

UNIVERSITY OF PENNSYLVANIA
School of Arts and Sciences
Department of Economics

ECON 262: Market Design
Special Topic: Social and Economic Networks
Spring 2018

Basic Information

Course Head	Prof. Benjamin Golub Department of Economics, Harvard Visiting Department of Economics, UPenn 2017-18 ben.golub@gmail.com
<i>Office hours</i>	Thursday 5-6:00 (tentative) McNeil 541 (youcanbook.me)
TA	Carlos Segura Rodriguez Graduate student, Department of Economics, UPenn cseg@sas.upenn.edu
<i>Office hours</i>	TBD
Meeting time	Lecture Tuesday and Thursday 9:00-10:20am No recitation
Location	McNeil 286-7
Prerequisites	ECON 101 (Intermediate Microeconomics) and 103 (Statistics for Economists) MATH 104 (Calculus) and either 114 or 115 (Basic analytic geometry with vectors, multivariable calculus)

Course description

Markets increasingly use and create networks, both social and technological. Some examples: the complex trading networks that underlie modern financial markets and supply chains; social media platforms; dating apps. These profoundly affect the economy and society more broadly: financial interdependencies are critical in economic crises, while rumors on Twitter have come to play a central role in our politics. How can we make sense of these phenomena—as individuals, within companies, and as policymakers? This seminar teaches models from the economics and statistics of networks that are essential to the task. Topics include the network origins of recessions, the diffusion of information and rumors, racial segregation, and matching markets. We emphasize how network models relate to key ideas from microeconomics.

Textbooks and readings

The main textbook that we will use for basic concepts and techniques of network analysis is:

- David Easley and Jon Kleinberg, *Networks, Crowds and Markets*. Cambridge University Press, 2010. There is a full-text version [available online](#).

A more advanced textbook if you want to get into the details of something is:

- Matthew O. Jackson *Social and Economic Networks*. Princeton University Press, 2008.

In addition, course material will include readings from the media, primary research literature, business publications, etc.

Assignments and evaluation

The assignments and their contributions to the grade are as follows. All assignments should be submitted on Canvas in electronic form by their due dates and times.

- 35% problem sets (due weekly on Thursday, with exceptions):
 - quantitative exercises;
 - written case comments;
- 35% midterm exams;
 - in-class, open book, equally weighted;
 - **March 1** and **April 12**;
 - if you miss one exam, the other is weighted double;
- 20% presentations: **April 19 and 24**
 - groups of 3-4;
 - 9-minute slide talks;
 - two options:

- mini-lecture on a networks topic not covered in the main class. Do about 20-40 pages of reading to learn topic, condense key concepts, teach others the topic.
 - an original analysis of economic policy or business strategy based on ideas you've learned in the course
- 10% attendance (two absences free, 1.5% off for each subsequent);

Late policy: lowest two problem sets dropped.

Course Outline

25 lectures. This outline is *rough*, both as to content and order. One lecture is organizational. [rough number of lectures]

1. Introduction
 - 1.1. Some motivating problems: The three phases of viral growth and the key economics of each ([lecture notes](#)) [1.5]
 - 1.2. Basic concepts: graphs, paths, cycles, components, diameter, etc. ([EK Chapter 2](#)) [1]
 - 1.3. The friendship paradox, and thinking about selection [1]

2. Games in networks: strategic models relevant to initial adoption and contagion
 - 2.1. Brief introduction to/reminder of game theory and basic coordination games: ([EK Chapter 6](#)) [1]
 - 2.2. Network coordination games ([EK Chapter 19](#)) [2]
 - 2.3. Large markets with network effects ([EK Chapter 17](#)) [1]
 - 2.4. Residential segregation and white flight ([Card, Mas, and Rothstein 2008](#)) [1]
 - 2.5. Time permitting: Schelling coordination, focal points, higher-order beliefs; [Chwe \(2013\)](#) [1]

3. Viral growth
 - 3.1. Cascades and branching processes ([EK Chapter 21](#)) [1]
 - 3.2. Statistics with branching processes ([lecture notes](#)) [1]
 - 3.3. Practical measurement of user growth ([Hsu notes](#)) [0.5]
 - 3.4. Time permitting: epidemics, strategic vaccination, network formation ([EK Chapter 21](#)) [1]

4. Networked markets
 - 4.1. Financial networks and financial crises ([lecture notes](#), [Glasserman and Young 2016](#)) [0.5]
 - 4.2. Supply chains and macroeconomic volatility ([lecture notes](#), [ten Raa 2006](#), [Gabaix 2016](#)) [1.5]
 - 4.3. Matching markets ([EK 10.1-10.4](#)) [1]

5. Communication processes
 - 5.1. Gossip models of updating beliefs and behaviors ([lecture notes](#)) [1]
 - 5.2. Network centrality ([EK 14.1-14.3](#), [Langville and Meyer 2011](#), 12)
 - 5.3. Homophily, segregation, and polarization ([EK Chapter 4](#)) [1]
 - 5.4. Social learning in the field ([Mobius et al. 2015](#)) [1]

6. Strategic communication ([lecture notes and papers to be distributed later](#))
 - 6.1. Basic signaling models (Spence signaling, etc.) [1]
 - 6.2. Stigma, signaling, and silence [1]
 - 6.3. Stigma on social media [1]
 - 6.4. Time permitting: Fads, fashions, and rational herds: Information cascades [1]

Departmental Course Policies All Economics Department course policies are in force in Econ 103 even if not explicitly listed on this syllabus. See Departmental Policies for Undergraduate Economics Courses

<https://economics.sas.upenn.edu/undergraduateprogram/course-information/guidelines/policies>

Academic Integrity All suspected violations of the code of academic integrity as set forth in the Pennbook (<https://provost.upenn.edu/policies/pennbook>) will be reported to the Office of Student Conduct. Confirmed violations will result in a failing grade for the course. We may check identification cards at exams, so please bring yours. <http://www.upenn.edu/academicintegrity/>

Bibliography

- Card, David, Alexandre Mas, and Jesse Rothstein. "Tipping and the Dynamics of Segregation." *The Quarterly Journal of Economics* 123, no. 1 (2008): 177-218.
- Chwe, Michael Suk-Young. *Rational Ritual: Culture, Coordination, and Common Knowledge*. Princeton University Press, 2013.
- Gabaix, Xavier. "Power Laws in Economics: An Introduction." *The Journal of Economic Perspectives* 30, no. 1 (2016): 185-205.
- Glasserman, Paul, and H. Peyton Young. "Contagion in Financial Networks." *Journal of Economic Literature* 54, no. 3 (2016): 779-831.
- Langville, Amy N., and Carl D. Meyer. *Google's PageRank and Beyond: The Science of Search Engine Rankings*. Princeton University Press, 2011.

Langville, Amy N., and Carl D. Meyer. *Who's #1?: The Science of Rating and Ranking*. Princeton University Press, 2012.

Mobius, Markus, Adam Szeidl, and Tuan Pham. "Treasure Hunt: Social Learning in the Field." Working paper, 2015, available at http://www.personal.ceu.hu/staff/Adam_Szeidl/papers/treasure_hunt.pdf

ten Raa, Thijs. *The Economics of Input-Output Analysis*. Cambridge University Press, 2006.