

Outline of the course
Introduction to the econometrics of causality

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Instructors:

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This course is offered jointly by the ECO and the SPS departments. It features 20 lectures from mid September until December and it will give two credits to students passing the final exam. Students are allowed to attend also half of the lectures (at their choice) in which case the course will give 1 credit.

At this stage, given Covid-19, we plan to have the first and the last lectures “in person” to get to know each others (in a location to be decided later), while all the other lectures will be on line via zoom. If conditions will improve, we will have all lectures “in person”.

1. Introduction to Causality (1 lecture)

ANDREA, ELIAS, MIRIAM

Thursday September 17, 15.00–17.00

- The problem and examples
- The potential outcomes framework
- Why the naive estimator is not a solution
- Sample selection bias

2. Randomized experiments (1 lecture)

ELIAS

Tuesday September 22, 15.00–17.00

- The best solution with some cons: theory, external validity
- Randomization inference

- Randomized control trials
- Examples

3. **Standard regression analysis and causality (1 lecture)**

ANDREA

Thursday September 24, 15.00–17.00

- The Population Regression function
- Conditions under which it has a causal interpretation
- RCT and regression
- Alternatives when Randomization is not an option: the rest of the course

4. **Difference in difference (3 lectures)**

ELIAS

Tuesday September 29, 15.00–17.00

Thursday October 1, 15.00–17.00

Tuesday October 6, 15.00–17.00

- The identification strategy
- What must be true for the strategy to work: pros and cons
- Implementation
- Examples

5. **Solutions based on control functions (2 lectures)**

ANDREA

Thursday October 8, 15.00–17.00

Tuesday October 13, 15.00–17.00

- Heckman two step procedure
- Generalized control function approach
- What must be true for the strategy to work: pros and cons
- Examples

6. **Instrumental variables (2 lectures)**

ANDREA

Thursday October 15, 15.00–17.00

Tuesday October 20, 15.00–17.00

- The traditional interpretation of IV

- The LATE interpretation of IV
- What must be true for the strategy to work: pros and cons
- Examples

7. **Regression discontinuity designs (3 lectures)**

ELIAS, ANDREA

Thursday October 22, 15.00–17.00

Thursday October 29, 15.00–17.00

Tuesday November 10, 15.00–17.00

- The identification strategy
- Sharp RDD
- Fuzzy RDD and the local LATE interpretation of RDD
- What must be true for the strategy to work: pros and cons
- The actual implementation and its problems o Testing identification conditions o Multiple thresholds
- Examples

8. **Experiments**

MIRIAM

Thursday November 12, 15.00–17.00

- An encompassing logic of design-based causal inference with observational data
- Examples and Applications
- What can go wrong

9. **Matching methods (1 lecture)**

ANDREA

Tuesday November 17, 15.00–17.00

- The identification strategy
- What must be true for the strategy to work: pros and cons
- Exact matching
- Propensity score matching
- examples

10. **Synthetic control methods (1 lecture)**

ELIAS

Thursday November 19, 15.00–17.00

- The identification strategy
- What must be true for the strategy to work: pros and cons
- examples

11. **Mediation Analysis (1 lecture)**

ELIAS

Thursday November 26, 15.00–17.00

- Introduction to Directed Acyclic Graphs
- The back-door criterion
- The front-door criterion
- What must be true for the strategy to work: pros and cons
- examples

12. **Uncertainty (2 lectures)**

ELIAS

Thursday December 3, 15.00–17.00

Thursday December 10, 15.00–17.00

- Parametric Inference
- Non-parametric inference: resampling with replacement
- Randomization inference
- Clustering

13. **Wrap Up (1 lecture)**

ANDREAS, ELIAS, MIRIAM

Thursday December 17, 15.00–17.00

- Summary, applications and extensions

Exercise classes

No exercise class

Teaching material (available on Brightspace or in the library)

- Lecture notes by the instructor

- Josh Angrist, Steve Pischke, “Mostly harmless econometrics: an empiricist’s companion”, Princeton University Press,
- Josh Angrist, Steve Pischke, “Mastering metrix: the path from cause to effect”, Princeton University Press,
- Articles in journals

Final exam and Grading

There will be final class room exam (referee report) and a take home exam (simulation exercise).