



M.A. Politikwissenschaft

Advanced Quantitative Analysis: Experiments and Causal Inference

Summer semester 2018

Seminar dates: Tuesdays, 10.04.2018, 17.04.2018, 24.04.2018, 08.05.2018, 15.05.2018, 29.05.2018, 05.06.2018

Seminar times: 16:00 – 19:00 h

Room: [Gebäude \(107b\), PC-Pool B III](#)

Instructor:

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Guest lecturer (sessions 4 & 6):

Dr. Bruno Castanho Silva
Cologne Center for Comparative Politics

1 Summary

This course provides an overview of different advanced quantitative methods that are used in political science to draw inferences about causal relationships from large-N data. The methods are discussed based on applications to topics of political behavior and representation in European politics, and students are expected to pursue a research project (e.g. M.A. thesis or thesis preparation, research paper during Ph.D.) related to European politics. All applications will focus on the identification of causal effects. For instance, we will ask questions like: 'Can political elites causally influence what people think about the EU?' or 'Does education really lead to more political participation?' or 'Did the European debt crisis make citizens more detached

from democracy?’ In each case, we will critically assess with appropriate methods whether a relationship is really causal or just coincidental.

The first part of the course will be dedicated to experimental methods as the ‘ideal’ or ‘gold standard’ for causal inference in the social sciences. We will focus on survey experiments as probably the most burgeoning class of experiments in political science as well as one that is comparatively easy to implement for students. In the second part of the course, we will review several causal inference methods for observational data that attempt to mimic the experimental ideal in various ways. These include matching methods, instrumental variables, synthetic control, and regression discontinuity designs. With regard to each method covered in the course, we will address its theoretical foundations and assumptions, practical considerations and challenges, critical discussions of applications, implementation in software as well as interpretation of results.

2 Goals

This course prepares students to conduct their own empirical research project for an M.A. thesis or a Ph.D. paper/chapter using an advanced experimental or observational causal inference method. Students will learn how to conduct their own (online) survey experiments on questions of political behavior and representation in Europe. They will also learn how to apply a plethora of popular causal inference methods for observational data to answer such research questions. By completion of the course, students should have developed a fully-fledged research design with an identification strategy addressing their research question.

3 Prerequisites

While this is a course in advanced quantitative methods, no prior knowledge of experimental or causal inference methods is expected. A basic understanding of quantitative methods (e.g. multiple regression analysis) is an asset, but students with strong motivation may also acquire this knowledge in parallel to the course. The first session of the course will provide a quick review of multiple regression analysis. A basic understanding of research design in political science is assumed. Some prior familiarity with the *R* software is an asset; some familiarity with *STATA* is helpful.

4 Organization of classes

In the first class on 10.04.2018, students are asked to **present a preliminary research question** (1-2 minutes) for a project (e.g. M.A. thesis or research paper) in which they would like to identify a causal effect in a more advanced way than through standard regression analysis. Ideally, this question will relate to a scholarly debate in which claims about causality are important. **Research questions must relate to European politics** broadly conceived (e.g. politics in European democracies and at the EU level). Students will advance their question and possible identification strategy during the course of the semester. From the second session onwards, classes will have the following structure (with some variation in the lengths of each component depending on topic):

- 30 minutes discussion of a paper from a field of European politics that applies the method addressed in the *last session*
- About 75 minutes lecture and discussion on a new method
- About 75 minutes computer lab with an application example of the new method and discussion of the results (using either *R* or *STATA*)

Students must read *pre-class readings* before they come to class. These readings introduce the method and, where applicable, controversial aspects of it. Students must read *post-class readings* before the next class. This will be a prominent research paper using the method. We will discuss the strengths and weaknesses of this paper in the beginning of the next class.

5 Assessment

Active participation in class is expected. Students will be assessed based on the following works:

- **Take-home exam (50%):** An exam paper will be handed out by 15.05.2018. The exam will ask students to answer several questions about different methods as well as perform statistical analyses on provided data and interpret the results. The exam paper is due on 08.06.2018.
- **EITHER research design OR analysis report (50%):** Students can choose between one of the following options that must be submitted by 29.06.2018...
 - A **detailed research design (3,000-4,000 words)** in which they further develop their research question (on a topic of European politics), establish the relevance of causality for this question, consider different possible identification strategies, and outline a specific identification approach (including data and method) that they view most viable and promising.
 - A **(pre-)analysis report (3,000-4,000 words)** in which they present (first) empirical results from a project (in European politics) applying one of the methods covered in the course as well as discuss limitations and possibilities for improving causal identification in the next steps.

