INFO 4220 NETWORKS II: MARKET DESIGN
(CS 4852 / ECON 3825 / INFO 6229)

January 23, 2024

INFO 4220 – Networks II: Market Design

Prof. Cristobal Cheyre-Forestier

This Lecture

1. Welcome
2. Structure of the Course
3. Course Staff
4. Calendar
5. What is this Course About

Some of My Research Projects

- Online advertising now captures more than half of advertising expenditures in the US
  - Can be targeted to the context of webpages or search terms
  - Or based on individual user's behaviors by using online tracking and behavioral profiling
- Advertising industry frames online advertising as an economic win-win
  - Fewer wasteful advertising, better experience for users, supports the internet
- Users don't like advertising: Too many ads, intrusive and invasive, and may enable market manipulation
- Users have started adopting ad-blockers and anti-trackers
  - **In 2020 survey (AudienceProject) 40% reported using some type of ad-blocker**

Some of My Research Projects

- Use of ad-blockers is bad for online publishers. Advertising is how they make money

- Can you convince people that use an ad-blocker to not use it?

- How hard is to convince someone that doesn't an ad-blocker to use one?

- We ask people how much do we have to pay them to get them to uninstall/install an ad-blocker
  - The question is posed in an incentive compatible way (we will discuss what this means in this course)
  - And then we ask them to uninstall/install an ad-blocker

WTA distribution

We Ask people for the minimum amount they would be willing to accept to uninstall their ad-blocker (if they use one), or to install an ad-blocker (if they don't use one) for one month.


WTA for uninstalling AdBlocker (User)
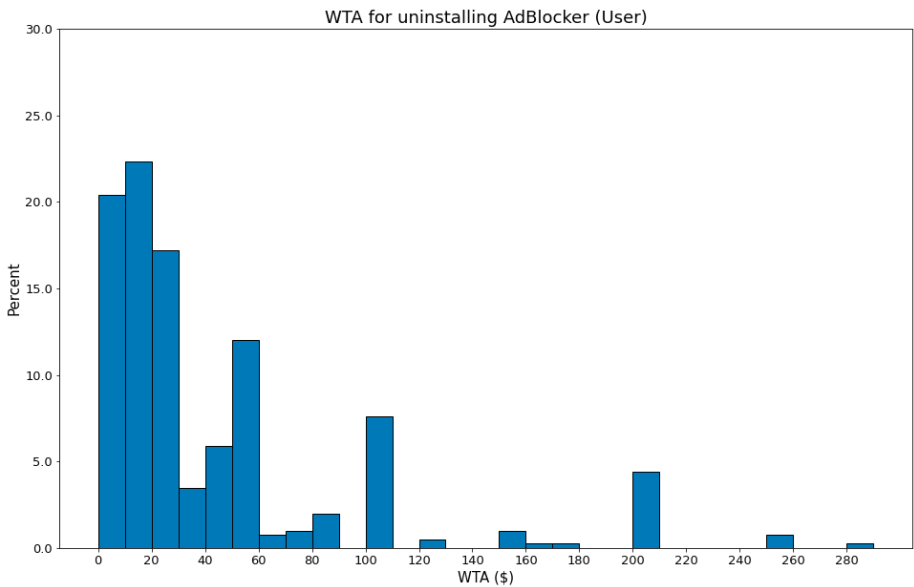
Count	Min	Mean	Median	Max
447	1	211.48	20	50,000

WTA for installing AdBlocker (Non-User)
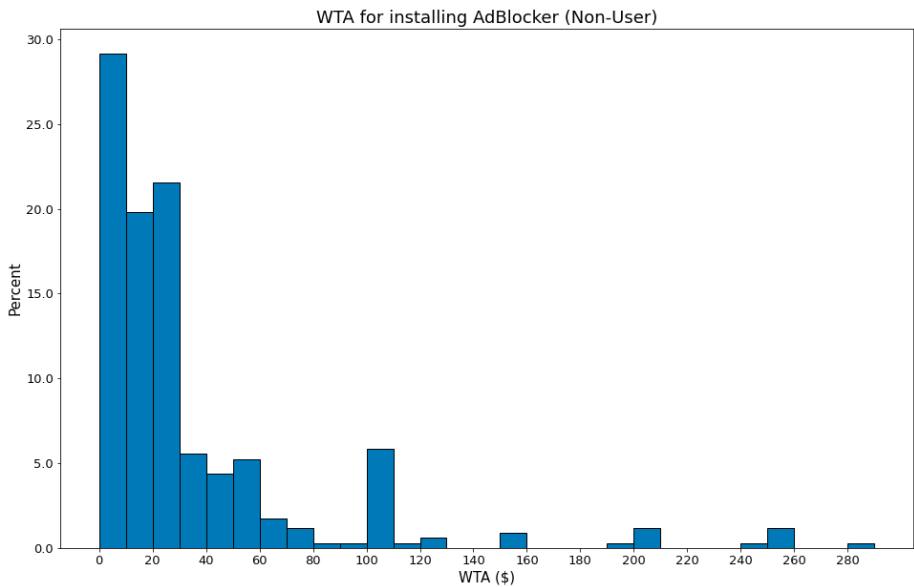
| Count	Min	Mean	Median	Max
356	0.5	5,672.15	20	1,000,000

Differences between Users – Non Users

Participants complete a survey that asks questions about their online experiences and attitudes towards advertising and tracking

