PhD Econometrics II: ECO-7425
Fall 2019
Syllabus

1 General Information

Instructor: Tobias Pfutze

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Office hours: Tue, Thu 3:30-4:45pm or by appointment.

Time: Tue, Thu 2:00pm-3:15pm

Location: DM 164

Changes to class schedule:

- The class on *Thursday, November 7* will most likely be canceled/postponed due to a conference.
- The class on *Tuesday, November 26* may also be changed.

Course Objectives: The course aims to provide the student with a solid knowledge of the most commonly used econometric estimation techniques beyond basic OLS. It focuses exclusively on methods appropriate to conduct empirical microeconomic research. It consists of two parts: The first

one focuses on endogeneity problems and the identification of causal effects in linear models. Topics covered are panel data methods, instrumental variables, simultaneous equations models, regression discontinuity designs, and matching methods. The second part provides an introduction to Maximum Likelihood Estimation (MLE) and to an introduction to machine learning (ML), and develops estimators for some its most common applications: Binary and multinomial dependent variable models, sample selection, censoring and truncation, and survival analysis. About over half of the course will be allocated on the first part, which will have a strong focus on how the techniques covered can be applied to real world problems. Parts two, comprising the last third, will be much more theoretical in nature.

Course requirements and grading schemes: Class attendance is expected. There will be four problem sets, one presentation of existing research, followed by discussion, and a final exam. For the presentations, all of you are expected to read the assigned papers. The principal deliverable is your own piece of empirical research in which you are expected to employ at least one of the methods covered in a non-trivial (!!!) application. For this, you should think ahead about a possible third year paper and/or dissertation topic. The paper will allow you to take a first stab at your idea. It is important that you meet with me in order to discuss your idea, data sources, and the appropriate estimation method. Your final grade will be derived as follows:

20% Problem Sets

20% Presentation

20% Exam

40% Final paper

If you are a PhD student, all your problem sets, presentations, and your final paper will need to be written in LaTeX, and handed in a pdf documents! For the problem sets, you are also required to hand in your Stata log files or Matlab code (depending on the problem set). LaTeXis a free software and won't cost you a dime. You can find information on LaTeX, including documentation, books and how to download, here:

The LaTeX Project

Your *presentation* should be 15-20 minutes long, followed by in-class discussion. The focus of your presentation should be on the econometric methods employed and whether you think the results are convincing (and why or why not!). Make sure to read the paper carefully, as you will be expected to answer questions that may arise. The most common LaTeXformat for slide shows is **Beamer**. More information can be found here:

Link to Beamer

Textbook & Readings: This course does not follow any particular textbook. However, as aspiring applied microeconomists, you should consider an investment in the following two titles:

> *Econometric Analysis of Cross Section and Panel Data* by Jeffrey M. Wooldridge, South MIT Press, 2010, 2nd Edition. **(W)**
>
> *Microeconometrics: Methods and Applications* by A Colin Cameron and Pravin K. Trivedi, Cambridge University Press 2005 **(CT)**

In addition, we will go over a number of theory papers, and empirical papers that employ the methods discussed in class. Most of the latter will be presented by you or your peers and you are expected to read them ahead of class to be prepared for their discussion. In order of appearance:

> Pritchett, Lant; *"Where Has All the Education Gone?"* Policy Research Working Paper #1581, The World Bank 1996
>
> Acemoglu, Daron; Johnson, Simon; Robinson, James A.; *"The Colonial Origins of Comparative Development: An Empirical Investigation"*; AER 2001 (AJR 01)
>
> Clemens, Michael; *"Do visas kill? Health effects of African health professional emigration"*; CGD Working Paper #114, 2007
>
> Shea, John; *"Instrument Relevance in Multivariate Linear Models: A Simple Measure"*; REStat 1997
>
> Stock, James H.; Yogo, Motohiro; *"Testing for Weak Instruments in Linear IV Regression"*; NBER Technical Working Paper No. 284, 2002

Clarke, Damian; Matta Benjamn; *"Practical Considerations for Questionable IVs"*; MPRA Paper 79991, 2017

Nevo, Aviv; Rosen, Adam M.; *"Identification with Imperfect Instruments"*; REStat 2012

