

ResEv554 – Intermediate Quantitative Research Methods

Wednesdays, 5:10-8:00

113 McKay Hall

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The main issue we face when studying human behaviour is that for many policy issues, it is difficult to randomly assign individuals to control and treatment conditions (e.g., to understand the impact of having a college degree on wages). The goal of this course is to supplement your statistical training with research methods used in education and the social sciences to estimate causal effects on observational (versus experimental) data. Although some of these techniques may seem complicated, they are in essence applications of OLS and logistic regression, material covered in ResEv 553. *If you plan to collect and analyze experimental data for your dissertation, this class will not be very useful for you.*

By the end of the course you should be able to understand and implement the following techniques to estimate causal effects on observational data:

- Fixed effects models with continuous and discrete dependent variables
- Regression discontinuity
- Instrumental variables
- Propensity scores for matched samples

We will be covering these topics as a way of introducing you to these techniques. To use any of these techniques in your dissertation may require additional study on your part.

This course will require a substantial amount of time each week. For undergraduate classes, a typical guideline is two hours outside of class per credit hour; this means that you should at a minimum be spending an average of six hours per week outside of the classroom on this course. Because this is a graduate course, for many (if not all) weeks you will be spending much more time than that – previous students have reported that some of the take-home assignments took them 6-10 hours to complete. *Please be aware that if you do not devote substantial time and effort to this course, you will likely fail.*

Depending on the pace of the class, we may not cover all topics listed on the syllabus. I may also change topics and add readings as the semester progresses. I will not change how you are evaluated, as listed below.

To succeed in this course you must have taken either ResEv 553 or Stat 404. If you have not taken either course, please see me immediately.

Expectations

Because we will be meeting in a computer lab, you will refrain from surfing the Internet or checking email during class. This ban will be in effect from 5:00 PM until the end of class. Students found using the computers for purposes other than class will receive one warning; the second time they will be asked to leave the lab for the remainder of the evening.

Attendance in this class is mandatory. Each class builds on previous classes, so missing class is a recipe for failure. If you decide to miss a class, you will be responsible for getting copies of notes and assignments from another student. I will not be available to review the missed material with you – that is the purpose of my class lectures. If you plan ahead, you may have a colleague tape record or film the class that you will be missing. Any student missing more than two classes will be dropped from the class.

You should already have a good knowledge of Stata from ResEv 553; if you have not taken ResEv553, please see me. (If you understand SPSS or SAS syntax you will be fine in this class, as Stata is very easy to learn). On my website I will post the Stata command files that I use in class each week. For the most part, you will be able to cut and paste these commands and make a few changes in them for your assignments. If this is your first exposure to Stata, you should also be spending some time outside of class learning how to use Stata.

Most students bring a USB drive to class, to save any work done in class. Each of you have been assigned personal storage space on the university servers, accessible with your netid. You can access this space when you log on to the computers in the lab, and you should save your work there. For more information see asw.iastate.edu/cgi-bin/acropolis.

Readings

There are no assigned texts for this class; all articles and book chapters will be posted in WebCT. I may occasionally hand out copies in class.

I have also listed some additional readings; these optional readings are included for your future reference.

Evaluation

Your grade will be determined as follows:

1. *Pop quizzes (20%)* – This is an advanced methods course, and in order to fully participate in class and get the most out of my lectures, you must complete the assigned readings for each class prior to attending that class. In order to encourage complete and thoughtful

reading of the assigned material, I will be administering pop quizzes on the readings at the beginning of class throughout the semester. These quizzes will be fairly easy; in other words, you will not have to memorize formulas from the text. Instead, the quizzes will ask basic questions about the readings.

2. *Take-home exams (80%)* – You will be given several assignments during the semester that cover various topics in the course; you will have one week to complete each assignment. These assignments will involve analyzing datasets and reporting results from your analyses. You may use your notes and assigned readings to do the assignments, but you may not consult with other people or sources (e.g., the Internet). These assignments should be double-spaced; you must include a copy of your Stata syntax file with your assignment (but no Stata output – you will have to construct tables based on your output). I refer to these short papers as exams to stress that you should complete these assignments completely on your own, without any computer or statistical assistance from anyone else (other than me, of course). There will probably be around 4-6 assignments, depending on the pace of the course.

I may decide to curve the final grades, or drop your worst exam score, depending on the performance of the class.

Academic misconduct

Academic misconduct in any form is in violation of Iowa State University Student Disciplinary Regulations and will not be tolerated. This includes, but is not limited to: copying or sharing answers on assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, F grade for the course, and could be suspended or expelled from the University. See the Conduct Code at www.dso.iastate.edu/ja for more details and a full explanation of the Academic Misconduct policies.

