

# EC251 Industry Networks and Economic Development

## (Fall 2024)

Seminar Leader: Thomas Eife  
Course Times: Tuesday, Thursday 1730-1900  
Place: TBA  
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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 part, 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. In the second part, we will use statistics package Stata. No prior knowledge of Python, Gephi, or Stata is required. The faculty will try to organize complimentary copies of Stata.

#### 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.

#### Textbook

The following book is required reading. Each week, two students will present two chapters from the book. With 16 chapters in total, we will complete the book by about week 8.

- 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.

#### Computer and Software requirements

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.

#### Assessment

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, handing in problem sets, and quizzes 30%
- Student presentations 10%
- Mid-term exam 30%: date and Time TBA (about the end of week 7).
- Final exam 30% date and Time TBA

#### Problem sets and term paper

Problem sets are mandatory due one week after being given. Problem sets will be given throughout the course where appropriate and constitute an integral part of the final grade. Solutions to problem sets can only be submitted on an A4 paper and need to be uploaded on Google classroom. Make sure that your solutions are organized and clearly written.

### Schedule

Classes start on Tuesday September 3 and run until Thursday December 12, with Fall break planned from Mon, Oct. 21 - Sun, Oct. 27, 2024. Completion week will take place from Mon, Dec. 16 - Fri, Dec. 20, 2024. Attendance is mandatory 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.

#### Tentative course structure

##### 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

*Classes missed due to federal holidays will not be rescheduled.*

(this version: June 22, 2024)