ECO 439H1S
Empirical Methods in Microeconomics

University of Toronto

Department of Economics
Winter 2024

Course Description

This course is primarily designed for advanced undergraduate students interested in econometric methods used in empirical research. The focus of the course will be on causal inference and will examine identification issues in empirical microeconomics, with an emphasis on the sensible application of these methods to empirical problems. Students will learn about randomized control trials, linear regression, matching, instrumental variables, regression discontinuity, difference in differences, and synthetic control methods. Empirical applications will be drawn primarily from labour and public economics. Students will also put these techniques to practice and gain familiarity with Stata, one of the most widespread statistical software used in Economics.

The course objectives are threefold. First, to expose students to a wide range of empirical methods and how they are used in practice. Second, to clarify the terminology and jargon that is used in econometric methods so that it will be less intimidating. Third, to give students the skills so that they have a firm grasp of the types of research designs that can lead to convincing analysis and be comfortable working with large-scale data sets.

Instructor

Instructor: Kory Kroft
Email: kory.kroft@utoronto.ca
Office: 150 St. George Street, #238

Office Hours: Wednesday, 3:00pm to 5:00pm

Teaching Assistant

TA: Adrian Klaus Schroeder
Email: adrian.schroeder@mail.utoronto.ca

Meetings

Lectures will be held on Tuesday, 1:10pm to 3:00pm, in FE 213.
Tutorials will be held on Tuesday, 3:10pm to 4pm, in FE 213 (see schedule below).

Prerequisites

Please see the course's calendar entry (ECO439).

Note: Prerequisites are strictly checked and enforced and must be completed before taking this course. By taking this course you acknowledge that you will be removed from the course at any time if you do

not meet all requirements set by the Department of Economics. Please talk to Ms. Sally Wong (Undergraduate Administrator, Department of Economics) if you have any doubt about whether you meet the requirements.

I expect that you will be able to perform basic calculus (i.e., take simple partial derivatives). The TA will offer brief reviews of the more advanced background material.

Website

The course website will be hosted on Quercus.

I will post the slides from my lectures on the Quercus website. I tend to use Quercus extensively as a means of communication with the class, so I recommend you check the announcements regularly.

Evaluation

A solid understanding of the various empirical strategies, and how they are implemented in real research is a key objective of the course. As such, a detailed understanding of important/illustrative papers in the field is an excellent way to acquire this understanding. There are several components to the graded course work:

1. Two problem sets that will involve an empirical application. Each problem set will be worth 20 percent.
2. One midterm examination worth 25 percent.
3. One final examination worth 35 percent.

Important Dates

February 13 – Problem Set #1 Due
February 27 – Midterm Test
April 2 – Problem Set #2 Due

Software

The course involves a significant amount of computing, and students must learn and use a sophisticated statistical software package. STATA is highly recommended and is the only package that will be supported by the instructor and TA.

Stata is available at reduced rates through the student pricing program, which allows U of T students to buy Stata software at low prices from StataCorp directly. The 6-month subscription to Stata/BE is sufficient for our needs: student page linked here (toggle to the 6-month tab for reduced pricing): https://www.stata.com/order/new/edu/profplus/student-pricing/. Stata is also available for free in the library computer lab: https://mdl.library.utoronto.ca/technology/statistical-software.

Familiarity with EXCEL is also useful.

Course Policies

1) Midterm Test

The midterm test will be held on Tuesday, February 27th during class time (1:10pm – 3:00pm) (location FE 213).

If you miss the midterm, you will be given a grade of 0 unless, on the day of the test, you submit one of four forms of documentation:

- Absence Declaration via ACORN
- U of T Verification of Illness or Injury Form (VOI)
- College Registrar's letter
- Letter of Academic Accommodation from Accessibility Services

A student may only self-declare one absence (of up to seven consecutive days) per term (not per course). It is an academic offence to feign illness to avoid a test.

If a student has been excused from the midterm test, he or she will be permitted to write the make-up test. The make-up midterm test will be given on Monday, March 11th, 12:10pm-2:00pm location TBA.

- It may not be the exact same format as the midterm test itself.
- Consistent with university policy, there is no "make-up" test for the make-up test. A grade of zero will be applied if a student fails to write the make-up test.

2) Problem Sets

The problem sets are due at the beginning of class on the assigned dates (February 13 and April 2). Late problem sets will receive a grade of zero unless you contact me before the due date about your assignment and submit one of the four forms indicated above.

