

PS9591B: Regression and Causal Inference (Methods 2)

Department of Political Science – Western University, Winter 2025

Tuesday 10:00-12:00am and Wednesday 10:00-11:00am, SSC 7200

Instructor: Dr. Sebastián Vallejo Vera (sebastian.vallejo@uwo.ca)

Office hours: Tuesday 12-1pm or by appointment... mostly by appointment (SSC 7221)

Teaching assistant: Axel Dery (adery2@uwo.ca)

Office hours: TBD

Course description

This course introduces students to basic statistical techniques used to estimating and testing causal relationships. Evaluating causal claims is best done using an experimental design like randomized controlled trials. However, most of the data available to political scientists is observational in nature. Drawing causal inferences from observational data is a hard task but not an impossible one, given careful treatment of the data. A series of methodological tools are available to scholars to evaluate causal arguments and hypotheses using observational data and this course introduces the most commonly used ones for cross-sectional data structures—observations of subjects (like individuals, polities, or countries) at one point or period of time. At the end of this course, students should be able to interpret *many* of the empirical analyses reported in political science journals and monographs and produce their own empirical analyses to estimate and test causal relationships of interest.

Course objectives

- learn how to use data to answer cause-and-effect questions;
- understand the conditions under which we can identify causal relationships by making comparisons;
- learn how to use methodological tools like randomized trials, regression analysis, regression discontinuity designs and difference-in-differences to evaluate causal relationships;
- learn how to interpret empirical analyses reported in political science journals and monographs;
- learn how to produce empirical analyses to estimate and test causal relationships.

Course texts

All reading will be posted in Perusall. The main texts we will be using in this course are:

- 1 Huntington-Klein, N. (2021). *The Effect: An Introduction to Research Design and Causality*. CRC Press. **Full PDF freely available on the web: <https://theeffectbook.net/>.**
- 2 Hernán M.A. and Robins J.M. (2020). *Causal Inference: What If*. Boca Raton: Chapman & Hall/CRC.

- 3 Wooldridge, J. M. (2019). *Introductory econometrics: A modern approach*. South-Western Cengage Learning. 7th Edition.

Additional readings will be posted on Perusall.

Perusall

The main external platform we will use in this class is Perusall (www.perusall.com). Perusall is a free collaborative annotation tool that allows you to analyze texts collaboratively. All the required texts for the class, the most important supplementary readings, and the class slides are available on Perusall.

You can access Perusall through the Content tab in the OWL page for the course.

Course assessment

Students will be assessed as follows:

- **Homework from Textbook (35%):** There will be five assignments, each worth 7 points of the final grade.
- **Homework from Lectures (15%):** There will be three assignments, each worth 5 points of the final grade.
- **Final take-home exam (50%):** Students will be given a replication exercise. More details will be provided in class.
- **Readings (0%):** Students must complete the readings for each class.
- **Class participation (0%):** Students will be randomly asked to solve problems in the classroom. Be ready when you come to class! (But also, it's OK to get things wrong...)

Assignments and Assignment Schedule:

A document with all the assignments will be posted in Perusall. All the assignments from the workbook were taken from Wooldridge (2019) and include a portion that will require you to use R code and provide the output in R Markdown. The TA will go over the code during laboratories on Wednesdays. There will be a link in OWL for you to upload your finished homework.

Additionally, there will be various assignment from the lectures that will be made available for students. Each student must submit, at least, three assignments. Each one is worth 5 points.

Class Expectations

1. **Always be respectful and mindful of your classmates.**
2. The class starts at 10:00 AM. It is as early for you as it is for me. Please, be on time and awake, or somewhat awake, or faking being awake.

3. I will start the class at 10:00 AM with whoever is in the room. Arriving late? No problem. Just enter discreetly and quietly, take your seat, and we are all good. 10:15 AM is not the time to greet, chat, wave vigorously to your friends in the room. When you do this, you distract those that were on time and you distract me (it is also disrespectful, see point 1).
4. If you are going to be taking notes in your laptop/iPad, close all other tabs that might distract you from the lecture. The secret is to hang to my every word.
5. I cannot make you pay attention and participate. But I can ask you to avoid distracting the rest of the class. Remember: I already know the material. The important part is for you to learn it.
6. If you are going to be watching TikTok during class anyways, at least drop the links to the really funny ones.
7. I do not care if you are wearing pajamas, but please come to class. Worst case scenario, the material presence of your being might allow you to learn through osmosis.

A quick yet important note on cellphones: Our class is 120 minutes long. Most things in life can wait two hours to be resolved/answered/liked/swiped-right/retweeted/watched/poked/high-fived/instagamed/swiped-left/live-streamed. There is no need for you to have your cellphone out and about (yes, I notice when you are in your phone even when you try to hide it under your desk). If, for some reason, you need to have your cellphone out, please let me know before class (you know, as a courtesy).

Children in Class

I applaud all of you who go to school with children! It is difficult to balance academia, work, and family commitments, and I want you to succeed. Here are my policies regarding children in class:

1. All breastfeeding babies are welcome in class as often as needed. If your baby requires your attention, you can step outside and tend to them.
2. Non-nursing babies and older children are welcome as well. As a parent of two school-age children, I understand that babysitters fall through, partners have conflicting schedules, children get sick, and other issues like a global pandemic arise that leave parents with few other options. If your child requires your attention, you can step outside and tend to them.
3. All students are expected to join me in creating a welcoming environment that is respectful of your classmates who bring children to class.

I understand that sleep deprivation and exhaustion are among the most difficult aspects of parenting young children. The struggle of balancing school, work, childcare, and high inflation is tiring, and I will do my best to accommodate any such issues while maintaining the same high expectations for all students enrolled in the class. Please do not hesitate to contact me with any questions or concerns.

