Econometrics II: Causal Inference

Prof. Henkel

Summer Semester 2024

ECTS: 3

Language: English

Occurrence: Summer semester

Scheduling: Kick-off Friday April 19, 2024, 2:00 pm – 4:30 pm in person (room will be announced). The course will be taught as a series of seven half-day seminars in June and July, either in the morning or on the afternoon. Dates will be coordinated with participants. The course is planned to be held in person.

Registration: Until April 17, 2024, via Moodle.

Description of Achievement and Assessment Methods: Participants will be assessed based on their seminar presentation (60%), homework assignments (20%), and oral contributions to the course (20%).

- *Seminar presentations* will be held by groups of two. Each group will present one method of addressing the problem of causal inference (e.g., RDD). The presentation of 120 min to 150 min shall introduce and explain the respective method as well as applications. Presenters will suggest an article in which this method is applied. The group will bring a dataset with which participants will apply the respective method during the course. The lecturer will meet with each group beforehand to aid in the preparation.
- *Homework assignment*. For some of the methods that we discuss in the course participants will do a homework assignment that consists of applying the method to a dataset, presenting the results, and providing an interpretation (in writing).
- *Oral contributions*. It is expected that participants prepare the readings for each session and are able to reflect on them. In addition, they shall actively take part in the discussion of the seminar presentations.

The course is pass/fail, not graded. In order to pass the course, participants must take part in all classes. In case of excused absence due to illness they need to hand in a written assignment about the content of the class they have missed.

Prerequisites: Participants need to have econometrics knowledge corresponding to an introductory Ph.D. level course in econometrics. They should have participated in such a course, e.g. in "Econometrics I: Research Design and Estimation Methods" by Professor Hottenrott. They should also have basic knowledge of STATA or R. Free self-study material for STATA and R can be found at https://sites.google.com/site/ econometricsacademy, and for R specifically here (introduction) and here (regressions).

Content: Econometric analysis aims at uncovering economic mechanisms, their causes and effects. Understanding the mechanisms behind a phenomenon is indispensable if one is to give advice to managers or policy makers, or to build theory. Simple regressions on cross-sectional data show associations, but not causality, so we need more sophisticated methods. This course shall convey econometric methods that

allow causal inference, or at least to come closer to uncovering causal effects. The focus will be on applicable knowledge, less on details of the theory. The course is part of a series of econometrics courses at TUM School of Management that also comprises "Econometrics I: Research Design and Estimation Methods" by Professor Hottenrott and "Econometrics III: Advanced Econometrics and Machine Learning" by Professor Farbmacher.

Topics comprise various methods to address selection issues and come close to causality:
1. Randomized controlled trials and natural experiments
2. Matching
3. Regression discontinuity design
4. Instrumental variables
5. Panel data
6. Differences-in-Differences
7. Heckman selection models

Intended learning outcomes: Participants shall be able to select the appropriate econometric method given a certain problem and data set; to apply this method proficiently using STATA and/or R; to know the advantages and pitfalls of each method; and to judge if the econometric approach in published studies is correctly chosen and well executed.

Teaching and learning methods: Learning methods are a mix of seminar presentations by the participants, group discussions, application of econometrics software, lectures, and guest presentations. We will use STATA, though if you prefer you may use R instead. Participants are expected to prepare each session and in particular read the assigned material and run the regression examples provided by Cunnningham such that we can have a discussion in class.

Sessions and obligatory readings:[1]

We will use the textbook by Cunningham including the data examples, plus select papers on the respective method.
Cunningham, S. (2021): Causal Inference: The Mixtape. https://mixtape.scunning.com/index.html.

PLEASE READ THE ASSIGNED MATERIAL AND RUN THE STATA OR R EAMPLES BEFORE EACH SESSION.

Session 0 (Kick-off): Introduction
- Cunningham, Chapter 1

Session 1: Randomized controlled trials and natural experiments
- Cunningham, Chapters 2 – 4. These chapters are not specific to the topic of Session 1, but of general interest for the course.
- Randomized controlled trial. Wikipedia. https://en.wikipedia.org/wiki/Randomized_controlled_trial.
- Natural experiment. Wikipedia. https://en.wikipedia.org/wiki/Natural_experiment.
- Bechtold, L., Rosendahl Huber, L. 2018. Yes, I can! A field experiment on female role model effects in entrepreneurship. Working paper.

