Syllabus

[cmcd.economia@fgv.br]

Course: ***Microeconometrics 2***

Professors:

Teaching Assistant: TBD

2026 FOURTH QUARTER

PROGRAM

This course is the second part of a sequence of two courses that presents core topics in Microconometrics. It covers topics about regression discontinuity design, instrumental variables, Panel Data and Difference-in-Differences, Shift-Share Designs, Synthetic Controls and Partial Identification. Its main goal is to prepare the applied researcher to use econometric tools appropriately.

TOPICS

1) Regression Discontinuity Design (RDD)
   a. Sharp and Fuzzy RDD
   b. Extrapolating Local Results

2) Panel Data and Difference-in-Differences
   a. Identification and Estimation
   b. Inference

3) Instrumental Variables (IV)
   a. Local Average Treatment Effect (LATE)
   b. Marginal Treatment Effect (MTE)

4) Shift-Share Designs, and non-random exposure to exogeneous shocks

5) Synthetic Controls

6) Partial Identification: Sample Selection, Misclassification

GRADING

Presentations: 30%

- The length of the presentation will depend on the number of enrolled students.
- Whether the presentation will be individual or in pairs will depend on the number of enrolled students.
- We will post another document with more information on what we expect from these presentations. Read it carefully. Here, we highlight that the goal of the presentation is to offer a thoughtful critique of the article, discussing its weak points and suggesting possible improvements.
- To help you prepare your presentation, we recommend two readings:
    - Chapter 3 in *Doing Economics What You Should Have Learned in Grad School—But Didn't* by Marc F. Bellemare (https://mitpress.mit.edu/books/doing-economics)
    - Chapter 3 in *A Guide for the Young Economist* by William Thomson (https://www.amazon.com.br/Guide-Young-Economist-William-Thomson/dp/026251589X)

Problem Sets: 20%. The problem sets may cover:

- Some theoretical questions from the lectures. It may include particular examples or lengthier proofs.
- Coding exercises (for example, Monte Carlo simulations or specific empirical applications).
- Analyzing and criticizing papers.
- The student may submit each problem set one week after the official deadline. In case of a late submission, the student's score will be penalized in 20 p.p. in this problem set. For example, suppose the student scored 250 points out of 300 points in a late submission. In this case, the student's score in this problem set will be $S = 100 \times \frac{250}{300} - 20 = 63.3$. This policy is set as a "no-questions asked" excuse to help students who, for some reason, are unable to complete submit their problem sets on time.

Short Research Project: 50% [Deadline: TBD]

- This project must contain a research question in any topic that can be answered using some of the techniques learned in Microeconometrics or more advanced econometric tools.
- This project must also contain one paragraph explaining how to use a specific econometric technique to answer this question and one paragraph explaining the relevance of this research question with respect to the literature.
- This short research project must have at most 1500 words. The reference list, your name and your project title do not count for the word limit.
- Use this link to count the number of words: https://www.aeaweb.org/journals/word-count/.
- In addition to the complete file, you must also submit the file used in the word counter (which must be exactly the same as the complete file, but without title, name, and references).
- If you are submitting a research proposal that has already been used in another class, you should submit both the original proposal and a new document with an updated version of the research proposal. In this case, you will be evaluated on the value added of the new version relative to the previous one.

To pass the course, the student must achieve a final score greater than or equal to 60.

(TENTATIVE) SCHEDULE AND BIBLIOGRAPHY

Lecture 1) TBD **and** TBD**:**

a. IV: LATE

- IW, Session 6.3
- Imbens, G. & Angrist, J. (1994) Identification and Estimation of Local Average Treatment Effects. *Econometrica*, 62 (2)
- Mixtape, Chapter 7

Lecture 2) TBD**:**

a. IV: MTE

- Cornelissen, T., Dustmann, C., Raute, A. & Schönberg, U. (2016) From LATE to MTE: Alternative Methods for the Evaluation of Policy Interventions. Labour Economics, 41.

Lecture 3) TBD**:**

a. Sharp and Fuzzy RDD

- IW, Session 6.4
- Mixtape, Chapter 6 (except 6.5)
- Imbens, G. & Lemieux, T. (2008) Regression Discontinuity Designs: A Guide to Practice. *Journal of Econometrics*, 142.
- Lee, D. & Lemieux, T. (2009) Regression Discontinuity Designs in Economics. *NBER Working Paper* 14723.
- Calonico, S., Cattaneo, M, Farrel, M. & Titiunik, R. (2017) rdrobust: Sofware for Regression Discontinuity Designs. *The Stata Journal*, 17 (2).