Differences Between Groups on Entry Survey
User - Non User
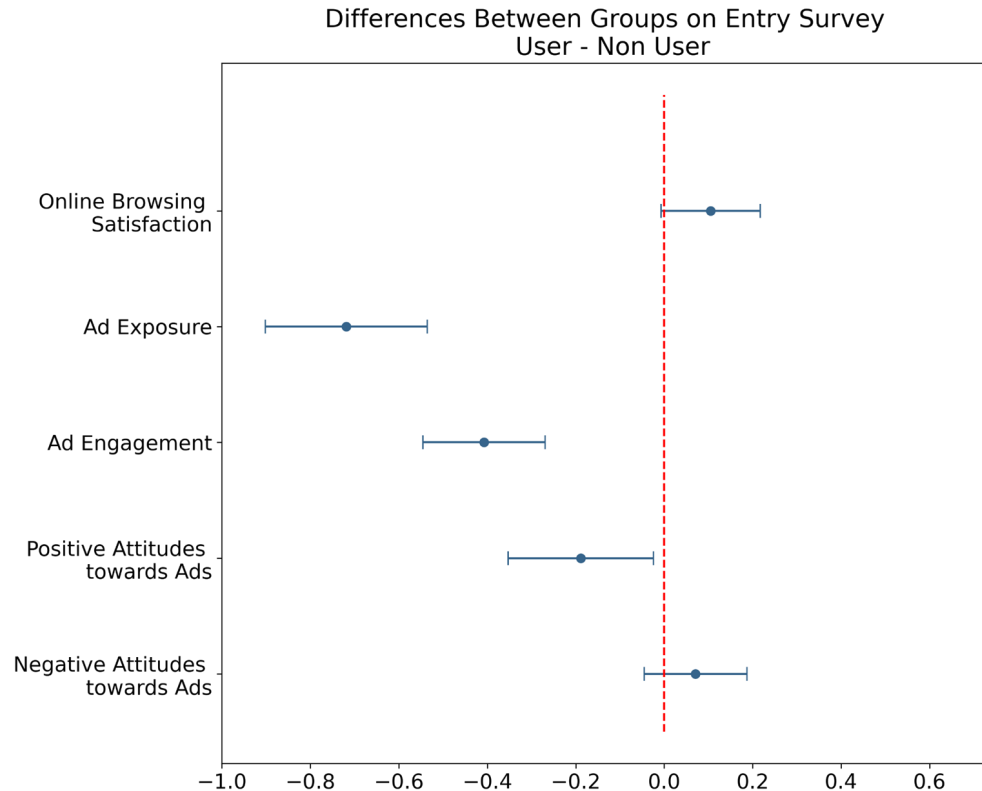
Differences in entry survey suggest self-selection into Ad-Blocking usage. This makes it interesting to assess how the treatment will affect each group
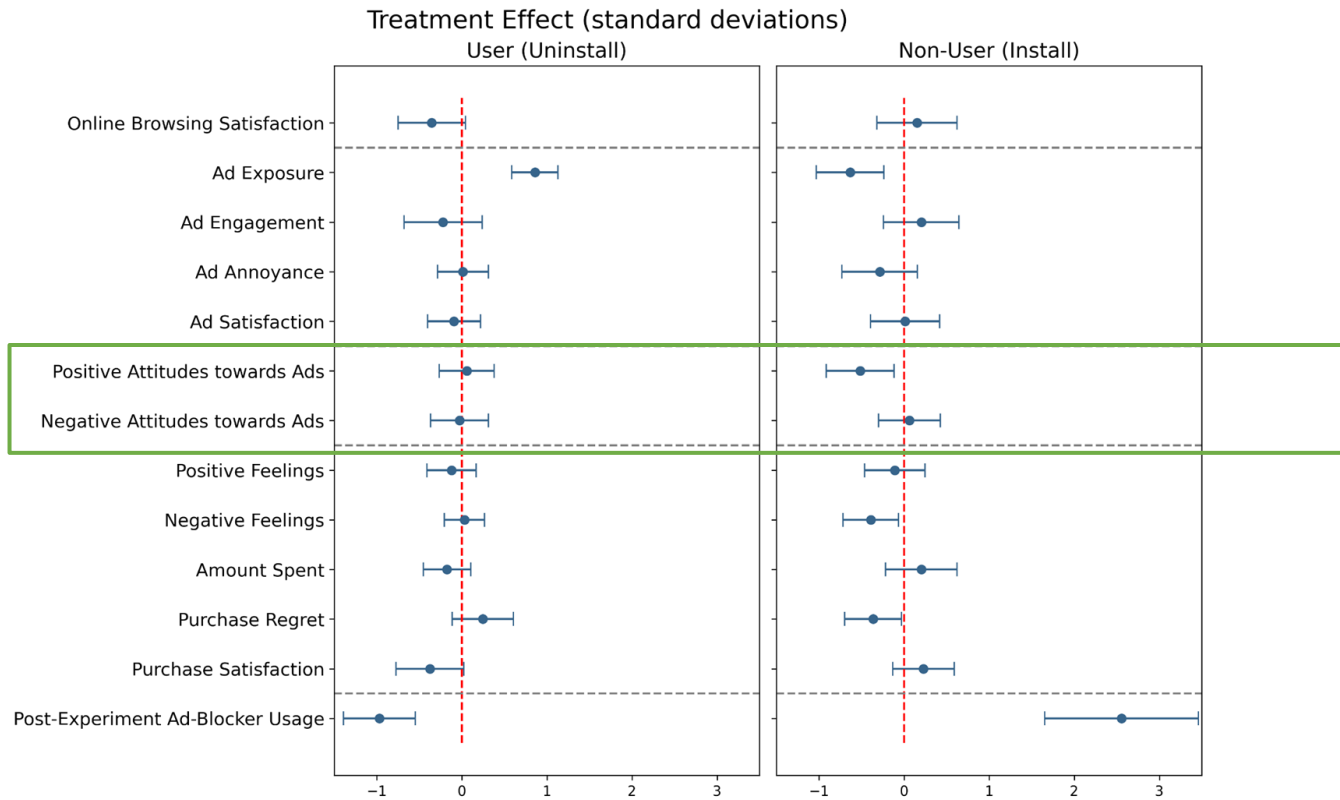
Treatment Effect (standard deviations)
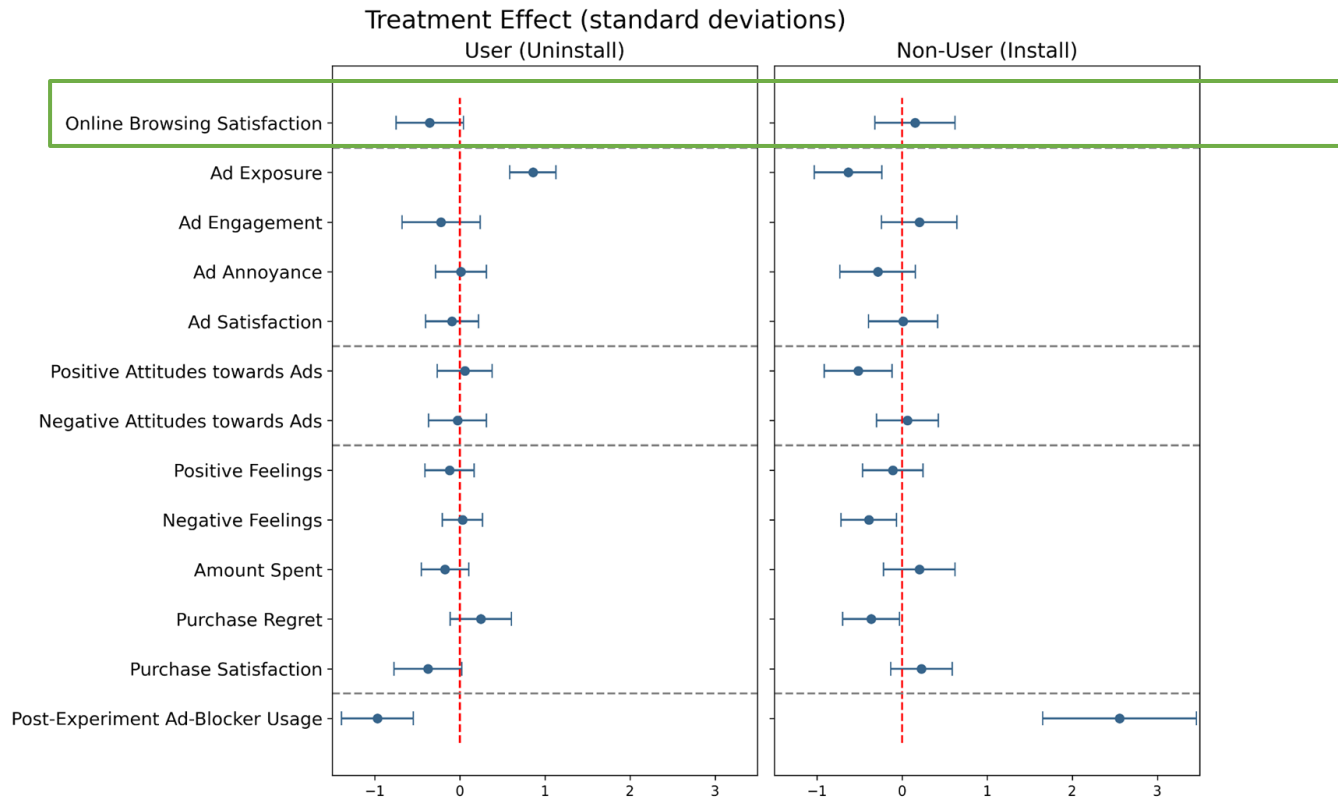