All students must hand in their own problem sets but are welcome to help each other out. This means writing your own code and running your own output for empirical problem sets. Any evidence of copying/cutting/pasting from each other will be treated as plagiarism.

For each problem set, you will be asked to submit three documents:

- a PDF containing the answers to your questions, with the adequate explanations and interpretations.
- the code (do-file) that you used for the analysis, duly commented (instructions will be posted on Quercus).
- the log file automatically generated by your code.

You will have to upload these documents before the deadline on Quercus.

3) Code of Behavior on Academic Matters

I have a zero-tolerance policy for any form of academic misconduct. Academic offenses, such as plagiarism or cheating during tests are serious academic offenses and could result in punishments ranging from failing the course to suspension or expulsion from the university.

Please read the University's Code of Behaviour on Academic Matters. It applies to all your academic activities and courses. The Code prohibits all forms of academic dishonesty including, but not limited to,

cheating, plagiarism, and the use of unauthorized aids. Violating the Code may lead to penalties up to and including suspension or expulsion from the University. You are expected to know the Code and inform yourself of acceptable academic practices – ignorance of the Code or the acceptable academic practices is not a valid defense if you are accused of a violation.

4) Appealing an exam

Appeals regarding the grading of a test must be submitted to me in writing, **within two weeks of your receipt of the graded work**. You must include the test with your written appeal. I shall re-grade the **entire exam** and this might result in a lower grade than the original.

5) Academic Accommodations

Occasionally students will need to apply for an academic accommodation due to disability, illness, religious observance, or personal emergency.

All requests for an academic accommodation due to disability are handled by the University of Toronto's Accessibility Services, not the instructor. For disability-related accommodations, Accessibility Services staff will determine suitable accommodations on a case-by-case basis based on recommendation from health providers and with student input.

Students who require consideration for missed academic work for **any non-disability related reason** (e.g., COVID, cold, flu and other illness or injury, family situation) may submit any one of four forms of documentation which includes both the Verification of Illness (VOI) form and student self-declaration (i.e., Absence Declaration) via ACORN. A student may only self-declare one absence (of up to seven consecutive days) per term (not per course).

If a non-disability related accommodation request is made, a resolution will be determined by the instructor. This may take the form of any alternate deliverable, deadline extension, reweighted course grade calculation, make-up test, or another solution deemed appropriate by the instructor. If an accommodation request is not made, the missed or late deliverable will be subject to an academic penalty. The extent of the penalty is at the discretion of the instructor.

6) Generative AI (e.g., ChatGPT)

Students can use Generative AI in certain instances or specific ways. Students may not use artificial intelligence tools for taking tests, creating computer code, or completing problem sets. However, these tools may be useful when gathering information from across sources and assimilating it for understanding. If you have any question about the use of AI applications for course work, please speak with the instructor.

7) Mental Health and Wellness

Feeling distressed? Are you in crisis? There's help. Call Good2Talk: 1-866-925-5454 (Ontario); text GOOD2TALK to 686868. Free, confidential helpline with professional counselling, information and referrals for mental health, addictions and well-being, 24/7/365. You can also contact U of T Telus Health Student Support 1-844-451-9700 (North America); 001-416-380-6575 (Outside of North America) or the U of T Employee & Family Assistance Program (EFAP) 1-800-663-1142 (toll-free); 1-866-398-9505 (TTY); 604-689-1717 (collect). Visit "Feeling Distressed?" for more resources.

Are you in immediate danger? For Personal Safety – Call 911, then Campus Community Police*

UTSG Police: 416-978-2222 | U of T Mississauga Police: 905-569-4333 | U of T Scarborough Police 416-978-2222 |
Centre for International Experience Safety Abroad 416-946-3929.
*24/7/365; Campus Community Police can direct your call to the right service.

Lecture Schedule – Winter 2024

1	January 9	Review of Regression
2	January 16	Causal Models and the Evaluation of Economic Policy
3	January 23	Matching on Observables Problem Set 1 Distributed
4	January 30	Instrumental Variables in Choice Models
5	February 6	Instrumental Variables in Choice Models Tutorial #1
6	February 13	Regression Discontinuity Tutorial #2 Problem Set 1 Due
7	February 27	Midterm Test
8	March 5	Panel Data and Canonical Difference-in-Differences Problem Set 2 Distributed
9	March 12	Staggered treatment timing and heterogeneous treatment effects
10	March 19	Synthetic Control Tutorial #3
11	March 26	Topics in Inference
12	April 2	Review for Final Exam Problem Set 2 Due

Reading Material

Most of the course material will consist of detailed lecture notes which will be posted on Quercus before the start of each class. Please do not post these notes in any public space or share them with anyone not in the class. The course material will emphasize some readings, which can be found below. Students can access most of the readings using JSTOR through the UofT library. Please note that it is NOT my expectation that you read all these articles. The lecture notes should mostly suffice. However, if you want a deeper understanding of the material, I encourage you to read the articles. Additionally, some of the problem set questions might require you to dig deeper into the articles.

