EC251 Industry Networks and Economic Development
(Spring 2024)

Seminar Leader: Thomas Eife
Course Times: Tuesday, Thursday 0900-1030
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Office Hours: by appointment

Course Description

The course Industry Networks and Economic Development explores the impact of industry networks on countries' GDP and their development opportunities. The curriculum is divided into two parts to provide students with a comprehensive understanding of network theory and its practical applications.

Part 1: Primer in Network Theory

In this section, students will delve into the fundamental concepts and principles of graph theory. We study key network measures and strategies for handling bipartite networks. The course places a strong emphasis on the visualization of networks. Part 1 includes a short primer in programming using Python and Gephi. No prior knowledge of Python or Gephi is required.

Part 2: Applications

Building on the foundation laid in Part 1, this part focuses on practical applications of network theory in economic contexts. Students will explore the historical and contemporary use of input-output tables, understand the role of the Product Space in measuring countries' development opportunities, and analyze and apply productivity networks.

Part 2 includes the following topics:
- The Product Space and Economic Complexity
  - The Product Space as a one-mode projection
  - Visualizing the Product Space
  - Measuring and interpreting Economic Complexity
- Production networks
  - The basic structure of an input-output table
  - A brief history of input-output analysis
  - Production networks and the business cycle
  - Production networks and international trade
- Productivity networks
  - The gravity equation and the distance puzzle
  - The shale revolution in the US

Learning Outcomes

- **Basic Understanding of Network Theory**: Define and explain fundamental concepts of graph theory. Interpret and apply key centrality measures in the context of economic networks. Cultivate a curiosity-driven mentality to dig deeper into advanced concepts beyond the course.
- **Network Visualization and Communication Skills**: Demonstrate proficiency in visualizing economic networks. Communicate complex network structures effectively through visual representation.
- **Programming Skills and Advanced Scripting Using ChatGPT:** Acquire basic programming skills in Python, including syntax and data structures. Demonstrate the ability to write simple Python scripts to solve basic computational problems. Explore advanced scripting techniques using ChatGPT's natural language processing capabilities.
- **Critical Thinking and Application**: Apply network theory concepts to critically analyze industry networks in modern macroeconomics.

Requirements

Prerequisites
This is an advanced economics course. Students taking this course should have already successfully completed Macroeconomics and Mathematics for Economics.

Textbooks
The following book is required reading. Every week, a student will present a chapter from the book.
- Albert-László Barabási (2014) *Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life*

Academic Integrity
Bard College Berlin maintains the highest standards of academic integrity and expects students to adhere to these standards at all times. Instances in which students fail to meet the expected standards of academic integrity will be dealt with under the Code of Student Conduct, Section 14.3 (Academic Misconduct) in the Student Handbook.

Attendance
Attendance at all classes is a crucial part of the education offered by Bard College Berlin. To account for minor circumstances, two absences from twice-per-week courses or the equivalent (e.g. one absence from a once-per-week course) should not affect the participation grade or require documentation.

Bard College Berlin may not offer credit for any course in which a student has missed more than 30% of classes, regardless of the reasons for the absences. The full Bard College Berlin attendance policy can be found in the Student Handbook, Section 2.8.

Use of cell phones and scientific calculators

The use of cell phones is not allowed during the classes. Please leave your cell phone in your bag during the classes.

<u>Computer and Software requirements</u>
The students will be required to bring their laptops to some of the classes. During the course we will use the software packages Gephi and Python.

<u>Assessment</u>
Assessment will be based on attendance, preparation for classes, student presentations, regular and active participation, possibly quizzes and handing in group problems sets, as well as a mid-term and a final exam.

Grade Breakdown
- Seminar participation (class exercises), student presentations, handing in problem sets, and possible quizzes 40%
- Mid-term exam 30%: date and Time TBA (about the end of week 7).
- Final exam 30% date and Time TBA

Schedule

Classes start on Tuesday Jan 30 and run until Thursday May 9, with spring break planned from Monday, March 25th, - Monday, April 1st, 2024. Completion week is from Monday, May 13th through Friday, May 17th. Make-up classes and final exams can take place in completion week. Students are required to be on campus during completion week.

The following course structure is provisional in order to allow for flexibility. It is the students' responsibility to keep themselves informed of any changes to the schedule provided here. An up-to-date schedule will be maintained by the course management in our Google classroom system. Lecture slides and problem sets will be posted in Google classroom.

<u>Tentative course structure</u>

Week 1
- Notation, terminology
- Historical abstract

Week 2 to 7
- Network measures,
- Visualizations using Gephi

Week 8 to 10
- Product Space
- Economic Complexity
- Visualizations using Python

Week 11 to 14
- Industry networks 1: Production networks
- Industry networks 2: Productivity networks

(this version: December 22, 2023)