Those uninstalled their ad-blocker reported a lower satisfaction on **online browsing experience** (significant).
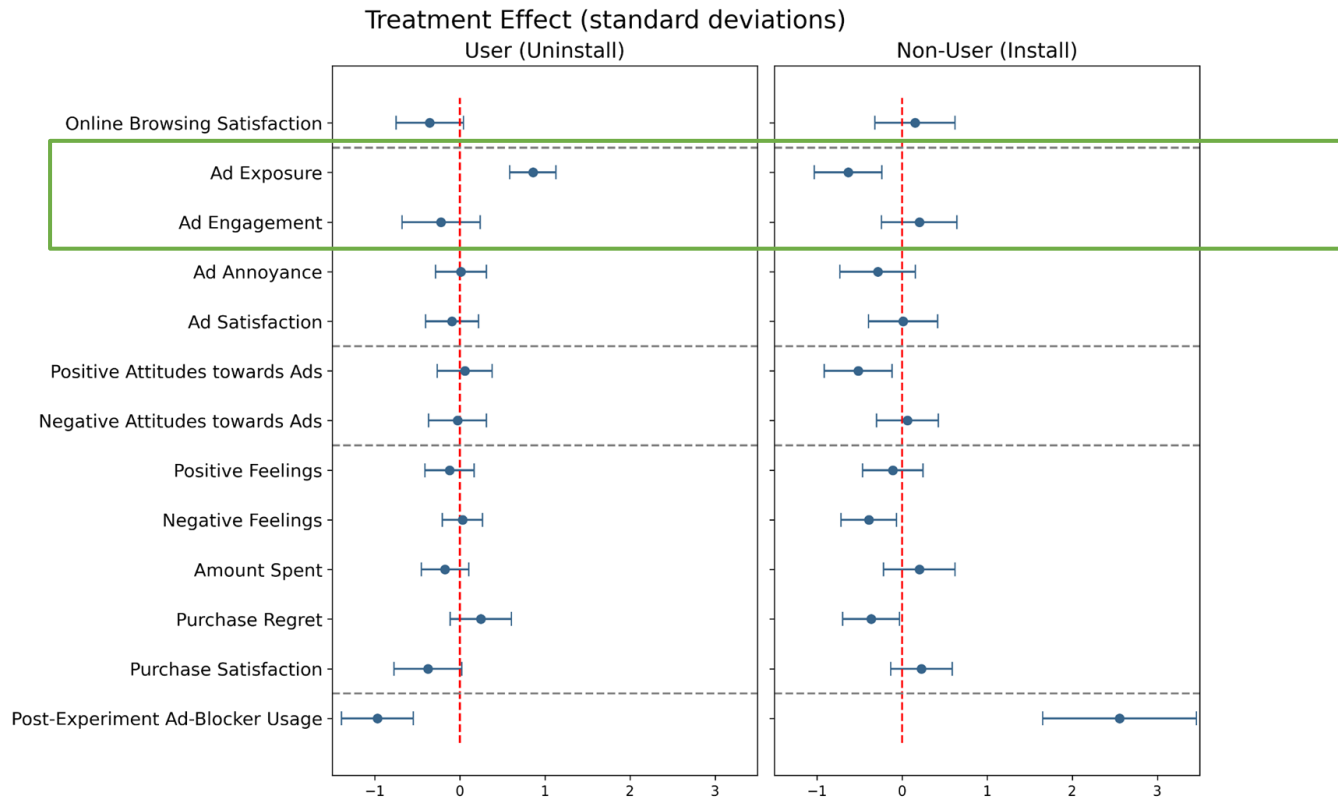
Significant treatment effects on **ad-exposure** for both groups, while the effects doesn't seem to transfer to ad-engagement.
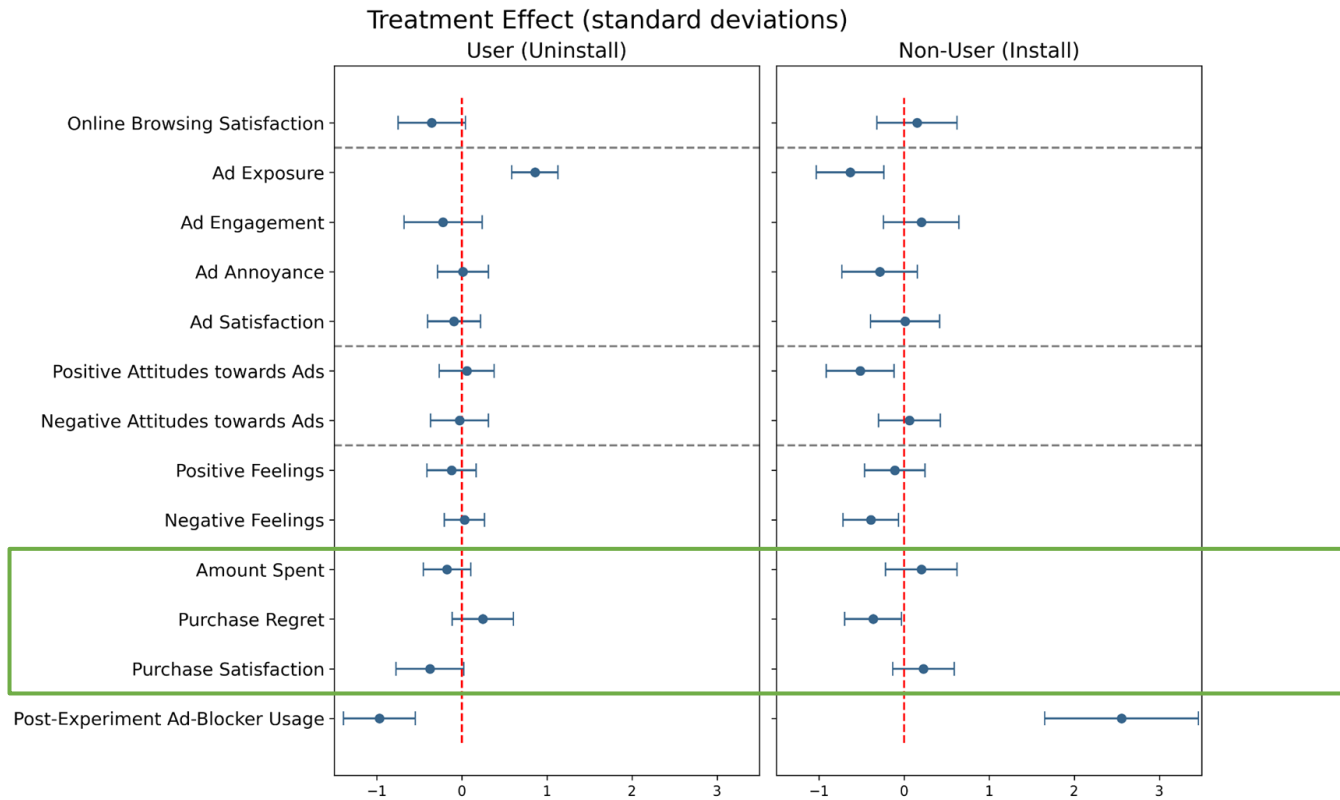
Treatment Effect (standard deviations)