Students can obtain '**bonus points**' that improve their grade by submitting written criticisms, comments and questions about the post-class reading to the instructor via e-mail before the next class. These contributions will structure the discussion of the post-class reading at the beginning of the next class. For each session, the best contributions will be awarded with one bonus point, with up to 50% of the students being able to obtain a bonus point per session.

6 Syllabus

The following two textbooks cover several topics of the course and can be used as reference throughout:

- Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

- Rosenbaum, Paul R. 2010. Springer Series in Statistics *Design of Observational Studies*. New York: Springer.

Session 1 **The ‘Potential Outcomes Framework’ and the ‘Experimental Ideal’**

(10.04.2018)

This session reviews multiple regression and introduces the topic of causal inference. It presents the ‘potential outcomes framework’ of Neyman and Rubin and formulates the fundamental problem of causal inference on this basis. Building on these foundations, we will see how randomization in experiments enables the identification of causal effects.

Key themes: potential outcomes, counterfactual, selection bias, observables and unobservables, SUTVA, ATE, ATT, spillover

Pre-class reading:

Chapter 2 in Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist’s Companion*. Princeton: Princeton University Press.

Holland, Paul W. 1986. “Statistics and Causal Inference.” *Journal of the American Statistical Association* 81(396): 945–60.

Gerber, Alan S., and Donald P. Green. 2008. “Field Experiments and Natural Experiments.” In *The Oxford Handbook of Political Methodology*, Oxford: Oxford University Press, 357–79.

Post-class reading:

Foos, Florian, and Eline A. de Rooij. 2017. “All in the Family: Partisan Disagreement and Electoral Mobilization in Intimate Networks – A Spillover Experiment.” *American Journal of Political Science* 61(2): 289–304.

Session 2 **Survey Experiments (I): Understanding and Influencing People’s Preferences**

(17.04.2018)

Experimental designs embedded into (online) surveys become increasingly popular in political science, especially in the field of political behavior. We discuss the justification for such experiments and review some of the commonly used designs that aim at either understanding or influencing respondents’ political preferences. These designs include so-called ‘stated preference’ (or conjoint and vignette) experiments as well as ‘priming’ or ‘framing’ experiments.

Key themes: vignette, conjoint, factorial design, balance tests, no carryover effects, no profile order effects, AMCE

Pre-class reading:

Berinsky, Adam J., Gregory A. Huber, and Gabriel S. Lenz. 2012. "Evaluating Online Labor Markets for Experimental Research: Amazon.com's Mechanical Turk." *Political Analysis* 20(3): 351–68.

Hainmueller, Jens, Daniel J. Hopkins, and Teppei Yamamoto. 2014. "Causal Inference in Conjoint Analysis: Understanding Multidimensional Choices via Stated Preference Experiments." *Political Analysis* 22(1): 1–30.

Tilley, James, and Sara B. Hobolt. 2011. "Is the Government to Blame? An Experimental Test of How Partisanship Shapes Perceptions of Performance and Responsibility." *The Journal of Politics* 73(2): 316–30.

Post-class reading:

de Vries, Catherine E. 2018. "Change or Die?" In *Euroscepticism and the Future of European Integration*, Oxford: Oxford University Press, 183–203.

Session 3
(24.04.2018)

Survey Experiments (II): Eliciting Sensitive Preferences

People tend to lie to pollsters about certain political preferences and activities (e.g. racist attitudes, turnout). We review 'list or item-count' and 'endorsement' survey experiments that attempt to elicit people's 'true' preferences and behaviors. We also discuss statistical power and sample size calculation as a key issue in experimental research taking list experiments as an illustrative example.

Key themes: social desirability bias, no design effects, ceiling/floor effects, difference-in-means estimator, ML estimator, sample size/power simulations

Pre-class reading:

Glynn, Adam N. 2013. "What Can We Learn with Statistical Truth Serum? Design and Analysis of the List Experiment." *Public Opinion Quarterly* 77(S1): 159–72.

Blair, Graeme, and Kosuke Imai. 2012. "Statistical Analysis of List Experiments." *Political Analysis* 20(1): 47–77.

Coppock, Alexander "10 Things To Know about Statistical Power", on EGAP website: <http://egap.org/methods-guides/10-things-you-need-know-about-statistical-power>

Post-class reading:

Cappelen, Cornelius, and Tor Midtbø. 2016. "Intra-EU Labour Migration and Support for the Norwegian Welfare State." *European Sociological Review* 32(6): 691–703.