Forms of academic dishonesty:

Obtaining unauthorized information. Information is obtained dishonestly, for example, by copying graded homework assignments from another student, by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, or by looking at your notes or other written work during an examination when not specifically permitted to do so.

Tendering of information. Students may not give or sell their work to another person who plans to submit it as his or her own. This includes giving their work to another student to be copied, giving someone answers to exam questions during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.

Misrepresentation. Students misrepresent their work by handing in the work of someone else. The following are examples: purchasing a paper from a term paper service; reproducing

another person's paper (even with modifications) and submitting it as their own; having another student do their computer program or having someone else take their exam. Plagiarism. "Unacknowledged use of the information, ideas, or phrasing of other writers is an offense comparable with theft and fraud, and it is so recognized by the copyright and patent laws. Literary offenses of this kind are known as plagiarism."

Disabilities

Iowa State University complies with the American with Disabilities Act and Section 504 of the Rehabilitation Act. Any student who may require an accommodation under such provisions should contact me as soon as possible and no later than the end of the first week of class or as soon as you become aware. No retroactive accommodations will be provided in this class.

Software

We will be using Stata (version 11) for the course. Stata is similar to SPSS, but is much more powerful in terms of what it can do. Stata is available in the computer labs in 113/108 McKay.

If you wish to purchase Stata, you can get it at a substantial discount through this course: <http://www.stata.com/coursegp.html>. We will be using Intercooled (IC) Stata; the Course ID is IOWA27 (please contact me if this code does not work). You can purchase a copy good for one year for \$98, or a perpetual license for \$179 (given the price difference, I recommend the latter).

You do not need to purchase the set of Stata reference manuals; I will hand out copies of any additional Stata reference material you might need. I also have a full set of manuals, and you can borrow and copy any sections you might want.

Course schedule

I would prefer to cover 75% of the syllabus very well, rather than cover 100% and have students leaving the course scratching their heads, so I will change the schedule as needed. I suspect that we may need extra weeks to cover some material and thus I will probably not assign additional material. If time permits, we may discuss models for sample selection. Any changes to the course schedule will be discussed in class.

The course is designed to alternate weeks. The first week will cover the theoretical background of a technique, with applications in class. The second week will be a discussion of several articles using these techniques. As you read the articles, you should take detailed notes and consider the following:

- What are the authors' research questions?
- What dataset(s) are they using? Why did they choose these particular data?

- How are they using the techniques that we learned in class? What are they doing that is new and/or different from what we learned? Are they using these techniques appropriately?
- How well have they answered their research questions? Are there any problems with the research?

Important class dates to keep in mind:

- October 21st – no class (IES grant review panel)
- November 4th – no class (attending ASHE)
- November 25th – no class (Thanksgiving break)
- December 2nd – last class
- December 9th – date for makeup class (if needed)
- December 9th – date last take-home exam will be due

Class 1 – Causal effects: introduction and overview

1. Stock & Watson, *Introduction to Econometrics*, chapter 9. **[Only sections 9.1-9.2]**
2. Angrist & Pischke, *Mostly Harmless Econometrics*, chapters 1-2.
3. Schneider et al., *Estimating Causal Effects: Using Experimental and Observational Designs*, chapters 1-3.
4. Riegg, S.K. (2008). Causal inference and omitted variable bias in financial aid research: Assessing solutions. *Review of Higher Education*, 31(3), 329-354.
5. Angrist et al. (2009). Incentives and services for college achievement: Evidence from a randomized trial. *American Economic Journal: Applied Economics*, 1(1): 136-163.

Class 2 – Fixed effects models

1. Stock & Watson, *Introduction to Econometrics*, chapter 10.
2. Allison, *Fixed Effects Regression Models*, chapters 1-3.
3. Cheslock, J.J., & Gianneschi, M. (2008). Replacing state appropriations with alternative revenue sources: The case of voluntary support. *Journal of Higher Education*, 79(2), 208-229. **[We will be using their dataset in class]**

Class 3 – Fixed effects models continued

1. Schilt, K., & Wiswall, M. (2008). Before and after: Gender transitions, human capital, and workplace experiences. *B.E. Journal of Economic Analysis & Policy*, 8(1): 1-26.
2. Tomaskovic-Devey, D., et al. (2005). Race and the accumulation of human capital across the career: A theoretical model and fixed-effects application. *American Journal of Sociology*, 111(1): 58-89.
3. Isely, P. & Singh, H. (2005). Do higher grades lead to favorable student evaluations? *Journal of Economic Education*, 36(1): 29-42.
4. Heller, D.E. (1999). The effects of tuition and state financial aid on public college enrollment. *Review of Higher Education*, 23(1): 65-89.

5. McLendon, M., et al. (2005). State postsecondary policy innovation: Politics, competition, and the interstate migration of policy ideas. *Journal of Higher Education*, 76(4): 363-400.