Non-user that installed an ad-blocker are less likely to agree with positive attitudes towards ads.

Treatment Effect (standard deviations)
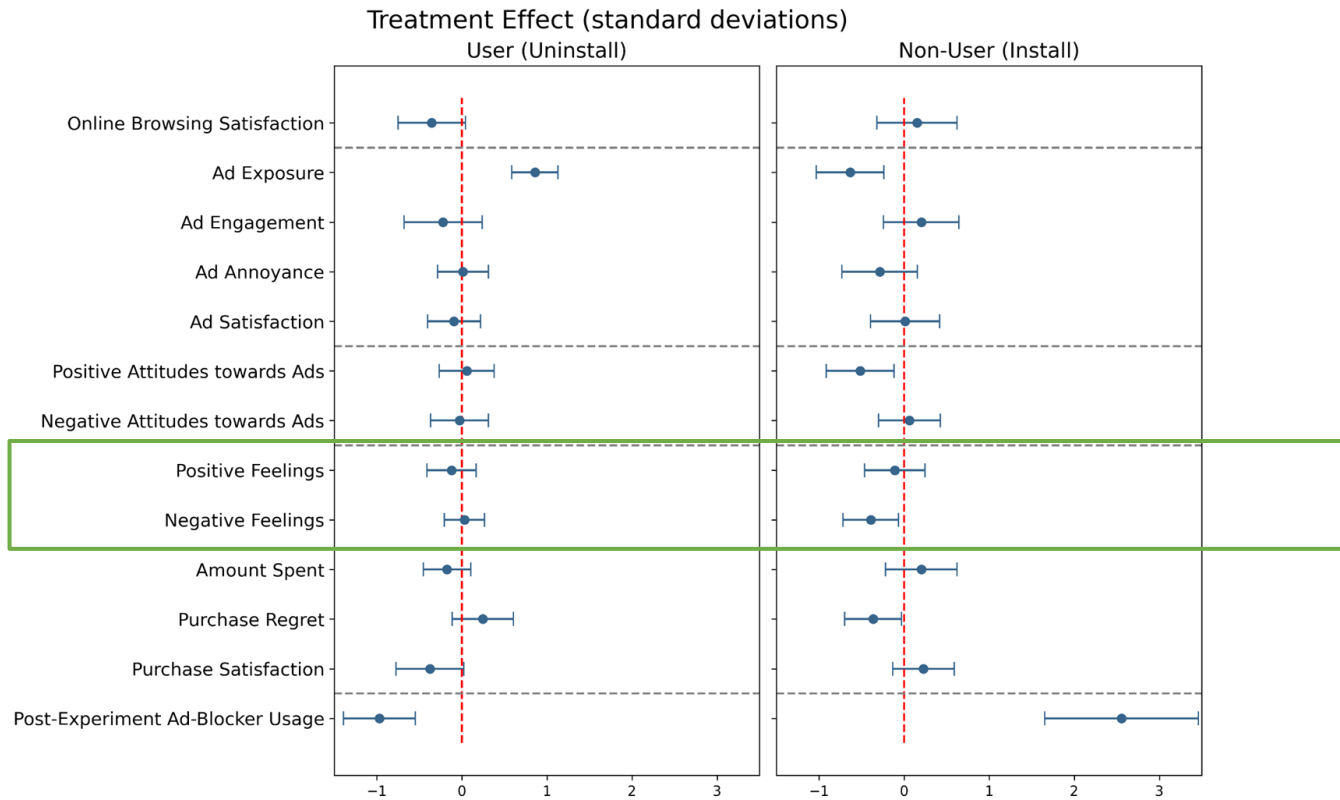
Non-user that installed an ad-blocker are less likely to have negative feelings.