Conley, Timothy G.; Hansen, Christian B., Rossi, Peter E.; *"Plausibly Exogenous"*; REStat 2012

Yang, Dean; *"International Migration, Remittances and Household Investment: Evidence From Philippine Migrants' Exchange Rate Shocks"*; EJ 2008

Duflo, Esther; *"Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence From an Unusual Policy Experiment"*; AER 2001

Albouy, David: *"The Colonial Origins of Comparative Development: An Investigation of the Settler Mortality Data"*, NBER Working Paper #W14130, 2008

Iyer, Lakshmi; *"Direct vs. Indirect Colonial Rule in India: Long-Term Consequences"*; REStat 2010

Jha, Saumitra; *"Trade, Institutions, and Ethnic Tolerance: Evidence from South Asia"*; APSR, 2013

Alberto Alesina, Paola Guiliano, Nathan Nunn; *"On the Origins of Gender Roles: Women and the Plough"*; QJE, 2013

Stock, James H.; Watson, Mark W.; *"Introduction to Econometrics"*; Chaper 11; Pearson, 3ed, 2015

Calonico, Sebastian; Cattaneo, Matias D.; Titiunik, Roco; *"Robust Data-Driven Inference in the Regression Discontinuity Design"*, The Sata Journal 2014

Duflo, Esther; Kremer, Michael; *"Use of Randomization in the Evaluation of Development Effectiveness."*; unpublished mimeo; 2003

Duflo, Esther; Glennester, Rachel; Kremer, Michael; *"Using Randomization in Development Economics Research: A Toolkit Handbook of Development Economics"*; 2007

Clemens, Michael; Demombynes, Gabriel; *"When Does Rigorous Impact Evaluation Make a Difference? The Case of the Millenium Villages."*; Journal of Developement Effectiveness, 2010

Miguel, Edward; Kremer, Michael; *"Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities"*, Econometrica 2004

Bertrand, Marianne; Mullainathan, Sendhil; *"Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination"*; AER; 2004

Bertrand, Marianne; Djankov, Simeon; Hanna, Rema; Mullainathan, Sendhil; *"Obtaining a Driving License in India: An Experimental Approach to Studying Corruption"*; QJE 2007 (BDHM 07)

Jones, Benjamin F.; Olken, Benjamin A. *Hit or Miss? The Effect of Assassinations on Institutions and War"*; AEJ: Macro, 2009

Lee, David S.; Lemieux, Thomas; *"Regression Discontinuity Designs in Economics"*, Journal of Economic Literature, Vol.48, June 2010

Heckman, James J.; Ichimura, Hidehiko; Todd Petra E.; *"Matching as an Econometric Evaluation Estimator: Evidence From Evaluating a Job Training Program"*, REStud 1997, No. 64

Smith Jeffrey A.; Todd Petra E.; *"Does Matching Overcome LaLonde's Critique of Non-experimental Estimators?"*, Journal of Econometrics 2005, No. 125.

Diamond, Alexis; Sekhon, Jasjeet S.; *"Genetic Matching for Estimating Causal Effects: A General Multivariate Matching Method for Achieving Balance in Observational Studies"*; REStat 2013

Brollo, Fernanda; Nannicini, Tommaso; Perotti, Roberto; Tabellini, Guido; *"The Political Resource Curse"*, AER 2013, 103(5) (BNPT13)

Dell, Melissa; *"The persistent Effects of Peru's Mining Mita"*; Econometrica, Vol.78(6), 2010

Abadie, Alberto; Diamond, Alexis; Hainmueller, Jens; *"Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program"*, Journal of the American Statistical Association 2010, Vol.105, Issue 490

Abadie, Alberto; Gardezabal, Javier; *"The Economic Costs of Conflict: A Case Study of the Basque Country"*, AER March 2003

Athey, Susan; Imbens, Guido W.; *"Machine Learning Methods for Estimating Heterogeneous Causal Effects"*, Unpublished Working Paper 2015

Athey, Susan; Imbens, Guido W.; *"Machine Learning Methods Economists Should Know About"*, Unpublished Working Paper 2019