Lecture 4) TBD**:**

a. RDD: Extrapolating Local Results

- Cattaneo, M., Keele, L., Titiunik, R. & Vazquez-Bare, G. (2016) Interpreting Regression Discontinuity Designs with Multiple Cutoffs. *The Journal of Politics*, 78 (4)
- Dong, Y. & Lewbel, A. (2015) Identifying the Effect of Changing the Policy Threshold in Regression Discontinuity Models. *The Review of Economics and Statistics*, 97(5)

Lecture 5) TBD**:**

a. Partial Identification: Sample Selection, Misclassification

- Chen, X. & Flores, C. (2015) Bounds on Treatment Effects in the Presence of Sample Selection and Noncompliance: The Wage Effects of Job Corps.
- Bartalotti, O., Kédagni, D. & Possebom, V. (2022) Identifying Marginal Treatment Effects in the Presence of Sample Selection. *Journal of Econometrics*.
- Ura, T. (2018) Heterogeneous Treatment Effects with Mismeasured Endogenous Treatment. *Quantitative Economics*, 9.

Lecture 6) TBD**:**

a. DiD: Identification and Estimation

- Roth et al (2023), “What’s Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature”
- Mixtape, Chapter 9 (except 9.6)

Lecture 7) TBD**:**

a. DiD: Inference

- Roth et al (2023), “What’s Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature”
- Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences- in-differences estimates?
- Ferman, B., & Pinto, C. (2019). Inference in Differences-in-Differences with Few Treated Groups and Heteroskedasticity.

Lecture 8) TBD**:**

a. Staggered DiD

- Roth et al (2023), “What’s Trending in Difference-in-Differences? A Synthesis of the Recent Econometrics Literature”

Lecture 9) TBD**:**

a. Synthetic Controls

- Abadie, A., Diamond, A., and Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program. Journal of the American Statistical Association, 105(490):493–505.
- Ferman, B. and Pinto, C. (2021). Synthetic controls with imperfect pretreatment fit. Quantitative Economics, 12(4):1197–1221.
- Ferman, B. (2021b). On the properties of the synthetic control estimator with many periods and many controls. Journal of the American Statistical Association, 116(536):1764–1772.
- Mixtape, Chapter 10

Lecture 10) TBD**:**

a. Shift-Share Designs and non-random exposure to exogeneous shocks

- Adão, Rodrigo, Michal Kolesár, and Eduardo Morales. 2019. “Shift-Share Designs: Theory and Inference.”
- Borusyak, Kirill, Peter Hull, and Xavier Jaravel. 2022. “Quasi-Experimental Shift-Share Research Designs.”
- Borusyak and Hull. “Non-random exposure to exogeneous shocks”

Lecture 11) TBD**:**

a. TBD

Lecture 12) TBD **and** TBD **:** Students’ Presentation

CONTACT INFORMATION

Instructor:
Email:
Office:

Instructor:
Email:
Office:
Office Hours: https://calendly.com/possebomvitor/officehour

- Office hours are a pre-defined period of time that is entirely dedicated to students. During this period, feel free to drop by my office for any reason. You can ask me any questions related to the course, to academia, to your career, to Economics or to your life as a graduate student.

ACCEPTABLE USE POLICY

You are free to use any published materials (e.g., a textbook), in preparing your assignments or for learning the material more generally. Similarly, you are free to use online resources such as stackoverflow questions or R tutorials. You are also strongly encouraged to work with others in your class. This is particularly helpful for learning to code. Each person must turn in their own assignment.

We do not tolerate cheating and plagiarism. Cheating or plagiarism will result in a 0 on the assignment and will be reported to the department. You are welcome to work together in groups, but you are required to submit your own write-up and your own code.

Please take precautions to avoid putting us in a situation where we are forced to decide if two documents are “too similar”. As future researchers, consultants, bankers, entrepreneurs etc, learning to do honest work in a timely manner is more important than getting everything correct.

If you are uncertain, please add proper citation. For example, if you relied heavily on a group-member's code for one part of an assignment, then you should make a footnote highlighting this fact. As long as proper credit is clearly given, it does not constitute cheating.

TEXTBOOKS AND MAIN SURVEY PAPERS

This course covers a large variety of topics. Consequently, we use many different references, including textbooks, survey papers and specific papers. Here, we list the references that are repeatedly used through this course.

- **Toolkit:** Kremer, M., Glennerster, R., & Duflo, E. (2007). Using Randomization in Development Economics Research: A Toolkit.
- **AP:** Angrist, J. D. & Pischke, J. (2009). Mostly Harmless Econometrics. Princeton University Press.
- **IW:** Imbens, G. & Wooldridge, J. (2009). Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature*, 47 (1)
- **Mixtape:** Cunningham, S. (2020). Causal Inference. The Mixtape, 1. (https://mixtape.scunning.com/)
- **GT:** Glewwe and Todd (2022). Impact Evaluation in International Development: Theory, Methods, and Practice. (http://hdl.handle.net/10986/37152)

There are many textbooks that cover topics related to the ones covered in this course. A standard textbook about cross-sectional and panel data is Wooldridge’s *Econometric Analysis of Cross Section and Panel Data*. Another standard option that covers cross-section, panel data and time series topics is *Econometrics* by Hayashi.

