# Applied Econometrics II

**Professor**
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**Schedule**
Monday and Wednesday, 7:00 – 9:00 PM
Office Hours: Schedule your appointment on my website.

**Course Description**
The topics learned in "Applied Econometrics I" give the foundation for this course. The scope of this course will be on methods that allow us to measure the causal effects. We will start with a short review of OLS making emphasis in the limitations of this method when doing a causal analysis. Later, we will explore the randomized experiments method applied to social sciences, with the objective of looking at the most reliable method in terms of identification. Then, we move to quasi-experimental methods that mimic (in a way) the strategies of a randomized experiment. The limitations of these methods would be emphasized, we will analyze how these methods have been used in the past with papers. We will put them into practice through problem sets using R or Stata.

Being an applied subject, during the course we will use data and statistical packages (mainly R and Stata) to make an empirical analysis applying the methods learned. The Workshop is a complementary course and will aid students to improve their programming skills in R and Python, mainly. At the end of the course, the students should be able to: use real data and adequately implement experimental and quasi-experimental methods to estimate causal effects.

## Grading

**Global:**
1/3 Workshop
2/3 Econometrics Fundamentals

**Grading of Econometrics Fundamentals**:
30% Problem sets
30% 1st Midterm Exam
20% 2nd Midterm Exam
10% Paper presentation
5% Zoom Q's
5% Podcasts and participation

## Course material

The course material (learning material, problem sets, solutions, etc.) will be available in *Canvas*.

## References


**(MH) Angrist, J. and J.S. Pischke (2009). "Mostly Harmless Econometrics," Princeton University Press**

**(W) Wooldridge, Jeffrey M. (2012). "Introductory Econometrics. A Modern Approach," 5th ed., Southwestern Cengage Learning**

**(AI) Athey, S. and G. Imbens (2016). "The Econometrics of Randomized Experiments," in Handbook of Field Experiments, Banerjee and Duflo (eds)**

**(CIT) Cattaneo, M., Idrobo, N. and R. Titiunik (2019). "A Practical Introduction to Regression Discontinuity Designs (Vol 1 and 2)," Cambridge University Press.**

(D) Duflo, Esther, Glennerster, Rachel and Michael Kremer (2007). "Using Randomization in Development Economics Research: A Toolkit." CEPR Discussion Paper No. 6059.

**Syllabus**

1. **Causality framework**

   *Ref: (MH) Cap. 2*

   a. Potential outcomes
   b. Treatment Effects
   c. Self-selection bias, Naive OLS

2. **Experimental Methods**

   *Ref: (MH) Cap. 2; (AI) Cap. 1-5*

   a. Identification of parameters of interest
   b. Estimation
   c. Experimental design: theory of change, calculations of the statistical power, stratified experiments
   d. Limitations
   e. Machine learning and experiments

3. **Instrumental Variables**

   *Ref: (W) Cap. 15, 16; (MH) Cap. 4; (AI) Cap. 9*

   a. Assumption: exogeneity
   b. Reduced-form, ITT, natural experiments
   c. Assumption: relevance
   d. First stage, IV, estimation, inference
   e. Relation with RCT: Partial participation, LATE
   f. Simultaneous Equation Models
   g. Overidentification: 2SLS
   h. GMM
   i. Limitations

4. **Difference-in-Differences**

   *Ref: (MH) Cap. 5*

   a. Panel Data and first differences
   b. First Differences and Fixed Effects Model
   c. Clustered SEs
   d. Assumption: parallel trends
   e. Estimation and identification, TOT
   f. Tests with pre-trends
   g. Robustness: DDD, falsification tests

5. **Regression Discontinuity**

   *Ref: (MH) Cap. 6; (CIT) Vol 1 y 2.*

   a. Assumptions: continuity and independece
   b. Sharp RDD. Graphical evidence, simple estimation, robust estimation, local ATE.
   c. Extensions: Fuzzy RD, many discontinuities, kink-RD
   d. Tests and limitations
   e. Local randomization.
   f. Permutations Test (Fischer Exact test).

6. **Matching**

   *Ref: TBD*

   a. Assumptions and types of matching
   b. Estimation
   c. Application in RCTs
   d. Synthetic control methods
   e. Machine learning