Treatment Effect (standard deviations)

User that uninstalled their ad-blocker are more likely to regret about their recent purchase, while non-user that installed one regret less and are more satisfied with the purchases.
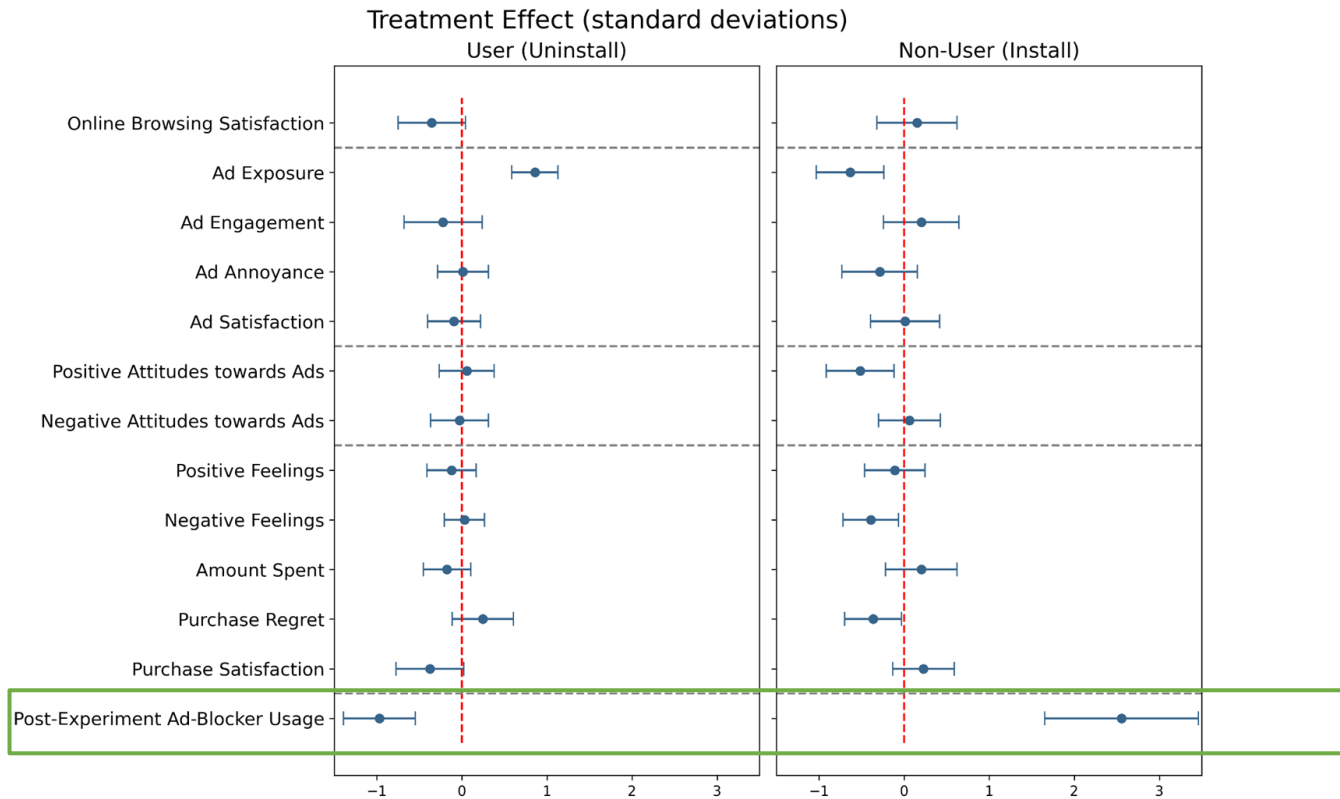
For both groups, the treatment affects the future use of ad-blocking tools. The non-user that installed an ad-blocker are more likely to keep it installed.