Session 4 **From Experimental Designs to their Imitation in Observational Studies**

(08.05.2018)

To conclude with experiments, we discuss best practices for the implementation of survey experimental designs (including randomization techniques). We then move on to see how the experimental ideal travels to the world of observational data. ‘Matching methods’ construct treatment and control groups from observational data. In the absence of randomization, balance on observables can be achieved but unobservable confounders are a threat to causal inference.

Key themes: effect duration, mutual causation, block randomization, selection on observables, common support, exact matching, propensity score matching, matching with and without replacement

Pre-class reading:

Gaines, Brian J., James H. Kuklinski, and Paul J. Quirk. 2007. “The Logic of the Survey Experiment Reexamined.” *Political Analysis* 15(1): 1–20.

Imai, Kosuke, Gary King, and Elizabeth A. Stuart. 2008. “Misunderstandings between Experimenters and Observationalists about Causal Inference.” *Journal of the Royal Statistical Society* 171(2): 481–502.

Chapter 15 in Imbens, Guido W., and Donald B. Rubin. 2015. *Causal Inference for Statistics, Social, and Biomedical Sciences. An Introduction*. Cambridge: Cambridge University Press.

Post-class reading:

Persson, Mikael. 2014. “Testing the Relationship Between Education and Political Participation Using the 1970 British Cohort Study.” *Political Behavior* 36(4): 877–97.

Session 5 **Instrumental Variables**

(15.05.2018)

If there exists a third variable that influences the independent variable but has no direct influence on the dependent variable, this variable can assist in estimating the causal effect of the independent on the dependent variable (for complying units that are nudged by the instrument). We introduce instrumental variable estimations with political science examples and discuss the relevant identifying assumptions.

Key themes: relevance of instrument, exclusion restriction, monotonicity (no defiers), encouragement design, LATE, 2SLS

Pre-class reading:

Chapters 4.1 & 4.4 in Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

Sovey, Allison J., and Donald P. Green. 2011. "Instrumental Variables Estimation in Political Science: A Readers' Guide." *American Journal of Political Science* 55(1): 188–200.

Kern, Holger Lutz, and Jens Hainmueller. 2009. "Opium for the Masses: How Foreign Media Can Stabilize Authoritarian Regimes." *Political Analysis* 17(4): 377–99.

Post-class reading:

Gabel, Matthew, and Kenneth Scheve. 2007. "Mixed Messages: Party Dissent and Mass Opinion on European Integration." *European Union Politics* 8(1): 37–59.

Session 6 **Synthetic Control**

(29.05.2018)

In comparative politics, many treatments occur as interventions over time that affect a few or a single unit (e.g. countries). For these units, often no plausible control units exist, because all available candidates differ on important observables. However, a 'synthesized' control unit can be constructed as a weighted combination of units from an untreated 'donor pool'. The causal effect of the treatment can then be identified by comparisons between treatment and synthetic control unit pre and post treatment. We review the fundamentals of the synthetic control method and consider its roots in the difference-in-differences logic.

Key themes: parallel trends, donor pool, synthetic control weights, placebo tests

Pre-class reading:

Chapter 5 in Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

Abadie, Alberto, and Javier Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *The American Economic Review* 93(1): 113–32.

Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. 2015. "Comparative Politics and the Synthetic Control Method." *American Journal of Political Science* 59(2): 495–510.

Post-class reading:

Armingeon, Klaus, Kai Guthmann, and David Weisstanner. 2016. "How the Euro Divides the Union: The Effect of Economic Adjustment on Support for Democracy in Europe." *Socio-Economic Review* 14(1): 1–26.

Session 7 **Regression Discontinuity Designs**

(05.06.2018)

Sometimes technical or bureaucratic thresholds with regard to a covariate score create some 'discontinuity' or 'jump' in the probability of receiving a treatment. If being above or below the threshold can hardly be controlled by the units, assignment to treatment is 'as good as random' around the threshold, which allows the estimation of a local causal effect of the treatment. We review basic regression discontinuity designs in political science. We also wrap up the course.

Key themes: sharp rule, forcing variable, no sorting, polynomial and local regression, bandwidth selection, placebo tests

Pre-class reading:

Chapter 6.1 in Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

Lee, David S. 2008. "Randomized Experiments from Non-Random Selection in U.S. House Elections." *Journal of Econometrics* 142(2): 675–97.

Eggers, Andrew C., Ronny Freier, Veronica Grembi, and Tommaso Nannicini. 2017. "Regression Discontinuity Designs Based on Population Thresholds: Pitfalls and Solutions." *American Journal of Political Science* 62(1): 210–29.