

# An Introduction to Causal Inference with Observational Data

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## *Course Outline*

The aim of this course is to provide an introduction to the identification and estimation of causal effects using observational data typical of the social sciences (e.g. survey or administrative data). We first briefly discuss i) the assumptions; ii) the potentials and iii) limits of using observational data in contrast to randomized experiments to obtain credible estimates of the causal effects of interest. Second, I introduce two clear and rigorous conceptualizations of the notion of causality: potential outcomes (POs) and directed acyclic graphs (DAGs). Then, we cover various strategies based on different data requirements and assumptions to estimate causal effects with observational data: 1) regression control functions with sensitivity analysis to unmeasured confounders; 2) propensity score and matching analysis; 3) difference-in-difference and synthetic control analysis; 4) regression discontinuity design. We will use minimum formalization, mostly relying on graphical tools and examples from the literature to grasp the main concepts. Each theoretical lesson is complemented by a laboratory/computer session in which the Stata software is used to analyze real-world data.

Requirements: the students are expected to have basic knowledge of statistics (descriptive, inferential) and linear regression. Basic knowledge of Stata (files management, data preparation) is also warranted.

## *Instructor's bio*

*Moris Triventi*, PhD, is Associate Professor in the Department of Sociology and Social Research at the University of Trento (Italy), where he teaches Quantitative Research Methods and Sociology of Education. From 2013 to 2016 he was Research Fellow at the European University Institute (Fiesole, Italy). His research interests comprise social inequalities, education, crime, migration and policy evaluation. His works have been published, among others, in *Annual Review of Sociology*, *Policy Sciences*, *International Migration Review*, and *European Sociological Review*.

*Course organization*

	<b>5/18/2020</b>	<b>5/19/2020</b>	<b>5/20/2020</b>
<b>9.00-10.30 – LECTURE 1</b>	Introduction to causal inference with observational data: potential outcomes (PO) framework	Stata Lab: Propensity score analysis and matching in Stata	Introduction to Regression Discontinuity Design
<b>Break</b>			
<b>11.00-12.30 –LAB 1</b>	Causal graphs, regression control function and sensitivity analysis	Difference-in-difference (and Synthetic control methods)	Stata Lab: Application of RDD
<b>Lunch</b>			
<b>1.30-3.00 – LECTURE 2</b>	Lab: Model specification for the estimation of causal effects (Daggity) using regression control functions with sensitivity analysis (Stata)	Stata Lab: Application of difference-in-difference and synthetic control methods in Stata	Discussion of students' projects and research ideas, in the framework of causal inference analysis
<b>Break</b>			
<b>3.15-4.45 –LAB 2</b>	Propensity score and matching approaches	Exercises for students	