Other Research Projects

- How can we learn how migrants use cities to consider them in urban design?

- Do crowdfounding platforms reduce discrimination against Black female founders?

- How does exposure to online advertising changes online browsing and purchasing behavior?

- Who cares about these things?
  - Federal trade commission
  - Anti-trust lawyers
  - Companies that feel shortchanged in these ecosystems

Course Staff

- Graduate TAs:
  - Jose A. Guridi [jg2222] (PhD IS)
  - Cristiana Firullo [cf528] (PhD IS)
  - Fengyang Lin [fl354] (PhD IS)

- Undergrad TAs:
  - Allen Chen (ac2324)
  - Tuan Anh Dang (td296)
  - Maximilian Dittgen (myd4)
  - Gaveal Fan (jf675)
  - Claire Jiang (cj337)
  - Helena Jiang (hj398)
  - Lauren Kam (lk543)
  - Sneha Kumar (sk2677)
  - Hannah Lee (hel33)
  - Arnaav Sareen (aks247)
  - Peixuan Tong (pt295)
  - Catherine Wang (cw797)
  - Isabella Zhi (yz952)

About the Course

"Only recently have we economists started to understand enough about how markets work so that we can help in that process"

Alvin E. Roth (2012 Nobel Prize Laureate w/ Lloyd Shapley)

Who Gets What

—and Why

ALVIN E. ROTH

Winner of
THE NOBEL PRIZE IN ECONOMICS

What is this course about:

- Networks & Markets... Mostly about markets

- What is a market?
  - Whenever there is a demand for something
  - And a supply for that something
  - Then, there is a market for that something
  - Markets are institutions for exchanges

- Traditional view is that in markets transactions happen at an equilibrium price $p:
  - There are sellers willing to sell x units for a price $p or less
  - There are buyers willing to buy x units for a price $p or more

But?

- How do we agree on the equilibrium price $p?
- Will this work for every market?
- Will it work in networked markets?
- What if it is a no-cash transaction?

- Market Design: How you organize a market matters. It affects agents' behavior and ultimately:
  - Especially relevant when resource are scarce
  - Who gets what
  - And at what price (if there is any)

Our focus

- The focus of this class is on market design and networked/online economies

- Why?
  - Networked economies/online platforms are everywhere
  - Most successful companies nowadays are platforms that heavily rely on market design

- How?
  - Formal models: Microeconomic Theory and Game Theory
  - Applications

Logistics

- Lectures:
  - Hollister Hall B14
  - Tuesday and Thursday 9.40 AM – 10.55 AM
- Office Hours:
  - Prof. Cheyre: Monday 11.00 – 12.00 or by appointment
    - Gates 210 or Zoom (If we agree on Zoom)
  - Starting Week 3 there will be office hours held by TAs. Calendar and locations will be published soon
- Device use policy:
  - Feel free to use your device to take notes answer PollEV
  - Do not use your device for other purposes (TikTok, Shopping, any other … specially if distracting others)

Grading

More details on each of these later:

- Problem Sets (30%)

- In class prelim 1 (20%)

- In class prelim 2 (20%)

- Final exam (30%)

- Class participation bonus (up to +5%)

Problem Sets

- Roughly once every 4 lectures
  - 5 problem sets, lowest grade is dropped
  - 2 slip days to use through the semester
- See calendar in syllabus for dates. Typically, due on a Wednesday at 11.59PM
- You can discuss the problem set with classmates
- Each of you must solve each of the problems on your own, and turn in your own solution
- Problem sets will be 30% of your grade

Prelims + Final

- Prelims (20% of the grade each)
  - About 1 hour long (in class)
  - Some short questions (1-3 lines type of answers)
  - 2-3 problems like problems in problem sets (maybe shorter)

- Final (30% of the grade)
  - Same as above, but slightly longer
  - If you are taking the course as INFO6220, the final exam will have an additional take-home component
  - INFO6220 additional take-home: Take home exam with a couple more open-ended questions or similar activity that requires you to synthesize and apply what your learnt in the semester

Generative AI

- I don't think it helps much in this course (maybe I am wrong)

- You can use it as long as:
  - You disclose you used it
  - You show the prompts and outputs you got
  - You explain what you used and whether it was helpful

- I recommend not using it for problem sets. You will not have it in exams

Class Participation Bonus

- Those that participate in the lecture activities can earn a bonus (Typically through PollEV)
- Given to those that obtain a total score in the top 33% in activities (33% considering all students enrolled, not only those attending/participating)
- Up to +5% during the semester
- For example: If there are 20 lectures with activities, each lecture in which you earn a bonus you obtain a +0.25% bonus
  - Per class bonus will be adjusted in order to make it possible to earn up to +5% in the semester

Logistics

- How to contact us:
  - General question that could benefit entire class: Use Ed Discussions. Will be checked and answered daily
  - Personal question: By e-mail to any of us [cac555, cf528, jg2222, fl354]. To maximize likelihood of timely response:
    - Start subject with: [INFO 4220] –
    - Standard response time: 24-48 hours (sooner if we can, not always possible).
- Class website: CANVAS