I don’t think that there is an optimal textbook. Some books work best for some students and other books work best for other students. Sometimes, you will need to read more than one reference to really understand a topic. Therefore, feel free to check any references that you find useful.

SOFTWARE

Much of the course work in this course will involve analysis of data using *R*, an open-source implementation of the object-oriented programming language *S*. It is widely used by applied statisticians and its libraries implement a wide variety of statistical and graphical techniques with applications to a range of disciplines, such as the agricultural and biological sciences, genetics, neuroscience and economics.

R can be downloaded from https://cran.r-project.org. The program documentation is excellent. There are also many excellent and free *R* references available online, for example, *Econometrics in R* (https://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf) by G. Farnsworth and *Applied Econometrics with R* (https://link.springer.com/book/10.1007/978-0-387-77318-6) by Christian Kleiber and Achim Zeileis. If your time permits and you want to dig deeper, there are also more programming-oriented references such as *An Introduction to R* (https://cran.r-project.org/doc/manuals/R-intro.pdf) by W. N. Venables, D. M. Smith and the *R* Core Team, and *Hands-on Programming with R* (https://rstudio-education.github.io/hopr/) by Garrett Grolemund. However, I recommend learning by trial and error, as it is the most time efficient approach and sufficient for the type of coding problems that we will consider.

If you have never used *R* (and have never used another programming language), it might be helpful to check Chapter 1-12 in this free book (https://bookdown.org/ndphillips/YaRrr/) by Nathaniel D. Phillips. There are two more online tutorials that are very informative and quick: *Introduction to R* (https://hhsievertsen.github.io/applied_econ_with_r/) by Hans H. Sievertsen. Moreover, Kyle F. Butts, Nick C. Huntington-Klein and Grant McDermott developed an online tutorial focusing on data cleaning and regression analysis: https://stata2r.github.io/.

Although introductory, two of my favorite references combining *R* and Econometrics is *Introduction to Econometrics with R* (https://www.econometrics-with-r.org/) by Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer, and *Using R for Introductory Econometrics* (http://urfie.net/read/index.html) by Florian Heiss. The theoretical depth of these books is surely not sufficient for a graduate course in Econometrics, but it covers most of the topics in this course and it brings many coding examples that may be helpful to you.

A deeper reference is *Causal Inference: The Mixtape* (https://mixtape.scunning.com/) by Scott Cunningham. It covers many recent econometric techniques and brings coding examples in *R* and *Stata*. However, it focuses exclusively on cross-section and panel data topics.

A similar resource is vikjam's and Shusuke-Hori's GitHub repository (https://github.com/vikjam/mostly-harmless-replication) that replicates the book *Mostly Harmless Econometrics* by Joshua Angrist and Jörn-Steffen Pischke. In this repository, you can find R, Stata, Python and Julia codes.

Moreover, there is a new book by Martin Huber that focus on policy evaluation with causal machine learning: https://drive.switch.ch/index.php/s/tNhKQmkGB48bjfz. It includes many examples in R.

If you are interested in *Python*, you may want to check the following introductory books:

- *Causal Inference for the Brave and True* (https://matheusfacure.github.io/python-causality-handbook/landing-page.html) by Matheus Facure Alves.
- *The Effect* (https://www.theeffectbook.net/) by Nick Huntington-Klein.

CLASSROOMS POLICIES

This class is committed to an inclusive learning environment. All students, teaching staff, and the professor are expected to treat each other with respect and dignity at all times. All community members should enjoy an environment free of any form of harassment, sexual misconduct, discrimination, or intimate partner violence.

Mental Health issues are an extremely common problem among graduate students (https://scholar.harvard.edu/bolotnyy/publications/graduate-student-mental-health-lessons-american-economics-departments).

To help any students, FGV offers the Pró-Saúde Program: https://eesp.fgv.br/pro-saude-fgv. Feel free to contact them at any time.

Moreover, there are many affordable options outside FGV that may be helpful to you too, such as

- Clínica Psicológica Ana Maria Poppovic – PUC-SP: https://www.pucsp.br/clinica/index.html.
- Psicodrama Público no Centro Cultura São Paulo: http://centrocultural.sp.gov.br/2020/03/05/subjetividades-e-espaco-publico/ e https://spcultura.prefeitura.sp.gov.br/evento/26868/.

Furthermore, there are many mindfulness and meditation apps that you may find useful:

- Ten Percent Happier: https://www.tenpercent.com/
- Unwinding Anxiety: https://unwindinganxiety.com/
- Meditopia: https://meditopia.com/pt/ (em Português)