We will not explicitly follow any textbooks. The following textbooks and articles are useful as references to supplement the readings covered in class:

Angrist, Joshua D. and Jörn-Steffen Pischke, Mostly Harmless Econometrics: An Empiricist's Companion, Princeton University Press, 2009.

Angrist, J.D. and A. B. Krueger (2001), “Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments,” Journal of Economic Perspectives, 15(4): 69-85.

Cunningham, Scott, “Causal Inference: The Mixtape,” https://mixtape.scunning.com/

Guido Imbens and Jeffrey Wooldridge (2009): “Recent Developments in the Econometrics of Program Evaluation,” Journal of Economic Literature, 47:1, pages 5-86.

1. Review of Regression (January 9)

Angrist and Pischke Chapter 3.1
Cunningham Chapter 2

2. Causal Models and the Evaluation of Economic Policy (January 16)

Angrist and Pischke Chapter 3.2
Cunningham Chapter 4

3. Matching on Observables (January 23)

Angrist and Pischke Chapter 3.3
Cunningham Chapter 5

Angrist, Joshua D. (1998): "Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants," Econometrica, 66(2): pp. 249-288.

Ashenfelter, Orley (1978): "Estimating the Effect of Training Programs on Earnings," The Review of Economics and Statistics, 60, pp. 47-57.

Ashenfelter, Orley, and David Card (1985): "Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs on Earnings," The Review of Economics and Statistics, 67, pp. 648-66.

Dehejia, Rajeev, and Sadek Wahba (1999): "Causal Effects in Nonexperimental Studies: Re-evaluating the Evaluation of Training Programs," JASA, 94.

Dehejia, Rajeev, and Sadek Wahba (2002): "Propensity Score-Matching Methods for Nonexperimental Causal Studies," The Review of Economics and Statistics, 84(1): 151-161.

LaLonde, Robert (1986): "Evaluating the Econometric Evaluations of Training Programs with Experimental Data," American Economic Review, 76, September, pp. 604-620.

4. Instrumental Variables in Choice Models (January 30)

Angrist and Pischke Chapter 4
Cunningham Chapter 7

Imbens, Guido W. and Joshua Angrist (1994): "Identification and Estimation of Local Average Treatment Effects," Econometrica, Vol. 62, No. 2, pp. 467-475.

Imbens, Guido W. and Donald B. Rubin (1997): "Estimating Outcome Distributions for Compliers in Instrumental Variables Models," The Review of Economic Studies, 64(4): pp. 555-574.

Ketel, Nadine, Edwin Leuven, Hessel Oosterbeek and Bas van der Klauuw (2016): "The Returns to Medical School: Evidence from Admission Lotteries," American Economic Journal: Applied Economics, 8(2): pp. 225-254.

5. Instrumental Variables in Choice Models (February 7)

Angrist and Pischke Chapter 4

Cunningham Chapter 7

Angrist, Joshua and William N. Evans (1998): "Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size," American Economic Review, 88(3): pp. 450-477.

Angrist, Joshua and Guido W. Imbens (1995): "Two-Stage Least Squares Estimation of Average Causal Effects in Models with Variable Treatment Intensity," Journal of the American Statistical Association, 90(430), pp. 431-442.

Angrist, Joshua, and Alan Krueger (1991): "Does Compulsory Schooling Attendance Affect Schooling and Earnings?" Quarterly Journal of Economics, 106(4), pp. 979-1014.

Bound, John, David A. Jaeger and Regina M. Baker (1995): "Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable is Weak," Journal of the American Statistical Association, 90(430), pp. 443-450.

6. Regression Discontinuity (February 13)

Angrist and Pischke Chapter 6

Cunningham Chapter 6

Angrist, Joshua, and Victor Lavy (1999): "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement," Quarterly Journal of Economics, pp. 533-575.

Imbens, Guido W., and Karthik Kalyanaraman (2012). "Optimal Bandwidth Choice for the Regression Discontinuity Estimator." Review of Economic Studies, 79(3), 933-959.