Textbook and readings

- The course is based in the following book:
    - G. Haeringer (2018). Market Design: Auctions and Matching
    - If you need additional help, the book is great
- In the syllabus, for each topic I list:
    - Relevant chapter from the book
    - Additional readings (the book many times is based on the additional readings)
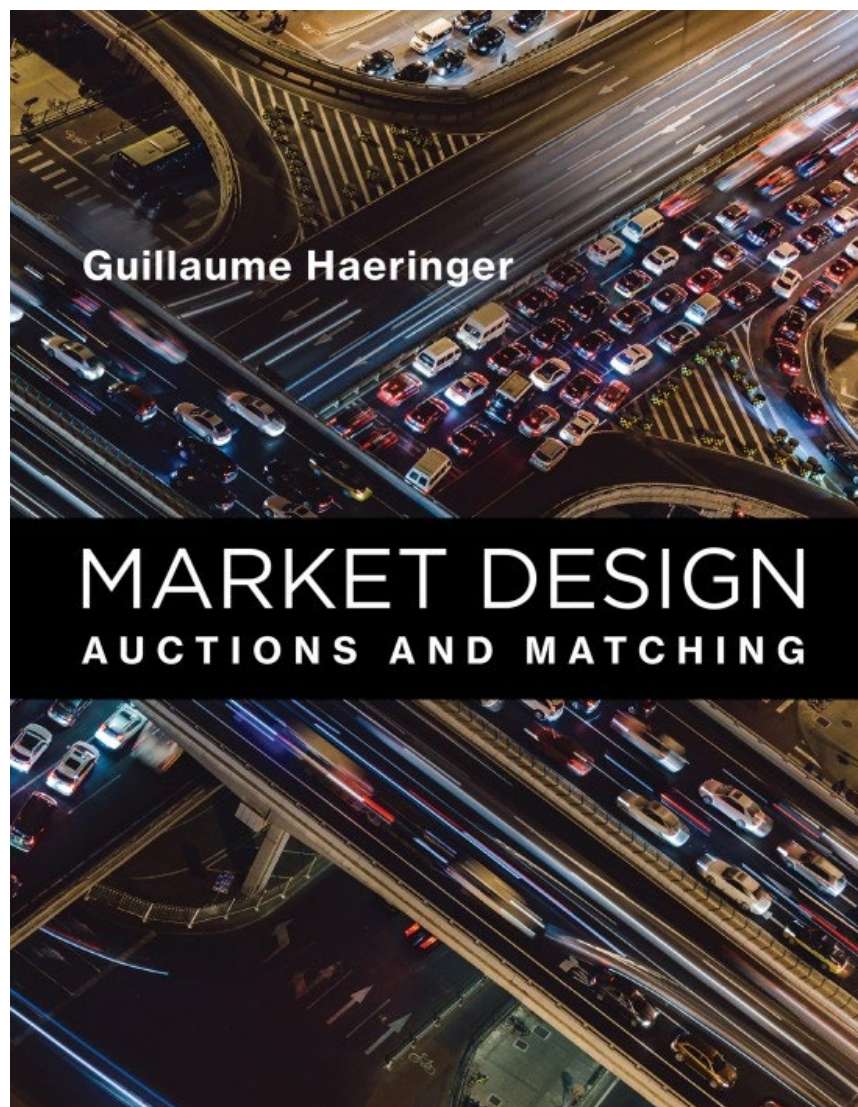
Missed Work & Regrading

- If you have an issue with a grade, **within one week** of receiving your grade
  - Write a re-grade request following the instructions and using the form available in CANVAS
- To account for personal circumstances:
  - I will drop 1 problem set grade
  - You have 2 slip days to turn in a homework up to a day late (you have to indicate in the HW If and how many days you are using, you can only use in 1 day increments)
  - Excuses and explanations are discouraged. If you have a personal problem that requires more accommodation, please follow the due process with student disability services

Missed Work & Regrading

- For exams, I follow Cornell's Faculty Handbook. The handbook recommends (but does not require) to consider special accommodations in four cases.
  - Illness, or family/personal emergency: Contact the advising dean for your college. The advising dean will then contact me directly and I will decide based on the case.
  - Employment interviews: Provide me with evidence of the interview, and that you cannot change the date.
  - Religious observance: I tried to avoid all conflicts. If you have one, please contact me within the first 3 weeks of class.
  - Athletics/Extra-curricular activities: Provide the standard permission slip at least 2 weeks before the exam.
- Time conflicts with exams: Only if you have a direct conflict, or **more** than 2 exams in 24 hours.

Academic Integrity

- **Academic integrity is expected at all times**
- Violations will be reported and prosecuted through the Academic Integrity Hearing Board
- Some basic class rules:
  - You can cooperate in PS, but you have to solve your own PS, and you have to disclose in your PS who you cooperated with. Your solution must be your own
  - You can use printed material, but you cannot copy a solution from the Internet or a published manual
  - You cannot post class materials online
- More info: https://cuinfo.cornell.edu/aic.cfm

Students with Disabilities

- Your access to this course is important

- Please request your student disability services (SDS) accommodation letter within the first 3 weeks of class in order to have adequate time to arrange your approved academic accommodation

- If you need to discuss your accommodation. Please reach out to me. It is important to me to provide you with what you need to access this course

- If a need arises during the semester, please contact SDS

Calendar

Day	Due
February-7	PS1 due
February-21	PS2 due
February-22	Prelim 1 (in class)
March-20	PS3 due
March-28	Prelim 2 (in class)
April-24	PS4 due
May-7	PS5 due
TBD (Check registrar's page)	Final Exam

Questions?

What is this course about:

- Networks & Markets: Much **greater focus on markets** than in Networks I
- What is a market?
  - Whenever there is a demand for something
  - And a supply for that something
  - Then, there is a market for that something
  - Markets are institutions for exchanges
- Traditional view is that in markets transactions happen at an equilibrium price p:
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But?