Class 4 – Instrumental variables

1. Stock & Watson, *Introduction to Econometrics*, chapter 12.
2. Murray, M.P. (2006). Avoiding invalid instruments and coping with weak instruments. *Journal of Economic Perspectives*, 20(4), 111-132.
3. Card, D. (1993). Using geographic variation in college proximity to estimate the return to schooling. *NBER Working Paper No. 4483*. **[Read only pp. 1-13 – we will be using his dataset in class]**
Optional: Angrist, J.D. & Krueger, A.B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic Perspectives*, 15(4) 69-85.

Class 5 – Instrumental variables continued

1. Stinebrickner, R., & Stinebrickner, T.R. (2008). The causal effect of studying on academic performance. *B.E. Journal of Economic Analysis & Policy*, 8(1) 1-53.
2. Williams, J., et al. (2003). Does alcohol consumption reduce human capital accumulation? Evidence from the College Alcohol Study. *Applied Economics*, 35: 1227-1239.
3. Bettinger, E.P., & Long, B.T. (2005). Do faculty serve as role models? The impact of instructor gender on female students. *American Economic Review*, 95(2): 152-157.
4. Long, B.T. & Kurlaender, M. (2009). Do community colleges provide a viable pathway to a baccalaureate degree? *Educational Evaluation and Policy Analysis*, 31(1): 30-53.
[Ignore their propensity score analysis]
5. Review use of instrumental variables in Angrist et al. (2009).

Class 6 – Regression discontinuity

1. Lesik, S.A. (2008). Studying the effectiveness of programs and initiatives in higher education using the regression-discontinuity design. *Handbook of Higher Education*, vol. 23, pp. 277-297.
2. Curs, B.R. (2006). What can merit-aid buy? The effects of financial aid packages on the enrollment decisions of applicants to a large public university. Manuscript, University of Missouri. **[We will be using his dataset in class]**
Optional, these are really just for further study if you want to use this technique:
 - a) Imbens, G.W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of Econometrics*, 142: 615-635.
 - b) Van der Klaauw, W. (2008). Regression-discontinuity analysis: A survey of recent developments in economics. *Labour*, 22(2): 219-245.

Class 7 – Regression discontinuity continued

1. Jacob, B.A., & Lefgren, L. (2004). Remedial education and student achievement: A regression-discontinuity analysis. *Review of Economics and Statistics*, 86(1): 226-244.

- Ludwig, J. & Miller, D. (2007). Does Head Start improve children's life chances? Evidence from a regression discontinuity design. *Quarterly Journal of Economics*, 122(1): 159-208.
- Moss, B.G., & Yeaton, W.H. (2006). Shaping policies related to developmental education: An evaluation using the regression discontinuity design. *Educational Evaluation and Policy Analysis*, 28(2): 215-229.

Class 8 – Propensity scores

- Guo & Fraser, *Propensity Score Analysis*, chapters 2, 3, & 5.
- Ho, D.E., Imai, K., King, G., & Stuart, E.A. (2007). Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*, 15(3), 199-236.

Optional, these are really just for further study if you want to use this technique:

- Bia, M., & Mattei, A. (2008). A Stata package for the estimation of the dose-response function through adjustment for the generalized propensity score. *Stata Journal*, 8(3): 354-373.
- Caliendo, M. & Kopenig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, 22(1) 31-72.
- Nichols, A. (2007). Causal inference with observational data. *Stata Journal*, 7(4) 507-541.

Class 9 – Propensity scores continued

- Wilde, E.T., & Hollister, R. (2007). How close is close enough? Evaluating propensity score matching using data from a class size reduction experiment. *Journal of Policy Analysis and Management*, 26(3): 455-477.
- Lee, J.C. & Staff, J. (2007). When work matters: The varying impact of work intensity on high school dropout. *Sociology of Education*, 80(2) 158-178.
- Attewell, P.A., Lavin, D.E., Domina, T., Levey, T. (2006). New evidence on college remediation. *Journal of Higher Education*, 77(5) 886-924.
- Review use of propensity scores in Long & Kurlaender (2009).

Classes 10 & 11 – To be determined

I've listed these additional readings because I think they will be useful to you as you work on your dissertation:

- Smart, J. C. (2005). Attributes of exemplary research manuscripts employing quantitative analysis. *Research in Higher Education*, 46(4), 461-477.
- Sutton, R.I., & Staw, B.M. (1995). What theory is not. *Administrative Science Quarterly*, 40(3) 371-384.
- DiMaggio, P.J. (1995). Comments on 'What theory is not'. *Administrative Science Quarterly*, 40(3) 391-397.
- Brint, S. (2002). Data on higher education in the United States: Are the existing resources adequate? *American Behavioral Scientist*, 45(10) 1493-1522.