Late Work Policy

Legally defined adults are late with things ALL THE TIME (myself included).

That said, deadlines serve their purpose. They can create an external structure to help you plan your workload and prevent everything from piling up on you. Furthermore, we live (and learn) in a community. When I take longer to submit a paper revision to a journal, I make the editor's job more complicated. If many of you turn in your work late, it makes planning the material we need to cover more challenging for me.

In this class, there are two types of deadlines: 1) the fatal ones, which are deadlines that cannot be postponed, and 2) the non-fatal ones, which are suggestions and planning guides (rather than arbitrary and punitive dates meant to generate anxiety). The fatal deadlines are those that are immovable for practical reasons. For example, any work submitted to me after the deadline I must submit grades will not be considered because, well, I will have already submitted grades. Similarly, due to their nature, the Final Exam must be submitted within the agreed-upon times.

The non-fatal deadlines are more flexible. While I **strongly recommend** that you keep up with the class schedule, I also acknowledge that things happen (e.g., global pandemics, climate crises, life events). Since I don't want your assignments to pile up and I also don't want you to feel like you must disappear if you submit something late, for the rest of the deadlines (e.g., homework), I have adopted a more "liberal" policy with extensions. The only thing I ask is that you proactively communicate with me to find solutions for any delays that will allow you to successfully complete the course. Note that, even if there is no penalty for late submission, if you submit an assignment late, you might also get late feedback, which might lead to knowledge gaps during lectures.

Finally, remember that I (and your TA) also have a life outside the classroom, and it is partly scheduled around important course dates. If you submit an assignment late, there's a good chance it will take us longer to return it corrected.

Topics, Readings, and Assignments

Week #1 (January 6–7): Course Introduction

Review of syllabus, class organization, and installation of packages and datasets for in-class exercises and assignments.

1. Cunningham, S. (2020). *Causal Inference: The Mixtape*. Yale University Press: Introduction.

Week #2 (January 13–14): Introduction to Causal Inference

1. Hernán and Robins: Chapter 1;
2. Huntington-Klein: Chapter 3;
3. Angrist, J. D., & Pischke, J. S. (2014). *Mastering 'metrics: The path from cause to effect*. Princeton University Press: Introduction (Optional);
4. Gerber, A. S., & Green, D. P. (2012). *Field experiments: Design, analysis, and interpretation*. WW Norton. Chapter 1. (Optional);
5. Gertler, P. J., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. (2016). *Impact evaluation in practice*. The World Bank. Chapter 3. (Optional)

Week #3 (January 20–21): Core Concepts of Experimental Designs

1. Hernán and Robins: Chapter 2;
2. Huntington-Klein: Chapter 6;
3. Druckman, J. N., Green, D. P., Kuklinski, J. H., & Lupia, A. (Eds.). 2011. *Cambridge Handbook of Experimental Political Science*. Cambridge University Press. Chapter 2. (Optional);
4. Angrist, J. D., & Pischke, J. S. (2014). *Mastering 'metrics: The path from cause to effect*. Princeton University Press: Chapter 1 (Optional);
5. Gertler, P. J., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. (2016). *Impact evaluation in practice*. The World Bank. Chapter 4. (Optional)

Week #4 (January 27–28): The Simple Regression Model (SRM)

1. Huntington-Klein: pg. 45-58; Chapter 13;
2. Wooldridge, J. M. (2012). *Introductory econometrics: A modern approach*. South-Western Cengage Learning. 7th Edition: Chapter 2.

Week #5 (February 3–4): The Multiple Regression Model (MRM): Estimation, Part 1

1. Huntington-Klein: pg. 58-66; Chapter 13;
 2. Wooldridge: Chapter 3 (Optional);
 3. Angrist and Pischke: Chapter 2 (Optional).
- Assignment #1: Due February 18, 11:55pm.

Week #6 (February 10–11): The Multiple Regression Model (MRM): Estimation, Part 2

1. Wooldridge: Chapter 3;
2. Huntington-Klein: Chapter 13 (Repeat, Optional);

3. Angrist and Pischke: Chapter 2 (Optional).

- Assignment #2: Due February 25, 11:55pm;

*****February 17–18): Spring reading week. Enjoy the break!*****

Week #7 (February 24–February 25): The Multiple Regression Model (MRM): inference, Part 1

1. Wooldridge: Chapter 4;
2. Huntington-Klein: Chapter 13 (repeat again?! why not).

Week #8 (March 3–4): The Multiple Regression Model (MRM): inference, Part 2

1. Huntington-Klein: Chapter 13 (this can't be right... but it is);
2. Wooldridge: Chapter 4 (can't get enough of that Wooldridge).

- Assignment #3: Due March 17, 11:55pm;

Week #9 (March 10–11): A Primer on Time-Series (guest lecturer: Dr. Matt Lebo)

1. Linn et al. Forthcoming. A Practical Guide to Time Series Analysis. Chapter 1 and 5.

- Assignment #4: Due March 24, 11:55pm;

Week #10 (March 17–18): The Multiple Regression Model (MRM) with Qualitative Information: Binary (or dummy) variables and functional form

1. Wooldridge: Chapter 7.

- Assignment #5: Due March 31, 11:55pm.

Week #11 (March 24–25): Difference-in-Difference (DiD)

1. Huntington-Klein: Chapter 18;
2. Angrist and Pischke: Chapter 5 (Optional).

Week #12 (March 31–April 1): Regression Discontinuity Design (RDD)

1. Huntington-Klein: Chapter 20;
2. Angrist and Pischke: Chapter 4 (Optional).