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Our focus

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- Why?
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  - Most successful companies nowadays are platforms that heavily rely on market design

- How?
  - Formal models: Microeconomic theory, and game theory
  - Applications

Matching Markets

- Used to solve the problem of matching two sets of agents without money

- As there are no prices, matches are arranged based on preferences and/or priorities over objects

- Different algorithms for different types of matching:
  - Match students in teams of two for a homework (one-to-one)
  - Need to form n soccer teams (many-to-many)
  - Want to allocate dorm rooms (one person to one object)

- Our goal is to find "good" matches

National Medical Residence Program

https://news.weill.cornell.edu/news/2023/03/celebrating-match-day-success-at-weill-cornell-medicine

Students from Weill Cornell Medicine celebrate their matches (March, 2023)

Kidney Exchange
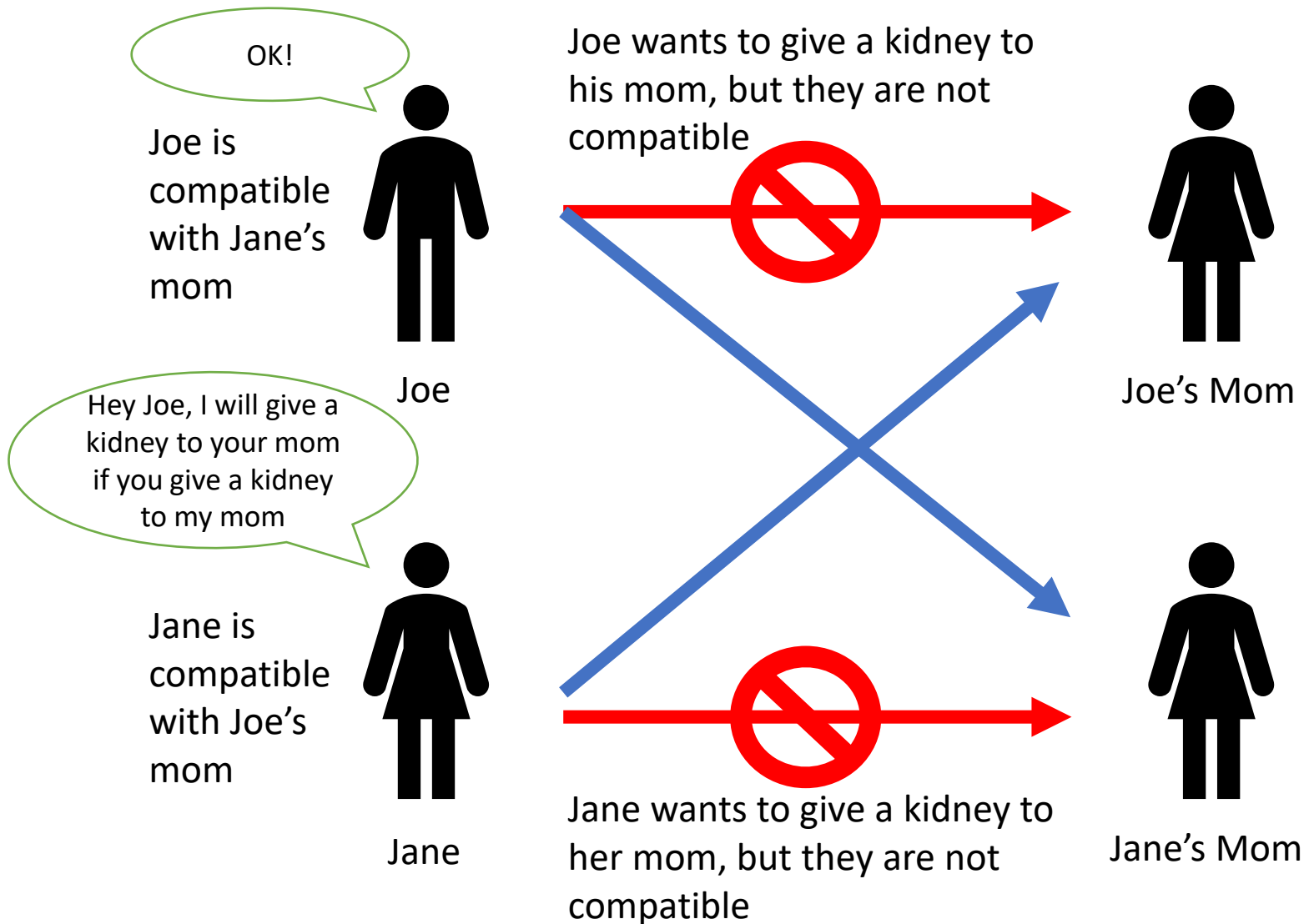
Kidney Exchange

60 Lives, 30 Kidneys, All Linked

February 18, 2012

FROM START TO FINISH A donation by a Good Samaritan, Rick Ruzzamenti, upper left, set in motion a 60-person chain of transplants that ended with a kidney for Donald C. Terry Jr., bottom right.

Dorm Rooms Allocation

- Universities have to assign students to dorm rooms every year

- Not a simple problem:
  - Can existing students keep their room or not?
  - If a student wants to change rooms, do they have to give up the room they have or not? (i.e. can they get a worse room or only a better room)
  - What are the efficiency and equity implications of different mechanisms for allocating rooms?

Auctions

- Market mechanism that uses prices to determine allocation

- And at the same time serves as a price discovery mechanism

- There are many types of auctions. They differ on:
  - What constitutes a bid
  - How bids are placed
  - How the final price and quantities to be traded are allocated

Keyword Auctions (online advertising)

eBay (online auctions)

Spectrum Auctions

What is this course about?

- Who gets what and at what price

- We will look at two contexts:
  - Matching Markets: When there are no prices
  - Auctions: When determining a price is hard

- Please read the syllabus:
  - If you have questions, ask in Ed (or by e-mail if it is a more personal issue)
  - If there is any problem with deadlines, let me know ASAP to adjust
  - Request your SDS accommodations with time, so we have time to arrange them