---

[1] I am grateful to my colleagues Oliver Alexy, Jens Förderer, Fabian Gäßler, Hanna Hottenrott, Hana Milanov, and Christoph Ungemach for suggesting additions to the reading list.

- Allcott, H., Rogers, T. 2014. The short-run and long-run effects of behavioral interventions: Experimental evidence from energy conservation. American Economic Review, 104(10), 3003-37.
- Koudijs, P. (2016) The boats that did not sail: Asset price volatility in a natural experiment. Journal of Finance, 71(3), 1185-1226.

Session 2: Matching
- Cunningham, Chapter 5
- Gordon, B. R., Zettelmeyer, F., Bhargava, N., Chapsky, D. 2019. A comparison of approaches to advertising measurement: Evidence from big field experiments at Facebook. Marketing Science, 38(2), 193-225.
- Vetter, M., Henkel, J., Piezunka, H. 2020. The effect of acquisitions on open source software development. Working paper.
- Blattman, C. 2010. The cardinal sin of matching. https://chrisblattman.com/2010/10/27/the-cardinal-sin-of-matching/.
- A reply to Blattman: https://econjeff.blogspot.com/2010/10/on-matching.html.

Session 3: Regression discontinuity design
- Cunningham, Chapter 6
- Flammer, C. 2015. Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. Management Science, 61(11), 2549-2568.
- Calvo, E., Cui, R., Serpa, J. C. 2019. Oversight and efficiency in public projects: A regression discontinuity analysis. Management Science, 65(12), 5651-5675.

Session 4: Instrumental variables
- Cunningham, Chapter 7
- Dittmar, J. E. 2011. Information technology and economic change: the impact of the printing press. Quarterly Journal of Economics, 126(3), 1133-1172.
- Samila, S., Sorenson, O. 2010. Venture capital as a catalyst to commercialization. Research Policy, 39(10), 1348-1360.

Session 5: Panel data
- Cunningham, Chapter 8
- Ball, G. P., Macher, J. T., Stern, A. D. 2020. Product recalls and new product development: Own firm distractions and competitor firm opportunities. Working Paper. https://www.hbs.edu/ris/Publication %20Files/WP%2019-028_9ad70e87-eec2-4108-96c3-0760ce6c6f3c.pdf.
- Becker, A., Hottenrott, H., Mukherjee, A. 2020. Division of Labor in R&D? Firm size and specialization in corporate research. Becker, A., Hottenrott, H., Mukherjee, A. 2022. Division of labor in R&D? Firm size and specialization in corporate research. Journal of Economic Behavior & Organization, 194, 1-23.

Session 6: Differences-in-Differences
- Cunningham, Chapter 9
- Catalini, C., Fons-Rosen, C., Gaulé, P. 2020. How do travel costs shape collaboration? Management Science, 66(8), 3340-3360.
- Marx, M., Strumsky, D., Fleming, L. 2009. Mobility, skills, and the Michigan non-compete experiment. Management science, 55(6), 875-889.

Session 7: Heckman selection models
- Heckman Correction. https://en.wikipedia.org/wiki/Heckman_correction.

- Certo, S. T., Busenbark, J. R., Woo, H. S., Semadeni, M. 2016. Sample selection bias and Heckman models in strategic management research. Strategic Management Journal, 37(13): 2639-2657.
- Criscuolo, P., Alexy, O., Sharapov, D., Salter, A. 2019. Lifting the veil: Using a quasi-replication approach to assess sample selection bias in patent-based studies. Strategic Management Journal, 40(2), 230-252.

Further suggested readings:
- Causal inference:
  - Angrist, J. D., Pischke, J. S. 2008. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton University Press.
  - Angrist, J. D., Pischke, J. S. 2014. Mastering 'Metrics: The Path from Cause to Effect. Princeton University Press.
- General background on econometrics:
  - Wooldridge, J. M. 2003. Introductory Econometrics.

Responsible for module: Prof. Dr. Joachim Henkel (henkel@wi.tum.de).