – matching markets and differential privacy

Gale and Shapley (1962), College Admissions and the Stability of Marriage, American Mathematical Monthly 69


Mon Mar 5 – differential privacy

Kannan, Morgenstern, Roth and Wu (2017), Approximately Stable, School Optimal, and Student-Truthful Many-to-One Matchings (via Differential Privacy), working paper

ACADEMIC INTEGRITY
This is a PhD-level elective designed to teach cutting-edge research and help you prepare to successfully write a dissertation. If you are seriously considering cheating in this class, you are so fundamentally missing the point that I wouldn’t even know where to begin a conversation about why you shouldn’t do that. See https://conduct.students.wisc.edu/academic-integrity/ for more information on academic integrity.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES
McBurney Disability Resource Center syllabus statement: “The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.” http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION
Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” https://diversity.wisc.edu/
SUGGESTIONS FOR FURTHER READING

Dominant-strategy implementation:
- Manelli and Vincent (2010), Bayesian and Dominant-Strategy Implementation in the Independent Private Values Model, ECMA 78
- Gershkov, Goeree, Kushnir, Moldovanu and Shi (2013), On the Equivalence of Bayesian and Dominant Strategy Implementation, ECMA 81

Participation, information acquisition, and investment:
- Cremer, Spiegel and Zheng (2007), Optimal Search Auctions, JET 134
- Lu and Ye (2016), Optimal Two-stage Auctions with Costly Information Acquisition, working paper
- Persico (2000), Information Acquisition in Auctions, ECMA 68.1
- Atakan and Ekmecki (2014), Auctions, Actions and the Failure of Information Aggregation, AER 104.7

Resale, collusion, and partial seller commitment:
- Dworczak (2017), Mechanism Design with Aftermarkets: Cutoff Mechanisms, working paper
- McAfee and McMillan (1992), Bidding Rings, AER 82.3
- Che and Kim (2009), Optimal Collusion-Proof Auctions, JET 144.2
- Che, Condorelli and Kim (2016), Weak Cartels and Collusion-Proof Auctions, working paper
- Liu, Mierendorff, Shi and Zhong (2017), Auctions with Limited Commitment, working paper

Matching markets: a simply enormous literature. A few good starting points:
- Abdulkadiroglu and Sonmez (2013), Matching Markets: Theory and Practice, Advances in Economics and Econometrics 1 for the “basic models”
- Kojima (2015), Recent Developments in Matching Theory and their Practical Applications, Advances in Economics and Econometrics 1 on “how the features of some real markets deviate from the classical models, and how the theory has been modified or expanded to tackle these problems”
- Roth and Sotomayor (1992), Two-Sided Matching: A Study in Game-Theoretic Modeling and Analysis, Econometric Society Monographs.

Or start at Al Roth’s website, https://web.stanford.edu/~alroth/alroth.html
Internet ad auctions:

   Athey and Ellison (2011), Position Auctions with Consumer Search, *QJE* 126.3

Spectrum auctions:

   Cramton (2013), Spectrum Auction Design, *Review of Industrial Organization* 42.2
   Milgrom and Segal (2015), Deferred-Acceptance Auctions and Radio Spectrum Reallocation, working paper
   Milgrom, Ausubel, Levin and Segal, Incentive Auction Rules Option and Discussion, working paper

Selling multiple goods:

   Hart and Nisan (2014), How Good Are Simple Mechanisms for Selling Multiple Goods, working paper
   Ausubel, Cramton, Pycia, Rostek and Weretka (2014), Demand Reduction and Inefficiency in Multi-Unit Auctions, *RESTud* 81.4
   Ausubel and Milgrom (2005), The Lovely but Lonely Vickrey Auction, in *Combinatorial Auctions* (Cramton/Steinberg/Shoham, eds), MIT Press
   Daskalakis, Deckelbaum and Tzamos (2017), Strong Duality for a Multiple-Good Monopolist, *ECMA* 85.3

Contests, and Other Similar Things:

   Siegel (2009), All-Pay Contests, *ECMA* 77.1
   Siegel and Olszewski (2016), Large Contests, *ECMA* 84.2
   Siegel and Olszewski, Performance-Maximizing Contests with Many Contestants, working paper
   Che and Gale (2003), Optimal Design of Research Contests, *AER* 93.3
   Bulow and Klemperer (1999), The Generalized War of Attrition, *AER* 89
   Fullerton and McAfee (1999), Auctioning Entry into Tournaments, *JPE* 107.3
Algorithmic mechanism design:


Chawla and Sivan (2014), Bayesian Algorithmic Mechanism Design, *ACM SIGecom Exchanges* 13.1


Hartline and Lucier (2015), Non-Optimal Mechanism Design, *AER* 105.10


Empirical approaches to auctions:

Guerre, Perrigne and Vuong (2000), Optimal Nonparametric Estimation of First-Price Auctions, *ECMA* 68.3 (and a large literature that builds on it)

Haile and Tamer (2003), Inference with an Incomplete Model of English Auctions, *JPE* 111.1

Aradillas-Lopez, Gandhi and Quint (2013), Identification and Inference in Ascending Auctions with Correlated Private Values, *ECMA* 81.2

Syrigkanis, Tamer and Ziani (2017), Inference on Auctions with Weak Assumptions on Information, working paper

A few other cool papers that don’t obviously fit anywhere else:

Bulow, Huang and Klemperer (1999), Toeholds and Takeovers, *JPE* 107.3

Eso and Szentes (2007), Optimal Information Disclosure in Auctions and the Handicap Auction, *RESTud* 74.3


Kim and Kircher (2015), Efficient Competition Through Cheap Talk: The Case of Competing Auctions, *ECMA* 83.5

Pavan, Segal and Toikka (2014), Dynamic Mechanism Design: A Myersonian Approach, *ECMA* 82.2

Ben-Porath, Dekel and Lipman (2017), Mechanisms with Evidence: Commitment and Robustness, working paper

Che, Kim and Mierendorff (2013), Generalized Reduced-Form Auctions: A Network-Flow Approach, *ECMA* 81.6