Abadie, Alberto; Kasy, Maximilian; *"The Risk of Machine Learning"*, Unpublished Working Paper 2017

Stock, James H.; Watson, Mark W.; *"Generalized Shrinkage Methods for Forecasting Using Many Predictors"*, Journal of Business and Economic Statistics, Vol. 30(4), 481-93, 2012

Varian, Hal R.; *"Big Data: New Tricks for Econometrics"*; Journal of Economic Perspectives; Vol.28(2), 3-28, 2014

Hastie, Trevor; Tibshirani, Robert; Friedman, Jerome; *"The Elements of Statistical Learning: Data Mining, Inference, and Prediction"*, Springer 2009

2 Course Outline

2.1 Reduced Form Estimation

Week 1: Introduction, Causes of Endogeneity, Stata Syntax

- W: Ch. 4, Ch. 19.3-19.4

- CT: Ch. 2.4, Ch. 4.7, Ch. 16.5, Ch. 26.1-26.2

Week 2: Panel Data Methods

- W: Ch. 10, Ch. 6.5
- CT: Ch. 21, Ch. 22.6-22.7

Week 3: IV Estimation

- W: Ch. 5, Ch. 6.3, Ch. 11.2, Ch. 11.4, Ch. 11.6
- CT: Ch. 4.8-4.8, Ch. 22.5
- Shea 1997
- Stock, Yogo 2002
- Clarke, Matta 2017
- Nevo, Rosen 2012
- Conley, Hansen & Rossi 2012

Week 4: IV Estimation cont. & Simultaneous Equation Models

- W: Ch. 9

Problem Set 1

Week 5: Presentations

- Pritchett 1996
- AJR 01 & Albouy 2008
- Clemens 2007

- Yang 2008
- Duflo 2001
- Iyer 2010
- Jha 2013
- Alesina, Guiliano, Nunn 2013

Week 6: Experimental vs. Non-Experimental Approaches

- W: Ch. 21.1-21.2
- CT: Ch. 25.1-25.3
- Stock & Watson, Ch. 11
- Duflo, Kremer 2003
- Duflo, Glennester, Kremer 2007
- Clemens, Demombynes 2011

Week 7: Regression Discontinuity Models

- W: 21.5
- CT: Ch. 9.1-9.6 & 25.6
- Lee, Lemieux 2010
- Calonico, Cattaneo, Titiunik 2014

Problem Set 2

Week 8: Matching Methods

- W: Ch. 21.3

- CT: Ch. 25.4
- Heckman, Ichimura, Todd 1997
- Smith, Todd 2005
- Diamond, Sekhon 2013

Week 9: Synthetic Control Methods & Presentations

- Abadie, Diamond, Hainmueller 2010

Presentations:

- Miguel, Kremer 2004
- Bertrand, Djankov, Hanna, Mullainathan 2007
- Bertrand, Mullainathan 2003
- Jones, Olken 2009
- Brollo, Nannicini, Perotti, Tabellini 2013
- Dell 2010
- Abadie & Gardezabal 2003

Problem Set 3

2.2 Non-Linear Models, Maximum Likelihood Estimation & Recent Developments

Week 10: Introduction to MLE, Binary Dependent Variable Models (Probit & Logit) & MATLAB

- W: Ch. 12.7, 15

- CT: Ch. 10, 14.1-14.3

Week 11: Multinomial & Ordered Response Models

- W: Chapter 16
- SW: Chapter 15.1-15.10

Week 12: Truncation & Censoring: Tobit and Selection Models

- W: Ch. 17.1-17.4, 17.6, 18.2, 19.1-19.6
- CT: Ch. 16.1-16.7

Week 13: Survival Analysis

- W: Ch. 22
- CT: Ch. 17

Problem Set 4

Week 14: Machine Learning & Thanksgiving

- Athey & Imbens 2015
- Athey & Imbens 2019
- Abadie & Kasy 2017
- Stock & Watson 2012
- Varian 2014
- Hastie, Tibshirani, Friedman 2009: Ch. 2, 3.4, 9.2 & 11.1-11.5

Week 15: Machine Learning cont.

FINAL EXAM: THU DEC. 12, 12:00-2:00pm, SIPA 502