Kostol, Andreas and Magne Mogstad (2014): "How Financial Incentives Induce Disability Insurance Recipients to Return to Work, American Economic Review, 104(2), pp. 624-655.

Lee, David, and Thomas Lemieux (2010): "Regression Discontinuity Designs in Economics," Journal of Economic Literature, 48, pages 281-355.

7. Midterm Test (February 27)

8. Panel Data and Canonical Difference-in-Differences (March 5)

Angrist and Pischke Chapter 5

Cunningham Chapter 9

Card, David and Alan Krueger (1994): "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," American Economic Review, 84(4), pp. 772-793.

Card, David and Alan Krueger (2000): "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Reply," American Economic Review, 90(5), pp. 1397-1420.

Meyer, Bruce D., W. Kip Viscusi and David L. Durbin (1995): "Workers' Compensation and Injury Duration: Evidence from a Natural Experiment," American Economic Review, 85(3), pp. 322-340.

9. Staggered treatment timing and heterogeneous treatment effects (March 12)

Angrist and Pischke Chapter 5

Cunningham Chapter 9

Borusyak, Kirill, Xavier Jaravel and Jann Spiess (2021): "Revisiting Event Study Designs: Robust and Efficient Estimation," Working Paper.

Callaway, Brantly and Pedro H.C. Sant'Anna (2020): "Difference-in-Differences with Multiple Time Periods," Journal of Econometrics, forthcoming.

de Chaisemartin, Clément and Xavier D'Haultfœuille (2020): "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects," American Economic Review, 110(9), pp. 2964-2996.

Golosov, Mikhail, Michael Grabner, Magne Mogstad and David Novgorodsky (2021): "How Americans Respond to Idiosyncratic and Exogenous Changes in Household Wealth and Unearned Income," Working paper.

Goodman-Bacon, Andrew (2021): "Difference-in-Differences with Variation in Treatment Timing," Journal of Econometrics, forthcoming.

Heckman, James J. and Jeffrey A. Smith (1999): "The Pre-Programme Earnings Dip and the Determinants of Participation in a Social Programme. Implications for Simple Programme Evaluation Strategies," Economic Journal, 109, pp. 1-36.

Sun, Liyang and Sarah Abraham (2020): "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects," Journal of Econometrics, forthcoming.

10. Synthetic Control (March 19)

Cunningham Chapter 10

Abadie, Alberto, and Javier Gardeazabal (2003): "The Economic Costs of Conflict: A Case Study of the Basque Country," American Economic Review, 93 (1): pp. 113–132.

Abadie, Alberto, Alexis Diamond, and Jens Hainmueller (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): pp. 493–505.

Arkhangelsky, Dmitry, Susan Athey, David A. Hirshberg, Guido W. Imbens, Stefan Wager (2021): "Synthetic Difference-in-Differences," American Economic Review, 111(12): 4008-4118.

Ferman, Bruno and Christine Pinto (2021): "Synthetic controls with imperfect pretreatment fit," Quantitative Economics, 12(4): pp. 1197-1221.

11. Topics in Inference (March 26)

Angrist and Pischke Chapter 8

Abadie, Alberto, Susan Athey, Guido W. Imbens, and Jeffrey Wooldridge (2017): "When Should You Adjust Standard Errors for Clustering?" NBER Working Paper 24003.

Bertrand, Marianne, Esther Duflo, Sendhil Mullainathan (2004). "How Much Should We Trust Difference-in-Difference Estimates?" Quarterly Journal of Economics, 119(1), 249-75.

Cameron, A. Colin, Jonah B. Gelbach and Douglas L. Miller (2008): "Bootstrap-Based Improvements for Inference with Clustered Errors", Review of Economics and Statistics, 90, 414-427.

Cameron, A. Colin, Jonah B. Gelbach and Douglas L. Miller (2011). "Robust Inference with Multi-Way Clustering," Journal of Business and Economic Statistics, 29(2), 238-249.

Cameron, A. Colin, and Douglas L. Miller (2015). "A Practitioner's Guide to Cluster-Robust Inference," Journal of Human Resources, 50(2), 317-73.

Imbens, Guido W., and Michal Kolesar (2016). "Robust Standard Errors in Small Samples: Some Practical Advice." Review of Economics and Statistics, 98(4): pp. 701-712.

Moulton, Brent (1986): "Random Group Effects and the Precision of Regression Estimates," Journal of Econometrics, 32, pp. 385-97.

12. Review for Final Exam (April 2)